

GOVERNMENT CONTROL OF RADIO COMMUNICATION

HEARINGS

BEFORE

THE COMMITTEE ON THE MERCHANT MARINE AND FISHERIES

HOUSE OF REPRESENTATIVES

SIXTY-FIFTH CONGRESS

THIRD SESSION

ON

H. R. 13159

A BILL TO FURTHER REGULATE RADIO COMMUNICATION

DECEMBER 12, 13, 17, 18, AND 19, 1918



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GOVERNMENT CONTROL OF RADIO COMMUNICATION.

COMMITTEE ON MERCHANT MARINE AND FISHERIES,
HOUSE OF REPRESENTATIVES,
Washington, D. C., December 12, 1918.

The committee met at 10 o'clock a. m., Hon. Rufus Hardy presiding.

The committee then proceeded to the consideration of the bill H. R. 13159, which is here printed in full, as follows:

[H. R. 13159, Sixty-fifth Congress, second session.]

A BILL To further regulate radio communication.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled. That when used in this act—

The term "signals" means the signals used in communication by any electrical system or method without the aid of a wire or other conducting connections;

The term "radio station," means any place, vessel or vehicle containing apparatus used, or capable of being used, for transmitting or receiving signals;

The term "experiment station" means a radio station actually used for conducting experiments for the development of the science of radio communication or the apparatus appertaining thereto, and used for no other purpose except as a technical and training school station;

The term "technical and training school station" means a station actually used for purposes of instruction in radio communication and of training operators, and used for no other purpose except as an experiment station;

The term "person" includes partnerships, corporations, and associations.

SEC. 2. That the President shall requisition and take permanent possession of, for the use of the Government, every radio station on land or on a permanently moored vessel, now in existence within the jurisdiction of the United States or any of its possessions, other than experiment stations, technical and training school stations, and stations belonging to the United States or the Government of the Philippine Islands.

SEC. 3. That no person shall maintain or operate, on land or on a permanently moored vessel, (first) within any State any radio station capable of being used, (a) for the transmission of signals, the effect of which extends beyond the jurisdiction of such State or causes interference with the transmission or receipt of signals to or from any place beyond the jurisdiction of such State, or (b) for the receipt of signals which originate outside such State, or (second) any radio station within any Territory, district, or possession of the United States. This section shall not apply to experiment stations and technical training school stations duly licensed, as provided by the act to regulate radio communication, approved August thirteenth, nineteen hundred and twelve, and stations belonging to the United States or the Government of the Philippine Islands. Whoever violates this section shall be punished by a fine of not more than \$600 for the first offense, and by a fine of not more than \$1,000 or imprisonment for not more than one year, or both, for each subsequent offense; and any radio apparatus operated in violation of this section shall be forfeited to the United States.

SEC. 4. That from the date of the passage of this act the Secretary of the Navy shall be charged with the execution of the provisions of the act approved July twenty-third, nineteen hundred and twelve, amending section one of an act entitled "An act to require apparatus and operators for radio communication on certain ocean steamers," approved June twenty-fourth, nineteen

hundred and ten, with the act entitled "An act to regulate radio communication," approved August thirteenth, nineteen hundred and twelve, and any amendments to the said acts, and the provisions of the International Radiotelegraphic Convention, signed in London in nineteen hundred and twelve and proclaimed by the President July eighth, nineteen hundred and thirteen, and future international radiotelegraphic conventions or treaties which may be ratified by the United States, except in so far as the provisions of the above-mentioned act, conventions, or treaties apply to stations operated by other departments of the Government of the United States or by the government of the Philippine Islands.

Sec. 5. That the Secretary of the Navy may issue special licenses, subject to such conditions and restrictions, and for such periods, as he deems proper, for the establishment and operation of stations for special emergency use in cases where no other rapid means of communication are available. Any violation of such conditions and restrictions shall constitute cause for revocation of the license without compensation therefor, and the owners of such station shall be punished by a fine of not more than \$500 or by imprisonment for not more than one year, or both.

Sec. 6. That when the United States is at war or when war is threatened, or during any war in which the United States is a neutral nation, or during any national emergency, such fact being evidenced by the proclamation of the President—

(a) The President may issue regulations for the conduct and censorship of all radio stations and radio apparatus within the jurisdiction of the United States or of any of its possessions. Whoever knowingly violates any such regulation shall be punished by a fine of not more than \$10,000 or by imprisonment for not more than three years, or both, and in case of any violation the radio station or apparatus shall be forfeited to the United States; and

(b) The President may cause the closing of any radio station on land or on a permanently moored vessel within the jurisdiction of the United States or any of its possessions and the removal therefrom of any radio apparatus, or may authorize the use of the station or its apparatus by the United States.

The regulations for the conduct and censorship of radio stations, the closing of a radio station, and the removal of apparatus therefrom shall continue no longer than the duration of such war or emergency. The fact that the war or emergency has ended shall be evidenced by the proclamation of the President.

Sec. 7. That if, in the opinion of the Secretary of the Navy, the operation of any radio station would interfere with the receipt of signals by radio stations belonging to the United States or the government of the Philippine Islands, or by radio stations on shipboard, or would be otherwise prejudicial to the interests of the United States, no license under the act entitled "An act to regulate radio communication," approved August thirteenth, nineteen hundred and twelve, shall be issued to such station, and any such license already issued to such station shall be revoked or suspended for such time as the Secretary of the Navy may prescribe.

Sec. 8. That when any radio station is requisitioned, taken possession of temporarily or permanently, or closed, or its license revoked or suspended, the United States shall pay to the persons interested therein just compensation for the property or interest so taken, provided that a claim for such compensation is made on the Secretary of the Navy, within two years after the date of passage of this act. In case of disagreement as to such just compensation, the Secretary of the Navy shall make an offer, and if such offer is not accepted there shall immediately be paid to the person interested three-quarters of the amount offered. The person interested shall be entitled to sue the United States to recover the balance justly due, in the manner provided by section twenty-four, paragraph twenty, and section one hundred and forty-five of the Judicial Code. An amount sufficient to pay such just compensation is hereby permanently appropriated out of any money in the Treasury not otherwise appropriated.

Sec. 9. That all radio stations taken possession of by the President shall be operated under the direction of the Secretary of the Navy.

Sec. 10. That the Secretary of the Navy shall, so far as may be consistent with the transaction of Government business, open naval radio stations to general public business under regulations prescribed by him and shall fix the rates for such service. He shall establish special rates for the handling of press dispatches by transoceanic or other special stations. The receipts from such services, less an amount not to exceed twenty-five per centum per annum for expenses, shall be turned into the Treasury as miscellaneous receipts.

Mr. HARDY (presiding). Gentlemen, we have practically a quorum present, and unless there is some objection we will proceed with the hearing.

Mr. GREENE. I can see no objection, Mr. Chairman.

Mr. HARDY. I see Mr. Secretary Daniels is present. This bill is presented by the Navy Department, I believe, in a large measure. Mr. Secretary, will you direct the hearing in such order as you wish it, presenting your views in the manner you desire?

STATEMENT OF HON. JOSEPHUS DANIELS, SECRETARY OF THE NAVY.

Secretary DANIELS. Mr. Chairman, this is a bill that would give the Navy Department the ownership, the exclusive ownership, of all wireless communication for commercial purposes. The history of wireless communication during this war has illustrated that there ought to be only one agency in control of wireless. This is not wrapped up with and has no connection with the question of Government ownership of public utilities, because wireless plants are apart from other means of communication and all other public utilities. It is the only method of communication which must be dominated by one power to prevent interference. That has been well demonstrated in this war, and it is true in time of peace, as well as in times of war.

I had a talk only a few days ago with Senator Knox, the former Secretary of State, speaking about the value of the wireless, and he said that when he was Secretary of State he felt the very great need then that the Government itself should own and operate all wireless communication, and he so recommended. I think that is true of all men who have been in either the Navy Department or the State Department.

The question of interference does not come in at all in the matter of cables or telegraphs, but only in wireless. We strongly believe that, having demonstrated in the war the excellent service and the necessity of unified ownership, we should not lose the advantage of it in peace, and while we are coming around, we hope and believe, to what will be a permanent peace, this Republic ought not to fail to be prepared to prevent communications from any country into this Republic which can not be controlled. Our experience at Sayville and Tuckerton, and with other wireless services owned in part or in whole by governments that were not at peace with us, or at harmony with us, is an illustration of the need. We ought to be able, through one agency of Government, to direct, to control, and to accelerate communication by radio.

I hope, Mr. Chairman, that what I now say will not be regarded as giving too much praise to the Navy. In saying this I do not give myself the praise, because we have an organization in the radio service that has fulfilled its purpose in so excellent a way as not only to win the commendation of our country but all the countries during this war. That service is so well prepared to undertake this work and to carry it on that I think we would lose very much by dissipating it and opening the use of radio communication again to rival companies.

The cessation of hostilities makes possible the publication of the remarkable story of the handling of radiotelegraphy by the Navy

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during the period of the war. The public has been deeply interested in the story of the part played by the Navy in the transportation of our army of 2,000,000 men to Europe, and of the monumental achievement of laying a mine barrage across the North Sea to bottle up the Hun submarines. The work of the Navy is not confined to the sea. Already the story of the huge mobile batteries manned by blue jackets has been told, and the part played by the heroic land forces of the Navy, the Marine Corps, is now part of the imperishable history of our country. At this time, then, it is very appropriate that the story of radiotelegraphy in the Navy be told. For a proper conception of the magnitude of the task and the perfection of the system evolved, it is necessary to realize how chaotic was the state of affairs at the beginning of the art.

When Marconi first began his epoch-making experiments with radiotelegraphy it was regarded by the public largely as a new curiosity. In certain quarters the true possibilities of the apparatus and the apparent erratic nature of the results prevented a true realization of its possibilities. The use of radio by the Russian and Japanese fleets in the Russo-Japanese war was its first application to the use which was eventually to overshadow all others. As the results accomplished became better known the danger from injudicious use was appreciated, and an international radiotelegraphic conference was held in Berlin in 1906 for the purpose of promulgating regulations regarding its use. The development of the art was so rapid that these regulations were found inadequate during the next few years, and a second international conference was held in London in 1912. The United States was represented at this convention by 13 delegates.

The sudden growth of radio and its spectacular and fascinating possibilities led to various wildcat schemes, the most notorious being the United Wireless Co., whose failure caused the loss of thousands of dollars to investors in all parts of the country. The amateur radio operator had made his appearance also, and shortly before the London convention it was realized that laws for the control of radio in the United States were imperative. Accordingly, on June 24, 1910, an act was approved which rendered radio apparatus and operators compulsory on passenger vessels. This was supplemented by an act approved August 13, 1912, which provided for the licensing of all transmitting stations and imposed fines for violations of certain specific regulations. The Navy Department played an important part in the framing of this law. It was early realized that the importance of radio for controlling the movements of naval vessels in war time was of paramount interest to the country, hence provision was made for an executive proclamation in time of war, which would enable the proper use and supervision of radiotelegraphy in war time.

Mr. GREENE. What was the date of that proclamation?

Secretary DANIELS. April, 1917; in that month some time. It was soon after we entered the war. I am informed the first was April 6 and the second April 30. I will incorporate these two orders in the hearings so you will have them.

Even these regulations, however, were far too lenient. An evidence of this is the fact that a German company was able to remain

in control of the powerful station at Sayville, which was undoubtedly of the greatest value to Germany. This station broadcasted information as well as sending unneutral messages to the cruisers *Dresden* and *Karlsruhe*. To prevent repetition, it was necessary to station naval operators at this station with a naval officer as censor.

The loss of the *Titanic* and the publication of results obtained by amateur operators in intercepting messages concerning this disaster proved a tremendous stimulus to the amateurs, and such stations began to multiply rapidly. Even when such stations complied strictly with the law, it was found that a large amount of interference with naval and commercial work resulted, particularly in congested centers such as New York.

Immediately after the United States declared war against Germany the provisions of the law of 1912 were invoked, and an Executive proclamation was issued, closing all stations not necessary for naval communications and delegating the control of all other stations except Government to the Secretary of the Navy.

Under the provisions of this proclamation, the Navy took charge of practically all radiotelegraphy in the country, and notable advances in the art have been made, especially in long-distance work. I wish to emphasize that, because there is a very prevalent, but false, notion that when the Government is in control of important functions important developments are not made. The contrary is true. The elimination of interference by centralizing the control has been productive of the most excellent results. "Duplex telegraphy" has been possible to an extent never before contemplated. In compliance with the recommendation of an interallied radio commission, several "receiving centers" were established on the Atlantic coast, at points remote from high-power transmitting stations, and these were connected by wire with the main control station in Washington. At the present time the principal receiving stations are Belmar, N. J., and Otter Cliffs, near Bar Harbor, Me. These stations are connected with Washington by wire, messages being forwarded by wire as soon as received. From the control station the four high-power transmitting stations at Annapolis, Sayville, Tuckerton, and New Brunswick have been operated by distant control, it being possible for all to transmit simultaneously. Similar arrangements have been provided in Great Britain, France, and Italy, it being possible to maintain continuous communication with Carnarvon, Lyons, Nantes, and Rome, all stations transmitting and receiving continuously. It is frequently the case that a message is filed at Washington, transmitted by distant control from one of the high-power stations, and the acknowledgment received through Otter Cliffs within 10 minutes. In addition to receiving from allied stations, the receiving stations found it practicable to receive all messages sent on long waves from Nauen, including the dispatches to President Wilson regarding the armistice. Replies to these dispatches were made by radio direct to Nauen, addressed to the Swiss minister, as well as by cable.

Information was early received that the enemy was making extensive preparations for the cutting of cables for the purpose of interrupting communications with our forces in Europe. Three cables were actually interrupted, and excellent evidence is at hand that enemy influences were responsible. Fortunately this was the ex-

tent of the damage, and radiotelegraphy was not called upon to assume the whole burden of the cable traffic, often 200,000 words per day in each direction. However, a large amount of press and of routine official business was transmitted by radio, thus materially reducing the load on the cables. At no time was it necessary for the trans-Atlantic radio service to be worked to its full capacity.

Communication with the United States was matter of much concern to Gen. Pershing. At his urgent recommendation that the radio stations be prepared to take over the work of the cables, plans were made for the erection of the most powerful radio station in the world at Bordeaux, France, which will be known as the "Lafayette" station. The site, the transportation facilities in France, and the foundations for the towers were provided by France; the United States Navy assumed the designing of the station, the construction of the towers and apparatus, and the erection of the station. The power of the station will be 1,200 kilowatts. It is not yet completed, but when finished it will provide absolutely reliable trans-Atlantic communication at any season of the year.

In addition to the construction of this enormous station the Navy has found it possible to furnish the Cuban Government 18 steel towers for radio stations, and the necessary apparatus. Also three radio stations have been designed, constructed, and placed in operation for the Republic of Panama.

As soon as war was declared plans were made for the training of radio operators on a scale never before known. Preliminary schools were established in the various naval districts which served as feeders for the main schools at Harvard and Mare Island. The Harvard school has a capacity of nearly 4,000 students, men being graduated at present at the rate of about 180 per week. This large supply of operators made it possible for the Navy to supply radio operators to all trans-Atlantic merchant vessels, in addition to the large number of operators required for naval vessels and naval shore stations. In addition to operators the Navy supplied all merchant vessels with codes and with instructions for the use of radio in war time. In order to prevent any improper use of radio the radio apparatus on merchant vessels not supplied with naval operators was sealed while in port.

To obviate the necessity of a vessel at sea using her transmitting apparatus and thus disclosing her location, a broadcasting system was inaugurated, whereby messages to all vessels, naval and merchant, were transmitted "into the air" at certain designated times, all vessels being instructed to copy all those messages.

To provide for necessary communications between masters of merchant vessels and owners or agents, arrangements were made for certain naval shore stations to handle such messages when properly coded. Such messages were forbidden in the Atlantic north of Jupiter, Fla., when submarine operations commenced off our coast.

To assist in the enforcement of the regulations concerning the use of radio, 37 "intercepting stations" were established on the Atlantic coast, each of which forwarded to the Navy Department each day a complete record of all radio messages intercepted during the 24 hours. Those "logs" were carefully examined for evidence of transmission by merchant vessels which would enable a submarine

equipped with a radio compass to determine her location, as well as for evidence of enemy signals. In the case of violations by merchant vessels not provided with naval operators, an interview with the master was arranged at the next port of call, in order that the proper procedure might be explained to him. Certain merchant vessels were furnished naval "communication officers," in addition to the radio operators, to handle the coding and decoding of all messages.

A comprehensive system of radio compass stations was installed, and arrangements were made whereby those stations would work in pairs for locating suspicious or enemy stations. It was also arranged that the use of those stations in peace time for furnishing bearings to vessels at sea or to aircraft would be a part of their regular duties.

Radio telephones were perfected and installed on a large number of seaplanes, submarine chasers, etc., and have proven invaluable for such craft. Radio operators were also given a special course of instruction in the use of modern listening devices for the detection of the presence of submarines.

In cooperation with the Committee on Public Information a free press service to various foreign countries was instituted. This press service was copied in Central and South America and even in China, and was the means of combating the extensive wireless propaganda of Germany.

The operation of the Radio Service has proven so satisfactory that the purchase of all the shore radio stations of the Federal Telegraph Co. and the Marconi Wireless Telegraph Co. of America, except the four high-power stations of the latter, has recently been announced.

This at once increases the number of naval shore stations from 58 to 111; the Navy Department now owns all of the radio stations in the United States and its possessions formerly used for commercial radio traffic, with the exception of 16 privately owned commercial stations. Of these 16 stations 5 are low-power radio stations located in the Hawaiian Islands and used for intercommunication between the islands. Four of the remaining 11 stations are high-power stations erected and owned by the Marconi Co. One of these is located in California and one in Hawaii. Before the declaration of war by this country these two stations were used for handling messages between Hawaii and the United States and Japan. The two Marconi high-power radio stations located on the Atlantic coast have never been used for commercial traffic, and one of these stations has never been in operation at all.

This purchase means that the Marconi Co. has gone out of business of handling ship to shore radio messages, and this business has been turned over to the Navy Department, by whom it will be handled in future. The Navy will have the advantage of using not only its coast stations previously established, but also the Marconi stations now purchased, which are scattered along the coasts of the Atlantic and Pacific, Gulf of Mexico, and the Great Lakes, as well as the stations that the Navy Department recently purchased from the Federal Co.

The Navy has handled commercial radio traffic since 1912 with great success. Always equipped with the most modern apparatus, the ships and shore stations of the Navy have afforded the most reliable means of communication, and vessels of all nations have

made use of the service. Even during the war, with rigid restrictions regarding the use of radio in effect, thousands of dollars have been turned into the Treasury of the United States as receipts from the commercial radio traffic of the Navy. Since the commercial service of the Navy is not designed for profit, but for the purpose of keeping the operators always in training, it is possible to provide very low rates for the service.

One of the most profitable activities of the Navy during the war has been the study of the file copies of the radio messages handled by the Sayville and Tuckerton stations with German stations—Nauen and Eilvese—prior to April 7, 1917. In cooperation with the office of the Alien Property Custodian, millions of dollars worth of German-owned property was confiscated. One message alone enabled the Alien Property Custodian to seize \$10,000,000 worth of German-owned ships, and another message enabled that officer to secure for the Navy Department the high-power station at Sayville. Another interesting fact concerning these stations is that a large sum of money, representing the receipts of these stations while under Navy supervision prior to April 7, 1917, was invested in liberty bonds, despite the protest of the German agent, now located in an internment camp.

Although the science of radio communication has continued to advance, the great increase, present and prospective, in the number of vessels on our coasts and the consequent increase in radio communication on many different wave lengths, continues to demonstrate the necessity for unified control under the Navy Department of all radio communication to prevent interference. The recent purchase will go very far toward accomplishing this end so far as ship to shore communication is concerned.

It was at one time suggested that if the Navy Department took over handling of commercial radio communication it would not be in a position to provide operators or proper inspection and repair of sets aboard ship to maintain commercial service. But, as stated above, since the outbreak of the war the Navy Department has established large radio schools, and has turned out from these schools several thousand operators, who are now manning not only all of the regular naval vessels and vessels temporarily in the naval service, but are also manning almost all other vessels flying the American flag, except some engaged in the coast trade. The department has also established at various ports repairs bases, at which radio sets on board merchant ships, as well as naval vessels, can be regularly inspected and kept in order until such time as the ship owners provide facilities for carrying on this work. The Navy is, therefore, thoroughly prepared to handle every phase of the commercial radio traffic between ship and shore which it has now taken over.

In addition to the above, there is at present a bill before Congress (H. R. 13159) providing for the permanent Government ownership of all commercial shore radio stations, the control of the stations to be delegated to the Secretary of the Navy. Provision is made in this bill for experimental stations and amateur stations, and the inspection and licensing of such stations, formerly under the supervision of the Department of Commerce, is delegated to the Secretary of the Navy. As the Navy already owns all but 16 of the commercial shore stations, the passage of this bill will secure for

all time to the Navy Department the control of radio in the United States, and will enable the Navy to continue the splendid work it has carried on during the war.

Mr. Chairman, Capt. Todd, the director of communication, is here with me—

Mr. GREENE. I would like to ask the Secretary a question or two.

Mr. HARDY. Have you finished with your preliminary statement? Secretary DANIELS. I have finished that; yes.

Mr. GREENE. Mr. Secretary, I understood you at the opening of your remarks to say that this was not intended to be the establishment of Government ownership. It seems that your statement—undoubtedly prepared, of course, by a gentleman who has been acquainted with newspaper work—discloses from beginning to end, over and over, Government ownership, Government control—

Mr. EDMONDS (interposing). Government monopoly.

Mr. GREENE. Government monopoly, contrary to any control that we hoped for years to establish under the Sherman antitrust law. This becomes an immense trust, and it also becomes, according to my view of it, the establishment of the Department of the Navy in the commercial business.

There are a number of gentlemen here that have had some experience in radio communication. I never have heard before that it was necessary for one person to own all the air in order to breathe; we all breathe more or less. And I believe that radio business has been and can be carried on without Government monopoly. We all admit that during the war it is a very proper thing to have absolute control, but now in times of piping peace, it seems to me there is a great opportunity to obtain advancement in the radio service even outside of the Navy Department. I do not think all the wisdom is contained there; it has not been heretofore, and I do not think it is all contained there now.

So I think there ought to be careful consideration of a proposition as broad as this bill is. This is absolute Government control, and it is almost a test as to whether this Government is to enter upon Government control. I must say that I must protest against what the Secretary has said about this not being a proposition for Government control.

Mr. HARDY. I think you misunderstand the Secretary, Mr. Greene. He said it was not connected with the Government control of public utilities.

Mr. GREENE. Well, this radio is a public utility of the highest kind.

Mr. HARDY. There is not any question as to the position of the Secretary with reference to this particular proposition.

Mr. GREENE. And if it is to be controlled for commercial purposes, it should be controlled by the Department of Commerce rather than by the Department of the Navy. In time of war I would permit the Navy Department to have everything they need, and they have had it, and they have had all the advantage of the number of men who have enlisted in the Navy for the purpose of extending the radio service. I know of men in my own city who were pronounced amateurs; yet they have some brains, and they have improved their brains and have improved their apparatus.

Mr. HUMPHREYS. Mr. Chairman, why would it not be a good idea to hear the evidence before we submit the argument to the jury?

Mr. EDMONDS. I would like to ask the Secretary a few questions.

Secretary DANIELS. Will you permit me to say a few words first? My preliminary statement was misunderstood, my distinguished friend—

Mr. GREENE (interposing). Well, that is what you said.

Secretary DANIELS. I think if you will look at the notes you will see that I said—

Mr. GREENE (interposing). But corrections will be made in the notes.

Secretary DANIELS. No; as I said it. I do not think I made myself quite clear. I said I hoped this bill would not be confounded with any general proposition for Government ownership of public utilities, because that was a question that might well be debated and ought not to be settled hastily as to the great public utilities which can operate without interference; but the radio stood separate and apart from anything else in that the air is the medium through which the communication is carried on and that can not be controlled, and interferences may be had, and the only safe thing about radio communication is that only one concern should control and own it.

Now, I beg to say that I do not claim for the Navy, although we admit freely the excellent—

Mr. GREENE (interposing). Oh, I am not saying anything against their excellence at all, against what they have accomplished.

Secretary DANIELS. I did not claim for the Navy that it had made through its officers, expert as they are, all of the great discoveries in radio. Our purpose all through has been to cooperate most cordially and to secure the advantage of all the inventions and ideas of men in civil life.

Mr. HARDY. Will you permit me just to make this statement? Judge Alexander had arranged to let those who offered this bill be heard at this time, and for those who opposed it to be heard commencing next Tuesday. He being sick, it is my desire to carry out that part of the program.

In the meantime, to shorten matters, I suggest that instead of discussing the merits of the bill, as members of the committee we simply ask questions for information as the witnesses come before us, and not attempt to discuss the merits of the bill, which we will do in executive session.

Mr. EDMONDS. That is what I was going to suggest.

Mr. HARDY. What we want now is the facts.

Mr. LEHLBACH. Mr. Secretary you have referred several times to obviating interferences. Will you not be good enough to inform us, or inform me—I suppose other members of the committee understand it—just the character of the interferences that are to be obviated, the nature of them, and what they are due to?

Secretary DANIELS. I will ask Capt. Todd, who is the Director of Naval Communications, to answer that question, because he is an expert in that subject.

Mr. EDMONDS. Mr. Lehlbach, will you not let Capt. Todd answer that question in his statement?

Mr. LEHLBACH. Very well.

Mr. EDMONDS. I would like to ask you this, Mr. Secretary: Has the department made any estimate of what the cost of this would be?

Secretary DANIELS. Yes; the cost of this would be somewhere in the neighborhood of \$5,000,000.

Mr. EDMONDS. How about patents and the patent rights?

Secretary DANIELS. Well, of course, if any man has a patent or a patent right, the court would determine his rights, but whatever determination the courts might make the Government would pay such royalties as were just and fair to the owners of the patent rights.

Mr. EDMONDS. You have no idea at all what that would be?

Secretary DANIELS. Of course, I can not foretell what the courts would do.

Mr. EDMONDS. But you have a kind of idea that it is going to be a pretty high price, have you not?

Secretary DANIELS. I do not think it will be a very high price.

Mr. EDMONDS. Do you think the Government would be able arbitrarily to settle the cost of those patent rights?

Secretary DANIELS. Arbitrarily?

Mr. EDMONDS. Yes.

Secretary DANIELS. Oh, I think the courts would settle them.

Mr. EDMONDS. The last hearing we had on this measure did not indicate that that would be settled very satisfactorily. Men came here that had patents and they did not seem to be able to get any satisfaction out of the department at all, if I remember correctly.

Secretary DANIELS. Of course, there are various conflicting claims about patent rights. Under this bill no man would lose any right he had of getting such royalty as would be fair.

Mr. EDMONDS. I believe you made the statement that you purchased the Poulsen-De Forest Co. Is that the name of the company?

Capt. TODD. The Federal and Marconi stations.

Mr. EDMONDS. Is not that the De Forest system, too?

Capt. TODD. You are speaking about the Poulsen system?

Mr. EDMONDS. Is not that the Federal system?

Capt. TODD. That is the Federal system.

Secretary DANIELS. We own that; we own everything they claim.

Mr. EDMONDS. You bought everything they claimed?

Secretary DANIELS. And everything they have.

Mr. EDMONDS. Did they want to sell it to you or did you take it?

Secretary DANIELS. We made a contract with them and paid them, and it was very satisfactory.

Mr. EDMONDS. You made the proposition to them? They did not ask you to buy?

Secretary DANIELS. I do not recollect who made the first proposal, but it was certainly satisfactory.

Mr. EDMONDS. As I understood you, it was something over \$1,000,000 you paid for that system?

Secretary DANIELS. Yes; a million and a half.

Mr. LEHLBACH. \$1,600,000.

Secretary DANIELS. \$1,600,000. That included nine stations.

Mr. EDMONDS. When was this purchase consummated?

Secretary DANIELS. About six or seven months ago.

Mr. EDMONDS. Then the Marconi system—you purchased their stations?

Secretary DANIELS. Their shore stations.

Mr. EDMONDS. And when was that consummated?

Secretary DANIELS. Within the last few weeks.

Mr. EDMONDS. Since the armistice was declared?

Secretary DANIELS. It had been under consideration—I think the agreement was made in October.

Commander HOOPER. It was started by the Shipping Board's request to purchase the sets on their ships.

Secretary DANIELS. I wish, Commander Hooper, that while you are speaking you make a statement to the committee about the request of the Shipping Board and the necessity for our doing it.

Mr. EDMONDS. I think that we had better defer that until you make your regular statement.

Why did you buy these different systems?

Secretary DANIELS. As to this one, because we were buying them, I think, at \$1,000 apiece.

Commander HOOPER. We had to get the sets for the Shipping Board, and in order to get them Marconi would not sell unless they sold their shore stations. We wanted the shore stations as part of our system, so there would not be mutual interference, so we finally decided to make one deal out of the whole thing and buy the ship sets and the coastal stations, and then afterwards be reimbursed by the Shipping Board.

Secretary DANIELS. And we needed the shore stations. We have so many ships—I do not know the number of merchant ships we have, but the Navy is manning and furnishing officers for and controlling all the ships that take troops to Europe and bring them back and all the other ships that are doing Army service, and then we furnish these sets to all the Shipping Board ships.

Mr. EDMONDS. What I am trying to get at is this: You had no lack of power during the war to take over these stations and to utilize them in any way you saw fit? Is not that true?

Secretary DANIELS. We had the power; yes.

Mr. EDMONDS. And then you exercised that power, you exercised it gradually, and then you exercised it finally by taking over every station and handling the entire wireless business of the country?

Secretary DANIELS. That is right.

Mr. EDMONDS. And up to the present time and at the present time you still have that power and can exercise it?

Secretary DANIELS. We have.

Mr. EDMONDS. And yet, at the same time, after this committee refused to bring out a bill to purchase wireless apparatus, you utilized the Government's money to purchase this wireless apparatus and took over the commercial systems without the consent of Congress?

Secretary DANIELS. Not at all. We did not act in defiance of Congress, because Congress had not done this. We did it because it was a good business proposition and because we had the funds appropriated by the Naval Committee to make the naval communication service more effective.

Mr. HUMPHREYS. You mean appropriated by Congress?

Secretary DANIELS. Appropriated by Congress.

Mr. HUMPHREYS. You said by the Naval Committee.

Secretary DANIELS. I mean through the naval bill.

Mr. EDMONDS. Yes, but Congress did not have any intention to put you into commercial ownership of radio communication at that time. You did not explain it to the Naval Committee that way.

Secretary DANIELS. We explained to the Naval Committee that this money we desired was for use in perfecting the radio service.

Mr. EDMONDS. Well, I have talked to members of the Naval Committee, and they had no impression at all that you were going to utilize the money for the purchase of radio systems and putting the Government into a commercial business.

Secretary DANIELS. We are compelled to have this for naval business, and as the Navy Department was put in charge of the merchant ships it was a splendid business proposition, and it never occurred to me that I was not following the intent and will of Congress in making this system more efficient.

Mr. HARDY. It seems to me, Mr. Edmonds, that you are indulging in argument.

Mr. EDMONDS. I only want the Secretary to tell me his reasons for handling this business in this way. If there is a good reason for the Government entering into this business, the committee ought to know it.

Secretary DANIELS. There is an act of Congress specifically giving us the authority to handle commercial business.

Mr. EDMONDS. I know you have that act; you had it before the war.

Secretary DANIELS. Oh, yes.

Mr. EDMONDS. If during the war there was anything developed that made it necessary for the Navy Department to purchase these systems, then I would say that you did perfectly right. But in my view, opposing Government monopoly as I do, I do not think that a question of policy like this ought to have been decided by the departments; it ought to have been decided by Congress.

Secretary DANIELS. I think we had perfect authority; if I had not, I certainly should not have exercised it.

Mr. GREENE. Was this authority a general authority, or was it not specific?

Secretary DANIELS. It was general authority.

Commander HOOPER. Mr. Secretary, I can bring out one point there. The Shipping Board at the beginning of the war asked us to provide the radio sets for their ships, as a logical thing to do, and we did it, with everybody in agreement. But there were large numbers of ships and large numbers of sets to be provided, and it was a great job to get it started. It took the fine cooperation of every radio manufacturer with the Navy Department to do the job. It took us then pretty nearly as long to get a radio set as to build a ship.

As time went on we furnished radio sets and operators to large numbers of ships of the Shipping Board—to the majority of their ships. They found that our system of doing business was very satisfactory to them and that the rental system which they had for the ships that they had requisitioned—on which ships the Marconi and other companies were charging them very high rentals for the apparatus and operators—was very unsatisfactory, and they were losing money by it. So they asked us to make a clean job of it, to buy all the rest of the sets that we did not own on the Shipping Board ships. It amounted to some 275 ships.

We undertook to negotiate with the Marconi Co. for the purchase of those remaining Shipping Board sets and they objected to selling. It was a matter of considerable profit to them, and naturally they objected to selling them. They said, however, that if we did buy them we ought to buy their coastal stations, because their coastal stations would not do them any good if they did not own the ship sets, which was perfectly true. Otherwise, they would charge us for those Shipping Board ship sets enough to make up for having to throw these coastal stations away. So rather than pay double for the price of the radio sets on these ships that the Shipping Board wanted us to buy, so as to save the Shipping Board all this big rental, we said we might as well have the coastal stations if the Marconi Co. did not want them and they were so valuable to us. So they threw them in.

Mr. EDMONDS. You approached the Marconi Co. first, did you not?

Commander HOOPER. Yes, sir; absolutely.

Mr. EDMONDS. The Marconi Co. did not fall all over themselves to sell you these?

Commander HOOPER. No, sir; they objected to selling them. They did not want to sell them at first. But we made a good deal, and I think they are very well satisfied and everybody is well off.

Mr. EDMONDS. Mr. Secretary, you did not state the price you paid for the Marconi system?

Secretary DANIELS. We paid \$1,400,000.

Commander HOOPER. \$1,450,000.

Secretary DANIELS. For stations and sets.

Mr. EDMONDS. That does not include the vessel sets?

Secretary DANIELS. It includes everything except the high-power stations.

Mr. HADLEY. Mr. Edmonds, may I ask a question, as a part of your interrogation?

Mr. EDMONDS. Yes; certainly.

Mr. HADLEY. I would like to ask the Secretary at this point what is the specific item in the naval appropriation bill which carries the fund for that payment?

Secretary DANIELS. I have forgotten the title of it. It is in the appropriation under the Bureau of Steam Engineering, which has direction and control of all radio matters. Under that appropriation we buy a tower and under that appropriation we put in radio stations, wherever the Chief of Operations of the Navy and the General Board feel that we ought to have them.

Mr. HADLEY. Was the estimate on the item itemized when it was before the Naval Committee?

Secretary DANIELS. I think it was not. I do not think it has ever been itemized in the radio matters at all; it has always been a general lump appropriation.

Mr. WHITE. How much was the lump appropriation?

Secretary DANIELS. Under the Bureau of Steam Engineering?

Mr. WHITE. Yes.

Secretary DANIELS. It was many millions of dollars. I can get the exact figures for you, if you desire.

Mr. LEHLBACH. The total amount expended on those purchases was about \$3,000,000—about \$1,400,000 for the Marconi companies, and about \$1,600,000 for the Federal company.

Mr. EDMONDS. I do not want Secretary Daniels to think that I do not appreciate the work of the Navy during the war, because I think that every Member of Congress thinks that the work of the Navy was handled very well and very satisfactorily.

Secretary DANIELS. I understand.

Mr. EDMONDS. The only question I am raising here is this: That the Navy Department, through this action, has embarked us on a project that should have the authority of Congress before it is undertaken. I do not question the Secretary's right to embark on whatever purchases were necessary; but I question his authority to embark us on a new and broad policy; and I am trying to find out why, in time of peace—

Secretary DANIELS (interposing). Well, we did not buy those properties in time of peace.

Mr. EDMONDS. Wait a minute, please, until I finish my thought; you had plenty of authority to take these sets, stations, and companies, and to handle them absolutely as you pleased, during time of war. But then you turn around and purchase these companies, perhaps embarking the country into a commercial policy, and a policy which should be decided upon in Congress before it is undertaken.

Secretary DANIELS. It is a policy which Congress had already decided upon many years before the war, giving us authority and direction. And it was a good business proposition to buy these two companies for war and for peace. If I had thought that I had not full authority, I would not have done so.

Mr. GREENE. I understand that you thought you had the right.

Mr. EDMONDS. Yes; I understand that you thought that; and, so far as the spending of the money is concerned, I am not questioning that at all. The question is one of policy entirely, whether we ought to embark into the owning and operation of the entire commercial business or not. That is the question in my mind.

Secretary DANIELS. That is a matter for you gentlemen to settle for the future. I am strongly of the opinion that Congress, having authorized the Navy Department, some dozen years or more ago, to do commercial business; and Congress having established the Shipping Board; and Congress having appropriated many millions of dollars to build ships, it would have been most uneconomical not to have responded to the request of the Shipping Board, when we were authorized by law to do so, and had the money appropriated under a general fund to strengthen the radio service.

Mr. EDMONDS. But you must recollect that the operation of ships by the Shipping Board is limited to a certain term of years; whereas you are tying a permanent policy on the Government of having a monopoly of the radio business. Now, that is a question that I think we ought to have decided and that ought not to have been decided in the department, since you had full and ample power and authority to take every one of those stations and do as you pleased with them during the time of war. At the same time, you have just bought enough radio properties to force the Government into a new line of work and into a new policy that Congress ought to have decided.

Secretary DANIELS. Perhaps so, if you proceed on the theory that the war is over; but the war does not end until the Senate ratifies the treaty of peace.

Mr. EDMONDS. After reading the Post this morning I thought we had a new war on our hands. [Laughter.]

Commander HOOPER. May I say a word at this point, Mr. Secretary?

The SECRETARY. Yes; certainly.

Commander HOOPER. If we had not purchased those sets for the Shipping Board we would have had to pay \$1,000 a year on the apparatus for those remaining ships; and as they intend to be in business, I understand, for about five years—or at least that seems to be the general opinion—that would have made \$5,000 a set that we would have had to pay as rental.

Mr. EDMONDS. Is that with an operator or without an operator?

Commander HOOPER. They have to pay extra for the operator; the operator is paid for in addition.

Now, those sets cost only about half of that amount. So it was a very good business proposition for the Shipping Board for us to buy those sets; and they asked us to buy them; and we had to take the shore stations in order to get them; and we are saving money for the Government by taking the whole business; and we would have been foolish not to have them throw the shore stations in if the Marconi Co. did not want them.

Mr. HARDY. As I understand, you mean that if you were only using them temporarily you would still be effecting an economy by purchasing them with the shore stations?

Commander HOOPER. That is it exactly; that is the whole thing; we would have had to pay too high a rental.

Mr. HUMPHREYS. How much rental would you have had to pay?

Commander HOOPER. \$1,000 a year for those sets.

Mr. HUMPHREYS. And how much did you pay—

Commander HOOPER. Well, we paid for the apparatus \$1,200 for some sets and \$2,500 for others.

Mr. EDMONDS. The companies kept them in repair on the ships, did they not?

Commander HOOPER. Yes; but that did not cost over \$50 a year.

Mr. EDMONDS. That would depend on the age of the material, would it not, just like it would cost more to keep an old automobile in repair?

Commander HOOPER. Well, we counted on an average of \$75 a year, putting it at the top figure.

Mr. EDMONDS. Does that include the overhead expenses, or just the cost of the actual physical repairs?

Commander HOOPER. That is, as we estimate a fair price for everything. And Mr. Marconi told me that his average price was about \$50 a year. Our relations have been very cordial and agreeable on the whole matter; there is no diversity of opinion between the Marconi Co., who made this deal, and the department as to the propriety of this deal. They did not want to keep the coastal stations, I believe, because they saw there would be no business for them; and it was a good business deal for them to sell just as it was a good business deal for the Government to buy them and save the Shipping Board all of that money.

But the interest of those companies in fighting this bill is not on account of those coastal stations that you gentlemen are asking

about. The opponents of this bill are fighting it on the high-power stations, which we have not bought; and that is the question that all of the arguments are coming up about; the matter of the coastal stations is something that they are satisfied with, and the Navy Department is satisfied with.

Mr. EDMONDS. Would they not sell you those sets without the coastal stations?

Commander HOOPER. No; that is the reason we had to buy them.

Mr. EDMONDS. Well, were you not buying sets on ships?

Commander HOOPER. We were buying sets of our own, but the Marconi Co. had contracted with those shipowners of the ships that were requisitioned by the Shipping Board, which bound them to keep the sets that the Marconi Co. owned, and to pay that rental of \$1,000 a year; and they wanted to get rid of that, so as to get it on the same basis as all the rest of the Shipping Board's ships.

Mr. EDMONDS. I do not suppose that any committee of Congress appreciates any more than this one the kindness of the Navy Department in endeavoring to save the Shipping Board a few cents—certainly somebody ought to be able to do that for them. [Laughter.]

Commander HOOPER. Yes. Well, I think we handled all of that business well, and I think the Shipping Board handled that business well; we saved them money; they wanted us to handle it all for them; and we made a good deal which nobody in the radio world objects to; we got what we wanted: the Shipping Board got what they wanted; and the Government made money on the whole business.

Mr. EDMONDS. Well, I suppose that the Shipping Board has spent that money that you saved by this time. [Laughter.]

Mr. WHITE. What did those sales include? Did they include any patent rights, or just the physical properties?

Commander HOOPER. They include the patent rights on the apparatus that we purchased—absolutely, clearly, and for all time. But not for any other apparatus except what we purchased; but as to the apparatus we purchased it is specifically stated in the contract that the patent rights are clear.

Mr. WHITE. But these companies from which you have purchased do not own all of the patent rights; and there are other patent rights, then, which the Government has not acquired?

Commander HOOPER. I can answer that in a different way, if the Secretary wishes me to go into that.

Secretary DANIELS. I would like to have you do so, Commander Hooper.

Commander HOOPER. Shall I speak about the board that you have appointed to go into the patent question, Mr. Secretary?

Secretary DANIELS. Yes; I would like for you to give all the information you can, because I think the committee ought to know all that we have done or have contemplated.

Commander HOOPER. The radio patent system is the most complicated thing in the world. If any one of us tried to straighten it out, I do not know what would happen to us; and I think all the radio people have about come to the conclusion that the only thing to do is for somebody to take hold of it and try to do fairly by everybody, and that they would all profit by it. The reason the patent situation

as to radio systems is in such a state is due to the patent laws of the country, and not to the neglect of anybody. And, of course, that is a matter that I can not discuss now.

But patents were granted to everybody in radio who applied for them in the beginning, because the Patent Office had no experts to tell whether a radio patent was good or not; and it is pretty hard to tell even now which ones are good; and the courts have adjudicated some patents, and others that may be of great worth have not been adjudicated.

When the war came on the whole patent situation was in such a mess that if we had not gone on and taken the bull by the horns we would not have been able to buy any radio sets, because everybody would have been arguing about patent rights all the time and about infringement.

I happened to be in the bureau at that time—I went to sea afterwards—and while in the bureau I got the radio manufacturers to agree—they were very patriotic and wanted to help in every way—to call all the patent rights off until after the war, and then we could settle those questions.

Mr. WHITE. In that connection, is it not true, as a matter of fact, that one of these processes, which was subject to patent or which has been patented, was the most valuable part of the whole radio outfit?

Commander HOOPER. If you will let me answer that in my own way I shall be glad, as I want to bring out the general policy first.

Mr. WHITE. But right in that connection I want to ask another question, so that you can discuss this at the same time: If you have taken over the physical properties and have not taken over the patents of these companies, and you forbid these companies to engage in the radio business, have you not left them with extremely valuable rights, or what might have been extremely valuable rights, which they can not utilize at all? Will you please answer with that question in mind?

Commander HOOPER. Yes. I want to explain to the committee, so that they can be proud of what we have done in the war and not feel that we have done the wrong thing; because we are proud of what we have done ourselves, and I am sure the gentlemen, both those for and those against us, will be pleased with the way we are trying to do it.

As I stated before, we said that we would call it all off until after the war. Well, that may have been a good thing or a bad thing; but at least we have got results, and we would not have got results in any other way. Now that the war is over; and it is our duty to pay the bill—

Mr. GREENE (interposing). Well, that does not agree with what the Secretary said—about the war being over. [Laughter.]

Commander HOOPER. The war, so far as getting radio apparatus in a hurry is concerned, is over. And we have got to pay the bill.

So there has been a board appointed—it was appointed a few months ago and consists of a representative of the Department of Justice and representatives of the War Department and the Navy Department, and the idea is—

Mr. EDMONDS (interposing). Excuse me for interrupting, but how long has that board been in existence?

Commander HOOPER. It has been in existence several months; I have myself recently returned to the bureau from sea duty.

Mr. EDMUNDS. Has that board done anything yet?

Commander HOOPER. Well, the war was on, and we could not do very much while the war was on, because we had not the time; we had to keep fighting for our existence. It has been a serious proposition, keeping up with the game.

And when I came back to the bureau, I was put on this board as a substitute for the officer that had previously been appointed. And I said, "Well, the thing to do is to wait until the armistice is signed, and then will come the time to pay the bill; there is no use stopping our war work," as we had to win the war then, and that was a very serious thing. And everybody seemed to be agreeable to that course; there was no particular objection to it.

And now we have taken active steps, or this board has, to proceed with this work of settling up the patent situation. An officer has been assigned, subject to the Bureau of Steam Engineering, to handle that patent work; and two other experts have been put on with him; and I will prophesy that in six months half of the work of the Radio Division of the Bureau of Steam Engineering will be in getting this patent business straightened out. We are getting up all the data now, as to what apparatus we bought, and who has the right to the patent, and all that sort of thing; and we will see what it all amounts to. The only way to do it, in my opinion—I do not know whether the Secretary will agree with me, because it may not be the proper thing to do—is to give each man a percentage on what apparatus we bought under the patent.

And I am sure that the idea of the board is, in a broad-minded way, to try to see that everybody gets what is coming to him—and I am afraid that they will all get a little more than is coming to them; but that is natural, and may not be a bad thing, broadly speaking, for the Government to pay liberally to the men that have done things, especially in a field like radio work, which needs every encouragement that we can give it.

Now, I have spoken a little longer, perhaps, than the Secretary would have had me speak, but I wanted to bring out these points and show wherein the radio inventors have helped us very much, and to state that we intend to do our part now toward them.

Mr. HARDY. I would like to suggest, gentlemen, that the Secretary has these representatives of the department with him; and when he gets through we can have these men make any necessary detailed explanation.

Secretary DANIELS. Mr. Chairman, I was very glad to have Capt. Todd and Commander Hooper go into what we may call these technical and detailed explanations, because they are more familiar with that than I am; I am not an expert wireless man.

Mr. SAUNDERS. If Mr. Edmonds is through, I would like to ask the Secretary something about the scope and purpose of this act.

Mr. EDMONDS. I am through for the present.

Mr. SAUNDERS. I understood you to say, Mr. Secretary, that this is not a proposition of Government control and ownership, except over this particular subject matter.

Secretary DANIELS. Over this particular subject matter, because this is different from everything else.

Mr. SAUNDERS. And in that connection you undertook to justify the Government going into the exclusive commercial business, by reason of the peculiar character of what you call the subject matter?

Secretary DANIELS. Yes.

Mr. GREENE. And also the profits; I would like to ask that—the profits.

Mr. SAUNDERS. As I understand it, this bill is the same bill you had before the committee heretofore?

Secretary DANIELS. I think it is an entirely new bill.

Mr. SAUNDERS. I do not mean with respect to the framing of it; but is not the subject matter of it the same, and are not the purposes that you seek to carry out by this bill practically the same as those you sought to effect by the bill that was before this committee once before?

Secretary DANIELS. The same principle.

Mr. SAUNDERS. This, as I understand it, is a commercial proposition; there is no lack of laws for the protection of the country during war—outside of the legislation that we enacted at the beginning of the war, the laws generally give the Navy, for the purpose of the protection of the country, ample control of the radio situation, do they not?

Secretary DANIELS. In time of war; yes.

Mr. SAUNDERS. Yes. You do not need anything then, under this or any other bill, for the purpose of public protection in time of war?

Secretary DANIELS. In time of war, no; we, of course, need those powers in preparation for war.

Mr. SAUNDERS. Yes; in preparation for war; I say, in connection with war, broadly speaking.

Secretary DANIELS. In connection with war.

Mr. SAUNDERS. So that what is sought to be accomplished by this bill is to see that the interests of the country, commercially speaking, would be advanced by this measure.

Secretary DANIELS. Well, when you use the term “commercially speaking,” I would like to qualify that. It is for the use of the country, commercially speaking; but it is largely for the use of the ships—naval and merchant marine.

Mr. SAUNDERS. Well, on the commercial side, because you have just indicated that for the purposes of national protection you do not need any legislation.

Secretary DANIELS. Not during war.

Mr. SAUNDERS. Yes; not during the war. Now, as I gather from looking over this bill, should we pass this bill the average citizen of the country, in the pursuit of his business, would be inhibited from establishing a plant of his own?

Secretary DANIELS. He could establish a plant and make apparatus which we could purchase if we could use it.

Mr. SAUNDERS. But he could not make it for the purposes of his own business, could he?

Secretary DANIELS. He could not be in competition and have a wireless operating, with all the interference that that would cause, which would largely negative the value of wireless as a means of communication.

Mr. SAUNDERS. Well, that brings up the question of interference, which is quite another and distinct principle. I understand you,

in your statement, to refer to a number of small plants—I presume they were small—and you mentioned the fact that the Wanamaker concern was operating one for its own purposes.

Secretary DANIELS. Yes.

Mr. SAUNDERS. And I can conceive very well that, in the development of the country, many other concerns might desire to have their own private wireless system like the Wanamaker concern is using, just like they have their own private telegraph or telephone systems. That would not be possible, as I understand it, if we should enact this bill?

Secretary DANIELS. They ought to be all under one domination, ownership, and control.

Mr. SAUNDERS. I am not raising the question of what they ought to be; they will be.

Secretary DANIELS. I might say that this bill carries with it the authority to issue a special license, which might be given wherever the needs of the public would require it.

Mr. SAUNDERS. I have not found such a provision in the bill; what section of the bill is it that you refer to which will authorize licenses to be issued which will allow those private commercial enterprises to have wireless plants?

Mr. EDMONDS. It is in section 4.

Mr. SAUNDERS. Is that what you refer to as giving that authority—section 5?

Secretary DANIELS. Section 5, on page 4, which reads:

That the Secretary of the Navy may issue special licenses, subject to such conditions and restrictions and for such periods as he deems proper, for the establishment and operation of stations for special emergency use—

Mr. SAUNDERS. Yes; for “special emergency.” Now, that does not contemplate a general commercial condition, of course.

Now, it says, “In cases where no other rapid means of communication are available”: that makes it more likely, therefore, that the man will be unable to get any special permit. I will take an illustration of this sort, a natural one: In the South there are a number of large cotton mills that are under one ownership; they are established in different parts of a State, or in several States. Those concerns might very naturally, for the same reason that caused Wanamaker to establish his private plant, want to have a special wireless system for their own use. Now, the possibility of that would be eliminated under this bill, would it not?

Secretary DANIELS. No; we could give them a license, if they would not interfere with our stations.

Mr. SAUNDERS. Well, you would hardly be able to call that “special emergency use in cases where no other rapid means of communication are available.”

Secretary DANIELS. Well, you might change the language of the bill, Mr. Saunders, and you might meet that objection by saying, “For the establishment and operation of such stations,” and strike out “for special emergency use.” I would not have any objection to that.

Mr. SCOTT. You would also have to strike out the words “where no other rapid means of communication are available.”

Secretary DANIELS. We could strike out all after the word “stations.”

Mr. SAUNDERS. Well, that would at once very materially change the scope of the bill because, in the commercial world of the United States, there might be a very great number of privately owned stations.

Secretary DANIELS. Well, not any more than you have in the case of telephones or telegraphs. A man might put in his own private telegraph, but he does not, because, under this bill, it would be operated so well, and he would have such good facilities that, except in exceptional cases, there would be no inducement for them to do that.

Mr. SAUNDERS. Well, should not that be left to the man himself, so that if he wants to he may establish one?

Secretary DANIELS. If it does not interfere, these special licenses would be granted.

Mr. SAUNDERS. What do you mean by "if it does not interfere"? Do you mean interfere with the operation of the general system?

Secretary DANIELS. With the operation of the general system.

Mr. SAUNDERS. That is a matter of regulation, is it not, with respect to the wave lengths to be used?

The CHAIRMAN. Yes; that is a matter of regulation.

Mr. SAUNDERS. Well, I will ask you, in that connection, then, would it be possible, with a proper system of regulation as to the wave lengths to be used, and the time that these stations could be operated, to have a broad, general system of privately owned and privately used wireless apparatus in the United States?

Secretary DANIELS. I think, Mr. Saunders, that we ought to have it absolutely, except in special cases, governmental owned and governmental operated.

Mr. SAUNDERS. Well, that comes back to what I said before, then.

Secretary DANIELS. There ought to be power to license, when such license does not interfere with the larger purposes and larger needs.

Mr. SAUNDERS. But when that license is to be so given, as shown in the illustration you have just made, that it is practically going to eliminate the privately owned and operated enterprises, we simply would not get them, that is all; I am just trying now to get at the scope of the bill, Mr. Secretary.

Secretary DANIELS. Well, the scope of the bill is for Government ownership—

Mr. SAUNDERS (interposing). And the real scope of the bill is to eliminate—

Secretary DANIELS (continuing). And operation; and then exceptions may be made of cases that do not work any interference.

Mr. SAUNDERS. You think, then, that the stations of private concerns all over the United States—

Secretary DANIELS (interposing). Ought to be governmental owned and operated, for the good of the whole people, and for the national need.

Mr. SAUNDERS. Well, that is going back again into the question of policy. I am just trying to get at what is contemplated in the bill.

Secretary DANIELS. That is what is contemplated in the bill.

Mr. SAUNDERS. You have said that you would give certain special licenses, where it was shown that there would be no interference?

Secretary DANIELS. Yes; if we are given that power.

Mr. SAUNDERS. Well, if the general system is to be governmental owned and operated, if that is to be the policy to be pursued, one little concern—or a larger concern, for that matter, such as the cotton factories I have indicated—would find it very difficult to show that they presented such a case of emergency; or take a hardware concern or any other concern as would justify you in breaking in upon what you think is the wise, broad, general policy. In other words, practically under this bill with the policy you have in mind, there would be no such private enterprise.

Secretary DANIELS. Well, in the main there would not be.

Mr. SAUNDERS. Yes; in the main there would not be.

Secretary DANIELS. It is a Government owned and a Government controlled wireless, because of the peculiar conditions surrounding wireless.

Mr. SAUNDERS. I want to ask you a question or two about that "peculiar conditions surrounding wireless" in peace times; as has already been fully stated and agreed upon, you did not need any legislation, either in anticipation of war or in the actual, flagrant war for the protection of the country, and of the interests of the country; you have got under the legislation that we have already afforded ample means of protection and ample authority to that end, have you not?

Secretary DANIELS. During the war; yes, sir.

Mr. SAUNDERS. So that all we are concerned with now, as I stated before, as I understand the purpose of this bill, is that you want us to understand that the commercial future of the country and the commercial interests of the country justify us in taking away from private enterprise and private concerns the right to use the air as a vehicle of communication—not the air, exactly, but the ether, as a vehicle of communication.

Secretary DANIELS. Yes; because the air can not be divided.

Mr. SAUNDERS. Yes; the air can not be divided.

Secretary DANIELS. And it is not only in our own country that we have to consider it. Last year we had a session here in Washington, or an international conference, of all the countries in North and South America, and this question of wireless communication was one of the matters that was taken up there; and it was the sense of that conference—the delegates not having the power to commit their Government—that concessions ought not to be granted to private parties, but that governments ought to control the wireless, and we ought to control these wireless stations. And I think it is one of the most important questions of public policy that everything going into Central America or South America ought to be controlled by the Governments of those countries.

And this proposed legislation is the beginning of a great, international, world-wide prevention of interference in wireless communication.

Mr. SAUNDERS. Of course, Mr. Secretary, we are all agreed that the ether itself is a common substance that can be used by everyone in connection with the wireless.

Secretary DANIELS. But it can not be, because if two or more use it—

Mr. SAUNDERS (interposing). Well, but that becomes a question of policy or regulation. I mean that that is the one substance which every wireless system must use.

Secretary DANIELS. Certainly; and if you have too many of them—

Mr. SAUNDERS (interposing). We are agreed on that. Now, with regard to this question, you said the Government should control. That is not necessarily a matter of commercial operation, is it? Control is a very different thing from committing the Government of this country to exclusive commercial use, is it not?

Secretary DANIELS. My judgment is that in this particular method of communication the Government ought to have the monopoly, just like it has with the mails—and even more so because other people could carry the mails on trains without interference, but they can not use the air without interference.

Mr. SAUNDERS. Well, you state that as your belief; and I am not questioning your belief, of course. But the thing before the committee is, for reasons to be furnished to it, why, in time of peace, for commercial purposes, anything that makes it necessary in our general interests as a country, that the country should, as a Government, run the wireless as a commercial system. What is there that requires that? Now, you have got all the regulations you speak of; you said the country ought to control, for the purpose of national policy, these wireless systems. We raised no issue about that.

Secretary DANIELS. You can not control as long as any man may start in operation his wireless apparatus.

Mr. SAUNDERS. Does that affect the national security at all, in time of peace?

Secretary DANIELS. It might, very seriously.

Mr. SAUNDERS. In time of peace? Well, I would like to have an illustration of that. For instance, take those cotton factories, that I have mentioned, in North Carolina or in Virginia; say there are a chain of cotton factories using their own wireless systems in time of profound peace; why is that in any sense endangering the national security?

Secretary DANIELS. As I said, just now, in any case where it did not operate to cause interference, a special license could be granted.

Mr. SAUNDERS. Yes; but you have already indicated, that, with your attitude toward this matter, it would be exceedingly difficult for any man to show that his case was one of special emergency, or that there was no other system of rapid communication; in other words, you have indicated your belief that the Government ought to run these things, and that there would be a very small chance of an individual enterprise bringing itself within the limitations that you have outlined.

Secretary DANIELS. You do not work any injury to those private concerns, because they have the telegraph and the telephone, which can operate without any interference with other people.

Mr. SAUNDERS. Well, I am not considering that at all.

Secretary DANIELS. Well, that is very important.

Mr. SAUNDERS. That phase of it certainly is essential in that connection. But I am just trying to bring out why, for the commercial interests of the country, it is necessary for the Government to be the exclusive and sole commercial operator in the country.

Mr. WHITE. Right in that connection, Mr. Secretary, why was it not necessary to take over these stations which have been allowed to operate?

Secretary DANIELS. We want to take them over.

Mr. WHITE. But it has not been done.

Secretary DANIELS. Well, we hope to do it.

Mr. WHITE. I was wondering what the special reason was; why, if complete domination and absolute control is necessary, they were not taken over during the war, as well as all of the others.

Secretary DANIELS. But they were taken over during the war—everything was taken over during the war.

Mr. WHITE. Well, I thought you said they had not been taken over.

Secretary DANIELS. No; I meant that they had not been bought. We controlled absolutely everything during the war.

Mr. WHITE. I did not understand that, and I was somewhat surprised that you had not.

Commander HOOPER. Mr. Secretary, there is one thing that the committee seems to want to know about, which is more or less technical in character. Do you want me to answer it?

Secretary DANIELS. Yes; I would like for you to answer it.

Commander HOOPER. It should be brought out that the function of radio telegraphy is, primarily, for use where you can not use wires. That is the primary function of radio telegraphy—between shore stations and the ships at sea. A ship at sea can not use a wire to talk to shore; and, therefore, everything should be made subordinate to the interests of those that can not use the wires.

Now, what you are trying to get at, Mr. Saunders, is why one man should own all the radios and run them, and the Secretary has been explaining that it is because of the interference; it is the interference with the work of the ships at sea—that is the thing.

Mr. BESHLIN. Excuse me; but I want to ask just one question at this point: Does the indiscriminate use of the wireless by people throughout the country interfere with its use by the Government?

Commander HOOPER. It does. I can answer that in two ways: All amateur stations and the coastal stations. There is no use for any other stations in the country just now; and there is no particular desire for them.

The amateur stations can be regulated so that they will not interfere, and still satisfy the amateurs. And the coastal stations are the ones that we want to own, principally because they work the ships at sea; and if one person does not own them all the ships do not get a fair deal—and that is a question of life-saving service. That is a point that we want to bring out, Mr. Secretary.

Mr. SAUNDERS. Now, you have undertaken to answer that question for the Secretary. Let us see if you have answered it sufficiently.

As I understand, there is no difference of attitude in this committee with reference to giving whatever legislation is necessary to provide an efficient sea service—there never has been any disagreement as to that.

Commander HOOPER. Yes; I understand.

Mr. SAUNDERS. Do I understand, in order that you may have that efficient service, you have to operate a system of wireless, commercial speaking, between, for example, Virginia and Florida, or Vir-

ginia and North Carolina, or between any other two points in the United States?

Commander HOOPER. No; there is no demand for that service, because you can get it cheaper by telegraph and telephone.

Mr. SAUNDERS. Well, it seems that there is a demand for it, because the Secretary indicated that the Wanamakers were running a wireless plant.

Commander HOOPER. Well; Wanamaker did that; but I think he was the only one in the United States that did.

Mr. SAUNDERS. Well, suppose there were a demand for that sort of service?

Commander HOOPER. Well, in my opinion, it should not be permitted where it might interfere with the work of the ships at sea.

Mr. SAUNDERS. Of, course, we all agree as to that.

Commander HOOPER. And we are trying to get around that.

Mr. SAUNDERS. Of course, you are trying to prevent that. We are all agreed that it should not be allowed if it interferes with the sea service, and yet you propose to allow the amateur to go along.

Commander HOOPER. But not to let him put down a shore station.

Mr. SAUNDERS. Then you propose to control him and prevent him from interfering with the sea service by regulation?

Commander HOOPER. By regulation; yes.

Mr. SAUNDERS. Now, if you can control all of these amateurs all over the country so as to prevent them from interfering with the sea service, why can you not control all of those other people by the wave length, which is the way the interference is prevented? Why can you not control these other people in the same way?

Commander HOOPER. Well, the ships have all got to use the same wave to communicate with the shore stations. And you have to use long wave lengths in order to get those messages over any long distance. The amateurs can use the short-wave lengths, that will not go very far. So that they can use a wave length that we do not care anything about. And if we let everybody in, there would be so many working at the same or about the same wave length that there would be great danger of—

Mr. SAUNDERS (interposing). Do I understand that you state, as a scientific matter, that as a reason for the commercial operation of this commercial wireless system by the Government that unless the Government takes it over and commercially operates all of these systems—that, in spite of your power of control, through regulation, there would be so many wave lengths that they would interfere with the sea service? Is that your attitude, as a scientific proposition?

Commander HOOPER. I would not put it exactly that way. I do not think I made myself clear. If we allow our stations along the coast to work with ships, and somebody else is allowed to have stations along the coast working with ships, we would have to use about the same wave lengths, because the ships all, logically, work on the same wave lengths; otherwise, they would not hear each other.

And it has been proved impracticable to have two companies working at the same time without mutual interference; and for that reason we have purchased these stations; and the Marconi Co. realizes, as well as ourselves—

Mr. SAUNDERS (interposing). Now, you are getting back to the sea service. I will ask you this question: There is going to be a certain

bulk, we will say, in the ether, of business that is going to be done, whether the Government does it or whether private interests do it under regulation; all the time there will be a certain bulk of wave lengths in operation in the ether.

Now, if the effect of those wave lengths, going along criss-crossing—if the private concerns being allowed to operate these systems commercially is going to cause confusion, will you tell me why, if the same bulk of wave lengths exist as a result of the Government's doing this business, there would not be the same confusion?

Commander HOOPER. Well, where it is necessary we can discriminate and not grant a license to those that could not operate without interference. But if the Government was not running it, but the private interests were doing so, it would not be possible to discriminate in that way by the issuing of licenses.

Mr. SAUNDERS. That comes back, then, to the fact that it is not an inherent difficulty that makes it beyond control, but it can be controlled by license and regulation?

Commander HOOPER. Not practically; no, sir.

Mr. SAUNDERS. It can not?

Commander HOOPER. Not practically; no.

Mr. SAUNDERS. Then, how would you do it, if it can not be controlled?

Commander HOOPER. Well, if I were doing it I would do it this way: I would start out and run it just like we are; and then when it was proved that two people could work together and not interfere with our system in any way I would license them if they could not work just as well by telegraph or telephone, but if they could work just as well by telegraph or telephone I would not do it, because it would just mean—where these two particular stations might work without interfering, if you license them on the wave lengths they wanted; but that would just invite everybody else to start in doing the same thing, and there would be two more stations here [indicating] that would want to communicate, and two more here [indicating] that would want to communicate and soon you would be lost.

Mr. SAUNDERS. Well, under a system of Government regulation they would not be able to dip in at all; they would not be able to do so under sufficient regulation.

Commander HOOPER. Well, we would do it well, I think. [Laughter.]

Mr. GREENE. Having just won a fight against autocracy, we would start an autocratic movement by this bill that would wipe out everybody. [Laughter.]

Commander HOOPER. No, sir; this is purely regulation.

Mr. GREENE. Of course, that is what is claimed for it.

Commander HOOPER. There is one point that I can bring out: This art is changing all the time. The opponents of this bill will refer to that fact as their principal reason why they should not be held down. This art is changing all the time, and as it changes we can license them more freely. But the party that is responsible has got to do the right thing.

Mr. LEHLBACH. That license is an afterthought, is it not, growing out of the proposed Government ownership and operation of all the apparatus?

Commander HOOPER. For the present it is not practicable to do it any other way. I have been a wireless officer for several years, and I have been in the operation end here and in the material end, and I have talked over this thing with a number of people abroad and heard what they have to say. And I am sure it is not practicable to do it in any other way just now and have it efficient.

Mr. SAUNDERS. You said that if we leave it so that your department has an exclusive monopoly you will run it well. I am not raising any issue about that. But that does not answer the specific question which I have asked; and I will repeat that, to some extent: Interference in the air is the result of different wave lengths being projected, is it not?

Commander HOOPER. Yes.

Mr. SAUNDERS (continuing). And put in motion at the same time; that is really interference, technically speaking, is it not?

Commander HOOPER. Yes, sir.

Mr. SAUNDERS. If you have the exclusive control of the whole thing, from the standpoint of the national safety, and from the commercial standpoint, the air would be full of wave lengths; there will be just as great a number of wave lengths in the air as if you were operating simply from the point of view of national security and private enterprise was operating the commercial end of it. And if they obeyed the scientific regulations which are necessary to prevent interference, why would there be any more trouble from the point of view of interference, under a privately owned commercial system, than under a Government owned and operated commercial system?

Commander HOOPER. Well, if it was all owned by one private concern, they may be able to run it as well as the Government could. But it should be either the Government or one private concern.

Mr. SAUNDERS. Well, when you start one wave length you can not radically change that wave length; when you start out or project a message, you are going to maintain one wave length in connecting with that message, are you not?

Commander HOOPER. Well, it is all right for that particular wave length and that particular place.

Mr. SAUNDERS. Yes.

Commander HOOPER. But suppose we took the highest practical advantage of the ether, and had as many systems working as possible; and suppose there was some ship down the coast calling for help, and these particular stations were interfering with her.

Mr. SAUNDERS. The coastal stations?

Commander HOOPER. Yes; under Government control we could send out and stop everything in that vicinity.

Mr. SAUNDERS. Could you not provide very easily in your regulations that when such a state of emergency and stress as you have described arose a signal sent out from some Government station would stop operations all over the United States?

Commander HOOPER. They would not hear the signals.

Mr. SAUNDERS. Would they hear them any better if they were Government operated?

Commander HOOPER. Yes; because they would be regulated; we have our district superintendents, and our organization, so that we can regulate the traffic.

Mr. SAUNDERS. Could you not require any private owners to conform to such a system that they could hear just as well as the Government stations could hear?

Commander HOOPER. No, sir; that is, there are private stations, like Wanamaker, who would be working all the time, sending messages from one to the other, and they would not hear such a thing, and would care very little about it.

Mr. SAUNDERS. Well, if you took over the Wanamaker station and other stations, would you undertake to meet the public requirements and handle the messages for them—sending the same messages that they send?

Commander HOOPER. We would cut out those messages; there is no reason in the world why they should be sent.

Mr. SAUNDERS. You propose, then, to eliminate those?

Commander HOOPER. We propose to eliminate the stations wherever there is interference. And those two stations have interfered with distress signals at sea. I have almost cried, at times, to hear ships calling for help when the Wanamaker stations were making such a noise that they could not be heard. It was almost a crime.

Mr. SAUNDERS. Well, why would not two commercial shore stations, if they heard the signals, be doing the same thing? How could you run these stations and meet the public demand, as well as that of the Government?

Commander HOOPER. We would not license two stations operating right alongside of each other, like the Wanamaker stations, that are interfering with the work of ships to-day or work like that; we would say that if we license stations to carry on business, they should be farther inland, where they would not interfere with the work of the ships.

Mr. SAUNDERS. Well, that is another proposition; that is a matter of regulation.

Commander HOOPER. Well, that sounds all right; but it is just the same thing as if you stood on a busy street corner and you made everybody have a piece of paper showing the laws regulating the traffic and expect everybody to carry out all of those laws but not have any policeman there. You can not regulate it as fine as it has to be in the radio business without having one person do the whole business.

Mr. SAUNDERS. That raises a scientific question.

Commander HOOPER. That raises a scientific question, and I would like to add that the opponents of the bill will bring that up in such a way that you gentlemen, not being radio experts, will get the idea that they can do this, and then take the statements of people who have been in the business and our statement that you can not do it.

Mr. HARDY. Let me ask you this question, Commander Hooper: Is not the purport of this whole bill simply the assertion of the fact, or of the proposition, whether it is a fact or not, that interference is very likely to occur with independent and irresponsible stations, and that some one central control and ownership must take the place of varied and diversified control?

Secretary DANIELS. That is the idea, exactly.

Commander HOOPER. Yes, sir; that is just it.

Mr. HARDY. Now, is it your opinion that varied and diversified control would result in such confusion as would be harmful to the whole radio system?

Commander HOOPER. That has been the experience ever since the art began; yes, sir.

Mr. HARDY. Is it your opinion, further, that some one single control and ownership, whether it be private or governmental, is absolutely essential to the effectual working of the radio system?

Commander HOOPER. I say that for all the stations that work with the stations at sea it is absolutely necessary.

Mr. HARDY. As I understand, if you had the inland stations you would not have much concern about them—that they would not be capable of much interference?

Commander HOOPER. If they did not reach as far as the coast we would not have any concern. But nobody wants inland stations.

Mr. HARDY. Because they have the telephone and the telegraph. One other question: An independent radio or wireless station on the coast is licensed, we will say. Suppose you tried to regulate it so that its wave lengths should not be the same as the wave length used by you; can that station change its wave length?

Commander HOOPER. It can change its wave length. Do you mean with that station equipped to work at sea?

Mr. HARDY. Could that station do that without changing its apparatus?

Commander HOOPER. Oh, yes.

Mr. HARDY. In other words, if you had the 20 independent radio stations on the Atlantic coast, all under regulation and order of the Government, to use a different wave length from what you use, is there anything in physics to keep those stations, or one of them, from changing to the Government wave length and then interfering?

Commander HOOPER. Well, it can be done very easily.

Mr. HARDY. They would violate the law, perhaps; but they could do it as a physical matter?

Commander HOOPER. They could do it; they probably would not, if they were ordered not to do it.

Mr. HARDY. Well, if you had the 20 independent radio stations along the coast who had been directed to use a different wave length to prevent interference, what, physically, is there to prevent them from coming in on the Government wave length or the standard wave length?

Commander HOOPER. Do you mean if they desired to disobey?

Mr. HARDY. If they desired to violate the law.

Commander HOOPER. Well, there is nothing whatsoever to prevent that.

Mr. HARDY. In other words, a station under order and regulation to use one wave length can, physically, use another wave length when it desires to do so?

Commander HOOPER. I will not go so far as to say that. All of the stations are built so that they can change their wave length.

Mr. HARDY. So that the only assurance you would have against interference on the part of those privately owned radio stations would be their intentional obedience to such regulations?

Commander HOOPER. No, sir. There is another point that should be brought out. There are many wave lengths that are established

now. The Government is not using just one wave length; it requires many wave lengths to do the work now. And there are not any wave lengths left for stations that are not working with ships.

Mr. HARDY. Then almost any wave length they would adopt would interfere with some of the Government's operation, would it?

Commander HOOPER. It would, if they tried to work with ships. We must realize that all of the argument is over the stations that work with ships—whether we should own those stations or whether the commercial interests should own them; if they work with ships they must use the same wave length that we use, because that is what the ships use.

Mr. HARDY. In other words, these privately owned shore stations would have to use your wave lengths, and therefore would interfere?

Commander HOOPER. If they work with ships—and that is what all the argument is about.

There are three sets of stations in this bill: The amateur stations, which we can easily allow everybody to use by keeping them down to a short wave length; and there are the coastal stations, which work with the ships, which must use the same wave lengths, otherwise the ships do not hear them, because a ship travels in all the different zones in the world, and must always be on the same wave length, otherwise she would not hear the calls of any shore station, or any other ship that might happen to be passing; they all have to have the same wave length in order to listen in. So that the coastal stations are the ones that really cause the most trouble. And they are the ones where it should be brought out that we must absolutely own those to give satisfactory service to the ships at sea, which is the purpose of radiotelegraphy.

And the third class of station is the high-power transoceanic station, as to which no questions have yet been asked and which use a long wave length that does not concern either the amateur station or the stations of the ships at sea.

Mr. SAUNDERS. Let me ask one question in that connection: You say there would be no difficulty in controlling these local amateurs, because you would hold them down to a short wave length. What would be the difficulty in holding down the Wanamaker stations to a short wave length?

Commander HOOPER. Well, he is right close to the naval station that receives for the ships.

Mr. SAUNDERS. That might furnish a reason why Wanamaker, under those circumstances, should not be licensed there—or anybody else.

Commander HOOPER. Yes.

Mr. SAUNDERS. But that does not change the general proposition. Take some concern that was not—

Commander HOOPER (interposing). Excuse me, but Mr. Wanamaker would object to the amateur interfering with him.

Mr. SAUNDERS. I am not bothering about Mr. Wanamaker's objections. I am wondering why you could not control, in the domestic world, other people just as well as you could control the amateurs. That is a practical inquiry.

Commander HOOPER. There are not enough wave lengths—

Mr. WHITE (interposing). Let me ask you a question there. I do not know much about the technical end of this thing, and I imagine that is the situation with most of the members of this committee. But I have understood that they could tune these receiving instruments so that they would hear or take and receive a particular wave length and would disregard all others. Is that true?

Commander HOOPER. You can not say a particular wave length; you can say a particular wave length in the vicinity of a particular space. That is to say, if you had a piano, and if you were not very expert in music, and you pressed a key, you might not know that it was not one of 20 keys, but you would know that it was not 1 away up on the scale.

Mr. WHITE. I had this idea in mind: That they had these instruments so perfected that a particular instrument would take a particular wave length and would disregard all other wave lengths; that is, that wave lengths tuned to a certain standard would not interfere in any degree or particular with those tuned to another standard. Now, if that is true—and I do not know whether it is true or not—why should there not be a wave length established for the naval service and for merchant vessels and other people be prohibited from using that particular wave length used for those purposes; that is, for the Government to set aside that particular wave length and leave all others open to the general public. Now, I am just asking for general information.

Commander HOOPER. Well, it takes more than one length for the Navy and for commercial vessels; it takes a certain proportion of the wave lengths.

Mr. WHITE. Well, suppose you take those and leave all others open?

Commander HOOPER. Well, that is exactly what we have done. We have got the amateurs tuned down to a 200-and-odd meters. That is their block. Then the naval and the merchant vessels are in the next block; that is, say, up to 2,500 meters. And they require all of that space.

Mr. WHITE. Then if you have all of that space reserved for them, what do you want anything more for?

Commander HOOPER. Well, the ships and some of the shore stations can not take everything, because there are long areas where you can not carry them. And the rest, if you could use them on the ship, it would be fine; but you can not; their outfit would not permit.

Mr. EDMONDS. I would like to ask you a question in line with what you have just said, Commander Hooper:

Under the present regulations, no man can have a sending outfit without a license, which gives him certain authority; and that license is revokable at any time, is it not?

Commander HOOPER. Yes, sir.

Mr. EDMONDS. If you found at any time an interference in the Wanamaker stations, you could revoke his license and prevent him from operating a wireless; is that not true?

Commander HOOPER. If we had the power.

Mr. EDMONDS. No; the Department of Commerce has the power.

Commander HOOPER. Well, the fact is that he has interfered with us a great deal of the time for years, and we have spent a great deal

of effort in every way to try to get it corrected and we never could do so, although the Department of Commerce has assisted us to the full power under the law. The fact is that he interfered with us all the time.

Mr. EDMONDS. Well, that is not in accordance with the act passed by Congress August 13, 1912, which I have before me, which governs radio communication between the several States, and says positively that they must have a license, and then provides that "this license is revokable for cause."

Commander HOOPER. Yes, sir. Well, his license allowed him to use a decrement of a certain amount. That is, that he would not interfere with the wave lengths that the ships were supposed to use; and when they measured his station it was always found to be all right; we would measure it and find it was within the law; and yet the fact was that when we tried to send messages to naval stations near Wanamaker's stations we could not get them or receive them, and it would be the same all the time, back and forth; we said we could not do it, and they said we could; it was that way all the time. But the fact is that the art is so intricate that the law can not be made, or is not made, to cover it correctly.

Mr. EDMONDS. Well, the law is made so that you can revoke his license if he interferes?

Commander HOOPER. Yes; but the Department of Commerce would go and measure their apparatus and say it was in compliance with the law.

Mr. EDMONDS. Well, was that on account of the incompetence of your operators or of his? [Laughter.]

Commander HOOPER. It is on account of the actual conditions that we have to recognize as existing—in the poor apparatus or the decrement or the poor operators on both sides.

Now, we have come to believe that we have to recognize conditions as they are and not as they should be.

I can pick out two experts in this room now, and can pick out two naval operators and two foreign commercial operators, and I can do wonders; I can prove to you that you do not need any laws in radio. And yet you have to figure on the average man that you get aboard a ship, with the pay that is allowed to those operators; you have to figure on what those men know, and you have to face the actual conditions and not theoretical conditions.

Mr. EDMONDS. Did you find in your travels, when you were talking to the operators in other countries, any government ownership of radio systems in any other country?

Commander HOOPER. Yes, sir.

Mr. EDMONDS. I am not talking about war times now; I mean in peace times.

Commander HOOPER. Yes; in France.

Mr. EDMONDS. That is the only one, is it not?

Commander HOOPER. I think the Japanese have Government ownership also.

Secretary DANIELS. Mr. Edmonds, I will say that when Capt. Todd comes before the committee he will be able to give you full information along that line.

Mr. HUMPHREYS. May I ask the Secretary a question, Mr. Chairman?

Mr. HARDY. Certainly.

Mr. HUMPHREYS. Is the reason that these privately owned and operated stations interfere with each other and with the Navy the sole reason why the department wants to control the radio system? Is there any other reason, of policy or otherwise, why the department wants to take over the radio business?

Secretary DANIELS. There are only two methods of operating the wireless: Either by the Government or for it to license one corporation; there is no other safe or possible method of operating the wireless.

Mr. HUMPHREYS. That is because of the interference in the ether, is it?

Secretary DANIELS. There is a certain amount of ether, and you can not divide it up among the people as they choose to use it; one hand must control it.

Mr. HUMPHREYS. And that is the sole reason that actuates the department, is it?

Secretary DANIELS. That is the sole reason.

Mr. HUMPHREYS. There is no other reason of policy that actuates the department?

Secretary DANIELS. That is the sole reason, that one hand must operate and control it.

Mr. BURROUGHS. I would like to ask one question: I understood you to say, at the opening of your statement, Mr. Secretary, that it was your understanding that the war had demonstrated the necessity for their being one single agency for the control and ownership of the wireless communication?

Secretary DANIELS. All the evidence was that there must be one agency, and only one agency, to own and control the wireless.

Mr. BURROUGHS. Are you able to say, off-hand, or would you be willing to put into the record any such specific cases or instances as you have in mind showing that the war had demonstrated that fact?

Secretary DANIELS. I will put into the record an answer to that. I would not be able to do it now; but I would be very glad if you would ask Capt. Todd, when he comes before you, that question; because he has studied along that line and is prepared to go into it more fully than I would be, except by reference to the reports.

Mr. HUMPHREYS. Mr. Secretary, there are several questions that I wanted to ask you; but I do not suppose that you are the one to answer them: With regard to the bill itself, will somebody appear before the committee who has drawn the bill and can explain it?

Secretary DANIELS. Capt. Todd will go into the bill in all its phases when he makes his statement.

Mr. HARDY. Is that all, Mr. Secretary?

Secretary DANIELS. I wish, gentlemen, just to add this, and to emphasize it just as strongly as possible: The wireless is, in a sense, just beginning the great and important work we shall depend on it to do. And, as Commander Hooper said, it is not the purpose to use the wireless where the telegraph or telephone are easy to be used; it ought to be reserved, it ought to be preserved, primarily for safety at sea, and for safety of communication with our neighbor on the south.

And you can not look into the future without knowing that the imperative duty of our Government at this time is to either license one private company and give them the exclusive power and ownership or have the Government to do it, and do it safely, and utilize, of course, the brains of all men who have studied this science. I look to see it become the great means of communication and to lessen accidents and deaths at sea.

The alternative before you is absolute; there is not any escape from it. If this wireless is to be utilized to the best advantage, you must either give it over to some department of the Government and let it absolutely own it, paying royalties to those people who make inventions that will improve it; or you must license some private people to do it. You are going to lose most of its efficiency if you permit any man who makes an adventure and starts a company to go on and use the wireless.

More than that, gentlemen, it has an international aspect. We ought, as a country, to have our high-power stations; no private company ought to be allowed to have the high-power stations in America. They ought to be American owned and American operated; and we ought to have such arrangements with all the South American and Central American countries; and I am certain that we can secure them.

I have taken this matter up very fully with the State Department, with the end in view of an arrangement by which all high-power stations between these various countries should be governmental controlled, governmental owned, and governmental operated. It seems to me that on the eve of large trade in South America, the large expansion of the world trade, it is a matter of primary importance; and that we ought not to delay in laying down a policy.

I ought to say that in presenting this matter it has been studied by all the departments of the Government. The State Department is strongly and earnestly in favor of this as an international necessity.

The Pan American conference approved the policy, and I believe that we have the opportunity now of utilizing wireless for the saving of ships and the saving of men and the saving of national trade and the furtherance of national amity between the countries that we wish to have closer relations with.

I wish to say at the very close that it is my profound conviction and is the conviction of every person I have talked with in this country and abroad, who have studied this question, that it must be a monopoly. It is up to this Congress to say whether it is a monopoly for the Government or a monopoly for a company which will leave it open to whoever wishes to come into it, and in that way you have destroyed its value, in my judgment, Mr. Chairman.

Mr. WHITE. Mr. Secretary, may I ask one question?

Mr. HARDY. At the end of this one question I want to see what time we will meet again.

Mr. WHITE. In order to make this governmental program efficacious, will it not be necessary also to have an international arrangement? Otherwise you might have a Mexican wireless and a Canadian wireless and a European wireless interfering in just the way you seek to prevent it; is not that true?

Secretary DANIELS. If there are no newspaper men in the room I would like to answer that. I am one myself, but I would not like them to print it. I hope they will not print this.

But in recent months, during the war, certain nations, through corporations not known to belong to other Governments, have sought concessions from South American Republics to put in high-power stations to connect with high-power stations which they owned in America. I think it would be a crime for us in America at this time not to protest and not to go on record that we are going to own all this wireless in America and that no country under the sun can put a high-power station on America unless it is a foreign Government which we understand and which we can control. There are companies now that own high-power stations in America who are seeking concessions in South American countries not owned by a private company but chiefly owned by foreign Governments which wish to get control of the wireless all over this hemisphere, and we ought not to permit it.

Mr. WHITE. It would require an international arrangement to prevent a Canadian company or a Mexican company interfering with anything we might do under this bill?

Secretary DANIELS. Yes.

Mr. WHITE. The international operation of wireless is controlled by international and political reasons?

Secretary DANIELS. International reasons and physical reasons also.

Mr. HARDY. Will you come back this afternoon?

Secretary DANIELS. Gentlemen, I think I have expressed all the views I have. Capt. Todd, when we meet again, will present an amendment to the bill for your consideration. He will explain it as well as I would.

Mr. HARDY. Then, gentlemen, let me ask what time we can meet?

Secretary DANIELS. Mr. Chairman, I can return at any time you desire, but I have some very important matters to attend to this afternoon.

Mr. GREENE. Send your word by wireless. [Laughter.]

Secretary DANIELS. I will communicate by wireless with you.

Mr. HARDY. We will now take a recess until 2 o'clock.

(Thereupon, at 12.20 o'clock p. m., the committee took a recess until 2 o'clock p. m.)

AFTER RECESS.

The committee reassembled at the expiration of the recess.

STATEMENT OF CAPT. DAVID W. TODD, UNITED STATES NAVY, DIRECTOR OF NAVAL COMMUNICATIONS.

Mr. HARDY. Captain Todd, will you please proceed now with the presentation of the matter in your own way?

Capt. TODD. For the information of the committee, and as an indication of who will best be able to answer questions that may occur to them in the course of the argument I may make in favor of the bill, I will say that I have to do with the administration of radio stations only. I am not in close touch with the details of the apparatus. I

know, in a general way, what has been accomplished, and is being accomplished. I have no ideas on Government ownership as such and the taking over of the land lines and cables is not my affair in any way. I have no arguments for or against Government ownership; I know nothing about them. As to that, Mr. Daniels is the one that controls the policy.

I have with me an officer, an ex-amateur, who is specially qualified to talk on the subject of amateur installations. And for myself, if the committee are willing, I would like Commander Hooper, who is the officer representing that bureau of the Navy Department which has to do with the purchase of apparatus, installation of apparatus, keeping in touch with technical developments, and all technical matters, to speak on those subjects. He also has all of the business of the department with regard to purchasing apparatus, purchasing concessions, and extension of the system generally.

I know generally what this officer is doing, and what the bureau is doing, but I am more concerned with policy than with apparatus as such, so when it comes to asking me questions about the details of technical developments I will not be able to answer.

At the beginning I should like to say that I have here the amendment which Mr. Daniels had in his hands this morning concerning the amateurs. The part of the bill providing for experiment stations I had hoped would cover the question of amateurs. Apparently, from what I have heard, the amateur wishes to be mentioned as such. I had an idea it would dignify the amateur to have his station considered under the head of experiment stations.

I am also wondering whether the word "amateur" should appear in the Government-ownership bill. It did not appear in the law that now governs radiotelegraphy. Two years ago, when a bill which looked forward to Government ownership was argued before your committee, the word "amateur" was mentioned as such. I have every reason to believe that the amateur interests are going to be thoroughly satisfied with this amendment which I shall offer.

Mr. HARDY. Read that amendment, Captain.

Capt. TODD. The amendment is as follows:

Insert after line 6, page 2, the following:

"The term 'amateur station' means a station used for private practice or experiment in radio communication and not operated for profit in either receiving or sending radio signals."

Insert in line 14, page 2, after "training-school stations" the following: "and amateur stations."

Strike out the sentence beginning in line 1, page 3, and ending in line 6, page 3, and in lieu thereof insert the following:

"This section shall not apply to stations belonging to the Government of the United States or the Government of the Philippine Islands, or to experiment stations, technical and training-school stations, and amateur stations, licensed as provided by the act to regulate radio communication, approved August thirteenth, nineteen hundred and twelve: *Provided*, That when such amateur stations are licensed for receiving purposes only no operator's license shall be required for the operator in charge of or operating such station; but when such amateur station is licensed for transmitting also the license shall require that the operator of such station shall hold a license showing his ability to send and receive at least seventy-five words per minute in the Continental Morse code: *And further provided*, That the license for such transmitting station may limit the power input to one-half kilowatt in case of amateur stations within one hundred miles of the Atlantic or Pacific Ocean, the Gulf of Mexico, or the Great Lakes, and to one-quarter kilowatt

within five miles of a Government receiving station. Amateur stations so licensed shall not use any wave length exceeding two hundred and fifty meters nor less than one hundred and fifty meters except by special authority in the license contained."

Mr. HARDY. I understood you to say that that amendment is satisfactory to the amateur people?

Capt. TODD. I do not know, sir; I hope it is.

Mr. GREENE. If there is anybody here that represents the amateur people who could give offhand their view, I should like to hear it.

Capt. TODD. I would like to touch on a number of features with which I am more familiar than I am with this particular subject.

Mr. HARDY. We will not go into that now.

Capt. TODD. Let me say just a few words on past history. The Secretary spoke in general terms this morning of where we stand at present, and a few more details will show why we need more legislation at this time. In the early stages of wireless everybody operating ships saw the immense possibilities of radio communication, and naturally all nations having navies took great, special, and permanent interest in it; and through the liberality of Congress we were able to erect stations on all our coasts, in all our island possessions, and in the Canal Zone. We have maintained that system of stations ever since, constantly increasing the efficiency of the stations, but not finding it necessary to increase the number very materially, except in the case of high-power stations, the use of which became more and more apparent as time went on.

Until 1910 there was no law whatever on radio telegraphy. In those days, whatever you may say about interference at the present time, there was very real and positive interference and a great urgency for legislation. Although at that time, eight years ago, we were promised immediate relief from all kinds of interference, there is still a little interference left; but it is not the kind of interference that I am going to point out now.

In 1912 the first law was passed, the law under which we are now working, which law I am going to try to show is quite inadequate. Immediately following that or the following year the Senate ratified the international convention which was framed in London, and we then found ourselves working under an international agreement as far as ship-to-shore communication was concerned. That international agreement touched very lightly on the subject of high-power stations, but it was forecast at that time that with the increase in the number of high-power stations the next international conference would have to take up that subject and regulate it to the same extent that the ship-to-shore business was regulated by this convention of 1912, which was ratified by us in 1913.

Almost the entire year of 1916 was taken up by an interdepartmental board, which attempted to frame a substitute for the law under which we are now operating, and the board was so large and unwieldy it took a full year to get anything out of it, and we finally came before this committee with a bill to regulate radio communication to take the place of the first one.

That bill failed, under the pressure of other affairs occupying the minds of Congress and for other reasons. But that bill, while it did not specifically provide for complete, definite ownership in a definite

time, sounded the principle very strongly, and those who argued for it on the side of the Government made it very positive that that was what the bill was intended to accomplish in time, for reasons that we then brought out.

To get the opinion of the various Government departments on record was comparatively easy at that time, because each one of the departments had a representative on the interdepartmental board that framed the bill. The executive departments indorsed the idea of Government ownership of radio stations used for commercial purposes, with the exception of two—the Department of Justice and the Department of the Interior. They, in different words, brought out the same idea. Several of them were very particular to say that they did not care to have their indorsement of this particular bill indicate in any way their attitude on the subject of Government ownership, which to them was entirely too large a proposition for them to express an opinion at that time, even if they cared to, but this matter of radio communication was a very peculiar and special case which needed special treatment, and that, to their minds, was an answer.

With your permission I should like to read a typical indorsement of the last bill, which will hold good for this one:

The Secretary of the Treasury said:

This bill involves the principle of Government ownership of coastal stations, and while it is a move in that direction it does not definitely provide for such Government ownership. It is the belief of this department that the principle of Government ownership of coastal and commercial stations is sound, and it is further believed that the bill should provide for Government ownership rather than treat of this principle in indeterminate fashion. The chief arguments in favor of Government ownership of this public utility are entirely separate and distinct from those in favor of Government ownership of other public utilities, and I desire to particularly emphasize that this letter is not to be taken as indicating in any degree whatever the views of this department concerning the principle of Government ownership in any public utility other than radio communication.

It will be noted that radio signals can not be confined to definite channels, but are transmitted through a medium to which no specific title can be conveyed to individuals or corporations, and therefore radio signals are not amenable to the ordinary measures of control. Where two or more stations operate in close proximity, as is the case to-day in many places, they mutually interfere, resulting in confusion, the hampering of radio traffic, and embarrassment to vessels in the vicinity depending upon this means of communication. This condition is particularly emphasized in congested commercial districts, such as New York and other important seaports, and it can be effectively obviated only by placing all stations under one control. It therefore appears that to save embarrassment to the Government, to shipping, and maritime interests in general, as well as to the public—all due to radio interference—the Government should exercise full control over this means of communication as far as practicable, and this can be effectively accomplished only through Government ownership and operation of all coastal and commercial stations.

Radio apparatus on board ship is of the greatest value as providing a means for summoning aid should the vessel be in trouble. When such a distress call is broadcasted, experience has shown that the majority of the ship and shore stations in the vicinity answer the call and attempt to get in communication with the vessel in distress; this results in interference and confusion, and oft-times causes delay in rendering assistance. This is of vital importance to the Coast Guard, which is charged by law with the duty of rendering assistance to vessels in distress. Should the Government have the monopoly of coastal and commercial stations, this difficulty would readily be overcome.

The Government, through the Navy Department, now operates as a military necessity a chain of radio stations along the coasts of the United States and most of its outlying possessions; commercial companies also operate radio sta-

tions. If all these existing coastal, commercial, and Government stations were placed under one management, interference—the basic argument for Government ownership—would be reduced to a minimum, first, by discontinuing a number of unnecessary stations, and, second, by enforcing the same set of rules and regulations at all stations. It is understood that the existing naval stations and personnel can take over the commercial radio business and handle it, in addition to the official business now carried on, with little, if any, increase in the expense of maintenance, upkeep, or operation, and that the revenue derived from commercial business, although not sufficient to make the business self-supporting, would materially reduce the operating expenses.

For the purposes of national defense, the enforcement of neutrality, and other military measures, the necessity for Government operation of radio stations is clear, but it is believed the Navy and War Departments can give more detailed views along these lines.

It is believed that the development of radiotelegraphy will not in any way be hindered by the enactment of the bill into law, but that, on the contrary, private enterprises will be stimulated to further effort in overcoming the many difficulties encountered in this means of communication. The scientists of to-day engaged in the solution of these problems are not, as a rule, connected with operating companies.

It is generally admitted by operating companies that the receipts from fees charged for shore-to-ship business, and vice versa, are far less than the operating expenses—in fact, are only nominal—and it is believed the handling by the Government of the shore end of communication between ship and shore would relieve operating companies of a burden.

The advantages of Government ownership of radio stations may be summed up as follows:

1. Advantages to the Government: (a) More efficient service, due to the elimination of interference and to the fact that the Government operators would be kept busy and in practice; (b) no confusion in taking charge of and operating all stations in time of war or when military necessity demands; (c) less difficulty in enforcing neutrality, in so far as it pertains to the radio; (d) increase in Treasury receipts.

2. Advantages to steamship lines, and other maritime interests and to the public in general, particularly large business concerns: (a) More efficient service due to 1 (a); (b) more expeditions rendering of assistance to vessels in distress.

There would be no disadvantages to the Government as the increase in operating expenses over that at present would be practically insignificant. There would be no disadvantages to maritime interests or the general public.

This bill, as I say, failed. It was followed within a few months by the declaration of war, and in accordance with the act of 1912, which was argued before this committee, the President directed the taking over of all the stations in the United States and the operating of such as were necessary for military purposes and as could be operated for commercial purposes by the Navy Department, and the closing of others. That order is still in effect.

The effect has been so marked that we have been able to see how simple the control has been with all the stations under one head, and it seems as if it should be very easy to convince you gentlemen that that is really the final answer as regards the operation of a large number of stations of various kinds inland and along coasts where there may be a great overlapping of effort.

As I said, in 1906, or about that time, the chain of naval stations was more or less complete. Up to 1912 those stations operated only for Government purposes, for emergencies, and to be there as an item of preparedness on the part of the Navy Department, and they handled the business of the Weather Bureau and all the Government business they could.

In 1912, Congress authorized certain of those stations to handle commercial business. This was taken up and developed, and the

department has been handling commercial business ever since, with great satisfaction to itself and with very few complaints from ship-owners and others who are interested. Since through the fortunes of war we have had charge of all the stations we have handled commercial business to as great an extent as we possibly could, keeping in mind the possibility of getting information to the enemy, either directly into Germany or in a roundabout way through Mexico, and the submarine menace. The story of keeping ships quiet has been related to you by Mr. Daniels. That was the main reason for not having business on the Atlantic coast, so that the ships would not give their position away to submarines equipped with direction finders, with resulting loss of life and tonnage.

Mr. HARDY. You mean by that last statement that during the war the uses of wireless telegraphy for commercial purposes were largely limited through fear of military disaster?

Capt. TODD. Yes, sir; on this coast, and in the case of high-power stations everywhere. The efficiency of receiving apparatus has increased so enormously that the signals of high-power stations will at times cover stupendous distances, and which anything sent from a high-power station on the Atlantic coast of the United States could be read with ease in Germany, there is also quite a possibility they would be able to read signals sent from the Pacific coast of the United States or even from Hawaii. It was considered dangerous enough to justify stopping that commercial work, as very important information concerning the movement of transports or the policies of the United States, as they were developing, could be put into a very simple, innocent-looking commercial dispatch. It would not matter to the sender whether or not the dispatch was sent to a fictitious address; if it could be sent out into the ether addressed to somebody in Hawaii or in Japan it would be sent equally strongly in the direction of Nauen, near Berlin, and be picked up in Germany. It was considered too dangerous, so the high-power work on the Pacific coast was suspended.

The ship-to-shore business will without much legislation, except in one or two particulars, straighten itself out in time, because there is very little money in it. Various companies have tried to make money out of it, and I am informed one of them has made a little, but unless there is a complete monopoly there can not be a lot of money in it, because under the present laws as soon as any firm commences to make money another one can immediately set up a station at no very great cost and take part in the business and take away some of it from the other fellows.

Mr. GREENE. Is not that usual in any commercial business?

Capt. TODD. It is usual in the radio business.

Mr. GREENE. Is it not usual in commercial business? Is there not liable to be competition in it if there is a chance for it?

Capt. TODD. I shall have to leave that for you, sir.

Mr. GREENE. Well, you brought that subject up. It seems to me that according to your idea you would destroy all commercial competition; it would all be a monopoly.

Capt. TODD. I am not arguing against it, sir. I am sure there is a confusion of effort there that results in economic loss. I will say that the operation of commercial radio stations right alongside the

stations already in the hands of the Government or already working for the Government's own purpose is a great economic loss.

The commercial station in some places does not have to operate 24 hours a day. There are a few hours a day when a certain steamer of a certain line is expected along; for instance, down South, anywhere north of Cape Hatteras, there must be a continuous watch maintained for all vessels. The naval stations everywhere must have full crews and must be maintained day and night, because their principal business is the general protection of shipping—not only the ships of the Navy, but all ships. Since they are there and fully manned, and since they have demonstrated that they can handle commercial business to the satisfaction of the shipowner, and the proper administrative details have been arranged to collect the money from the person from whom it is due, irrespective of the flag of the ship and irrespective of the ownership of the land lines connecting with the radio station or the cables over which the dispatch must be further transmitted in order to reach a destination, all of which was worked out by the London conference and is now international law—since that business is already on a firm foundation and working properly, it seems to me a mistake to have commercial stations right alongside of them handling the business if there is no great amount of money in it. I think that in time the ship-to-shore business will gradually drift into the hands of the Government for that reason. With technical advancement, of course, there may come changes, but this bill deals with present-day conditions.

I would like to go on to the matter of the high-power stations. The high-power stations are increasing in number right along. The Navy has its system of high-power stations, of which the first one is across the river here and the last is at Annapolis. The British Marconi Co. has its system. The American Marconi Co. has its system, connecting with the British. The Germans had a fine system of their own started, with two stations in this country, German owned, and several other stations in their colonies and protectorates.

Mr. EDMONDS. Do you mean the German Government?

Capt. TODD. The German Telefunken Co., which is to all intents and purposes, I believe, the German Government.

Mr. BESH LIN. Where were the plants located in this country?

Capt. TODD. They were at Sayville and Tuckerton, but the Alien Property Custodian has condemned Sayville and sold it to the Navy Department. The ownership of the Tuckerton station is in dispute between German and French interests. In the meantime we are occupying that station.

Mr. EDMONDS. Has that Sayville station sale been completed?

Capt. TODD. I believe it has, sir.

Mr. EDMONDS. There were some complications in regard to that sale, were there not?

Capt. TODD. I do not know, sir; I was not connected with that.

Mr. EDMONDS. I would like to know, if you please, Captain, the price paid to the Alien Property Custodian for the plant.

Capt. TODD. I do not know, sir; but Mr. Hooper will be able to tell you. All questions of stations are under the bureau which Commander Hooper knows the details of. The French have a high-power

system in contemplation, which will include Algeria, the east coast of Africa down near Bombassa; at Saigon, in Cochin China; two stations in the Pacific islands—I am not sure which islands, either the Marquesas, the Society Islands, or the New Hebrides; and at Martinique, down in the West Indies. The Dutch are putting up high-power stations. They have one in Java which they hope in time to have in direct communication with Holland.

Mr. EDMONDS. In these cases of which you are speaking, where there is a Government monopoly, I wish you would mention it, and where there is not a Government monopoly I wish you would mention that also, so we can get some idea with regard to how the other countries are handling the matter.

Capt. TODD. Naturally all the countries engaged in the war or having anything to do with it, or having to do with the preservation of their neutrality, for after-war purposes have control of radio activities in those countries. Immediately prior to the war there was the authentic document of the international bureau at Berne, which has to do with the centralization of international arrangements for the control of radio stations. According to their publication there were 29 nations that had radio stations. Of these 29, 7 had privately owned stations. Of those seven, four were important nations, and the other three were China, Liberia, and Colombia. The four important nations were, first, the United States, Great Britain second, Spain third, and Germany fourth.

You gentlemen know how free the erection and operation of stations has been up to the present time in the United States. Great Britain from the earliest days has backed the Marconi Co. to the fullest extent. Having the greatest need of all nations for ship-to-shore communication, she naturally took the greatest interest in the protection of her commerce, as she has always naturally taken the greatest interest in the laying of cables.

Mr. HARDY. Will you give the committee, as well as you can, the facts leading to the ownership and control of the British Marconi Co., whether it is a Government concern or private, or what?

Capt. TODD. I am a little weak on that subject, sir; but I will say that the British Marconi Co. seems to be, as far as I know, entirely distinct from the Government, but the Government does favor it to the extent of giving it facilities for putting up stations. It does practically the same with that company as we do with the American Marconi Co.; it buys large quantities of apparatus from them and leans on their engineers to some extent. As far as I know, it is not part of the Government. The American Marconi Co. is an offshoot of the British Marconi Co., and anything they do is favored in Great Britain, because that country favors the system. Privately owned stations in Great Britain are all Marconi stations. The British Marconi Co. has an offshoot in Spain as well as in the United States, and they have put up nine stations.

Mr. HARDY. Is there no other company in Great Britain except the Marconi?

Capt. TODD. That I can not say, sir. I believe there are one or two stations that were operated by another company; whether they were commercial or experimental I can not say, but I know there were some other stations.

Mr. HARDY. The reason I was asking that, Captain, was to ascertain whether the radio system of Great Britain, either governmentally owned or privately owned, was practically a monopoly.

Capt. TODD. Practically a monopoly; yes, sir. The other companies are of no great strength.

Mr. WHITE. It is not a monopoly by law?

Capt. TODD. It is not a monopoly by law. However, I am getting in deep water in discussing that subject. I am not very familiar with the British Marconi Co., and my statements are merely hearsay. At any rate, of the 47 stations that Great Britain is credited with, the greater part were Marconi stations.

Mr. SAUNDERS. This would be true, would it not, Captain? Having in mind what Secretary Daniels advanced as reasons why we should have Government ownership in this country and exclusive Government operation—namely, shipping interests—there seems to be more reason in Great Britain why they should have that Government ownership and exclusive Government operation than in any other country in the world, having in mind her shipping interests.

Capt. TODD. I personally am convinced that Government ownership will follow in all countries of the world.

Mr. SAUNDERS. I understand, but I say the reasons would be more convincing in the case of Great Britain than with us, conceding that the Secretary's arguments were sound?

Capt. TODD. Yes. I expect Great Britain will buy out the Marconi Co., but I may not have good reasons for believing that.

The Norwegian Government is putting up a high-power radio station. The British Marconi Co. is putting it up for the Norwegian Government, but it is to be a Government institution to handle communications between Norway and the United States, the American Marconi Co. putting up the United States station. This station is erected, and is at Marion, Mass.

Mr. GREENE. How would that affect your operation of the radio?

Capt. TODD. That is a technical matter, sir. Personally I think it would be considerable of a nuisance, and I believe the Marconi engineers think the same.

Mr. GREENE. My idea is that America does not need to take lessons of the British or of any other country.

Capt. TODD. But, Mr. Greene, this is British apparatus. This does not represent the latest American development of the highest type of apparatus. I do not believe the Marconi Co. intends to operate any great length of time in the future with its set.

Mr. GREENE. But the idea that the British Government may have may not be a good example for us to follow. We usually steer clear of all entanglements of that kind, and I am only questioning how far we ought to go.

Capt. TODD. If we were to back one company to the same extent the British Government is backing the Marconi Co. we would accomplish to a very great extent the things we are trying to show here.

Mr. GREENE. That is, you take it monopoly is far superior to any competition?

Capt. TODD. Not superior, but necessary in this particular case.

Mr. HUMPHREYS. Do you mean monopoly of ownership or monopoly of control?

Capt. TODD. Monopoly of operation; the Government should operate them. I do not think you would want operation without ownership, because the funds that would come in to the Government as a return on the investment would not be a sufficient reason. It is a question of doing the greatest good to the greatest number. The general needs of the Nation would be best served by operation under one directing head such as we have had in times of war.

Mr. HUMPHREYS. If you had control in some centralized head it would obviate all the difficulties that have been suggested here, would it not?

Capt. TODD. We have that control in this present law, but the present law provides for too weak a control for any practical purposes. I will explain what I mean. Under the present law the German Government, through the Telefunken Co. or any other company, or the British Government through any company, or the French or Chinese or any other Government, may put practically anywhere in the United States a station of any power for any purpose whatever, and the Secretary of Commerce is required to issue a license.

Mr. HUMPHREYS. Of course we can amend that; we can change the control and adjust it to the requirements as demonstrated by the experience you have gone through. All you want is some centralized control, is it not?

Capt. TODD. May I suggest that that will very probably happen automatically in the case of high-power stations, for this reason: The last international conference took no note of high-power stations; the next must. With the increasing number of high-power stations only the most careful international arrangements will keep them apart. For instance, we have here on the Atlantic coast of the United States four high-power stations. In Europe, in three different countries, there are four more. We have special arrangements by which all four of these stations here can be sending at the same time all four stations over there are sending, and every word going both ways will be received except in bad weather conditions, and there will be no interference in these signals themselves.

Mr. HUMPHREYS. That is not due to ownership; that is due to operation.

Capt. TODD. Due to operation; yes, sir. But I am leading up to the point that you will get only the most careful arrangements necessary if the Government has a large part in the operation.

Now, these four stations on each side can go on indefinitely sending all the time; and they are able to receive all that is sent. But these four stations here [indicating] interfere with four others on the Pacific coast. Those four over there [indicating] interfere with four others in Germany—when she comes to her senses—Austria, Norway, or Constantinople. These four stations will interfere with four more that may be down in the West Indies or in the northern part of South America. These on this side will interfere in the same way with any that may be erected in northern or central Africa.

In spite of the advance in the art and the increase in the number of wave lengths that can be used and the nearness together at which those stations can work, the number of high-power stations keeps

ahead of that always. The art has not yet been able to keep up. I would say that the next international conference, which was scheduled to meet in Washington last year, will take up the question of high-power stations, and I fully expect that the consensus of opinion of the delegates, of the 20 to 30 nations that will be represented there, will be that absolute Government operation of high-power stations is necessary; they will call for it, or they will call for such strict control as to amount to the same thing, which will take the place, to a great extent, of anything we are asking for at this time.

Mr. WHITE. In that connection, Captain, there will come from this bill a minimum of value, so far as these high-power stations are concerned, unless there is also this international agreement, which you expect to follow.

Capt. TODD. Under present conditions we have proper working arrangements with all the nations concerned, except Norway. We have not yet approached Norway on the subject. They have asked us to start the work; but we could not do that on account of our obligations to the allies. We are in close coordination with the principal European allies for this trans-Atlantic work; and, if this bill should be enacted into law, we would have no difficulty at all in arranging direct with the governments for the work of high-power stations, except possibly in the case of Great Britain, where we would have to deal direct with the British Marconi Co. Spain, having no high-power stations, we would have to arrange with Germany also, but we also look on the German stations as Government owned.

Mr. WHITE. In other words, then, if this bill is passed, in order to protect your high-power stations against outside interference, you have got to consummate arrangements with the Marconi Co., or with the British Government, with Spain, with Germany, and possibly with other nations?

Capt. TODD. We have to do it, sir; and that would take place automatically at this international conference. All the nations will be eager for that conference, so as to get their stations working and bring up to date, as far as technique is concerned, the business of handling ship-to-shore messages. The ship-to-shore business has advanced also.

They have an international conference; there have been two of them. I think there is no doubt that the next conference will take place within about a year, and that all nations will be eager to adjust the work of high-power stations.

I know directly what trouble has been involved, what an amount of handling of dispatches back and forth has been necessary to make our stations on this side keep clear of the four stations on the other side and to arrange for handling traffic with people of other nationalities. In Paris, where an international commission sits to keep this regulated, the work is rather heavy and formal on account of being international, and to us it seems as if it were very slow indeed. But it does take careful regulations, and they treat it with great solemnity over there, as something that has to be adjusted with great care. Now, if four stations on each side of the Atlantic have their work coordinated with difficulty and require a commission to sit every now

and then to do it, and a constant interchange of dispatches, when the number of stations that Government and commercial demands will call for are erected and placed in operation, the situation will be very complicated, and can only be straightened out by this international conference.

Mr. SAUNDERS. Captain, is not this true, that your scheme for the future of wireless, as you have it in mind, is for the development of international communication and ship-to-shore communication, and you are not contemplating a development of wireless communication in what I might call the continental United States for use in the land areas of the continental United States?

Capt. TODD. We are not contemplating that, for this reason: The telephone and telegraph are so clearly indicated for such communications that it seems a waste of a very valuable means of communication with ships at sea and with foreign nations to use it for overland work.

Mr. SAUNDERS. In other words, you have deliberately excluded that phase of possible development for the wireless?

Capt. TODD. Yes, sir. May I explain still further?

Mr. SAUNDERS. Just a moment. In that connection, do the people who are interested in the commercial development of wireless agree that that is a desirable and wholesome thing to be excluded from one of the possible developments of science for the service of the world or for the service of our country?

Capt. TODD. Yes, sir; they would agree to it very readily after a little thought. That is for this reason: It is quite possible that two communications can take place in certain parts of the United States, but if two stations here are permitted to work then two more can work, and so on. So you will soon reach the limit of practical communication. Five years from now that may not be so; it may be just as practicable as with the telephone and telegraph.

I might illustrate in this way the greater advantage of using the telegraph and telephone: This is a borrowed idea, but it seems to me very well put, indeed. If radiotelegraphy had been discovered first, before land telegraphy, and we had to communicate with New York by sending out a dispatch that could be read also in Cincinnati, Chicago, St. Louis, and Charleston, S. C., and the dispatches from New York to Washington had to be mixed up with those coming from Chicago, and if the telephone and telegraph were suddenly discovered as a means of limiting these various communications to definite channels, maintaining the necessary secrecy and keeping the communications all apart, the discovery of the land lines would seem to be a much more wonderful thing than the discovery of the radio has been, which followed long after the other. It is because the land lines are satisfactory for one purpose and the ship-to-shore communication or overseas communication is satisfactory for another purpose that one should not be encroached upon in the interest of the other.

Mr. SAUNDERS. Just one thought in that connection. You say that under present conditions you do not think the wireless is a practical instrumentality for this domestic commercial use, but that possibly five years from now conditions may be such that it will be?

Capt. TODD. Yes, sir.

Mr. SAUNDERS. Do you think this restricted control, this restriction of development that you are asking for in connection with this bill, would be likely to hasten or retard that development of the wireless which will make it in the future this valuable instrument for domestic communication?

Capt. TODD. From that particular point of view I do not think the Government control of commercial communication will affect it one way or the other. The matter of what the effect of Government control on technical development will be is something I shall have to leave for others to talk about. But you may be sure, just as sure as this bill or any bill is not the last word on any subject, just as sure as such things are possible, the demands of the people will be so great that you gentlemen will pass another bill which will abrogate any feature of this bill that will interfere with this overland radio communication in competition with land lines and the telephone and telegraph or as an adjunct to them.

Mr. GREENE. May I call your attention to the great improvements that have been made in telephone communication, for instance? I recollect myself when I had a telephone put in my office to extend a few blocks it was the wonder of the whole community and people came from all portions of the city to test it. They thought it was a wonderful thing that we could talk by telephone two blocks. Now, there was trouble with other lines then, and that was cured by reason of experience. Why can not you believe that there is likely to be something that will relieve this situation that you want to tie up perpetually? Is there not a possibility of relief by use, by experience, and by the employment even of amateurs? They might discover something; they have done so, and will do so hereafter.

Mr. LEHLBACH. In that connection, may I not ask whether there are not now in use devices which will eliminate the interferences which exist, and are not those devices susceptible to still further improvement, and is it not possible that interferences from operating stations can be totally eliminated?

Capt. TODD. The art is advancing right along, but not as rapidly as the demands of commerce and the Government. You are quite right in saying that things are possible now that were not possible a few years ago. The art is advancing, and some advances are most remarkable; but none of them completely solve any of the problems, except in special circumstances.

Mr. LEHLBACH. As I understand the position of the Navy Department, they ask for this solely on the ground of the physical characteristics of the radio system and for the elimination and control of interferences?

Capt. TODD. No, sir; that is not the sole reason. If I may go on I should like to touch on a very powerful reason for it.

Mr. EDMONDS. Before you go further I should like to ask a question. You said the Department of Commerce was required to issue licenses in case a foreign company came here and asked for an installation. They are not required to do it if they do not want to?

Capt. TODD. I believe I am right, sir; there is no restriction.

Mr. EDMONDS. Are there not any conditions that may exist in the neighborhood?

Capt. TODD. It has to be an American company in name.

Mr. EDMONDS. This is what I mean. If I want to put a radio station alongside of a naval station and ask for a license for it, it can be refused.

Capt. TODD. Not alongside, sir; it must be 5 miles away.

Mr. EDMONDS. They have what they thought was a sufficient restriction as to distance between stations. If they wanted to make it 10 miles they could do so.

Capt. TODD. You could do so, but not the Department of Commerce. You did make it 5 miles at our earnest request, and it took long argument to get you to agree to it.

Mr. EDMONDS. Your department during the war did a great many things, and I do not see why you did not raise it to 25 miles.

Capt. TODD. We are not able to enact laws.

I would like to speak about one very strong reason for Government control, which harks back to the former bill. In 1912, when this present law was contemplated, the possibility of the United States getting into a war was about as remote in the mind of anybody as the moving of the Pyramids to this side, and all interests united in saying that in time of war the President might do anything with our stations. So that was stated in the bill, which has been a great joy to us, in that we did not have to ask Congress for any specific authority to operate stations when the war broke out.

Mr. GREENE. We had a little wisdom at that time. [Laughter.]

Capt. TODD. When the war broke out we had ample authority from Congress to handle the situation. But before the war broke out, when we were a neutral Nation, the first thing that happened when the war broke out between Great Britain and Germany was the use of the Sayville station here in our own peaceful land to warn the German cruisers to get out of the way, that war had been declared and the German merchant marine generally on the Atlantic was called to seek cover, and others like the *Kronprinz Wilhelm*, that happened to be at sea with guns in her hold, got the warning so that they knew the war had broken out and could get out of the way and mount their guns and begin to prey on British commerce. As to all those things we were at a loss to do anything. We had no laws to prevent companies putting up German stations to be used against our interests or against the interests of the nations with which we were at peace.

As soon as the menace was discovered, the President issued a proclamation which required the taking over for operating control of the Sayville and Tuckerton stations which were then in German hands or in the hands of German interests, and the Navy Department was delegated to do it, and for the rest of the time, when we were neutral, we did not censor the stations but we actually operated them. We put in them operators and handled the German and other messages direct with Germany all that time, so as to be sure that our neutrality was maintained.

Mr. WHITE. What was the name of the company which operated the Sayville station?

Capt. TODD. The Atlantic Communication Co.

In that way we knew exactly, so far as we could tell from the commercial messages, what was happening; and the dispatches were

so important to the countries at war with Germany that we copied every single one of those dispatches sent between the Nauen station, between Berlin and the Sayville station, and between Eilvese station near Hanover and the Tuckerton station in the middle of New Jersey; and the copies that the Naval Communication Service had in its hands, when we entered the war, as you have been told before, were of vast interest to the Alien Property Custodian, as it represented all the direct business carried on between Germany and German interests in the United States.

Mr. GREENE. That was rather an advantage than a disadvantage.

Capt. TODD. It was a distinct advantage having those stations in operation while we were neutral. When we entered the war, as I say, we were all clear on that question of neutrality, and, thanks, to the fact that the British Navy was strong enough to restrain the German Navy entirely and soon got rid of the raiders, the neutrality of the other coast stations, the ship-to-shore stations was not a matter of consequence, there being no German ships to speak of loose in the Atlantic or even in the Pacific, it was not therefore necessary for the President to take over these other stations as an emergency measure.

But, consider radio stations not in Government hands in case of a delicate situation. We said in 1912. "There is no possibility of the United States getting into war." Now that this war is over, or the chances of the United States engaging in war again, or having any more world wars, is removed off some years, or possibly forever; at the same time, there are indications that the British Government, at least, and our own is going to take the matter of possible future conflicts seriously enough to maintain a fleet, and seriously enough to be sure that our late enemies will not be able to get a fleet or build an armed force of any kind for some years.

In the delicate days just preceding the outbreak of hostilities with another nation every little act of a government is watched and reported back from one government to another. In that twilight period between the strained relations and actual outbreak of the war, or on the verge of an outbreak, it is very necessary for both sides to begin to look ahead a little and at least get their merchant ships into safe port or back home—anyway, off the high seas—and it is also necessary to begin to move ships around so that the fleet may be mobilized in its proper place for opening the campaign.

You might say right here, "There is no such thing as naval campaign without radio stations operated by the Government." The communications are all in all to fleet operations. If the danger of getting into conflict with another nation seemed to be so closely at hand that the President found it necessary to put the stations under the control of one of the military branches of the Government, that would immediately attract the attention of the would-be enemy, and they would say, "You are trying to avert a conflict and talking peace, but here you are manning your radio stations. You are warning merchant ships; you are gathering your fleet together; you are making other war preparations, which looks to us as if you contemplated this move and were about to strike, so we will strike first." That may seem remote now, but it strikes me as a very good reason which affects the country as a whole why it would be well to have the stations in the hands of the Government long before war

breaks out, so that they will be working smoothly and efficiently and in accordance and with full knowledge of how to work with the fleet, the question of handling traffic in the most direct way, and using the necessary codes and ciphers. If all that could be done and at the same time the entire needs of commerce could be provided for, through confidence reposed in the Navy by Congress, we would have the best arrangement for the national needs and the needs of commerce.

Mr. GREENE. Did you ever consider the question which was brought up by the Secretary this morning of the profit which would likely come out of it? Would that have anything to do with it—the profits coming out of the commercial use of the radio under the direction of the Government—whether, it being a profitable operation, the Government could take that up and get a nice profit out of it, which an individual with skill might take up and try to get a profit to live on, of which the individual would be deprived even though he had the opportunity to get a living out of it, because the Navy had absorbed it?

Capt. TODD. In this particular matter?

Mr. GREENE. I can understand your argument in case of war. But we are pretty near out of the war.

Mr. HUMPHREYS. Your purpose just explained would be in favor of section 6, would it not, even if there was no provision for Government ownership? It provides, "That when the United States is at war or when war is threatened, or during any war in which the United States is a neutral nation, or during any national emergency, such effect being evidenced by proclamation of the President."

Capt. TODD. That is what I was trying to bring out: In an international emergency of that kind, it would be unsafe to make any change in the administration of stations.

Mr. HUMPHREYS. Section 6 there, as I read it, and I wish to say that I have a perfectly open mind on the subject. I am a new Member, and was not here before. I am seeking light. But without any ownership by the Government, section 6 appears to me to cover all the possible emergencies suggested by you, even if it were in private ownership.

Capt. TODD. May I suggest that this is practically what the present law, the law that you enacted in 1912, provides, but with the provision of a penalty. Just now we are able to close any station or take it over, or what not, but there was nothing to deter any one from putting up another station. We would have to find the station and seize it.

Mr. HUMPHREYS. This would add to that?

Capt. TODD. It adds a penalty.

Mr. HUMPHREYS. This provides punishment for people if they undertake that. So that with this in the law, so far as the particular matter you mention is concerned, we will get along under private ownership as well as under Federal ownership?

Capt. TODD. Well, except that question of emergency. If the President in time of emergency—that is, when he expects the country to go to war with another nation, or Congress to declare war, take them over at that time the other nation will say you are making a warlike move. That is the only point I brought out there.

Mr. GREENE. It would be a good plan to make provision for an emergency.

Mr. HUMPHREYS. I assume it would be impossible for us to have a war with any nation and undertake any of the necessary preliminary steps without that Government knowing we were beginning to assemble troops or beginning to mobilize our war resources in any event?

Capt. TODD. This would have to be done before that. The taking over of stations would have to be one of the first things to be done, because a fleet can do nothing without the radio.

Mr. HARDY. If I understand you, Captain, it is that the very necessity we would be under to take over these independent radio stations would not only open the eyes of our possible opponent, but make them think we were preparing for war when we were only taking precautionary steps?

Capt. TODD. And trying to avert war.

Mr. HARDY. And what we want to avoid is being in a position where we would have to take steps which would look like war while we were taking steps to preserve peace.

Capt. TODD. The taking over of the radio stations at such a time would be a distinct menace, because it means operation of the—

Mr. HUMPHREYS (interposing) I was about to indulge the hope that this Government will not come into any war of its own choosing, except as a defensive matter. I can not see what difference it would make if some country is pressing to make war, and we begin to polish up our guns and brighten our swords. That would rather have the effect, I should think, of letting him know that perhaps he had not better be so quick to embroil us. [Laughter.]

Capt. TODD. Perhaps the answer to that is that all the other features of the bill besides this the committee is in a position now to hear, I consider, so far as the operation of these radio stations is concerned, it is a military preparation.

Mr. EDMONDS. I think the captain wants to have control finally during the time of war, and also during the time of "Too proud to fight" and "Peace without victory." [Laughter.]

Mr. HUMPHREYS. May I ask the captain one question? You stated just now that the sole reason for the department's desire to take over the radio operations was not due to the interference in the ether of operations by the various agents. The other reason is the one you gentlemen gave, that if the President would have to take these over before the war that it would be a warning to the other countries—is that the other reason?

Capt. TODD. Yes, sir; it is a wise precaution, and then there is still another reason. It is an economic waste for a multiplicity of stations to exist in the United States. Since the Government must have its stations, for its own purposes, and can handle the business of commerce, since the business of commerce is fostering commerce in every possible way, this is one other way in which commerce can be fostered by good service and low rates and a unified system through Government stations that are necessary for the national welfare in other respects.

Mr. HUMPHREYS. That argument, of course, would apply to the ownership of a great many public utilities.

Mr. LEHLBACH. That is the argument against private monopoly as against Government ownership in any lines, practically.

Mr. SAUNDERS. If the opinion expressed in answer to Mr. Humphrey's question is sound, ought not section 6 to be stricken out? It seems to me that is just making trouble for us. There you contemplate doing certain things which you say if we do will calculate to embroil us in war.

Capt. TODD. Judge, it would not harm the bill very much to strike out that clause, because it was already enacted into law by you six years ago, except the penalty clause. Understand, that in time of war the President has full power to close any station as soon as he discovers it, but the enemy agent may put up another station in the forests of Maine or in the mountains of North Carolina.

Mr. SAUNDERS. Another reason, it seems to me, that ought to go out is that you have a policy contemplated in section 2 where there is going to be these other stations.

Capt. TODD. There are other stations that are contemplated in section 2.

Mr. SAUNDERS. Do you contemplate in this that the Government is to be absolutely in the whole wireless field, and there is not to be anybody else in it?

Capt. TODD. You have not read the bill, because there are other stations provided for.

Mr. SAUNDERS. Those in section 5 are not contemplated to give trouble in times of national emergency or war. On the contrary, as the Secretary intimated, the difficulty of getting any station of that kind would be negligible.

Capt. TODD. Understand, the bill takes over commercial stations only. There are other stations privately owned by the thousands that are closed temporarily by the war and will reopen.

Mr. SAUNDERS. But section 2 contemplates taking over everything?

Capt. TODD. Section 2 contemplates taking over everything of a commercial nature.

Mr. SAUNDERS. It does not say that. It says that—

The President shall requisition and take permanent possession of, for the use of the Government, every radio station on land or on a permanently moored vessel now in existence within the jurisdiction of the United States or any of its possessions, other than experiment stations, technical and training-school stations, and stations belonging to the United States or the government of the Philippine Islands.

Those would have to be in existence by virtue of these special licenses, and those would be so hedged about that you do not contemplate any trouble from them. It is these commercial stations you have been describing as possible sources of trouble?

Capt. TODD. Why could not an enemy station put up a station and have it ready for use in time of war? There is nothing to prevent that.

Mr. SAUNDERS. It is conceivable, but it has been so remote that it has not been in your mind up to the present.

Capt. TODD. I do not believe I understand your suggestion.

Mr. SAUNDERS. You have not suggested that any of these little school stations as operated would have to come in under this special license. I refer to amateur wireless operators.

Mr. HUMPHREYS. That is to be taken care of, Judge, in the emergency which he suggests in time of war when there might be some amateur stations. That is taken care of, because it says when war is threatened the President takes control of the radio.

Capt. TODD. Only in time of war.

Mr. HUMPHREYS. In time of war is the only time you need it?

Capt. TODD. Yes.

Mr. EDMONDS. In section 2 it says that "the President shall requisition and take permanent possession of, for the use of the Government, every radio station on land," etc. Suppose the man did put up a station?

Capt. TODD. But there is no punishment in the present bill.

Mr. GREENE. You now put that punishment in the bill.

Mr. HARDY. If you have experiment stations which otherwise the Government might want to take over, section 6 gives power.

Mr. SAUNDERS. They leave that as a possible source of danger. That is what we have been discussing, that you ought not to allow these special licensed operators, because if you allow them, then under section 6 you would have to take those steps and that would aggravate these other nations and provoke these hostilities.

Capt. TODD. These other stations are as necessary to the Government as the Government stations themselves, because the Government does not undertake to assume responsibility for the development of the art of radio telegraphy.

Mr. SAUNDERS. Then you would have to take chances as to these other stations?

Capt. TODD. They will operate with a short wave length and the possibility of their doing harm is not great enough to make it necessary to eliminate them.

Mr. SAUNDERS. Then it comes to what I said a moment ago, that from those stations under that section the danger would be negligible?

Capt. TODD. Negligible; yes, sir.

Mr. SAUNDERS. So that really you do not need section 6?

Capt. TODD. We do not need section 6, and it could be wiped out of the bill.

Mr. EDMONDS. Captain, was it your intention to take possession of all the manufacturers of radio apparatus?

Capt. TODD. Not at all.

Mr. EDMONDS. The bill reads: "The term 'radio station' means any place, vessel, or vehicle containing apparatus used, or capable of being used, for transmitting or receiving signals."

Capt. TODD. That is, the place where the apparatus is put together into a complete set naturally must have some means of testing itself, and that is a special license under the head of "technical and training school station"; that is, it is used for the purpose of developing the art of radio telegraphy.

Mr. EDMONDS. But you certainly want a manufacturer to put up a station to see whether or not his apparatus is correct?

Capt. TODD. Yes, sir; and to try the thing on an antenna provided for under this bill.

Mr. EDMONDS. Of course, he would have apparatus capable of being used for transmitting and receiving signals?

Capt. TODD. I can see that if he has apparatus stored in the warehouse that would be a radio station, but that is beyond my power to stretch it.

Mr. EDMONDS. Of course, you realize that after this bill becomes effective there will be no radio schools, but simply experimental amateurs, because there will be no place for a man to get into a position. Suppose a one-armed man comes back from the war and studies radio, what good is it to him, since he can not get into the radio and can not get into your stations and he can not operate anywhere else?

Capt. TODD. A one-armed man has a lot of other occupations closed to him and I do not see why the radio should be picked out particularly.

Mr. EDMONDS. Here is a business for a man who comes back from the Army with one arm. It is a recognized business.

Capt. TODD. He can be kept in the Navy or Army.

Mr. EDMONDS. He can not be kept in the Navy, because you will not accept him if he comes back with one arm.

Capt. TODD. I think he would be kept in the service if he can perform certain military duties.

Mr. LEHLBACH. Assuming that he was not in the Navy, but assuming he was in the Army he could not get into the Navy, although he might be retained in the Navy.

Capt. TODD. He could serve aboard a merchant ship.

Mr. WHITE. Section 1 provides for the taking over of every radio station on the land and permanently moored vessels. Do you seek to exercise any control over a vessel of the United States on the high seas which has wireless apparatus?

Capt. TODD. Only the control that the Government is required to keep over her by the international convention and all the nations over their own ships.

Mr. WHITE. I figured that if the powers proposed in this bill were granted to you, you would undertake to control the selection or the employment of radio operators on merchant vessels of the United States?

Capt. TODD. No, sir. We are having to look out for that for the present, until commerce can be readjusted, but we certainly would not be expected to operate sets on board merchant vessels not in the hands of the Government.

Mr. WHITE. I wondered how you would control the merchant vessel and the operator on a merchant vessel.

Capt. TODD. If he violated the international regulations he would be complained of very promptly by some other nations, and his operator's license would have to be revoked.

Mr. WHITE. In that connection, might he not violate the provisions or the purposes of this law without violating any international regulations?

Capt. TODD. This is in addition to the international regulations. This is not contrary to anything in the international regulations. This furthers the purposes of international regulations.

Mr. WHITE. But, as a practical question, what I was getting at was this: I do not know anything about the international regulations, but I was inquiring whether a merchant vessel outside of New York or

anywhere else or any number of merchant vessels might not be operating their wireless and interfere with your purposes just as much as a radio station on land?

Capt. TODD. Oh, yes, sir; they could. They sometimes do.

Mr. WHITE. I was wondering how you were going to control them.

Capt. TODD. The operator's license would be subject to forfeiture for disobeying the rules he has sworn to carry out when he accepts his license. I believe he is put under oath for secrecy, but he is granted a license for a certain grade in recognition of his ability and reliability and his willingness to do as told and carry out the laws of the country. The international convention when ratified by the Senate becomes law.

Mr. WHITE. There is nothing in this law which touches a vessel on the high seas.

Capt. TODD. That is supposed to be fully regulated at present, sir.

Mr. BANKHEAD. What is the situation with regard to commercial stations which were in operation before we entered the war, as to being operated or closed down?

Capt. TODD. All but 16 that were in operation before the war. Understand, the Navy was operating a great many stations commercially before we entered the war, in accordance with the law passed by Congress in 1912. All the commercial stations in the country are operated by the Navy at the present time and will be, and all but 16 of those have been purchased and incorporated into the naval communication system. There are 16 stations that would have to be purchased under the terms of this bill.

Mr. WHITE. Are there any special reasons why those 16 stations were not purchased?

Capt. TODD. They were not for sale. We expect to make arrangements for some of them. There is a possibility of buying the stations in the Hawaiian Islands. It seems as soon as the coast was clear there they would be very ready and willing to sell, but the other stations are not for sale, as far as we know.

Mr. LEHLBACH. Captain, in case they had been on the market, you would have bought them?

Capt. TODD. I would have bought all that were available if I had anything to do with it.

Mr. LEHLBACH. And in that event this legislation would not have been necessary. You would have simply made a monopoly of the radio commercial business without this legislation?

Capt. TODD. Except as to two points: There would be no prohibition for other companies to start up, or the same companies to start up and put up other stations, starting a new system paralleling the systems already in existence, which are more than sufficient to cover the country for Government and commercial purposes; and the other point is the question of authority from Congress to handle commercial business. That is tied up with the question of private operation of stations commercially.

Mr. BANKHEAD. Has any provisions been made for compensation to owners of these privately owned stations that have not been taken over for their idleness during the period of the war?

Capt. TODD. Yes, sir. Their commercial stations are being paid for on a rental basis, and it is costing the Government a good deal of

money which it would not, of course, if the Government owned the stations.

There is one other feature of the bill——

Mr. HUMPHREYS (interposing). It is contemplated under this bill that you will license people to operate radio stations in the future?

Capt. TODD. Yes, sir; but not for commercial purposes.

Mr. HUMPHREYS. And if they run for three or four years, for instance, and you decide to take them back, that they are interfering with the receipt of messages, etc., you take them over, then you provide here, as I understand it, in section 8, to pay them whatever the damages are?

Capt. TODD. No, sir; the idea is to buy them outright.

Mr. HUMPHREYS. It says here:

When any radio station is requisitioned, taken possession of temporarily or permanently, or closed——

Capt. TODD. That is in time of war.

Mr. HUMPHREYS (reading):

or its license revoked or suspended, the United States shall pay to the persons interested therein just compensation for the property or interest so taken, provided that a claim for said compensation is made to the Secretary of the Navy within two years after the date of the passage of this act.

Capt. TODD. That is in time of war; that is section 6.

Mr. HUMPHREYS. No, sir; that is section 8. It comes right after section 7, which says, "And if, in the opinion of the Secretary of the Navy, the operation of any radio station would interfere with the receipt of signals by radio stations," etc., that the Secretary of the Navy may then, under those circumstances, etc., take them over; and then the next section provides the method for compensating them therefor. They may run them several years before that emergency arises. A man may operate for five years, for instance, under his license, and it then might become advisable in the opinion of the Secretary of the Navy to revoke the license?

Capt. TODD. Yes, sir.

Mr. HUMPHREYS. And then under section 8, as I understand it, do you undertake to pay him for them?

Capt. TODD. Yes, sir.

Mr. HUMPHREYS. But you have this peculiar provision in there that I would like to have you explain. You pay him provided he files a claim within two years after the date of the passage of this act. Suppose he runs three years before you conclude to take it back; then he is out?

Capt. TODD. I see what you mean. This is intended——

Mr. HUMPHREYS (interposing). I was wondering why that limitation was put there.

Capt. TODD. That is intended to cover the taking of these commercial stations.

Mr. HUMPHREYS. Whatever it may be intended for, that is not what it says it covers.

Capt. TODD. The wording is defective.

Mr. HUMPHREYS. It says under certain conditions the Secretary of the Navy may revoke these licenses when it becomes apparent to him that the operation of the station is interfering with the receipt of messages, etc., he may revoke the license, and then immediately

follows a section which undertakes to provide that these people shall be compensated, but he can only be compensated in the event he files his claim within two years after the passage of the act.

Capt. TODD. That is defective. It is intended to cover all cases of interference with commercial activities in accordance with this bill. That was the intent, and the "two years" was put in the wrong place. It was intended to cover simply compulsory purchase of the 16 stations I spoke of.

Mr. HUMPHREYS. Beginning with the words "Provided that a claim for such compensation is made on the Secretary of the Navy, within two years after the date of the passage of this act," down to the period would probably just as well go out?

Capt. TODD. Yes, sir.

Mr. HUMPHREYS. Or, let us strike out all after words "Secretary of the Navy."

I would like to ask you one other question, if I may, Captain, and I want to assure you again I am not asking these questions in a controversial spirit, because my mind is entirely open on the subject. Naturally, I imagine everybody opposes the Government engaging in any operation that private parties can engage in for profit as well as the Government, unless there is some very strong reasons for it. I would like to know why, in your opinion, everything that you have in mind could not be effected outside of this economic waste that you have suggested here by some governmental control—for instance, require that everybody who goes into this business shall take out a license; prescribe some reasonable rules for the operation of it. Of course, naturally, nobody is going into this business if there is such confusion that you can not send messages. They probably would not want to go into it then. They would probably want some reasonable regulations. Why should not the Government provide that nobody should go into this business except they took out a license and the license prescribed certain reasonable rules that experience has shown necessary?

Capt. TODD. That is the present law, sir. But it would not be up to date to cover present conditions, and the simplest, surest, and most complete way of doing it, and one which I believe you will very probably enact in a reasonable time, is the inclusion under one management of all the radio stations. And I believe that all Governments will have the same thing within a very few years. I think it is coming, for various reasons.

Mr. HARDY. Do you think it would be a wise thing to have the naval radio service owned by some outsider, some ordinary citizen who was making money out of this monopoly?

Capt. TODD. If there be no more wars, sir. As long as we have the Navy, we must have the radio stations wherever our ships will be required to operate.

Mr. HARDY. If the Navy has to have under its own control a certain large percentage of the radio service, as I understand it, you would not, and probably no one of us would favor putting that radio service under the control of an ordinary citizen, but we would want that under the Government control.

Capt. TODD. It must be, sir.

Mr. HARDY. As I understand it, also, it would be a great waste economically to have two systems operating side by side?

Capt. TODD. Yes, sir.

Mr. HARDY. And you think one system would most economically transact the radio service both commercially and for the Navy?

Capt. TODD. It could serve the Government needs, not only the Navy but, we will say, all Government vessels and the Weather Bureau, but would also serve the needs of commerce at the same time, with the same stations and the same personnel. They can do it and have done it.

Mr. HARDY. Now, the general economy for the public—

Capt. TODD. For the general good of the whole; yes, sir; a very great benefit to commerce.

Mr. HARDY. Since we have to have that naval service anyhow, what is the essential reason for objecting to the naval radio stations doing commercial business?

Capt. TODD. There is none; and you have enacted into law in 1912 that very provision, and we have been taking advantage of it and have handled commercial business for six years very successfully to our satisfaction, and I hope it will be shown by the letters that come to you to the satisfaction of Congress to a great extent.

Mr. GREENE. We are getting them on the other side pretty largely, in opposition to the bill, and we have not had any declaration favoring the bill except such as have come from yourself and the Secretary.

Capt. TODD. Yes, sir; but undoubtedly you will have some.

Mr. GREENE. I am going to suggest this: Harking back to the early days before the days of telegraphy and other things, and before the days of travel by cars, the country started with very small beginnings, and it has grown, and developed, and widened, and broadened, and beaten out all other nations, and now we come to tie everything up so tight that we have to be careful where we step. We have got to have our possibilities bound up by cords that we can not break. We would be punished if we undertake to do anything. I am of the opinion—I have lived longer than some of you around me—that it is too much to ask the people of America to punish the people of America by restraining all their abilities and opportunities and all their hopes and expectations. You have to have some place of opportunity that young men can in the future get into, because they can not get into the Navy because the Navy will not increase as it has during the war, and the Navy bottles up and keeps for itself the opportunities and keeps everybody out. That would be a broad proposition that would affect me very slightly.

I do not believe in any such thing, not even the suggestion of my friend, the presiding officer, Mr. Hardy. He and I do not agree on that kind of a proposition. I believe in the broadest chance to the American, and especially to the coming American, and the coming American would be fully equal to the present, because the opportunities of education are far superior to what they were in my early days. I had no opportunity of education. I may have had the opportunity, but I did not have the ability to secure education, but had to go to work; and the youth that grow up to-day, even the young men born poor, have every opportunity, and I want to have them have some inspiration. This bill ties up all the inspiration that every young man has.

Mr. ROWE. Captain, did I understand you that the English Marconi system had practically all the stations in England?

Capt. TODD. If I said it, I do not speak with sufficient knowledge to say how many. The British Government has some stations, but the commercial stations the Marconi has are larger than any other company.

Mr. ROWE. Does the British Government maintain, as we do, separate stations under the control of their Navy?

Capt. TODD. Oh, yes, sir.

Mr. ROWE. Very much as we have in this country?

Capt. TODD. Yes, sir.

Mr. ROWE. Do you know how many?

Capt. TODD. No, sir; I could take it out of the reports.

Mr. EDMONDS. Captain, just at the present time the Marconi people are exceedingly active all over the world in establishing stations, are they not?

Capt. TODD. Not that I know of. I have mentioned those—

Mr. EDMONDS. They are endeavoring to establish stations in South America?

Capt. TODD. Yes, sir.

Mr. EDMONDS. You know that, do you not?

Capt. TODD. Yes, sir.

Mr. EDMONDS. They have representatives down there endeavoring to get in connection with the different Governments?

Capt. TODD. Yes, sir; but I do not know with what success.

Mr. EDMONDS. Is that being done by the English company?

Capt. TODD. I do not know whether the agent was English or not; he may be either.

Mr. EDMONDS. Is there not a company known as the American Marconi?

Capt. TODD. No, sir; the Pan American Wireless Co. is a separate organization, an offshoot, apparently—from the personnel of the officers of the company—of the American Marconi Co. and the Federal Co.

Mr. EDMONDS. And if this company were to establish through South American private lines or partially governmentally owned lines, whatever they may be, in accordance with the terms of the Government, it would be in control of Americans, so far as you know?

Capt. TODD. Yes, sir.

Mr. EDMONDS. I want to ask you a question in connection with that: If they were to put a line in Mexico right across the Rio Grande and have a tremendous station there that would reach pretty near all over the world, and they were to be in telegraphic connection with this country, even if you controlled the wireless in this country, how could you prevent information going out of the country without control of the telegraph and telephone?

Capt. TODD. We could not prevent the information getting out of the country.

Mr. EDMONDS. You could not prevent it?

Capt. TODD. No, sir; unless you established censorship, and then you would not be sure of it then.

Mr. EDMONDS. Then control of the wireless is not going to prevent information getting out of the country, whether you take the wireless

over right now, or just before threatened war; it is not going to be of any advantage in any case?

Capt. TODD. It will shut off one channel. The information could still go across the borders.

Mr. EDMONDS. I think when you were here before I asked you that question, and you said that eventually you thought that the Government would have to control all the wireless?

Capt. TODD. Yes, sir.

Mr. EDMONDS. We talked about land stations and sea stations, and you said they would all have to be taken over eventually?

Capt. TODD. Yes, sir.

Mr. EDMONDS. Now, we are bringing it up to a point where the Government will have to control the telephone and telegraph for the same reasons?

Capt. TODD. I have no idea on that, sir; that is entirely a separate item that I want to be very clear with.

Mr. LEHLBACH. The only reason that would apply to wireless that would not apply to the telegraph and telephone is interference by reason of physical characteristics of the radio. Every other argument applies to telephone and to telegraph equally with the radio, does it not?

Capt. TODD. No, sir; because what passes over the telegraphs and telephones is secret, except between the points through which the lines actually pass, and if any news is passed between the United States and Mexico it is peculiar to those countries; if any news passes between the United States and Germany it is peculiar to Germany, Great Britain, Austria, and to Japan. Instead of wireless sending in one direction, it sends in 360 or 10 times that number of directions, and can be received equally well in any part of that circle as in any part of the European circle.

Mr. HUMPHREYS. I mean in times of peace would not that be a matter of consideration of the people who were transmitting this information? A man wants to send a radiogram to Germany in times of peace, knowing that a man in Mexico may read it, that is more or less his business, is it not? If the Government owned it all these neighboring nations are going to get the information just the same, if this man uses it commercially. You realize when he sends his message, if he wants to preserve secrecy he has to take that chance.

Capt. TODD. That is the great difference between the cable and the radio. The cable has two definite ends, and what is going on one end is taken off the other, and no one in between knows about it. The radio has a thousand ends, and therefore there is no secrecy to it, even with codes. We know by our experience that codes and ciphers are very easily broken by an expert, and the secrecy is not obtained.

And right here I would like to call attention to one point: The receiving station should be licensed. At present anyone can put up a receiving station anywhere and receive anything. Not only the business of the Government with its ministers and ambassadors across the seas, but the business of all foreign Governments is open to him. He may intercept all of it. If he does it for practice, it is nothing. If he is an expert in breaking codes and ciphers, it might mean a lot to him.

Then, the personal messages between members of the same family, one aboard a ship—become public property. The commercial messages may be intercepted by rival firms and use made of the information obtained. A firm in New York, sending a radiogram to an agent in South America, to drum up some business, if he communicates with his home office and says anything of importance, a rival firm may have a receiver which is taking every bit of it and is using it to their own advantage.

The receiving stations should be licensed, so that some definite hold is maintained on the personnel. They must know the nationality and the good standing of the operator of the receiving station. They must know where it is, so that we can know where the leaks are, and we must protect international dispatches, commercial dispatches, and press dispatches.

Mr. HUMPHREYS. That is applied to cable, as well as those that come through the air, I suppose?

Capt. TODD. No, sir; because the cable messages are not public property; and, at present anything sent by radio—not during the war, but in times of peace—is public property, because a very sufficient receiver is only a matter of \$200, \$300, or \$400—I stand corrected on that—and very little else. It does not take high powers any more or long stretches of wire, being but a simple frame with some wires wound around it connected with an instrument that covers no more space than that [illustrating], and anybody can have that without a license or reference to anybody.

Mr. HUMPHREYS. Just without reference to your illustration of your idea that the Government operation of the radio system would make against economic waste, it would be interesting to cite some activity that the Government has engaged in upon which you predict they hope that it would make against economic waste.

Capt. TODD. I have only the specific instance I mentioned; sir, understand the Navy's business is to be prepared for war. The preparation, or one of the most important preparations, for war these days is efficient radio stations. The Navy must have the most efficient radio operators obtainable as fast as we can get them into the stations. It must necessarily constantly keep up with technical progress. That is what we are paid for—to be prepared for war. We have the familiar experience of having within a few miles—50 or 100 miles—a station, with about one-tenth the operating ability of the naval station, handling all the commercial business, and the naval station is being restrained to handling weather reports, storm warnings, cases of distress, and the communications with Government ships that pass. We can not keep the ships of the Navy cruising up and down the coast to give our stations practice. As a consequence, our naval stations, which must be there fully manned with the latest operators, sits idle while all the work is handled by a station in the hands of a commercial company that is least able to do the work.

That is one of the points of this bill that I wish could be enacted, if nothing else were here, the question of unrestricted handling of public business by naval stations.

Mr. EDMONDS. Just at present you are restricted by law?

Capt. TODD. Yes, sir.

Mr. EDMONDS. And yet at the same time you are doing all the commercial business that is done by wireless to-day?

Capt. TODD. Yes, sir.

Mr. EDMONDS. But when the war stops you are, of course, going to be limited then to the amount of commercial business that has not got a station available to handle it?

Capt. TODD. Yes, sir.

Mr. EDMONDS. You want a little loosening up on that, I presume, so as to handle commercial business a little more readily?

Capt. TODD. It is contained in a provision, section 10 [reading]:

That the Secretary of the Navy shall, so far as may be consistent with the transaction of Government business, open naval radio stations to general public business under regulations prescribed by him, and he shall fix the rates for such service.

That is in reference to high-power stations.

Mr. EDMONDS. If you took over all of the radio you would not want that section in.

Capt. TODD. It would not be necessary, except that the previous law does not specifically apply to high-power stations. The high-power stations are not specifically enumerated by the previous act, and the situation in the Pacific is deplorable, in that the cable facilities are very meager, and the commerce is crying loudly for help, and the Government now has a chain of stations reaching across the Pacific. The Marconi Co. has also a chain. They are all needed to handle the Pacific communications, and there are great changes going on in the world now and the demands on radiotelegraphy are going to be very great, and many of those demands will be the demands of business and thinking people to get the American point of view and the American news into the far corners of the earth. It would be a very great waste for the Government to keep its own high-power stations quiet and forbid itself authority to handle this commercial work when so much good can be done by it.

Mr. HADLEY. There is no provision in the present law against the Government transacting as much commercial business as it sees fit in other points where there are no private stations?

Capt. TODD. No, sir; but the high-power stations are not covered specifically enough. The wording seems to point to general public business between the ships and shore. It does not cover specifically the operation of power stations, and any high-power station that happens to be within a hundred miles of a commercial station would be prevented any way.

General permission to handle commercial business by high-power stations is very, very desirable; if not, the value of the stations to the Government will be very much reduced.

The press has shown, I have noticed in a number of places, a very great desire to use the high-power stations for the transmission of press items—the big press associations. They have asked us again and again to do it, and we have had to say in time of war it could not be done on account of our international agreements with the allies not to handle anything except Government business, and the fact that if we, so far as the Pacific is concerned, took up press, we would have to consider it the same as commercial business, and commercial business was not deemed safe to handle.

Mr. EDMONDS. Would there be any international complications arise from taking over these by the Government?

Capt. TODD. The international complications would be relieved, because the Governments in Europe would not have to deal with us and with the other owners of high-power stations.

Mr. EDMONDS. And yet the Governments in Europe are very jealous of the success of their merchants and their commercial chances in different portions of the world.

Capt. TODD. Yes, sir.

Mr. EDMONDS. Would the handling of this by the Government of the United States lead them to suppose that information was leaking from the United States operators to individuals that was giving information in regard to commercial business?

Capt. TODD. No, sir. The action of this Congress in enacting this bill, would, to those knowing anything about the subject, having studied the subject, appear to be a very logical and proper action, an action which I believe the Government will take. There are only a few Governments now that allow private stations at all, and I look for none inside of four years, and I would not be a bit surprised if the next conference did not contain an international agreement to have at least the high-power stations in the hands of the Government.

Mr. EDMONDS. And yet the great commercial nations of the world, England and Germany—

Capt. TODD (interposing). Germany has only three stations, and they are in her protectorates, and she did have two on our own shores.

Mr. EDMONDS. And yet you say all the wireless in Germany was virtually governmentally controlled.

Capt. TODD. Yes, sir.

Mr. EDMONDS. England and Germany and the United States—the three great commercial nations of the world—have not owned their wireless. Those other nations have been forced to build Government wireless stations and have Government wireless stations for the simple reason that no private person was encouraged by commercial business to build wireless.

Capt. TODD. That may be the reason.

Mr. WHITE. You say that there are only seven Governments that do not control their wireless. Does that mean that all other Governments forbid private wireless enterprises, or that private enterprise has not undertaken the development in these other countries?

Capt. TODD. It means that the operations or stations is in Government hands.

Mr. WHITE. Private operation is forbidden, or it just happens that the Government has got it?

Capt. TODD. In some cases, in the weaker nations, say, in South America—I don't know whether I would say that.

Mr. WHITE. I wondered what the fact was, whether it was simply a case of where the Government had gone ahead and made arrangements, or where the Government had forbidden private enterprise to do it. It might make a very material difference.

Capt. TODD. I can not say positively as to every one of these nations, but the majority of them have positive laws requiring the Gov-

ernment monopoly, that no radio stations shall be operated except by the Government.

Mr. BURROUGHS. How effective is that regulation in those countries, do you know?

Capt. TODD. I do not know. I know that they have no advertised commercial stations; they are all down as Government stations.

Mr. BURROUGHS. What is to prevent, in case you get this legislation, some one from erecting one of these little stations that you speak of and cutting in and getting these messages and you not know any thing about?

Capt. TODD. Nothing at all. The receiving outfit might be set up in this room, and with the best operators could receive messages from Germany right here without it showing outside. But it provides the penalty for doing anything of the kind. It is like any other law that is broken.

Mr. WHITE. You can pick up a station which is sending, but you have no means of checking up a station which is receiving?

Capt. TODD. None at all without the license system, which the present law does not provide for at all. Anybody, not only amateurs and Americans, but any foreigner can put up a station and not be questioned.

Mr. BOWERS. You can establish a penalty there, but how are you going to enforce it; how are you going to tell as a practical thing whether they are doing it or not?

Capt. TODD. You would have to judge from results. If there is a leak of information of a private nature, we would have to trace it down and find out where it came from. If the Associated Press collects news in foreign lands at great expense and tries to transmit it from a high-powered station, we will say, to somewhere outside the country, and that news is suddenly published in a local paper, somebody connected with the Associated Press would immediately demand an investigation, and we would look for the illicit radio station.

STATEMENT OF LIEUT. J. C. COOPER, JR., UNITED STATES NAVAL RESERVE FORCE.

Lieut. COOPER. Gentlemen, I am an ex-amateur radio operator and "amateur naval officer," as I am soon going back to civil life to take up the practice of my profession again. As many other amateurs, when the war broke out, I offered to do what I could for the service, and have had some duties in connection with radio work which have given me an opportunity, I hope, to be able to see the point of view of the Navy and the point of view of the amateur operator to some extent at the same time.

Several days ago there was a meeting called in Capt. Todd's office—without knowing how many men would be present—of all of the ex-amateurs who happened to be on duty in the naval service in Washington. There were about 25 or 30 men present. The question of the operation of amateur stations after the war was very liberally discussed, and a memorandum was prepared and sent to each of those men and any other men in the naval service in Washington who had been amateurs that we could locate, with the request that the questions be answered and sent back as soon as possible, with an idea of

drafting an amendment to the present law which would, as far as possible, meet the combined view of themselves as previous amateurs, knowing amateur operations and knowing what the amateur desires to do and what he has done, and also with their experience since the war as part of the Government's service that has controlled radio. I had the unfortunate responsibility of having to say the final word on collating those opinions and putting them into the form of an amendment. There is no body of men, I believe, who disagree more violently among themselves on every subject that concerns them than do the amateur radio operators. I am convinced that from now on, as these hearings are going to be printed, my name is going down in radio history among the amateurs to some as guilty of high treason, to others as being foolish, to others as deserving some credit if this amendment goes into law. I do not expect all the amateurs to agree with it at all. It is the collective judgment, however, of a certain number of amateurs who have seen both the Navy point of view and the amateur point of view, and I, myself, with the approval of the department, and it is offered as an amendment to the bill.

The present law states that the amateur who does not hold a special license is authorized within 5 miles of a Government station to use a transformer input of one-half kilowatt, elsewhere 1 kilowatt, and to use a maximum wave length of 200 meters. All amateurs are agreed that you can not properly tune an efficient amateur station quite as low as 200 meters; that an extension in wave length is desirable. The consensus of opinion of those I have talked to is that the limitations of this amendment—that is, not to exceed 250 meters—will greatly increase the efficiency of amateur stations, and will enable the amateur to further fulfill his real function, which is to train him as an operator for any national emergency that may arise, and to possibly train him as a further developer of the radio art. The amateur has no place in the scheme of things if he is not useful. The ether is a means of communication which must be put to the use of the community as a whole for the advancement of the community. Unless the amateur operator advances the art, or advances the community, the amateur has no right to exist. I, personally, as a naval officer, have had many operators under me. I have found that of the new men under me, the easiest trained, the most adaptable to the new apparatus, and the most efficient men I had were ex-amateur operators.

I took two of my best men the other day and put them on the President's ship to receive official messages from Washington. They were both ex-amateur operators; and I think that I speak for Capt. Todd and the Navy when I say that no one more than the Navy realizes the value that the amateur operator was to the Navy when the war first broke out. I, personally, of course am prejudiced in favor of the amateur, because I am praising myself when I praise the amateur, because I am an amateur operator.

This amendment also licenses receiving stations without requiring a license of the operator. In other words, the jeweler who has a receiving station simply for the purpose of receiving the Arlington time signals and checking up his chronometer will not require to be a radio operator to operate his receiving stations. Likewise, the amateur who is only learning to send, who is just starting, will not have to have any license in order to operate a receiving station. We do

not think, on the other hand, that any amateur ought to have a right to touch the key and to cause possible blundering interference by his lack of ability as an operator unless he can receive and send what is usually called 15 words per minute; that is, 75 letters per minute, in the ordinary standard of 5 letters to the word, which is what we use in averaging an operator's speed. I personally do not think that that limit is too high. Others may disagree with me. I personally think that no operator ought to touch a key and ought to be allowed to interfere with this medium of commerce, which is the ether, unless he has that degree of skill. If he is required to have that degree of skill, it will be an incentive to him when he is first learning the art to get up to that degree of skill as soon as he can, so that he can have a transmitting license.

This amendment includes a clause authorizing the Government, where it is found expedient—as, for instance, in large centers or elsewhere—to limit the transformer input of amateur stations to one-half kilowatt if within 100 miles of the seacoast or within 5 miles of a Government receiving station to one-fourth kilowatt. I am frank to say that those powers are higher than the consensus of opinion of these written documents from which I compiled the amendment. Those powers are more liberal than the great majority of the men who compiled these memorandums thought proper, but after talking with Capt. Todd and Commander Hooper, and with especially this idea in view, namely, that there are many amateur stations which will have to apply for a license before they can again reopen, who, if the input is cut down very much from the present law, will be required to remodel a part of their apparatus or give up their apparatus if we change the power limits very much. Personally, I think that those limits are as reasonable as can be safe from the point of view of noninterference with the real business of radio, which is sending official and commercial dispatches, and that those powers are ample to provide full experimentation that an amateur ought to have occasion to do and all communication that he may have occasion to make. Mark me, it does not say that a license can not be issued up to 1 kilowatt under those limitations. It says that the Government may in its discretion put those limits on.

For example, we will take on the peninsular of Michigan or on parts of the more or less uninhabited coasts of the Gulf, there is no reason why there would be stations near enough or ships working near enough so that 1 kilowatt would necessarily cause interference by what we call "forced oscillation." The amendment leaves it in the discretion of the licensing power to cut down to those limitations amateur stations which are near the centers of commerce, where other stations are using radio for its real purpose, and still it allows the amateur to work.

There are a lot of amateur operators here, some of whom I have known personally; some I have met since I have been here to-day; some I have had correspondence with before the war. A lot of them are going to disagree with me; some of them are going to think these limitations too low, and some are going to think these limitations too high. That will be for the committee to decide. This is submitted by the Navy as a measure to assist in the future development of amateur radio.

I want to say a few words about the high-power stations at the present time, so far as the actual operation is concerned, and before I do so, if anyone wants to ask me anything about the amateur, I will answer before proceeding with the high-power stations.

Mr. SAUNDERS. I want to ask you a few questions about the amateur before you get on the subject of high-power stations. You have read the bill that is under consideration by the committee?

Lieut. COOPER. I have read it, sir.

Mr. SAUNDERS. Aside from your amendment you have been discussing, there is no provision in the bill whatever relating to amateurs, is there?

Lieut. COOPER. I understand, sir, it was the intention of the department to license amateur operators.

Mr. SAUNDERS. Under the bill that has been introduced there is no provision for the amateur?

Lieut. COOPER. Not under the name "amateur."

Mr. SAUNDERS. Is there under any other name?

Lieut. COOPER. I think, sir, there would have been no reason why amateur stations should not have been licensed under the term "experimental stations."

Mr. SAUNDERS. Suppose it is just a single individual. I understand a great many of these people who are amateurs took up this thing before the war—just young men who took up the business themselves?

Lieut. COOPER. I did so myself.

Mr. SAUNDERS. That would not be called a station, would it?

Lieut. COOPER. Oh, yes, sir.

Mr. SAUNDERS. Do you think, under the language "experimental stations," that any little individual amateur operator in the wilds of my district, I will say, who has been working on the thing himself as an intellectual improvement, could be described as "experimental station"?

Lieut. COOPER. I think so. But I say it is a moot point in view of the amendment.

Mr. SAUNDERS. I do not see how that could be done with respect to the provision as to who is to be licensed as an amateur. Under that, necessarily, before any man could start out as an amateur, he must have had the opportunity to take some training at some school.

Lieut. COOPER. Very frankly I think that very few amateurs ever went to a training school.

Mr. SAUNDERS. You require them to possess certain capacities by your amendment; they have got to have a certain facility.

Lieut. COOPER. The amateur can learn that by using the buzzer. All amateurs do the same thing, all operators.

Mr. SAUNDERS. Can he experiment enough with the wireless apparatus to acquire that facility without having a trainer?

Lieut. COOPER. May I suggest, sir, that the process would be something like this: That by listening in, as we call it—and you will note that no license is required for receiving—a man can become accustomed to using the receiving apparatus, and he can become accustomed to the sending with a key hitched to a little buzzer, which is not a radio operator, and he can be taught to send up to any speed he can ever attain.

Mr. SAUNDERS. He can teach himself, in other words, can he?

Lieut. COOPER. Teach himself, or be taught by other amateurs.

Mr. SAUNDERS. He can pick that up by his own efforts, and by his own ingenuity and application at home and can acquire the facility which you have imposed upon him before he can receive a license?

Lieut. COOPER. I think any of the amateurs here will agree with me on that.

Mr. SAUNDERS. With respect to this amateur, after he has attained that speed, and then is given the license that you contemplate, all of his operations would be controlled by the terms of his license?

Lieut. COOPER. They are at present, under the present law.

Mr. SAUNDERS. Do you contemplate any difficulty in that connection, if he operates according to the terms of his license, with commercial operation of the Government system, or any other commercial system?

Lieut. COOPER. The limitation of wave lengths, sir, and the limitations of power in the present law of 1912, as amended by this amendment, are designed to prevent the amateur from causing interference with commercial stations.

Mr. SAUNDERS. But you can see no danger of interference with the wireless system in the hands of private enterprise or Government control?

Lieut. COOPER. It was my view, sir, in drafting the amendment as it is, that these limitations on power and wave lengths would prevent such interference.

Mr. SAUNDERS. So that in considering the general problem with respect to the necessity of having this entire business under Government ownership and control, we can eliminate any factor of danger from amateur operators?

Lieut. COOPER. I think so, sir, with the exception of the fact that adequate inspection of amateur stations must be had in the future if the amateur is to maintain the dignified position in the radio world that he should.

Mr. SAUNDERS. That is, by regulation?

Lieut. COOPER. Yes, sir.

Mr. SAUNDERS. As I said, you eliminate the amateur experimenters as a factor in determining this policy, because they will operate in a field outside of the field that this policy is designed to control?

Lieut. COOPER. That is the idea of the amendment.

Mr. SAUNDERS. Can you not provide us with copies of that amendment?

Lieut. COOPER. These copies are being made, and will be here tomorrow morning.

There is one coming factor in radio work which may adversely affect amateur operating which should be looked forward to at the present time. The fleet—and this is not disclosing military secrets—is using for intercommunicating purposes very short wave length, shorter than the one hundred fifty meters mentioned here as the minimum length that an amateur should use. Aircraft are also using various wave lengths, some of which are almost down to 250 meters. There may be trouble in the future, sir, between aircraft operating overland and working with their receiving or transmitting stations,

and amateur stations. That is a possibility of the future that I will call the attention of the committee to at this time, because this thing may come up here at another time under some future law, and I simply want to warn the committee that this is a new field that we know nothing about. Aircraft radio was not in existence to any extent when amateurs last operated. There may be interference between amateur operators and aircraft radio stations, but it is hoped that there will not be.

Mr. SAUNDERS. Government ownership has nothing to do with that problem?

Lieut. COOPER. Except the Government would probably be operating the stations for aircraft.

Mr. SAUNDERS. The possibility which you speak of which may arise hereafter is a thing that will be met by appropriate regulations, is it not?

Lieut. COOPER. It might be, sir, if this amendment is passed, that it might have to be met by legislation again reducing the wave length back to where it is now.

Mr. SAUNDERS. Appropriate legislation?

Lieut. COOPER. It might be legislation and not regulation.

Mr. SAUNDERS. Legislation is just that much more authoritative than regulation.

Lieut. COOPER. I usually think of "regulation" as a regulation of a department.

Mr. SAUNDERS. I admit that is so in general, where you think of something issued by some department head or some bureau chief.

Lieut. COOPER. Are there any other questions? If not, I want to say just a few words about the high-power stations in this country at the present time.

There are present representatives of the principal radio companies in this country. With all due respect to them and with all due respect to other experts, I wish to say that since the war the Navy Department has had more experience in handling high-power radio traffic, and is therefore in a better position from a practical operating basis to say what can and what could be done than anybody else. The high-power traffic existing before the war commercially was one circuit from Hawaii into California, operated by the Federal Co.; another circuit from California into Hawaii, operated by the Marconi Co.; the Marconi circuit from Hawaii in connection with the station of the Imperial Japanese Government at Funabashia. The only high-power stations constructed in the world in the last three years by other than Government agencies have been the stations on American soil, and the station at Carnarvon, Wales, constructed by the British Marconi Co., and in which so-called time-spark apparatus is installed.

No trans-Atlantic radio traffic between the United States and Europe has ever been handled except the German traffic between Sayville and Nauen and between Tuckerton and Eilvese.

The only commercial radio traffic with Great Britain from this continent was a circuit operated from the Newfoundland station by the Canadian Marconi Co. with the corresponding station at Clifden, owned by the British Marconi Co. No commercial concern has ever faced the problem that the United States Government has faced in handling trans-Atlantic radio communications; that is, joint and

simultaneous radio traffic between the United States on the one hand, France, Italy, and England on the other. The Navy has handled that traffic and is doing it.

There has been developed a system of operation which has been maintained as a military secret, which has recently been made more or less public, and which Capt. Todd has authorized me to explain to you gentlemen.

The four high-power stations on the Atlantic coast now in operation—the naval station at Annapolis, Md., the station at Sayville, the station at Tuckerton, N. J., the station at New Brunswick, N. J.—are all operated by keys located in my office in the Navy Department. Four operators sit at the four small tables in one room. The pressure of a key on one of those tables operates, by means of relay, the actual sending station at Annapolis; another key operates the station at New Brunswick; another key operates the station at Sayville; and another the station at Tuckerton. No receiving is done at any of those stations. When we commenced to develop this trans-Atlantic system, in response to very urgent requests and; in fact, insistence of Gen. Pershing, that adequate steps be taken immediately to substitute the cables, in case they were cut by German submarines or other enemy activities, the Navy Department used first the two receiving stations constructed, but never used for that purpose, by the Marconi Co., one at Belmar, N. J., which was to have been the receiving station for the New Brunswick station, and the one at Chatham, Mass., which was to have been the receiving station for the Marion station. It was early found, sir, that the physical locality of neither one of those stations was all that was to be desired. The Navy constructed a receiving station of its own at a place called Otter Cliffs, not far from Bar Harbor, on the point of Mount Desert Island. That station and the Belmar station also—the Chatham station we have since turned back to the Marconi Co. and closed—those two stations are equipped so that they can receive simultaneously from each of the high-power trans-Atlantic stations in Europe. Radiograms can be received simultaneously from Carnovan in England, from Nauen in Germany, because we find it of great interest to copy everything the Nauen has to say; Lyon, the high-power station of the French Army in France; Nantes, the high-power station of the French Navy; and Rome, which is the high-power station erected last year by the Italian Navy. In addition to that, we can receive two or three other stations, if necessary, at the same time. As a matter of fact, we at the Otter Cliffs station are receiving messages from the Pennsylvania, relayed from the President's ship, and also other experiment schedules are maintained as well as our regular trans-Atlantic traffic.

Mr. SAUNDERS (presiding). You mean the different operators receive at the same time, or one operator?

Lieut. COOPER. I mean different operators. The stations are duplex stations. That is not a proper word, because "duplex" from its proper derivation means "double." The stations are multiple receiving stations; that is, they can receive from a large number of transatlantic stations at the same time.

What is the economy of operation in this scheme, and what advantage has it over any other scheme of transatlantic radio traffic? Absolute unity of control.

I venture to suggest, sir, that if you do not pass this bill now there will be many of you still in the service in Congress when you will pass this bill. The Government control of high-power radio traffic from the economic standpoint of the maximum amount of business to be handled is bound to come.

Mr. GREENE. That is an opinion.

Lieut. COOPER. That is my opinion, sir.

Mr. SAUNDERS. You say that is what you call a duplex receiving station.

Lieut. COOPER. Yes, sir. A multiple receiving station.

Mr. SAUNDERS. Tell me what is required for a duplex station. Can not all these other stations receive anything?

Lieut. COOPER. They can, sir. But I am trying to explain to you how this operates as a whole. Let us consider that the Tuckerton station goes back to its owners, whoever the courts determine that its owners may be, either a French corporation or a German-controlled corporation; the Tuckerton station, whoever owns it, will erect a receiving station to receive from the station that they happen to be working with in Europe. The New Brunswick station, if turned back to the American Marconi Co., will operate a separate receiving station and will operate that station as a part of a separate circuit. What occurs? In case at the present time any one transmitting station breaks down here is a message that the operator has got on his desk [illustrating with a piece of paper]. It is passed over to the next desk and sent. That can always be done if this present Government system is maintained.

Mr. SAUNDERS. That means three or four sending stations under your control?

Lieut. COOPER. Yes, sir.

Mr. SAUNDERS. And if one breaks down, it is turned over to the next?

Lieut. COOPER. Yes, sir.

Mr. SAUNDERS. Suppose a commercial private enterprise has one, two, three, or four sending stations, do they not send from one of those stations, like the telegraph?

Lieut. COOPER. Here is the situation, sir: On account of the actual physical limitations of radio traffic the maximum number of high-power stations which can be operated at one time is undoubtedly limited. I personally believe that the number now in operation on the Atlantic coast is getting very close to the practical limit of continuous operation, because in order for them to be of their best use to the community they must all be used at one time. Now, suppose these stations are all operated by separate concerns. In case of any breakdown you are just losing that much traffic which could be handled for the benefit of the community; that is the point I was trying to make, sir.

If all of these stations are handled on separate circuits you have not the same flexible control; you have not the same flexible handling of your traffic and you have not the same direct control over the wave length and operation of the stations that you would have with the uniform control.

Mr. SAUNDERS. Now let me work that out a little and see if the committee understands it: The Government, we will say, has a send-

ing station at Long Island, and a sending station at Annapolis, and one at Washington.

Lieut. COOPER. Yes, sir.

Mr. SAUNDERS. Now, I understand that if a message commercially is offered to the station here at Washington, and that station happens to be out of repair, they would just turn it over to the sending station at Annapolis; that is what you contemplate, is it?

Lieut. COOPER. You do not quite get me. We really have one control room, one physical room.

Mr. SAUNDERS. But the effect of that is that you turn the message over to that other station?

Lieut. COOPER. But that is a sending station—

Mr. SAUNDERS (interposing). Well, that is a matter of detail. But the fact is that you turn it over to that station?

Lieut. COOPER. Yes.

Mr. SAUNDERS. Now, if you turn it over to that station, and furnish those facilities to the public, they can have a control room too, can they not?

Lieut. COOPER. But with no other means than the control of all of the stations operating together.

Mr. SAUNDERS. All of their own stations, of course?

Lieut. COOPER. That is exactly it, sir.

Mr. SAUNDERS. Well, the Government only controls the Government sending station, does it not?

Lieut. COOPER. You can not handle as much traffic if you have a large number of concerns controlling that traffic as you can handle if you have only one concern controlling all of the stations that are handling the traffic; and I believe that the traffic experts—

Mr. SAUNDERS (interposing). Well, that is another proposition.

Lieut. COOPER (continuing). I believe that all of the traffic experts will agree with me on that.

Mr. EDMONDS. That seems to be a familiar argument; it is like the one they use about the railroads.

Mr. SAUNDERS. You can not lay that down as a scientific proposition, can you, Lieutenant?

Mr. EDMONDS. He states that the ether waves are pretty well taken up. I understand that you can run these wave lengths up to 25,000 meters, or more?

Lieut. COOPER. The longest wave length in use at the present time is about 17,000 meters; and if there is any single hole in the ether, up to 17,000 meters, it can not be found.

Mr. EDMONDS. Well, is there such a condition that a difference of only 200 meters between stations will prevent them from operating at the same time?

Lieut. COOPER. Absolutely.

Mr. EDMONDS. What is the nearest to each other that you can have them, in wave lengths?

Lieut. COOPER. It depends on the type of transmitter, as well as the ability of the operator and the type of receiving apparatus. Certain operators can read a weaker signal, while reading another station, just on account of their own mental make-up. But, so far as the actual present traffic is concerned, I can give you the actual wave lengths in use, and as I explained, I do not think there are any

holes in the ether where any other wave length can be used in the present high-power stations. Beginning pretty well along down the list, the station at Tuckerton is using about 8,000 meters. The station at Nantes in France is using 9,000, on some of its schedules, on low power. They interfere with each other.

Mr. EDMONDS. You say they do interfere with each other?

Lieut. COOPER. Yes; one is French and the other is American. The regular station wave is 10,000 meters for trans-Atlantic traffic. The station at Sayville is using 9,600 meters.

Mr. EDMONDS. Does that interfere with the one at Tuckerton? /.

Lieut. COOPER. No; these that I have given are being operated simultaneously without interference.

Mr. EDMONDS. Then a difference of about 400 meters in the wave length would allow the message to go through all right, would it?

Lieut. COOPER. A difference of 500 to 750, if it is a very sharply tuned high-power station, would. Certain types of stations can not be used anywhere near that sharp. The station at Carnavon, working at 14,000 meters, on account of what we call certain harmonies, prevents the reception in London of messages at about 11,500; that is on account of the different types of transmitters in use. I am talking about the sharply tuned stations.

Mr. EDMONDS. Well, is it not the modern idea to have sharply tuned stations?

Lieut. COOPER. Exactly; and our claim is that the stations of the Navy are the most sharply tuned ones.

Mr. EDMONDS. Well, can not the other people have them, too?

Lieut. COOPER. They can have them, but they have not put them in up to the present time.

Mr. SAUNDERS. What do you mean by "holes in the ether?" [Laughter.]

Mr. EDMONDS. That is one of those things that aeroplanes drop into. [Laughter.]

Mr. SAUNDERS. I have heard that phrase before, and I was curious to know what it meant.

Lieut. COOPER. It is a slang expression which I should have not used to the committee.

Mr. SAUNDERS. Do I understand correctly that it is an oscillation in the power of the instrument?

Lieut. COOPER. What I mean by "holes in the ether" is that I do not think there are any spaces existing between wave length now in operation where other wave lengths could be placed.

For instance, last year the station at Carnavon was working on 14,000 and about 100 or 200 meters. Nauen station in Germany was working on 12,600 meters. It appeared perfectly plain that there was a space in between there where another trans-Atlantic station could be used. New Brunswick station was therefore turned for 13,600 meters and operates on that wave length.

Mr. WHITE. How long have you been connected with the Navy Department, Lieut. Cooper?

Lieut. COOPER. Since May 17, 1917.

Mr. WHITE. And have you been employed all that time in connection with radio activities?

Lieut. COOPER. I was assistant to the district communication superintendent in the Charleston radio service until September 1, 1917.

I was ordered to Washington for duty, in the office of the Director of Naval Communications at that time; and it has been my good fortune to be there ever since—except that, personally, I would have liked some foreign duty, but have not been able to get it.

Mr. WHITE. How long had you been a wireless operator or student before your connection with the Navy?

Lieut. COOPER. The first radio book that I remember reading was in 1902.

Mr. WHITE. So that you have been a wireless operator or student since 1902?

Lieut. COOPER. I took a special course in mathematics and physics in college and was more or less familiar with radio telegraphy as a student.

Mr. SAUNDERS. Well, as I understand, the scientific conclusion that you state is that, in this field, practically, they have exhausted all these possible wave lengths that may be efficiently and commercially used?

Lieut. COOPER. Unless some stations now in actual use are made to behave themselves very much better than they are now doing, by very much more efficient tuning—and I am not referring to the American stations now.

Mr. SAUNDERS. There is a limit, then, on the possible development—that is the statement, that you have exhausted the feasible wave lengths?

Lieut. COOPER (interposing). No, sir. I say, with the present development.

Mr. SAUNDERS. Then, all that you mean is that, so far as the present state of the science is concerned, you can not use any other wave lengths?

Lieut. COOPER. That is exactly what I mean.

Mr. EDMONDS. You can go higher than 17,000 meters, can you not?

Lieut. COOPER. You can, by building new stations. You can not tune a station higher than a certain wave length and still get an efficient operation of that station.

For example, the antennae of a certain size has a certain natural wave length, that is, that antennae of itself oscillates at a certain wave length. Now, you can not tune that station very many times beyond that natural wave length and still get a sufficient output, compared to the amount of money you are paying for power coming in. Theoretically, you could tune an amateur station to 100,000 meters, but you would get no radiation that would be efficient; and the same is true of high-power stations.

Mr. EDMONDS. But as the demand comes on for higher power stations, they would tune those stations up to very much higher wave lengths as necessary, would they not?

Lieut. COOPER. What we are going to collide with in the operating and development of wireless, when we get into excessive wave lengths—I do not believe any gentleman here can answer as to that, as to what the maximum wave length is that is going to be practicable in the future for radio operation. I do not think that anybody can answer that question. Do you think anybody can, Commander Hooper?

Commander HOOPER. No; I do not.

Mr. SAUNDERS. Well, having in mind that this is an open field, and that the possibilities of development exist, every possible stimulus ought to be given for the inquiring, scientific mind to open up new wave lengths that can be efficiently and commercially operated.

Lieut. COOPER. I think so, sir; but I frankly believe that Government control of radio telegraphy will not act as a damper upon the scientific development of the art.

Mr. SAUNDERS. Are you prepared to say that, in your judgment you think it would be effective in aid of it?

Lieut. COOPER. I will say that Commander Hooper is especially qualified to speak on that point when he makes his statement. I think that what is true of the past would be true of the future; that is the only answer that you can make to a question of that kind.

Mr. SAUNDERS. Does that mean that up to the present time the main developments in this field have been made through the Navy experimenters?

Lieut. COOPER. I beg your pardon. I was going to finish my sentence. The Navy Department has in the past been in advance of commercial companies in installing up-to-date apparatus in its stations.

And what has been true in the past there is no reason why it should not be true in the future—and it will undoubtedly be true, because the Navy desires the best apparatus that it can have, to give the most efficient service that it can give.

Also, a Government institution, not being bound by the purely commercial outlook, is at liberty, for the purpose of obtaining more efficiency, to take out of its stations obsolete apparatus and install new apparatus, when a commercial company could not do so, because the obsolete apparatus might not have been there long enough to have paid for itself.

Mr. SAUNDERS. As I understand your answer to my question, you said that the Navy was ahead of commercial companies with respect to the installation of big apparatus. Do you also mean to say that the Navy experts and inventors have been responsible for the development of that art by devising new apparatus, etc., or has that come from the outside?

Lieut. COOPER. As I said, Commander Hooper is more familiar with that than I am; but my own opinion is that the Navy has adopted, as rapidly as was consistent with proof of its worth, the best apparatus that was developed by outside inventors, and has also contributed its honorable part in the development of the science.

Mr. EDMONDS. Lieut. Cooper made a statement there that is positively true—that the Navy does not have to exercise any care as to how much money it spends. [Laughter.]

And, on the other hand, a private company has to do so. Then, on top of that, they do not have to worry about patents; they simply give orders and take all of them they want and do what they please with them, whereas the private company would have to pay for the patents they used. Therefore the Navy should develop very rapidly and should be in the lead in the science to-day. [Laughter.]

Lieut. COOPER. I can not help answering you as a lawyer. I am a lawyer by profession. Congress has provided the Court of Claims to meet exigencies of that kind.

Mr. EDMONDS. Has the court met yet? [Laughter.] I happen to be on the Claims Committee of the House, and I know what happens, and I am very sorry for any man that gets there.

Mr. GREENE. I have had some claims before it, and I have never been able to get anything from it.

Lieut. COOPER. Well, the Navy is not responsible for other bodies created by Congress.

Mr. SAUNDERS. Are there any other questions that any member of the committee desires to ask the witness?

If not, the committee will ask Capt. Todd to put on his next witness.

Capt. TODD. May I ask that a recess be taken until to-morrow morning, Mr. Chairman?

(Thereupon, at 5 o'clock p. m., the committee adjourned until Friday, December 13, 1918, at 10 o'clock a. m.)

COMMITTEE ON THE MERCHANT MARINE AND FISHERIES,
HOUSE OF REPRESENTATIVES,
Washington, D. C., December 13, 1918.

The committee met, pursuant to adjournment, at 10 o'clock a. m., Hon. Joshua W. Alexander presiding.

Mr. EDMONDS. Mr. Chairman, before the committee proceeds with the next witness I should like to ask Capt. Todd a few questions.

The CHAIRMAN. Very well. Before Capt. Todd proceeds I should like to make this statement. The amendment in which the amateurs seem to be interested is being mimeographed, and copies of it will be available shortly for distribution. I make this statement for the information of some gentlemen who inquired about it a little while ago.

STATEMENT OF CAPT. DAVID W. TODD, U. S. NAVY—Resumed.

Mr. EDMONDS. Capt. Todd, the Secretary yesterday spoke of erecting wireless stations in Panama and Cuba. Were those stations erected by the Panama Government and the Cuban Government?

Capt. TODD. In the case of Cuba they were erected by the Cuban Government. We simply got the material for them, as they would have had difficulty in obtaining them in war time. The radio stations in Cuba were, in this particular juncture, of very great military value, because we were expecting submarine operations in the Gulf of Mexico.

The stations in Panama, however, are being erected by the United States Government, in accordance with an agreement with the Government of Panama. The defense of the Canal Zone is so intimately tied up with the radio stations, and the stations in the Canal Zone must be so absolutely free from interference that we persuaded the Panama Government to agree that they would not put up any stations of their own in their Republic. They protested and said "That would interfere with our development." We said "We understand that, and we are not going to shut you out altogether, and such stations as are necessary, by mutual agreement between the two coun-

tries, for the commercial development of Panama, or for the safety of our ships, or the shipping approaching the Canal Zone, we will erect and operate for you, so that you will get everything you want, and the defense of the Canal Zone will not be imperiled."

Mr. EDMONDS. Then they are owned in Panama by our Government?

Capt. TODD. Yes, sir.

Mr. EDMONDS. Outright?

Capt. TODD. Yes, sir.

Mr. EDMONDS. In Cuba you did not lend any money to erect the stations?

Capt. TODD. Not that I know of, sir.

Mr. EDMONDS. Have you approached any other South American country with the idea of erecting wireless stations?

Capt. TODD. None, excepting possibly Brazil. When she was our strong ally during this war we did offer to send a receiver down there with our operators. We did not care to let one of the latest receivers, built under the pressure of war, go down there to be examined by anybody that might come along, so we offered to send a receiver down there with our operators to manage it, in order that they might receive from the United States as much as they needed for war purposes. But, if I am not mistaken, nothing was done about it, because the armistice was signed before the plan was carried out.

Mr. EDMONDS. Have you not approached different South American countries with the proposition that you would erect wireless stations there and supply the money for doing so?

Capt. TODD. I believe not, sir.

Mr. EDMONDS. Or that you would lend the money to do so?

Capt. TODD. I believe not, sir. I do not think that was ever actually done.

Mr. EDMONDS. You had that in your mind, though? The department had it in its mind to do so?

Capt. TODD. I won't say that, sir. That idea was discussed, because in connection with the Pan American wireless matter that the Secretary of the Navy touched on yesterday—

Mr. EDMONDS (interposing). You were not approaching it through the Pan American Wireless Co. at all; you were approaching it directly yourself?

Capt. TODD. I was speaking about the Pan American wireless scheme. We had a Pan American radio congress, and urged them to own and operate their own stations for the mutual benefit of the two Americas, for closer commercial union, and for possible military use in case of encroachment.

Mr. EDMONDS. You have not offered financial assistance to any of these countries?

Capt. TODD. Not that I know of.

Mr. EDMONDS. To lend them money for the purpose of building a Government wireless?

Capt. TODD. Not that I know of. In connection with the discussion of the Pan American scheme it was suggested that many of the countries of South America who were interested in the scheme would not be in a position to erect stations of their own and would be dependent upon foreign capital, foreign apparatus, and so on. I have

heard it suggested that one way to do that would be to encourage strictly American companies to do it, or to lend them the necessary financial assistance to put up their own stations, so they would not be dependent on foreign capital—meaning European.

Mr. EDMONDS. But that has not really been carried out?

Capt. TODD. No, sir; not so far as I know.

Mr. HUMPHREYS. When was this Pan-American congress held?

Capt. TODD. About three years ago, sir.

Mr. HUMPHREYS. Whereabouts?

Capt. TODD. In Washington, under the auspices of the State Department.

Mr. WHITE. Captain, you spoke of sending one of your men down there with one of these latest receivers in order to prevent anybody inspecting it. Was that receiver something that was developed and perfected by the Navy Department, or was it something you got when you took over these private companies?

Capt. TODD. I would rather Commander Hooper would answer that question. I will say I am pretty sure it is a combination of all the latest ideas, the very highest type of long-distance receiver in the world.

Mr. WHITE. Yes; but what I wanted to get at was whether it was something evolved by the naval officers or whether it was something the department got from outside and private concerns which the department took over.

Capt. TODD. As far as I know, the department did not take over any private concerns, sir. We have been buying our radio apparatus from the manufacturers of the country. That is just something I have heard; I do not know definitely, and Commander Hooper will be able to answer that question with great exactness.

Mr. EDMONDS. In regard to the offer of money to assist these other Governments you say, "Not that I know of." Would there be anybody else that would know if it were being done?

Capt. TODD. The State Department; yes, sir. That would be a State Department matter. All correspondence with those South American countries is conducted by the State Department, but it is highly probable I would know about it.

Mr. EDMONDS. I should imagine you would. If you find any different, will you let us know?

Capt. TODD. Yes; I will.

Mr. EDMONDS. Will you take the trouble to make the inquiry?

Capt. TODD. Yes, sir; I will.

The CHAIRMAN. Captain, you would not appear here in the position of an apologist to the American people for the Navy Department if any such policy as that were in view, would you?

Capt. TODD. I would probably hear of it; yes, sir.

The CHAIRMAN. I say, you would not put yourself in the attitude of a criminal doing something against the public interest if you had tried to make such arrangements between the United States and South America, for the establishment of a system of wireless for use in time of peace for commercial purposes, and in time of war for the national defense, would you?

Capt. TODD. No, sir. All those things would be strictly in line with my duties.

The CHAIRMAN. Very well. Then you would not feel any hesitation about disclosing to this committee and to Congress if that was a fact, would you?

Capt. TODD. Only from the point of view that these are negotiations of the State Department which I could not make public.

The CHAIRMAN. I can very well understand why some special interest might object, or some European interest, but I can not understand why the red blood of America should. I simply wanted to explain my view of the matter.

Capt. TODD. I should hesitate to make public in this way what the State Department is doing, even though I had had a hand in the correspondence in connection therewith. I had hoped and still hope that one of the higher officers of the State Department will appear in support of this bill to-day.

Mr. EDMONDS. I do not think personally that there is anything criminal in the matter.

The CHAIRMAN. I think that is an inference from your question, that you thought it was some scheme against the public interest.

Mr. EDMONDS. I am merely trying to bring out the fact that the Navy Department has originated a new policy without the consent of Congress. That policy should be known by Congress, and if we want to consent to it we should, and if not we should not allow the policy to be extended any further. The matter of lending several hundred thousand dollars to different South American countries is a matter for Congress to decide, not the Navy Department.

The CHAIRMAN. Well, there is not a dollar of money appropriated by Congress unless it is made under its authority and carrying out some policy. I do not know how far the Navy Department has gone, because these questions of appropriations come up before the Committee on Appropriations and the Committee on Naval Affairs primarily, but I would think it a desirable policy just the same, speaking from a personal viewpoint. As to whether those extensions should be controlled by the Navy Department, that is secondary, but as a national policy I should think it would be of importance, because that is what the European governments have done and continue to do. The question is whether we will recognize our national interests and protect them.

Mr. BANKHEAD. I would like to ask this for my personal information, Mr. Chairman. Something was said yesterday about the probable cost to the Government of requisitioning all these other plants that are proposed to be taken over; was that discussed in any way yesterday?

Mr. EDMONDS. The Navy Department has purchased the Federal wireless and the Marconi wireless stations at a cost of about \$3,000,000; I think that is about the round figures. Secretary Daniels stated that it would cost about \$5,000,000, in round figures, to purchase these stations that they are talking about in this bill. That has nothing to do with these South American stations.

As to the South American question, of course, if the Government is intending to commit itself to the policy of Government-owned wireless, then the question of having stations at different points is a part of that policy, and what I am trying to bring out now is whether the Government has committed itself. We are sitting here

objecting to Germany and other countries having wireless in our country, and that same objection is just as good in some of these other countries, and there are international complications which we have to take into consideration when we discuss this bill, because these wireless stations are absolutely useless unless we have somebody to talk to.

Mr. BANKHEAD. I understand your attitude. My question was just for personal information.

Mr. EDMONDS. This was the physical valuation that Mr. Daniels put on these properties—about \$5,000,000. That was in the testimony yesterday. Outside of that is the question of patent rights, which, of course, become valueless in this country when there is only one person to purchase them, or become considerably depreciated in value. All of those patent rights are in litigation, and I think when Commander Hooper appears to-day we will probably get some light on the patent situation.

I said yesterday that we had before this committee a Government ownership bill which we had decided to lay aside, and yet at the same time the Navy Department has gone ahead and embarked us on the policy of Government ownership, and the question is whether we are going to go all the way or let it stand where it is.

The CHAIRMAN. I can not see any ground for your statement that the Navy Department, notwithstanding the Government ownership bill, has gone ahead and committed itself to a policy, because ever since wireless was first developed the Government has built up naval wireless stations, and they have the greatest plant in the world, Government owned and controlled. So it is not the beginning of the policy; it is a continuation of a policy that is decades old. The question is how far we shall extend it; that is all.

Mr. EDMONDS. Mr. Chairman, they embarked into a commercial competitive business, and they are going to make a Government monopoly of it. That is exactly what they are trying to do. Before that the Navy Department had wireless for its own use.

The CHAIRMAN. Yes; but now the Marconi people have given up the ship-to-shore stations because they found them unprofitable.

Mr. EDMONDS. As the result of a policy something like the tank motto—"Treat 'em rough." [Laughter.]

The CHAIRMAN. Well, that is not true.

Capt. TODD. No; that is not exactly fair.

The CHAIRMAN. At least, I got a different statement from their attorney. They are very willing to give up their ship-to-shore stations.

Mr. GREENE. After the foundation has been taken away from under them, of course.

Mr. WHITE. But this proposition goes a great deal further than ship to shore.

The CHAIRMAN. I am not prepared to say how far we should go.

Mr. BANKHEAD. It seems to me those are matters of argument for the committee. I did not seek this character of controversy when I asked my question.

Mr. LAZARO. I thought, Mr. Chairman, it was understood yesterday we were to hear the evidence and not argue these questions?

Mr. HARDY. I do not like to hear the continual reiteration of the claim that we have taken up this bill before and rejected it. We

have taken up the bill, but if we have ever had any final committee action on it, I do not know.

Mr. GREENE. It died.

Mr. HARDY. Yes; because it took us weeks to hear what was said.

The CHAIRMAN. It was never considered and reported out at all. My purpose, and only purpose, in consenting that hearings be held on this bill was that the whole question might be presented for the consideration of Congress and the country. That is the only thing I had in view when I consented to set the bill down for hearing, and that is what I am anxious to do. I am anxious to hear every possible angle of this question discussed.

Mr. EDMONDS. That is the reason I wanted to bring out the situation as to South American wireless.

Capt. TODD. On the subject of witnesses, I hope that one of the officers of the State Department will appear and speak in favor of the bill. At the present time there is only one more witness, the technical officer of the Navy Department, who is prepared to go on the stand now. There are a number of men who have no objection to the bill, but are not prepared to speak in favor of it. They represent, technically, the amateur interests; that is, I mean to say they will have no objection to the bill when this mimeographed amendment is passed around. But if there are any others who expect to favor of the bill, I have not heard of them.

With Commander Hooper and his officer from the State Department, the testimony in favor of the bill will be completed. I would ask, however, that toward the end of the proceedings I be permitted to say a few words. There are some amendments to the bill that will clarify the wording, as brought out yesterday, and as will be brought out probably by other witnesses. But I would like to say, further, that, judged by past experience—this is my third and last appearance before the committee—the opponents of the bill that have come before the committee have made what might be called outrageous statements. I do not mean they have made deliberate misstatements of fact; but radiotelegraphy and everything concerned with it—patents, apparatus, inventions, operation of stations, policy, international matters, personnel, manufacturing, and a thousand and one matters—every feature of it is so full of complications and the facts surrounding it are so intertwined that it is the simplest thing in the world for some one to make a statement that gives it a ridiculous appearance, just as you can pick out of some beautiful picture the figure of a man and paste that on a blank sheet of paper and it will be a caricature.

So, if something should occur to mislead the members of the committee on a subject on which they can not possibly be thoroughly informed, I should like the privilege of making a remark or two, from official records or from experience that I have had, that will qualify me to speak with authority. At the present time the Navy Department is operating the greatest system of radio stations we have ever had in the world, and we can talk with some authority on these things.

Mr. GREENE. Mr. Chairman, I do not think there is any objection to the captain giving us all the light he can give—if you will only give us some light and not hold back.

**STATEMENT OF COMMANDER S. C. HOOPER, UNITED STATES NAVY,
EXECUTIVE OFFICER, RADIO DIVISION, BUREAU OF STEAM
ENGINEERING, NAVY DEPARTMENT.**

Commander HOOPER. Mr. Chairman and gentlemen, I occupy the position of executive officer of the radio division in the Bureau of Steam Engineering, which bureau is charged with the provision and supply of all apparatus for radio purposes of the Navy and such other vessels as have been necessary during the war, the construction of all the shore stations, and their maintenance and upkeep; also the development of the radio in so far as the department is interested.

My experience in radio has been about 10 years, off and on. I was fleet radio officer of the Atlantic Fleet under two commanders in chief. I went abroad to study the general radio situation at the beginning of the war in 1914, on both sides, and since then I have been in the Bureau of Steam Engineering in my present capacity, except during the most of the past year, when I was at sea in command of one of our destroyers. But I have kept in close touch with what the bureau has done, and I think I can give an impartial view from our standpoint.

Before going into the general subject I do not think it would be out of the way that I should pay tribute to the fine cooperation and fine work of the radio manufacturers and inventors and amateurs in our country. When war came on us we were totally unprepared to handle the entire situation. The amateurs saved the day when we had to man practically the entire merchant marine by naval radio operators in order to incorporate the merchant marine into the naval system.

The manufacturers came down to Washington and placed themselves at our disposal and in every way possible did their utmost to further the plans and slightest desires of the department. The inventors were keen and active in every effort in their research work to produce what might be used against our common enemy. I take particular pains to mention the assistance given by Mr. Nally, vice president and general manager of the Marconi Co., whose company more than anyone else suffered through what war brought upon them, and also of the Federal Telegraph Co., which stood next in being harmed, due to the Government's closing the stations.

These officers have performed a service as great as any military officer in the radio work for the Government in time of war, and this service should be recognized in some way. They know in their consciences that they have done a great good to the country, the same as the soldiers and sailors have done, and it ought to go down in the records of history that they have done their duty,

It has been the same with all the radio manufacturers. They have done their duty to a man. They have borrowed money, they have worked overtime, they have worked until they could not work any longer in order to fill the needs of the Navy. It is our duty, now that the war is over, to see that they are properly rewarded, and I consider that a brief mention of this fact is not out of place in the hearings before this committee.

I shall endeavor to bring out in my testimony the advantages of Government ownership of radio communication from a technical point of view, dealing principally with the cause of the interferences.

Before I proceed with the interference subject I wish to emphasize one statement made by the Secretary of the Navy yesterday which should be continually borne in mind on this subject. That is that radio, by virtue of the interferences, is a natural monopoly; either the Government must exercise that monopoly by owning the stations or it must place the ownership of these stations in the hands of some one commercial concern and let the Government keep out of it. Otherwise two systems can not effectually operate to the highest efficiency or with absolute safety to navigation and the greatest assistance to ships in distress at all times. It is a high duty that we have in connection with radio. We have to look out for ships at sea, which have no other means of communication with the shore, and in our opinion we should legislate however may be necessary in order that they may be properly protected.

I will discuss first the question of interference, then I will follow that by a short history of what we have done during the war—which will be of interest to the committee—and then the question of patents, which some of the gentlemen are very much worried about, will be discussed.

In the first place, for the benefit of those who are not familiar with the details of interference, I will give an illustration which possibly will make clear the terms “wave length” and “tuning,” which should be thoroughly understood in order to understand the requirements which the service must fulfill.

Take a simple illustration, a piano. Each key of a piano makes contact with a metal string, and dependent upon the size and length of that metal string there is a tone produced. If the string or wire is longer or shorter, the tone is lower or higher.

That tone might be considered to correspond to a wave length. A high tone, for example, would be a high wave length, and a low tone, for example, a short wave length. Different tones interfere, so that if there were several keys pounded at the same time you could not distinguish one tone clearly from the other; you would have interference. If you were able, though some ingenious means, to distinguish which one of the keys was being drummed upon, you could say that you were able to “tune out” the interference.

I think that illustrates the idea of wave lengths and tuning. If it does not, I would like to be questioned further, because I think it is absolutely imperative that you gentlemen understand these terms in order to appreciate our reasons for desiring Government ownership as regards interference.

Understanding what a wave length is, we can say that its length, or tone, depends upon the length of the string or wire of the piano. Similarly, the length of the wave sent out in radio depends upon the length of the antenna which is used in the transmitting station. If we have a very low antenna, we send out a very long wave length; if we have a short antenna, we send out a very short wave length. Naturally a station that uses short wave lengths will be very much cheaper in construction than one with a long wave length.

The CHAIRMAN. Speaking of wave lengths, a wave is what?

Commander HOOVER. The length of the wave or oscillation in the ether. The opponents of the bill will undoubtedly endeavor to bring up intricate questions about wave lengths and so on to confuse you, but I assure you, gentlemen, you understand enough now about

the whole thing, so that if you do not allow yourselves to be confused by these questions and keep the issue clearly in mind you can understand the absolute necessity for a monopoly of some sort in radio communication.

Mr. LAZARO. You have compared a wave length to the sound from the string of a piano. Now, what about the receiver? Would you compare that with the ear?

Commander HOOPER. With the ear; yes, sir.

Mr. LAZARO. What difference is there in receivers? For instance, some ears are deaf to these tones from the piano and some are very acute.

Commander HOOPER. We have very acute receivers, sir.

Mr. LAZARO. I know; but in that connection would it not be a good idea to discuss the receiver? We do not know very much about those things, you know.

Commander HOOPER. If you will just imagine that your ear is the receiver, I think that will be perfectly sufficient for the purpose, sir. The receiver is so connected up that if the ear is turned in the proper direction, for example, it will respond to the tone; it will hear the tone. If the receiver is so tuned by having the proper length of wire in series with the aerial, it will respond to the incoming signal of the particular wave length which the aerial is set for.

Mr. WHITE. What differences in the wave lengths must there be in order for a skillful operator to pick out the differences and avoid confusion or interference?

Commander HOOPER. I will answer that broadly first and then in detail. Yesterday it was developed that we used up to about 17,000 meters wave length in our largest stations, and, of course, all the smaller stations, having smaller and shorter aeriels, use a less wave length.

Mr. HUMPHREYS. What do you mean by 17,000 meters wave length?

Commander HOOPER. I mean that the formula for a wave length is dependent upon the speed of the transmission of the wave, which is the speed of light, and that speed of light is equal to the frequency multiplied by the length of the wave, the rapidity with which the wave goes out. I think I have given you enough of that, sir, so you will understand what I am going to say.

We use about 17,000 meters for our longest wave lengths, and can work efficiently on short wave lengths with the present apparatus on the ships within about from 50 to 100 meters from one to the other. At long wave lengths, using high power, it is practically true that we can not work within 500 meters, one station sending at the same time as the other.

Mr. WHITE. So that between 17,000 meters and 100 meters how many gradations—if that is the right word—are there where interference can be avoided?

Commander HOOPER. On an average, every 300 meters, practically speaking.

Mr. EDMONDS. Is that in the lower-power stations, too?

Commander HOOPER. For lower-power stations it is very much greater. For short distances you can tune within 25, or even 15, meters.

Mr. EDMONDS. And when you get up to 10,000 or so you have to have a very much larger margin?

Commander HOOPER. Yes, sir.

Gentlemen, I would like to have this question of interference considered in three different phases; that is, as to three different sectors or areas of wave lengths; first, the short-wave lengths, the one the amateurs are interested in; second, the medium-wave lengths, which are the ones the ships use for working with the coastal stations; and, thirdly, the long-wave lengths, which are the ones by which the trans-oceanic work must be carried on. It would be wise to discuss each one of these three phases separately, and consider each one as a separate part of the bill, so that on each one you may form a judgment as to whether Government ownership would fit this particular phase. Then, after all three have been discussed, you will have your opinion on each one and be able to sum up and decide whether the three phases are proper for the Government to own and regulate as planned, or whether one out of the three is absolutely necessary to the Government to own or regulate, or two out of the three.

Whatever the decision is, it is imperative in the present state of the art that some congressional action be taken to clear up the situation, both from the point of view of the opponents of the bill and from the point of view of the Government. Otherwise we must assume responsibility for a very serious and dangerous situation which is developing, and which will cause eventually the loss of great sums of money by commercial institutions.

Mr. HARDY. You mean by that that it is necessary this bill should be acted on either favorably or unfavorably?

Commander HOOPER. I mean it should be acted on favorably as to that part which affects safety at sea; if the rest of it is not acted on favorably, it must be acted on definitely. Otherwise commercial concerns will spend great amounts of money in building stations which must eventually be taken away from them.

Mr. EDMONDS. Captain, you mean that unless we pass this bill for Government monopoly in this thing, it is going to be necessary for us to pass a bill with very much greater regulation than we have at the present time?

Commander HOOPER. Yes, sir; absolutely. That is the point I bring out. That is what brings up these bills each year, because some legislation is necessary, and we believe in taking the whole business, because we think we can do it better, more efficiently, and cheaper.

The opponents of the bill believe it is unnecessary for us to take it all, but I think they are willing to grant us a good deal. Whatever we do, we must do something. It is absolutely essential. It is a serious situation, which tends to the point of bringing about international troubles. I will get to that a little later.

With your permission to proceed with each phase separately, I will first discuss briefly the amateurs, which question was pretty well cleared up yesterday by Lieut. Cooper in connection with the amendment to this bill. I was myself an amateur at one time, although we did not have the radio amateurs then; we had little telegraph lines between our houses, we boys, and I have the point

of view of the amateur. I agree it is very interesting to the amateur, and very educational, and it is a great advantage to the radio art to permit the amateurs to develop themselves, and it is of great value to the Government, as I stated before, to have all these operators self-trained for use in case war comes upon us.

The amateurs, of course, can not afford to expend large sums of money on radio stations and build large aerials for long wave lengths, and naturally they prefer to have the short wave lengths and the small aerials, which fit admirably into our organization and are in accordance with the present law. So I think there will be no objection on the part of the amateurs as a whole to the amendment as it stands.

To go back to our illustration, if we assume that the piano has 170 keys, the amateurs would have the first two keys; they would have the first 200 or 250 wave lengths. That would give them the opportunity to use the space that our receivers are not particularly tuned to, and the short wave lengths are entirely sufficient for their purpose.

I do not think there will be any objection on their part to our judgment in that matter. The judgment has been arrived at as a result of conferences with the amateurs, and it fits in pretty well with the general scheme of things.

The next phase of the situation is the one where the ship-to-shore business is concerned and the work between the ships on the high seas. The Navy has a number of coastal stations scattered along the coast which can operate from 400 to 800 miles—halfway across the ocean, some of them. The Marconi Co. had a number of these stations scattered intermittently between the naval stations on the Atlantic coast and some on the Pacific coast. The Federal Telegraph Co. had some on the Pacific coast.

The idea originally was for the Marconi and Federal stations principally to operate with the ships and handle their messages, their ordinary telegraph traffic, for personal convenience. The idea of the naval stations was for military service to the ships, which is highly necessary. It was found, after the stations became sufficiently numerous, that when one station was working another station would be interfered with, not because there were not a large number of wave lengths in this area of wave lengths, but in order to guarantee that all ships can intercommunicate and communicate with any shore stations they happen to pass in any part of the globe they must all communicate on one wave length, which happens to be designated as 600 meters. That wave length is agreed to internationally and is in common use throughout the world.

If that had not been agreed upon, it is obvious that ships choosing any wave length they wished to call the shore station, and the shore station listening on all wave lengths at the same time, they would not hear the calls. A ship in distress might require hours before she could reach anybody, and it would be a very serious situation. In fact, it is absolutely necessary that all ships and all coastal stations which are able to work with the ships should call and answer each other on 600 meters.

Now, since that is necessary, it must be a matter of very careful regulation to see that they do not interfere with one another. For example, a ship on the high seas, 300 or 400 miles off the coast,

wishes to send a message to Norfolk at the same time that Norfolk wishes to send a message to the ship. He calls Norfolk, and Norfolk tries to send a message to him on 600 meters, and Charleston begins to send a message to some other ship on 600 meters, and this poor fellow is out there where the signals come in equally strong from both stations, and he can not read either. With hundreds or thousands of ships along the coast and many coastal stations all trying to work on the same wave length, it can be readily seen that there is endless confusion unless the most careful regulation is exercised.

Mr. BANKHEAD. What sort of regulation do you suggest in that connection?

Commander HOOPER. That is regulated by law, sir. Each station has its own zone, geographically, and is supposed to work only with ships that pass within that zone. The objection to the old arrangement was that our stations would work with ships at the same time that the commercial stations would work with ships, and both would work more or less in the same zone.

For instance, take our naval station at Norfolk, as compared with the Marconi coastal station at Hatteras, which is 200 miles down the coast. Suppose there was a merchant ship off in the vicinity of Hampton Roads. He would have to send his message clear to Hatteras, because the naval station, right close by, could not handle commercial business. For that reason he would have to send on high power to reach Hatteras, and that would drown out all the signals the naval station was trying to receive from the men-of-war. So there is a sort of criss cross there that is avoided and regulated if one system is used—that is, if there is a station placed every 100 miles or every 200 miles, as may be necessary, when a ship comes into the zone of a station she operates with that station; she does not have to operate with some other station, because the particular station nearby happens to belong to the wrong company.

Mr. EDMONDS. But you can not confine the waves to that zone; so, if a ship were in another zone, the two waves would still conflict.

Commander HOOPER. They would conflict to some extent, sir; but not anywhere nearly as much.

Mr. GREENE. Captain, in case a man had an important business message that he wanted to send, and the Navy wanted to do a little talking with some officer for some purpose, who would get the privilege? Under what control?

Commander HOOPER. There is no question about that now, sir.

Mr. GREENE. Oh, I ask the question about that now. You are bringing this up as a matter of importance that the Navy should control the business. Now, suppose an important business proposition comes up and a man wants to send a message, and a couple of naval officers are having a nice conversation. Which would have the preference?

Commander HOOPER. The stations are adequate, sir, to handle both without any delay whatsoever.

Mr. GREENE. There would be no objection?

Commander HOOPER. There would be no objection to that extent, sir.

Mr. GREENE. Oh, I know; but let us understand—

Mr. EDMONDS (interposing). Ask him how they handled it before.

Mr. GREENE. Yes: before you took possession. If an S. O. S. came in did not everybody just drop everything and say, "We want to save lives"?

Commander HOOPER. No, sir; they did not. They tried to, but they would make so much noise they could not. I have heard a poor ship making the S. O. S. call and everybody interfered with it.

Mr. GREENE. How are you going to help that now?

Commander HOOPER. There will be a particular naval officer in each district who will have the authority and be recognized by all the stations.

Mr. LEHLBACH. Can not we do that without the Government owning the stations?

Commander HOOPER. No, sir; we can not.

Mr. GREENE. I want to understand. Are business affairs going to have as fair a chance under Government ownership as they would under private management? I want to know where the line is going to be drawn and who is going to determine it. If a couple of naval officers are discussing something between themselves from one boat to another nobody knows what they are talking about any more than you do on a telephone to-day. Now, if a man has an important business proposition, how is he going to get a chance at the radio if the naval officers are passing the compliments of the day?

Commander HOOPER. They do not pass them, sir. You ought to see our regulations.

Mr. GREENE. That is what I want to know.

Commander HOOPER. Our regulations are very strong on that. The radio in the Navy is not permitted to be used excepting for official business, absolutely, and the commander in chief is more particular about that than anything else.

Mr. GREENE. Then for official business. Which would have the preference

Commander HOOPER. There are ample facilities, so there will be no trouble about that.

Mr. GREENE. Then what is the occasion for interference?

Commander HOOPER. The trouble about interference is that when there are two systems going then we are both trying to handle more or less the same work, with two stations regulated by different people, and there is nobody to settle the differences that arise.

Mr. EDMONDS. Was there not a division of time between you and the commercial people before you took the plants over?

Commander HOOPER. There has always been in the law, but it has never been carried out.

Mr. EDMONDS. Whose fault was that?

Commander HOOPER. The fault of both sides; they both wanted to work at the same time. That is not workable from either a commercial point of view or naval point of view.

I want to say, gentlemen, that I do not believe there is any argument from any of the commercial people present. I know for a fact that there was not any particular money in this business of owning the coastal stations for the companies that owned them. They were willing to sell them. They made money out of the ownership of the ship stations, because they could charge high rentals—

Mr. GREENE. But they are valueless without the shore stations.

Commander HOOPER. I think they will agree the shore stations were merely put there for the convenience of their ship stations. They made them valuable. But if we do the same thing the ship stations will be worth just as much to them, if we handle the commercial business, as they would handle it.

Mr. LEHLBACH. Before you leave that, may I ask a question? I read somewhere within the last few days that more than one message can be received simultaneously by a receiving apparatus. Is that so?

Commander HOOPER. Yes, sir.

Mr. LEHLBACH. How about the interference in that case?

Commander HOOPER. If it were not for the fact that all the ships have to listen for calls on the same wave length and that the apparatus should not be tuned too sharply—otherwise the men listening will not hear the ship call, even if he has nearly the same wave length—then there would be no question in it as to this second phase. But the ships must listen on this 600 meters, and the shore station must listen on that, otherwise their calls will be unheeded. I think it is obvious that to get the best service we must have it under the most highly organized control. I do not think there will be any objection to this on the part of the commercial companies. Their objection is going to be on the third phase.

Mr. GREENE. You have wiped out pretty nearly all the commercial companies, haven't you?

Commander HOOPER. They have voluntarily given up, because they could not see that there was any money in it. They are after this other business; that is where the competition comes in.

Mr. WHITE. I understood you to say you used a 600-meter wave length. The question that arises in my mind is, If you reserve an area or a wave length of 600 meters and a margin of safety up and down on each side of it, if you reserve that exclusively for the use of these ship-to-shore stations and compel all others to keep away from those limits, why would not that take care of that situation as between ship and shore? I just ask for information, you understand.

Commander HOOPER. The ships must always call on 600 meters and they must always answer on 600, and the same way with shore stations, otherwise the receivers will not respond to the calls. But it is our proposition that after we have received that call and answered it we can make use of the area above, as you suggest, by letting them do their work in that area after they have established communication, which is not regulated under the present law.

Mr. WHITE. But, if 600 meters is the standard as between ship and shore, how would it affect the situation if private concerns were allowed to operate, for instance, on a 1,000-meter wave length or 200-meter wave length? It would not interfere in any degree, would it?

Commander HOOPER. The 200-meter wave length is down in the amateur's domain. It is necessary, in order to accommodate the large number of communications that are carried on simultaneously, that after we have established communication on 600 meters we make a little signal, a single letter, which means to shift to 1,000, or shift to 1,800 and carry on the rest of the communication. In that way we avail ourselves of this whole area.

Mr. WHITE. So that, as a matter of fact, although 600 meters is the standard which you have adopted, you do not use it exclusively?

Commander HOOPER. Not exclusively; no, sir. It has got to be used exclusively for commercial work, but in the Navy we shift off of it to get out of the way of the commercial work, after we have established communication, and we intend to advocate letting the commercial stations shift also.

Mr. WHITE. In that connection, suppose you confined your naval work and your work governing the movement of merchant vessels to this 600-meter wave length and kept all others away from that, would not that answer the purpose?

Commander HOOPER. They must all be on one wave length to start with; otherwise they are not going to be heard. In other words, they have all got to use the same key to get in the safe. After we get in we can use different drawers if we want to.

Mr. BURROUGHS. Why is it necessary to use any different drawer?

Commander HOOPER. Because if we do we can carry on more pairs of communication at the same time.

Mr. WHITE. If you confined it to your naval work and your control of vessels and kept away the commercial business, could you not do it on your 600-meter wave length? Is not that the difficulty, that you are doing commercial work and superimpose on that your naval work?

Commander HOOPER. No, sir; the whole work has to be accommodated in this area. It is more the location of the station that brings the trouble there. For example, a ship will be right near Norfolk, but she is not allowed to work with Norfolk, which could be done on a very low power and without interference; so she has to work with this commercial station away down at Hatteras, which is a very much greater distance and has to use high power, which drowns out all the other signals, both for Hatteras and Norfolk and everybody else. That is the answer to that.

Mr. ROWE. You say that commercial business is done on 600 meters. Why is it not practicable to have a road there, for instance, from 400 to 800 meters, having your calls all on 600 and your messages on another scale?

Commander HOOPER. That is more or less what we do now, because we have had to do it. That is a very good point, and I see you have gotten the idea. Our point is that we have these stations along the coast, and if we do not put them under one management the ships work with the station which is not the logical station or the nearest station, and therefore there is a good deal more interference than is necessary.

As I say, the commercial companies are not contesting this particularly. There is only one company that I know of that does. For example, the companies that had commercial stations—Marconi, they have decided that the money is in the high-power transoceanic work, and the Government is the logical one to handle this coastal work; and the Federal Co. have decided the same thing; the United Fruit Co. have previously favored the bill—Mr. Davis of that company has previously favored the bill. The only other company is the International Radio, which owns two small stations, and their argument is based on the patent situation. That is a matter I will take up later.

Mr. EDMONDS. Your statement is not perfectly clear to me. You say this ship will work with a commercial station. How can it? Take the Jersey coast, for example. Say there is a wireless station at Sandy Hook, and a ship station at Cape May. A ship passing along the coast near Sandy Hook sends out a message, but Cape May gets it just the same.

Commander HOOPER. No; but they have to talk back and forth. She has to call and Sandy Hook has to answer. Sandy Hook may have a message for her, and she may have a message for Sandy Hook.

Mr. EDMONDS. I know, but you say if you have this in your hands a ship will be able to talk to its own particular station in that zone.

Commander HOOPER. My point is this: Suppose that Sandy Hook were owned by the Government and Cape May by the Marconi Co. Suppose this ship were up off Sandy Hook. Under the present law she would have to send her message clear down to Cape May, several hundred miles extra, and use a tremendous amount of power to do it, and cause interference with all the other ships around.

Mr. EDMONDS. Is it really a greater expense to send to Cape May, several hundred miles more?

Commander HOOPER. It is not the expense, it is the interference. That means that while she is right off Sandy Hook there may be a lot of other ships trying to call Sandy Hook and they can not do a thing, although that ship is not sending to Sandy Hook, she is sending to Cape May.

Mr. LEHLBACH. If she were sending to Sandy Hook instead of Cape May nobody else could do anything there either?

Commander HOOPER. She is not allowed to send to Sandy Hook now; she has to send to Cape May, and interfere with both of them. Why should it be necessary to interfere with both of them?

Mr. EDMONDS. Suppose she is directly off Cape May and wants to send a message to Cape May. She is a Marconi boat, with Marconi apparatus. At the same time you have other boats near Sandy Hook trying to call Sandy Hook. If she sent it to Cape May, would it not interfere with the boats trying to get Sandy Hook?

Commander HOOPER. She can do it fine, as long as she is near Cape May.

Mr. EDMONDS. Why would it not interfere with the boats trying to get Sandy Hook?

Commander HOOPER. Because she is using low power. She talks in a low voice. But if she were trying to talk from Cape May up to Sandy Hook she would have to yell her lungs out, and everybody on the ocean would have to stop work.

Now, I think I have convinced you gentlemen that from the point of view of interference it would be waste for two concerns to operate in this wave-length area. And there is no particular objection on the part of the commercial companies, because we are not throttling any industry at all, as this industry is not a profitable one. That is where the law is most needed, in connection with these coastal stations; that is where the ships at sea are concerned; that is where the lives are involved.

Mr. LEHLBACH. Would it be practicable to have the call standardized at, say, 600 meters for naval and Government work and 1,000 meters for all commercial work, and in that way cut out interference in calling and signaling and getting into communication?

Commander HOOPER. It is more or less regulated that way now, sir.

Mr. LEHLBACH. Then, they are not all on 600 meters now?

Commander HOOPER. No. The possibility of interference in any particular wave length is due to many wave lengths on either side, and it is especially so as the sending station is near the receiving station.

Mr. GREENE. Is not this interference caused by the complexity of the naval business and the complexity of the commercial business? Now, is the commercial business good for nothing? You say these parties can not make any money. Are we to understand that commercial wireless is a failure?

Commander HOOPER. No, sir; the money in it is on the ship end of the business and not on the shore-station end.

Mr. GREENE. Then, what do you want it for?

Commander HOOPER. We want it to reduce the interference.

Mr. GREENE. Is that the only thing?

Commander HOOPER. And the general good of the country, the same as we own the Life-Saving Service and the Coast Guard Service.

Mr. GREENE. Is it not also that you want the money there is in it?

Commander HOOPER. No, sir. We used to say we wanted the money, because we thought it appealed to you, but now we see you are against that, and so we say we do not want the money. [Laughter.] It used to be the general policy of Congress, sir, to try to save all the money they could through governmental agencies. Now they are getting distrustful of Government ownership, and they may have a right to be so, so we are not appealing to them on that ground; we are appealing strictly on the ground of interference and improvement of the service.

Mr. GREENE. Now, wait a minute. This Government ownership business, so far as it has been developed until the last six years, for instance, has been very extravagant; nobody can make any excuse for it. Now, I understood the Secretary to say yesterday that what you wanted this commercial business for was because there was money in it; you wanted Government operation because the Government wants to get the money. You want to administer private enterprise; the Government itself wants to do the business.

Commander HOOPER. He was speaking about the high-power stations. I am talking about the coastal stations.

Mr. GREENE. Well, you came here to explain this business, and you get into deeper mysteries instead of getting down to the point.

Commander HOOPER. I will get to that point when we discuss the high-power stations.

The CHAIRMAN. You stick to your text and do not let the gentleman from Massachusetts divert you.

Mr. GREENE. I do not want to divert him from anything, but I want him to keep to the line of what we are trying to get at.

Commander HOOPER. I would like to say, sir, that I believe if you would take a vote right now of the opponents of this bill and the majority of reasonable, thinking men in radio work who are here on both sides, bearing in mind their interest in the matter, you would have a large majority, almost a unanimous vote, in favor of this proposition.

Mr. GREENE. Well, you might be as disappointed as the Democratic Party was in the last election. [Laughter.]

Commander HOOPER. Well, sir, I have talked to all of them, and I know their views.

Mr. EDMONDS. Do you mean the ship-to-shore business or the entire thing?

Commander HOOPER. The ship-to-shore business and the amateurs.

Mr. EDMONDS. Now, let me ask you a question about the ship-to-shore business. Is it your intention, when you get control of the ship-to-shore business, to continue on the 600-meter wave length entirely, or is it your intention to get these stations on a different wave length?

Commander HOOPER. It is our intention to bring up that question at the next international radio conference to try to get the maximum use of the ether.

Mr. EDMONDS. Your own idea would be what?

Commander HOOPER. My own idea is that we ought to continue that 600-meter wave length for some time if that is decided upon as the best calling wave and use that purely for calling, acknowledging, and S O S signals and for navigational purposes, possibly, and when communication has been established that we make one letter to indicate the wave length in the area that can be used for ship-to-shore work, which they will shift to in order to carry on the communication.

Mr. EDMONDS. That is one of the improvements you have in mind by having one ownership of these shore stations?

Commander HOOPER. Yes, sir; we can do that with one ownership if we can get all the stations to carry out our orders.

Mr. EDMONDS. Well, if you own all the stations you ought to be able to get them to carry out your orders.

Commander HOOPER. Yes, sir; we can do that.

Mr. WHITE. You said your idea would be to give a letter which would indicate that you desired to shift to some other wave length and talk?

Commander HOOPER. Yes, sir.

Mr. WHITE. What are the practicable limits of wave lengths within which these instruments can operate?

Commander HOOPER. In the ship-to-shore business, for example, the area is restricted between, say, 300 meters at the lowest extremity and 3,000 meters at the highest, because the aerial of a ship can not be made very long; it is limited between the masts.

I wanted to bring out this point, gentlemen. I have talked to nearly all the opponents of the bill, and especially those who would be in any way injured by the loss of profits, and I think they are all convinced that the art and the service of the United States will be greatly improved, and they are all willing to let the Government run it, and are satisfied we are the logical owners, either the Government or some one company. And, as I stated before, either the Government or some one company must monopolize this particular area of wave lengths to give the ships sufficient service. And if one company is designated, what company would you trust? If you put it in the hands of a private company they might do very well now, because they know the reasons why the laws was passed, but a few years from

now they may have directors who would be tempted to put the prices up. The Government would not do anything like that.

Mr. EDMONDS. Would you trust this committee? [Laughter.] We might get up a company of our own to run it.

Commander HOOPER. I would trust it if you would actually do it.

Mr. HARDY. If I understand the whole situation it is that at Norfolk, for instance, it is not a good idea to have more than one sending and receiving station of high power?

Commander HOOPER. Medium power, sir.

Mr. HARDY. Of medium power, yes. If you had two or three right there they would be constantly interfering with each other?

Commander HOOPER. Yes, sir.

Mr. HARDY. If one of them was owned privately and one by the Government they would be constantly getting in each other's way?

Commander HOOPER. Yes, sir.

Mr. HARDY. So it seems to you necessary to have just one station at Norfolk?

Commander HOOPER. Yes, sir; that is the thing.

Mr. HARDY. And that one station must be owned by somebody?

Commander HOOPER. It must be owned by somebody; yes, sir.

Mr. HARDY. If it is owned by the Government it is a Government monopoly, and if it is owned by the individual for mercantile purposes it is a mercantile monopoly?

Commander HOOPER. Absolutely a mercantile monopoly; yes, sir.

Mr. HARDY. So the choice is between having a private monopoly and a Government monopoly, one or the other owning that station at Norfolk? That is the whole thing?

Commander HOOPER. That is the whole thing in a nutshell, and there is not any particular opposition to it.

Mr. LAZARO. From your experience in the service, for the good of the people, which do you prefer, Government monopoly or a private monopoly?

Mr. GREENE. Well, he is a prejudiced witness.

Commander HOOPER. I will try not to be prejudiced, sir. I would say the Government would give better service, because they are unbiased.

Mr. LAZARO. In time of war and in time of peace?

Commander HOOPER. In time of war and in time of peace. The Government is not interested particularly in any financial transactions. The officers of the Government at sea and elsewhere are only trying to make good.

Mr. LAZARO. One more question: If the Government comes in and takes charge of this whole business, are you not afraid that it will perhaps interfere with individual initiative and improvement of the art, and so on, and in the long run cripple the service?

Commander HOOPER. No, sir; I am going to dwell at length on that after I get through with the general interference question.

I want to emphasize particularly in this connection that companies which have been in that business are generally agreed that we are the proper ones to do it, and there is not any particular objection on their part to that, because it is not the main money-making business. I also want to state that our testimony, gentlemen, is the testimony of men who are interested in the good of the whole and

not interested in any financial transaction. We have nothing to make out of this either way, and the commercial people must naturally testify, as it is going to affect their pocketbooks—and I do not blame them. That is the reason I believe the Government should not go into any ownership where a natural monopoly is not absolutely necessary for efficiency.

Mr. LAZARO. It seems to me that if we remove the financial spur we do interfere with initiative and invention.

Commander HOOPER. Yes, sir; but the financial spur does not amount to anything in this particular area.

The maximum efficiency of the radio is the sole object of our favoring this bill. We have not anything to gain by it personally, and we are interested in it for the good of the whole. The people on the other side must be looking out for their own interests, and that is perfectly logical. It is not to our Government's interest in any way to prevent the people from making money. We want to have them make money. That is the principle of democracy. That is the reason we oppose Government ownership in other things, because we want to protect people in making money.

Mr. GREENE. What do you mean by "other things"?

Commander HOOPER. Everybody getting in and making all he can. This bill has not anything to do with that, as far as the coastal stations are concerned.

Mr. EDMONDS. Democracy is perfectly safe, then, if we do pass that phase of it?

Commander HOOPER. Yes, sir; democracy is perfectly safe.

We have these coastal stations now. All we want to do is to open them to business. We have had them all the time. We will probably make a profit off of them and probably make them pay for themselves. We would probably have to have them anyway for military purposes, and why not let the Government save money by letting us take the place of the companies?

The CHAIRMAN. Some gentlemen do not seem to understand that the Navy Department has coastal stations all around the coast, on the Atlantic, the Gulf, and the Pacific, and extending to our outlying possessions at the present time.

Mr. GREENE. Yes; in time of war.

The CHAIRMAN. And they must be maintained for military purposes; they must be maintained in order to navigate our naval vessels. At the same time there are commercial stations along the coast at substantially the same points where the naval stations are located, being used for the ship-to-shore business. If I understand your view point, as it is absolutely necessary for the Government to maintain these stations for military purposes they might as well be utilized for commercial purposes from ship to shore, and thus serve the double purpose, and at the same time prevent interferences and increase the efficiency of the service—

Commander HOOPER. And pay for themselves.

The CHAIRMAN. And the money that may be earned commercially will diminish pro tanto the expense of maintenance of these military stations.

Commander HOOPER. That is absolutely the general summation of the subject. Also, there is not enough money in it anyway for any-

body to be desirous of being in it from a financial point of view. Most of the people admit it. Some of them will not say they admit it, because they have patent rights, and so on, which they are trying to get money out of. But that is a separate matter, and should be considered as a separate matter.

There is another part in that coastal station matter—

The CHAIRMAN (interposing). Right in this same connection: We have built up a large merchant marine, and we are increasing our tonnage, hence the ship-to-shore station, from a national viewpoint, is becoming more important all the while, and the same places that are now under control of the Navy and utilized to communicate with our naval vessels could be utilized to communicate with our merchant ships at sea, and with the increase of our merchant marine that phase of it assumes the larger importance?

Commander HOOPER. Yes, sir.

The CHAIRMAN. And, whether under governmental control or not, it should be under one unified control?

Commander HOOPER. Absolutely under one control.

There is another point that I may mention which is really interesting and also has a bearing on this subject: The Government is putting a system of additions to its stations, by which it can give the bearings of ships at sea, showing their direction from the station. For instance, a ship going along the coast and passing a lighthouse may get its bearings and find out where it is by communication with the lighthouse. For instance, the light is not visible in rainy weather and foggy weather at distances from shore, and at the very time you need the light you can not see it. We have developed, with the assistance of the inventive genius of this country and other countries, a radio compass, as we call it. It is a little receiver which measures the direction that the radio signals are coming from. You would not think it possible, but as soon as we get that signal we can send out to the ship with our transmitting station a message and tell them where they are. You can see what an immense value this is going to be to navigation, how many ships will be kept off the rocks in foggy weather; that is the time they run aground; they do not run aground so much in clear, nice weather.

Mr. EDMONDS. You mean the Navy Department developed this?

Commander HOOPER. From our own experience, and we have taken advantage of the inventive genius of the country, and we are putting these stations in.

Mr. HARDY. That is a discovery within the last year or two?

Commander HOOPER. It is a discovery since the war broke out.

Mr. EDMONDS. An invention of the Navy Department?

Commander HOOPER. It is a combination invention. We are first to see the need of these things, and we advertise it and the inventors cooperate with us.

Mr. EDMONDS. If you have no other stations, you naturally would be the only people who would think of it?

Commander HOOPER. I will keep on with coast stations. They do not develop very fast under commercial control, because it costs so much to renew apparatus. Our commercial stations have done always a good deal better and have been a good deal more efficient than commercial stations, because we can afford to be a little more liberal

in spending money and putting in new apparatus. We have got to do it in order to keep the fleets supplied with equipment they insist on to compete with the world.

Government ownership is objectionable on the part of some people, who say we are in competition with anybody and no one will want to develop—I am a little ahead of my story, but I will just mention this now. We are in competition; that is, our Navy is in competition with the navies of the world. We fellows are right on the job, and our function is to get ahead of foreign nations, and for that reason we are right in the forefront of invention in all things that have to do with the Navy, and radio has a great deal to do with the Navy, so we are right on the job there. And when you hear my little story of what we have done in the war you will see we have been on the job and you will be proud of us. I will not tell you what we have not done, because you might not retain us.

I think the chairman has summed up the general coastal station, and I will pass on to the high-power stations. They are the stations of long wave length areas, and the stations which communicate are across the ocean. They are the stations which compete with the cables for the handling of messages over sea, and I am not making any new prophecy when I state that the competition will be very keen. It costs a great deal less to build radio stations than it does to build cables, and the maintenance is very much smaller for the radio. If genius can perfect the stations so that they will work satisfactorily across the ocean, the cables have got a hard road to hold their own.

The war has developed these stations very much more rapidly than they developed before. Prior to the war, as explained yesterday by Lieut. Cooper, there were only a very few stations that pretended to communicate across the ocean, and they did it only a certain part of the day, the other part of the day being interfered with by certain atmospheric disturbances. Since the war has been on we have established reliable communication across the ocean, and now we never miss a message from the other side. That is a fact.

Commercial concerns are keenly interested in this bill, because they fear the taking away of the high-power stations from them, and that is a point where money is involved and where the advance of the art in the future will be the greatest, they say. That is their point, and they claim that the Government should not own these stations on that account.

However, the fact is that the number of these transoceanic communications you can carry on simultaneously is considerably limited. In fact, at the present time, with the present status of the art, we are unable to use many more stations as high-power and as transoceanic stations than we have, taking into consideration the fact that the interference is not only from our own stations but from the stations in the various foreign countries and on both sides of the ocean.

For instance, here in Washington our signals are interfered with when we are trying to receive from Lyon, France, by Rome and Italy, or by our own station in Annapolis, or by the station in Honolulu, and we must consider this interference problem as a whole when we discuss this matter, and not only just because of our own United States interference. I think there will be many opinions expressed on both sides of this question which will be convincing,

and it is my purpose to bring out the advantage to the Government of the Government owning these commercial stations. There are certain logical doubts as to whether the step is proper, logical doubts which will originate in your minds, and I am not so absolutely insistent myself on that phase of it as I am in regard to the coastal stations, because I consider that absolutely some action must be taken in respect of the coastal stations. I consider if you do not take action on the high-power stations that we are storing up trouble for ourselves, and when you will have to take action finally it will cost us a lot more money and a good deal more heartburn.

The fact is that as the art develops further we will be able to have more high-power stations, more transoceanic circuits, but, at the same time, we must realize that every country is going to put up its own stations, either commercially owned or government owned, and that those things progress very rapidly, and it will soon be a question where an international board will have to try to get at the bottom of the matter and regulate these high-power stations, or else we will have international difficulties. Some foreign country will take up through diplomatic channels the fact that we are not respectful to them because we are interfering with their messages, and we will come back and say they are interfering with our messages. We are liable to get in some sort of a row.

Mr. EDMONDS. Why can not they be regulated just as well under private ownership as they can by Government ownership?

Commander HOOPER. Well, that is a question that I think Capt. Todd brought out yesterday. I would rather let him answer that.

Mr. EDMONDS. Of course, I understand that if the laws or regulations that have been made have not been carried out on a vital question like this they should be carried out. If we make laws and you folks fail to carry them out it is not our funeral. If we make regulations for the handling of this matter through this parliamentary procedure here and we follow that up with laws regulating private business, if you do not carry them out in some way by some department, then, of course, we can not help it and it is your fault.

Commander HOOPER. Suppose we allow these high-power stations to be built, and after they are built supposing they did start to build them after the war, as they probably will—all the different nations and commercial companies—and then suddenly they all begin to work, what are you going to do? We will have to have an international commission established, and they will decide that only one station can be used in the country, or something like that, and all of these fellows will be out millions of dollars, which they may put into the stations.

Mr. EDMONDS. That is a commercial risk they take. That is no business of Congress to regulate a man's commercial desires. That is his own business. If he wants to spend his money on a guess, as many hundreds of people have done during this war by promises made by the Government that have not been fulfilled, it is perfectly up to him to do so.

Commander HOOPER. That is a risk that we know more about than he does. I think it is more or less a patriotic duty to our citizens to put that in.

The CHAIRMAN. The commercial end of it seems to occupy the minds of more people than any other. If a half dozen companies

want to develop high-power stations for international service and sell their stock on the market at a profit, and the enterprise becomes a failure because of interference or for any other reason, it is no concern of the Government. But a feature of it to which you called attention is this: Shall we have a half dozen companies in this country capitalized for large sums, the money for which has been contributed by a confiding public in the purchase of stock, of which 50 per cent usually goes to the promoters, but the balance has been expended in the developing of the station. They all undertake to do business, and they want to make profits, properly so. In the other countries they duplicate that same unwise course from a commercial standpoint and international complications ensue. Somebody must interfere. It is proper for the Government to interfere and regulate them. They can not all exist and profit and thrive commercially. It will ultimately lead to monopoly in one or the other and governmental control. Otherwise these complications will continue indefinitely. Is not that true?

Commander HOOPER. Yes, sir.

Mr. EDMONDS. By licensing and regulation we could accomplish the same purpose as Government ownership?

The CHAIRMAN. Government control by these nations—in other words, they must act in harmony and adopt some method whereby each Government owned these high-power stations or controlled them. There ought to be uniformity, so that the stations of one country will not be regulated prejudicially in favor of those of another; in other words, there should be equal rights, equal privileges, equally beneficial, to the end that the highest class of service may be rendered; and, of course, looking at it from the commercial end, that is the most reasonable thought.

Commander HOOPER. I hope to see the greatest development in this high-power business, and I certainly think it will be a wonderful step in advance if this comes about. Of course, we can not foretell what will come about, but I predict there will be a great development in a few years to come. It is just a short time since you witnessed the first trans-Atlantic communication and now we see it actually a fact on a very cheap basis. But there can not be any objection that I can see to the Government using its stations for commercial business. It has got these stations. We had them put up in time of war for use in case the cables were cut away, which some of them were, and at the earnest request of Gen. Pershing, and I think it would be good business to open up those stations to commercial business.

As I say, Capt. Todd's arguments were mainly on that line and mine are purely technical, so it would not be wise for me to repeat his testimony about the advantages of these high-power stations being Government owned.

Mr. EDMONDS. Did you buy any high-power stations when you took over the Federal Co.?

Commander HOOPER. They are a sort of between what you call medium and high power. The Federal Co. had a chain of stations on the west coast—one at San Francisco and one at Hawaii—and they did business in competition with the cables in that circuit; and we took over that circuit, among other things.

Mr. EDMONDS. Is that all the high-power stations they had, just between San Francisco and Hawaii?

Commander HOOPER. We call anything that works across the ocean high power, from one side of the ocean to the other.

Mr. EDMONDS. That was all they had, was it not, just those stations at San Francisco and Hawaii?

Commander HOOPER. Those did the transoceanic work.

Mr. EDMONDS. Did they not have a station in Mexico and did you take that over?

Commander HOOPER. No; we did not take that over.

Mr. EDMONDS. None outside of the country?

Commander HOOPER. None outside of the country; no, sir.

Mr. BANKHEAD. As I understand your position in relation to the high-power business, long-distance business from one country to another is separable from the middle power stations?

Commander HOOPER. Yes, sir.

Mr. BANKHEAD. So that it would be possible on your theory for Congress to take charge of the middle-distance operations and either own or control it absolutely and leave entirely alone the long-distance communications.

Commander HOOPER. It would be entirely possible to do that, but it would not be to the interests, as we see it, for the Government to omit part of it.

Mr. BANKHEAD. It is a practical proposition?

Commander HOOPER. It is a practical proposition. If you would not do the whole business you certainly should be advised on our part, being the responsible party, to take over the coastal business at once.

Mr. BANKHEAD. And there is no real difference, then, in the operation of international communication and that for mid-sea distance communication, the middle-distance communication?

Commander HOOPER. Those transoceanic stations do not particularly interfere with coastal stations if they are properly placed when they are built and have modern apparatus. Before we went into the war the Marconi people had a lot of old, cheap apparatus in their stations. The station in California interfered with everything on the coast in the way of ship-to-shore business when they started up. Of course, it was the most modern thing at the time, and that was a step in the chain of events that led to the production of this fine apparatus we have now.

Mr. EDMONDS. We had quite a large argument about junk the last time. Do not let us bring it in this time.

Mr. HUMPHREYS. Commander, have we an instrument perfected by which you can direct the waves so that they will go in this direction and not that?

Commander HOOPER. We have, within limits; that is to say, you are speaking of high power now?

Mr. HUMPHREYS. I was speaking generally, because I have no information on the subject.

Commander HOOPER. We have an instrument that will send the waves stronger in one direction than in the other direction. That is, for instance, the wave instead of going out in all directions in exact circles and traveling on indefinitely, it goes out in egg-shape form; that is to say, it will be heard a thousand miles off in the direction

it will point toward, and it would only be heard 300 or 400 miles off on the side or maybe 500 or 600 miles.

Mr. HUMPHREYS. I was wondering if there were not such an instrument as would permit the commercial companies to operate on land and let them turn the machine around so that it would not interfere with ship-to-shore communications?

Commander HOOPER. We do that to some extent now.

Mr. HUMPHREYS. And if that could be done, then the Navy would have no special objection, because it would not interfere at all with the Navy if these commercial companies could confine their activities to the land.

Commander HOOPER. You mean the high-power stations?

Mr. HUMPHREYS. I mean any they have got.

Commander HOOPER. Coastal stations working with ships?

Mr. HUMPHREYS. I say it would not interfere with ship-to-shore business if commercial companies were limited to the land for their activities and required to set their instruments so that it would not effect any interference with the ship-to-shore business. Then the Navy would have no further interest in it, would they?

Commander HOOPER. We have only interest in it so far as it would interfere with our own stations.

Mr. HUMPHREYS. And with your communication with the ships?

Commander HOOPER. I will say, sir, we believe that radio should be confined to use where it is a benefit to the community and you can not use other means of communication. Nobody wants to put up two radio stations when it costs a couple of thousand dollars to communicate if they can at four dollars a month obtain a telephone, for example.

Mr. HUMPHREYS. But, still, that would be his?

Commander HOOPER. Yes, sir.

Mr. HUMPHREYS. All of us do foolish things when it comes to the conduct of our personal enterprises. But the point I want to get at is this—and I have no information on it—I am seeking information: If we have an instrument that would confine these disturbances in the air to the land, so as not to interfere materially with communications from ship to shore and from shore to ship, then the Navy's interests in these land operations would cease, would it not?

Commander HOOPER. I would say, the "Government's interest."

Mr. HUMPHREYS. No; but I am asking about the Navy's interests.

Commander HOOPER. When we speak of the Navy we speak of the merchant marine; is that your idea?

Mr. HUMPHREYS. Yes, sir.

Commander HOOPER. Well, there would be some interests the Navy would have.

Mr. HUMPHREYS. What?

Commander HOOPER. That could be regulated by license, I believe.

Mr. HUMPHREYS. What interests would the Navy have if it did not interfere with any communications going out to sea or coming from sea to you?

Commander HOOPER. It would be more of a precaution against spies and so on in war times.

Mr. HUMPHREYS. We are talking about peace. Of course, when war comes we will take the whole business over, if necessary, but we hope that peace will be our normal state.

Commander HOOPER. I do not see any field or possibility of us using anything inland except in special cases, like in the St. Lawrence River, where there are islands, or on the Lakes.

Mr. HUMPHREYS. I understand that, Commander. Of course, the Paris Exposition authorities did not see any possible utility in the phonograph. They said it was rather an ingenious invention, but could not be put to commercial use. But we know there are limitations upon our vision. But if, as a matter of fact, you confine the commercial companies to the land, the Navy would not have any further interest in the matter, would they, if they could not interfere with the Navy out on the sea?

Commander HOOPER. It would interfere with anything we have now unless confined to very low power, because there is not any directing apparatus so good that if it uses enough power it will not interfere with everything along the coast.

Mr. EDMONDS. Has not wireless been used for dispatching trains?

Commander HOOPER. Yes, sir; it has.

Mr. EDMONDS. And very successfully during times of distress and storms, has it not?

Commander HOOPER. Yes, sir. It has been used, and we are right now arranging with the coast guards, I believe, if I am advised correctly, so that communication with their cutters on the Mississippi River for use in case of floods, and so on, and we have stations along the Lakes.

Mr. EDMONDS. We talked a good deal yesterday about the Wanamaker stations as a type of shore stations. As a matter of fact, it is but one of sending stations licensed in this country.

Commander HOOPER. You mean the amateurs?

Mr. EDMONDS. Amateurs and others.

Commander HOOPER. That is a fact. They do not interfere with us particularly.

Mr. EDMONDS. I was in Sunbury a short time ago, and there was a station in a dry goods store there that a man was using in communication with some other station on shore. I do not know what it was, but that is what they told me. There are thousands of them on shore.

Commander HOOPER. There are lots of receiving stations which jewelers use to get the signals each noon from Arlington.

Mr. GREENE. Since the war broke out they have not been able to do that?

Commander HOOPER. I have tried to explain this absolutely and impartially, gentlemen.

Mr. LAZARO. Mr. Humphreys asked you a while ago if you had an instrument that would concentrate waves in one direction, and in answer to his question you used the expression "egg-shaped."

Commander HOOPER. Yes, sir.

Mr. LAZARO. You said, for instance, the waves from it would go a thousand miles, for instance, directly, while on the side it would go 300 to 500 miles?

Commander HOOPER. Yes, sir.

Mr. LAZARO. What about the distance from the ends there?

Commander HOOPER. I am speaking very broadly.

Mr. LAZARO. I just wanted to get information on that.

Commander HOOPER. A signal that will reach France efficiently will be heard down in the West Indies almost as strong as it is in France if we use the most highly known directional type. That would be an example. Perhaps it would extend half as far on the side as it did in the front if we pointed the thing in the direction of the receiving station.

Mr. HUMPHREYS. Is that a new invention?

Commander HOOPER. No; that is not strictly new; some phases of it have been improved.

But I have tried to keep my testimony more or less on technical lines in this high-power business. With your permission I will read a review of our activities during the war.

Mr. HARDY. Do you want to discuss the patent phase before you read that review?

Commander HOOPER. I think it would be well to read that review first, if you gentlemen would like to have it. If not, I will leave it out.

The CHAIRMAN. We should be glad to have it.

Commander HOOPER (reading):

RADIO DIVISION,
BUREAU OF STEAM ENGINEERING,
October 4, 1918.

Memorandum for the Secretary of the Navy.

A review of the activities and accomplishments of the radio division during the preceding fiscal year is hereby presented, summarized under four subdivisions.

1. Ship and shore coastal radio stations.
2. Radio for aircraft.
3. Transoceanic radio communication.
4. Research and development.

The organization as a whole being correlated and directed under the personal supervision of the officer in charge of the division.

RADIO FOR ALL SHIPS AND SHORE STATIONS, OTHER THAN TRANSOCEANIC RADIO STATIONS—NAVAL VESSELS.

In addition to the replacements, repair, and maintenance of the radio equipment on all vessels of the United States fleet and its auxiliaries for operation on a war footing, which have been effected by the radio division, the following new installations have been made or are being arranged for: 3 battleships; 80 submarines; 5 battle cruisers; 6 scout cruisers; 248 destroyers; 54 mine sweepers; 27 seagoing tugs; 40 light vessels for Department of Commerce; 17 lighthouse tenders for Department of Commerce; 440 110-foot submarine chasers, including 100 for the French Government; 112 Eagle patrol boats; 250 motor boats, yachts, etc., as auxiliary patrol boats.

Some of them have not been completed, but if the war had lasted a few months, if the ships had been completed, we had our part practically completed.

Making a total of 1,282 new installations for naval vessels provided for during the preceding fiscal year.

Considerable work has been accomplished toward standardization of installations with a view to providing for prompt repairs by the use of standard spare parts and also the production of apparatus in large quantities to meet the constantly increasing demands for radio equipment and the comparatively few manufacturers capable of producing suitable apparatus, owing to the necessity of employment of specially trained men who have considerable previous experience of a technical nature in the production of radio apparatus.

The remodeling of the radio installations on 22 units of the battleship fleet, to provide for efficient operation in conjunction with the British grand fleet, has been practically completed. A large number of the units of the fleet and its auxiliaries have been equipped with radio compasses and also radiotele-

phone transmitting and receiving sets (which apparatus is of the greatest practical value) after various difficulties in connection with the successful operation of this apparatus on shipboard had been overcome.

Practically all of the vessels of the fleet and its auxiliaries had been equipped with auxiliary radio transmitters for emergency use during the preceding fiscal year.

Replacements of radio apparatus of improved design on submarines, resulting in increased range of communication and greater reliability of the equipment, have also been effected.

In addition to the ex-German, ex-Austrian, Dutch, and various other vessels of foreign registry, acquired or chartered by the United States Shipping Board, for which their radio installations, replacements and repairs have been effected during the preceding fiscal year, the radio division has contracted for and shipped to the various naval districts, as the apparatus has been delivered by the contractors, radio equipment for approximately 2,500 new vessels of the United States Shipping Board Emergency Fleet Corporation.

All privately owned vessels of the American merchant marine, under the control of the United States Shipping Board, numbering approximately 450, have had their radio installations maintained and repaired under the direction of the Radio Division.

The total number of existing and prospective radio installations for naval and merchant vessels, and those of other branches of the Government provided for and maintained by the Radio Division during the preceding fiscal year was in excess of 4,000.

The expense in connection with radio installations on Government vessels have been charged to the various branches of the Government operating the vessels, while that in connection with radio installations on privately owned vessels has been collected from the owner of the vessel; that is, the maintenance and expenses.

The naval radio coastal stations numbering 50 and the commercial coastal stations, taken over by the Government, numbering 75, have been maintained and operated during the preceding fiscal year and various additions, improvements, and enlargements considered essential to the successful prosecution of the war have been provided for.

The compensation to owners for the use of their stations taken over and operated or closed has been adjusted in a satisfactory manner to the owners and the Government.

Protective facilities, including quarters for the guards, etc., have been provided for all the important or exposed radio stations.

The following is an outline of some of the additional stations provided and enlargements, etc., including about 13 abroad; I am not sure whether it is 13 or 15 in France. We have a lot of shore stations there for our own forces.

Construction of 25 section patrol radio stations for communication between shore and patrol boats and auxiliaries; construction of 30 radio stations for air stations, including those abroad; construction of 25 radio compass stations for locating enemy vessels and unauthorized radio stations and assisting vessels to determine their position; construction of 3 radio transmitting and receiving stations at isolated points in the Republic of Panama, constructed for the Republic of Panama for operation by the Navy; removal of United States naval Newport radio station to Melville, R. I., as a precaution against possible explosion in the magazines at Newport; enlargement of the United States naval Norfolk radio station due to the establishment of the naval base, Hampton Roads; construction of radio station at Port au Prince, Haiti, for the use of the Marine Corps; enlargement and improvement of radio station, Santo Domingo City, Dominican Republic, for the use of the governor, Dominican Republic; enlargement and improvement of United States naval radio station, St. Thomas, for the use of the governor, Virgin Islands.

An immense amount of development and experimental work in connection with the production of suitable radio transmitting and receiving apparatus for use on aircraft has been successfully accomplished during the preceding fiscal year.

Prior to July 1, 1917, no service or training aircraft had been equipped with radio, due to the difficulties encountered in obtaining satisfactory equipment. Subsequent to July 1, 1917, however, the difficulties have been overcome to such an extent that 50 service aircraft and 40 training aircraft in the United States have been equipped with radio apparatus which has proved to be satisfactory. 60 outfits have been shipped abroad for installation on aircraft in France and

Great Britain, and contracts have been awarded for a total of approximately 3,000 complete outfits.

Arrangements have now been made for the equipment of all aircraft with radio prior to its being shipped abroad.

The radio telegraphic communication from aircraft in flight to stations on land can now be effected a distance of 200 miles. Similar communications from stations on land to aircraft in flight is practical up to a distance of 50 miles, while communication from aircraft resting on the water to points on shore is possible up to distances of 40 miles.

The development of the radiotelephone for use on aircraft has also been perfected to such an extent that it is now possible for the personnel of aircraft in flight to communicate to stations on land by this means a distance of 60 miles, while telephonic communication from stations on land to aircraft in flight is now possible up to a distance of 15 miles.

The regular reporting of positions of patrol planes and dirigibles to shore stations for distances up to 100 miles by means of radio communication has been accomplished at several of the home coast-patrol air stations, which demonstrates the fact that remarkably efficient aircraft radio equipment has been produced by the aircraft section of the Radio Division subsequent to July 1, 1917, notwithstanding the very great obstacles which had to be overcome.

A direct comparison of American with foreign apparatus showed that the American apparatus accomplished in one set what was being accomplished in Europe by two separate sets and an additional hand-driven generator. The range of American apparatus in the air is at least 40 per cent greater, and the range on the water is over 100 per cent greater. The weights of this apparatus, considering the head resistance of the apparatus, is the same.

During the previous fiscal year the radio division enlarged and improved several of the high-power radio stations, with a view to providing adequate and reliable, continuous transoceanic radio communication.

Four of the high-power radio stations on the Atlantic coast, namely, Sayville, Tuckerton, New Brunswick, and Marion, have been developed into reliable and efficient trans-Atlantic radio transmitting stations, capable of continuous radio communication with European stations.

In addition, the Annapolis trans-Atlantic radio transmitting station, which is the most powerful radio station in the United States, was constructed and commissioned during the previous fiscal year. This station was constructed to provide, in conjunction with the Sayville, Tuckerton, New Brunswick, and Marion transmitting stations, continuous communication with our forces abroad in the event all of the cables are cut. I will modify that slightly by saying that Marion was never quite satisfactory for continuous communication.

The CHAIRMAN. What station was that?

Commander HOOPER. Marion, Mass. It was one of the Marconi Co.'s high-power stations.

As an additional precaution and to provide facilities for the steadily increasing demands for trans-Atlantic radio-communication service, a station similar to that at Annapolis has been authorized for construction in the southern part of the United States, and plans for this station have been practically completed.

A new United States naval trans-Atlantic radio transmitting station located in France has been under construction by naval personnel, under the direction of the radio division, during the past fiscal year. This station is rapidly nearing completion, and when commissioned will be the most powerful radio station in the world, and will insure continuous communication from our forces in France independently of the cables, if this should eventually prove to be necessary.

Three trans-Atlantic radio receiving stations capable of receiving radiograms from the principal European stations have been established and developed, enabling the naval radio communication-service to maintain continuous reception of radiograms from European stations.

A new high-power radio transmitting station is nearing completion at El Cayey, P. R., which, when commissioned, will be capable of trans-Atlantic communication with our possessions in the West Indies and our vessels cruising in southern waters.

Trans-Pacific radio communication facilities have been improved during the preceding fiscal year.

The United States naval trans-Pacific radio transmitting stations located at San Diego and San Francisco, Cal.; Pearl Harbor, Hawaii; and Cavite, P. I., and the subsidiary trans-Pacific stations at Guam and Tutuila have been enlarged and improved to meet the demands for increased trans-Pacific service. The Marconi Co.'s trans-Pacific circuit, Bolinas-Marshall, Cal., Kahuku-Koko Head, Hawaii, capable of continuous communication to Japan via Hawaii, has been maintained in condition for immediate operation should the military situation make it advisable to provide increased means of trans-Pacific communication.

The CHAIRMAN. I understand that this report refers to a period prior to the signing of the armistice?

Commander HOOPER. Yes, sir; this was written prior to that. Pretty nearly everything we have done was with the idea that the war would last some time.

In general, the accomplishments of the transoceanic section of the Radio Division during the preceding fiscal year have made it possible to supplant the cables for necessary communication for trans-Atlantic and trans-Pacific communication and also communication with our West Indian possessions should this need arise.

It is obvious from the foregoing outline of work accomplished by the Radio Division during the preceding fiscal year that an immense amount of research and development work has been necessary owing to the highly technical nature of all radio apparatus and the absolute necessity of conducting careful experiments before any alteration in the design of workable apparatus could be attempted, which alterations and redesign of radio equipment has been essential in order to meet the various demands of the service, notably radio apparatus for aircraft.

It is requested that attention be directed to the fact that there has been practically no increase in the number of technical employees of the Radio Division during the preceding fiscal year, notwithstanding the great amount of work of a technical nature involved as outlined in the foregoing.

Continued and patient experiments in connection with radio apparatus for aircraft have been conducted with a very limited personnel until it was possible to design and produce suitable and efficient apparatus for this service. From data available, it is established that the radio apparatus for aircraft produced by the Radio Division, and for which contracts for a large number of sets have been awarded, are superior to similar apparatus used on aircraft of other belligerent countries.

Much has been accomplished during the preceding fiscal year toward the standardization of various types of radio apparatus and its component parts with a view to greater facility of exchange of spare parts and effecting repairs.

A large amount of research and development work has been necessary in connection with the establishment of efficient transoceanic radio transmitting and receiving stations.

The use of radio for fire control on naval vessels and aircraft has been developed into a practical service.

That is a very important thing, using the aircraft to control the ranges that we give to the guns when the guns are firing at the enemy. We developed that.

Three types of radio compasses have been designed to meet the varying needs of the service and they have proved their value both for the purpose of determining the position of ships at sea and also for determining the location of enemy submarines and other vessels and unauthorized shore radio stations.

Our destroyers, having these radio compasses on board, are able to pick up the convoys very much easier. They used to go out and try to meet the convoys at a certain definite position that the admiral would specify, and destroyers would go out there and could not find them, especially if it was foggy or rainy; it would be like looking for a needle in a haystack; and sometimes the convoys as a result would have to go into port without any armed escort; but after we got

these radio compasses on board, we could get their signal and would know just what way to go; and it was a great improvement.

Mr. ROWE. Could not the enemy submarines pick up those messages also?

Commander HOOPER. Well, they were usually under the water. They could if they got on the surface and listened. But when we used it, we kept moving; we did not take any chances.

The Radio Division has assisted in the development of the radio telephone transmitting and receiving outfits during the past fiscal year and has equipped a large number of naval vessels with this apparatus which has proven to be of the greatest practical value.

A system of underground radio reception has been developed which obviates the use of masts to support an overhead antenna, which is of great value from an economical and military point of view.

Some of the opponents of the bill will undoubtedly bring up the same arguments that they have in the past, about the retardation of the advance of the art if the Government owns the radio stations.

The fact in the past has been that the Government has advanced the art most rapidly. And we have done it because we wanted the apparatus and were willing to pay for it, and we buy absolutely from the outside. We do not make it ourselves, although we have made some where they tried to charge too much, where they had a monopoly on a particular thing; we would make some particular apparatus and bring the prices down.

Mr. EDMONDS. Does your department own any patent rights now?

Commander HOOPER. I am going to discuss the patent situation as soon as I get through with the question of the advance of the art.

Mr. EDMONDS. I thought you were going to discuss it now; you had mentioned it.

Commander HOOPER. If you can judge the future on what the past has been, the art will be accelerated rather than held back by Government ownership. We have been noted among the radio world for taking the lead in this country, and they seem to center on us as the place to bring all their inventions, and bring all their apparatus to see whether it is a good thing or not. We encourage every inventor. We keep competition open for the purchase of our apparatus, and we have been the leading "pusher," you might say, in trying to get out of the art all there was in it.

Among the examples that I could give of things that we have taken the leading part in developing—that is to say, we did not develop them ourselves but we got the inventive genius of the country, which is very capable, busy and they produced results.

For example, in the aircraft radio there has been a wonderful development during and prior to the war. When I was in the bureau before they had only been making aeroplane flights for a year or so and there was very little development in aircraft radio. In fact, a few sets had been made with such short range that it was not believed possible to develop the range so as to be worth anything to the aeroplanes. The maximum range then was thought to be 20, 30, or 40 miles, and the aeroplane could fly and report its own scouting results, 20 or 30 miles, quicker than they could send a message that distance.

So that there was not much encouragement from the aircraft industry that we could develop the radio for aircraft use.

However, we got the idea that there might be something in it in the future; you never can tell. And so we thought the only way to develop this aircraft radio was to hold out the money, and let people see it, and then they would get busy and try to make something.

So the Secretary authorized us to make a requisition for aircraft radio sets—50 radio sets, I believe it was. That was considered a large number before the war. We used to buy less than that in a year.

And we were authorized by the Secretary to get bids on them and require the different bidders to submit samples. And we had keen interest in the matter; and I think there were some six or seven samples submitted.

That was the first advance ever made in aircraft radio sets in this country, and that was produced by our initiative in offering to buy sets if people could produce them. We did that in order to advance the art. And some of the gentlemen here this morning were among those who submitted the first bids—and we thought they were fine at the time. They could work some 75 or 80 miles; they weighed very much more than a similar apparatus weighs now.

Then the aviators were given these sets, and they found that they could make use of them, and we installed them, and that opened up the field, and then we ordered more.

Now, if we had not done that we would have been absolutely unprepared in this war, and I beg to say that we would not have had an aircraft radio set delivered before the war was over.

And that shows where, through our encouragement of the inventive genius of the country, we have aided in developing this matter.

Mr. SAUNDERS. Are you speaking now of the radiotelegraphy or radiotelephony?

Commander HOOPER. We class both radiotelegraphy and radiotelephony together; it is all in radio.

Mr. SAUNDERS. Well, I used to read about the progress of that art long before the United States came into the war—about the aeroplanes of the European nations were using radio for signaling purposes.

Commander HOOPER. That was for a very short range.

Mr. SAUNDERS. Well, they were using it, anyhow.

Commander HOOPER. And our problem was for long-distance scouting, you see.

Mr. SAUNDERS. Well, it has been a gradual improvement in the instruments used, has it not?

Commander HOOPER. I will not say that. We developed ours independently of the people abroad. We deserve the credit—I do not mean the Government, but the inventors.

Mr. HARDY. The American inventors?

Commander HOOPER. Yes, sir.

Mr. SAUNDERS. Then, those people abroad have got the wireless with the radius that you have mentioned?

Commander HOOPER. They have it now, but it is no better than ours.

Mr. SAUNDERS. Well, they developed it, did they not?

Commander HOOPER. Yes; they developed it also.

Mr. EDMONDS. Has there ever been any advance in the art made by an employee of the Navy Department?

Commander HOOPER. Yes; lots of them.

Mr. EDMONDS. Will you please mention a few?

Commander HOOPER. I do not know that I could mention any offhand.

Mr. EDMONDS. Why, if there have been lots of them you ought to be able to name some.

Commander HOOPER. I can say that in this aircraft business we told the inventors just what to do and outlined how to do it, and we deserve about half of the credit of getting the thing up. If we had not done that, they would never have made the effort and produced the inventions.

Mr. ROWE. You found out what you wanted, did you not?

Commander HOOPER. Yes.

Mr. EDMONDS. The probabilities are that you did that very thing, and you deserve credit for it, but I am asking you whether any employee of the Navy Department has ever made any important invention that has advanced the art?

Commander HOOPER. Dr. Kolster, of the Bureau of Standards, got up what we call the "radio compass."

Mr. EDMONDS. Well, he is not in the Navy Department.

Commander HOOPER. Well, we all worked together. It was made at our instigation, the same as the radio for aircraft. We said it would be a good thing to get up a radiocompass. They had a radiocompass before that which was never satisfactory for ships. So we decided that we would try to stir up a lot of enthusiasm about it, and the man who happened to do it happened to be a Government employee. He was just as much in the Government service as our employees are. The Bureau of Standards has always cooperated with us absolutely and efficiently—

Mr. EDMONDS (interposing). I believe that the man who invented that apparatus to cut out the static interference was employed by your department, was he not, and also employed by the Marconi Co.?

Commander HOOPER. Well, I will not say that. I would say that we did as much to invent that as he did, and I am not sure—

Mr. EDMONDS (interposing). Well, he got the patent, did he not?

Commander HOOPER. We got the patent on our invention and he got the patent on his. I am not sure that ours is not better than his. That is an honest conviction.

Mr. HARDY. When you go into the Government employ, what you do does not count anyhow. [Laughter.]

Commander HOOPER. Yes, sir.

The CHAIRMAN. No; not in the estimation of some people.

Mr. HARDY. It is generally discounted anyhow.

Commander HOOPER. Well, in the radiotelephone the Government does not want to take credit for what it has not done, but it ought to get credit for what it has done.

Now, we started with the radiotelephone years and years ago, and we got the Western Electric Co. to take an interest in it, and they had made the telephones used on our ships, which were satisfactory, although previous to that we had the unsatisfactory telephones made by another concern, and this development work was carried on for a period of several years, until it finally reached a point where, when the war broke out, it could be made useful in all sorts of ways, espe-

cially on the aircraft; and if we had not taken the interest in pushing them along and trying to advance the art, I do not think that would have happened, at least for ship phones.

I read in the newspapers the other day that somebody had advertised that the Government had done all this and that the radiotelephone was the wonderful invention that the Government had made.

And I would like to take occasion to say that the Government did not make that invention; that the Western Electric Co. and the General Electric Co. and the De Forrest and Marconi companies, and some other companies are the ones that deserve the credit for the radiotelephone.

The Western Electric Co. is the one that particularly developed it for the war use. We have been active in pushing the development and it is a fact that as we have handled it it has developed faster than it could have developed with a commercial monopoly doing it.

Mr. WHITE. Is it not true that everybody has been offering such suggestions as they could to your bureau and every bureau of the Government during the war time?

Commander HOOPER. Yes.

Mr. WHITE. I know that is one of the things that Congressmen have been deluged with—offers of all sorts of inventions to aid in carrying on this war.

Commander HOOPER. Well, I was speaking about previous to the war more than about during the war. Most of these things started before the war. We have been pushing the inventors right along. In our Navy we were in competition with other nations and we had to be very keen in order to keep up. And in the last hearing on a bill similar to this the opponents of the bill got up and made the committee believe, or led them to believe, that the Government wanted to manufacture the radio apparatus; that nobody else would be allowed to manufacture anything pertaining to it.

We have not any idea of that kind in the world. We know that the genius of the country should be encouraged and that the manufacture should be done by outsiders.

And we are not anxious to go into that; we are trying to keep from it. There is always a pressure to do the manufacturing within the service to some extent, but we realize our responsibilities and we realize that the development of the art will be very much more satisfactory if it is done on the outside. When we want anything done we tell the people on the outside what we want, and they produce it.

Mr. EDMONDS. As a matter of course, many of these ingenious men who make these inventions and work out their ideas have not got the money to protect them.

Commander HOOPER. That is true.

Mr. EDMONDS. And then you step in and give them a lift and help them out, do you?

Commander HOOPER. Yes; nobody else could do so.

Mr. EDMONDS. No; the probabilities are that nobody else would; and you deserve a great deal of credit along that line and I do not want to depreciate or deny your efforts in that direction. The only thing I wanted to draw out was whether your own men had invented

anything or done anything that could be considered as a tremendous advance in the art.

Commander HOOPER. Well, I should say that we could make claims to patents that would appeal to people. If they were represented properly, they would be considered very valuable, and the Government would have had to buy those patents if those men had not been in the Government service.

Mr. EDMONDS. Well, the improvement that you have made in these things, from the crude article that the inventor has first developed, the improvements that you have made would be patentable, and the department deserves credit for everything of that kind that it has done.

Commander HOOPER. Yes. And the thing that we patent nobody thinks amounts to anything. They say, "That is a simple matter," whereas if some outsider invents a similar article, he wants a million dollars for it right away.

Mr. SAUNDERS. With regard to the substance of this situation, as you have stated it, it is about this, is it not? That here is a situation in which the American people need in this particular field the very best that the inventive genius of American inventors can produce?

Commander HOOPER. Yes, sir.

Mr. SAUNDERS. And Congress without stint provided the funds to get it, and, as was your duty, you used those funds to get it, and technical men in the Navy helped it along. That is about all this situation amounts to, is it not?

Commander HOOPER. No, sir; you are speaking of the war now—

Mr. SAUNDERS. I am speaking now about the war period.

Commander HOOPER. No, sir; during the war was no different.

Mr. SAUNDERS. Yes; during the war you had more funds than you ever had before.

Commander HOOPER. Yes.

Mr. SAUNDERS. Those large funds?

Commander HOOPER. The requisitions for those aircraft sets and radio compasses were made before the war.

Mr. SAUNDERS. I am not talking about any particular features.

Commander HOOPER. Those were the two most important things and they were developed before the war.

And the fact is, if you take the history of the high-power stations—if you will bear with me I will explain how we have always pushed ahead of the commercial people:

Originally we used what is called the spark type of apparatus in the high-power station. That was developed in this country, among others, by the Marconi Co., and they made it their standard. Along about 1910 we wanted to build a high-power radio station in the Canal Zone, and we advertised for bids for the apparatus, and the so-called continuous wave system was bid on by one of the companies, a new company that had never furnished apparatus to the Government before, this being a new invention at that time, an improvement on the spark apparatus, which was broader tuned; it was not so efficient; it would not carry so far.

The rival bidders tried in every way to keep us from making the award on the basis of this new type of apparatus, which was an advance, in every way they could—that is, in every honest way. I do not mean to say they used improper pressure, but they wrote long

letters about the subject and represented to the Secretary that their apparatus was as good as the other.

And we used our best judgment—at least, the department did; I was not there at the time—and decided to adopt what we thought was the best apparatus after we had made a series of tests with it.

So that there was a marked step in advance. That same continuous-wave apparatus now is recognized the world over as the best apparatus, and we have put it in our transoceanic systems.

Mr. EDMONDS. Whose invention was that continuous-wave apparatus?

Commander HOOPER. That was the Poulsen system.

Mr. EDMONDS. The Poulsen system? What is that?

Commander HOOPER. Yes; it was invented by a Norwegian—or I believe it was a Dane—and was purchased by the Federal Telegraph Co., of San Francisco.

Mr. SAUNDERS. Well, the Federal Telegraph Co. was not a Government system, was it

Commander HOOPER. No, sir.

Mr. SAUNDERS. That was a commercial enterprise, then, that had this very desirable invention of Poulsen?

Commander HOOPER. Yes, sir; but if it had not been for us they would not have been able to do anything with it at all; and we just pulled them out of the fire, and showed it before the world as an improvement in the art.

Mr. SAUNDERS. Let me ask you this question, so as to get it into the record, because we have had something about this before, and I want to get the respective contentions of both sides into the record, and make a clear issue on the point: Do I understand correctly that you maintain that before the war the efficiency and advance of the radio art in the Navy was greater at that time than was manifested in the commercial world?

Commander HOOPER. Yes.

Mr. SAUNDERS. Do you make that distinct claim?

Commander HOOPER. Yes, sir; there is no question about it. The reason was that the commercial companies could not afford to keep replacing their apparatus with the latest types; they must standardize; whereas the Government must improve, from a military point of view, because we must keep our Navy competing with the other navies of the world; and if we have got a gun, or an engine, or a radio set that is not as good as the very latest thing in other countries, we are not the equal of our possible enemies in efficiency, and we are not as ready to meet them on an even basis as we ought to be.

Mr. SAUNDERS. Were you doing commercial business before the war?

Commander HOOPER. Yes, sir; we were doing commercial business down south of Cape Hatteras.

Mr. SAUNDERS. Then anyone desiring to send a radiograph before the war could send it through the naval stations, could they?

Commander HOOPER. All those south of Hatteras—am I right about that, Capt. Todd?

Capt. TODD. Yes.

The CHAIRMAN. The law provides for that.

Mr. SAUNDERS. I know the law provides for that; but I wanted to find out if they were doing it in a commercial way. We had that

question up yesterday; the law authorizes it, but it does not follow that they were doing it.

The CHAIRMAN. The law itself would show that.

Commander HOOPER. I can give you many other examples of cases where we have pushed the development of the art——

Mr. SAUNDERS (interposing). I want to ask you this: You say that those stations south of Hatteras prior to the war were freely open for commercial use?

Commander HOOPER. Certain of them were, and certain of them were not; some were reserved for Government business, because we could not handle both.

Mr. SAUNDERS. That leaves it in rather an indeterminate situation. I am trying to bring out to what extent in that area you were doing general commercial work before the war.

Capt. TODD. May I answer that question?

Mr. SAUNDERS. Yes; I will be glad to get that for the record.

Capt. TODD. There were no stations that were not handling commercial business south of Hatteras as a——

Mr. SAUNDERS (interposing). I understood Commander Hooper to say that some were and some were not. Then that was a mistake; they all were?

Commander HOOPER. I withdraw that statement.

Mr. SAUNDERS. I understand. I wanted to get the record straight. Then all south of Cape Hatteras were doing commercial business, were they?

Capt. TODD. All south of Cape Hatteras, except where specifically prohibited in the law of 1912, and that meant that in case a commercial station within 100 miles of a naval station was open for the general public service between ship and shore, 24 hours of the day, then the naval station had to keep quiet.

But wherever the commercial stations did not operate a 24-hour schedule the naval stations not only south of Hatteras on this coast but on the Pacific coast and throughout our island possessions, did handle the work with the commercial ships exactly the same as commercial stations all over the world.

Mr. SAUNDERS. Freely, in competition with commercial stations?

Capt. TODD. Not in competition with commercial stations, because the commercial stations did not find it practicable to maintain a service which safety at sea, combined with the needs of ships and their passengers required—all except high-power stations.

Mr. SAUNDERS. Well, what service outside of that did the commercial stations do—if you exclude from that, what sort of work would they undertake to do?

Capt. TODD. They have their stations open at the time when they get the most business; they know that certain ships will enter certain ports at certain times, and then there will be a flood of messages. They were careful to have one or two operators to cover those periods. In New Orleans, speaking of the territory south of Hatteras, it was possible to maintain a 24-hour service by commercial stations, with the result that the naval station did not handle any commercial business until the war.

Mr. SAUNDERS. Now, if those commercial stations were open to commercial business, as indicated, and gave better service than the ordinary commercial station could give, it would seem to be a very

clear conclusion that they would run the commercial stations out of business; nobody can compete with a poor service as against a superior service.

Capt. TODD. Well, as a practical matter, the Navy has acquired their station; in other words, it was not practicable for the commercial station to continue, and they have sold their stations voluntarily to the Navy Department.

Mr. SAUNDERS. Just one question in that connection: Have those people gone out of business as a result of the fact that they were affording an inferior service, which could not compete with the Navy, or as the result of restrictions or regulations put upon them so that they could not enter upon full and free commercial use?

Capt. TODD. There were no restrictions upon the erection of commercial stations. Anybody could put up a commercial station anywhere and demand a license, and get it, and operate for commercial profits. There was simply not enough in it to make it profitable.

Mr. SAUNDERS. So that it was the condition of competition that squeezed out those stations?

Mr. WHITE. That is what I want to know.

Capt. TODD. Yes.

Mr. SAUNDERS. Now, if it was competition that squeezed out those stations, where are the stations which the Navy Department should take over?

Capt. TODD. Principally the high-power stations.

Mr. SAUNDERS. With respect to the high-power stations, would not the same conditions prevail? They are commercial stations, are they not?

Capt. TODD. They are commercial stations, but they are not specifically covered in the law you passed in 1912. The law of 1912 made this provision for the handling of commercial work between ship and shore; the overseas work was not specifically covered.

Mr. SAUNDERS. Do you mean by that that the naval overseas high-power stations are not competing with the commercial high-power stations?

Capt. TODD. They are not, and can not, and will be kept idle—

Mr. SAUNDERS (interposing). Then, if we should just allow you to do commercial work with respect to those high-power stations, automatically, just as you squeezed out those other stations, by operating a superior service, you would automatically squeeze out these high-power stations?

Capt. TODD. That is a possibility, if we maintained superior service.

Mr. SAUNDERS (continuing). Without being troubled with this matter of Government ownership and the exclusion of private enterprise?

Capt. TODD. If we maintain superior service, naturally we will handle more business; but it would be many years before we would monopolize it all.

Mr. SAUNDERS. Let me ask you one question in that connection, brought out by statements made yesterday before the committee, as I understood them; let me see if I got them correctly; I understood that we have about as many high-power stations on our coasts as can be effectively operated; in other words, the field is about exhausted. Was I correct in that apprehension?

Capt. TODD. In the present state of the art considering the contemplated new high-power stations.

Mr. SAUNDERS. In other words, then, your contention is that so far as our coast is concerned it is not a field that is capable of further development by the erection of further high-power stations until the art advances?

Capt. TODD. That is just about right, sir.

Mr. WHITE. Well, my question is very similar to Mr. Saunders's last question. You spoke about this service being unprofitable to the commercial companies, Capt. Todd. I just wanted to get clearly in my mind whether that is because of anything inherent in the nature of the business or whether it was unprofitable when they undertook to do it in competition with the Government. Is not the reason that the business was unprofitable and that private companies had to face Government competition?

Capt. TODD. No, sir; because, except in certain cases which are very clear—that is, stations of very great strategical value to the Government from a national point of view and a small limit around the Government station—the commercial station could not be put within 5 miles, I believe, of the Government station. All commercial companies were perfectly free to put up stations anywhere, and their erection and operation would automatically close the nearest Government station to commercial business. That was the provision of the law you gentlemen passed. With the exception of some stations that I believe I can mention offhand—Key West; San Juan, P. R.; Canal Zone; San Diego; Puget Station in the northwest corner of Washington; and the stations in Alaska and the Philippines—all other stations at which Congress allowed the Government to handle commercial business would be closed to commercial business automatically by the erection of stations in those localities.

So that if there is any money in it the Marconi Co. or any other company was perfectly free to erect stations and take the business away from the Government, if they found it practicable. But it was profitable only in the neighborhood of the largest seaports, and all the largest seaports are north of Hatteras. Of course the stations around San Francisco handled no commercial business, because that is a large seaport. There the commercial companies had their 24-hour schedule and had a monopoly.

Mr. SAUNDERS. And I believe that my apprehension was further correct, that you contemplate that there is no occasion for and no likelihood of the development of this art in the interior communication of continental United States?

Capt. TODD. I do not remember talking about that.

Mr. SAUNDERS. I do not know that you made that statement, but I think that was developed, because I asked those questions. Certainly the effect of this bill excludes the possibility of that, and it was certainly outlined here yesterday by some witness that you did not contemplate that that would be a practicable or a likely development—small stations dotted all about the United States—that a single enterprise or one of a chain of enterprises wanted to use for their own purposes, or that two cities wanted to use for communicating with each other.

Capt. TODD. If there could be no interference there would be no reasonable excuse for refusing a license.

Mr. SAUNDERS. Well, but you have hampered the issuing of your license, under this bill, so that it would be very difficult for anybody to get a license.

Capt. TODD. I did not quite understand that.

Mr. SAUNDERS. I say that you have hampered the issuing of licenses, under the terms of this bill, so that it would be very difficult for anybody to get a license.

Capt. TODD. It would not be difficult, under the terms of the bill, at all, sir. And may I suggest this? Not only must two stations working in the interior of the country not interfere with ship-to-shore communication, thereby robbing the ships of their only means of communication beyond the visual range, but the Government must also protect itself from groups of stations, and see that they do not interfere with other groups of stations, and so on.

Mr. SAUNDERS. Well, I understood you did not contemplate putting any restrictions on amateurs, and you said that any danger from that source would be eliminated by the wave lengths that you prescribed for them?

Capt. TODD. Yes, sir; there is a very practicable limitation for them.

Mr. SAUNDERS. Well, the same limitation as to wave lengths, as you have outlined as to amateurs, could be prescribed for these interior stations, so as to eliminate any possible interference by them with shore-to-ship or transoceanic signaling?

Capt. TODD. Yes; but it could not be done. If they have the status of amateur stations they are properly regulated so that they can not interfere; but for long distances, such as you suggest—the average cities, of course, are close together, and the amateur waves would do for them, and there is no objection to that. But it is not possible to grant them higher wave lengths and higher powers—

Mr. SAUNDERS (interposing). Well, I do not suppose that any member of this committee holds any other view than that appropriate legislation should be enacted which will prevent any sort of commercial system of wireless from interfering with an efficient sea service. We are all agreed on that. That is a matter of regulation.

Now, you stated that there would be no danger of their not being able to get licenses in proper cases. I have mentioned a case of where a man wanted to put up a set of stations for a chain of factories for the purpose of communication between the different ones.

Section 5 of the bill provides—

That the Secretary of the Navy may issue special licenses, subject to such conditions and restrictions, and for such periods as he deems proper, for the establishment and operation of stations for special emergency use in cases where no other rapid means of communication are available.

I submit that with that language in the bill a set of cotton factories in the South, or other kind of factories in the North or West, who wanted, for their personal use, to set up a small wireless system, would have very great difficulty in getting a license.

Capt. TODD. May I answer that in this way? Congress must, by legislation, establish some agency to get the best results out of this

art of radiotelegraphy; some office or department of the Government must enforce the laws which Congress passes. Now, if those cotton factories were the only ones who would wish to operate between this system of stations that could not interfere with ship-to-shore communication, well and good. But suppose the fertilizer factories, and the wealthy farmers, and the various associations, either the medical association or any organization of any kind, and the railroads—suppose all of those people wanted to put up their system of stations.

Mr. SAUNDERS. Yes; I am speaking of just such a commercial development as that.

Capt. TODD. Well, should there not be some governmental agency to prevent them from destroying the effectiveness of radiotelegraphy?

Mr. SAUNDERS. Well, that raises another question; that raises the question of regulation. What I said was, does not this bill—and I think you will find it in the hearing of yesterday, that this system of development I have just referred to, development in continental United States, was rather discouraged as a possibility, discouraged as an undesirable thing, not likely to be commercially possible. Now, it seems to me, bringing the general view to it, that it is a development that ought to be allowed, if it can be brought about, and every opportunity ought to be afforded to it.

Capt. TODD. I quite admit that.

Mr. SAUNDERS. I do not know whether it can be done or not, but a few years ago we were all agreed that flying was a physically impossible thing.

Capt. TODD. I will answer you in a few words: It can not be done in the present state of the art, and for that reason the telephone and telegraph should be used.

Mr. SAUNDERS. Well, that brings us back to what I said was announced here yesterday on behalf of the office of the Secretary of the Navy.

The CHAIRMAN (interposing). Capt. Todd, it is now 10 minutes to 1 o'clock and the only purpose for which Commander Hooper gave way was that you might answer the question as to how many southern stations were open for commercial purposes; we have gone far afield from that inquiry now. So that I think it will be well for him to resume his testimony later if it is material to the development of the subject.

But it is now nearly 1 o'clock, and I suggest that we take a recess until 2 o'clock, when Commander Hooper can resume his testimony.

Capt. TODD. May I ask that Mr. Long may take the stand this afternoon?

The CHAIRMAN. Of course we will hear him, if that is the desire.

Commander HOOPER. May I take just a few minutes, Mr. Chairman, to discuss one particular phase of the matter?

The CHAIRMAN. Yes; if you can finish in a very few minutes.

Commander HOOPER. I just want to say that the development of the art is entirely outside the scope of the bill and is a thing that the bill does not have anything to do with. We are not going to interfere with the invention or the manufacture of radio; we are just going to let it go on like it has in the past and have freedom of development in every way.

Mr. GREENE. The manufacture is not to be carried on in connection with the apparatus for ships?

Commander HOOPER. We have a certain amount of manufacture of our own, but we would rather not do it; we would prefer getting it done outside. We are rather narrow in the Navy in some respects.

But we are all working together in the same field, and we are all trying to solve the same problem; and perhaps we are not likely to see a broad thing, and so we encourage everybody to do what they can to develop the art. And the development of the art has not anything to do with this bill at all. That is my idea of it. I am speaking absolutely what I think, and I think I have a broad view of the situation from both sides. I am not recommending any monopoly where there will be any restriction or any curbing of competition or of development.

(Thereupon, at 12.50 p. m., the committee took a recess until 2 o'clock p. m.)

AFTER RECESS.

The committee reassembled at the expiration of the recess.

The CHAIRMAN. We will proceed with the hearing. Mr. Breckinridge Long, the Third Assistant Secretary of State, is here. His work at the department is urgent, and if there is no objection, we will hear Mr. Long at this time.

STATEMENT OF HON. BRECKINRIDGE LONG, THIRD ASSISTANT SECRETARY OF STATE.

The CHAIRMAN. Mr. Secretary, the committee has under consideration H. R. 13159, a bill to further regulate radio communication. I understand you are here to make a statement on behalf of the State Department.

Mr. LONG. Yes, sir; the State Department desired to express its entire approval of the bill as drawn, in substance. There will be forwarded to you, Mr. Chairman, for your committee, a formal communication from the State Department which will set out very shortly one or two suggestions that the department makes from a legal point of view. But from the point of view of general principles, the department is thoroughly in sympathy with the bill.

There are several reasons which underlie the attitude of the department, but the primary reason is the international one and its specific application to communications to and from this country during wars—during wars in which we are engaged and during wars in which we are neutral.

During the present war—for peace has not yet been declared—we have found occasion to exercise a censorship more or less vigorous, which could not have been done without a certain amount of control of the avenues of communication. During our period of neutrality we found ourselves in a very embarrassing position at times, because of the attempts on the part of other governments to use stations which they owned, contrary to what we conceived to be to the interests of this Government; and it is for the purpose of regulating these means of communication, both during periods of neutrality

and during periods of belligerency, that the State Department feels it advisable to vest control of the communications in the executive branch of the Government.

The CHAIRMAN. The European war began in August, 1914. Under the provisions of the radio act, in the event of public emergency or war, the Government has power to take over the control of communication by radio; and, in the exercise of that power, the Government did take over the control of all the wireless plants in this country. Has there been any lack of power in the Government under the existing law to do that? In other words, has it not been complete?

Mr. LONG. So far as I know, it has, Mr. Chairman. But the State Department is not technically concerned in these questions, and I can not say whether or not it has been complete from a technical point of view. I am only speaking from the point of view of policy.

Mr. WHITE. Would the State Department be concerned, Mr. Long, in anything other than the high-power stations which communicate from here across the water—that is, you would have no concern, would you, in what we may call continental communication here between points in the United States?

Mr. LONG. Well, if I am properly informed, wireless telegraphy has advanced to such a high degree of scientific use and efficiency that receiving stations are now easily transported in articles and bundles the size of trunks—not much larger, certainly—and can be set up in unknown and unobservable places and can be used to pick out of the air messages that come from very distant places.

Mr. WHITE. Yes; and that is the interest of the State Department in that kind of message. For illustration, if the Pennsylvania Railroad system wanted to control the movement of its trains by wireless between points in this country, the State Department would not have any interest in that. It is only the foreign communications in which you are interested?

Mr. LONG. Oh, yes; we are only interested in foreign communication, or such means as may be used to receive or to send communications to foreign lands.

Mr. HARDY. You would be interested also in communication with foreign vessels at sea, would you not? That is, you might be?

Mr. LONG. Oh, yes; very much.

Mr. EDMONDS. The State Department is not interested in developing wireless in other countries besides the United States?

Mr. LONG. No; we are not.

Mr. EDMONDS. The question was asked Capt. Todd this morning, and he stated that that would come under the State Department. The question was asked him whether they were interested in establishing wireless stations in South American countries.

Mr. LONG. Well, we are not at present, and, so far as I know, have not been in communication with any South or Central American countries for the purpose of establishing wireless plants.

Mr. EDMONDS. You have not offered to assist any Government financially in building wireless plants?

Mr. LONG. As far as I know, the answer is negative, except possibly in the case of Brazil, which was done during the war, inasmuch as Brazil was a belligerent, simply for war purposes and simply

as a temporary proposition, not to establish a wireless plant there but simply to help them man such plants as they had.

Mr. EDMONDS. You do not know of any negotiations with any of those countries to help them establish wireless communication in connection with our system?

Mr. LONG. No, sir.

Mr. GREENE. Are you in any way affected by or interested in questions of commercial development which it is proposed to carry into effect by the use of wireless if we pass this bill and put into the hands of the Navy Department the power to control and regulate the use of wireless?

Mr. LONG. By "commercial use," do you mean, sir, the use for paid messages or the development of our foreign trade?

Mr. GREENE. Yes; paid messages.

Mr. LONG. Or both?

Mr. GREENE. Both.

Mr. LONG. I do not think we would have any particular concern in just commercial messages, except in so far as they might be used, or the system might be used, to help out foreign trade.

Mr. GREENE. Well, at the present time the Department of Commerce has that matter in control. This would transfer it from the Department of Commerce to the Department of the Navy, the Department of Commerce not having been liberally dealt with in the matter of money by the administration in power. The point I want to make is this, that the Department of Commerce has been broadly interested in trade and the development of foreign affairs; they issue trade notices and have men employed outside of the consulates of the United States who originally were intended for the development of trade.

I do not speak of this on account of any interest that I have, because I am not interested at all in foreign trade, or interested in trade in any way, and am entirely independent of anything of that kind. What I want to get at is whether or not you would think that a transfer of those commercial interests which have heretofore been under the Department of Commerce would be advisable for the development of foreign trade—to transfer it to a department like the Navy Department, that has never been engaged in the development of business, but rather has been engaged in the development of the Navy.

Mr. LONG. As I understand the bill, Mr. Greene, it would not transfer the control of trade or commercial operations to the Department of the Navy, but simply create the Navy as an agency through which commercial messages, or any other messages, might be sent.

Mr. GREENE. Well, I think they would be pretty likely to be considerably interested in trade after they have handled commercial messages for some time. I do not see how anybody would not be interested. I am interested in it, and I never was in foreign trade, never was in a foreign port, never was outside of America so far as being out of sight of land—I never was outside of the United States. I am a strong American; not in any way involved in foreign trade, except that in my position as a Member of the House I am interested in anything that means the development of the United States or the development of the Navy—I have always supported everything for them—and, naturally, the interests of the State Department and every department. Now, their proposition is to take all business

operations and put them under one head, one monopoly—they, themselves, call it a monopoly—to put into the hands of the Navy Department the entire monopoly of the radio business to the exclusion of any body else. They have bought most of the apparatus of various companies and wiped them out of business and then want to get the rest of the control by this legislation.

The CHAIRMAN. I understand that, looking at it from a broad point of view, the State department approves the policy that is sought to be developed and carried out by this bill?

Mr. LONG. Approves the policies—

The CHAIRMAN. The legislation embodied in this bill.

Mr. LONG. Yes, sir.

Mr. EDMONDS. All that you said that was necessary in connection with your department and radio business, could it not be carried out by regulation just as well as by public ownership?

Mr. LONG. By Executive regulation?

Mr. EDMONDS. By Executive regulation—either by act of Congress or, if necessary, by Executive regulation. Of course, in time of war it is fully covered. Now, in time of peace, would not your interest be just as well cared for by regulation if the plants are privately owned?

Mr. LONG. I doubt that. I doubt the authority to regulate in time of peace.

Mr. EDMONDS. We have had regulation in time of peace; we have regulated it. We licensed every station, and we can take away their licenses. We can revoke them if they do not behave themselves. We have the power of regulating interstate business, and this is interstate business.

Mr. LONG. Yes; you have the power to regulate interstate business by congressional action.

Mr. EDMONDS. Very well, then, by congressional action. We can frame those acts.

Mr. LONG. Yes, sir.

Mr. EDMONDS. And we can regulate this just as well in private ownership as in public ownership.

Mr. LONG. By congressional act I think you can regulate it. I think this would be simply authority to one of the divisions of the executive branch of the Government to regulate it. I think the regulation could be done just as well by congressional act as it could be by a department of the Government, except that when it is done it is a very firm and rigid regulation which can not be framed readily to meet changing situations.

Mr. EDMONDS. Well, we have had probably the greatest number of changing situations existing during this war that we will ever have in our lifetime, and yet you have found the laws passed by this Congress to be absolutely perfect in your handling of the wireless. You have not needed any more law. You have not asked for any more law. You did not come in here and ask us for anything. Why? Because you found the laws on the statute books gave you all the power you would ask for. And if that is not enough we can pass other regulations.

Now, I am only asking this question. We can regulate by act of Congress, and you know we can, the private owners of this wireless

apparatus, and in that case we would not have to pass a public-ownership bill. This bill creates public monopoly.

Mr. LONG. It creates public monopoly, yes; but the premise is that the medium of operation of wireless is the air, and the air is not susceptible of control by any power known, and the only way to direct the use of the air is to control the instruments through which the messages are received.

Mr. EDMONDS. You brought up the question of a man being able to carry in a small package the apparatus with which to receive messages. No matter what Government regulation we provide, even if the Government owned all the wireless apparatus, we could not prevent that man from doing that very thing, because he can make an apparatus himself that would do that, and he could come down here and sit in one of the parks in Washington and take all the messages from the Arlington station or the different wireless stations just the same. Government ownership has nothing to do with that at all. If a man is going to be a traitor to his country in time of war and he wants to get that message, he can get it without any trouble.

Mr. HARDY. Do you think it likely that this Government, under any administration, would ever sell or dispose of its own naval wireless stations to private corporations?

Mr. LONG. I do not know that I have any right to have an opinion on that subject. It is rather a naval matter than a State Department matter. My impression would be negative.

Mr. HARDY. Do you think the State Department itself would rather prefer a private corporation engaged in the business for profit to a wireless station owned by the Government?

Mr. LONG. I think the State Department, as a branch of the Government, would have more confidence in a Government-owned organization than it would have in any private organization.

Mr. HARDY. You do not think a private corporation could be quite as close to the Government as its own agency?

Mr. LONG. I think some private corporations could; yes; but as a general proposition a Government agency is a part of the Government.

Mr. HARDY. When a private corporation gets as close to the Government as its own instrumentality the corporation is practically a part of the Government, is it not? [Laughter.]

Mr. HUMPHREYS. The Government did rely upon the cables, owned by private corporations, to communicate with foreign Governments before they got this wireless, did they not?

Mr. LONG. Yes, sir.

Mr. HUMPHREYS. Do you think you could get along better if they owned the cable than you would with the cable being owned by private interests?

Mr. LONG. Well, circumstances are conceivable wherein it might be better.

Mr. HUMPHREYS. In some circumstances it is conceivable it would be.

Mr. EDMONDS. During the war they relied on the cable and after the war was over they took possession of the cable.

Mr. HUMPHREYS. Well, we can hardly draw much of a conclusion from that. A state of war is a very abnormal condition; I am speak-

ing of times of peace. Of course, if we have war you can take all these things anyhow if corporations own them. There is no corporation in this country that is going to be bigger than the Government, in spite of some very interesting speeches that you may listen to occasionally on the stump. The fact is the Government is bigger than any of these corporations and can take over the operation of their business in times of war if the State Department, the War Department, and Congress, and the Government in all its branches think that is wise. We have that power. I am speaking of times of peace.

Mr. WHITE. Do you think there would be less liability or more that we might have international complication with the several Governments of the world owning and operating these wireless plants than we would have had with private concerns owning and operating them?

Mr. LONG. In time of peace or in time of war?

Mr. WHITE. In time of peace, on account of interference in the passing of messages.

Mr. LONG. Well, I do not think there would be any great trouble in time of peace, but in time of war it is quite conceivable that there would be a great deal of trouble.

Mr. WHITE. There has been a suggestion made here that even in times of peace, if stations owned and operated by the United States interfered with the transmission and reduction of messages by stations of another country, it might be a cause of friction between the two countries. Would you think there was much merit in that suggestion?

Mr. LONG. Well, I do not see how they can interfere; it may be they can, but I do not know. It is possible, however, that if it should be persistently done it would cause friction.

Mr. HUMPHREYS. May I ask this question, Mr. Secretary? If you are anxious for a message that you are going to send to a foreign Government to be kept secret, would you not prefer to trust its transmission to a cable owned by a private corporation than to send it out into the air by radio owned by the Government?

Mr. LONG. Well, if I was sure my code was all right, I do not think it would make much difference which way it went.

Mr. HUMPHREYS. Of course, if a message is sent out into the air everybody can get it. A man can have an instrument in his garret, if he wants to, or down in the cellar. If you send a code message there will be a thousand people in the United States who would read it, whether they could understand it or not. If you sent it over the cable, there would be nobody but the operator of the cable who would get it. So it would be very much safer in the hands of the cable operator under the control of private enterprise than in the case of the radio owned and operated by the Government, would it not?

Mr. LONG. Yes; that is true. Of course, you understand there is a pretty close relationship between the State Department and the Navy Department. The Navy has ships all over the world, and we have our consular and diplomatic officers all over the world, and they are constantly dealing with incidents arising throughout the world. The State Department and the Navy Department, under all administrations and from the time both departments began to exist, have

always been very close, and we very often have occasion to resort to the Navy to send messages for us.

Mr. HUMPHREYS. This is true, is it not, that there are experts, and a number of them, in code deciphering?

Mr. LONG. Yes.

Mr. HUMPHREYS. They hear these code messages sent time and again, and after hearing them so many times they can decipher them. There are experts that can do that fairly well, are there not?

Mr. LONG. I believe there are, that do it fairly well.

Mr. HUMPHREYS. So that even if you send it in code it would be very much safer if you sent it by cable than it would be if you put it out into the air?

Mr. LONG. I think that is true, if you have a code that can be deciphered.

Mr. HUMPHREYS. That is true of all codes, is it not?

Mr. LONG. I am not sure of that; no.

Mr. GREENE. Is it not a fact that during the recent war England, and possibly this country also, but England especially, deciphered the German code, and was able to combat much of their work in trying to destroy vessels of the Navy or United States vessels crossing the ocean? I remember reading in the newspapers that they had deciphered these code messages that were sent out by Germany.

Mr. HARDY. As a matter of fact, did the State Department use the wireless during the war at any time, or did it depend upon the cables for trans-Atlantic communication?

Mr. LONG. We nearly always have used the cable.

Mr. HARDY. You have used the wireless when you did not have the cable convenient, or for other reasons?

Mr. LONG. Yes, sir.

Mr. HARDY. To any considerable extent?

Mr. LONG. No, sir.

STATEMENT OF COMMANDER S. C. HOOPER, UNITED STATES NAVY—Resumed.

Commander HOOPER. Mr. Chairman, there is but one more question to discuss, as far as the technical bureau is concerned, the matter of the patent situation. This worries us as much as it worries the inventors, and everybody concerned with radio. There is a feeling, which will be brought out, that the inventor will not be properly encouraged and that men that have already obtained patents on radio apparatus will not be properly reimbursed under Government ownership as they might be if the Government did not own the radio.

There is a difference, which must be recognized, between the patent situation as affected by radio art and by ordinary art, such as patents on machinery and other articles where there is no such confliction. In radio we have to recognize the fact that there must be either regulation or ownership of the art in order to overcome interference conditions, for if we must regulate it in some way—we must hold it down in some way—and we must restrict its use in some way. The men who get the patents on devices which might be very useful if we did not have to hold it down must suffer in some respects, which would not be true in the case of an ordinary patent on an engine

which does not interfere with any other engine. For example, if you invent an engine and get a patent on it you can sell that engine to anybody that wants to use it, and they can use it.

But with the radio outfit the use is restricted, and some inventor might get up a scheme in connection with radio which would be very valuable if it could be used, but because of various regulations it can not be used in all respects. That is a condition we must realize and we must recognize that it differs from ordinary patent conditions.

Also we must recognize the fact that radio science is such a highly complicated affair that the Patent Office has never been able to keep from granting patents which do not infringe one on another. In fact, there are patents granted, I understand, to several persons which are almost indistinguishable one from another, and it is very difficult for the people who own the patents to obtain redress in the courts and proper remuneration, in the same way that it is difficult for us to convince you gentlemen of the technical features of this bill, because it takes almost a lifetime of study to understand the whole thing. It is a fact that many inventors, especially the Marconi Co., have been held back from proper compensation for the fine inventions they have gotten up because of the impossibility of getting good decisions out of the courts which cover the whole thing. That is another point that needs to be considered.

The third point is that the Government, in order to take advantage of this rapidly evolving art, must be unhindered in the use of these inventions as they come about without waiting to go through the courts to prove these patent claims. Otherwise we would be years and years behind all other nations and would not be able to use the inventions we have. In fact, it takes the life of a patent before it is properly adjudicated so that the man who invents it can get anything out of it. That is a fact that has to be recognized.

MR. WHITE. Does not that apply to any patent? Would not that apply to an improvement in the mechanism of a gun just as much?

Commander HOOPER. Well, it is easier to get through a court and get a proper decision on a thing like that than it is with a complicated part in radio. I think the radio people would agree to that.

Now, in order to get around that the courts have decided, I believe, that by right of eminent domain the Government can go ahead and use all these things that are invented, and the matter will be straightened out afterwards. That is a very valuable thing to the Government, to the advancement of the art, and to everybody but, at the present time, the poor inventor. That has been decided, and it is up to us to recognize that fact, the fact that radio is different from other arts, and provide some means for straightening it out.

There is another point which comes up and which is particularly true in this radio situation. We are anxious to reimburse the inventor for the patent—the Government should be, I am sure. It is the Government's duty to see that nothing is put in the way of the inventor's getting his proper reimbursement, but it is a fact that the inventors themselves have not the means to go through this long litigation in an effort to have their claims properly adjudicated, and the poor inventor will lose out unless some means is provided for him to get prompt relief.

Thus far the patents that they have been able to get adjudicated have been purchased by companies which are exploiting these patents and which have the backing to really drive them to a conclusion in years and years of time. But are we really interested so much in the companies as we are in the inventors themselves? Should not some regulation be arranged so that the inventor himself would be paid as soon as his device is properly recognized, so that he would not lose out altogether, and not have it so the only people that possibly would ever get anything out of an invention would be the exploiting companies?

Those are facts that should be considered in connection with these peculiar conditions.

The CHAIRMAN. If that situation can be solved, if the inventor himself can be reimbursed for his work, being compelled to turn it over to some company to exploit, it would be the greatest thing in the world to encourage invention in this country, because I think the history of this country will prove that in ninety-nine cases out of a hundred the inventor never profits anything out of his invention.

Commander HOOPER. The opposition will probably claim that this bill affects the poor inventor. It is not the poor inventor that this bill affects. I believe the poor inventor would get more out of it if it were eventually established that the Government was the clearing house for radio than if it were allowed to drift on aimlessly the way it is going, the exploiting companies paying the inventor just as little as they can.

Why should we sympathize with a company which pays a man \$100 for a great invention and then, because they have large means, are able to go through the courts for years and years and finally are able to collect several million dollars damages? What have they done for the art? They are not doing anything particularly for the art; they are merely doing business, a business which is really an illegitimate taking advantage of the man who deserves the credit.

Mr. HARDY. Let me ask you a question along that line. Would litigation by parties opposing the granting of proper patents be rather perfunctory, or would there be more litigation if the Government had it?

Commander HOOPER. There would be hardly any litigation if the Government did it right—and I have a scheme. Of course, you will say the radio should be considered like everything else and follow the same laws, but I have pointed out certain peculiar features, which make the radio different from anything else. And if it is different from anything else that has come about, why not recognize that difference and make the law such that the matter will be corrected and place the responsibility where it belongs?

Up to a short time before the war all of the Government contracts, so far as I know, had a clause in them that the seller of the apparatus must protect the Government from all claims for patent infringements. As a matter of fact, the manufacturing concerns had to sign that contract or they did not get any chance to make any money. They would sign that contract in the hope that they could protect themselves, knowing full well time would drag along so that they would probably never be sued by anybody, because the companies would be out of business by that time. It was a great relief to these

companies when the Government, especially during the war, removed that clause from its contracts, because of that decision in the case which placed the responsibility on the Government. They placed that responsibility on the Government because the Government, by reason of the power of eminent domain, had a right to order apparatus from anybody. That was the Government's right. That relieved the situation and relieved the manufacturers greatly from worrying about it, because they could sell anything the Government wanted. If the Government wanted the latest thing in radio, we did not have to go to the various conflicting patentee claimants and try to straighten out things; we could go ahead and order what we wanted and we could keep the art right up ahead of the times.

Now, it is up to us to take some means to relieve the situation, for we have in that way usurped the patent laws, and because this situation is different from any other, I think it deserves special consideration. The war is over, and the various companies interested in patents have held off from suing the Government and from suing each other, because it would have taken the time of the Government's experts off of their war work, which was the first essential, and we were all combined to try and whip the enemy. So it is up to us now to take the initiative and try to straighten out this mess.

Mr. WHITE. May I interrupt you? You have spoken of the right of the Government to exercise the right of eminent domain and take these patent rights. What is the legal authority for that? I should like to have it in the record.

Commander HOOPER. I do not remember exactly who made the decision. Perhaps some gentleman here can tell us. I think Mr. Pumphrey was the attorney in the case.

Mr. WALTER H. PUMPHREY. That was the act of 1910, interpreted by the Supreme Court in the case of Marconi Co. v. Simon.

Commander HOOPER. I do not know whether that is final or not; but, anyway, that gives you an idea of the general situation. If we allow it to drift on, there will be continuous litigation, which will be very expensive both to the Government and to all the radio firms, and will bring us nowhere, except that the man who can hold his breath the longest will win out in the end—the man that has the most money. The people who will profit by it will be those who are concerned in the legal part of it.

Now, is it right that we leave the art in such a state that the only people who would profit by the art would be the lawyers and, to some extent, the patent exploitation companies?

Mr. EDMONDS. You speak about settling these matters up. Have you any idea what it is going to cost the Government before you get through with it?

Commander HOOPER. I have my ideas, but I believe there are certain things to be considered which will reduce the cost, and, if we do the proper thing, we certainly can keep the cost down. That is the main thing. If we did not have the proper thing in the past, we can make arrangements to have the proper thing in the future.

Mr. EDMONDS. Would it go into the millions of dollars?

Commander HOOPER. It will go into the millions of dollars; yes, sir.

Mr. EDMONDS. It will cost more to settle the patents than to buy the apparatus, will it not?

Commander HOOPER. Well, the apparatus went into many, many millions of dollars.

Mr. EDMONDS. I mean, to buy the 16 plants that you are proposing to buy in this bill. Mr. Daniels said yesterday it would cost about \$5,000,000.

Commander HOOPER. No, sir; I think the apparatus would, to a very large extent, exceed the cost of protection of the patents.

Mr. EDMONDS. When you bought the Federal wireless, did you buy any patents?

Commander HOOPER. We bought their patents; yes, sir.

Mr. EDMONDS. Did you pay extra for those?

Commander HOOPER. That is really what we bought—the patents.

Mr. EDMONDS. You only paid the one sum, then?

Commander HOOPER. We paid the \$1,600,000.

Mr. EDMONDS. That included their patents?

Commander HOOPER. That included all of their patent rights and radio stations.

Mr. EDMONDS. That included the Fessenden patents?

Commander HOOPER. The Poulsen is one patent that the Government has cleared up in this deal.

Mr. EDMONDS. Has not that been decided in this case here? Did not Mr. Fessenden get the original patent for the long waves?

Commander HOOPER. I do not believe that would cover this. I say I do not believe it, because I have not given each one of these cases thorough study since the war.

Mr. EDMONDS. It is pretty evident here that the judge has given Mr. Fessenden absolute control of the basic patents.

Commander HOOPER. The Fessenden patents may be valuable. I will state there is another company that was willing to pay more for those same Polsen patents than we did.

Mr. EDMONDS. This was a case where your department intervened with some of your employees, was it not? In this case of the International Electric Signaling Co. *v.* Atlantic Communication Co. you were helping the Atlantic Communication Co.?

Commander HOOPER. We were helping them before the war; yes, sir. Before the war the department endeavored to straighten out some of the patent situation by taking sides and encouraging the litigation to go on so that either one side or the other would win out. We joined sides with either, depending on which one we thought had the most right, and in consideration of the Government's interests.

Mr. WHITE. What is the Atlantic Communication Co.?

Mr. EDMONDS. That was the Telefunken Co.'s branch in this country, was it not?

Commander HOOPER. That was the German Government's indirect branch in this country, it might be said.

Mr. GREENE. The United States helped Germany in that case?

Commander HOOPER. We did, without knowing it. [Laughter.]

Mr. GREENE. It seems to me your sharp intellects ought to have told you you were helping Germany. I can not understand that.

The CHAIRMAN. Our friend lived right down there near Sayville and did not know anything about it. [Laughter.]

Commander HOOPER. That company was incorporated under the laws of the United States in all respects, and there was no evidence of any kind that it was in any way a German company.

Mr. LAZARO. You said you had a scheme to offer?

Commander HOOPER. Yes, sir.

Mr. EDMONDS. The idea you had in sending these men there was just to get some settled decision?

Commander HOOPER. Our idea was to place our evidence before the courts and at the same time look out for the Government's interest.

Mr. EDMONDS. And you sent them there at the expense of the Government?

Commander HOOPER. At the expense of the Government; it does not amount to anything. We wanted to put our evidence in freely and openly, so that the case would come to a head. But even that does not clear the situation. The poor inventor remains absolutely out of it. I would like to see it arranged so that the inventor would be the man that would get the money.

Mr. WHITE. In that connection does your department assume to pass on the conflicting claims of inventors and the persons who claim to own these patent rights?

Commander HOOPER. No, sir; I will explain the idea. The original idea was to bring these cases to a head as far as we could by the Government joining one side or the other. That would bring out all the evidence, and we would be able to let the people go to the Court of Claims. The only thing we would contest would be the price that was paid for the patent. That is to say, if the thing had been decided by the judge the case would go through the Court of Claims very promptly instead of having to wait. But we were merely contesting the price.

But that is not satisfactory, and we have decided, among the departments, to clarify the situation, that this is a matter that our department is interested in, but a matter that the Department of Justice is primarily interested in, because it is a question of the adjudication of patents, and a matter that the War Department is also interested in because they have purchased a good deal of radio apparatus. The flying section of the War Department is also interested. So we have a board appointed now, an interdepartmental board, and that board was appointed several months ago though it has not done much yet because the war is just over. Now that the war is over it is our duty to proceed and try to straighten this tangle out with this board, and the Secretary has ordered that this matter be actively pursued as far as the Navy Department is concerned, and the other departments are proceeding similarly. In a very short time our board will commence sittings. In the mean time we are drawing up a list of all the apparatus we have bought, a list of all the patents that have been violated, and we are going to try to decide in the board just what patents are clear, with the different claimants, and which ones we can settle without our own experts and get an agreement, and we will let them go to the Court of Claims—and it will probably go through without contest.

Mr. EDMONDS. I am informed that there is a resident of Pennsylvania, not a company, just an individual, who has backed this Fessenden patent to the amount of \$1,000,000 or maybe \$2,000,000 actual money. You say these patents are not going to cost you much, but you are going to take away from him all his opportunity

of redress if he can get it under this patent. And if you are going to buy that patent, how is he going to get out of it the money he has spent in developing it?

Commander HOOPER. I will answer that in this way. In case we can not agree among ourselves, why then he has the only redress, just the same as any other claimant—he has to go to the Court of Claims and convince them. It is not the Government's fault if any man backs a losing horse in a race. The loser takes the chance.

Mr. EDMONDS. Then you are very liable to spend a great deal more than \$5,000,000 for these patents before you get through?

Commander HOOPER. Well, I am not so sure. Is it not our duty to spend it anyhow if it is coming to them, whatever it may be?

Mr. EDMONDS. It is your duty to spend it, but I think the committee is entitled to know what this is going to cost.

The CHAIRMAN. How can the committee know now? Have you ever had any experience in litigation?

Mr. EDMONDS. Well, we can have some idea about it. The department comes here with this proposition, and they must have an idea of what these things are going to cost.

The CHAIRMAN. Well, it would not be worth a straw if they expressed an opinion.

Mr. WHITE. But is it not permissible for us to ask about it?

The CHAIRMAN. Yes; but it is not practicable for them to give it.

Mr. LAZARO. I suggest, Mr. Chairman, that the commander give us his opinion in full, and then we can ask him questions.

Commander HOOPER. Well, the question of taking over the stations is a very small part of it. \$5,000,000 is a small part of the apparatus we have bought. We have bought \$30,000,000 or \$50,000,000 worth of radio apparatus. We have to stand for all of that. This \$5,000,000 is a very small part of the total, and I think that is such a small percentage that it should not even be included in the discussion of this bill.

What I am really trying to point out is the fact that something ought to be done, in the way of legislation, to recognize that it is in our hands, or let us try to recognize these inventions.

Mr. HARDY. Well, that is not involved in this bill at all, is it?

Commander HOOPER. I do not think it has any bearing whatsoever on this bill. The only thing is that I am trying to bring it up in advance, before the opponents come around and say that Government ownership will absolutely—

The CHAIRMAN (interposing). I suggest, Commander Hooper, that the orderly way to proceed is to present your own case, let them present theirs, and then you will have leave to present anything in rebuttal that is germane to the merits of this bill.

Commander HOOPER. Yes, sir.

The CHAIRMAN. But do not anticipate. I do not think that is good pleading; and if I were trying a case in court as a lawyer, I would not do it that way.

Commander HOOPER. Well, when I come before you, gentlemen, I feel that I have responsibility for both sides, and I try to put it fairly for both sides.

Mr. EDMONDS. Let me ask you this as to the question of inventions in the future: What stimulus will there be in the future for an in-

ventor to go into the invention of radio apparatus when he has only one customer?

Commander HOOPER. Well, I think that this board of which I have spoken—

Mr. EDMONDS (interposing). No; I am talking about the future.

Commander HOOPER. I know. But the idea is that I think this board is intended to be made continuous, so that instead of having an inventor who has anything to sell take the matter up with the courts or with exploitation companies, he will only go before this board, which is absolutely in touch with all the radio situation, and the relative value of patents, and the history of everything pertaining to the radio art, and the board would be prepared to recommend that he be paid in proportion to the value of his invention to the Government. That would be kept right up to date all the time, otherwise he would have to sell it out cheap to some patent-exploitation company.

Mr. EDMONDS. Well, that has not been true in the past; everybody who has had an invention to sell has not got the short end of it. You were speaking of George Westinghouse a short while ago.

Commander HOOPER. But he is not a radio inventor.

Mr. EDMONDS. I mean that every inventor has not had the short end of it in selling his patents.

Commander HOOPER. Well, the radio people have; there is hardly one of them that has not had the short end of it. You spoke a while ago about the Pennsylvania firm; you said they wanted to get a large sum for their patents. Their inventions were made by Prof. Fessenden—at least I think he is the one that they based their claims on—and he tells me that he never got anything out of them; they gave him stock and never gave him anything else.

Mr. EDMONDS. My understanding is that there has been no stock sold at all; it is simply a case of one man putting up the money for the protection of the invention, I have been told. I do not know whether that is true or not.

Commander HOOPER. Well, that is a good illustration of where the inventor got nothing, and the exploitation company has a good chance to make money out of it.

Mr. EDMONDS. But Prof. Fessenden owns 50 per cent of the stock, and he will get 50 per cent of what the company gets for the patent; and if he owned 10 per cent of the stock, he would get 10 per cent.

Commander HOOPER. Well, that is a good example right there. I think the radio people would agree that this board of which I spoke is a proper thing, and that we should straighten out the past and sit continuously in the future and make recommendations.

Mr. EDMONDS. What I am afraid of is that you intend to pay these men arbitrarily what you please, and not pay them on any valuation except what you think will be fair in your own mind.

Commander HOOPER. Well, we have a representative of the Department of Justice on this board. They have a leading part in it, and they are a permanent factor there.

The CHAIRMAN. Well, I would suggest, as that has nothing to do with the bill, in your view, that you pass to something else.

Commander HOOPER. I do not think that it has anything to do with it at all; but I merely wanted to answer some questions that would reflect on the bill and show what the facts were.

Mr. WHITE. I am interested in this question of the extent to which the department proposes to interfere or to interest itself—whichever you prefer to call it—between an inventor and a man who claims to have a patent right. Suppose I claim to be an inventor of a radio process and Mr. Edmonds has another process. I claim that he is infringing my process, and I go into court and bring a suit against him for an infringement of my patent right. Am I to understand that the Navy Department will go into court and interest itself, upon one side or the other, in litigation of that sort?

Commander HOOPER. Do you mean is that our idea in the future, or have we done that in the past?

Mr. WHITE. Well, I mean if you have been doing it in the past or propose to do it in the future.

Commander HOOPER. We have been going in on both sides; at least, it has been done, I understand, with the idea of getting the evidence all before the court, and that the Government was a party to the deal as a good business proposition. In other words, the department has in the past assumed that it should take an interest on the side that was to the best advantage of the Government, and not let the Government be robbed absolutely without the Government's having interested itself in the case.

The CHAIRMAN. In other words, these are equitable suits and the Government has intervened as an interested party?

Commander HOOPER. As an interested party.

The CHAIRMAN. Having bought an invention the infringement of which was claimed by one or the other of the parties?

Commander HOOPER. Yes, sir.

The CHAIRMAN. And it is good business that you shall do so?

Mr. EDMONDS. As near as I can understand, the Government did not intervene; the Government went in there in the interest of one side or the other in those cases.

The CHAIRMAN. But the Government had bought the invention. Here was a suit about who was the inventor, who was entitled to the money for an invention; the Government intervened in the case.

Mr. EDMONDS. In the cases that I refer to, the man testified that he was sent there by the Navy Department, at the expense of the Navy Department, to testify in favor of a certain invention belonging to a certain company; that is the way I understood it.

The CHAIRMAN. Well, I would not believe any such statement as that.

Mr. EDMONDS. Well, that was brought out in the testimony—the men testified that, in their opinion as experts, the invention belonged to one of the parties.

The CHAIRMAN. Well, I suppose that was a case where the Government was interested.

Mr. HARDY. It looks to me as if we are trying to try the Government for trying a case. [Laughter.]

Mr. WHITE. I want to find out what the Government does and what it proposes to do. It seems to me that inasmuch as this bill proposes that people who have existing patent rights shall not be permitted to operate under those rights, under this bill, it is germane to this bill to make this inquiry.

The CHAIRMAN. Where is there anything in the bill to that effect? I wish you would point out the provision in the bill that provides that.

Mr. WHITE. The bill proposes to give the Government a monopoly and to give it authority to determine that nobody else shall operate a radio plant in this country.

The CHAIRMAN. How many other purchasers of radio improvements are there in this country?

Mr. WHITE. I do not know.

The CHAIRMAN. The Marconi Co. and the Government are the only two.

Commander HOOPER. That is practically the situation.

The CHAIRMAN. Yes; the Marconi Co. and the Government. And the poor inventor will be between the devil and the deep blue sea—between the Government and that company. [Laughter.]

Mr. ROWE. How will it be when the Government owns the Marconi Co.?

Commander HOOPER. It will be a question just as hard to answer, whether the Government owns or regulates, because under regulation a man is also restricted from operation.

Mr. EDMONDS. Suppose a man gets a patent from the United States Government, he gets the free and exclusive use of that patent for 17 years, does he not?

Commander HOOPER. Yes; but it may not be any good.

Mr. EDMONDS. And then the Government passes an act and makes a monopoly of that business, and he has not any customer to go to to sell it.

Commander HOOPER. Well, it is a monopoly anyway.

Mr. EDMONDS. Well, there are lots of private manufacturers and lots of private radio operators.

Commander HOOPER. Yes; there are so many mixed in that they could not operate, in so far as they depended on the patent situation.

Mr. EDMONDS. I think it is a very hard question to decide, and I think it ought to be decided and settled once for all.

Commander HOOPER. Yes; and I think we can settle it to the advantage of everybody. But if we let it drift the inventors will get so that they will not bother about inventing, and we will not have any improvements.

Mr. EDMONDS. Well, if we pass the bill they will do the same thing.

Mr. BESHLIN. That is what they say now—that the passage of this will destroy initiative.

The CHAIRMAN. Well, I was a member of the Committee on Patents for years and the ranking member at the beginning of this Congress; and the opinion of the men on that committee was to the effect that the inventor fared badly at all events.

Commander HOOPER. Yes, sir. Now, the Government will try to get the art advanced, and we will offer inducements. We have bought a lot of patents, and the people that we bought them from are the most energetic in trying to produce other inventions; and I think it is good business, and we will all benefit by it, and it will continue; and I think if we are allowed to do it regularly we will be able to become gradually more and more fair.

Mr. EDMONDS. Those energetic people are now in your employ, are they not? [Laughter.]

Commander HOOPER. No, sir.

Mr. EDMONDS. Are they outside the service trying to become inventors?

Commander HOOPER. Yes, sir; some are and some are not.

Mr. EDMONDS. You have some of the Federal people in your employ—quite a few of them—have you not?

Commander HOOPER. We had during the war. We have none in our employ now, excepting where they have gone into the service during the war.

Mr. EDMONDS. What did you do with the operators in the Marconi shore stations and the Federal shore stations?

Commander HOOPER. Most of them joined the Navy.

Mr. EDMONDS. Could they join the Navy? Did they not have to pass a physical examination, or did you just take them in anyhow?

Commander HOOPER. We had to put them through a physical examination.

But you brought up a point yesterday which I think ought to be answered in connection with the bill—about the one-armed soldier coming back and wanting a job and not being able to pass our examination for enlistment—and I think that the Navy, just the same as other departments and private concerns, has a duty to perform to make the requirements such that those men can come in, and I do not think there is any question that it will. There is no reason in the world why a man in a shore station who has one foot gone, or something of the kind, can not do just as good work as the man who has two feet.

Mr. EDMONDS. I understand that there were some 10,000 operators; and, of course, if we could put 1,000 or 2,000 men in a position like that, it would be a very fine position for them and a very valuable thing to do.

Commander HOOPER. Yes, sir; and they would be most loyal and appreciative.

Mr. EDMONDS. I think that is true.

Commander HOOPER. And I think it is highly desirable. I am informed that the Bureau of Medicine and Surgery has just established a precedent in that regard and waived the physical examination of a one-legged operator and allowed him to come in the naval radio service.

Mr. EDMONDS. What has become of the Department of Commerce operators that worked in this service?

Commander HOOPER. They were not operators; they were inspectors, to see that the law was complied with.

Mr. EDMONDS. Are they going to get out of the business now?

Commander HOOPER. I imagine that they will do the same thing for us.

Mr. EDMONDS (continuing). Or will we continue to appropriate for them and have them do nothing?

Commander HOOPER. When the war came on most of them went into the Navy.

Mr. EDMONDS. Will they continue in the Navy, probably?

Commander HOOPER. Yes, sir; we have to keep up this big organization in order to give satisfactory service.

Mr. EDMONDS. Then, if we pass this bill, will we have to pass another one for the Department of Commerce?

Commander HOOPER. I do not think it will be necessary to pass one for the Department of Commerce for radio.

Mr. EDMONDS. Well, even if we did not pass the bill, it would not be necessary, would it?

Commander HOOPER. They would have to take these people from us and put them back on their own work, and perhaps if the men wanted to stay with the Navy they would have to get somebody else.

Mr. EDMONDS. Well, there is considerable duplication in the departments now, and it was about time some of it was cut out.

Commander HOOPER. I think so, too; and I think we are agreed as to that; we had the support of the Department of Commerce on this bill, as we had on the last bill.

Mr. EDMONDS. Well, the Government departments have a habit of keeping what they have and trying to get more.

The CHAIRMAN. We have a report of the Department of Commerce on the bill, which will be submitted to the committee at the proper time. I do not know what their attitude is. In the past, as you say, they have been reluctant to give up everything—the Government departments. (See p. 389 for this report.)

Mr. EDMONDS. Will you put all the present laws in the hearings?

Commander HOOPER. I will endeavor to do so.

Mr. EDMONDS. I mean all the present laws with regard to regulation, and so on.

Commander HOOPER. Yes, sir.

(The laws referred to appear on pp. 409 to 467.)

Commander HOOPER (continuing). I think I have brought out all the general features with regard to the patent situation. I know there will be criticism, because if we try to do it fairly some of the exploitation people may suffer. But I think in all business it is a question of give and take, in argument, and finding a proper adjustment in the end. And if people do not give and take it is only right that they should go to the Court of Claims; that is the way it is with all business.

But our idea is to have this thing all adjusted agreeably to everybody, and then they can just go formally to the Court of Claims and get their money without contest, and they will not find any opposition in the Court of Claims. But if they are not reasonable we will say, "All right, we will have to let you go to the court and fight it out, as all others do."

Mr. HARDY. After all, is not an inventor more likely to get justice from a Government monopoly than from a private monopoly?

Commander HOOPER. Absolutely; and I think all the inventors will say so. I do not think all the exploitation people will say so, or, possibly, all the lawyers; but I think the inventors will say so. I believe they would rather take a chance with the Government. Our proposition would result in a gain for the inventors I think, and they would be very enthusiastic about it.

Mr. EDMONDS. I have not seen any of them rushing around here yet to support the bill. [Laughter.]

Mr. GREENE. I would like to ask this question: You are suggesting in this bill that the Government go into the commercial business. Now, I am interested for the country, not for any special person; I do not know anybody in the business that you would be likely to

affect. But if you are going into the commercial business you are going into a pretty broad line. And I want to know, if a call for a radio came before your department, or before your man who had charge of the radio, and a call came before him for commercial business, which would have the preference?

Commander HOOPER. Well, it is our duty to have our stations sufficiently efficient so that there will not be any conflict or delay in either. I think that business would gradually get the preference, because they would insist on it; and we have a civilian Secretary of the Navy, and always will have, and that is an advantage, in having a civilian Secretary of the Navy. I think that would come about more and more if such a condition arose; but I do not think the instance would arise.

Mr. GREENE. My experience is that the civilian Secretary of the Navy succumbs entirely to the Navy men. I do not see that he has any opinion of his own. [Laughter.]

Commander HOOPER. Well, if you would go to the civilian Secretaries, as we always have to do, you would see how hard they are to convince if there is any proposition in which the rights of the public are liable to be taken advantage of.

Mr. Chairman, in connection with this board of ours I do not want to make any promises. I merely state what I think will be an ideal scheme.

Mr. GREENE. I am much obliged for your answer to that, because I asked another witness the question and he dodged it, and I am glad that you are frank enough to state your opinion.

Mr. HUMPHREYS. It would depend upon what, in your judgment, was the relative importance of the two businesses, would it not?

Commander HOOPER. Yes, sir.

Mr. GREENE. Of course, in case of war I would not expect the Navy to give way to anybody, but we are going out of war now and going into peace, and you are proposing to go into a great scheme of business development, and you are going to be greater than anybody else, even on business development, and I want to know where you are going to draw the line in this important matter. You are pretty strong as a Navy now, which I am glad to see, but when you go into another line I want to know how far you are going.

Commander HOOPER. There is another point in favor of the bill which I could bring out. The Government does not intend to own the radio sets on merchant ships. We are not in that business. We have made it possible by the purchase of a large number of the sets that the Shipping Board had to have for their vessels for them to buy their sets where they wanted to buy them. Heretofore they have been forced, because the Marconi Co. had a monopoly on this situation, to license the sets at a high rental, which was, of course, detrimental to them. I mean they should not pay more than is right, but they had to rent their sets from the Marconi Co. at a high rental.

Mr. EDMONDS. I notice in the report of the Shipping Board that they are paying \$6,100 apiece for their wireless. That is what it says in their report. I presume that is the right price.

Commander HOOPER. No, sir; that is not right. They have been paying \$1,000 a year and not owning their sets. Now, we have made it possible for a steamship company to buy a radio set wherever

they want it, just like they buy a winch or anything else. A radio set becomes a part of a ship, and in that way they are not required to pay a high rental.

Mr. EDMONDS. Well, why is not the Shipping Board taking advantage of that when they have been buying wireless outfits at \$6,100 each?

Commander HOOPER. That is not correct. Sometimes we put in for more money than we really need, because we have not much idea of how much it will cost, and then perhaps we do not spend all that money. But we have made it possible for steamship owners to own their sets and to buy them from any concern, and that will be a good thing for a good many manufacturing concerns, and also a great thing for the merchant ships to have that privilege.

Mr. EDMONDS. Will that not interfere with your shore stations if you have all kinds of apparatus?

Commander HOOPER. No, sir. Of course, the apparatus is all standardized by law, the same as before.

Mr. EDMONDS. Do all the operators on the merchant ships have to pass examinations?

Commander HOOPER. Yes, sir; all have to pass examinations, and it is just a question of having them licensed by one department rather than by another.

Mr. EDMONDS. You do not have any naval operators on the merchant ships, do you?

Commander HOOPER. During the war we have had, but it is not the intention to retain them, as I understand, although I believe it would be better if they were all in the Naval Reserve, so that if war came on us suddenly we would have given them a certain amount of instruction in the Naval Reserve, but not in the active service. That is to say, if we would have the power of eliminating certain undesirable foreigners we would prevent spies going on American ships, and in that way could arrange some way of having them instructed in our forms, so that would use them occasionally and be ready for war when it occurred.

After we took over the merchant service, with out radio operators, it took us months after they were placed on the ships to teach them military procedure, and the whole thing was not efficient for a long time; and probably there were many spies—I do not say “probably”—but there might have been spies on the ships as operators, who could have done tremendous damage.

But nowadays, on the declaration of war, the merchant marine becomes just as much a part of the Navy as a battleship is. A merchant ship has to have a gun, and has to operate in formation with destroyers, and all that sort of thing; and they have to pass overnight into a system which it takes a naval operator a long time to learn about. And if they were in the Naval Reserve they would have the necessary knowledge and skill without further training.

But that has not anything to do with this bill. That would not restrict the employment of operators by steamship companies, wherever they wanted to get them, as long as they passed the requirements with regard to nationality, examinations, etc.; it is necessary to see that they can operate sufficiently for military purposes as well as otherwise. I do not think there would be any objection to that.

Mr. BESH LIN. Did you have any difficulty in getting the requisite number of wireless operators on the outbreak of the war?

Commander HOOPER. We had difficulty in getting good operators. But we established a large school for them at Harvard; that was our principal school. They were kind enough to lend us some of their buildings there; and we have worked up to 5,000 operators in training at a time. But I should say that the efficiency of the service went down about 50 per cent, due to this sudden requirement for military operation on all ships, and it took some time to break them in. Practice is what makes a good operator.

Mr. BESH LIN. How long does it take a man studying wireless, without any previous knowledge of the subject, to become proficient?

Commander HOOPER. Well, a young man can become pretty good as an ordinary commercial operator in, say, six months; he goes to school three or four months. If they are amateurs beforehand, it will be less. But as soon as the Navy takes over a merchant ship, the operators have to learn all sorts of extra things—the naval procedure, the ciphering and handling of secret codes, handling special wave-length arrangements to dodge the enemy's signals, and try to get some degree of secrecy in our messages; and there is a good deal to learn about it which is not just operation, and to become proficient in that a man usually has to have a year or two of service; it depends altogether on the man.

Mr. BESH LIN. You have answered this question while I was out. There seems to be considerable opposition to this measure on the part of the amateurs, who state, in substance, that it would have a tendency to destroy or discourage initiative and cut out all of that incentive.

Commander HOOPER. Well, I believe that is satisfactorily arranged now in that amendment as it stands; that is my opinion, and I believe the amateurs will say so. But there will always be disagreements, because, naturally, the amateurs would not want any regulation at all if it was not necessary. But I believe those who have heard this discussion will see that we both have to give and take in order to give everybody a chance.

Mr. HUMPHREYS. Do you think the amateurs ought to be limited to the receiving part of the apparatus?

Commander HOOPER. No, sir; I do not think so at all. If an amateur is receiving, he can receive anywhere without interfering with anybody. The only interference that he creates is by sending his communication.

Mr. HUMPHREYS. That is what I say. Do you think he ought to be limited to receiving and be prohibited from sending messages in the air?

Commander HOOPER. They should have no limits in receiving, except that they should be required to take out a license and be properly catalogued, so that we could inspect them, and in case of war know where they were, and also so that we would have an idea as to how many of them there were.

Mr. HUMPHREYS. And the limitation on the sending would be these wave lengths?

Commander HOOPER. Wave lengths and power; yes, sir.

Mr. HUMPHREYS. If we give the Navy the exclusive right to operate these shore stations here, within the limits that are necessary to communicate with ships, and then let the amateurs have this short wave and let the commercial companies, if they want to, operate the trans-Atlantic business, would that be sufficient protection, in your opinion?

Commander HOOPER. That would take care of the emergency situation. I do not believe it is the Secretary's idea, however, that we should let the commercial people have the higher-power stations, although it would not injure any particular phase of the situation at the present moment, the idea being that it would be a disadvantage to have the commercial companies build the big stations and then possibly not be able to operate them, because they might all conflict with each other later on, and it would be a waste of their good money. It would only be fair to add that inventive genius may prevent them seriously conflicting in the end, although this is doubtful.

Mr. HUMPHREYS. And then, if we should later take over the whole business, of course, we would have to pay for the installation of the numerous high-power stations that ought never to have been installed; is that correct?

Commander HOOPER. That possibility will develop. I can not say that that will be true; it may be that the art will advance so that these high-power stations will do a great deal that we do not know that they can do now. That is a matter for the future to decide; and I hope that the widest encouragement will be given to inventors, so that they can bring out what the full extent of the art makes possible. And there would be an advantage to transoceanic messages sent by radio, because the cable is a monopoly, and it would be to the general public good to bring cable rates down.

I, myself, think it would be a crime now to permit private companies to open commercial stations to commercial service, both from the standpoint of operation and of efficiency; and the Government will save money by this proposition, which appears to be an objection now, in a way; but when we come back to the normal conditions we will say that it is not a bad thing if we do save money.

Mr. GREENE. Well, it will be a new idea. [Laughter.]

Mr. HUMPHREYS. Let me see if I get your idea correctly: If we give the Navy the exclusive right to operate from ship to ship, and from ship to shore, and then permit them to do commercial business across the ocean if they want to, would that be your idea?

Commander HOOPER. I think that is essentially it. I think we would be throwing money away not to do so; we would have built all of these Government stations and have them all, and not to be allowed to use them for the public good and save the merchant ships all this expense of having to pay for other stations to be put up would be a crime against them.

Mr. HUMPHREYS. Then having done that, would you put any limitation on the right of private interests to establish these high-power stations to carry the transoceanic traffic?

Commander HOOPER. Well, that is a question that Capt. Todd is primarily interested in—the high-power business. I think the Secretary's policy is to take them all. It is not essential that we take them all on account of the interference at present, although, as I say, it would be bad policy if you let the commercial companies go

into it, and then after they had built a lot of expensive stations they might find that they could not use them because they interfered.

Mr. HUMPHREYS. With each other; that would be a dereliction on the part of the Government. Suppose they transferred all of those stations now to the Department of Commerce, would that be a handicap to the Navy?

Commander HOOPER. I beg your pardon?

Mr. HUMPHREYS. Suppose we were to transfer all of these receiving stations, and all of this radio business, instead of to the Navy to the Department of Commerce; would that be a handicap to the Navy?

Commander HOOPER. Yes; that would be a very great handicap to us, because the military service of the Navy has to have its own stations. We have a continual training system, and the necessity of communication with all our fleets, which could not be properly handled by any other department but the Military Establishment. And we have to own our own stations; and as long as we own them, we are the logical ones to own the rest of the stations, because if anybody else did the stations would conflict with ours.

Mr. HUMPHREYS. Well, I do not get your idea exactly; I wish you would make that a little clearer to me—how it would make any difference to the Navy Department whether the Department of Commerce had control or the Navy Department had it; you could still send your messages to and fro.

Commander HOOPER. Well, a radio station to us is just the same as a battleship. The battleships and radio stations work together, and they are part of a definite, fixed organization—the Navy personnel and the radio station; we are just as strict about how they use it as we are how they use a battleship. We have certain secret rules which, in drills, we require them to carry out; and it is absolutely essential to our military organization that we have our own stations. It would just mean that the two departments of the Government would be rivals in the business instead of having one control it. The Navy Department is the logical one to control it. And having two departments of the Government interested would destroy the monopoly which is essential to efficiency in radio matters.

Mr. EDMONDS. Well, every one of your stations could be turned over to the Department of Commerce, including that at Guam and that in Hawaii, and then you would send your messages through the Department of Commerce.

Commander HOOPER. Yes; but we would not be able to have all of the military arrangements; they would probably not pay any attention to what we desired.

Mr. EDMONDS. Well, they would be fair to you and also to the commercial business; they would do your business part of the time and the commercial business part of the time.

Commander HOOPER. Yes; but there are certain things that are important; we have certain stations picked out to do certain things—to report the movements of enemy ships; to call for information from passing ships to give us an idea of what the enemy is doing, and all that sort of thing; and that requires us to have our own men in charge. And we transfer those men from ship to shore. They are experienced on the ship and know what the ship is up against, and they are used to the ship's strategical maneuvers, so that a man on a shore station can sit at his desk and know what is going on on

the whole ocean; he knows the whole strategical situation. In that way it is of very great advantage to have the men who are acquainted with ships on the shore stations.

Mr. EDMONDS. Well, they could take over the men in the shore stations.

Commander HOOPER. That would be all right until those men got old and left the service and they then took in new men; and we would not have any control of it then. I do not think the Department of Commerce would care to have anything like that. I think they thoroughly approve the Navy's control of wireless.

Mr. BESH LIN. There would be no advantage in doing that anyhow, would there?

Commander HOOPER. No advantage whatever. It has never been asked for; and, in fact, I believe the Department of Commerce—if this is not correct, I hope Capt. Todd will correct me—has offered to let us have the licensing rather than have a duplication of work in the two departments.

Mr. HUMPHREYS. Well, let me ask you, do you think that would be necessary?

Commander HOOPER. What?

Mr. HUMPHREYS. For the Navy to issue the licenses?

Commander HOOPER. Somebody has to do it.

Mr. HUMPHREYS. I know somebody has to do it. But would it interfere with the efficient operation of the system to continue to permit the Department of Commerce to issue licenses?

Commander HOOPER. It would to a certain extent. Anyhow, it would be a duplication of effort. We have all of this force, and we could do it in addition to our other work. It would be hard for some of their inspectors, if they were not all trained in our methods, to see the broad situation, both from a military point of view and a land point of view. I think it would be objectionable both from the standpoint of efficiency and that of undue expense.

Mr. EDMONDS. It would be an advantage to the commercial business to have them know that they were under charge of a department where their business was considered just as important as the Navy business, would it not?

Commander HOOPER. I think the answer to that is that the Navy is now specializing certain officers in radio, who are going to do hardly anything else in a lifetime. We have an arrangement to give certain of the graduates at Annapolis postgraduate courses in wireless and make them efficient in it; and we will be able to do the thing just as well or better than anybody else; and although we are in uniform, our naval training will be only for the purpose of assisting us to cooperate in the whole scheme of things. In other words, we are in the business to do good; and instead of having a changing lot of officers who are inexperienced, we are making arrangements to get and actually have got a number of officers now who do little else but wireless, because that is their business.

Mr. EDMONDS. Can you insert in the record the rate of pay of these radio men in the Navy, their titles and duties, and the total number at the different radio stations; and also what pay the private corporations were giving them before you took them?

Commander HOOPER. That would be more under Capt. Todd's office.

Mr. EDMONDS. Well, you and Capt. Todd can make up such a statement between you.

Commander HOOPER. Yes.

Mr. EDMONDS. And show in it what these men were paid under private operation, how you rate them, and what they are paid under the Navy Department.

Commander HOOPER. Yes.

(The statement referred to appears on p. 399.)

The CHAIRMAN. Is that all, Commander Hooper?

Commander HOOPER. That is all, I think, Mr. Chairman.

The CHAIRMAN. I have a telegram here, dated December 12, 1918, addressed to me. It says:

Mr. C. B. Cooper will appear before your committee to represent us in connection with H. R. 13159. The operation of the radio service of the Navy has been of inestimable value to shipping in general, and we heartily indorse it, because it obviates the possibility of blockaded or jammed messages by coast stations belonging to different owners and those by ship stations.

That is signed "Luckback Steamship Co. (Inc.)"; but I do not know of any other steamship company with a similar name except the Luckenback Steamship Co., and I take it that it is that company.

I understand that Mr. Cooper has just arrived in the city and that he will be here in a few minutes, and we can take a short recess until he arrives.

(Thereupon, the committee took a recess of 30 minutes, at the conclusion of which the hearing was resumed.)

The CHAIRMAN. Mr. Cooper is here. Mr. Cooper, give the committee your name and address and your business.

STATEMENT OF MR. C. B. COOPER, NEW YORK MANAGER FOR THE KILBOURNE & CLARKE MANUFACTURING CO., AND GENERAL SUPERINTENDENT OF THE SHIPOWNERS' RADIO SERVICE (INC.), 149 BROADWAY, NEW YORK.

Mr. COOPER. My name is C. B. Cooper; address, 149 Broadway, New York.

The CHAIRMAN. And what is your business?

Mr. COOPER. My business is New York manager for the Kilbourne & Clarke Manufacturing Co., and also general superintendent of the Shipowners' Radio Service (Inc.).

The CHAIRMAN. What is the business of that first company you mentioned?

Mr. COOPER. The first company's business is the manufacture of radiotelegraph apparatus. The business of the second company?

The CHAIRMAN. Yes.

Mr. COOPER. Is that of handling the service details of radio apparatus for several companies using apparatus on ships or shore stations.

The CHAIRMAN. You may proceed, Mr. Cooper.

Mr. COOPER. I have also been requested by several steamship companies to represent them, and if permitted I would like to read this telegram that I received from them. It is from Seattle, Wash.:

We, the undersigned shipowners and managers of the Puget Sound district, authorize you to represent us as favoring the passage of the Government bill,

H. R. 13159, and urgently request you to do all in your power for the accomplishment of this proposal, which we feel would greatly add to the efficiency of communication from and to all ships using radio apparatus.

R. R. PIERSON,
Superintendent of the Alaska Steamship Co.
 G. E. PLUMMER,
Manager of the Puget Sound Tug Boat Co.
 M. M. CALVERT,
General Manager of the San Juan Fishing & Packing Co.

I think that before I say anything further I should say I have not discussed with the people I have just mentioned anything in regard to general Government ownership, but I think I ought to say that I do not think that anything I say should be taken to infer that they in any way favor Government ownership of public utilities, except in this one particular instance under discussion.

In figuring on my interest as a manufacturer, the passage of this bill will probably make for fewer sales, because under naval operation there will undoubtedly be fewer stations erected, because one naval station will serve a complete district, in which, under commercial operation, there would probably be several competing stations. Nevertheless, we consider this bill engenders the most efficient way to handle radio service. Therefore, what I want to say may be considered the opinion of the manufacturer as well as the other interests mentioned.

Radio transmission is not a communicating method that can be considered in the same light as we do other communicating systems, because no one can start a radio signal traveling along a set pathway prescribed by franchise or private purchase rights, but every signal will travel where it will, without regard to whose yard or radio station it trespasses on. Therefore, any system will interfere with others regardless of how carefully a station may be operated.

This means that if competing shore stations exist it is practically impossible to devise a law that would enforce equal rights for all station owners, or for those steamship companies who have to rely on the stations for ship communications, because if stations can not help interfering with others, then it is practically impossible to prove whether interference is accidental or intentional; and if the existence of a commercial station, as it necessarily must, depends on the earnings derived from the handling of messages, it is only logical that every station will do their utmost to force their business through, regardless of interference with others.

Our present radio laws require certain ships to be equipped with radio apparatus, and such equipment is practically useless unless there are shore stations with which these ships may communicate. The reason that certain ships are compelled to carry their own wireless is not so that they can handle commercial messages but for the purpose of communication in case of accident as a means of saving lives.

Therefore, as far as ship-and-shore communication is concerned, that is practically the only thing of wireless communication that should be considered.

Inasmuch as wireless stations are bound to interfere, and inasmuch as, for the preservation of human life, the law requires certain ships to be equipped with radiotelegraph, then it is not safe to leave

the connecting shore station link in the hands of competing commercial interests, because if a commercial interest depends for their existence, as they must, on tolls derived from messages, they must get their business through, regardless of interference with others. Or if, in addition to tolls, they rely on rental or sale of ship-radio installations then they must give those ship installations as much preferential service as possible, also regardless of interference, and because wireless stations necessarily interfere it is practically impossible to devise a law which can compel stations to stop interfering.

This means that in order to get the maximum of service from shore stations one organization must control every shore station. If that control is left in the hands of a commercial organization they should also control the ship installations. Otherwise, the same competition to handle messages from ships will exist, because it will be from this means that they must derive a revenue.

It has been found impossible for one commercial organization to control the whole field by patent monopoly or competitive methods. And as the years go on and the art of wireless transmission develops it will be more impossible, because new methods and new systems are continually being devised and early patents are expiring.

The United States Government could not permit one company to operate all shore stations and leave within the hands of that company communication to all naval vessels. Therefore, they have been compelled to erect their own stations. This has been found necessary in the past, and will be more necessary in the future. Therefore, they also enter into the field as a factor in interference. If the Navy must operate shore stations, and if there are commercial radio stations, then these two organizations are, necessarily, bound to interfere in message transmission, which interference not only injures the usefulness of wireless in the life-saving field, but endangers the usefulness of the United States Navy itself. Therefore, I believe that there is only one way to obtain the maximum efficiency and good from the radio telegraph communication, and that must be that the United States Government control every station, because this means that we will have a noncompetitive, disinterested party handling the shore end of the business that will not have to rely on its existence for tolls derived from commercial messages, but an organization which will be able to put in every means of long-distance control, direction of operators, proper working schedules, and every means known to make for speedy handling of business and a minimum of interference.

In the first stages of radio communication the primary object of the commercial companies was to rent a set of apparatus for use on steamships, and in order to make this leasing possible it was necessary to provide a shore station with which such sets could communicate. Steamship companies saw no usefulness in radio communication, and were right in considering that it was useless without shore stations. Therefore, various companies in the United States erected land stations to accommodate their particular zone of operations, and one station or one ship of one system would not communicate with ships or stations of other systems, because the main argument to induce a steamship company to adopt one particular system of apparatus was, necessarily, the facilities that the system could produce for the transmission of messages to shore. Our first radio law corrected this non-

working limitation, and forced all stations of any system to communicate with stations of another system. But still, because of the peculiar nature of wireless signals, it was practically impossible to enforce this law and not have interference.

In the meantime the United States Government had found it necessary to erect their own stations, and inasmuch as they had these stations, they put in a rule that they were open to communication with any ship station. This helped the situation considerably, because it meant that if a ship could not get service from a commercial station, they would eventually be able to communicate with a naval station. This is the condition radio communication was in prior to the war, and it is probably the situation that it will go back to if the bill under discussion is not passed, and under this condition it is impossible for radio to produce its best and most useful service.

The spirit with which steamship companies first viewed radio communication is now changed, because with the growth of shore-station communication and because of numerous ship installations that now prevail, and the efficiency of apparatus used, they are enabled not only to safeguard their passengers and crew, but they can obtain and transmit useful information to or from their ships. This last phase is secondary to the safeguarding of life, but is nevertheless important, and therefore it is of vital importance to them that shore communication be taken out of the chaotic condition that is bound to prevail under commercial operation, and that it be put in the hands of one organization, which organization is logically the United States Navy, because they are the ones who are absolutely compelled to have their own stations for communication with naval vessels, and they are compelled, therefore, to keep up an organization for the handling of their own stations and can, with a very little extra expense, make this organization sufficient to care for all stations and all business pertaining to radio. Actual experience has shown me and those I represent that the naval communication service is well, able, and efficiently organized to handle this business. Therefore I respectfully urge upon you the necessity of your recommending a favorable decision as to the passage of this bill in its present form.

The CHAIRMAN. Do you represent any steamship companies on the Atlantic coast?

Mr. COOPER. I understand that a message was sent in by the Luckenbach Steamship Co. saying that I would be here to represent them, but I have not seen a copy of that message.

The CHAIRMAN. I read it into the record.

Mr. COOPER. I thank you for that.

Mr. GREENE. Mr. Chairman, I would like to ask the gentleman a question: As I understand, you say that if the Navy Department had this under control they would reduce the number of stations. Instead of having as many stations, for instance, as there are out on the coast, they would reduce the number—did I understand you correctly?

Mr. COOPER. No, sir. I did not mean that they would needlessly reduce the number. What I meant was that they would reduce the possibility of numerous stations being built if competing radio companies were permitted to build such stations, because one Navy station would control one whole district in which otherwise there might be several competing stations.

Mr. GREENE. Oh, yes. But the Navy already having bought out the several radio companies and anticipating buying others, they would have these stations that were built for the accommodation of commercial business. And this proposition now is to put them into commercial business. I agree that it is very profitable for the Navy proposition, but for commercial business they would be likely to reduce the opportunities for commercial business if they were to reduce the number of stations in the line of economy. They would reduce the number of stations, making fewer stations, but that would give less accommodation for the people who want to transact business. These stations are not built merely for pleasure; they were built for profit and use and development, built for the increase in trade, and would never have been built without trade. Now, according to the testimony we have here, they intend to develop trade and increase trade and make greater opportunities for development of the business. But, according to your theory, they would be likely to discontinue stations, because it would be more economical in the use?

Mr. COOPER. That is possible in this matter. I will cite an instance. At the mouth of the Columbia River there is a Navy station, and on the opposite side there is a commercial station located within a very few miles of each other. If one station was handling all business at the mouth of the Columbia River, I believe it could be handled much better and in larger volume than if the two stations were permitted to try to operate and jam each other, and probably there are a number of other instances where one station will more economically and more efficiently cover one district than if several stations were erected there, with a possibility of conflicting impulses.

Mr. GREENE. That is all right for that kind of a proposition. But, for instance, we take in the matter of ordinary business on the street here. We will say here are several stores down here. We can take and consolidate them into one store. The business will be more efficiently and more economically handled, and we ought to wipe out a number of stores and have fewer stores. It is of greater advantage—less money cost to carry on fewer stores. If that was the character of our theory, we should get on to a business of tremendous monopoly, and the parties controlling would do just as they please if they had no competition and struck out the number of stations and the number of business propositions. It seems to me your logic is not good.

Mr. COOPER. If you please, if each one of those stores had to stop all business while the other was selling goods, would it not then be preferable to have all the business in one store?

The CHAIRMAN. That is a crackerjack.

Mr. GREENE. They do not happen to do that.

Mr. COOPER. That is a fact in wireless.

Mr. GREENE. And there has never been any evidence presented by the Navy Department that the commercial station at the mouth of the Columbia River caused interference with their Columbia River station or any other station.

Mr. EDMONDS. What ships are in the New York Steamship Co. that you represent?

Mr. COOPER. The Luckenbach Steamship Co. is the only one I represent.

Mr. EDMONDS. Before that you said you represented several ship-owners, associations, or something?

Mr. COOPER. I am superintendent of the Shipowners' Radio Service.

Mr. EDMONDS. I thought it represented several steamship companies.

Mr. COOPER. It does represent several steamship companies. If you sell station apparatus to one company owning one ship, they usually want some one to take care of repairs and furnish operators and all that.

Mr. EDMONDS. You do not really represent ship companies. You represent a service that you give a ship because that company asks you for it and pays for it.

Mr. COOPER. That is the idea.

Mr. EDMONDS. Then, outside of that, the only lines you represent are the Alaska and Puget Sound lines?

Mr. COOPER. Those are the only ones specifically mentioned.

Mr. EDMONDS. You have not said anything about overseas and trans-Atlantic stations, just the ship-to-shore service?

Mr. COOPER. I have not said anything about those.

Mr. EDMONDS. And that is a part of the bill.

Mr. COOPER. That is a part of the bill; but what I have said only pertains to them if they would cause interference with shipping business, or what is, to my mind, the primary object of wireless communication, the most important thing we can do, the saving of lives.

Mr. EDMONDS. The testimony that has been given here seems to indicate clearly that the trans-Atlantic business is an entirely separate field and does not interfere with the ship-to-shore business, and therefore you do not want your remarks to be construed as indorsing that section of the bill?

Mr. COOPER. I did not specifically mention that section of the bill, because it is something I am not thoroughly familiar with.

Mr. EDMONDS. You come here indorsing the bill?

Mr. COOPER. Yes, sir.

Mr. EDMONDS. That is, a portion of the bill.

Mr. COOPER. And that enters into my argument only inasmuch as it will cause interference.

Mr. GREENE. Were you sent here by the people on the Pacific coast, the Columbia River people?

Mr. COOPER. I am New York manager of the Kilbourne & Clark Manufacturing Co., and came here last spring. I was not sent here from Seattle; I am located in New York.

Mr. GREENE. You have been instructed especially to come here from Seattle?

Mr. COOPER. I have not been instructed to come here except as per telegram.

Mr. GREENE. Have you read the bill before?

Mr. COOPER. Yes, sir.

Mr. GREENE. But you were not sent here by the Seattle people to represent them?

Mr. COOPER. I have not come from Seattle to represent them, but simply from New York. I am sent here from New York by the Seattle people.

The CHAIRMAN. We will adjourn the hearings now for this afternoon until next Tuesday morning at 10 o'clock, at which time the Marconi Co. will have the first right to present their case, and following the hearing on behalf of the Marconi Co., other interests who care to be heard on the bill will be given an opportunity. I presume that the Marconi people will hardly finish up on Tuesday, but we will try to finish the hearings next week. However, we will give everybody ample time to be heard. Nobody has any right to be heard on Tuesday except the Marconi people, and I notified the attorney for the Marconi people that I would start the hearings on next Tuesday and that they should have the right of way.

Mr. GREENE. I do not know anything about that.

The CHAIRMAN. Others may be reached on Tuesday, because I do not know how full the hearings are going to be, but we are going to continue the hearings until completed. I have been very careful not to create any confusion or misunderstanding on that score.

(Thereupon, at 5 o'clock p. m., the committee stood adjourned to meet Tuesday, December 17, 1918, at 10 o'clock a. m.)

GOVERNMENT CONTROL OF RADIO COMMUNICATION.

COMMITTEE ON MERCHANT MARINE AND FISHERIES,
HOUSE OF REPRESENTATIVES,
Tuesday, December 17, 1918.

The committee met at 10 o'clock a. m., Hon. Jushua W. Alexander (chairman) presiding.

The CHAIRMAN. Gentlemen, when we recessed last it was understood that the representatives of the Marconi people would be heard this morning, and I am advised by the local representative of the company that Mr. Edward J. Nally wishes to be heard first.

STATEMENT OF MR. EDWARD J. NALLY, VICE PRESIDENT AND GENERAL MANAGER MARCONI WIRELESS TELEGRAPH & TELEPHONE CO., AND PRESIDENT PAN-AMERICAN WIRELESS TELEGRAPH & TELEPHONE CO.

The CHAIRMAN. Mr. Nally, will you give your name and your official position?

Mr. NALLY. Edward J. Nally, vice president and general manager of the Marconi Wireless Telegraph & Telephone Co., and president of the Pan-American Wireless Telegraph & Telephone Co.

The CHAIRMAN. What company is that and where does it operate?

Mr. NALLY. The Pan-American company is a new company organized to operate in South America.

The CHAIRMAN. When was it organized?

Mr. NALLY. It was organized about a year ago.

The CHAIRMAN. With what capital?

Mr. NALLY. With a capital of no par value.

The CHAIRMAN. Has it the same officers and stockholders as the Marconi company?

Mr. NALLY. Not altogether. The Marconi Co. of America owns three-eighths, the Marconi Co. of England three-eighths, and the Federal Telegraph Co. of California two-eighths.

The CHAIRMAN. The Marconi Co. of America is the one of which you are the vice president?

Mr. NALLY. Yes, sir.

The CHAIRMAN. What interest has the English company in that company?

Mr. NALLY. They hold a stock interest; a minority stock interest.

The CHAIRMAN. How is the stock interest divided?

Mr. NALLY. You mean exactly?

The CHAIRMAN. Yes; that is, how many shares are owned and controlled by them?

Mr. NALLY. As near as I know, they own less than one-fourth of the entire stock of \$10,000,000.

The CHAIRMAN. Do any other foreign companies or persons own stock in the American Marconi Co.?

Mr. NALLY. There are, of course, foreign stockholders, but no foreign companies.

The CHAIRMAN. That is all, Mr. Nally. You may proceed.

Mr. NALLY. In the press dispatches of November 25 there appeared a statement given out by the honorable chairman of this committee, in which he incorporated a statement prepared by officials of the Navy Department giving their reasons why the Government regards it necessary for the Navy to own and operate radio stations in this country. Among other things, it stated:

The part played by high-power stations in this war and before the United States became a party to it shows very clearly the necessity for governmental operation of these stations. Transoceanic radiotelegraphy is not a serious competitor of the cables.

By referring to the evidence just introduced by the Navy Department before this committee and quoting from Secretary Daniels down to Lieut. Cooper, one would get a very different impression of the part played by high-power wireless stations, and certainly the comparison of high-power service with cable service, instead of showing that transoceanic radiotelegraphy (to quote the statement) "is not a serious competitor of the cables," the evidence of the Navy officials would strongly prove the contrary to be the case.

The Navy statement further reads:

High-power stations are not yet able to receive from one another all day in all seasons.

Yet, Commander Hooper, in his very interesting report of what the Navy had accomplished with its high-power service, says:

I am not making any new prophecy when I state that the competition [between high-power wireless and submarine cables] will be very keen. Since the war has been on we have established reliable communication across the ocean, and now we never miss a message from the other side: that is a fact.

Why this effort, on one hand, to extol the value and advantage of wireless, and, on the other, while depreciating its worth wishing to hold onto it? Is it because, as Wilde says, "All men kill the things they love"?

Further, I read:

Cable communication is secret, while signals from radio stations are transmitted equally in all directions, and all nations can read the business of all others.

It had always been acknowledged that cable communication possesses the virtue of secrecy, but I was startled some months ago by a report coming from a representative of the Navy Department that there were reasons for the belief that submarine cable communication would be no longer secret and it was feared that the enemy was copying all of the intelligence which passed between the United States and our allies.

This was supposed to have been accomplished by laying a short length of submarine cable parallel to and alongside of the existing cable and continuing the short length into Germany, where signals induced in the short length of cable were easily read by means of recorders and magnifiers.

This is an old trick, often played on land, but the report was not credited by practical cable engineers; nevertheless it was an interesting possibility, and inasmuch as it was sponsored by representa-

tives of the Navy Department there is no reason why they should not be expected to support the statement in contradiction of their present statement that submarine cable communication is secret.

It is quite true that "signals from radio stations are transmitted equally in all directions," but it is not true that "all nations can read the business of all others." That one individual may not learn the business of another and that one nation may not know the private correspondence of another is the prime reason for the use of codes and ciphers.

Inasmuch as governments regard private codes of the highest value, and inasmuch as private commercial concerns also do, we must assume that they fulfill the purpose for which they were designed, namely, perfect secrecy for written communication.

There is no reason why the most obtuse code or cipher can not be transmitted by radio with an equal degree of accuracy and secrecy as by the so-called secret submarine cable. We also know that this objection has no foundation in fact, for the reason that the Government itself has been sending, by means of its high-power stations situated on the Atlantic seaboard, long and important secret cipher communications to its representatives in Europe during the last 12 months, and if there was any possibility of all nations learning the confidential affairs of this Government such messages would not have been sent by radio when submarine cables were available.

Even though it be taken for granted that submarine cables offer a more secret medium of communication, that fact has never been of weight with the large interests that have made use of the submarine cables in their business intercourse. Secrecy was to them essential, and the only security they had faith in was that offered by a first-class code or cipher; and it is a fact which can easily be proven that prior to the introduction of cheap, plain-language cable messages over 99 per cent of the total communications crossing the Atlantic were in code or cipher. A plain-language business cable message, apart from press matter, was a great rarity.

It were rash to claim that wireless could completely supplant the cables, but it is equally misleading to say that wireless telegraphy is not a serious competitor of the cables. Both forms of communication have their distinct and separate value, and some of the reasons urged against radio telegraphy will not bear analysis.

Lack of secrecy is claimed as the one great weakness of radio and its only disadvantage. In these days of peace conclaves and of centering of hopes upon a great league of nations and the establishment of genuine and lasting brotherhood among nations, the most potent of all means for establishing broad understanding and creating harmony and sympathy is the vital one of communication. The greater our means of international communication, the closer we will get in touch with the peoples of other nations.

It is quite conceivable that with the growth of closer international relations and the larger community of interest which will express itself in the proposed league of nations, and in view of the fact that wireless signals radiate in all directions, a high-power "world-wide" wireless station located, say, in the neighborhood of New York, to broadcast and disseminate daily for the benefit of our Government or for newspaper associations a digest or résumé of the news of North America, would be an invaluable instrument in our President's scheme

for greater harmony and intercourse between the countries of the world.

Such a situation is a very likely one, in view of the prominent part in world affairs assumed by the United States. One such station, and one such transmission, would circulate matter simultaneously to Mexico; West Indies; Central America, and all the South American countries; great Britain; all of the European countries, and perhaps even to South Africa and the Far East. Such news matter, of course, would necessarily be in plain language, for the world to read.

To duplicate this effort by submarine cables at the present time is an impossibility; to connect the world so directly with the United States, as is here suggested, would involve an expenditure, for submarine cables alone, of more than a hundred million of dollars, and in addition to the economical saving that would be effected by wireless, the economy of time and of effort in transmission of such information by wireless as compared with cable is too obvious to need further explanation.

So that here it is possible, without any great stretch of imagination, to turn this so-called defect of radio into one of its greatest advantages.

In the testimony of Lieut. Cooper an attempt is distinctly made to imply that sensational progress in this branch of the art has been made during the past 18 months, or since the United States declared war and took possession of all United States radio stations on April 7, 1917, and that the remarkable progress made should be properly credited to the United States Navy Radio Service.

This inference is entirely misleading. The most important advances related by Lieut. Cooper are:

First, that the Navy Department has developed a wonderful system of distant control, whereby it is now possible to concentrate in one small office in Washington the operating keys, which energize high-power transmitting stations situated at various points on the Atlantic coast. The connection, of course, is made by land lines leased from the telegraph or telephone companies.

Second, duplex operation is now said to be entirely successful as operated by the Navy Department, by means of which messages can be sent to Europe at the same time that messages are being transmitted by stations in Europe to the United States.

Third, the design of a special antenna which produces a so-called "egg-shaped" wave, or a wave so distended in the direction in which it is desired to communicate that the maximum effect is produced in that direction with the minimum interference in other directions.

In order that the committee might appreciate the correct facts in the development of distant control and duplex operation, and of which apparently some naval officers are not even aware, it is only necessary to mention that transoceanic communication was first established by the Marconi Co. between Ireland and Nova Scotia, in 1907, or 11 years ago. The service rendered at that time was limited in character and was utilized mainly by newspapers. The service, however, was so successful that it was opened the following year, 1908, or 10 years ago, to general public correspondence in competition with the existing submarine cable facilities, and many hundreds of thousands of commercial messages were transmitted between Great

Britain and Canada, or the United States, without serious interruption, until 1917, when the stations were utilized exclusively for governmental purposes. In passing, I might mention that this same trans-Atlantic service has been released by the British and Canadian naval authorities since the armistice was signed, and is again open to commercial intercourse in competition with the submarine cables.

This was the first and most important long-distance-wireless commercial circuit, and the experience gained in the operation of this pioneer circuit has been of inestimable value to the art in the development and progress of later and higher-powered transoceanic wireless circuits. During all this time, when the obstacles appeared almost unsurmountable and when the financial success of such service was seriously doubted by most people, there was no particular interest in international radio communication shown by our Navy Department. It is true that the Navy Department, within the last five years, has built a number of high-power stations, the object of which was to communicate in emergency with our naval outposts, such as Hawaii, Guam, and the Panama Canal; but the first noticeable desire of the Navy Department to engage in commercial international communication was discernible shortly after circumstances, with which the committee is thoroughly familiar, placed the operation of the Sayville and Tuckerton high-power stations in the hands of the Navy Department. They immediately realized the full possibilities of an international high-power radio circuit, and we have it on record, in the minutes of the previous hearing, that the operation of these stations was so profitable that within a period of two years, and after deducting all naval operating charges, a return of over 30 per cent has been earned upon the investment. This high return, however, was not so much due to the efficient operation of the stations, as claimed by the Navy Department, as to the exorbitant tools which were charged on the traffic handled. Prior to the severance of the submarine cables connecting the United States with Germany the tariffs were 25 cents and 12½ cents per word, but during the time that the radio stations were operated by the Navy Department this tariff was set at 50 cents per word.

As Secretary Daniels openly informed us a few days ago it would be "good business" for the Navy Department to take over the operation of all high-power radio stations, but it should not be forgotten that this "good business" was foreseen in 1908 by the Marconi Co., and ever since that time we have been striving to improve our high-power machinery, so that we might have an opportunity to fully enjoy the fruits of our labors, and also to earn for our 22,000 stockholders some suitable return on the investment of the many millions which we have placed into high-power stations waiting at this moment to furnish a commercial international high-power service to Great Britain and Ireland, to Scandinavia and Russia, and to Hawaii, Japan, and the Far East.

Now, reverting to the claims here made that specific improvements, such as distant control and duplex operation, are the results of naval efforts developed during the stress of war, I desire to state, and radio engineers the world over will corroborate my statement, that the Marconi Co. was the originator of the schemes of duplex operation and distant control. In the year 1912 the original trans-Atlantic service having become congested with traffic, it became necessary to in-

crease its carrying capacity, and Marconi engineers planned the method by which the capacity of that circuit was doubled by the use of duplex operation; and, since that date—I repeat, this was six years ago—the trans-Atlantic service spoken of, has been continuously worked duplex. At the same date, Marconi engineers arranged for the operating key to be placed some 50 miles away from the transmitting machinery, and this has since that time been the sole manner in which all Marconi high-power stations have been operated. This, gentlemen, is the same distant control of which you have heard Lieut. Cooper speak in connection with his concentrated telegraph office in the Navy Department Building.

The American Marconi high-power stations, which were completed on the Atlantic coast in 1914, were designated for exclusive duplex operation and are so arranged to-day. The American Marconi trans-Pacific high-power stations, which have seen commercial operation since September 24, 1914, were designed for duplex operation and were operated by this same system of duplex control. For confirmation of this fact Lieut. Cooper need only ask several of his ex-Marconi operators now working for him in the Navy Department Building, and who formerly operated in a highly efficient manner the Marconi trans-Pacific high-power service to Hawaii and Japan.

We are particularly gratified to learn of the Navy Department's success with the egg-shaped wave, and it will surely interest Mr. Marconi, who invented and patented the well-known Marconi directional aerial many years ago, the effect of which is to project a wave more effective in the direction of the receiving station than in any other direction. All Marconi high-power stations in this country were equipped with this "egg-shaped wave" producing antenna in 1913 and 1914.

Lieut. Cooper further stated that "since the war the Navy Department has had more experience in handling high-power radio traffic and is therefore in a better position, from a practical operating basis, to say what can and what could be done than anybody else."

We have no desire to belittle the splendid work of Lieut. Cooper or of any other naval officer, but he himself confessed to being an amateur in radio work and a lawyer by profession, and it is only fair to the Marconi Co. to point out that the radio-traffic expert who was singled out by the Navy to directly supervise the operators employed in this central radio station in Washington, where such alleged wonders have been worked, was, up to the date of our entering the war, in direct charge of the Marconi high-power trans-Pacific circuit. He has devoted his career to the problems of radio communication and patriotically offered his services to the Navy Department when they were in need of highly qualified men.

The CHAIRMAN. Did you name who that was?

Mr. NALLY. Mr. Baxter.

We do not claim to have a monopoly on operating talent, but the fact stands out strongly that the Navy Department, in April, 1917, when this country entered the war, was short of really competent, high-grade transoceanic operators and appealed to this company for such men as we had specially selected and specially trained for this important branch of radio. It should be realized that there is a vast difference in the efficient operation of a ship-to-shore service and the requirements of a high-powered international service. This latter

work is most exacting, and perhaps not more than a few out of a possible hundred average wireless operators have the requisite ability to satisfactorily cope with the heavy and high-speed work encountered on a transoceanic wireless circuit. I have already said that this company had picked a group of specialists, and it was these men the Navy Department made special call for to assist in the new high-power responsibilities when this country entered the war. With one or two exceptions, the whole of this force volunteered its services to the Navy Department, and they are to-day to be found occupying responsible positions both in the high-power stations being operated by the Navy Department and also in the central radio office, with which Lieut. Cooper himself is connected.

I might also say that the Marconi Co. has successfully operated transoceanic radio service at a higher rate of speed than has ever been accomplished by other agencies. The Marconi Co. was the pioneer in automatic high-speed transmission and automatic high-speed reception. It has developed this system to a remarkable degree of proficiency. Whereas it is not possible to operate a radio circuit by hand (or, as we term it, manual operation) at more than 30 words per minute, the Marconi Co. has successfully and for long periods transmitted by automatic-speed operation at speeds varying from 60 to 100 words per minute. This remarkable advance in the art, as can readily be seen, immediately doubles and even quadruples the capacity of a single circuit. I believe I am safe in saying that the Navy Department still makes use of the old system of manual transmission in the operation of its high-power stations.

The Navy Department, while making every effort to obtain a monopoly of wireless, would have it appear that this form of communication is something wholly different from other forms of electrical communication. In Postmaster General Burleson's letter of January 5, 1917, to the honorable chairman of this committee he writes:

There is no essential difference in principle between communication by radio and communication by telegraph or telephone: The fundamental principle involved in all means of electric communication is the transmission of intelligence.

I am in full accord with Mr. Burleson's views on this point. Prior to October 1, 1913, when I joined the Marconi service—and I was the first telegraph man to enter wireless—I had been continuously in the telegraph business for more than 38 years, starting as a messenger boy with the Western Union in 1875 and resigning from the Postal Telegraph-Cable Co. in 1913, where I was a director, first vice president, and general manager.

The period from 1875 to the present date made me a pioneer in all the forms of communication by electricity. I was associated in the construction and operation of most of the transcontinental telegraph routes, I have visited nearly every town and hamlet in the United States, I am familiar with every part of the telegraph service, and I can truthfully say that I experienced no appreciable change when I transferred from the land lines and cables to wireless, except, to speak in paradox, that whereas in the land-line service I was ever thinking of schemes to educate the public how to use the wire more, in radio, my new field, I argue why the public should use the wireless.

What Secretary Daniels stated in his opening remarks on Thursday of last week about the early history of wireless is unfortunately true. Wireless was such a wonder maker that it appealed readily to the imagination, it was a word to conjure with, and it was natural that men who lived by their wits and saw an opportunity to make money out of a trusting public should seize upon it as a means to that end. But all of this is past history.

The year 1912 found the Marconi Wireless Telegraph Co. of America in full possession of all property formerly belonging to the defunct and dishonest United Wireless Corporation, and the Marconi Co. undertook to construct a substantial and highly efficient organization to serve the public, and I can truthfully say that it has succeeded in doing so. The corporation to-day is as clean as a hound's tooth, it is vigorous and virile, and it has made surprising strides in the last few years and in the face of a most difficult and, at times, most discouraging conditions and under circumstances that would ordinarily have caused failure to a less vigorous organization.

I very much appreciate, personally and officially, the tribute which Commander Hooper made to myself and to the Marconi Co. in his talk to the committee on Friday, and when you hear the brief report which I ask your permission to make, touching upon the activities of the company during the period of the war and for a short time prior thereto, I feel sure you will be convinced that the credit which the Navy Department so generously gives the company has been fully earned.

When, in August, 1914, the European war broke out the American Marconi Co. was at work upon the final tests of the high-power stations which it had constructed at great cost at New Brunswick and Belmar, N. J., for operation with similar and complementary stations owned by the British Marconi Co. and located in Carnaven and Towyn, Great Britain.

Immediately upon the declaration of war, Great Britain took over the high-power stations at the places named, and we were, therefore, unable to carry on our great enterprise.

Many months in advance of the time that we had appointed for the opening of our service we engaged a corps of the finest and most expert operators that ever worked a cable—we had our pick from the different cable companies. These men were given a course of many months' training in wireless, and finally, when on September 24, 1914, we completed our chain of high-power stations in California and Hawaii for trans-Pacific communication with Japan, via Hawaii, we utilized many of these men for this service, which was in very satisfactory operation at the time our country entered the war in April, 1917, when our Government took over all of our stations, both coastal and high power, and have had them ever since.

We also erected in Massachusetts a transmitting station at Marion and a receiving station at Chatham, Cape Cod, high-power stations similar to the New Jersey, California, and Hawaii stations above referred to, but the completion of these stations was delayed and interfered with on account of the war, the Norwegian stations, with which they were to work, having only recently been completed. This circuit was intended for wireless communication with Scandinavia and Russia, and but for the war would be in full operation at this time.

The company also constructed and operated coastal stations for ship and shore business at 45 points, from northern Alaska, on the Pacific coast, to southern California, and from the extreme North Atlantic coast to the extreme South and in the Gulf region and in the region of the Great Lakes.

The company also established schools of instruction in the larger cities on both coasts and on the Great Lakes, and the graduates of these schools, numbering many thousands, form by far the largest source of supply in this country from which trained wireless operators were drawn.

Through cooperation with colleges and Young Men's Christian Associations the company is doing everything it can to increase the interest in the study of wireless, with the idea of developing the art in every way, and in this respect it has been very successful.

The company also publishes, through its subsidiary, The Wireless Press, a monthly magazine called The Wireless Age, which is the only American publication of the kind devoted entirely to wireless, and which ranks with the best technical magazines in the country. In addition to this publication the company also publishes and distributes the Ocean Wireless News on passenger ships carrying Marconi apparatus.

Wireless textbooks, written by the Marconi Co.'s staff of engineers and experts, are to be found in every school and in the homes of nearly every wireless student in the country. More than a hundred thousand copies of these textbooks, the standard in their radio schools, and they used them by the thousand.

Just before the war broke out the company operated a factory at Aldene, N. J., and gave employment to about 125 men. This factory covered a floor space of only 20,000 feet. To meet the demands of the Government several new additions were made, and the works now cover a space of 80,000 square feet and employ over 800 men and women. For a time it ran continuously, with three shifts. Nearly all of its facilities were used in manufacturing apparatus for the Navy, although some very substantial orders were received and important work was done for the Army. This factory designed and developed for the Government for use in the war more than 3,000 wireless telegraph and wireless transmitting and receiving sets.

Secretary Daniels, in his arguments before this committee on Thursday, made the following statement in answer to Mr. White's question:

Mr. WHITE. In order to make this governmental program efficacious, will it not be necessary also to have an international arrangement? Otherwise you might have a Mexican wireless, and a Canadian wireless, and a European wireless interfering in just the way you seek to prevent it; is not that true?

Secretary DANIELS. If there are no newspaper men in the room I would like to answer that. I am one myself, but I would not like them to print it. I hope they will not print this. But in recent months during the war certain nations, through corporations not known to belong to other governments, have sought concessions from South American republics to put in high-power stations to connect with high-power stations which they owned in America. I think it would be a crime for us in America at this time not to protest and not to go on record that we are going to own all this wireless in America and that no country under the sun can put a high-power station in America unless it is a foreign government which we understand and which we can control. There are companies now that own high-power stations in America who are seeking concessions in South American countries not owned by a private company but

chiefly owned by foreign governments which wish to get control of the wireless all over this hemisphere, and we ought not to permit it.

Mr. WHITE. It would require an international arrangement to prevent a Canadian company or a Mexican company interfering with anything we might do under this bill?

Secretary DANIELS. Yes.

Mr. WHITE. The international operation of wireless is controlled by international and political reasons?

Secretary DANIELS. International reasons and physical reasons, also.

I think he must have had in mind the Pan American Wireless Telegraph & Telephone Co., of which I am the president, and in view of the fact that the Government, particularly the State and Navy Departments, were consulted before this company was organized and its charter was viséed, corrected, and amended by the solicitors of both departments, Mr. Daniels's remarks, I think, call for some comment.

In October, 1915, I addressed the honorable the Secretary of State in regard to wireless communication with South America. I explained to him the program which the American Marconi Co. had in mind to follow in conjunction with its connecting company, the British Marconi Co. I fully explained the organization of the American company, but the Secretary of State replied that, while recognizing the American corporate character of the Marconi Wireless Telegraph Co. of America, the State Department was obliged to inform me that it was inclined to lend its support abroad to the efforts of undivided American interests rather than to those who were affiliated with foreign corporations.

I replied fully on November 4, 1915, that the American company had under consideration plans for the extension of its operations to South America and the erection of high-power wireless stations on both the east and west coasts of that continent, provided the requisite concessions for that purpose could be obtained, and that while we fully appreciated the position taken by the State Department as outlined in the reply above set forth, the American company had determined to proceed along lines wholly independent of any other company in its endeavor to obtain the requisite concessions, and asking for the support of the State Department.

Later an official of the Navy Department suggested the advisability of the organization of an entirely separate company to exploit long-distance wireless communication with South America, and, with the consent of our Government and of the State and Navy Departments aforesaid, this organization was consummated.

On February 6, 1918, at the request of two officers of the Navy, I addressed the accompanying letters to the Bureau of Steam Engineering, which, with your permission, I will read into the proceedings of this committee:

PAN AMERICAN WIRELESS TELEGRAPH & TELEPHONE CO.,
New York, February 6, 1918.

BUREAU OF STEAM ENGINEERING,
Navy Department, Washington, D. C.

GENTLEMEN: Confirming my promise made orally to Commander Le Clair and Commander Sweet when in Washington last week, I herewith submit, for your information and for such favorable action as you may decide upon, this company's plan for long-distance wireless expansion in South America. Desiring to work at all times in the closest possible harmony with the wishes and aims of the Government, and realizing that the erection of high-power wireless stations in all the countries of Latin America will not only be of the highest importance as regards benefits conferred, but will also at this time involve ques-

tions of considerable delicacy, especially to the Navy, I respectfully request that you will let me know, as definitely as circumstances may admit, the measure of the approval which we can expect from you for our program and, as well, any points for criticism which you may find in it.

OBJECT.

The Pan American Wireless Telegraph & Telephone Co. has for its main purpose the closer linking together of the Americas by means of radio telegraphy and telephony. Primarily its activities will be directed to the rendering of a first-class wireless telegraph service between the United States and South America, to be followed later with extensions to the smaller territories of Central America, Mexico, and the West Indies.

The general idea of all "all-American" commercial wireless service between the South American countries and the United States has been discussed regularly at Pan American and scientific conferences for several years past. The need for such additional means of communication has long been apparent. Brazil and Uruguay have always been totally isolated from the United States telegraphically, except by means of British-owned cables, which first cross the Atlantic before connecting with other cables to the United States. The telegraph rates from this country have in consequence been excessively high, and to-day the tariff from the United States to Brazil is considerably higher than that to Argentina.

PROGRAM.

As you are fully aware, we have already completed arrangements for the entrance of our company into Argentina, and expect to erect a station in Buenos Aires which will work direct with New York.

Our next field will be Brazil, Paraguay, and Uruguay, and it is our desire to proceed without delay in an effort to secure the consent of the Governments of these countries to permit us to unite their principal cities into a system which, like that of Argentina, will be of such power that a continuous and direct commercial service may be had with the United States. In this zone the plan is to erect the high-power station near Rio de Janeiro and medium-powered intercommunicating stations at Para, Pernambuco, Bahia, and perhaps Santos.

Following this our next effort will be made in Chile and Peru, where it is desired to erect intercommunicating stations at Valparaiso, Antofogasta, Lima, and Iquique. The Lima station will be of sufficient power to work direct with the United States and to be a central collecting and distributing station for all the west coast countries.

Continuing northward, it is desired to erect stations at Buena Ventura, in Colombia; at Caracas, in Venezuela; at Limon, in Costa Rica; at Guatemala City, in Guatemala; at San Salvador, in Salvador; at Managua, in Nicaragua; as well as station at Tegucigalpa, in Honduras.

In the West Indies we contemplate the erection of a high-power station near Habana, Cuba, and additional stations in Porto Rico, Santo Domingo, and the Virgin Islands.

It is also our wish, if possible, to include Mexico in our program, if such activity at present is not considered untimely. In Mexico the preliminary work will not be easy, and we expect to encounter delays and obstacles which may require months of negotiations to overcome. Here we have to contend with not only a weak, half-organized government, but we also find there our German wireless competitors already entrenched with a number of stations, and this, added to the fact that the new Mexican constitution is only just beginning to be interpreted, causes us to look forward to tedious delays in our negotiations. For these reasons we feel we should begin our work in Mexico as early as possible, so that the necessary concessions may be secured for commencing active operation as soon as the European war terminates.

GOVERNMENT SUPPORT.

In all this important work of linking together the sister Republics with the United States by means of an all-American wireless telegraph company, it is most essential that we have the whole-hearted support and cooperation of the State and Navy Departments, and it is specifically for this purpose that we are addressing you to-day.

Not only from the point of view of this company, but also from the larger view of the whole country, whose business interests we will serve in a most important way, the carrying out of our program should not be delayed a moment longer than necessary, for, as is agreed by everyone, the United States must be ready in every sense of the word if it is to be successful in retaining its rapidly increasing share of South American trade when the war is over. And in all the propaganda which we propose in winning our way into each of these countries we will always be paralleling the Government effort to create and foster a greater friendliness for all things American.

In those countries where German intrigue has obtained a foothold the Telefunken stations have been doing their part, and it must be considered a decided gain to all of us whenever the Pan American Wireless Telegraph & Telephone Co. is able to persuade the Government concerned to supplant such stations with those which will be "made in America" and operated under American management.

Very respectfully,

EDWARD J. NALLY, *President.*

FEBRUARY 27, 1918.

Commander G. C. SWEET,
Navy Department, Washington, D. C.

DEAR COMMANDER SWEET: I hand you herewith a copy of my letter of February 6, in which I outlined for the Pan American Wireless Telegraph & Telephone Co. its plans and program for South American extension of long-distance wireless, and I particularly call your attention to the paragraph on the second page in which I refer to Mexico. I speak of this because of our conversation this morning in which you requested that I make clear just what we have in mind with respect to Mexico. I have a good man available; in fact, he is waiting for instructions to proceed to Mexico City and carry on negotiations along the lines outlined by me.

I hope that I may receive approval soon from the State Department, who, I understand, have my letter before them, to proceed with the Mexican matter.

Yours, very truly,

EDWARD J. NALLY, *President.*

FEBRUARY 27, 1918.

The SECRETARY OF THE NAVY,
Washington, D. C.

SIR: At the suggestion of Commander Sweet and on behalf of the Pan American Wireless Telegraph & Telephone Co., an American enterprise, of which I am president, I wish to state that there is no British or other foreign representation on the board of the Pan American Co. nor among its officers. Its charter, with which you are familiar and which was submitted to you before completion of its organization, provides that there shall be no alien control. At present the stock holdings are divided as follows:

Marconi Wireless Telegraph Co. of America, three-eighths; Federal Telegraph Co., of California, two-eighths; Marconi Wireless Telegraph Co. (Ltd.) of England, three-eighths, so that you see the American interests are five-eighths against the three-eighths held by the British company, and the latter's stock is nonvoting.

Mr. WHITE (interposing). May I interrupt you at that point? You say "the latter stock is nonvoting"?

Mr. NALLY. Yes, sir.

Mr. WHITE. That is, the Marconi of England?

Mr. NALLY. Yes, sir.

Mr. GOODWIN. While the interruption is on will you permit me to ask you a question? Will there be any opposition in South America to the establishment of American wireless in that country, controlled by Americans?

Mr. NALLY. Only by our Government.

Mr. GOODWIN. Only by our Government?

Mr. NALLY. I say only opposition by our Government and not by the South American Governments.

Mr. HUMPHREYS. Will you pardon me, but I do not understand that exactly. Do you mean that the only opposition to Americans owning and operating wireless stations in South America comes from our Government?

Mr. NALLY. Yes, sir.

Mr. GOODWIN. And none from the South American Governments?

Mr. NALLY. No, sir.

Mr. HUMPHREYS. Do you mean by that that our Government is opposed to it because they want to do it themselves?

Mr. NALLY. Yes. If you will permit me to finish, I think I will explain that fully.

The British company received its stock interest in the new company in return for patents, concessions, and other valuable interests owned by them in South America which was their contribution to the new company. The Federal Co. received its two-eighths and the American Marconi Co. its three-eighths in return for their respective contributions to the new company.

I am very anxious to push the work in connection with the construction of high-power stations in this country and in Buenos Aires with the least possible delay, and it is particularly important that work should be commenced in Argentina because the concession granted to our company there will expire on June 27 next unless land for a site is acquired and actual work on the new station begins.

Hoping to hear from you very soon that the above is satisfactory and that the proposed plan, as outlined in detail in my letter of February 6, meets with your approval, I am,

Very respectfully,

PAN AMERICAN WIRELESS TELEGRAPH & TELEPHONE Co.,
By EDWARD J. NALLY, *President*.

MARCH 4, 1918.

The SECRETARY OF THE NAVY,
Washington, D. C.

SIR: Supplemental to my letter of February 6, addressed to the Bureau of Steam Engineering, and my letter to you dated February 27, I beg to state that it is our wish to begin immediately the work of securing concessions and sites in Central and South American countries for the high-power wireless stations which we propose to build, and which will constitute a chain of high-power stations connecting South American countries with North America. I hope that the plan as outlined with much detail in previous letters meets with your approval.

I wish to say further that the Pan American Wireless Telegraph & Telephone Co. pledges itself to employ American citizens only as officers, engineers, and operators, both as comprising its staff and its operating force, at all high-power stations to be erected by this company in the United States for communication with South American countries. We will be willing that such officers, engineers, and operators shall be employed with the understanding that they shall be enrolled in the United States Naval Reserve Force under conditions and regulations to be proposed by you.

While the scheme of my company is one of great magnitude and importance and was conceived with the idea that it will prove to be a success from a business standpoint, and one which will bring those who take financial part and responsibility in it reasonable returns, we also think that it will be a very helpful and potent thing for the Government and will constitute a strong arm in the event of war or times of stress.

Of course, we can not hope to obtain money—and we shall require very large sums for such a vast enterprise—unless we give reasonable assurances to those who invest that the business will not be interfered with nor interrupted so long as it is conducted along legitimate lines and in harmony with the Government, but I think I can speak for our stockholders and say that should the present policy of the Government with respect to the ownership of high-powered wireless stations be changed and legislation enacted placing the ownership of such stations in the Government, in such event the company will be satisfied with remuneration and compensation based upon its investments and its obligations taking

into account the company's physical assets, its good will as a going concern, the value of the circuit or circuits from a traffic-bearing standpoint, and just consideration and allowance for the fact that the taking over by the Government of the United States high-power stations would greatly affect, if not wholly destroy its investment in and the business of its foreign stations.

Very respectfully,

EDWARD J. NALLY, *President.*

I was assured by Commander Sweet that the matter was now clear to Secretary Daniels, and that there was no obstacle in the way of our plans, and accordingly, on April 17, I sailed for South America, proceeding directly to Buenos Aires, Argentina, where I arranged for the extension of the concession which had been previously granted to a subsidiary of the Federal Telegraph Co., known as the Federal Holdings Co., which we had purchased and which concession was about to expire.

In addition to the extension, I had the concession greatly broadened, and I arranged for a site near Buenos Aires for the transmitting station, a public-spirited citizen of Argentina, the honorable Dr. Benito Villanueva, who has been respectively Senator, Vice President, and Acting President of Argentina, donating the larger portion of the land required for this purpose.

I also visited Peru, Chile, Uruguay, and Brazil, and everywhere I found the people and the government officials whom I saw most favorable, indeed, enthusiastic over our proposition, and all expressed themselves as anxious to cooperate and assist in every way. But, owing to the war, and the difficulty of obtaining material, and the general uncertainty in regard to the shipment of apparatus, I thought it wise not to ask, at the time, for concessions in other countries than in Argentina.

Upon my return from Argentina I was informed that our Government had undergone a change of heart; that the Pan American Wireless program was in disfavor and I called upon the Navy officials, some of whom reassured me; others stated that the Secretary of the Navy was absolutely committed to Government ownership.

I called on Secretary Daniels, who was very outspoken in the matter, and who confirmed what I had heard. He positively stated he would not favor the erection of wireless stations by the Pan American Wireless Telegraph & Telephone Co., and, in fact, disclaimed all knowledge of his department having passed on the proposition and having approved it, stating that he did not do so personally, and saying, practically, what he repeated in his remarks before this committee.

I attempted to argue with him that a private company could handle the international situation much better than the Government; that I knew this was true with respect to certain countries in South America, mentioning Argentina, Chile, and Mexico, and he agreed that perhaps it was true with respect to those particular countries and that he would be glad if the Pan American Co. would go ahead with its station in Argentina and he would agree to reimburse us for all of our expenditure there when the station was completed. This, I told him, we could not do unless we were assured we could also erect the United States station, but he would not give me any assurance as to this, but stated that he would discuss the matter with the Secretary of State and advise me; but I have not heard from him since in regard to the matter. Mr. Daniels stated in the interview that he thought the objections of some foreign countries, particularly

in South America, to Government ownership would be overcome if it were made known to them that our country would be willing to finance the construction of the stations, and even furnish a trained staff to operate them, which, I inferred from what he said, would be done. I pointed out the danger of international complications in such a scheme, and told him I thought a private company could do the thing much better and with less danger.

Later, I was informed by Capt. Todd that it was the intention of the Navy Department to construct a very large station in North Carolina, near Raleigh, which would be used during the period of the war for transoceanic wireless service with the continent of Europe, probably to work in conjunction with the big wireless station which was being constructed by the United States Government near Bordeaux, France, but that the North Carolina station would be used after the war for South American service, and he hoped the Pan American Co. would go ahead with its Argentina station, which, of course, I told him we were disposed to do.

Thus the matter rests. In the meantime we are prevented from going ahead with the necessary work at Argentina to enable us to comply with the requirements of that Government's concession, and we have stopped all work on contracts for apparatus, and likewise called in our representatives whom we had sent to other Central and South American countries.

Some facts bearing on the wireless situation in our neighboring Republic may be of interest to this committee. It shows how terribly disadvantageously we are placed with respect to the commercial wireless agencies of other countries, and the great handicap suffered by United States manufacturers and operators of wireless apparatus.

We sent an agent to Mexico to look over the situation in that country and to make preliminary arrangements toward the creation of a commercial wireless service with the United States. We were aware, of course, that the Germans were in full control of the wireless stations in Mexico, and we hardly expected, without active aid from our Government, to be able to break such control before the end of the war, but we were animated by a feeling that any success at this time, however small, would not only be to our own advantage but would tend to the patriotic end of assisting in the "winning of the war."

Our representatives found that the new Mexican constitution, formulated in 1916, had carefully provided for Government ownership of wireless, in direct response to the urgings of that Pan American Congress which Secretary Daniels mentioned in his statement last week as having the hearty approval of our Government.

The predecessors of Carranza, after Diaz, had already, to some extent, recognized the great desirability of supplementing the land telegraph system with a chain of radio stations linking the outlying Provinces with the capital, so as to lessen the chances of interruption of communications by the numerous bands of roving rebels. A few small stations had been constructed, but far too few and too small to satisfy the need, and when Carranza came into control he at once set about to make improvements. But he had little money and less credit, and nowhere in Mexico were there factories or skilled men

capable of manufacturing wireless equipment. Like other Latin American countries, Mexico depends, in matters of this kind, upon foreign capital and factories, and it was therefore the most natural thing in the world that the Carranza government should fall an easy victim to the wiles of the German Telefunken Co. when they offered to repair the old stations and to finance, erect, and man with competent German operators and engineers new stations, both military and commercial. It is only fair to Carranza to keep in mind, in this connection, that at the time this deal was made both Mexico and the United States were neutral, and the Mexican Government had as much right to buy from Germany as from any other country. Our company would probably have been bidding for the business at that time had it not been for the fact that we had hanging over our heads this menace of government ownership, which prevented our knowing whether or not we could safely undertake contracts to give an international service to Mexico or any other country.

On the other hand, had such a law as this one here proposed by the Navy Department been in effect at that time, so that the Government of the United States had been the exclusive owner of all radiotelegraph stations and, in addition to that, had the Navy Department been empowered to finance and erect and even man wireless stations in Mexico, it is impossible to imagine that such a deal as the one made by Germans could have been entered upon, for notwithstanding the efforts of our citizens to make the nations to the south of us feel that we only desire to be helpful and just in our relations with them, there exists fear and some distrust and it is out of the question for many of them to tolerate the idea of wireless stations on their soil owned or in any way under the influence of the United States Navy Department.

But it is equally well known that there exists no particular prejudice in the matter of doing business with American private corporations, and if our company had been in position to go ahead freely and with the support and cooperation that our business men have a right to expect from the United States Government in their dealings abroad, it might have happened that, instead of there being upward of 25 wireless stations in Mexico under German control, as at present, there would be 25 under American control. And if an American private company were in control in Mexico I am sure that neither Secretary Daniels nor this committee, nor the people of the United States in general, would fail to see anything but a decided military advantage in times of war and an equally valuable commercial advantage in times of peace.

Although the Mexican Government claims title to all these stations, the apparatus is strictly German and there have been German operators in every one of the 25-odd stations. Moreover, there have sprung up Government electrical shops with German superintendents, and the whole system has been supervised by German radio experts who were formerly employed at Sayville and Tuckerton and on the German liners which were interned in this country at the beginning of the war.

Leaving out of consideration the military thorn in the flesh that this system in Mexico has been to us during the war, we must recognize in it an even greater disadvantage and handicap to our mer-

chants and manufacturers in the days to come when they are fighting for a reasonable share of the trade of Mexico.

If the Pan-American Wireless Telegraph & Telephone Co. were placed in position where it could go forward freely with its plans to establish stations in the various Central and South American countries, connecting with like stations in this country, all built and operated by Americans for the exclusive purpose of handling Latin-American communication, American business would receive an advantage beyond calculation. Our company's success will depend upon its ability to foment business at both ends of the line, and our representatives will be in reality the most aggressive and enterprising commercial agents which this country could have; and while this would not hold quite as true in those countries which have followed our Government's advice in the adoption of the idea of government ownership of wireless, there is no country to the south of us which does not depend for its equipment of this character upon foreigners, and most of them would be compelled to leave the operation and supervision to foreigners also. So that wherever we would succeed in establishing ourselves there would be Americans controlling one of the vital arteries of communication.

Much stress was laid by the proponents of this bill on the economic loss which would result from private companies entering the high-power field.

Really, the greatest loss to private companies is from the uncertainty of the situation. Private enterprise may be trusted not to spend its money recklessly, but how is it possible to finance large undertakings when the Government throws its wet blanket of ownership over wireless enterprise?

Emphasis, too, was laid on the fact that in private ownership of wireless the art would suffer, because private companies could not afford to keep up with the rapidly changing conditions.

In this, as in all matters of private enterprise, competition must be met; and where it can be shown that improved apparatus will increase the capacity of the circuit and thereby add to its revenue, no enterprising company would hesitate for a moment to scrap the obsolete machinery. Indeed, this is what the Marconi Co. has already done. The apparatus which was installed in our New Brunswick, N. J., station for communication with England, and which was ready for test when the war began, has since become obsolete and has been removed. At our Marion, Mass., station, built for communication with Norway, we also scrapped apparatus which, although being the latest thing in the art when the station was started, became obsolete before the station could be completed, and we have installed the new timed spark, which Capt. Todd mistakenly described as obsolete and admittedly so by the Marconi Co., which is far from the facts; indeed, we hope to demonstrate that the timed spark will meet all of our high expectations.

Much has been said about coastal stations and of the recent transfer by the Marconi Co. to the Government of its chain of small coast stations.

It is perhaps unnecessary for me to say to this committee that the Marconi Co. gave up this part of its business very reluctantly, I might say even sorrowfully. While we have always looked upon

the ship-to-shore business as a collateral branch of our service, our main scheme being world-wide wireless in competition with the land lines and cables, yet wireless having begun as a ship-to-shore proposition, and because of its great rôle and part as an agency of humanity and its honorable record in the saving of countless lives and much property, we hoped to continue it as a life-saving agency and to add to its efficiency and efficacy in every way we could by the employment of invention, improvement, and the closest supervision.

The history of the causes which led to our sale of the coastal stations, which was referred to at this hearing last week, will be told by our commercial manager, Mr. David Sarnoff, who will follow me.

Now that the Government has purchased practically all of the coastal stations, the Marconi Co., of course, agrees that the Government should exercise the closest supervising regulation and control of all wireless communication, especially should it safeguard wireless communication between ship and shore, for the reason that safety of life and property at sea is more dependent upon wireless as a means of communication than is the case in any other situation or circumstance on land. Hence the vital and imperative need that every reasonable safeguard and regulation should be exercised and maintained in time of peace, as well as in time of war.

The Marconi Co. further agrees, because it solemnly believes it possible and wholly practicable, that a fair and just division of the paths of universal ether can and should be marked out by which the several interests—Government, private, and amateur—may travel, each in its serious and practical way, each without interference with one another and yet each given full scope and opportunity to develop and expand and to serve the common good.

So much has been said as to the difficulties in the way of such a scheme; let us take up the task seriously and patiently. It is the inherent weakness in mankind that voices the ever human slogan of "it can't be done," which is the reason why there are relatively so few persons in the world who really accomplish constructive things.

If those who pioneered in wireless had not pushed and persevered and overcome interference, and interference, and then, again, countless interferences, the art would have remained undeveloped, if, indeed, it had not died a-bornin. Thanks, however, to these staunch souls, these men of strong faith, difficulty after difficulty was overcome, obstacles removed, and the wonder and the miracle of the art defined and developed, step by step.

Shall we now say, with the original doubters, that the end has been reached; that no further improvement is possible; that we shall rest with what has been accomplished?

That we have only touched upon the possibilities of wireless is my honest belief, and one need not possess the gift of prophecy to promise to the world even greater things than those already accomplished.

I wish, in closing, to offer to this committee something in the way of a concrete plan, with the view to putting an end to this costly controversy between the Government and private companies, which, more than anything else, has retarded the development of wireless and which, if persisted in, will keep the United States in the background as compared with other nations.

Leaving out all questions of manufacture, patents, and other questions which will tend to cloud and confuse the subject, let us divide the activities of wireless into three divisions:

First. The ship to shore.

Second. High power for transoceanic and transcontinental communication, embracing also medium power for point-to-point overland communication.

Third. The interests of the student and amateur.

Now that the Government has purchased the coastal stations, they should be given full opportunity to operate them. Therefore, I propose the following:

First. The Government shall have the exclusive opportunity for ship-to-shore wireless communication, either by telegraph or telephone, or both, and the exclusive right to conduct commercial business for the public between ship and shore.

Second. Private companies shall be given the exclusive opportunity, supported by Government sanction and influence, to develop and extend commercial high-power and semihigh-power operation, transoceanic as well as point-to-point overland wireless communication.

Nothing in these propositions shall authorize the Government to conduct any commercial wireless communication except the ship-to-shore business aforesaid.

Third. With respect to the student and the amateur, the amendment proposed and which has been before the committee, seems an equitable solution of this problem, as it appears to represent the joint views of the Navy officials and the representatives of the amateurs, and is apparently satisfactory to both sides. Therefore, the Marconi Co. is glad to add its voice in approval and to express the opinion that the proposed regulation governing amateur radio operators and amateur radio stations is both sound and equitable.

With a view to harmonizing the different interests, provided some such plan as the one I have suggested meets with general agreement, I offer the following suggestions:

The Secretary of Commerce shall continue to exercise the powers conferred upon him by the act of 1912 in the matter of licensing privately owned radio stations. To meet the rapidly changing conditions of the radio art, and to apportion wave-lengths ranges best suited for Government, private commercial, and amateur stations, it is recommended that a national radio commission be appointed under an act of Congress, the commission to consist of five members, as follows:

Two designated Government officials and two representatives from the principal commercial operating radio companies.

This commission shall keep abreast of the radio art and shall determine and issue suitable regulations for the harmonious operation of all radio stations under the jurisdiction of the United States, and shall recommend to Congress such additional legislation as in its judgment may be necessary from time to time.

In case of an application for license for radio stations is refused or revoked by the Secretary of Commerce, the applicant shall have the right of appeal to the national radio commission, which shall hear the evidence in the case and the vote of a majority of the members on such appeal shall be considered final.

With the idea of meeting the objections of the Government and obtaining its approval of the plan, I suggest for the operation of transoceanic and transcontinental wireless circuits, I beg to offer, on the part of the Marconi Co., the following:

In order that the privately owned high-power stations located in the United States territory shall always be in readiness for Government operation and control in case of riot, tumult, disorder, war, accidental catastrophe, or other emergency, said companies shall employ only American citizens to operate such stations; such personnel shall be attached to Government service as to be subject to impressment at any time or such force shall constitute an arm of the reserve force of the military power of the Government.

The Marconi Co. will further agree to erect its stations within such reasonable time as in the judgment of the Government may be required, and, generally, will agree to such terms and conditions as to the carrying on of commercial business as, by arrangement with the executive departments, may be found reasonable and just. It will give preference at all times to Government messages.

The CHAIRMAN. Did you say anything, Mr. Nally, about the control of rates for wireless transmission?

Mr. NALLY. I did not.

The CHAIRMAN. What is your notion about that?

Mr. NALLY. About controlling rates?

The CHAIRMAN. Yes.

Mr. NALLY. I think that the public should be free to compete freely.

The CHAIRMAN. Well, what other company would there be, under your scheme, except the Marconi Co?

Mr. NALLY. We could compete with the cables—we would compete with any wireless company. I do not ask for exclusive right for the Marconi Co.

The CHAIRMAN. You referred to the constitution of Mexico. I was not sure but I understood you to say that the constitution of Mexico provided for Government ownership and control of the wireless in Mexico?

Mr. NALLY. Yes, sir; that is a law recently passed, as a result of the Pan American Conference.

The CHAIRMAN. And under that policy the Government of Mexico does hold all wireless stations there, but the apparatus used is of German manufacture, and the stations are in control of German experts?

Mr. NALLY. Yes, sir.

The CHAIRMAN. Is that the policy of other Central American and South American countries that those stations shall be Government owned and controlled?

Mr. NALLY. The only country that I can speak positively about is Brazil. There, also, has been passed a measure of that character. But the law provides that a "national company"—that is, a company organized in Brazil and made local, as we make local companies here—can be given privileges by the Government; in other words, by incorporating a local company there, complying with the requirements of a "national company," a private company can operate.

The CHAIRMAN. How can you operate in Mexico, in view of their constitutional provision that the wireless shall be under Government ownership and control?

Mr. NALLY. We do not think we could obtain rights there now for a station to be owned outright by a private company. We think we could arrange to have a station built there, where a private company, say, the Marconi Co., would have an interest but not have control.

The CHAIRMAN. That is, it would be a Government station?

Mr. NALLY. The Government of Mexico would probably want to own 51 per cent of it.

The CHAIRMAN. I wish you would make a little clearer your notion as regards the control of wireless, the ship to shore, by the Government; the international high-power stations by the Marconi or some other company or companies; and in each instance taking care of the amateurs. Did I understand you to say that you will agree that the Government shall take over and control absolutely all the ship-to-shore stations, including commercial stations from ship to shore, and vice versa?

Mr. NALLY. Yes.

The CHAIRMAN (continuing). That ought to be under Government control, and you would not have any objection to its being under direct control of the Navy, for the reason that the Navy is bound to maintain stations for the service of the fleet?

Mr. NALLY. I will further say, Mr. Chairman, that I recommend that that be done, that the Navy be given control; that they be given full rights to operate those stations for commercial business.

The CHAIRMAN. That would leave the international field for private enterprise, would it not?

Mr. NALLY. Yes.

Mr. WHITE. And it would leave continental United States for private enterprise?

Mr. NALLY. Yes.

The CHAIRMAN. Yes; all except the ship to shore. That is, the inland and high power would be left to private enterprise?

Mr. NALLY. High power and so-called medium high power.

The CHAIRMAN. Yes. Have any members of the committee any questions to ask Mr. Nally?

Mr. BURROUGHS. What are your reasons, Mr. Nally, for making that recommendation?

Mr. NALLY. My recommendation, in the first place, is, in view of the fact that we have lost the stations and the further fact that under the new order of things, the result of the war, which will be very fully explained by our commercial manager, instead of the Marconi Co. having 95 per cent of all the ships equipped with wireless there have been perhaps 4,000 or 5,000 ships equipped since the war with apparatus owned by the Government. So that the Government now actually monopolizes the ownership of apparatus on ships.

Mr. BURROUGHS. Suppose the Government were not in that position at this time, would you still have the same view of it?

Mr. NALLY. No; I should very strongly wish to have our stations back and be free to carry on the ship-to-shore business as formerly.

Mr. BURROUGHS. It is, then, largely because of the facts of the present situation and the Government having acquired those stations that you now take that view?

Mr. NALLY. Entirely because of that fact.

The CHAIRMAN. Do you not recognize the fact, Mr. Nally, that it is necessary for the Government, for military purposes, to retain and control ship-to-shore service in the interest of the Navy?

Mr. NALLY. I do recognize that, Mr. Chairman, and I recognize, too, that there are certain potent reasons in favor of the Navy's contention in respect to ship-to-shore business.

The CHAIRMAN. Yes; and for that reason—

Mr. NALLY (interposing). But those reasons have become more important and more urgent by reason of the conditions growing out of the war.

The CHAIRMAN. Yes; I understand the Government has taken over your shore stations and has now installed wireless apparatus on the majority of the commercial ships at sea.

Mr. NALLY. Yes.

The CHAIRMAN. And that condition only emphasizes the fact that there should be governmental control of the ship-to-shore business under existing conditions?

Mr. NALLY. I think so.

The CHAIRMAN. Are there any further questions?

Mr. SAUNDERS. Yes; I would like to ask a few questions about this art. As I understand, Mr. Nally, your reasons with respect to this, ship-to-shore communication, for favoring Government control of it, are practical reasons, growing out of the present conditions rather than scientific reasons making it necessary?

Mr. NALLY. Yes, sir; that is quite right.

Mr. SAUNDERS. Now, I wanted to ask you some questions relating to the art in other directions. I gathered the other day, as the effect of the testimony of the witnesses who testified here in behalf of the contention of the Secretary of the Navy, that they did not consider, apparently, that there was much field for point-to-point development, in a commercial way, for wireless in continental United States. I wanted to ask you whether, with your knowledge of the art and what you conceive to be the possibilities of the art, whether, in your judgment, there is not a great field for development along that line—commercial development?

Mr. NALLY. I think there is. I think that is the big thing that lies in the future. I believe that wireless trunk lines will take the place of transcontinental wire lines. I believe it will be possible instead of spending \$30,000,000 for a telephone-pole-and-wire line between New York and San Francisco, for instance, to have the trunk line a wireless line for such telegraphic and telephonic communication.

Mr. SAUNDERS. And so, I presume, that logically under that scheme there would also be communication between points closer together—I mean shorter internal lines.

Mr. NALLY. Yes. I want to say frankly, Mr. Saunders, that the one great thing against the commercial development of that idea from a revenue standpoint, perhaps, is the low toll rate—the low telegraph rate which would exist in average point-to-point communications for commercial purposes. I think that the point-to-point wireless communication will be largely used as an adjunct for pri-

vate enterprises and will be used, as in the cases you suggested, by cotton mills, between mines in remote places, between oil-pumping stations, etc. And I think that its uses in connection with the operation of railroads will be one of its very greatest opportunities.

Mr. HARDY. As I understand, you think that the wireless would be cheaper than the telegraph?

Mr. NALLY. Yes, sir.

Mr. SAUNDERS. According to this proposed amendment to the bill, to which you have referred in your statement, and which I have just glanced over, it seems practically to turn the amateur operators and experimenters loose, so far as operating their little plants is concerned?

Mr. NALLY. Under a very restricted wave length.

Mr. SAUNDERS. What I mean is, of course, they would have to get a license, but there seems to be no limit, under the amendment, upon the wave lengths that they can project.

Mr. NALLY. Oh, yes; there is.

Mr. SAUNDERS. Well, if that is true, and if the figures which have been given to me with respect to the number of those amateur operators are correct, the ether will be filled with those short waves projected by those experimenters and special licensees.

Is there any danger to be apprehended—I presume there is not, or else the Navy Department would not have agreed to it—but I will ask you, is there any danger to be apprehended from the multiplicity of these waves of their interfering with the ship-to-shore stations?

Mr. NALLY. I believe not. I think they would principally interfere with each other.

Mr. SAUNDERS. Now, with respect to the transcontinental communication and transmarine communication—I believe that is what you call the high-power stations?

Mr. NALLY. High-power stations; yes.

Mr. SAUNDERS. I gathered, and I think it was expressly stated in response to a question of mine the other day, that there was already practically a scientific limit—not a commercial limit—reached as to the high-power stations on the Atlantic shores of the United States.

Mr. NALLY. I know that was stated, but—

Mr. SAUNDERS (interposing). Well, I wanted to ask you now specifically whether, as a scientific proposition, from what you know of the present development of the art, there is any limit to the number of stations that could be used to do this transcontinental or transmarine work without interference with the other?

Mr. NALLY. I think there would be a limit, but I do think it would be a reasonable limit.

Mr. SAUNDERS. As I understand, you can not undertake to fix 12, 15, or 20 stations close together—with regard to the limit as to the number of stations that could be established—so as to work without interference one with the other?

Mr. NALLY. I think we could have many times more wireless high-power stations than there are now cable lines. I believe this country could put up all the wireless stations that will be needed and that they could be controlled and regulated so that there would be no interference.

Mr. SAUNDERS. Practically, then, what you say amounts to this, that it is a commercial rather than a scientific limitation?

Mr. NALLY. No; I think it is a scientific limitation—

Mr. SAUNDERS (interposing). Well, that is so large, as I understand from you, that you would not undertake to—

Mr. NALLY (interposing). I do think there is a reasonable limit.

Mr. SAUNDERS. You would not undertake to name any specific limit, would you?

Mr. NALLY. For instance, it is generally supposed that high-power stations ought not to be closer than 50 miles to each other on the coast. That is the broad limitation generally considered wise—

Mr. SAUNDERS (interposing). Well, when you take the Atlantic coast from Maine and around to the Gulf of Mexico, that would allow a pretty large number of high-power stations, would it not?

Mr. NALLY. Yes; of course, but it is not conceivable that there would be that many stations.

Mr. SAUNDERS. Of course, I understand that, commercially, there would be no profit in that number; but I am just speaking now with reference to these scientific possibilities of operating satisfactorily, so far as the patrons of those stations are concerned, in the regularity and exactitude of their work and from freedom from interference with others or from being interfered with by others.

Mr. NALLY. Perhaps I could answer that better by citing the case of England, which is, of course, a small country. There they contemplate a very extensive system of high-power stations to operate with all other countries and with their own colonies. They had in mind before the war an imperial chain of stations that would reach around the world, practically, and I do not think that they feared any great scientific limitations.

Mr. SAUNDERS. They have not ascertained that there is any difficulty in their projected scheme?

Mr. NALLY. No.

Mr. SAUNDERS. Now, with respect to the suggestions that commercial companies would not give, commercially, the best service in connection with this business if they were allowed this field, by reason of the fact that they would keep up to date their plant, their apparatus, we have an immense number of industries in the United States of a technical character. And I believe it is regarded as the pride of American industry that those plants keep themselves up to date; and in reading the various technical journals I believe I have seen, time and again—correct me if I am mistaken in that apprehension—that, as compared with foreign industries, the difference between American industries and foreign industries was that the foreign industries sought to make an old machine that was a good one go as long as possible, while the American industries did not hesitate to scrap it when it was brought into competition with something that was more up to date. And that being true of American industry in a large way, is there any reason why it should not be true of this particular industry, with respect to keeping up to date?

Mr. NALLY. It would not be true, Mr. Saunders. As I have stated, we have already scrapped a lot of apparatus that we had never used, because the art had changed before we could use it.

Mr. SAUNDERS. Well, so far as the facts are concerned, that contention of the Navy Department, then, is not supported by the facts?

Mr. NALLY. No. It is so very obvious that a commercial company that wishes to compete for business must increase its carrying capacity, and that the cost of new apparatus to increase the capacity is so small, comparatively, they would not hesitate to scrap it.

Mr. SAUNDERS. Would they not be bound to scrap it?

Mr. NALLY. They would be bound to scrap it.

Mr. SAUNDERS. Under the conditions of competition, are you not bound to scrap in order to keep up to date and to keep your patronage?

Mr. NALLY. Yes; there is nothing in the other theory at all.

Mr. GREENE. Your idea, then, of course, is that, with private competition, there would be a very great advance in the art?

Mr. NALLY. I am sure of it.

Mr. GREENE. Let me make this statement in that connection:

Some 30 years ago I went down into the State of Texas with a number of business men from the Northeast. We started out first with an attempt to go down there and develop some business, but that idea petered out. I had been invited, with the privilege of inviting three other men from my own city, to go down there on an expedition which was paid for by private interests to look over the situation. And knowing something of the cotton industry at Fall River, and having seen it grow from small beginnings until it became the largest cotton-manufacturing city in the country, while I was down there a gentleman called on me at the hotel and wanted me to go across the Brazos River and look over a cotton plant. He wanted me to go over there and view a cotton plant with a purpose of interesting New England capital in developing cotton plants through that section. I told him I did not know much about cotton mills, although I had lived in the atmosphere of cotton mills all my life, but my business had been outside of cotton mills.

When we got over there I found that they had some second-hand machinery which came from my own city, Fall River, which had been shipped down there and had the mark of my own city on it. I looked over the plant somewhat critically—not as an expert—and I said, “You can not interest New England capital in a proposition of this kind; your machinery is rusty; it is out of use; you have not used it for a long time; and it was second hand when you bought it.” I found three or four plants down there that had second-hand machinery with the stamp of Fall River manufacturers on it. I said that proposition was something that no one would look at.

Now, in 30 years, of course, the South has advanced very materially and has come in competition with the North in cotton manufacture; and they now have plants which are equal to our own. In the State of North Carolina, I believe, they have more spindles than Massachusetts has; and other southern States have also made remarkable progress.

There has been that great improvement in the cotton mills of the South; and that has come about without any Government ownership or Government control, but has come out in the line of competition. And it seems to me, looking at that not from a scientific standpoint, because I am not a scientific man, but looking at it from a practical standpoint, that if this industry is left open to the public development of the art, that arises from every-day use—from the experience

of the amateurs who have been life-savers to the Navy during the war in furnishing operators for their plants when they could not have operated without those amateurs—I have evidence of that, from correspondents in my own city and know of the plants that these young men have developed in their own houses and of the improvements that they have made.

In view of all these things, I want to know whether that would not be very much more to the advantage of the art, the improvement of foreign trade which we are now aiming for, and would not be very much broader than any development by the Navy itself? The Navy is broad enough to run the Navy but not broad enough to run the world; not broad enough to establish, because they do not know anything about business, except what they read and what they learn by mixing with the people. And they do not mix with the people; they do not touch the people in their daily lives, as I do, and as every public man does, and is obliged to do in order to keep himself in touch with life and conditions in this country.

The Navy has a plan now by which nobody could get out of the Navy unless they can keep three hours in the water—

The CHAIRMAN (interposing). Are there any other questions?

Mr. GREENE. I wanted to question Mr. Nally.

The CHAIRMAN. Well, I suggest that what we want to get is Mr. Nally's viewpoint, and not to give our own.

Mr. GREENE. Well, I would like him to say whether he thinks my viewpoint is correct or not. I want to bring this point out: Whether you think, as a man—this has nothing to do with any official view—but whether you really think that the wireless art would be likely to develop and improve very much faster under private development and private ownership than it possibly could under the stagnation of Government ownership?

Mr. NALLY. I feel sure that that would be the case, Mr. Greene.

Mr. HADLEY. I would like to ask one additional question, Mr. Nally:

You alluded in your discussion to the probable effect on international relations of the Government ownership and operation of the high-power business. I think you touched upon it in connection with some correspondence of the Secretary of the Navy. But you did not express your views. I wish you would amplify them.

Mr. NALLY. What I meant was that, in the event of war, a privately owned station in Argentina, for example, would have much more show to continue in operation than a station that might be owned in Argentina by the United States Government. I think it would have much more chance to continue in operation than a station that might be owned by the Argentine Government. I think that, being in private hands and working under the conditions under which it would be necessary to work it in order to comply with the Argentine law—and that law requires that we shall have a certain number of Argentine citizens in the Argentine stations—that in the event of war between Argentina and this country, that station would remain in the hands of American owners; that is which would probably not be the case if it were owned and operated by our Government.

Mr. ROWE. When we entered the war, did the American Marconi Co. do practically all the ship-to-shore business on the Atlantic?

Mr. NALLY. Over 90 per cent; yes.

Mr. ROWE. And how about the Pacific coast?

Mr. NALLY. Over 90 per cent everywhere.

Mr. ROWE. And did you own practically all the apparatus on the ships?

Mr. NALLY. Practically all.

Mr. ROWE. You have just stated that the Government had recently taken over this branch of your business?

Mr. NALLY. Yes.

Mr. ROWE. Who negotiated or represented your company in that transaction?

Mr. NALLY. I did.

Mr. ROWE. Before the negotiations began, was there any attempt to remove your apparatus from the ships?

Mr. NALLY. If it is entirely agreeable to you, I wish you would wait until the whole story is told by Mr. Sarnoff. It is such a long story that I did not undertake it; and anything I might say now would anticipate what he will say later, and he will tell the whole story.

Mr. EDMONDS. Before you finish, I would like to ask this: Has the sale been consummated?

Mr. NALLY. Yes.

Mr. EDMONDS. And paid for?

Mr. NALLY. Yes, sir.

Mr. EDMONDS. Would not the same line of reasoning that you say is potent as showing that the Government should own these shore stations follow as to the ships?

Mr. NALLY. I think not. I think there is some difference between the ship-to-shore stations and the high-power stations; then there is the fact, too, that there is more domestic—

Mr. EDMONDS (interposing). I am not talking about the high-power stations. I am talking about the ships themselves. Would not the same reason why the Government should own the shore stations communicating with ships follow as to the ship installations themselves?

Mr. NALLY. That has followed. The Government owns nearly all of the apparatus on the ships. They also purchased from us 330 sets that were in use on the Shipping Board's ships, in addition to the stations. That is, when we sold our ship stations we were compelled to sell our shore stations. This also will be explained more fully by Mr. Sarnoff.

Mr. WHITE. Then this was not altogether such a voluntary transaction as we were given to understand?

Mr. NALLY. No; it was not very voluntary.

Mr. EDMONDS. The statement was made before the committee that the transaction on your part was voluntary. I got here late this morning and I do not know whether you have mentioned that yet in your testimony.

Mr. NALLY. We will read our correspondence with the Navy Department, which will tell the whole story.

Mr. EDMONDS. You will read your correspondence with the Navy Department?

Mr. NALLY. Yes, sir.

Mr. EDMONDS. Who did the negotiating on behalf of the Navy Department?

Mr. NALLY. Several of the officers. It started originally with Commander Hooper; then with Commander Le Clair; and later finished by Commander Hooper.

Mr. HARDY. Will you allow me to ask you a few questions?

Mr. NALLY. Yes, sir; certainly.

Mr. HARDY. I understood you to say that prior to the war your company did 90 per cent of the business on the Atlantic and Pacific coasts?

Mr. NALLY. All ship-to-shore business.

Mr. HARDY. All ship-to-shore business. What I wanted to get at was this: How about a resulting monopoly? Can any competition be sustained against a well and strongly established and widely disseminated system already in existence and backed by plenty of money? Take the Marconi Co., for instance. When you have 90 per cent of the existing business, your stations are established along the shore where you find your business. Is it practicable for any little company or any outsider to come in and establish any competition with you?

Mr. NALLY. It has been done, Judge Hardy.

Mr. HARDY. Has it ever been successfully done?

Mr. NALLY. It has been done.

Mr. HARDY. Was it successful?

Mr. NALLY. Well, to the extent that it is still in force—there are quite a number of competitive companies. We feel that they are not rightfully our competitors because all have infringed our patents.

Mr. HARDY. Well, I want a frank and full statement along that line. Is not this business, practically and necessarily, a monopoly by the company that occupies the field effectually first?

Mr. NALLY. So far as the ship-to-shore business is concerned, it is better as a monopoly.

Mr. HARDY. That is exactly what I wanted to get at. A number of independent companies would have a hard road to travel after one big company got all the required stations, would it not?

Mr. NALLY. Well, I want to be entirely frank—

Mr. HARDY (interposing). That is what I want.

Mr. NALLY. Before the war, when the total American merchant marine consisted of about 600 ships that carried wireless apparatus, then it would, as you say; but now with that number increased by thousands and with that much larger field than ever before provided, these other companies would be free, under patents that they own, with apparatus that did not infringe our patents—there is no reason why there would not be a field for them.

Mr. HARDY. But your tendency would be to absorb all useful patents, and in that way prevent outsiders from competing with you?

Mr. NALLY. Well, we would continue to improve what we had and try to hold all, of course.

Mr. HARDY. As a matter of fact, what you are fairly and reasonably considering or contemplating is that your percentage of the business would increase, and, instead of having 90 per cent, at the end of a few years you would probably have 99 per cent of the business?

Mr. NALLY. We hope for 100 per cent.

Mr. HARDY. You hope, then, for a complete monopoly. Is that not the natural result of private ownership, that the strong companies would gradually weed out the weak ones?

Mr. NALLY. It is the natural result of good service.

Mr. HARDY. The natural result, then, of private ownership is monopoly?

Mr. NALLY. If it is good service.

Mr. HARDY. Of course, the interest of the company would be to give good service, to the extent——

Mr. NALLY (interposing). Naturally, that is the thing that dominates every effort in every enterprise.

Mr. HARDY. Your interest would be to give good service, and if you gave good service the result would be monopoly; is that correct?

Mr. NALLY. In other words, we would have it so that whoever wanted good service would have to come to us.

Mr. HARDY. It would be like all other business; a great established business would not have much trouble in driving out weak, independent interlopers, would it?

Mr. NALLY. No; I think not.

Mr. HARDY. Let me ask you another question along that line: Take it for granted that the natural tendency would be to monopoly by some big private company; after you have obtained the monopoly, would not your tendency then be, as to patentees, to hold them down, they having only one market in which they could sell their inventions? The enterprising inventive genius of America would have to come, so far as wireless is concerned, to your company alone, after you had obtained a monopoly of that business?

Mr. NALLY. Well, you see, you are confusing things. You started out with ship-to-shore business. I explained that ship-to-shore business is only a very small, collateral branch of wireless.

Mr. HARDY. I am starting out with the proposition that you suggest, that the private commercial interests should control this wireless, and especially the inland stations, and the next proposition is that that would result in a monopoly. Now, when it did result in a monopoly, would not the inventor have to deal with that monopoly?

Mr. NALLY. Not necessarily so; provided the inventor could invent something that would be better than anything the Marconi Co. had.

Mr. HARDY. Would he not run across this condition, that if he undertook to deal with an independent he would be dealing with a weakling who would be almost sure to be crushed out by your company.

Mr. NALLY. I do not think that is true.

Mr. HARDY. And, in addition to that, would you not have countless ways in which you could tangle up and obstruct any benefits he might derive from his patent, by litigation, claiming that it was not new—or whatever those methods are?

Mr. NALLY. I do not agree with you on that.

Mr. HARDY. Do you not recognize the fact that an old-established company can interfere, by litigation, and destroy practically all the benefits that a poor inventor gets, if he does not submit to its terms and sell his patent at their prices?

Mr. NALLY. I can see that all of those things could be done; but that does not argue that they will be done or have been done.

Mr. HARDY. Unless your company shall be altruistic and ready to give to the inventor what his invention is worth—if they shall be disposed to make him take whatever they want to give him, then they can obstruct him by those methods, can they not?

Mr. NALLY. Well, that has not been the history of such things. The Bell Telephone Co. had a monopoly. Prof. Pupin, as "a poor inventor," came around to them with an invention worth \$1,000,000, and they paid him \$1,000,000 for it; they did not try to get it for \$10 or \$100 or \$1,000. The Bell Telephone Co., and all large companies of the kind, are on the lookout all the time for inventions to improve the service.

Mr. HARDY. You thing, then, that a monopoly would be just as fair to an inventor as if his invention had some competitive buyers?

Mr. NALLY. I think not only that they would be as fair to him, but I think they would be fairer to him, because they would be capable of being fairer; because they have more money with which to pay for inventions than a small company.

Mr. HARDY. And do you thing that a private monopoly would be fairer in its treatment of an inventor than a Government monopoly would be?

Mr. NALLY. I think so; yes, sir.

Mr. BURROUGHS. As illustrated by the purchases made of the telegraph and cable business by the Post Office Department.

Mr. HARDY. I just wanted to ask you, along that line, one other question: Do you not think a private monopoly, having well-established apparatus and equipment, would be slow to scrap that costly apparatus that they had for a new invention unless they were compelled to do so in order to retain the business?

Mr. NALLY. I certainly do not think anything of the kind. I think that any company smart enough to build up a monopoly is smart enough to keep it; and no company can keep a monopoly by reactionary or obsolete methods, as it is absolutely necessary in order to maintain a monopoly to keep the service up to date.

Mr. HARDY. Your opinion is, then, that any big company having an installation of costly machinery would not hesitate to scrap it and install very expensive new machinery?

Mr. NALLY. Not for a minute.

Mr. HARDY. There would not be any tendency of that kind?

Mr. NALLY. No; not the slightest.

The CHAIRMAN. I think the history of our Patent Office would show that there are powerful companies in this country who have very valuable plants and who are rendering reasonably good service and have been doing so for the last 30 years, when some new invention came along which threatened to revolutionize their processes, by some hook or crook, bought it up rather than to go to the expense of scrapping the expensive plant and organizing along the lines of utilizing the new invention, and that by buying at an extremely small price to control them rather than to scrap their plant or revolutionize their methods of doing business; and I think you take an altruistic view about it. But, as I understood you, a private monopoly is preferable to a Government monopoly, because of being altruistic, and that the people and the inventor would get a square deal under private monopoly; is that your view?

Mr. NALLY. Yes, sir.

The CHAIRMAN. Now, about control: I assume that this is an issue, whether or not the Government or the Marconi Co. shall monopolize the wireless of ship-to-shore stations or in the continental or international business, because up to date no other company has had the courage to enter the field and contest seriously with the Marconi Co., and I am not saying whether that is desirable or not—but about the the control, I think you will agree with me that the Marconi—and I say that so far as I know their management has been clean and capable and progresive; and if we are to have a private monopoly there is no other company I would like to have control of it more than your company, but divorced absolutely from foreign control or ownership.

Mr. NALLY. If foreign control or ownership were hurtful to it, I should say yes. But why do you single out the Marconi Co.?

The CHAIRMAN. Because it is the case of the company under discussion.

Mr. NALLY. How about the cables and the telegraph and the ships and everything else?

The CHAIRMAN. So far as ships are concerned, under the American flag, we have tried to divorce them from foreign control by legislation. And now the British Marconi is, to all intent and purposes, a government control instead of private, is it not?

Mr. NALLY. It is not, sir.

The CHAIRMAN. Have they any other agencies for international intercourse by wireless than the Marconi?

Mr. NALLY. Why, yes; they have their own agencies.

The CHAIRMAN. What are they?

Mr. NALLY. The British Government has its own shore stations, and they also have several admiralty stations for purely military purposes.

The CHAIRMAN. I am speaking about commercial business. I am asking for information, because I have no knowledge about it.

Mr. NALLY. You see, Judge, this high-power transoceanic and transcontinental wireless is a "new baby." It was born just when the war broke out, and its growth has been retarded ever since. None of these high-power circuit projects which were planned about the time of the war have been able to operate except in the way the governments have operated them, and private enterprise has not been given full opportunity as yet in transoceanic communication.

The CHAIRMAN. Ought they not to be American owned and controlled?

Mr. NALLY. They are American owned and controlled.

The CHAIRMAN. You said that one-third of the stock in your company is owned by the British Marconi?

Mr. NALLY. I said one-fourth.

The CHAIRMAN. It would be desirable if all of it were American owned, would it not?

Mr. NALLY. But its stock is nonvoting.

The CHAIRMAN. By virtue of the constitution and by-laws of your organization?

Mr. NALLY. No. They have agreed to make it nonvoting.

The CHAIRMAN. The British Government, then, speaking plainly, would have no control over your company directly or indirectly?

Mr. NALLY. The British Government, strictly speaking, has no control at all over the British Marconi Co.

The CHAIRMAN. Are you certain of that?

Mr. NALLY. I am sure of it; yes.

The CHAIRMAN. In your investigations of conditions in Mexico and in Central America, have you secured copies of their constitutions and statutes concerning the ownership and control of wireless that will be available to the committee for information?

Mr. NALLY. I have not any with me; no, sir. But we have such documents.

The CHAIRMAN. If you have, we would be glad to get it, as I would like the committee to obtain all the information it can on this subject.

Mr. NALLY. I think I can get them for you.

The CHAIRMAN. We would be obliged to you if you can do so.

(For laws referred to see pp. 400 to 409.¹)

Mr. GOODWIN. What countries have developed this art most extensively?

Mr. NALLY. I think the United States and England.

Mr. GOODWIN. What countries have nationalized these activities of wireless intelligence?

Mr. NALLY. The only countries that I can recall are Japan, China, I think Norway, and I suppose Mexico. But Great Britain, United States, Germany—I am not able to say now positively about France or Italy, because there are no commercial high-power stations operating in those countries. But the countries that have most developed high-power wireless have left the development in the hands of private companies—that is, England, Germany, and the United States.

Mr. HUMPHREYS. May I ask a question, Mr. Chairman?

The CHAIRMAN. Oh, yes.

Mr. HUMPHREYS. I want to go back to that question of monopoly of ownership and operation, the different aspects of the question, not economic but scientific. In your opinion, is it necessary for one central control, either in private ownership or Government ownership, in order to prevent the interference in the waves?

Mr. NALLY. I have not gotten your question clear. Do you mean so far as private ownership or so far as I suggested?

Mr. HUMPHREYS. It has been suggested here that there must be a monopoly of operation, either in Government or in some one privately owned and operated company, in order to prevent interference in the ether.

Mr. NALLY. I do not think that is necessary. If some national radio commission with powers such as I suggested to regulate wireless is constituted, I do not think then that it makes any difference.

Mr. HUMPHREYS. I just wanted to get your opinion on that subject. Now, one other question: We have two kinds of monopoly, one by law and the other by merit, we may say. Your object was to go out and fairly win 100 per cent of the business?

Mr. NALLY. Yes; that is our object.

Mr. HUMPHREYS. If you failed to avail yourself of the inventions that were made, that would add to the economy of the service:

¹ For wireless laws and regulations of the different countries see Yearbook of Wireless Telegraphy and Telephony, 1918, published by The Wireless Press (Ltd.), Marconi House, Strand, London, W. C. 2; Sydney, N. S. W., Wireless House, 97 Clarence St.; New York, U. S. A., 42 Broad Street, which will be found in the Library of Congress.

then, of course, your hold on the public favor and patronage would be to that extent jeopardized?

Mr. NALLY. We would lose it, Mr. Humphreys.

Mr. HUMPHREYS. Whereas if you had a monopoly by law you could or not, as you chose, adopt any improvements that were presented, and nobody else could take it if you had the monopoly under the law?

Mr. NALLY. If there is an improvement in wireless, an improvement of the kind that you had in mind, something that will make a capacity for 100 messages where perhaps we had a capacity for, say, 10 messages before?

Mr. HUMPHREYS. Yes.

Mr. NALLY. It is inconceivable that any private company having bought a device that may increase their capacity twofold or fivefold or tenfold or thirtyfold would not accept it. If they did not do it the inventor could very easily find capital to build a competing system that would force the reactionary company out of business.

Mr. HUMPHREYS. That is, where a monopoly is not by law?

Mr. NALLY. Yes.

Mr. HUMPHREYS. Is there any reason why, assuming that your company had gone out and gotten 100 per cent of the business, or 90 per cent, the Government could not regulate your rates and practices under the law as fairly as they have the rates of the railroads and telegraph companies?

Mr. NALLY. There is no reason.

Mr. HUMPHREYS. So that the Government could very readily prevent your adopting extortionate rates or oppressive practices even if you had the monopoly of the business?

Mr. NALLY. I will state as a case in point an instance where we did have a patent monopoly by reason of a certain invention, the high-frequency invention, under which we took a license, and for which we had to pay the National Electric Co. 20 per cent royalty. The National Electric Co. lost out in litigation with another company, and although we had a contract with the National Electric Co.—under which we had a right to cancel on 90 days' notice—we took the chance and canceled that contract, and then we voluntarily reduced the rental on 500 ships an amount equal to what we had been paying the National Electric Co. under the contract. Although we had contracts with all our shipowners requiring them to pay us \$1,200 a year, we reduced it to \$1,000.

Mr. HUMPHREYS. Do you expect to engage in transoceanic business in competition with the cable companies? What do you think of the desirability of forbidding by statute any interlocking directorates between the two companies—the Cable Co. and the Marconi Co.?

Mr. NALLY. I think that is already forbidden in the Sherman Act and subsequent statutes.

Mr. HUMPHREYS. That is forbidden?

Mr. NALLY. Yes.

Mr. HUMPHREYS. And you think that would prevent any agreement that would eliminate the competition between the two?

Mr. NALLY. I think it would prevent it.

Mr. SAUNDERS. In view, Mr. Nally, of the direction this inquiry has taken, I would like to ask you two or three questions. Having in mind the suggestions embodied in the questions of Judge Hardy, is

not the logic of that some action in relation to the patent laws rather than to Government ownership of this particular enterprise? In other words, is not the logic of what he had to say about a strong company backing some particular invention, and therefore being able to drive other competitors out of the field, applied to everybody who invents something new, something which no one else can operate under the patent laws of the United States?

Mr. NALLY. Yes, sir.

Mr. SAUNDERS. He has got a hold of something which nobody else can utilize. He forms a company which, by virtue of the merits of that particular proposition, soon enlarges and becomes a big company. How can you break in on that except with a new invention, or, so to say, scrap the old invention, so that all the suggestions that in a general way would apply in this connection to the Marconi invention would apply to every other invention which was patented under the laws of the United States?

Mr. NALLY. Yes, sir.

Mr. SAUNDERS. With respect to this particular invention, the conditions between one company that holds an invention or improvement in this field and another company—is not here one radical difference between this and any other field of enterprise that it is a basic field that nobody has a right to enter, nobody can get a patent to use the other; it is a patent on some instrumentality using the other? Are the Marconi people the only people holding patents on methods agitating the ether, setting in motion these waves which are being taken up at the other end for the transmission of intelligence?

Mr. NALLY. There are some other patents.

Mr. SAUNDERS. You do not hold any exclusive patent in this field?

Mr. NALLY. No.

Mr. SAUNDERS. To the extent that these other patents offer as good service as you do or conceivably a result of their particular invention a better service than you do, they are in a position to enter into free competition with you because they have the basic element which you all use and which you can not crowd them out of except by adopting superior instruments for the transmission?

Mr. NALLY. Yes. The same situation exists with regard to the land telegraph.

Mr. SAUNDERS. In the telegraph, of course, you have got to establish your physical wires, so far as that is concerned, but in the field of wireless here is this field ready to be operated by anybody who invents a means of using it. And what I understand you to say now is that you do not hold any exclusive patents on any instrumentalities for the use of the ether, but that there are other competing patents?

Mr. NALLY. There are many others. There are some in which questions are involved which have not yet been adjudicated.

Mr. SAUNDERS. If you hold these competing patents would you be any different from any other patentee of a new invention in that respect?

Mr. NALLY. No, sir.

Mr. SAUNDERS. In respect to this from point to point development in the United States, having in mind the simplicity of the apparatus, that is, the facility with which it can be established within the United States, if there are other inventions as good as yours or even better than yours, how would the size of your company prevent competition between your company and others under circumstances of that sort?

Suppose a company wanted to erect two wireless stations, we will say, to communicate between Washington and Richmond. The only backing that would be required in connection with a company would be, of course, to establish the two plants, one here and one in Richmond, and then the possibilities of return from there. Would not that prevent a fair field for competition on the part of the smaller company with the larger companies?

Mr. NALLY. Where the smaller companies or individuals have patent rights there is nothing in the world to restrict them.

Mr. SAUNDERS. Because they can all get to the ether?

Mr. NALLY. Yes.

The CHAIRMAN. Your object, then, would be to have the instrument to get to the ether, and they control the instruments?

Mr. SAUNDERS. I understand not.

The CHAIRMAN. Nobody has got a patent right on the ocean.

Mr. SAUNDERS. Your illustration is just in point. It is destructive to this argument.

Mr. EDMONDS. Germany tried it, but lost out.

Mr. SCOTT. The present plan of the Government, as outlined by the Secretary of the Navy, is to control the high-power stations in the United States regardless of their purpose. I mean by that regardless of whether commercial or military or otherwise.

Mr. NALLY. Control of wireless.

Mr. SCOTT. At the present time the Marconi Co. and subsidiary companies are not operating in many countries. You have not any stations in Canada?

Mr. NALLY. There is a Marconi Co. in Canada, but it is separate.

Mr. SCOTT. A separate company, independent of the British Co.?

Mr. NALLY. And independent of the Marconi Co.

Mr. SCOTT. Have the Marconi Co.—when I say “Marconi” I refer to subsidiary companies also—any stations in South America at the present time?

Mr. NALLY. The American Marconi Co.?

Mr. SCOTT. Any of the Marconi companies?

Mr. NALLY. Yes; there is an Argentine Marconi Co.; there is a Brazilian Marconi Co.; and I think a Chilean and Peruvian Marconi Co.

Mr. SCOTT. At the termination of the war those companies in Great Britain, France, Chile, South America, Canada, and the various other places will operate as they did before the war?

Mr. NALLY. Canada is already operating; they resumed about 10 days ago.

Mr. SCOTT. You make contracts with merchant marine and install the equipment, do you?

Mr. NALLY. Yes, sir.

Mr. SCOTT. And the British Co. and the other companies use a peculiar character of instrument?

Mr. NALLY. Yes.

Mr. SCOTT. That conforms with your sending station or receiving station, as the instance may be?

Mr. NALLY. They have their own type.

Mr. SCOTT. Supposing that you in your progress in connection with sending messages should decide to alter your method of send-

ing, it would necessitate changing the apparatus on shore and ship, would it not?

Mr. NALLY. I do not know just what you mean. You see, we are regulated by the act of 1912.

Mr. SCOTT. You mean here in this country?

Mr. NALLY. Yes.

Mr. SCOTT. I am talking about the foreign countries.

Mr. NALLY. It is the same all over; the law is international.

Mr. SCOTT. The point I am trying to bring out is, for instance, whether if the United States Government should take over the Marconi system and operate it it might not develop that while the United States Government was engaged operating the wireless system in this country that the Marconi companies elsewhere, having equipment on a large percentage of the merchant marine—because you will remember that when we got into this war we had less than 10 per cent of the ships on the ocean that were operating under the American flag—it might develop that a large percentage of the merchant marine of the country will be using your instruments, and a new invention would require you to change your instruments on shore and on the ships, and the United States Government would be left with a government-ownership proposition where they would only be able to communicate with a small percentage of the merchant marine; is that a possibility?

Mr. NALLY. It is not a probability.

The CHAIRMAN. I take it that all red-blooded Americans would prefer that American ships be controlled by American companies rather than by foreign?

Mr. SCOTT. I did not get that.

The CHAIRMAN. I take it that all red-blooded Americans would prefer for the American merchant marine to be controlled by American corporations rather than by foreign corporations?

Mr. SCOTT. I presume so.

The CHAIRMAN. Your position is that we should give it over to foreigners?

Mr. SCOTT. If the 14 peace propositions prevail, we will all be one family before long.

The CHAIRMAN. Possibly.

Mr. SCOTT. If the United States Government should take over this project in compliance with the present plan and they should enter the field of commercial work, they would be obliged to communicate from the stations in this country with the Marconi stations in other countries, would they not?

Mr. NALLY. Yes; or with such Government-owned stations as they might be able to find.

Mr. SCOTT. I do not understand that under the present plan the United States Government contemplates building and maintaining stations in South America and various other countries. There was comment made on that fact.

Mr. NALLY. I think that is one of their plans.

Mr. HARDY. If I understand the gentleman's question, it relates to the possibility that the Marconi companies, having practically covered the field of Great Britain, France, Chile, Peru, and South America generally, and Canada, might take it into their heads, in order to nullify the value of the American plan, if it was Govern-

ment owned, to change their instruments and get out of tune. Could they not do that just as well if there was a private monopoly in the United States?

Mr. NALLY. That is such a remote possibility that it were almost ridiculous to discuss it.

Mr. HARDY. Then, in your judgment, there is no use in contemplating the probability of the Marconi companies elsewhere trying to kill the American company because it is Government owned?

Mr. NALLY. Not any more than for England to attempt to make the English language the language of the world.

Mr. HARDY. So, in your judgment, that is not really an element in the situation?

Mr. NALLY. I do not think so.

Mr. HARDY. But as to this question of monopoly, with reference to the use of the patents, there are hundreds of ways in which big, strong, going business can beat down its competitors, are there not?

Mr. NALLY. There are a hundred ways that people can rob, steal, and murder.

Mr. HARDY. As a matter of fact, is not that a usual way for big business to beat its competitors down?

Mr. NALLY. Not any big business I have been associated with, Judge.

Mr. HARDY. You never heard of the Standard Oil undertaking to destroy competition by underselling and other methods?

Mr. NALLY. I have read of those things.

Mr. HARDY. Do you not know it is a fact that they did for a long time, and do you not know that under the domination of the Bell Telephone Co. it has been almost impossible to establish independent telephone companies even in a small community?

Mr. NALLY. I know the opposite to be the fact, Judge.

Mr. HARDY. You may know the opposite to be a fact in some places, but in my own town I know they tried it and they were driven out of business.

Mr. NALLY. I have had pretty broad experience in that field of investigation. I found there were more independent exchanges, and even more independent telephones, strange as it may sound, than Bell telephones.

Mr. HARDY. Hanging on by the eyelash?

Mr. NALLY. Yes; but usually due to the weak eyelash. [Laughter.] Usually because they did not deserve to succeed.

Mr. HARDY. Was it not because of this fact—

Mr. NALLY. If I may finish, Judge?

Mr. HARDY. Yes.

Mr. NALLY. Because those independent exchanges were run by the butcher, the baker, and the candlestick maker in those towns, and they did not know anything about the telephone, and yet they tried to run the telephone business. That is why they failed.

Mr. HARDY. Was it not also a fact that it was due to their small capital; that they were trying to run an independent concern without as much capital as their competitors?

Mr. NALLY. I do not think so.

Mr. HARDY. Let me illustrate.

Mr. NALLY. I think there has been more private capital wasted on the independent telephone exchanges than there has been invested by the Bell institutions.

Mr. HARDY. Nearly all the independent exchanges have been lost.

Mr. NALLY. Deservedly so, in most cases, because they were very poorly managed; I know that to have been the reason.

Mr. HARDY. The intention was good?

Mr. NALLY. Yes.

Mr. HARDY. Do you think that in this wireless business the independents would have more capital to try to compete with your universal Marconi Co. than the independent telephone companies had to compete with the Bell telephone, that the independents would really have some chance?

Mr. NALLY. If the independents deserved to succeed.

Mr. HARDY. Mr. Nally, just to put it down in plain black and white, do you not know that if this thing is left to commercial enterprise that your company will have an absolute monopoly in nearly all countries in the world?

Mr. NALLY. As much as I might say I would hope for that outcome before I die, yet that is a large order. There are great obstacles ahead. I think, on the other hand, that wireless is going to open up more opportunities for all.

Mr. HARDY. For the butcher, the baker, and the candlestick maker, for those people to dig in with independent companies?

Mr. NALLY. And wireless men. There are more people studying wireless to-day than almost any other technical subject in the world.

Mr. HARDY. That is quite true; but if an inventor had an invention or patent to-day and undertook to put it on the market without consulting your company, would he not have a rocky road to travel?

Mr. NALLY. Yes; because no one would know the value of a patent as well as we, and no one could afford to pay as much for it.

Mr. HARDY. And he would not have as much money to develop it himself?

Mr. NALLY. He would if he had a real invention.

Mr. HARDY. As a matter of fact, if he had the patent, and you were not litigating with him, and nobody else was litigating with him, would he not, if he started to establish a station, be lacking in connections because of his relationships. He would be a single, lone individual like the independent telephone companies, would he not?

Mr. NALLY. I can not agree with you. There never has been as much opportunity for the individual as to-day.

Mr. HARDY. And yet you had obtained before this war 90 per cent of the business in America and expected to run it up to 100 per cent? Where is the independent going to be when you get the 100 per cent?

Mr. NALLY. It is because we are the only company who has developed; we are the only one entitled to it.

Mr. HARDY. Then you are the only people in America who had any enterprise?

Mr. NALLY. Up to this time.

Mr. HARDY. And yet you say there are hundreds of enterprising inventive geniuses?

Mr. NALLY. I am talking about developing. It has taken us 20 years before we developed it sufficiently to pay a dividend. Why talk about a great monopoly and encouraging the individual or the concerns that for 20 years must struggle in order to be able to pay 5 per cent dividends?

Mr. HARDY. When you get your institution up to 100 per cent, you think it is then time to consider a monopoly?

Mr. NALLY. Will you please consider that 90 per cent of 10 would only be 9, and 90 per cent of 500 would be \$450, and if there are only 450 ships, does not that mark the limitation?

Mr. HARDY. Do you mean to say that you could not get any more ship business than there are ships?

Mr. NALLY. That is exactly what I mean.

Mr. HARDY. And your monopoly would be limited to the number of ships?

Mr. NALLY. I mean, Judge, all depends on the limits of the field. It is the large field that makes competition.

Mr. HARDY. Was it not complained that your rental of instruments was annually at \$1,000 each, when you sold them for probably \$2,000?

Mr. NALLY. Yes.

Mr. HARDY. How do you account for your altruistic views consistent with the fact that you were charging \$1,000 rental a year on machinery—

Mr. NALLY. Very easily.

Mr. HARDY (continuing). That you sold for \$2,000?

Mr. NALLY. They are not altruistic; they are business reasons. I never claimed that the Marconi business was pure altruism; it is a business proposition, and if you will be patient the manager who follows me, I think, can convince you that while it was not altruism it was fair business.

Mr. HARDY. It is a little argumentative, yet is it not a fact that the prohibition against monopolies, so far as it applies to your own wireless business, in your judgment, was a foolish proposition, and that we ought to favor a monopoly of wireless?

Mr. NALLY. That is your view. I did not entertain it.

Mr. WHITE. It is just what this bill is for, a monopoly.

Mr. NALLY. There is nothing I have said that would indicate we claim absolute monopoly.

Mr. GOODWIN. You stated just now that there had not been such opportunities in the world for individual effort as now?

Mr. NALLY. I said it is so in wireless and everything.

Mr. GOODWIN. But, still, you have a monopoly now of 90 per cent of this business?

Mr. NALLY. I wish you would get that straight. I wish you would understand what 90 per cent means. I answered the question about the ship to shore business. I will state that the ship to shore business was merely a collateral branch of wireless. I said that before the war there were about 500 ships and that we operated about 90 per cent of those. That is a monopoly proposition, as to those ships, but it is a limited monopoly, is it not?

Mr. WHITE. And it had no reference to the possibilities of your business?

Mr. NALLY. No.

Mr. GOODWIN. On what proposition did you hope to get 100 per cent part of the business?

Mr. NALLY. That the others than the 500 ships mentioned that had infringing apparatus might be made to see the error of their ways.

Mr. GOODWIN. Then, what opportunity would there be for individual effort to get anywhere if you get 100 per cent monopoly?

Mr. NALLY. In the future of the art—our patents do not last forever—or incentive to inventors to get away from our control of the patents, if you please. But not to go into competition with us with any apparatus, which they did not have any right or title to.

Mr. GOODWIN. What other patents has your company bought up, if any?

Mr. NALLY. Bought up?

Mr. GOODWIN. Bought and having utilized?

Mr. NALLY. Well, we are utilizing a number of basic patents.

Mr. GOODWIN. How many have you bought that you have not utilized?

Mr. NALLY. I can not tell you.

Mr. GOODWIN. About how many?

Mr. NALLY. I can not tell you.

Mr. GOODWIN. You can make a rough guess.

Mr. NALLY. No; I could not.

Mr. GOODWIN. A half dozen?

Mr. NALLY. A half dozen, or it might be 50; we can not tell. We have patents—take Prof. Pupin's patents, which he refers to, and which we bought but which we never utilized because we have other patents which made that patent obsolete.

Mr. GOODWIN. What is the use of buying patents if you do not utilize them?

Mr. NALLY. Because something better comes into the field, and we scrap the old patent and use the new one.

Mr. GOODWIN. But did you buy with the idea of utilizing, and then did not use the patent?

Mr. NALLY. No; we were not so foolish.

Mr. GOODWIN. Then, do you buy anything that comes along in the way of a patent?

Mr. NALLY. We do not buy everything that comes along; we buy what seems to fit into our business, and we utilize that until something else comes along that scraps it.

Mr. GOODWIN. Do you then seek to develop that to the highest point of efficiency?

Mr. NALLY. Always.

Mr. GOODWIN. And then scrap it?

Mr. NALLY. Scrap it, I say, if something else comes along that is better.

Mr. GOODWIN. Do you scrap that and use the same thing you have had all the while?

Mr. NALLY. Do I scrap and use it, you mean?

Mr. GOODWIN. And use that which you have had all the while?

Mr. NALLY. We can not use it if we scrap it, and we can not scrap it if we use it.

Mr. GOODWIN. No; I say this, do you buy a patent, scrap that, and use the same old patent that you had?

Mr. NALLY. I can not understand your question.

The CHAIRMAN. For instance, why did you buy Pupin's patent?

Mr. NALLY. Because it was good when we bought it.

The CHAIRMAN. Did you have anything as good at that time?

Mr. NALLY. No; or we would not have bought it.

The CHAIRMAN. Why did you not use his patent?

Mr. NALLY. Because we got something that was better afterwards.

Mr. GOODWIN. Is it not a fact that you do buy a great many patents and put them in the "cellar," as the saying goes?

Mr. NALLY. It is not true; it is absolutely untrue.

Mr. HUMPHREYS. There is one matter I just want to get cleared up. You speak of the Marconi Co., and Judge Hardy spoke of this universal Marconi Co. These various Marconi companies have the same name "Marconi," but they have no basis of business relations? You use the word "Marconi" very much as we use the word "telephone" or "telegraph"; is not that the idea?

Mr. NALLY. It is because "Marconi" means wireless.

Mr. HUMPHREYS. That is what I thought. It is not the same company?

Mr. NALLY. No; it means wireless.

Mr. HUMPHREYS. Let me ask you this question. I am interested in this patent matter to some extent, solely from the standpoint of the patentee, disregarding the public interests altogether. You had 90 per cent of the business; that means one thing. There are 12 companies, each one doing, say, 8 per cent of the business, and the patentee has an invention that would effect a saving of 10 per cent of the operating expenses. He comes to you, and you buy his instrument. That would be effecting a saving of 10 per cent or 9 per cent of the business. If, in place of your company, there were 12 companies and he would come to you, his invention would be effecting a saving of 10 per cent or 8 per cent. I say, looking at it solely from the standpoint of the patentee, he would be very much more likely to get a large compensation from you, who had 90 per cent of the business, than he would if he only had 8 per cent of the business?

Mr. NALLY. Yes; because it would increase our business just that much.

Mr. HUMPHREYS. It might mean the saving of money, of hundreds of thousands of dollars, to you yearly, whereas if you had only 8 per cent of the business it would be just one-twelfth.

Mr. SCOTT. Mr. Nally, the question of the value of patents is as much of a controversy with private concerns as it is with the Government, is it not?

Mr. NALLY. Yes, sir.

Mr. SCOTT. The Lewis & Browning case was a matter that was scattered around the country for the edification of the people and was a controversy as to the value of a patent in which the Government solely was interested?

Mr. NALLY. Yes.

Mr. SCOTT. So that the relative merits of a patent can become as enthusiastic a proposition for discussion whether the Government is interested or not?

Mr. NALLY. You are right.

Mr. SAUNDERS. Mr. Nally, there is nothing at any time, having in mind experience in other directions, that will hinder you from being displaced by some invention of superior merit to yours, is there?

Mr. NALLY. No, sir.

Mr. SAUNDERS. A few years ago the first, as I recall, successful commercial adding machine was what was known as the Burroughs adding machine, and that machine dominated the whole commercial

world for a time. To-day there are a number of first-class competing adding machines, several of them claiming to be the superior of the Burroughs.

Mr. NALLY. I think it is true also of the typewriter.

Mr. SAUNDERS. It was true also of the typewriter. That applies to your situation, does it not, under the patent laws and under the general conditions in the business world?

Mr. NALLY. Just the same.

Mr. SAUNDERS. In respect to this suggestion that the Bell people, as that has been brought in as a matter of discussion, I want to put a little of that into the record—the Bell Telephone Co. interfering with the independent concerns “hanging on with eyelashes.” Is not, as a matter of fact, this the situation, that a number of these little fellows, thinking that the Bell people were making enormous profits at the rates they were charging, went into the telephone business and charged a much lower toll rate than the Bell people did, one that did not provide for replacements, and one which did not provide, as has been the experience of all people who have been in it for awhile, for the increasing expenses that go along with any telephone company as it gets old, and as a result of that found themselves in a few years “hanging on by their eyelashes,” but as a result of their own lack of business foresight and not as a result of any competition or interference by the Bell people?

Mr. HARDY. Won't you let me illustrate by using my home town of Corsicana as an illustration as to just what the facts were?

Mr. SAUNDERS. No; I want him to answer that.

Mr. NALLY. I would like to say I know of numerous instances where independent companies have gone into towns like Corsicana and where they called on leading citizens, and they would picture the enormous profits which these citizens—the banker and the judge and the other prominent citizens—could make by investing in a certain telephone outfit. They then told that story about the poor washerwoman who was compelled to take a share of telephone stock in payment for a bill for laundry, and who held on to it, not knowing its value, and was finally worth \$10,000,000. You hear those stories. They tell the same story about the wireless business. That banker and that judge and prominent lawyer put their money into this local enterprise; they did not know any more about that business than I know about banking or than I know about the law. The man who started that local telephone exchange moved to another city and allowed them to “hold the bag.” He went all around the country and organized other exchanges.

Mr. SAUNDERS. We established in my county one of those local companies. We actually had an exclusive charter. We had a monopoly all right, and we started out with the idea that the low rate would pay us these handsome dividends. The Bell people have not interfered; they have given us all sorts of help. Right now they are doing that with respect to interchanging messages, and so on. But as time went by and, as I said—that is the experience of all telephone companies—your expenses increase, and as you increase the number of your phones your expenses increase instead of being reduced as the business increases, and now we are not paying any dividends at all and can not pay them. But the Bell people are not responsible for that situation. [Laughter.]

Mr. HARDY. We were paying \$3 for a telephone for a private dwelling and \$4.50 for offices when the independent company established their system and began to connect their rural connections. They started out at \$2 for a resident and \$3 for an office. The minute they got an established patronage of perhaps two or three hundred customers the other people put their rates down to \$1.25 for a residence and \$2 for offices, and they kept it there for five years, until they drove that independent concern out of business.

Mr. SAUNDERS. That was a case of piratical interference; I agree with that.

Mr. EDMONDS. I would like to say that the best investment I have in Philadelphia is in an individual local telephone company—the Keystone Telephone Co.—and I get my dividends regularly. I would like to put in the record, Mr. Chairman, in connection with this the quotation from the report of the United States census for 1912:

According to the United States census for 1912, there were 1,740 independent telephone companies with over \$5,000 annual income from 12,237,721 stations. Many of these companies connect with the Bell system. The capital invested is approximately \$3,824,000 and the income is about \$48,950,000 per annum.

The CHAIRMAN. The committee will now take a recess until 2 o'clock this afternoon.

(Thereupon, at 12.45 o'clock, the committee took a recess until 2 o'clock this afternoon.)

AFTER RECESS.

The committee reassembled pursuant to the taking of recess.

The CHAIRMAN. The first gentleman to be heard this afternoon is Mr. Sarnoff. You may proceed, Mr. Sarnoff.

STATEMENT OF MR. DAVID SARNOFF, COMMERCIAL MANAGER OF THE MARCONI WIRELESS TELEGRAPH CO. OF AMERICA AND VICE PRESIDENT OF THE PAN-AMERICAN WIRELESS TELEGRAPH & TELEPHONE CO.

Mr. SARNOFF. Mr. Chairman and gentlemen, Mr. Nally stated that I would explain the circumstances which led up to the sale of the Marconi coastal stations and ship sets to the Navy Department, and, without preliminaries, I will proceed to tell the facts, which follow:

The Marconi Co. maintained an extensive chain of coastal stations on the Atlantic, Gulf, and Pacific coasts, as well as on the Great Lakes. These coastal stations were erected for the purpose of carrying on communication with ships at sea, and prior to the war were operated by the Marconi Co. in accordance with all the requirements of international laws, as well as the laws and regulations of the United States, which means that these coastal stations were open for service with ships at sea regardless of the system of radio apparatus used by these vessels.

The Marconi Co. leased its apparatus to American shipowners and furnished not only its equipment but trained wireless operators, as well as the necessary maintenance and repair of the apparatus and all other items which are included in a comprehensive wireless service organization. The coastal stations, the ship stations, the wireless

operators, and all the other items of service constituted what has been referred to as the Marconi Co. since its organization was responsible for a large number of vessels carrying wireless apparatus and the excellent service rendered shipowners and the public generally.

The Navy Department manifested its hostility toward the Marconi rental system wherever and whenever it had an opportunity to do so and, through its various agents, encouraged those who endeavored by the outright sale of infringing apparatus and ruthless competition to make inroads upon the Marconi rental system.

Although this attitude on the part of the Navy Department made matters extremely difficult for the Marconi Co., yet we persevered in the face of these hardships, and when our country entered the war the Marconi Co. maintained its wireless apparatus on over 500 American merchant vessels, as well as its chain of coastal stations, numbering 45.

When our country severed diplomatic relations with Germany Mr. Nally, the vice president and general manager of the Marconi Co., at once telegraphed the President of the United States as follows:

FEBRUARY 3, 1917.

His excellency, Hon. WOODROW WILSON,

President, United States of America, Washington, D. C.:

The Marconi Wireless Telegraph Co. of America, in accordance with the act to regulate radio communication approved August 13, 1912, hereby places at the disposal of the Government for use in any emergency its entire organization and personnel, including its high-power and coastal stations wherever situated, its manufactories, workshops, and trained staff. Myself, associated officials, and staff are subject to your orders or to the orders of any particular department of the Government which may need our services. I shall be glad to proceed to Washington for conference if you so desire.

EDWARD J. NALLY,

*President and General Manager of
Marconi Wireless Telegraph Co. of America.*

Immediately upon the declaration of war by the United States the Marconi Co. turned over to our Government its entire system of coastal as well as high-power stations in this country.

Just as soon as the Navy Department obtained complete control of all wireless stations and operations in the United States, it followed a line of action which appeared to us calculated to destroy the Marconi rental system and to render the Marconi coastal stations worthless at the end of the war, so that no alternative would be left the Marconi Co. except to sell its coastal stations to the Government. So well were those plans of the Navy Department laid and followed, that the ends sought by them were obtained even before the war terminated.

The United States Shipping Board, having requisitioned about 300 American merchant vessels equipped with Marconi apparatus and operated under the Marconi rental contract, made no request to the Marconi Co. that it terminate the rental contracts and sell the apparatus on these ships. On the contrary, our relations with the United States Shipping Board were at all times most cordial. In fact, the New York branch of the United States Shipping Board entered into a contract with the Marconi Co. immediately upon the declaration of war for the repair of the radio equipment on over 30 German vessels interned in various parts of the United States, the German apparatus on these ships having been damaged and in some cases destroyed by the German officers before they left these vessels.

The Marconi Co. also furnished trained radio operators for these vessels and made efforts to supply the larger needs for radio equipment and radio operators which we foresaw the Shipping Board would have.

But our attempts to carry on this work were promptly blocked by the Navy Department, which contended that it would care for the needs of the Shipping Board.

What plans the Navy Department followed to change the attitude of the Shipping Board we do not know, but the first result of their program was that the Marconi Co. was instructed not to maintain its own apparatus on vessels requisitioned by the Shipping Board, this work having been assigned to the Navy Department.

The Marconi Co. was, therefore, kept from looking after its own sets installed on merchant ships, but nevertheless we reduced our monthly rental charges by an amount equal to the cost of maintenance and repair.

The next step taken by the Navy Department was to request the Marconi Co. to sell its apparatus outright and to terminate its rental contracts.

The Bureau of Steam Engineering in its letter to the Marconi Co. of May 29, 1918, stated:

The bureau is opposed to the payment of rental for leased radio apparatus at any figure.

Feeling that the Navy Department had not given full consideration to our side of the case, and that its attitude was one of discrimination, I addressed a letter to the Bureau of Steam Engineering on May 6, 1918, which letter perhaps will give to the committee the clearest conception of the points involved, and, therefore, I beg to read the letter referred to:

MARCONI WIRELESS TELEGRAPH COMPANY OF AMERICA,

May 6, 1918.

BUREAU OF STEAM ENGINEERING,

Navy Department, Radio Division, Washington, D. C.

Attention Lieut. Commander H. P. LeCLAIR.

SIRS: With further reference to my letters of April 12 and 25 and subsequent interview in your office, on the subject of the Marconi Co.'s rental contracts covering radio equipment installed on merchant vessels, I beg to submit our further explanations as to the reasons for our present rental rates and the factors which govern them.

The Marconi Co. charges \$1,000 per annum for the rental of its equipment installed on any merchant vessel, and since the entrance of this country into the war, we have deducted from this amount \$60 per annum in respect to any vessels upon which the apparatus is maintained by the Navy Department. Thus the net rental paid to the Marconi Co., at the present time, is \$940 per ship per annum.

As I have indicated in my previous letters and discussions on this subject, it has taken about 15 years to successfully organize and develop the rental business and to bring it to a position where it can be operated on a reasonably profitable basis. All sorts of rates were charged steamship companies by competitors for the rental of apparatus prior to 1914 and the results were unsatisfactory and unprofitable, both to the steamship companies, and to the radio organizations which conducted the service. This is especially true in the case of the United Wireless Co., which, prior to 1912, had charged steamship companies a rental of approximately \$7 per annum, and although it operated, at that time, upwards of 400 vessels, the results based on these charges were such as to throw the United Wireless Co. into bankruptcy. Aided from its failure to earn a reasonable profit on its investment, it was also unable to improve its

equipment and to keep the radio apparatus on merchant vessels in a state comparable to the advance of the radio art.

After the Marconi Co. purchased the assets of the United Wireless Co. it dismantled practically all of the apparatus installed on American merchant vessels and installed in place thereof, at its own expense, improved apparatus of the latest design, which is being purchased and used by the Government itself at the present time. This, as you will perceive, was an enormous undertaking on the part of the Marconi Co., which, by reason of its policy of improvement, was obliged to relegate to the junk heap about \$150,000 worth of radio apparatus in order to carry out this policy and to render steamship companies reliable and efficient radio service. It was necessary, indeed imperative, to place the rental business on a solid foundation and to ask steamship companies to make compensation in the form of rental commensurate with the improved apparatus and service.

Our present standard form of agreement was submitted to the majority of American steamship owners about the end of 1915, at which time the rental rates charged were \$1,200 per annum. The steamship companies at that time gave full consideration and made a thorough investigation of the subject and, though competition then, as now, was keen and others had offered steamship companies lower rental rates and the privilege of outright purchase of the radio equipment, yet the steamship companies, who are practical business men and recognize the value of service, determined that no proposition was as good as the Marconi rental contract, and accordingly signed our contracts and continued to receive all the advantages of our service. We have received no complaints from any of the steamship companies either against our charges or our service.

Prior to Judge Mayer's decision in the National Electric Signaling Co.'s high-frequency case, the Marconi Co. was obliged to pay the N. E. S. Co. royalty on all its apparatus, rented or sold, and embodying the feature of high-frequency sparks. Although this agreement with the N. E. S. Co. gave the Marconi Co. right under all the N. E. S. Co. patents, yet after Judge Mayer's decision in the high-frequency case the Marconi Co., at its own risk and expense, terminated this agreement and voluntarily reduced its rental rates to ship owners from \$1,200 to \$1,000 per annum.

When the United States entered the war the Marconi Co. was making satisfactory progress in its rental business, both as regards ships already equipped and those in the course of construction, but the Navy Department advised that it would furnish the equipment on all vessels over 2,500 tons, and while this at once deprived this company of the opportunity to extend its rental business, yet, because of the Government's desire, we promptly acquiesced.

Next we were informed that your department desired to own the radio equipments installed on any vessels purchased outright by the Government and that, so far as the Navy Department is concerned, it is opposed to the principle of paying rental. A number of vessels equipped with our system and under rental contract, were affected by this decision of your department, and, although we were deprived of the benefits which we were justly entitled to receive under the rental contracts then in force and covering the vessels within this class, yet, because of the department's expressed wishes in this matter, we likewise promptly acquiesced in this case and sold to your department the apparatus at extremely low rates and terminated the rental contracts.

Later we were instructed that the Navy Department would maintain the radio apparatus on all vessels controlled by the Government and that the Marconi Co. should reduce its rental by the amount it normally expended on the maintenance of the apparatus on such vessels. This procedure has not been followed by allied Governments, whose vessels continue to be equipped with radio apparatus under rental contracts. Foreign vessels belonging to our allied Governments also come to our shores and transport material and American troops abroad, but the rental contracts covering the radio equipments and service on such vessels continue undisturbed. We were given to understand by your department that your decision in this respect would not be altered, and while this further weakened our rental organization, yet we bowed to the wishes of your department and not only cooperated to the fullest extent, as you well know, but gave to the Navy Department a number of our skilled men and experts in this line in order that the Navy Department might receive the maximum support and assistance in the execution of its program. You will be interested to know that to date we have furnished the Navy Department with 33 skilled engineers, construction men, and inspectors, and approximately 225 experienced and licensed radio operators.

I might state that since this letter was written a number of additional employees of the Marconi Co. have joined the Government service, and at the time of cessation of hostilities the number of Marconi employees who had entered the Government service were as follows: Engineers and construction men, 35; transoceanic or high-power radio station operators, 26; and radio ship and coastal station operators, 395; making a total of 456 employees.

It now appears that some of the merchant vessels being operated by the Government have been taken over under what is known as a "bare-boat charter," and I understand that in such cases the particular department of the Government having the vessel in charge is obliged to pay the rental for the radio equipment which it uses. In such cases the Navy Department has expressed its opposition to the continuance of the rental contract and has requested us to sell the apparatus outright. The Marconi Co. is unable to comply with the department's wishes in this respect.

Aside from the legal rights which the Marconi Co. has under its rental contracts, which are between this company and the steamship owners and which still continue in force and can not be terminated by either party to the contract until the agreements shall have expired by their terms, we submit that the enforcement of the department's policy in this respect is not to the advantage of either the Government, the steamship companies, or the Marconi Co.

The rental and operation of steamship radio equipments has been the foundation of the Marconi Co., and we attach the highest importance and value to this branch of our organization, which has enabled us to train large forces of radio men and to render to the steamship companies and to the public a successful wireless telegraph service. Compliance with the department's present wishes would mean practically the disintegration of the Marconi Co.'s rental organization and would effectively obviate the possibility of this organization again coming to the assistance of the Government in times of need or national emergency.

Moreover, the merchant vessels which are now being commandeered and requisitioned by the Government will presumably be turned back to their owners after the war for operation in the usual manner and to leave at that time to the individual shipowner the responsibility of properly maintaining and operating the radio equipments in compliance with national and international laws and the procuring of competent radio operators and the successful handling of ship-to-shore and ship-to-ship traffic is indeed to leave in the hands of unskilled men the performance of duties which require training and expert knowledge. We have no hesitancy in stating such a condition would approach chaos, and it seems to us unreasonable and unfair to disrupt an institution which has taken so many years to develop and which, if allowed to retain its present activities, will be ready after the war, as it has always been, to properly care for these equipments and personnel and to extend to steamship companies and the general public all the advantages of a competent and successful organization.

For the reasons I have outlined in this and previous letters, we submit that it is not fair to compare the purchase price of a set with the rental rate being charged by the Marconi Co. The purchase price of a set, which is taken as a basis by your department, does not take into consideration development, patent, and organization expenses, and therefore appears low as compared with an annual rental charge. However, these items should not be omitted, for obviously they must be compensated for in some way, and the rental furnishes reasonable compensation. These rates are generally considered just and equitable, and, as I have previously indicated, they have been established under a competitive system between commercial organizations.

The Marconi Co. considers the rental it receives for its wireless equipment in the same way as the telephone company considers the rental it receives for an instrument it installs in a private residence or business office. If the price of a telephone instrument itself is compared with the rental charge made by the telephone company over a period of years, the results would favor the outright purchase of the instrument; but I feel it unnecessary to point out the results which would ensue the individual ownership of each telephone instrument. The telephone company places a value on its service, and so does the Marconi Co.

I might also cite the case of the Pullman Co., which operates a sleeping-car service practically over all railroads in the United States. The Pullman Co. operates its service under a contract agreement with the railroads. The Government has taken over the railroads for the period of the war, and Congress has provided that just compensation be made to the railroads, which, in turn, continue to live up to the terms of their agreement with the Pullman Co.

Presumably the Government does not contend that the Pullman Co. shall receive compensation based on the actual cost of the steel cars and furnishings only, for compensation can only be just when due recognition is given to all the factors of a service organization. It is also presumed that the Government does not require the railroad company to abrogate its contract with the Pullman Co., nor does it require the Pullman Co. to sell outright to the Government its steel cars and furnishings.

In the same way the Marconi Co. furnishes the steamships a wireless service covered by a contract, and while the Government may itself be operating certain of these vessels, it does not follow that the contracts with the steamship companies in these cases should be terminated and the sets sold outright to the Navy Department, which desires to purchase them at such prices as to eliminate all recognition of service, development, patents, organization, etc.

A further illustration might be cited which would, perhaps, more clearly emphasize our point of view. Take the case of the submarine signaling bells installed on merchant vessels now being operated by the Government under "bare-boat charter." We understand that submarine bells are installed on vessels under a rental contract, and that the instruments remain the property of the Signaling Co. We are informed by steamship companies and the Signal Co. that where vessels equipped with submarine bells have been taken over by the Government under "bare-boat charter," the Government continues to pay the rental for these submarine bells, in accordance with the contract between the steamship company and the Signaling Co. The submarine bells still remain the property of the Signaling Co., and the Government, so far as we know, has not purchased nor attempted to purchase any of these devices installed on "bare-boat chartered" vessels.

We therefore do not understand why the Government should differentiate in its policy between the Marconi Co. and the Submarine Signaling Co., especially since the Marconi Co., in addition to its apparatus, also maintains a reliable service and organization throughout the world.

Summarizing, I wish to say that the Marconi Co. considers its present rental rates as entirely just and equitable and feels that the Navy Department should not oppose, but, on the other hand, should assist this company in the preservation of its organization, not only for its own benefit, but for the benefit of the Government, the shipowners, and all others concerned in the operation of radio equipments in maritime service.

I understand that it has been suggested by your department to the Shipping Board and to others that the equipments on requisitioned vessels be purchased and that the Marconi rental contracts be terminated. We believe that if such suggestions have been made they have probably been made prior to the consideration of all the facts in the case, and, knowing the department's disposition to act fairly in this as in all other matters, I respectfully urge a reconsideration of this matter. If in my letters of April 12 and 25 and of this date I have failed to cover any of the points upon which your department desires further light, I shall be glad to submit any additional particulars that you might request.

Trusting that you will reconsider this matter and reach a favorable decision, I am,

Respectfully, yours,

DAVID SARNOFF,
Commercial Manager.

The Navy Department made no reply to the letter I have just read, but in subsequent communications reiterated and affirmed its opposition to our rental policy, and under date of June 12, 1918, the Bureau of Steam Engineering addressed the Marconi Co., stating that—

the bureau has no other recourse than to adhere, without exception, to its policy and declines to authorize or recommend payment of any bills for rental which may be submitted to the bureau for such radio equipment;

they sending a copy of this letter to the Director of Naval Communications, United States Shipping Board, Quartermaster General, United States Army, and Bureau of Supplies and Accounts.

The matter of radio apparatus and communication being placed in the hands of the Navy Department, the Shipping Board naturally

relied on its judgment as to the best course to follow, and, apparently, the continued persuasion of the Navy Department resulted in instructions issued by the Shipping Board of the Navy Department—and referred to by one of the officers who testified here—requiring them to purchase outright all of the Marconi radio equipment installed on merchant vessels under requisition.

Accordingly the Bureau of Steam Engineering, brushing aside all of our arguments and contentions, addressed a communication to the Marconi Co., under date of June 26, 1918, reading:

GENTLEMEN: The bureau has been authorized to purchase, for account of the Shipping Board, the leased radio equipment on all vessels operated by or under the control of the Shipping Board.

It is requested, therefore, that you furnish quotations covering your leased radio apparatus installed on vessels included in the inclosed list of requisitioned vessels dated June 19, 1918, and also any additional vessels for which you may be billing the United States Shipping Board for the rental of your leased radio equipment.

An early reply is requested.

Very respectfully,

(Signed)

By direction of Chief of Bureau.

From the foregoing it will be obvious to this committee that the Marconi Co. was confronted with the alternative of selling over 300 of its ship sets to the Navy Department, and adjusting itself to the new conditions forced upon it by the Navy Department, or else refuse to sell the apparatus and take legal action against the Government in the Court of Claims, a procedure with which the gentlemen present are no doubt quite familiar.

Not, indeed, from choice, but from absolute necessity, the Marconi Co. decided to yield to the Navy Department and to sell its ship equipment, which at once made necessary the sale of its coastal stations, for, its rental system practically destroyed by the Navy Department, the Marconi Co. had no longer need of its coastal stations. Hence, we submitted to the Navy Department a proposition covering both our ship and coastal stations, and, after negotiations, the sale of 330 ship sets and 45 Marconi coastal stations was effected to the Government at the price of \$1,450,000, and the rental contracts covering these ships terminated.

Having recited these circumstances in full, I leave it to the decision of your committee as to whether or not this sale was a voluntary act on the part of the Marconi Co. However, I think it only fair to say that after the Marconi Co. decided to sell its ship and coastal stations the Navy Department, through its officer in charge of the radio division, Commander S. C. Hooper, who only recently returned to the bureau from sea service, dealt with this subject with the utmost fairness and concluded negotiations equitable and satisfactory both to the Government and to the Marconi Co., and it is a pleasure, gentlemen, for me to testify here to the uniform courtesy and fairness of spirit exhibited by Commander Hooper in his administration of the complicated and difficult matters under his jurisdiction.

Now, with reference to future development of the radio art, the passage of this bill (H. R. 13159) would stifle the development of the radio art. Those testifying on behalf of this bill apprehended that the opponents of the bill would contend that its passage and enactment into law would stifle the growth and development of the radio art, and well were they justified in their apprehension.

We not only contend that such would be the case, but we honestly and firmly believe it to be true. It may be said of us that we are commercial men, and as such our opinion on this subject is perhaps not an impartial one. But, what can be said of the opinion of the technical men and the inventor, who the naval officer asks us to believe would fare better under a Government ownership and naval monopoly of radio communication than he does at present? Why do not these technical men and inventors employed by commercial companies, here described as victims of the present system, come before you and urge the passage of this bill and the creation of a Government monopoly? And, more significant still, what are the views and opinions expressed by independent scientists and inventors, whose long experience in the fields of discovery and invention have qualified them to speak authoritatively on this all-important phase of the question?

Lest the significant words of those belonging in this class, who previously appeared before you, be temporarily overlooked or forgotten, I have taken the liberty of extracting from the records of the hearings held before your committee in 1917, on a similar bill, the pertinent statements of the leading scientific witness.

The Hon. Thomas Ewing, United States Commissioner of Patents, being asked by Judge Saunders, of this committee, whether it was not true that Government ownership of radio would limit the possibility of development of the radio art for commercial purposes, said in reply to this highly relevant question:

That is true, and the question, I think, that Congress is to take into account is where it is going to draw the line. We have a present situation and we have the future possibilities. The present situation is that we have an instrumentality for a communication that is of great importance to the Government and to commerce, and we ought to get the benefit of them. The future possibility is that it may be made very much better. My theory and my objections to the theory of Government ownership are that if the Government takes over the wireless business it will largely be the end of the development of wireless.

Continuing, Mr. Ewing said:

I do not think that the Navy Department or any department of the Government is organized for purposes of investigation and development of the sciences and arts, such as wireless, and that if the Navy Department gets control of it it is not at all probable that the advance will be such as it will be if we can leave the field largely open to private enterprises. * * * As a matter of encouraging scientific investigation the Government is not a shining success in comparison with private enterprises.

These are the words, gentlemen, of a distinguished patent lawyer and the Commissioner of Patents for the United States, who, perhaps, has been in the best position to judge of the merits of scientific research and invention and the sources of production.

Then, considering the testimony of Prof. Pupin, professor of electromechanics of Columbia University, New York, an inventor of international fame and one of the leading mathematicians and scientists of the present age. His statements before this committee are just full of emphasis that, in his judgment, Government ownership of any art, and especially a young and rapidly developing art, such as radio communication, will mean its stagnation and its death. He deals with the subject not only from the material point of view of the inventor who, under Government monopoly, lacks the incentive, but also from the psychological viewpoint, which is that the Government

getting around scientific difficulties by legislation, as is proposed in this case, limits the scope of the art and its practical utility, and thus minimizes, if not entirely obviates, the apparent need for invention and improvement. In other words, the good old slogan "Necessity is the mother of invention" is as true in the radio art as has been in any other art, and if you eliminate the necessity for invention, you are very likely to preclude the possibility of invention.

It should also be recognized that most of the inventions and improvements which have been made by the practical and technical men employed by the various commercial interests concerned with the operation of radio stations. The operation of the stations by private interests has given the various technical employees the opportunity to experiment with and improve upon the apparatus used. Actual operating conditions at the stations and experience with the equipment employed form in most cases the basis upon which new thought, new ideas, were founded and which resulted in invention and improvement.

If the Navy Department is given a monopoly over the operation of all radio stations in this country, where will these outside technical experts obtain their further experience and knowledge of actual operating conditions?

I seriously doubt whether the salaries paid by the Government to their technical experts are such as to invite commercial experts to join the ranks of the Government employees. In fact, I have discussed this subject with a number of my friends and acquaintances in the radio art, who have unhesitatingly expressed themselves against employment by the Government in time of peace.

The very greatest incentive to experimenters and technical experts is offered when the field is left commercially free and where incentive is found, there the best work is done and the maximum results obtained.

I wish to say just a few words on the subject of overland radio communication. The proponents of the bill have urged that where other means of rapid communication exist no license shall be granted for the erection and operation of radio stations. Here is a concrete example of the limitations of this bill and the tendency to stifle the growth and development of the radio art.

Telegraph and telephone lines communicate satisfactorily and rapidly when the wires stay on the poles, but sleet and wind storms, and hurricanes, have no respect for wires nor for telegraph poles, and those of you who have lived longer than I have, undoubtedly can recall better than I the countless times when communication by wire from point to point was impossible because the wires were prostrated by storm.

I might say to you that I am a member of the Association of Railway Telegraph Superintendents, to whom communication means everything, and for the past few years, particularly since the installation of the Marconi system on the Lackawanna Railroad, these railway superintendents have studied and discussed thoroughly the possibilities of radio as an auxiliary means of communication when no other means are possible. Several years ago, during a raging winter storm, practically all of the telegraph lines in the East were temporarily put out of commission, and railroad passenger and freight traffic was seriously delayed. The Lackawanna Railroad Co.,

by means of maintaining a radio station at Binghamton, N. Y., and Scranton, Pa., and at Hoboken, N. J., was able to maintain continuous communication by radio, and I have been informed by the superintendent of telegraphs of that road that because of this fact the Lackawanna Railroad Co. was able to resume the operation of its trains earlier than any other railroad company in the East. This single instance of wireless communication, he said, saved the Lackawanna Railroad Co. \$150,000. Under the provisions of this bill I believe that the possibilities of the railroad companies adopting a radio system for communication are remote and quite improbable, if not entirely impossible.

T And what shall we say about the future of the wireless telephone, which is rapidly coming to the front, and to which the world has given great impetus. Leave the commercial expansion of the radio art unhampered and I am confident that it is only a matter of a few years when we shall have transcontinental radio telephony. That this is scientifically possible has already been demonstrated; it but remains for technical experts to perfect existing wireless telephone apparatus, and for private enterprise to erect high-power radio telephone stations to effectively compete with telephone lines and materially reduce telephone tolls. It could not help but reduce the rates, because a radio telephone station located in New York and another in San Francisco, capable of continuous transcontinental communication, will be possible of erection at an investment of approximately \$1,000,000, and this investment is small, indeed, compared with the investment which the users tie up when talking over a long-distance wire telephone circuit strung between New York and San Francisco, which investment, I should say, roughly, represents \$20,000,000.

And now I have come to the keynote of all that has been thus far said before your committee in behalf of the bill—namely, the so-called interference problem.

The leading exponent of this Government ownership bill now under discussion, the honorable Secretary of the Navy, who has appeared and testified before you, was questioned by Congressman Humphreys, one of the members of this committee, as to the compelling reasons why the Navy Department must have an exclusive monopoly of the radio business, and in my judgment these questions and the Secretary's answers constitute the substance and the meat of this entire proposition, and the particular passages in the testimony to which I refer are the following:

Question by Mr. HUMPHREYS. Is the reason that these privately owned and operated stations interfere with each other and with the Navy the sole reason why the department wants to control the radio system? Is there any other reason of policy or otherwise why the department wants to take over the radio business?

Answer by Secretary DANIELS. There are only two methods of operating the wireless, either by the Government or for it to license one corporation. There is no other safe or possible method of operating the wireless.

Mr. HUMPHREYS. That is because of the interference in the ether, is it?

Secretary DANIELS. There is a certain amount of ether and you can not divide it up among the people as they choose to use it. One hand must control it.

Mr. HUMPHREYS. And that is the sole reason that actuates the department, is it?

Secretary DANIELS. That is the sole reason.

Mr. HUMPHREYS. There is no other reason of policy that actuates the department?

Secretary DANIELS. That is the sole reason—that one hand must operate and control it.

Gentlemen, you have heard these questions and answers, and since interference is claimed by the Secretary of the Navy to be the sole reason for this bill I trust you will bear with me while I analyze this prime cause for our presence here.

Let me admit at the outset that interference in wireless communication does exist, and that it is more or less of a problem, and that while many improvements and advancements have been made toward the elimination of this troublesome factor in radio communication it is nevertheless a fact that the problem is yet to be completely solved; but the all-important question is, Does the bill sponsored by the Navy Department solve the problem, and does it do so in a scientific and practical way? My opinion is that the bill does not accomplish this purpose. You can not legislate interference out of existence. True, you may temporarily minimize interference and the difficulties experienced therefrom—that is, you may decrease the present difficulties of operation and make the life of the radio operator easier—but at what cost to the art, and at what cost to the public, and last, but not least, to the Government itself?

The fact that the Navy Department admits that there is no way in which to solve the interference problem except by legislation bears the most eloquent testimony to its poverty in scientific perception and its lack of faith in human genius to overcome this problem. In my judgment and in the judgment of men whose scientific opinions are infinitely more valuable than mine, the problem of static interference—which interference Prof. Pupin so aptly termed an “act of God”—was a far more serious and more puzzling and less hopeful problem to solve than that of wave-length interference—“the act of man.”

In discussing the static problem with radio men I have in the years gone by been told by some of the leading scientific experts that in their opinion the static problem was unsolvable and that there was no way to overcome it, and yet this baffling problem, an obstacle to continuous radio communication over long distances, has been solved, and solved by an American in civilian life, who has never been connected with the Navy Department or any other Government agency.

Only yesterday I discussed anew with the inventor of the static preventer the question of interference, and asked his opinion in the matter. He unhesitatingly replied that he felt confident of the complete solution of the interference problem, and, what is more, he stated that right now, every day, definite and important progress is being made and that the complete solution of what is left of the interference problem is almost in sight.

If the members of this committee can find an opportunity to refer to the records of the last hearing, held in this room on a similar bill, when the matter of interference was discussed, they will find that what I have said and quoted is confirmed by the opinions expressed by such scientific geniuses and men skilled in the radio art as Prof. Pupin, of Columbia University; Prof. Kennelly, of Harvard University; and Prof. Goldsmith, of the College of the City of New York.

As against the opinions of these leading scientific minds, let me ask which of the proponents of this bill who have thus far appeared before your committee are willing to take issue with these men and their opinions and to state as a scientific conclusion that the interference problem is unsolvable? And, further, that there is no other way to meet the emergency except by legislating interference out of existence, which, perforce, means limiting the number of stations operating at the same time and consequently limiting the number of messages which can be sent and received at the same time. This would place an artificial barrier on the expansion and development of a public utility which bids fair, under commercial operation, not only to rival but to surpass every other means of intelligence transmission. If such there be among the proponents of this bill, let me say for his information that interference has not singled out radio communication for its sole attack. Mr. Interference has simply come to life again, and is at present in the air but looking down upon the Navy Department, which seems to include the only people fearing his power and who have complained to Congress, seeking his destruction and annihilation through this present bill.

Our old friend "Interference" seems to have a particular dislike for those who wish to communicate, and a study of this scientific subject will illustrate that in the early days of land wire telegraphy and telephony they experienced exactly the same trouble from inductive disturbances on the telegraph lines and cross-talk on the telephone lines. These disturbances were produced in a wire by the operation of neighboring wires. Now, if at that time legislation similar to that now being sought by the Navy Department had been enacted, prohibiting the stringing of telegraph and telephone wires on the same poles and compelling duplicate sets of poles and lines, separated miles apart, would the present high state of perfection of the telegraph and telephone systems have been reached? I think not. What happened instead? The scientific minds struggled with the problem until they solved it, and interference from neighboring wires is no longer a problem, and as many wires can be strung on a pole line as the poles will hold, and they can be placed almost as near together as you please. This, of course, means a tremendous saving in the expense of installation and operation of telegraph and telephone lines.

The honorable Secretary has stated that "there is a certain amount of ether, and you can not divide it up among the people as they choose to use it; one hand must control it." Now, the ether knows no national boundaries or 3-mile limits; it is a common and international medium, and therefore it is not possible for one hand to control it. It is not the American people, and not the American stations which our Government will have difficulty in controlling, because it has the power of the present regulations, and the ability to obtain more regulation if this, in the judgment of Congress, seems necessary. It is the foreign stations that may cause the greatest amount of interference, and we have no means of controlling them except by international agreement; and if we can get along harmoniously with all of our neighbors in the rest of the world by living up to international agreements, why is it impossible or impracticable for the Navy Department to get along amicably and to work harmoniously with its friends on American soil? One hand, to use the Secretary's phrase, may control all the high-power stations in the

United States. but that will not prevent interference from such stations as may be erected in Canada, or in Cuba, or in Mexico, or in any other South American country.

Gentlemen, it must be evident to you that this question of interference, which, it has been stated, is the sole reason for this bill, is really not a reason—it is an excuse for obtaining Government ownership and Government monopoly of all radio communication in this country. Our friends, the English, who have had experience in Government ownership and Government operation of telegraph and telephone lines, do not seem to fear the increasing number of high-power stations, and are making extensive arrangements for some long-distance stations, and it is significant, too, that the British Government, while operating telegraph and telephone lines, has not, so far as we know, launched on a policy of Government ownership of high-power radio stations.

The CHAIRMAN. During this war who operated the high-power stations in England?

Mr. SARNOFF. The British Government.

The CHAIRMAN. And in France?

Mr. SARNOFF. The French Government.

The CHAIRMAN. And in Italy?

Mr. SARNOFF. I believe the Italian Government.

The CHAIRMAN. The Government took over and operated them during the period of the war?

Mr. SARNOFF. Yes, sir.

Mr. EDMONDS. I think it was testified this morning that the Canadian Government returned what they had taken 10 days ago.

Mr. GREENE. Have any of the governments across the water returned what they took over?

Mr. SARNOFF. The only return of radio stations, so far as we know at present, has been by the Canadian Government.

It has been stated to you that only seven countries at present favor or permit private ownership of radio stations, but it has not been stated that these seven countries are the only countries which have helped to develop wireless communication, and, therefore, the proponents of this bill have not claimed that ship-to-shore radio communication would be interfered with by the working of high-power radio stations, and I merely wish to emphasize this important fact that private operation of commercial high-power international radio stations has nothing whatever to do with the interference problem—so far as this problem applies to ship and shore work.

So far as the interference which may be caused by the operation of high-power stations is concerned, this matter comes under two distinct heads: First, the interference which may result between commercial stations operated by different private companies; and, second, the interference of these latter stations with such stations as the Navy may have operating in this field.

As to the first item we fail to see why the Navy Department should concern itself over the troubles which they apprehend may develop between rival private interests, since this is a matter which these private interests should settle amongst themselves; and in the extreme case that additional legislation should be required, it should be for these interests themselves to appeal to Congress for such legislation.

Another item of even greater importance is the fact that as matters stand to-day the only commercial high-power stations controlled by private interests—with the exception of Tuckerton—are owned by the Marconi Co., and such problems as may develop due to the entrance of other parties into this field will be problems of the future and not of the present.

Concerning the second item, namely, interference with Navy stations, let us first consider which high-power stations the Navy has, and, next, what possible use they may have for them. I may say that at present there are two stations on the Atlantic coast, Sayville and Annapolis, owned by the Navy which can be properly termed high-power stations. For what possible purpose can the Navy require these stations other than to work with their ships at sea. Certainly the private companies can take care of all transoceanic commercial communication. If the only need for naval high-power stations is to work with the naval ships, then these high-power naval stations will be necessary only in case the naval vessels are at very great distances from the United States as otherwise the naval coastal stations can take care of them.

I think you will agree, gentlemen, that the fleet of the United States is found at great distances from its own shores only on occasions which occur so rarely as to be almost negligible in times of peace. We do not keep our Navy in England or France or Japan, but we keep it in or near our own ports except in time of war. From this I think it will be obvious to you that the amount of long-distance radio communication for the Navy is so small that the question of its being interfered with by commercial operation is of no consequence.

Summarizing my remarks on this interference question, I wish to say that I am of the firm opinion that intelligent regulation and enforcement of these regulations will provide all of the technical benefits sought by the Navy Department under this bill and will at the same time obviate the very serious perils which confront the radio art if the Navy Department is given the sole and exclusive monopoly of all radio communication and private interests are destroyed.

Mr. BANKHEAD. I have been very much interested in the last few days in the announcement that the telephone had been perfected to such an extent that numerous messages can be conveyed over the same wire. You were talking about the possibilities of additional inventions and discoveries. Have you contemplated the possibilities of the same wave lengths for the conducting of more than one message, simultaneously, in the future?

Mr. SARNOFF. At the present time it is not possible, but I would not say it would be impossible in the future. The wireless stations have already surpassed in invention and improvement all other methods of communication. For example, it is possible to send at a very high rate of speed at radio stations in some cases up to 200 or 300 words per minute, while the cables, which have been in existence for over 50 years, send at a very low rate of speed, about 40 words a minute.

The CHAIRMAN. You mentioned an invention of an instrument to prevent static interference, but I do not believe you gave the name of the man who invented it?

Mr. SARNOFF. The gentleman I referred to is Mr. Roy A. Weagant, the chief engineer of the Marconi Co.

The CHAIRMAN. Has it been tested out so that you can tell whether it is a success?

Mr. SARNOFF. Yes, sir; it has been tested, and has been in operation for the past two years.

The CHAIRMAN. As I recall, when we had the hearings on the radio act of 1912 there was another company, the National Electric Signaling Co. of Pittsburgh, or some of their inventors, who were about to perfect an instrument to prevent ordinary interference. What progress was ever made along that line?

Mr. SARNOFF. As far as I know, that instrument is not on the market.

The CHAIRMAN. It has not been perfected yet?

Mr. SARNOFF. I do not know of it.

The CHAIRMAN. If an instrument like that could be perfected, that would go a long way toward solving all of these difficulties, would it not?

Mr. SARNOFF. Yes, sir; and I believe in time such perfection and improvements will be made.

The CHAIRMAN. No progress has yet been made, so far as you happen to know?

Mr. SARNOFF. There has been considerable progress made in minimizing a great deal of the interference which existed three or four years ago. We are making definite progress every day, but the problem has not yet been completely solved.

The CHAIRMAN. To what extent has that been done?

Mr. SARNOFF. I do not know that I could answer that question in terms of percentages, but I believe at the present time it is possible to operate a number of high-power radio stations with a variation of wave lengths of from 1 to 2 per cent, whereas three or four years ago this was not possible. There has been improvement not only in the transmitting apparatus but likewise in the receiving apparatus. It has been made much more selective. Also the installation of antennas with respect to the stations with which they are required to work is a matter upon which much improvement has been made. It is now possible to receive from a desired direction much better than from the direction not desired.

Mr. WHITE. One of the Navy witnesses stated that they used a 600-meter wave in this ship-to-shore and shore-to-ship service, and I asked him if there could not be reserved a limit of wave length for the use of that particular service, and if private enterprise could not be allowed to operate outside of those limits either above or below without any interference with this particular ship-to-shore service. What do you say as to that?

Mr. SARNOFF. Under the act of 1912 commercial ship-to-shore stations are obliged to tune their apparatus to standard wave lengths of 600 meters and 300 meters. They may use any wave lengths below 600, and they may also use any wave length above 1,800, and the range between 600 and 1,600 is reserved for Government use.

The commercial people have not complained about their limitations, but the Government, which has an unrestricted range of wave lengths, does complain.

Mr. WHITE. That is what I wanted to get at. Why can they not, between those limits of 600 and 1,800 meter wave lengths, carry on this ship-to-shore service and leave the balance of the field for commercial purposes? Why can not that be done?

Mr. SARNOFF. For a medium distance of, say, 400 or 500 miles, I believe the Navy can conduct all the communications necessary with its naval ships and coastal stations by sticking to that range of wave lengths. When it decides to go farther and long-distance communication is attempted, different apparatus is employed, and with respect to such apparatus the use of longer waves, above 1,800 meters, has been found to be more efficient.

Mr. HUMPHREYS. You spoke of renting these instruments for \$1,000 to the ships. That is an annual charge, is it not?

Mr. SARNOFF. Yes, sir.

Mr. HUMPHREYS. When one ship communicates with another there is no charge; nobody is charged for that?

Mr. SARNOFF. The shipowner is not charged.

Mr. HUMPHREYS. Suppose the shipowner wants to communicate with his New York office?

Mr. SARNOFF. Under our rental contracts we provided for a certain amount of communication which was incorporated in this charge of \$1,000. To be specific, we allowed a shipowner 6,000 words per ship per annum, which figures was found to be more than the average shipowner would use in that time.

Mr. HUMPHREYS. Above that he would pay—

Mr. SARNOFF (interposing). The regular coastal charges.

Mr. HUMPHREYS. So that this \$1,000 rental charge for the apparatus included a certain amount of service free?

Mr. SARNOFF. Yes, sir; it included all the service the shipowner required, because I do not believe there has been a case where a shipowner has paid the Marconi Co. tolls on any messages sent between his office and his ship on his business.

The CHAIRMAN. In reference to the rental of \$1,000 per annum for the installation and use of the apparatus on the ship, does that include the service of an operator?

Mr. SARNOFF. No, sir; we made a separate charge for that.

The CHAIRMAN. That was paid by the shipowner?

Mr. SARNOFF. That was paid by the shipowner. I would like to say further, in answer to Mr. Humphreys's question, that this service of the Marconi Co. rendered to shipowners under rental contract, providing for 6,000 words per ship per annum, means \$360 per ship per annum, on the basis of the present rates charged, namely, 6 cents a word, by the Navy Department or the Marconi Co., so that the shipowner who will now privately operate his set will pay to the Navy for 6,000 words per annum \$360, and the inference has been conveyed here by some that the charge of \$1,000 was excessive.

Mr. BANKHEAD. You said there was an additional charge for the wages or salary of the wireless operator. Under the contract was the shipowner allowed to furnish his own operator or required to use the services of an operator furnished by your company?

Mr. SARNOFF. We furnished the operators and the shipowner could pay the wages direct, if he saw fit to do so.

Mr. BANKHEAD. He had to take the operator you furnished?

Mr. SARNOFF. He had to take the Marconi operator we furnished, because in that way we took the responsibility for the service on that ship. If we installed the instrument and had no control over the operator, we could not guarantee the service.

Mr. HUMPHREYS. Who paid for the maintenance and upkeep of the set which the ship had?

Mr. SARNOFF. The Marconi Co. maintained the apparatus. It did that at its own expense, and also kept the apparatus up to date and installed all the latest improvements at its own expense.

The CHAIRMAN. The shipowner first paid \$1,200 a year, and that was then reduced to \$1,000. The shipowner paid that sum, plus the cost of the hire of the operator and the cost of his maintenance on shipboard, did he not?

Mr. SARNOFF. Yes, sir.

The CHAIRMAN. You are responsible for the maintenance of the apparatus at your own expense?

Mr. SARNOFF. For the maintenance of the apparatus on shipboard, and also the maintenance of the coastal stations, and we also paid the operators at the coastal stations.

The CHAIRMAN. In addition to the protection to his ships and passengers by the installation of this apparatus, the shipowner had the benefit of 6,000 words per annum, amounting to \$360 per annum?

Mr. SARNOFF. Yes, sir.

Mr. BANKHEAD. After the Navy took over the wireless stations, did they furnish the operators or were they so furnished by your company, or recommended by your company?

Mr. SARNOFF. In the case of vessels which carried guns and an armed guard the Marconi men were replaced by naval men, or else the Marconi men were taken over by the Navy. In other cases the Marconi men remained.

Mr. BANKHEAD. Was there any difference in the wages paid by the Marconi Co. and those paid by the Navy for men of the same class?

Mr. SARNOFF. There have been some cases where the compensation paid by the Navy Department was less than that paid by the Marconi Co. I do not know definitely the rates of pay maintained by the department, but the Marconi rates commence at \$40 a month, with a \$10 a month increase every six months until a maximum salary of \$80 a month is reached. I believe this maximum salary is in excess of the amount paid by the Navy Department.

Mr. HARDY. Let me ask you about the free service that went with the rental contract. That was at the time when the Marconi Co. owned the shore stations?

Mr. SARNOFF. Yes, sir.

Mr. HARDY. That contemplated 6,000 words to be exchanged between the ships and Marconi shore stations?

Mr. SARNOFF. Yes, sir.

Mr. HARDY. Did that give any right to have communication with the naval shore stations?

Mr. SARNOFF. The naval shore stations were not required to carry on commercial communications with ships.

Mr. HARDY. Suppose one of these naval vessels which had upon it one of your instruments rented for \$1,000 a year wanted to communicate with a naval shore station. Did you take out of that \$1,000 the payment for that service?

Mr. SARNOFF. There have been no cases, so far as I know, where a vessel equipped with Marconi apparatus operating under a rental contract was obliged to use the Navy coast stations and transmit these service messages included in the 6,000 words.

Mr. HARDY. What occurred to me was this: When the Navy took over your instruments, or required you to sell them, or agreed to buy them, at that time they owned all the ship-to-shore stations, did they not?

Mr. SARNOFF. No, sir; they owned the naval stations, and they took over and operated the Marconi coastal stations.

Mr. HARDY. They were operating them at naval expense?

Mr. SARNOFF. Yes, sir.

Mr. HARDY. That annual charge of \$1,000, allowing the sending of 6,000 words, is the expense of receiving it at the shore station, is it not?

Mr. SARNOFF. In the cases where the naval stations, or the Marconi coastal stations under Navy control, conducted commercial communications with ships equipped with Marconi apparatus, the Marconi Co. paid the Navy Department 6 cents per word for every message sent between the shipowner and the master of the ship out of this \$1,000.

Mr. HARDY. As I understand this figure, the Navy Department had taken over these coastal stations, and after the Navy Department had taken over those stations you have been deducting from this \$1,000 the amount that the messages sent would amount to at 6 cents a word?

Mr. SARNOFF. We paid the Navy Department for any messages sent by the ship companies or ships equipped with our apparatus.

Mr. HARDY. At the rate of 6 cents a word?

Mr. SARNOFF. At the rate of 6 cents a word.

Mr. HARDY. That reduced the rental?

Mr. SARNOFF. That reduced the rental by that amount.

Mr. HUMPHREYS. I would like to ask a question, please. You say they took over the Marconi stations for the period of the war. Has the Navy Department absolutely acquired the title to the shore stations?

Mr. SARNOFF. Yes, sir; it now has acquired the title to those shore stations.

The CHAIRMAN. Under the act of 1912 during the period of the war or probable emergency the Government has the right to take over the stations.

Mr. SARNOFF. Yes, sir; and we voluntarily offered them.

Mr. HUMPHREYS. Yes; but you do not get my question. Is that only for the period of the war?

Mr. SARNOFF. Well, the stations were originally taken over under the provisions of the act of 1912, ostensibly for purposes of the war, but owing to the conditions which I have recited at length, we sold these coastal stations and they are now the property of the Government.

Mr. HUMPHREYS. What is the life of a set of Marconi instruments, the ship set?

Mr. SARNOFF. The life of a wireless set itself can be fairly stated as 10 years, but the radio art progresses by such leaps and bounds

that nobody would think of using a set to-day that was used 10 years ago; at least, not without improvements.

Mr. HUMPHREYS. Then, what would you say is the probable practical life of a set?

Mr. SARNOFF. I would say about five years. I think the evolution of wireless has a sort of five-year demarkation point, if I may so term it; every five years a new type of equipment comes in.

Mr. HUMPHREYS. About what is the annual cost of upkeep and maintenance? Do you know, approximately?

Mr. SARNOFF. The cost of inspection and maintenance itself was approximately figured at \$5 per month per ship, or \$60 a year, where over 500 vessels were maintained; and naturally it depends upon the number of vessels that you maintain. But this figure does not take into account the question of obsolescence or improvement or major repairs.

Mr. HUMPHREYS. The obsolescence was taken care of in that first question I asked you. I do not know just what you mean by the major repairs. If you have sets on the 500 ships, about what would you figure it would cost you to keep those up per year?

Mr. SARNOFF. Roughly, \$60 a ship per year.

Mr. HUMPHREYS. That would cover major repairs and all, about \$60 a year? And what was the cost of those sets? What would it cost you to put a set on a boat, to buy it and install it?

Mr. SARNOFF. The same sets that we have installed on ships under the rental contract of \$1,000 a year were sold commercially for \$3,300 per set. And right at this point, if I may be permitted to carry out your thought, if you take the figure of \$3,300 and allow even 10 per cent for depreciation, and then the interest on the investment and the cost of maintenance and repair and inspection of that set, and the cost of all these messages that are provided for under the rental contract, and the cost of improvements that may be made, and the possible damage that the ship owner may sustain by reason of the operator violating the rules and regulations specified in the act of 1912, and a number of other matters, such as maintaining the accounts of messages handled on shipboard, providing supplies, furnishing operators, changing them, and countless other details which I could go on and mention, I think you gentlemen will find that \$1,000 a year is not an exorbitant price to charge for all the service rendered under our rental contract.

Mr. HUMPHREYS. This price of \$60 a year did not take into account at all any part of the maintenance of the shore stations, which was, of course, necessary in order to operate?

Mr. SARNOFF. That is right; it did not. The Marconi Co., in addition to maintaining the ships, was obliged to maintain these coast stations at its own expense and operate them.

Mr. HUMPHREYS. Let me ask you one other question. You send 6,000 words free from the ship to the shore. Now, was it then the duty of the Marconi Co. to transmit those 6,000 words to the office of the ship, or was there some charge for that?

Mr. SARNOFF. The radio message which originates on shipboard is sent to a coastal station, and from the coastal station it is sent over the wires of the Western Union Telegraph Co. or the Postal, as the case may be, and the shipowner must, of course, pay the land-wire telegraph company.

Mr. HUMPHREYS. That is delivered by the Marconi Co., though, to the telegraph company without charge?

Mr. SARNOFF. Yes, sir.

The CHAIRMAN. At 6 cents a word?

Mr. HUMPHREYS. No; no charge at all.

Mr. SARNOFF. No charge at all. The land telegraph charge is made by the Western Union or the Postal and the shipowner pays it.

Mr. HUMPHREYS. And the rate of 6 cents a word did not apply until 6,000 words had been received?

Mr. BESH LIN. I understood one of your objections to the proposition for Government ownership and control to be that it would have a tendency not to develop the art. Assuming that a private company had a monopoly of the business, would it have the same effect; and if not, why?

Mr. SARNOFF. No, sir; it is not my opinion that this would be the case where a private monopoly existed. I do not know that I can improve on the ideas expressed by Mr. Nally on this very subject this morning.

The CHAIRMAN. The question was very thoroughly gone into this morning.

Mr. BESH LIN. I was not here then.

Mr. HUMPHREYS. I have just been figuring here. You estimate the service at \$360 a year?

Mr. SARNOFF. Yes, sir.

Mr. HUMPHREYS. And the upkeep at \$60 a year?

Mr. SARNOFF. Yes, sir.

Mr. HUMPHREYS. That would be \$420, so that \$580 is what you would be getting from the ship?

Mr. SARNOFF. Well, we figure a little differently, because we do not figure that the \$360 costs us 6 cents a word.

Mr. HUMPHREYS. I understand that; but if you had rented the machine out and also had the understanding that they would pay whatever they sent, it would cost them \$360?

Mr. SARNOFF. Exactly; that is so.

Mr. HUMPHREYS. That would be \$580. In five years you would receive \$2,900 on a machine that cost you \$3,300, the average life of which is five years.

The CHAIRMAN. The machine cost them \$2,000, as I understand it.

Mr. HUMPHREYS. Three thousand three hundred dollars, he said.

Mr. SARNOFF. I said that was the market price of the machine.

Mr. HUMPHREYS. Well, that is a fair price, I assume.

Mr. HARDY. I thought that you did not sell any of these machines; that you just rented them.

Mr. SARNOFF. We have sold them to the Government.

Mr. HARDY. That is, prior to that?

Mr. SARNOFF. Why, yes; we always sold apparatus to the United States Government, the Navy Department, or War Department, regardless of our rental system. We also sold apparatus to foreign ships when the foreign shipowners wanted them.

Mr. HUMPHREYS. According to your figures you lost money on that operation. [Laughter.]

Mr. SARNOFF. I do not think we did, but I do not think we made as much as we should have made. I am frank to say we did not lose. You see, we charge \$1,000 a year and operate 500 ships and manufac-

ture the apparatus in large quantities and maintain our own service, and, in addition, use those coastal stations for the transmission of private messages for which we are paid tolls—passenger traffic.

Mr. HUMPHREYS. I do not mean, of course, that the company actually lost money on this deal.

Mr. HARDY. They did not use the 6,000 words.

Mr. EDMONDS. There was a considerable amount of business you got from the ships?

Mr. SARNOFF. Yes, sir; there was considerable passenger traffic.

Mr. HUMPHREYS. They certainly were not making very much money; they were not making any unreasonable amount of money out of ships that only paid \$1,000 a year. That is very clear from these figures.

Mr. SARNOFF. I will tell you, Mr. Humphreys, what we made. There has been so much speculation about it. In 1916 the Marconi Co. earned from all its ship and shore operations \$100,000, and it operated 500 ships.

Mr. EDMONDS. Mr. Sarnoff, you are going to put a financial statement of your company in the testimony, are you not?

Mr. SARNOFF. Yes, sir.

Mr. EDMONDS. I would like to see in that anyway, as far as you have gone, the number of employees you have. The other day the secretary gave us the estimate that it would cost us about \$5,000,000 to buy these high-power stations. I would like to have your estimate on that.

Mr. SARNOFF. Well, I will leave that matter for Gov. Griggs to deal with. Gov. Griggs will follow me.

Mr. EDMONDS. The reason I am asking the question is this: In this testimony before us about a year ago the Navy Department estimated the coast stations would cost us \$400,000. They appear to have paid \$3,000,000 for them. I just wondered whether their estimate of \$5,000,000 was as good as that.

Mr. SARNOFF. I believe the Secretary was either misinformed or mistaken about the \$5,000,000.

Mr. EDMONDS. I would like, if you will, to go a little further into the Pan American Wireless Co. I believe you are vice president of the Pan American Wireless Co. Tell us, please, your intentions and what your ideas were.

Mr. SARNOFF. That, too, Mr. Edmonds, was covered very fully this morning by our president, Mr. Nally.

Mr. EDMONDS. Oh, I did not hear that.

Mr. BANKHEAD. What is the capital stock of the Marconi Co.?

Mr. SARNOFF. \$10,000,000.

Mr. BANKHEAD. And you made \$100,000 in 1916?

Mr. SARNOFF. On ship-to-shore business; that dealt only with those ship-and-shore rental contracts.

Mr. WHITE. Is that the company in which you have 200,000 stockholders?

Mr. SARNOFF. Yes, sir.

The CHAIRMAN. I have in my files the contract between the Marconi Wireless Telegraph Co., formerly known as the Wireless Telegraph & Signal Co., of London, England, and the Marconi Wireless Telegraph Co., of America, incorporated and organized under the

laws of the State of New Jersey, dated April 18, 1902. Have you any existing contracts between your company and the English company showing the relation between the two?

Mr. SARNOFF. I believe the contract you refer to, Mr. Chairman, is the only contract covering the relationship between these companies.

The CHAIRMAN. I have never put it in the record; I never felt I was at liberty to do so. I simply wanted to call it to the attention of the committee, so that if they wanted to read it they may.

Mr. HUMPHREYS. There is one other question I should like to ask about this ship-to-shore business. A passenger on a ship wants to send a message to somebody on shore. Does the ship company participate in the distribution of that fee, whatever it is?

Mr. SARNOFF. No, sir.

Mr. HUMPHREYS. You get all of that?

Mr. SARNOFF. Yes, sir.

Mr. HUMPHREYS. The Marconi Co. gets it all?

Mr. SARNOFF. Yes, sir.

Mr. BURROUGHS. Let me ask you a question or two, if I may. I understood you in your testimony to say that you knew of no reason from a technical or scientific point of view why this matter of interference could not be taken care of as well by regulation as in any other way?

Mr. SARNOFF. Yes, sir.

Mr. BURROUGHS. Is that correct?

Mr. SARNOFF. That is correct; yes, sir.

Mr. BURROUGHS. Now, you have been doing it, or trying to do it, by regulation, have you not?

Mr. SARNOFF. Yes, sir.

Mr. BURROUGHS. Are you in a position to state, or would you care to state, to the committee wherein you think, or for what reason you think, that particular form of regulation which they have used has failed, or why it has failed—or perhaps you do not think it has failed?

Mr. SARNOFF. Why, I believe the act of 1912 was a very far-sighted document. I believe that since then the art has developed, and it would be sensible to modify it in some degree and to add such additional provisions and regulations as may seem necessary, but I certainly do not consider that the act of 1912 was a failure. On the other hand, I consider it has been a marked success.

Mr. BURROUGHS. You think the form of regulation which has been in use, then, has been particularly successful?

Mr. SARNOFF. I do; yes, sir.

Mr. BOWERS. And beneficial?

Mr. SARNOFF. Yes, sir.

Mr. BURROUGHS. What, if any, specific suggestions would you make as to any changes in the form of regulation that has been in use?

Mr. SARNOFF. I have no better suggestion to make than the one made by Mr. Nally, namely, the appointment of a national radio commission to study and investigate this subject. The commission should take everything into account and not merely the viewpoint of the commercial people or the viewpoint of the Navy Department. It ought to represent all interested parties, and together they should make such recommendations as seem necessary.

Mr. BURROUGHS. I understood Mr. Nally this morning to recommend that the ship-to-shore business, since it was a natural monopoly, be controlled by the Government; that the stations should be owned and the communications controlled entirely by the Government. Would that be your opinion?

Mr. SARNOFF. Yes, sir; it is my opinion; and I heartily indorse Mr. Nally's recommendation. I believe that as to this particular point it is only justice to the Navy Department, which has acquired these stations, because under the act of 1912 a naval station is not permitted to handle commercial traffic with ships at sea when a commercial station exists within 100 miles of the naval station. Obviously if that part of the law is not amended it would mean that the Navy Department would not be free to utilize some of the coastal stations they purchased from the Marconi Co.

Mr. BURROUGHS. Then your recommendation that that be a Government business is based wholly upon the fact that they have the advantage of the situation by having purchased these stations?

Mr. SARNOFF. Exactly.

Mr. BURROUGHS. And for no other reason?

Mr. SARNOFF. Correct.

Mr. BURROUGHS. That is, if they had not purchased the stations, you would see no particular reason for advocating such a policy?

Mr. SARNOFF. I would not then; no, sir.

The CHAIRMAN. The fact is that under dual control the service would not be efficient, whether it was governmental or private?

Mr. SARNOFF. My idea is that it could be made efficient with intelligent regulation and improvement in the art.

Mr. BURROUGHS. I am talking about the ship-to-shore business; that is what I mean.

Mr. SARNOFF. Yes, sir. Of course, I want to say that this interference exists to the very largest degree in the ship-to-shore end of radio communication. Here most of the trouble exists, because so many ships are trying to work at about the same wave length.

Mr. BURROUGHS. Would the fact that human life is perhaps more largely at stake in that branch of communication have any influence on your advocacy of the doctrine that the Government should control that particular branch?

Mr. SARNOFF. Still considering that the Government now has the situation under control and owns practically all these coastal stations, I say they ought to be allowed to operate all of them; otherwise, I certainly do not consider that the Navy Department, through its operation of coastal stations, is better able to preserve life or to make sea travel safer than the private companies have been able to do.

Mr. BURROUGHS. But it is also a question whether they would be able to do it better than by having two concerns—the Government and the outside companies also.

Mr. SARNOFF. If the Government were restricted to the operation of Government business only and such business as it was necessary for them to transact by wireless between these stations and the commercial companies left entirely free to handle commercial business with the ships at sea, then I certainly should not foresee any danger to life because of this dual operation of coastal stations, provided, further, that the Navy Department operated on those wave lengths which were reserved for it.

The CHAIRMAN. What other private company was in competition with you in the ship-to-shore service before the war began?

Mr. SARNOFF. There was the Kilbourne & Clark Manufacturing Co. on the Pacific coast; the Wireless Specialty Apparatus Co. in Boston, the Federal Telegraph Co.—

The CHAIRMAN (interposing). How many ship-to-shore stations did the first company named control?

Mr. SARNOFF. The Kilbourne & Clark Co. had no coast stations. They simply sold apparatus to ships. The Federal Telegraph Co. maintained coastal stations on the Pacific coast. The National Electric Signaling Co.—

The CHAIRMAN (interposing). How many sets did it maintain on shipboard?

Mr. SARNOFF. I believe that the Federal Co. maintained about 20 to 25 sets on merchant ships.

The CHAIRMAN. A negligible number?

Mr. SARNOFF. Seventeen, I am told by Mr. Nally.

Mr. EDMONDS. How many coastal stations?

Mr. SARNOFF. Two, I believe.

The CHAIRMAN. What other companies maintained sets on shipboard?

Mr. SARNOFF. There is the National Electric Signaling Co., which maintained some sets on shipboard and also maintained two or three coastal stations.

The CHAIRMAN. How many sets did they have on shipboard?

Mr. SARNOFF. I believe about a dozen.

The CHAIRMAN. All told, about 20 sets were maintained on shipboard aside from those maintained by your company?

Mr. SARNOFF. There was in addition the Kilbourne & Clark Co., which maintained about 50 sets on shipboard, and then there is the United Fruit Co., or the Tropical Radio Telegraph Co., which maintained and operated its own ship sets on about 20 or 25 ships, and also maintained coastal stations at one or two points in the South.

Mr. BURROUGHS. I believe you remarked that there were only seven countries that did not now have government ownership and control of wireless communication. Is that right?

Mr. SARNOFF. This is the number specified by one of the gentlemen testifying on behalf of the Navy Department.

Mr. BURROUGHS. Are you able to state what those seven countries are?

Mr. SARNOFF. The United States, England, Italy, Germany—and what others, Mr. Nally? Do you recall them?

Mr. NALLY. A few smaller nations.

The CHAIRMAN. I will say this, that up to 1913-14 our Government and Austria were the only governments that had legislated on radio communication.

Mr. HUMPHREYS. I would just like to get your ideas on this as a matter of legislative policy. You say to authorize the Navy Department to engage in commercial business, ship-to-shore, not giving them the exclusive right, but simply authorizing them to engage in it, and then appoint a commission such as that suggested by Mr. Nally, and if anybody else wanted to go into this business they would have to go in under such reasonable regulations as the commission made?

Mr. SARNOFF. Yes, sir.

Mr. HUMPHREYS. But you would let the authority of the Navy Department, so far as commercial business is concerned, extend to the ship-to-shore business and nothing more?

Mr. SARNOFF. Nothing more; yes, sir.

Mr. HUMPHREYS. Now, either your suggestion or Mr. Nally's suggestion—I have forgotten which—was to give the Navy exclusive right to engage in commercial business, ship to shore, forbidding them to go beyond that. I assume they would have no power to go beyond unless they were authorized to do it.

My question is this: Suppose we simply give them authority to engage in the ship-to-shore business, with permission to supervise generally and regulate the radio business—not exclusively; simply give them authority to engage in that business, and if anybody else wanted to engage in it they could, under such regulations as this commission would make—what would you say about that?

Mr. SARNOFF. Well, the Navy Department at the present time operates and controls more than 100 coastal stations, and is therefore amply equipped to communicate with ships at sea. Having these provisions, and the interference problem still not having been completely solved, but, as I have said, more troublesome in the lower wave-length ranges than they are above, I would consider it more practicable to allow the Navy Department the exclusive field in the case of ship-to-shore communications.

Mr. HUMPHREYS. Suppose Judge Saunders and Judge Hardy and myself, for instance, had more money than we had good judgment, and we wanted to engage in that enterprise, under regulations prescribed by this commission. Why should we not?

Mr. SARNOFF. I have still reserved for private enterprise overland communication and high-power transoceanic communication; and if Judge Saunders and Judge Hardy would ask my advice, I would tell them to leave the coastal station business alone; to leave it to the Navy Department.

Mr. HUMPHREYS. But they are not going to ask your advice, and they are not going to take it if they ask it—

The CHAIRMAN. Why not show your generosity by inviting them to keep out of the field altogether?

Mr. HUMPHREYS. Now, you and Mr. Nally seem to think this commission can regulate the business efficiently. Of course, everybody agrees there will have to be some regulation. I would like to know upon what theory you proceed when you say we should not be permitted to do ship-to-shore business if we want to?

Mr. SARNOFF. My theory is that at the present time there are enough coastal stations on the Atlantic coast, the Pacific coast, and the Great Lakes, all that are required to efficiently conduct the ship-to-shore business.

Mr. HUMPHREYS. That is your opinion as a business man; I am asking your opinion now as a lawmaker. Of course, as a business man, you naturally would advise us not to embark in the enterprise because you think we would lose money in it. But upon what theory would you write the law that would say we should not do it?

Mr. SARNOFF. I must confess that so far as excluding the private citizen from the business of communication by wireless is concerned, I believe that the law is really not the answer; that invention and

improvement ought to so eliminate this interference problem that as many as desire could engage in this ship-to-shore communication. But dealing with present circumstances, and confining ourselves to the ship-to-shore proposition only, there being so many ships equipped during the war—many, many more than there were equipped prior to the war—the Navy Department already having acquired all these coastal stations, why I think it is the logical thing to leave the ship-to-shore field to them.

Mr. HARDY. You think there would be interference?

Mr. SARNOFF. In the matter of ship-to-shore work there would be interference, in the present state of the art, provided both the commercial companies and the Navy Department were operating on the same wave length; and the Navy Department under the present law has the right to use any wave length it chooses to, and does so.

Mr. HARDY. If Mr. Humphreys and myself got in there, we would make mischief?

Mr. HUMPHREYS. We could not make mischief if we had an efficient board to regulate it.

Now, suppose I have an invention, and you do not believe and the Navy Department does not believe that it is a good one, but I do. I go to some capitalist, and he puts up the money. I say, "We will provide sets for all these ships, and we will not charge them anything for it. All we want is commercial business, and our apparatus is so superior to all these others that in a short while we will do all the business." Now, I would like you to give me some theory upon which you predicate your idea that the law should come in and say we shall not do that. I am assuming, of course, that it can be regulated so as not to interfere with the Navy Department and not to interfere with anybody else.

Mr. SARNOFF. In the matter of ship-to-shore communication again?

Mr. HUMPHREYS. Yes; that is what I am talking about now.

Mr. SARNOFF. My knowledge of the practical operating conditions is such that I question very seriously whether interference can be eliminated on the short-wave lengths to a degree where anybody and everybody should be permitted to erect a station on shore to communicate with ships at sea. In the matter of the high-power stations it is an entirely different proposition; there you use extremely long waves, and the number of high-power stations that would be erected would be limited to the commercial possibilities. There would not be a multiplicity of high-power stations, because there would not be enough money in it for them.

Mr. HUMPHREYS. Let me state this instance: "In the process of the suns" we all at times reach that state of mind where we are not willing to say that this thing can not be done. Now, this man with this invention that he is satisfied will do the work more efficiently and very much more economically than the Navy is doing it, goes to this commission that has been established and convinces the commission by actual experiment, on land we will say, that he has the machine that will do it. They are scientific men, well qualified to pass judgment on that, and in their opinion he has the instrument that will simply put the other man out of business, just as the electric-light men put the coal-oil lamp out of business. The Navy Department, not under any regulation of this commission but under the law of the land, has the exclusive right to do that business. Then what? That

man will have to go to Congress and get a law passed repealing an act that has given the Navy Department this exclusive right.

Now, just why should he be put to that hard necessity, if he can convince the commission that he has got it, and that he has the money and is willing to try it out, because he is not able to convince the Navy Department? The Naval Department will not take it over themselves, and they have the exclusive right under the law. And maybe he would not sell it to them. Why should the law of the land say to that man, "You have got a good thing here, but you just hang your clothes on a hickory limb and don't go near the water"?

Mr. BURROUGHS. "You can not go in, because of a monopoly."

Mr. HUMPHREYS. I would like to hear your theory upon which you predicate your belief that some exclusive power should be given to the Navy under the law?

Mr. SARNOFF. Of course, Mr. Humphreys, in the matter of ship-to-shore communication, we deal with what has been referred to as a matter of safety of life, and I am proceeding on the theory that at the present time there is not any instrument that will eliminate interference in ship-to-shore work and that will make possible two shore stations close together working at the same time on the same wave length without interfering with each other; and further, not on the theory but on the fact that in that particular zone and range of wave length there are more radio stations operating off of the Atlantic coast than there are high-power stations in the world. Therefore, I say leave that field to the Government, now that the Government has all the necessary stations, and thus minimize interference.

However, I am frank to say that if a man comes along with an instrument such as you have described and he can convince the commission that the instrument will eliminate interference and provide for the safety of life regardless of the number of stations working, then and in that event the Navy Department should not have the exclusive monopoly of ship-to-shore communication.

Mr. EDMONDS. The Navy Department would have an advantage over any competitor anyhow, because they could utilize a little greater or a little less wave length. could they not? A commercial concern on ship-to-shore business would have to use the 600-meter wave length, would it not?

Mr. SARNOFF. Yes.

Mr. EDMONDS. And the Navy Department do not have to do that, do they?

Mr. SARNOFF. No; but the ships at sea do.

Mr. EDMONDS. Well, they could have a different apparatus for sending and for receiving, could they not?

Mr. SARNOFF. Under the present law, both stations must use the same wave length. Six hundred meters is also the standard wave length for the distress calls, and under the provisions of the act of 1912 if a man built a commercial station alongside of a naval station the Navy would be prohibited from handling commercial business with ships at sea.

The CHAIRMAN. If Mr. Humphreys's theory is correct, we made a mistake in passing the law of 1912. In other words, he does not believe the Government can interfere at all to regulate anything.

Mr. BURROUGHS. As I understand you, Mr. Sarnoff, you believe this matter of interference can be handled by regulation as well as in any other way?

Mr. SARNOFF. I do; yes, sir.

Mr. BURROUGHS. Then, why the necessity of the Government taking it over, if they had not, as a matter of fact, gone ahead and forced the situation and done it?

Mr. SARNOFF. But the Government has forced the situation and now has the stations, and having all the coastal stations, it seems logical to me that they ought to be permitted to use them.

Mr. GREENE. They may have made a bad trade.

The CHAIRMAN. Is there anything further?

Mr. GREENE. I would like to ask Mr. Sarnoff a question. Now, when the telephone business began, you could hear people talking over another line, and there was a great deal of trouble about it. Nowadays we have lines put together in a cable and twisted and double-twisted, and there is no interference. That has been cured by experience and by invention. Why is it not possible that this interference in radio operation can be cured? Why tie this up so tight, as has been suggested? Why tie this up so close and so tight that you can not get it apart without coming back to Congress? Why not take it in the form of regulation? Then, if the Navy Department has made a trade with the Marconi Co. that was not a good trade, if the Navy got stuck and made a foolish trade, let them bear the brunt of it and not protect them because they made a trade that was not a very good one. They have made lots of mistakes in the last few years, and they are being shown up as they come to light. Why not let them go ahead and make their trade? I do not like to have so much tied up ahead. There is another day coming, a better day, I hope, when there will be more daylight.

Mr. SARNOFF. The Navy Department did not make a bad deal at the price it paid, Mr. Greene. I think they got what they paid for.

Mr. GREENE. In the present light that is possible, but I do not know whether it is a good trade or not. But you would not have completed a trade if you had not both thought you were getting the best of the other fellow. The Government thinks it got a good trade. Why not let it be tested as to whether it is a good trade or not? There is a matter of doubt in the minds of some of us here whether it is a good trade or not. They are not always right. They may construct good vessels and good machinery; but here they are going into a practically new venture. They do not know any more about radio than a good many men in this room know about it. They have had some experience in it, but these other men have had some experience in it, too.

Mr. SARNOFF. I have suggested, Mr. Greene, that the Navy Department be excluded from the commercial operation of high-power stations and also excluded from commercial operation of point-to-point stations; that is, for overland service. I think that in those two fields lie the maximum opportunities for commercial expansion and for commercial profits. I do not think there will be very much opposition on the part of the commercial people to leaving the coastal stations in the hands of the Navy Department, now that they have acquired them through purchase for the use of the ships at sea.

Mr. GREENE. If they do not get too much into this business which they do not know anything about, that is all right. I am willing to

let them go ahead so far as they know anything, but I am not willing to get them into the mysteries of commercial business, which they do not know much about and can not do much with.

The CHAIRMAN. Is there anything further? Gov. Griggs will be heard next.

**STATEMENT OF HON. JOHN W. GRIGGS, REPRESENTING THE
MARCONI CO. OF AMERICA.**

Mr. GRIGGS. Mr. Chairman and gentlemen of the committee, I think you must all be conscious that you have done nearly a day's work, and with that consideration in view I will be just as brief as possible and try not to revert very fully to points that have already been discussed.

The declared object of this bill is to take over for the Government, to be administered under the Navy Department, the long-distance stations. The only company in the United States that is prepared for long distance is the Marconi Co., and so, in so far as this bill would have present effect, it would seem to bear most directly and hardest upon the Marconi Co. The Marconi Co. is not only the most important in the way of capital and property and its stockholders, but it is the oldest wireless company in the United States.

When Mr. Marconi had developed the knowledge of the Hertzian waves so as to be able to produce signals and had secured patents in Great Britain and the United States, they formed the Marconi Co. of New Jersey, and Mr. Marconi conveyed to it all the patents and inventions he then had, with an agreement to convey to it all other patents and inventions which the parent company acquired, and I think that is substantially the only agreement on the subject that ever existed between the two companies.

In addition to the patent in that contract the company has put out \$7,000,000 worth of stock, which was paid for in cash. Its present capital is \$10,000,000, and I think its total assets, as figured on its statement, amount to something like \$12,000,000. It has no bonded indebtedness—it has no indebtedness whatever except the week-to-week current bills that it incurs. It has paid two dividends in the course of the 15 or 16 years it has been engaged in business. It has 22,000 stockholders, the most of whom are residents of the United States, who acquired their stock on the hope and expectation that eventually the Marconi Co. would be able to become a successful competitor of the oceanic cables, and thereby would derive a large income which would justify an investor in waiting 10 or 15 or even 20 years for a dividend, because he expected when the result was obtained he would reap largely in returns.

The company out of the \$7,000,000 which it raised in 1908 by an issue of stock of that amount has spent about \$5,000,000 in building stations preparatory to trans-Atlantic, trans-Pacific, transoceanic service. Of course, you can not have transoceanic service unless you have not only a station at this end but you have to have a coordinating station in the other country. So that whether it is the United States Navy, or whoever it is, that attempts to carry on wireless internationally, they must have somebody to cooperate with at the other end or they can not do it.

The Marconi Co. had in Great Britain the British Marconi Co. to cooperate with, who did agree to put up and who did put up a coordi-

nating station. The Marconi Co. had a contract with the Government of Norway to put up a coordinating station in Norway, and they have put up that station there. The Marconi Co. had an agreement with Japan to put up a coordinating station in Japan, and when the United States was dragged into this war we were carrying on successfully profitable wireless communication with Japan.

And I might stop right here to say that since the United States Navy took over our San Francisco and Hawaiian stations that service has been stopped. It has not been renewed, and to-day it takes seven days to get a cable from the United States to Japan, and we put it through and got an answer back in less than an hour.

I said we spent \$5,000,000 in getting ready to do this international, this transportation business. It was from that that the promoters of the company—and when I speak of “promoters” I mean not in the sense of those who sold the stock, because we did not have any such promotion, but I mean those who were proceeding with the business and development of the company. It was their expectation that the great profit of the company would come from this long-distance service, and what we expected was that we would so cut into the rates charged by the cable companies that we would acquire a very large part of the business; and not only that but that we could take certain messages that were called “deferred” messages at rates which the cable companies could not afford to transmit.

Well, just when we were ready to inaugurate this service with the British Islands, Great Britain went into the war, and, of course, they had to take over the stations, and our stations have been idle ever since. I am speaking only of our long-distance stations—they have been idle ever since, so far as the Marconi Co. has been concerned, although I understand the Navy Department has operated one or more of them to some extent.

That being the situation, and the war being—well, under armistice, but practically over, and the methods of peace about to be resumed throughout the world, as we hope, in comes the military arm of the Government, the Navy Department of the United States, and asks power of Congress to take away from the Marconi Co. not only these stations but all of this prospective business that it has been planning and working and spending money for 20 years to develop and build up. Just when the farmer has planted his seed, plowed his field, and harrowed it, and cultivated his crop, and the corn is ready to husk, the Government comes in and says, “We want that crop.”

Well, there must be some justification for such action as this. It is unusual; it is severe. The requisitioning of the property devoted to the uses of commerce or manufacture by citizens of America, the requisitioning of that property is harsh, unusual in time of peace, and ought not to be permitted by Congress except on grounds of public necessity. You can not take ground for a railroad under the laws of condemnation of any State in the Union, unless it is necessary. You can not take the right to string telegraph or telephone poles unless it is necessary for the purposes I have named.

Now, is it necessary that the Navy Department should have control of the commercial long-distance communication of the United States? It strikes one as peculiar that when a request is made of the Congress to turn over the commercial traffic in wireless that request should be to put the power in the least qualified, from a busi-

ness point of view, department of the Government. I should say, I should expect normally and logically, that if the proposition were made by anybody that the Government ought to control long-distance service, they would expect not the Navy Department but the Department of Commerce to control it. It would seem to me that the theory of the formation of these departments of the Government would put in the Department of Commerce the oversight and the conduct of commercial business to be done by the Government. And it is quite anomalous, and I might say it is startling, to have the military branch of the Government come here and say, "We must conduct commerce."

Well, now, what necessity, what reason do they give? The reasons are not harmonious and they are not consistent. Nearly two years ago, before this same committee, there was a bill providing for the Navy Department taking over the wireless system. The reasons for it were given by various gentlemen connected with the department and others, including the Secretary of War. The Secretary of War—I refer to page 12 of the record of the hearings two years ago—says:

It would be a very harsh thing to do to wait for war to break out and then take over the commercial stations; it would be a very harsh thing to interfere with private interests.

The Secretary of War recognized then that it was a harsh thing to do in time of war. He had a feeling of compassion for the company.

But Commander Todd—I do not know, but I hope he has been promoted since and is captain now—but Commander Todd said then, on page 30:

But we can not take them over to advantage—

Meaning the stations—

when war is imminent; it is too late.

And, to the same effect, Capt. Bullard, who had been in charge of the aero department of the Navy, said, on page 78:

Now, we hear considerable about the proposition in regard to these commercial stations, that the Government is in a position to take them over in time of war; but it must be remembered that in time of war, however we deplore it, we do not get all the notice in the world we want; we do not get three or four weeks' notice or we do not get three or four months' notice. It comes on us overnight. And we want to be prepared.

So that the reason at that time was that in case of war they wanted to be prepared beforehand. Now all that reasoning and all that argument is absolutely dissipated by the experience of the Navy Department in this war, which came after that hearing, because they have said, with the fullest justice to the wireless companies, that they most patriotically turned over their apparatus, their stations, their force, their everything to the Government, and that everything ran as smoothly as could be; in fact, they take certain justifiable pride—the Navy Department does—in the way they conducted the wireless during the time the war was raging; and we agree that the Government suffered no harm from the fact that that bill did not pass in 1917, the fact that they had no power to take the stations until actual war was going on did not disturb the public safety in the slightest degree.

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All the reasons they gave then to endeavor to persuade this committee to give them this harsh power that Secretary Baker spoke of, all the reasons they gave then have absolutely vanished, yet here they are back again with a bill a good deal more extensive than the one they had then, and they have found a new reason for interfering with the natural forces of commerce, and the new reason for interference is the reason of "interference."

I am not going to deal with that technical feature that for the Marconi Co. to be carrying on its business, its commercial communication with Great Britain and with Norway, and with Pan American countries, with South America—I am not going to deal with the question as to whether that is going to interfere with the Navy operations of their stations in time of peace. You have heard all there is about it. But I want to call your attention to this, gentlemen: In time of peace the interests of commerce and business are superior to all the navies of the earth. This country does not exist for the benefit of the Navy. The Navy Department exists for the benefit of this country, and no interests of this country should be subordinated to the control of the Navy Department merely because they want it, and substantially that is the only reason that is behind this bill so far as these officers of the aero bureau of the department are concerned.

Let me ask you this: What law compels the Navy Department to transmit official business or press messages by these stations if they take them over? And if they are willing to transmit messages, if they find that the needs of communication in time of peace, when battleships will lie rusting in harbors—if they find that the needs of their service will still permit some business to be carried on, how will they carry it on? We have had a censorship for the last year and a half. No man could send a message by cable unless it passed a Government censor. No newspaper could get a communication from the front unless it was such as the censor permitted to come over the wires. Do you want to perpetuate a censorship in the Navy Department? If, then, the power—the only power—to operate transoceanic stations is the Navy Department, what newspaper, what correspondent, what business house but what would be at the mercy of some lieutenant commander who had a prejudice against the paper or the correspondent or the business house and did not like it, and who would not take their messages unless they conformed to his ideas of what was proper news to send across? Is there anything to hinder that? The interests of the Navy Department could always be cited as the reason why particular news should not come. I do not hesitate to say that I can conceive of no emergency in time of peace connected with the maintenance and operations of the American Navy or naval stations which would require that they should have first control of long-distance wireless. I say the first use belongs to business and commerce; it belongs to the business people, to the press people, to the commercial people of the United States, and it does not belong to the officers of the Navy Department.

Of course, gentlemen, I understand that there are some people who think the Government should control all these utilities for the purpose of preventing monopoly, and for other reasons. I do not want to enter into a discussion of that, but I do want to point out that it was immediately after the Navy Department had forced the Marconi Co.

into an agreement to sell their ship-to-shore stations that this bill asking for more power came in, and that after this bill got here the cable companies were requisitioned by the Government, after the armistice had been signed; and that there is pending in the House of Representatives, a bill or a joint resolution to have the Government take over the cable companies and administer them through the Post Office Department, in which connection I wish to call to your mind the fact that the present Postmaster General addressed a letter to Judge Alexander, the chairman of his committee, on January 15, 1917, in advocacy of the policy of taking over the wireless stations for the Government, and he said, quoting from page 96 of the record of that year:

There is no essential difference in principle between communication by radio and communication by telegraph or telephone.

There it is, stripped bare. To the mind of the Postmaster General they both come under the same head.

The fundamental principle—

He said—

Involved in all means of electrical communication is the transmission of intelligence, and this is distinctly a postal function, and there is no logical or consistent reasoning that will sustain a proposition to place the licensing of stations and the fixing of rates, etc., for one means of electrical communication, in another department, while jurisdiction to some extent over other means of electrical communications is already lodged with the Post Office Department.

And he wants the bill amended so as to have control of wireless stations in the Post Office Department.

I do not know whose handiwork this bill is, but certainly it is a most inadequate—and, I might say, most inartistic bill. We can pass over the omissions and contradictions contained in the bill, and get a little insight into the state of mind of the department in connection with the taking over of our stations.

It provides in this section 8:

That when any radio station is requisitioned, taken possession of temporarily or permanently, or closed, or its license revoked or suspended, the United States shall pay to the persons interested therein just compensation for the property or interest so taken, provided that a claim for such compensation is made on the Secretary of the Navy within two years after the date of the passage of this act.

Of course, as was pointed out in the last hearing, if the station was taken over three years from now there would not be any way of getting compensation. But that was a mere slip of the pen.

In case of disagreement as to such just compensation, the Secretary of the Navy shall make an offer, and if such offer is not accepted there shall immediately be paid to the person interested three-quarters of the amount offered.

And then the person interested can go to the Court of Claims and have a law suit for the rest.

Passing over the obviously unjust, unfair, and arbitrary methods of dealing with the person whose property is thus taken, I want to call your attention to the fact that that does not provide at all for just compensation. Just compensation is what the Government owes for the property taken.

If you have a company like the Marconi Co., that has been 20 years elaborating, improving, expanding, building up to a certain point of perfection, and then the Government comes in and takes

that merely at its scrap-rate value, or its value as it stands, and does not take it at its value as a going company, nor take into account what it is capable of earning, nor take into account the money that has been spent working it up, scrapping of machinery and apparatus, and has taken all these 20 years—you see how much encouragement you are giving people to invest their money in enterprises of this kind, and you see how unjust it is to these stockholders, who have been willing to wait 5, 10, or 15 years until the company could do this business and earn dividends, to buy them out for the scrap value of their stations.

Two years ago Commander Todd said significantly that he thought these stations could be got for \$5,000,000, and if we waited five years they would be worth \$20,000,000. There was evidence that Commander Todd knew when those stations were put in operation the large business that we expect was coming to them and the profits that were earned by the company, property which represented merely on the ground \$5,000,000 as a going concern would be worth \$20,000,000. I do not tie myself to any figures, but you know the difference between the preparation to do business and the doing of business.

Let us see what it is that they propose thus to take in this arbitrary way. They propose to take the Marconi system in the United States. Well, what is the Marconi system and who is Marconi? I would like to read to you a judicial statement made in 1905 by Judge Townsend, of the United States Circuit Court for the Southern Division of New York, in a patent suit. I read from One hundred and thirty-eighth Federal Reporter, page 673:

The exact contribution of Marconi to the art of spark telegraphy may be stated as follows: Maxwell and Crookes promulgated the theory of electrical oscillations by means of disrupted discharge. Hertz produced these oscillations and described their characteristics. Lodge and Popoff devised apparatus limited to lecture or local experiments or to such impracticable purposes as observation of thunderstorms. Marconi discovered the possibility of making these disclosures available by transforming these oscillations into definite signals, and, availing himself of the means then attained, combined the abandoned and laboratory apparatus and by successive experiments recognized and developed them into a complete system, capable of commercially utilizing his discoveries.

Marconi has been recognized by almost all the great scientific societies of the world as the real inventor and discoverer of the practical art. He has had conferred upon him the Nobel prize. The Governments of Great Britain, of France, of Spain, of Belgium, of Russia, of Italy have honored him by reason of that invention. The only two great commercial countries that have persistently refused, so far as their Governments are concerned, to recognize Marconi or his patents are the United States and Germany.

When this company first began its operation of ship-to-shore business we got permission to put a station on the Scotland Lightship, at New York Harbor, equipped with Marconi apparatus. The Telefunken, a German company, in which the Emperor of Germany is said to have been a stockholder, equipped a German ship with Slaby-Areo apparatus, and when it came along it attempted to communicate with the Scotland Lightship and the Scotland Lightship refused to communicate with them because they had not the Marconi apparatus. The ship reported the thing to the home government at Berlin. Immediately the Kaiser sent word, through the German ambassador, demanding some kind of satisfaction for the outrage, and immedi-

ately, in compliance with his demand, the Marconi Co. was ordered to take its apparatus off the Scotland Lightship—and it did.

Let us see what the attitude of this department has been toward the Marconi Co.

The CHAIRMAN (interposing). When did that occur, Gen. Griggs?
Mr. GRIGGS. I beg your pardon.

The CHAIRMAN. When did that occur? It is interesting history.

Mr. GRIGGS. Well, I can only tell you according to our old Latin way—the way they used to do it in Roman times—“Roosevelt being President.” [Laughter.] I should say it must have been about 1904; but I am not certain about that. I think we have the communication on file yet.

Let us see what the attitude of the Navy Department has been toward the Marconi Co. and generally toward all inventors and patentees—because you must bear in mind when you think of monopolies in connection with business—that a large part of the property of the Marconi Co. consists in lawful monopoly, conferred upon it by the United States Patent Office under the law. Its patents are supposed to be monopolies, and they are given monopolies as incentives to reward invention and discovery; and in that respect we are proud of our monopoly.

Very early—as early as 1904—the Navy Department began equipping naval vessels with piratical apparatus purchased from companies that made apparatus and sold it embodying the Marconi patents. The Marconi Co. protested to the Navy Department against that practice, and said it was not fair to patentee to have the United States Government, which granted the patent, accept goods and buy them from a pirate. It was replied by the admiral, who at that time had charge of the bureau, that the Navy Department took no cognizance of patent rights, except so far as they had been adjudicated by some court. Whereupon the Marconi Co. brought a suit—which I referred to—against the De Forest Wireless Co., and the Marconi patents were sustained as valid, and the De Forest Co. was enjoined, and there was a complete judicial determination of the validity of the Marconi patents by Judge Townsend, who was a very able judge.

Whereupon we meandered again down to the Navy Department and saw the admiral and said to him: “Sir, we have brought suit against an infringer, and the Circuit Court of the Southern District of New York has declared our patent valid, and we now ask you to cease buying apparatus from these infringers.” And the admiral said: “We can not recognize the decision of a subordinate court. We must have a decision of an appellate court.” “Ah, but,” we said, “De Forest will not appeal. He acquiesces in the decision.” To which Admiral Manning replies, “Well, that is your misfortune.”

The Navy Department proceeded from that time to this, against our protest, ordering apparatus that embodied the patents of the Marconi Co., which had been adjudicated, and some of them subsequently adjudicated—some other patents—by the Circuit Court of Appeals. They went right on, in spite of decisions, and protests, and everything, ordering apparatus from piratical contractors.

Mr. HARDY. Just pardon me one moment.

Mr. GRIGGS. Yes, sir.

Mr. HARDY. Did you try to enjoin these other parties from making or selling this apparatus?

Mr. GRIGGS. Yes, sir; we brought a suit in New York in the Federal court against a man by the name of Simon, to enjoin him; and the Assistant Secretary of the Navy sent a private letter to Judge Hough of the court—this was before the war; it was not during the war—saying that if Simon could not be allowed to go on and fill his contract with this pirated apparatus—he did not say “pirated,” I am putting that in—it would be injurious to the interests of the Government. Whereupon the judge dismissed our suit. We took an appeal to the United States Supreme Court, and the Supreme Court held he was wrong and reversed him and remanded the suit back to be tried; and then when we had prepared to try the suit again, the war having intervened, the Navy Department asked all the Federal courts not try any patent suits—to stop trying that suit against Simon. They directed the Marconi Co. to stop bringing on an appeal in the Circuit Court of Appeals for the Ninth Circuit that was set for argument in San Francisco, in which the Government was not a party and was not interested at all; and because the Marconi Co. did not come right down and agree to do it, but rather protested against the injustice, they telegraphed to the court and asked the court not to hear it. The Marconi Co.—

Mr. HARDY (interposing). That was during the war?

Mr. GRIGGS. That was during the war.

Mr. GOODWIN. Who was it sent that telegram?

Mr. GRIGGS. The Assistant Secretary of the Navy, Mr. Roosevelt, so I am informed by counsel in the case who was out there at the time. Of course, I have never seen the telegram. We had a decree against another De Forest Co.—because as fast as you beat one of them by an injunction and order to pay costs they went bankrupt, and then they made up another company and started again—before Judge Mayer for an injunction and accounting, and that was affirmed by the Circuit Court of Appeals, and we wanted to go on with the accounting and the Government would not let us.

Well, several years ago, having got no relief whatever from this treatment by the Navy Department, we began suit against the Government in the Court of Claims to recover royalties for the apparatus which they had bought from pirates, the claims arising under the adjudicated patents; and what do you think the Government did? They not only denied our right to any royalty, but they denied the validity of the patents and required us again in the Court of Claims to go through another trial as to validity of patents which had been passed on by the Circuit Court of Appeals, although applications for certiorari to the Supreme Court were refused.

Mr. BANKHEAD. When was that litigation instituted in the Court of Claims?

Mr. GRIGGS. In 1916.

Mr. BANKHEAD. That has not been decided?

Mr. GRIGGS. Has not been decided. We examined one witness, and the Government's counsel adjourned for cross-examination, and he has never been willing to cross-examine him yet; and only yesterday, gentlemen, the clerk of the court sent word to our attorney to appear in court and show cause why the case should not be struck from the calendar because the case had not gone on, and the Government attorney had to get up and admit it was his fault.

Mr. GREENE. I should like to suggest that we were assured when we had the hearing before that while they would not make any arrangement to pay anything, you could go to the Court of Claims.

Mr. GRIGGS. Oh, yes. Well, there are a good many inventions which do not belong to the Marconi Co. which are used in wireless apparatus, but the department went on treating them all alike, and during the war there was perhaps some justification for the Navy Department's saying, "We can not stop to adjudicate patents now," provided that had not been a continuance of the practice maintained for 15 years constantly.

The thing went on until it seems Commander Hooper was the first who had a pricking sense of honor and justice sufficient to induce him to do something in the way of remuneration to the people whose patents had been nullified by the Navy Department, and he told you something about what was going to be done. I do not want to take any credit away from Commander Hooper, not any credit he is entitled to or that he claims, but I happen to know something about how that came about. It came about this way: The War Department applied to the Marconi Co. for apparatus, and we asked, "What about patents?" and they sent Capt. Young to see us—an Army officer who had been a patent lawyer—and he brought with him an opinion from the Judge Advocate General of the Army saying that it ought to be the policy of the War Department, where patents had been adjudicated, to recognize the right of the patentee and not to use the patents except on settlements for the royalty. Cap. Young came and wanted to make an arrangement for royalties for the War Department for whatever they bought of others which embodied our patents.

And then, in connection with that, it went on so that we suggested to Capt. Young that the War Department ought to develop that idea until all the claims of patentees for infringement against the Government or any of the departments were settled up at one lump and all this disgraceful situation put an end to; and it was through Capt. Young that this commission was initiated and formed, if I am correctly told, and I hope that something good will come of it, because we have evidence, gentlemen, we have very strong evidence that the policy of the Navy Department has very materially changed within the last six months; because it is on record in this hearing that whereas they would never recognize any patent that had not been adjudicated and they would not recognize any adjudicated patent that had not been confirmed on appeal, and then they would not recognize any patent whatever—they bought a patent or a bunch of patents that had never been adjudicated for \$1,600,000. [Laughter.]

Mr. GREENE. Tell us the whole story.

Mr. GRIGGS. Now, one or two words with reference to the Pan American Co. and its status under this bill if it should pass.

That company has not any stations, and this bill refers to the taking over of stations. But that company is forbidden to do business under this bill.

Who is going to recompense them? That company was encouraged by the State Department of your Government; it was encouraged by the Navy Department, or the officers of the Navy Department of your Government. Over \$100,000 has been expended. We have

pledged our good faith to the Government of Argentina that we will build that station down there, and they expect us to do it, and yet this bill is going to wipe that thing out and not make one dollar of recompense to the stockholders of the Pan American Co.

Do you gentlemen agree to that kind of a policy? What kind of a spirit does this bill show? What does a bill drawn with such imperfect comprehension of the principles of just compensation indicate as to the minds of the men that are backing it up? Does it indicate a desire for arbitrary power? Does it indicate that the military spirit is back of it and not the spirit of justice and peace?

Mr. HARDY. Gov. Griggs, I do not understand what that particular case is that you refer to now—the Pan American case?

Mr. GRIGGS. It has been explained; perhaps you were not here at the time, Judge Hardy.

Mr. HARDY. Perhaps I was not.

Mr. GRIGGS. It has been explained that a company has been formed, officered entirely by Americans, to build communicating stations between the United States and South America, and Mr. Nally told the committee how he had gone to the Argentine Republic and had secured the extension of a concession from the Argentine Government which we had bought, and that we had purchased a site for a station; and, whether Mr. Nally stated it or not, I do not know, but we were about to establish a site for a station and enter into a contract—which was drawn—for the construction of a station in this country at an expense of probably \$2,500,000.

Mr. HARDY. A station in this country and one down there in Argentina?

Mr. GRIGGS. Yes; a station here and one down there. And after that had been done, with the knowledge, approval, and encouragement of the Navy Department, or, at least, of the officers of the Radio Bureau and of the State Department, we were notified by the Secretary of the Navy that he was now opposed to the scheme; and in prudence we had to stop spending money on that scheme, and there is no station built.

Now, this bill, if it passes, will make everything that was done by that company void; it ends its rights; it forbids it to go on with this enterprise; and all this money is forfeited; and there is no provision whatever for recompense.

Mr. HARDY. I see your point now.

Mr. GRIGGS. You see the point, do you not? There is no provision for recompense in this case, because the bill only provides for taking over stations.

Now, is any gentleman on this committee willing to perpetrate an injustice like that on a company that, while it is trying to make money for its stockholders, is certainly trying to do something big and good for the commercial and business interests of the United States?

Then something was said about the policy of having stations in South America; for instance, controlled by this Government or by private companies. Now, here is a point about that that I may refer to:

If in time of war in which the United States or the Argentine is a neutral a private company is allowed to carry on communication with a belligerent country, it is not a breach of neutrality on the part

of the country. But if a government station in Argentina or in the United States carries on communication with a belligerent government, it is a breach of neutrality under international law.

I might point out that one reason why the ship-to-shore business in the United States has been so limited is probably due to the shipping laws of the United States, in which connection it has occurred to me that gentlemen who talk about freedom of the seas as a policy of the United States have entirely forgotten that no foreign bottom can do business under the coastwise shipping laws; no foreign ship can trade between the United States and Hawaii, or the Panama Canal, or the Philippine Islands, or any of the possessions of the United States, and perhaps the wireless would be better and our standing as advocates of the freedom of the seas would be better if we let up a little on our shipping laws and our coasting laws.

Mr. Chairman, that is about all I have to say, except this:

I suppose that you gentlemen would never think of reporting as barren and as naked a bill as this, even if you were in favor of the Navy's taking over these things, which I would suppose you would not be in view of the imminent discussion of this whole subject that is liable to occur before this time next year.

But if you should—which I hope you will not—think that the Navy Department ought to run the commercial business of the United States to this extent, then I submit that it is only just that you should amend the bill in this way: Put in at the end of the eighth section in the section relating to "just compensation" something like this:

"When any radio station, stations, or systems of stations of any wireless company shall be permanently requisitioned or taken over by the United States the just compensation to be paid to such company shall include the value of the services, expenses, work, and labor done and expended in the development, elaboration, and preparation of said company for the transaction of wireless communication on a commercial basis, and shall include the value of the good will and patents of the company, so far as such patents are or may be valuable for use in such stations for transoceanic commercial communication, to the end that such company shall not be deprived without compensation of the prospective profits that would accrue to it if it were permitted to continue in the operation of wireless communication with transoceanic countries. The mere value of the physical properties of the company shall not be the measure of compensation. In case of disagreement between the United States and any owner of a station or stations so requisitioned as to the amount of compensation that shall be paid by the United States such amount shall be determined by arbitrators. The United States and the company shall each name one arbitrator; if these two can not agree, they shall choose a third person as umpire, and the amount fixed by any two of such arbitrators shall be the amount to be paid by the United States to the company as just compensation. The fees and expenses of the arbitrators shall be paid by the United States upon the approval of the Secretary of the Navy."

Now, it does not seem to me that, in view of all the business that the Court of Claims is going to have consequent upon this war the methods by which disputes as to the value of property are ordinarily determined ought to be adopted by this Government; and whether

you ever use that amendment or not in this case I think I am doing a service to you gentlemen of Congress in calling your attention to the fact that the Court of Claims no longer stands, in a strict sense, as a court of justice wherein justice is judicially administered, because it is not administered there as promptly as it ought to be.

The CHAIRMAN. I would like to refer to one matter in connection with section 8, as written in the bill:

That is substantially the form in which some provision has been written into other bills reported out of this committee, which have since become law, especially with reference to the condemnation of property for housing, facilities for docking, and other purposes. Now, it is our view, and I think the view of Congress, that we should not undertake to limit what just compensation is by statute.

The Constitution, of course, provides that private property may not be taken for public use, except upon just compensation. And even if the bill were enacted into law as written, the courts, in determining what would be just compensation to the Marconi Co. for its properties, would not simply include the physical property, but also the good will and the value of the property as a going concern; in other words, all the elements, substantially, which you set out in detail in your proposed amendment.

Mr. GRIGGS. Do I understand, Mr. Chairman, that you would so interpret this section 8 of the bill as it now stands?

The CHAIRMAN. Well, I say that just compensation, under the Constitution, would include all of those things.

Mr. GRIGGS. Compensation for what?

The CHAIRMAN. For the property.

Mr. GRIGGS. It says for the station.

The CHAIRMAN. No; it says "property." It reads this way:

That when any radio station is requisitioned, taken possession of temporarily or permanently, or closed, or its license revoked or suspended, the United States shall pay to the persons interested therein just compensation for the property or interests so taken, provided that a claim for such compensation is made on the Secretary of the Navy, etc.

Now, do you think the courts might construe that to refer to the individual station?

Mr. GRIGGS. Yes; to the station and the apparatus and the ground.

The CHAIRMAN. Without reference to its value as a part of a great system?

Mr. GRIGGS. That is what I mean.

The CHAIRMAN. Well, if you do mean that, and the courts take that narrow a view, I agree with you that we ought to modify that language.

Mr. GRIGGS. You would not construe it in that way. The fact is that the Marconi Co. could not get anything for its good will or get anything for its patents or get anything for its labor.

The CHAIRMAN. Well, I would say that that would be unconstitutional, if that were the construction by the courts.

Mr. GRIGGS. How could you say that when Congress has the right to take a business without compensation, just as it did in prohibiting the breweries from using their property without any just compensation to them?

The CHAIRMAN. Well, that depends upon a different principle; the courts have never recognized the right of a brewery or a distillery to

sell its products; in other words, those people had no vested rights to the manufacture and sale of intoxicating liquors. But I see your point.

Mr. GRIGGS. I will leave this proposed amendment with the committee.

Mr. HUMPHREYS. I would like to ask you as to a question of policy you have already discussed here in Mr. Nally's statement. What do you think of the policy? I just want your opinion on that.

Mr. GRIGGS. What policy?

Mr. HUMPHREYS. I am going to ask the question now.

Mr. GRIGGS. I beg your pardon.

Mr. HUMPHREYS. The policy of giving the Navy the exclusive right under the law to do ship-to-shore business.

Mr. GRIGGS. I do not think it is good policy myself.

Mr. HUMPHREYS. Well, what do you think of this proposition, submitted by Mr. Nally, of creating a national commission to regulate the radio business generally and to—

Mr. GRIGGS (interposing). I approve of that. I will say this, that if you could get Capt. Todd, of the Navy Department, Mr. Chamberlin, the Commissioner of Navigation, and two practical wireless men, they could sit down and determine all these questions just about as fairly as could possibly be done, without injustice to anybody.

Mr. HUMPHREYS. Do you think the Navy Department ought to be permitted to do commercial business—ship-to-shore business?

Mr. GRIGGS. I do not. Now, that is my sentiment, you understand.

Mr. HUMPHREYS. I understand; I just want your opinion.

Mr. GRIGGS. My sentiment is that no military department ought to be allowed to do business.

Mr. ROWE. Commercial business?

Mr. GRIGGS. Commercial business, I mean.

Mr. GREENE. I have argued against it, because I do not believe they can do it successfully.

Mr. HUMPHREYS. Well, as a consequence, you do not believe, of course, that they ought to be permitted to do this long-distance business?

Mr. GRIGGS. Certainly not. The nature of a military man, whether of the Navy or of the Army, is to put the interests of his department above all other things; that is what the military education produces.

Mr. GREENE. That is the result of his training.

Mr. GRIGGS. Yes; and it is to his credit during war time; that is what we have him for. But in time of peace he is not the man to conduct the affairs of peace.

The CHAIRMAN. Are there any further questions?

Mr. EDMONDS. This \$1,450,000 that you have got for the shore stations must have included something besides the value of the shore stations, did it not?

Mr. GRIGGS. Yes; it included three hundred and odd sets of apparatus on the ships, each one of which had cost us about \$3,300.

Mr. EDMONDS. Your shore stations last year were estimated by the Navy Department to be worth about \$400,000. What made them go up so much in value?

Mr. GRIGGS. The Navy Department made that estimate?

Mr. EDMONDS. Yes.

Mr. GRIGGS. I do not know what their estimate was based on, but you must bear in mind that when they took over these sets of apparatus, 300 of them, they took over our prospective income out of the contracts we had—

Mr. EDMONDS (interposing). Then they did make a settlement with you, based on some prospective value outside of the real value of the property?

Mr. GRIGGS. I think so. I did not negotiate the details of that at all.

Mr. BANKHEAD. What is your official connection with the Marconi Co.?

Mr. GRIGGS. I am president and general counsel of the company.

The CHAIRMAN. Are there any further questions, gentlemen?

If not, we will adjourn until to-morrow morning at 10 o'clock. The hearing will begin then and I will be glad if every member of the committee will be present.

(Whereupon, at 5 o'clock p. m., the committee adjourned until Wednesday, December 18, 1918, at 10 o'clock a. m.)

GOVERNMENT CONTROL OF RADIO COMMUNICATION.

COMMITTEE ON MERCHANT MARINE AND FISHERIES,
HOUSE OF REPRESENTATIVES,
Wednesday, December 18, 1918.

The committee met at 10 o'clock a. m., Hon. Joshua W. Alexander (chairman) presiding.

Mr. HARDY. Mr. Chairman, before we start the hearing this morning I wish to state that some parties representing inventors have asked me whether it would be possible for them to have a hearing. There are two gentlemen who stated they would like to make a 15-minute presentation each of the attitude of the inventors.

Mr. HUMPHREYS. After the amateurs get through—

Mr. HARDY. Yes; what I would like to do is to suggest the time when they might be heard.

The CHAIRMAN. I suppose we can get through with the amateurs to-day. We want to give everybody a chance to be heard before we close the hearing.

Mr. HARDY. Then we might hear these gentlemen to-morrow morning.

The CHAIRMAN. I agreed with Mr. Penfield, who represents the United Fruit Co., that if he could not be heard this morning we would let him in the first thing to-morrow morning. I think we will get through the hearings to-day and to-morrow; but if we do not, we will continue them over, that is all.

Mr. HARDY. Then I will tell these gentlemen to be here to-morrow morning at 10 o'clock.

The CHAIRMAN. Yes; and I am not sure but what they might be heard this afternoon.

Mr. GREENE. I do not think these amateurs will be through to-day. They want a fair show, and have come from a distance.

The CHAIRMAN. I understand that, and they will get a fair show, but they are not as long winded as some people.

Mr. GREENE. I am not so long winded as some people myself, but I want everybody to have a fair show.

The CHAIRMAN. There is no trouble about that, and everybody will have a fair show. They have always gotten it in this committee under this administration.

Mr. GREENE. Well, they had it under mine, too.

The CHAIRMAN. Mr. Maxim, I believe, is to be heard first this morning on behalf of the amateurs.

STATEMENT OF MR. HIRAM PERCY MAXIM, PRESIDENT OF THE MAXIM SILENCER CO., AND ALSO PRESIDENT OF THE AMERICAN RADIO RELAY LEAGUE, HARTFORD, CONN.

The CHAIRMAN. Please give your name and address and whom you represent.

Mr. MAXIM. My name is Hiram Percy Maxim; my residence is Hartford, Conn.; my occupation is president of the Maxim Silencer Co. I am also president of the American Radio Relay League, at whose request I present this plea for amateur wireless.

The CHAIRMAN. What is the business of the American Radio Relay League? Is it a business concern or simply an association of those interested in this art?

Mr. MAXIM. It is purely an association of amateurs.

This appeal is made by the American Radio Relay League (Inc.), an organization of amateur wireless station owners having a membership exceeding 4,000, who are located in every State of the Union. The present headquarters is the office of its president, Mr. Hiram Percy Maxim, at Hartford, Conn.

It appears that House bill 13159 contemplates, among other things, making it unlawful for the amateurs to communicate with each other by radio.

We propose to show that the latter action will work an unjust hardship upon many American citizens, will constitute a shortsighted policy on the part of the Government, and will unquestionably be imperialistic and thoroughly un-American.

The CHAIRMAN. Are you speaking to the proposed amendment or simply to the bill as introduced?

Mr. MAXIM. I am speaking to both of them. If you will let me lead up to my point you will find that I refer to both of them.

The magnitude of amateur wireless as an institution in our country is probably not entirely appreciated by this committee, and very evidently not at all by whoever proposed this bill. From the beginning of the art up to the outbreak of war in 1917 the American citizen has been free to communicate with a fellow citizen by running a wire from an upper window of his house to a nearby tree and connecting up a few standard and easily obtained pieces of apparatus. He not only has enjoyed radio telegraphic communication with a fellow citizen on the other side of his own town, but he has also enjoyed this form of communication with fellow citizens in more or less distant towns and even in neighboring States. Everyone possessing a certain form of intellectual make-up responds to the marvel of this thing. To him who has a free running imagination this communicating through the air appeals intensely.

In 1912 when it became necessary for the United States to ratify an international agreement controlling wireless the number of private citizens who had become interested and who had educated themselves in this science and who had erected small private wireless stations, either for receiving only or for transmitting and receiving, was so great that they commanded the consideration of the Government and were given a legal standing before the law under the name "amateurs."

The importance and value to the country of these amateur stations and their amateur operators were recognized by the framers of the law of 1912. Certain specified wave length, wave purity, wave decre-

ment, and power were established for amateur use. Careful thought was given these values so that where the limitations were observed there could be no interference caused the Government or commercial stations. Government inspection by inspectors from the Department of Commerce inspected these amateur stations under the terms of the law of 1912, and regularly licensed them and issued official call letters when they were found to comply with the requirements and where they did transmitting as well as receiving. Where they did receiving only, no license was necessary, but in order to control even this it was wisely made unlawful for any amateur to divulge the contents of any message that might be received except to the person to whom the message was addressed. The law provided also for the licensing of the amateur operators of these stations. They were examined as to their ability to transmit and receive and as to their understanding of radio apparatus, and were given license according to their abilities.

We have heard it said that the cost of enforcing the law among amateurs is more than the amateur is worth. The value of the amateur to the country will be referred to in a moment and in a manner which will show how much he is worth. The enforcing of the terms of the law was evidently not considered necessary by the Department of Commerce, because it was not done except in the most flagrant cases and where interference with Government or commercial stations was actually caused. But it came to pass that the amateurs themselves took into consideration attending to this matter in order to reduce unnecessary interference among themselves and to set higher standards of amateur efficiency. It is a matter of record in the American Radio Relay League that steps were actually under way at the outbreak of the war to offer to the Department of Commerce the services of such men as were needed to enforce the law among amateurs and who would be willing to serve as deputy inspectors on a \$1 a year basis and who would organize to report to the regular inspectors of the different districts amateur violations as to power, wave length, wave purity, and decrement. There is no doubt that this offer would be made to the Government later on if it is desired and if amateur radio is permitted. Therefore, any criticism regarding the cost to the Government of enforcing the existing law among the amateurs is not justified.

Under the existing law the amateur increased in numbers by leaps and bounds. When the outbreak of the war came and the President by proclamation required the dismantling of all apparatus, amateur wireless had become an important institution in this country. It supported upward of 25 manufacturing concerns, several magazines, and had in an orderly and systematic manner organized relay lines of little stations, whose work will probably startle this committee when it is recited. For example, one of these relay lines of private citizens started a message at 1.40 a. m. on the morning of February 6, 1917, from New York City addressed to a citizen of Los Angeles, Cal. The message was delivered and the answer was back in New York City at 3 a. m. the same morning. In just 1 hour and 20 minutes these amateurs had communicated across the continent and back.

Mr. HUMPHREYS. If it would not disturb you, I would like to ask you a question right there. How many relay stations were there between those two points?

Mr. MAXIM. This is from memory—the stations started at New York City. It was then relayed by a station, I think, in Cleveland. It was relayed from Cleveland to a station in Illinois; from Illinois I think it went to some station in western Missouri; from the western Missouri station it went to Denver; and from Denver to Los Angeles.

Mr. HUMPHREYS. From Denver to Los Angeles?

Mr. MAXIM. Yes, sir; in one jump.

Mr. BANKHEAD. About what was that distance?

Mr. MAXIM. I think that distance by air line is 700 or 800 or 850 miles; again I am speaking from memory.

Mr. HUMPHREYS. I thought it was something more than 1,000 miles from Los Angeles to Denver.

Mr. MAXIM. No; I may be mistaken, but I do not think it is 1,000 miles. I know in this air line everything is disappointing as to distance.

Mr. HUMPHREYS. How far would you say, Mr. Hadley?

Mr. HADLEY. I do not know how far it is by air line, because there is such a difference between air line and by rail.

Mr. MAXIM. You understand that distance can only be attained on good occasions; the atmospheric conditions have got to be right. This is a comment not so much upon—some people might say unfairly that that is an illustration of where an amateur was using too much power because he was able to communicate from Denver to Los Angeles, but that is not the point. You have missed it. The point is that the amateur is so keen, he is so intent upon getting the closest possible thing to 100 per cent efficiency, that the value of the thing is that his instruments and his powers of listening were so acute that he was able to do this.

Mr. HUMPHREYS. Was that message from Denver to Los Angeles sent by short-wave instruments?

Mr. MAXIM. Yes, sir.

Mr. HUMPHREYS. What length?

Mr. MAXIM. Two hundred meters. Maybe I am thinking of the 2 P M station in New York City, which is exactly 200 meters, as close as we could measure.

Mr. HUMPHREYS. At any rate, it was a short wave?

Mr. MAXIM. Yes, sir; it was within the limit. Just as another example, which I have not cited and which is worth while now that you have spoken of this thing, is that this 2 P M amateur station in New York of 200 meters, of course, with the very finest instruments and with the most finesse which you do not see in most Government or commercial stations—and you see the very finest finesse that can be attained in this art in these amateur stations—that little station, working on 200 meters, was right in touch with Denver direct on more occasions than one.

Mr. HUMPHREYS. From New York City to Denver?

Mr. MAXIM. From New York City to Denver on 200 meters and 1 kw.

Mr. HUMPHREYS. What do you mean by 1 kw.?

Mr. MAXIM. The limit of the power as provided in the old law was 1 kilowatt, which we refer to as 1 kw.

Mr. GREENE. Then you believe that with the advantage you have already that you can even make improvements on what has already been accomplished?

Mr. MAXIM. Yes, sir; you will see us make improvements. You liberate us again, and we will show you improvements in the next six months that will beat last year.

Mr. HUMPHREYS. May I ask still another question? In sending a message from New York, you mean New York City, do you?

Mr. MAXIM. Yes, sir.

Mr. HUMPHREYS. In sending a message that close to the sea to Denver, were those waves short enough so as not to interfere with any ship-to-shore messages?

Mr. MAXIM. Those waves were short enough, they were pure enough, and they were of the proper character, so that the New York Navy Yard could not hear it. Not only did it not interfere with them, but there was no way we could hear it. The instruments at this New York Navy Yard were not suitable to get down that low. Of course I am speaking now of very beautiful conditions, which the amateur has got the time and the interest and the incentive to work to.

Mr. HUMPHREYS. I understand that, and that shows the possibilities.

Mr. MAXIM. Yes, sir; it does, distinctively. It is one of the things we are very proud of as amateurs.

Mr. GREENE. How long have you been resting now?

Mr. MAXIM. I think it was April 7, 1917, that the President of the United States shut us up. May I proceed, Mr. Chairman?

The CHAIRMAN. Yes.

Mr. MAXIM. Our interest was so keen that improvements in radio apparatus were invented and developed which were made use of by Government and commercial stations. It ought to be of interest to this committee to know that Capt. Edwin H. Armstrong, now of the United States Army, in charge of radio laboratory, Paris, France, was an amateur before the war broke out, and that he is the inventor of the Armstrong regenerative circuit, and that this invention was made as a result of his amateur work, and that it was adopted and was made use of by every single station at the present time. We amateurs hope we may be pardoned for wondering what the Secretary of the Navy would have done without the amateur Armstrong's circuit.

The amateur radio and wireless clubs which had come to be organized in most of the cities and towns throughout the country, and with whom our American Radio Relay League was in contact, invariably had many times as many members operating receiving stations as there were operating transmitting stations. Let us see what the probable number of amateur wireless stations were in the United States when we were forced to close up on the outbreak of the war. Radio stations of the United States, edition of July 1, 1916, issued by the Radio Service of the Bureau of Navigation, Department of Commerce, contains a list of over 5,000 licensed amateur stations. If we take the best estimates of the various clubs and associations throughout the country, we find that the average indicates that there were about 25 unlicensed receiving stations for every licensed trans-

mitting station. Therefore, in July, 1916, there must have been about 125,000 amateur wireless stations in these United States. This figure is more or less checked by those of us who traveled about with this thing in our minds. The number of houses one noticed in town and country in all States where the father or son of the household, or both, had put up their wires and evidently had built their little wireless station was legion. To-day, great numbers of the owners of these stations who were either too young or too old to enter the service are writing to us and asking what we are going to do about this very serious matter of eliminating the amateur.

The location of these various amateur stations should be of value to this committee.

The first district, under the existing law, includes the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut, in which, in July, 1916, there were 848 licensed amateur stations.

The second district includes the eastern section of New York and the northern section of New Jersey in which there were, oddly enough, also 848 amateur stations at the date mentioned.

The third district includes the States of New Jersey (lower section), Pennsylvania (eastern section), Delaware, Maryland, Virginia, and the District of Columbia, in which there were 815 licensed amateur stations.

The fourth district includes the States of North Carolina, South Carolina, Georgia, Florida, and the Territory of Porto Rico, in which there were 105 licensed amateur stations.

The fifth district includes the States of Alabama, Mississippi, Louisiana, Texas, Tennessee, Arkansas, Oklahoma, and New Mexico, in which there were 120 licensed amateur stations.

The sixth district includes the States of California, Nevada, Utah, Arizona, and the Territory of Hawaii, in which there were 618 licensed amateur stations.

The seventh district includes the States of Oregon, Washington, Idaho, Montana, Wyoming, and the Territory of Alaska, in which there were 195 licensed amateur stations.

The eighth district includes the States of New York (western section), Pennsylvania (western section), West Virginia, Ohio, and the Lower Peninsula of Michigan, in which there were 823 licensed amateur stations.

The ninth district includes the States of Indiana, Illinois, Wisconsin, Michigan (Upper Peninsula), Minnesota, Kentucky, Missouri, Kansas, Colorado, Iowa, Nebraska, South Dakota, and North Dakota, in which there were 786 licensed amateur stations.

These figures are as of July 1, 1916.

Mr. HUMPHREYS. You spoke of Porto Rico, can the amateurs connect with Porto Rico from the land?

Mr. MAXIM. I have no record of it ever having been done, sir.

The President's proclamation closed us up early in April, 1917. The number of additional stations set up by amateurs between July 1, 1916, and April 1, 1917, is not available to us at this time, but they may be secured from the records of the Commissioner of Navigation, Department of Commerce. If we judge from the fact that during the month of November, 1916, a total of 285 amateur licenses were issued

for amateur stations, the total number of licensed amateur stations at the time we were closed up must have exceeded 7,000. Mr. Chamberlain told me the other day it was actually 8,562. These were transmitting stations. If we take the best estimates that are procurable as to the number of unlicensed receiving stations to licensed transmitting stations, we are compelled to believe that there must have been in the vicinity of 175,000 amateur wireless stations in this country at the outbreak of war.

An authority of the Radio Club of America, and in charge of the radio apparatus department of a large electric supply house of New York and Chicago, has said in the daily press that these amateur wireless stations represented an investment of not less than \$10,000,000. There are the best reasons for believing that this figure is not extravagant. From our own memory, we can point to Mr. T. E. Gaty, of Morristown, N. J., vice president and secretary of the Fidelity and Casualty Co. of New York City, whose amateur apparatus must represent an investment in excess of \$5,000. Mr. John Hays Hammond, jr., an amateur of Gloucester, Mass., has probably invested in excess of \$15,000 in amateur apparatus. Mr. Leonard D. Fisk, of Hartford, Conn., has invested in excess of \$2,500 in amateur apparatus. Mr. W. H. Carroll, of St. Louis, Mo., has invested in excess of \$5,000 on amateur apparatus. The speaker has invested over \$2,000 in his amateur apparatus. What is to become of all this property if we wipe out amateur radio? Will it be considered right to pass a bill here which will render this property and all other property of the amateur stations of the country useless?

This committee would do well to understand that the amateur is not always a boy in short trousers. We consider our knowledge of the amateurs of the country as second to none, and this knowledge is that the majority of them are men between the ages of 20 and 30. There are a large number of boys, and there are also a large number beyond 30. The average type of young man who is interested in wireless represents the mentally keener among us. He is fired more than ordinarily with that wonderful American spirit which has been shown the world on the battlefields of Europe during the past year. Wireless appeals profoundly, probably because it represents the profoundly difficult. Wireless arouses the cooperation and the admiration of the young man's parents. They believe it leads to better thought and better things. It is our experience that the majority of the younger men interested in wireless come from families of the most modest means. We wish we might tell you of the examples that have come to our personal notice of the untiring effort and the intensity of purpose in which the sole animating motive has been to earn money to buy a pair of first-class head phones, or a regenerative receiving tuner, or an amplifying vacuum valve detector—apparatus which the amateur can not make himself. These examples compel the respect of us more fortunate ones who are in a position to spend \$25 without serious consequences.

We believe it will be of assistance to this committee to have a list of some supply houses who furnish apparatus and supplies for amateurs. As typical, we are taking a list from a single issue of the amateur wireless magazine "QST" of the issue of March, 1917. There are of

course many others, but this is typical and has the advantage of understating the case.

Clapp Eastham Co., Cambridge, Mass.	Mignon Wireless Corporation, Elmira, N. Y.
Adams Morgan Co., Upper Montclair, N. Y.	Lenzite Crystal Corporation, Pasadena, Cal.
W. J. Murdock Co., Chelsea, Mass.	Wireless Experimental Apparatus Co., Philadelphia, Pa.
Thordarson Electric Manufacturing Co., Chicago, Ill.	Wireless Manufacturing Co., Canton, Ohio.
C. Brandes (Inc.), New York City.	H. A. Reverend Manufacturing Co., Kansas City, Mo.
Radio Apparatus Co., Pottstown, Pa.	Electroset Co., Cleveland, Ohio.
Holtzer Cabot Co., Toledo, Ohio.	McGuire & Shotten, Albany, N. Y.
William B. Duck Co., Toledo, Ohio.	Elliott Electric Co., Shreveport, La.
E. T. Turney Co., New York City.	Jones Radio Co., Brooklyn, N. Y.
F. B. Chambers, Philadelphia, Pa.	Borger-Decker Co., Buffalo, N. Y.
Doubleday Hill Electrical Co., Pittsburgh, Pa.	J. H. Ferris, Royal Oak, Mich.
Klitzgen Wireless Apparatus Co., Racine, Wis.	J. F. Arnold, New York City.
Winger Electric Manufacturing Co., Chicago, Ill.	Fosco Corporation, Chicago, Ill.
A. H. Grebe & Co., Richmond Hill, N. Y.	De Forest Radio Telegraph & Telephone Co., New York City.

If we permit the unamended bill under discussion to become law, we will at a stroke block the business which these concerns have had a right to expect would come back to them after the war and after the amateur had been allowed to open up. What is infinitely worse, we block the ambition of over 100,000 of the best brains we possess to apply their efforts in that field in which they most want to work. We will have very successfully prevented them from repeating in the future what we shall presently show they have done in the past to the glory of themselves and their country.

We submit that is too important a matter to pass over lightly. No man should dare to say what embryo world-famous scientist has not his fate pending in this committee room at this moment. We consider it our sacred duty as an American citizen who perhaps has been by chance placed in possession of special knowledge of the subject, to present to you these facts and direct every ounce of energy we command to urge upon you to so modify this bill that by no possibility can it eliminate the amateur wireless station or its owner.

This phase of this matter is not complete without considering the untold possibilities in the way of collateral or side developments that any scientific person knows unavoidably accompanies work of the character we are discussing. An example we can point to at this moment is certain work going on by an amateur which is aimed at the separation of oxygen and nitrogen from the atmosphere by a means that was suggested during the operation of his amateur wireless station. We also know of certain promising experiments in the joining of metals which were suggested to an amateur as a result of working his amateur station. To anyone who is familiar with inventions and scientific development, it can not be otherwise than apparent that there must be thousands of inventions in the making and which may be of priceless value, and which you will kill if you prohibit American citizens from operating amateur wireless stations.

It would take too much time to present a list of the amateurs who volunteered in the Navy and in the Army when the country went to war in April, 1917. Our military forces were faced with the absolute want of a great corps of radio officers, instructors, and opera-

tors. They were needed immediately. There was no time to train them. The emergency was so great that I, as the executive head of a large amateur organization, was called on long-distance telephone by a naval officer at one of the largest navy yards and asked if I would call upon him at my earliest convenience. I called the next day with Mr. A. A. Hebert, the vice president of our American Radio Relay League. This officer asked for our cooperation in securing 500 amateurs' enrollments in the Navy immediately, and as much first-class amateur apparatus as could be located. He explained that the experienced amateur would require very little training. He also stated that the necessary radio apparatus was not available immediately, and that the apparatus of the good amateur stations, if obtainable, could be made use of at once. We extended our very best cooperation and the Navy got its experienced amateurs in the next few days.

I have a letter from a young amateur named J. K. Hewitt, who was one of the young men of our organization who volunteered. He writes that he and two friends who were not amateurs enlisted together. To use his own words, "I was the only one of the three that had amateur experience. I finished the training at the electrical class, Brooklyn Navy Yard, in three weeks and went to sea. My two pals took seven months, and they did not begin to know what I did." This young man was torpedoed by a German submarine and his ship sunk from under him, and was rescued after being in the water for some hours. He now solicits my help in urging you not to pass a law that will prohibit his returning to amateur operating when he is mustered out of the service.

There is another letter which contains information which this committee would do well to have. It is from Lieut. C. D. Tuska, United States Army commander of Radio Training School, Camp McClellan, Anniston, Ala. Lieut. Tuska is a very good example of the typical American amateur. Up to the outbreak of the war, he had a good amateur station, most of which he had built himself, and had become one of the founders and the secretary of the American Radio Relay League, had founded and was the publisher of the amateur wireless magazine, "QST" and when the war came, he volunteered. His radio knowledge, gained exclusively from his amateur experience, caused the authorities to place him in charge of the organization of radio training, without as much as one hour's training from them. He went straight from amateur wireless to Government wireless training with an officer's commission, and he represents a clean-cut and eloquent example of the value to our Government of the amateur. His letter reads:

CAMP MCCLELLAN, ALA., *November 15 1918.*

Mr. H. P. MAXIM,
Hartford, Conn.

DEAR MR. MAXIM: This is just a short personal note to you to let you know that my job seems to have finished with the signing of the armistice. That is the way things appear at this time and if I am lucky I shall be back at the old amateur radio work before very long. It will be quite a change to start operating an amateur station after the kind of radio work I have been doing here.

You would be perfectly amazed if you were able to see with your own eyes the way the amateurs have come across in the case of the Army. I never have been able to tell you very much about the radio training I have been doing.

but I have turned a whole lot of operators out for the Air Service and have become pretty well acquainted with the type of human it takes to make a first-class radio operator. I don't believe you will be very surprised when I tell you the very first sort of a student we looked for is an amateur. He seems to have had all the experience and all we have to do is to acquaint him with a few special facts and he is ready for his Army job. If we can't get an amateur or a commercial radio operator, then we try to convert a Morse operator, but it is a pretty hard job. After the Morse man, we take electrical engineers, and from then on, but a man without previous experience is almost hopeless as far as my experience has shown. Of course we can make an operator of him in 15 or 16 weeks; whereas, the other way an amateur, if fitted, in as few as 100 hours. They've surely done their bit and I am mighty proud I was one.

With very best regards, I am, sincerely,

C. D. TUSKA.

It is very much to the point at this juncture, in order to show what we amateurs did for the Navy and Army, to read the editorial entitled "War," in the May, 1917, issue of our American Radio Relay League Magazine, "QST":

Well, fellow amateurs, war has come to our good old Star Spangled Banner and all the sacrifices we have dimly dreamed in the past are now up to us to make. Yesterday's fancies are to-day's realities, and mighty grim ones at that. Our stations are all closed. At this writing there is no knowledge when we shall be allowed to reopen. Your guess is as good as ours. But there is one thing we do know positively. That is that even if we may not operate our own stations, we may operate our Uncle Sam's. And this constitutes the most golden of all golden opportunities.

We are asked by our country to come and help in the hour of need with our special radio knowledge and training. Radio operators are wanted by both the Navy and Army and the service is made more agreeable than any military service ever before known. We are asked to serve only for the war if we prefer, and we are given living conditions, pay, and training of the most favorable kind. No one of our membership in good health and free from dependents should hesitate a moment to enroll. To those who do not, it will be the one big regret of their lives in the years to come.

There will be a German War Veterans' Association, and honor rolls, and you and yours will be very proud to have your name among the others. You can put it there now. You can not later, and when we are all opened up again with new and better equipment, and our A. R. R. L. has acquired the strength of having passed through the fire, then will those who have done their bit be proud of it, and those who have not will be very, very sorry.

There was another matter which occurred some time before the war and in which the amateur showed his value to the Government. This was the case of Mr. Charles F. Apgar, of Westfield, N. J., the owner of an amateur receiving station. He had noticed, as had all of us, that the Sayville commercial station was sending out messages to German cruisers. After this was stopped and Navy censors placed in the station, Mr. Apgar and the rest of us noticed most peculiarly worded messages. Mr. Apgar conceived the idea that it might be interesting—this is typical of the amateur—to make a permanent record of these messages, so as to absolutely avoid the possibility of any personal error. He arranged a dictagraph onto his receiving instruments and took records night after night of what Sayville sent out. These records, when studied, indicated most suspicious possibilities and he reported the circumstances to the radio inspector at New York City. It was immediately referred to the secret service. The latter department went to Mr. Apgar's station and, under Mr. Apgar's direction, a new series of records were taken. These records and Mr. Apgar's testimony were later used in court with the result

that the Sayville station was taken from its German owners. Certainly it was worth having amateurs around just for this one case.

Mr. EDMONDS. There were naval stations in that neighborhood that could have taken that too, were there not?

Mr. MAXIM. Yes, sir; but the point that this committee would do well to consider there is that this took a lot of trouble and it took a lot of time and it took a lot of fussing around to do this little trick; but that is what the amateur likes to do. He is not a paid man. He is working for—

Mr. SCOTT (interposing). Sport?

Mr. MAXIM. Well, I do not know what to call it. It is not sport. It is that thing which we Americans have—he is working to do something and to get there.

Mr. GREENE. Glory?

Mr. MAXIM. Yes; maybe it is glory. I do not know what to call it. We amateurs are hopelessly scattered at the present time in the Army and the Navy. It would involve a great labor to prepare a list to show where we are and what we are doing. We do not believe it necessary to do this, and we appeal to this committee to be fair enough to give this point the full weight it deserves when we state that purely from the memory of those of us who could be hastily called together, we are able to present the following list of wireless friends who have given to the service of their amateur obtained radio knowledge. It should be borne in mind that most of these and thousands of others are mute in this matter because of military regulations, and they may not speak in their own behalf before you at this time unless you call them:

Lieut. Commander A. H. Taylor, naval air base, Hampton Roads, Va. Mr. Taylor was an amateur at the University of North Dakota.

Lieut. J. C. Cooper, jr., United States Navy, naval communications office, Washington, D. C. Mr. Cooper was an amateur in charge of one of our relay lines with headquarters at Jacksonville, Fla.

Lieut. C. D. Tuska, United States Army, commander radio school, Camp McClellan, Ala. Mr. Tuska was secretary of our A. R. R. L. and publisher of "QST."

Ensign M. B. West, United States Navy, officer in charge, radio school, Great Lakes, Ill. Mr. West was an amateur of Lima, Ohio.

Capt. E. H. Armstrong, United States Army, in charge of radio laboratory, Paris, France. Mr. Armstrong was an amateur, president of the Radio Club of America, and is the inventor of the well-known Armstrong regenerative circuit in general use at this time.

J. O. Smith, radio expert, Division of Military Aeronautics, Washington, D. C. Mr. Smith was an amateur of Valley Stream, N. Y., and a district manager of one of our relay trunk lines.

Howard L. Stanley, plant approvals officer, Bureau of Aircraft Production, Western Electric Co., New York City. Mr. Stanley was an amateur at Babylon, N. Y., and a director in our A. R. R. L.

Lieut. Victor F. Camp, United States Army, Aircraft Production. Mr. Camp was an amateur of Brightwaters, N. Y., and a director in the A. R. R. L.

Ensign C. R. Runyon, United States Army, executive officer Radio Compass School, Pelham Bay, N. Y. Mr. Runyon was an amateur at Yonkers, N. Y., and held the record for number of amateur messages handled in a month. He is a director in our A. R. R. L.

Lester Spangenberg, radio inspector, Bureau of Steam Engineering, United States Navy. Mr. Spangenberg was an amateur in charge of one of our relay lines.

Joseph Fried, radio drafting work, Bureau of Steam Engineering, United States Navy.

George T. Allen, radio inspector, Bureau of Steam Engineering, radio compass work.

Lieut. Walter Lennon, in charge radio telephone work, Bureau of Steam Engineering, United States Navy.

I can go on here and cite amateurs who are in London on Admiral Sims's staff, in Siberia, in France, in the tank service, but I will not take the committee's time to read them all, but will submit them for the record.

Ensign C. A. Service, United States Navy, Communication Service.

Ensign Thomas J. Styles, United States Navy, Radio Aircraft Section, Bureau of Steam Engineering.

Ensign Charles Horn, United States Navy, radio investigation, third naval district.

Ensign G. E. Burkhardt, officer in charge radio school, Pelham Bay, N. Y.

Ensign M. Z. Bishop, radio aircraft section, Newport Navy Yard. Mr. Bishop, notwithstanding the fact he was an amateur, has been officially commended by Capt. Todd for the excellence of the Newport aircraft station as to general appearance and operation.

Ensign George J. Else, attached to Admiral Sims's staff, London, England.

Ensign Frank King, radio officer, United States Naval Air Station, Dunkirk, France.

F. W. Keeler, United States Army, American Expeditionary Forces, somewhere in Siberia.

H. B. Deal, United States Navy, Marconi School, Cleveland, Ohio.

W. P. Corwin, United States Navy, Naval Radio Station, London, England.

H. J. Burhop, United States Navy, Naval Radio Station, Detroit, Michigan.

L. A. Kern, United States Army, Tank Corps, somewhere in France.

R. H. G. Matthews, United States Navy, district commander's office, Chicago, Ill.

L. E. Dutton, United States Navy, Naval Radio Station, Bar Harbor, Me.

G. B. Bauer, United States Navy, Naval Radio Station, Ludington, Mich.

A. Ball, United States Navy, Naval Radio Training Station, Bar Harbor, Me.

P. B. Parks, United States Navy, Naval Radio Station, London, England.

R. J. Iversen, United States Navy, Naval Radio Station, Bar Harbor, Me.

J. Clausing, United States Navy, Naval Radio Laboratory, Washington, D. C.

L. A. Gebhard, United States Navy, Naval Radio Station, Belmar, N. J.

Cecil Bridges, United States Navy, Naval Radio Station, Duluth, Minn.

W. Hauenstein, United States Navy, district commander's office, Great Lakes, Ill.

F. Finehout, United States Navy, Reserve Force, Purdue University, Lafayette, Ind.

J. M. Clayton, United States Army, Buzzer School, University of Arkansas.

W. Woods, United States Navy, Naval Radio Station, Bar Harbor, Me.

L. W. Paust, United States Navy, Naval Radio Station, Belmar, N. J.

L. C. Young, United States Navy, Naval Air Base, Hampton Roads, Va.

A. F. Rufsvold, United States Navy, Naval Air Base, Chatham, Mass.

J. C. Strobel, United States Navy, United States radio inspector, New York City.

B. Butcher, United States Navy, Naval Radio School, Great Lakes, Ill.

R. T. St. James, United States Navy, Naval Radio School, Great Lakes, Ill.

W. P. Rathert, United States Navy, Naval Radio School, Dunwoodie Institute, Michigan.

S. Kauffman, United States Navy, U. S. S. *Texas*.

R. F. Laidlaw, United States Navy, Naval Radio Station, Milwaukee, Wis.

H. H. Shotwell, United States Navy, Naval Radio Station, Harvard University, Cambridge, Mass.

H. T. Johnson, jr., expert radio aid, in charge Aircraft Radio, United States Navy. Mr. Johnson was an amateur and a member of the board of directors of the Radio Club of America.

Lieut. H. Sadenwater, United States Navy, radio officer, Aircraft Radio. Mr. Sadenwater was an amateur and before the war had been appointed a radio inspector of the Department of Commerce, stationed at New York City.

I would like to point out to you gentlemen a very interesting thought. Let your imagination just feed on this a moment. These young men, like Lieut. Cooper, are coming back into the amateur service. Think of it. You are going to have, if you let us live, if you give us the breath of life, when these young men open up again, the finest radio traffic handlers, experts, and inventors in the world. You are going to let loose the finest brains this country has ever seen. You can not stop it, gentlemen; it will not do.

Even the one who introduced this bill, with all his lack of appreciation of the patriotism displayed by us amateurs who volunteered immediately when they asked us, will have difficulty with this short list made up from memory only. To all else it ought to be apparent that the knowledge of us amateurs was of tremendous assistance not only in those first desperate days of unpreparedness but since then, and even right now at this moment.

In the unamended bill the only radio stations shall be naval stations, experimental stations, training-school stations. No mention is made of the amateur, as is the case in the existing law of 1912, and also as was the case in House bill No. 2573 introduced by Mr. Padgett on April 9, 1917. The amateur is entirely ignored. We wish most

positively to protest against this, because we maintain it amounts to the total elimination of the amateur. It is not satisfactory to us to gloss over this question by explaining that the amateur is tacitly included under "experimental stations" or "training-school stations." Such an explanation is to our minds indirect, doubtful, and not what we regard as straightforward and square treatment. Such an arrangement would leave us at the mercy of unfriendly interpretation of the law, and it seems to us there is no need of ambiguity. We submit that our record is such that we not only deserve to be squarely and directly dealt with and recognized before the law of our country but also that it would be a public misfortune if we are not. We are not asking for anything new. All we ask is the same recognition in the future that we have had in the past under a law which after five years of experience commands respect from all of us.

We are not finished with this aspect of this subject until we point out one more important detail. If we change the existing law and blot out the amateur, what will be our situation some years hence if another great national emergency should arise? We have demonstrated beyond all question of argument the value of the wireless amateur when the great national emergency arose in April, 1917. If there are to be no amateurs at that coming day, when we will again face a national emergency, and no man should say such a day will never come, it is very likely that we will be found tremendously less prepared radiowise than we were even in 1917. It is quibbling to avoid this point, at least, according to the straightforward mental processes of those young men who will soon be back among us. They are going to want to continue to operate their little wireless stations, especially when they know that observing the law of 1912 will positively prevent them causing any trouble. In their behalf and while they are absent from the country or unable to speak to you on account of military regulations, we emphasize as solemnly as we know how that it is shortsighted to brush aside with the wave of a hand, as this unamended bill proposes, the amateur.

Most of the amateurs do not know that you are considering their elimination here at home while they are away. What they will think when they come home and find that you have wiped them out without explanation and with no understandable reason, should be left to the imagination. It will certainly bring the question of Government ownership very much to the front in the mind of those stout-hearted young men, who many people think will have influence in political affairs in the days to come. The mental attitude that will be taken involuntarily by these younger men who are now abroad, and who will want to be amateurs again when they come home, is something which we are firmly persuaded this committee would do well to consider. We know this young man, because we have been about with him, we have headed his organization for some years, and because he talks to us daily and writes to us. We believe we speak truly when we say that this business is going to partake of the smell of "Verboten" to him, with all that this term implies.

It is a waste of breath to tell him that he interferes with Government and commercial stations. He knows better, except, of course, in those rare cases of infraction of the law, or unless he is very close by. He knows that not only does his power and his wave length, wave purity, and decrement prevent harmful interference

to the users of longer wave lengths, but he also knows the reason why. He also knows that when examples of amateur interference are pointed to as a reason for prohibiting amateur wireless altogether, that every one of them represents a violation of the law, and therefore easily preventable. He also knows that considering the great number of amateur stations operating, that the total number of cases of interference makes a ridiculously small percentage. He also knows that no great effort was made to enforce the law among amateurs, and that even the small number of cases of interference would be materially reduced if measures were taken to enforce the present law.

While on this point, we believe it desirable to dwell a moment upon what the amateur has done among himself. The extent to which he has made use of his brains is something which would command the admiration of this committee were they as conversant with this subject as are we. This radiotelegraphic communication between citizens has been developed by a class of young men that we consider intellectually the highest type we have among us. It takes brains to understand radiotelegraphy. It takes more brains to design and build efficient radiotelegraphic apparatus. A great many amateurs have and always will build their own apparatus from the raw material. This takes brains. It takes still more brains to be able with this home-made apparatus and with the small amount of power that is permitted the amateur by law to carry on reliable communication so that citizens separated by hundreds of miles may talk with each other through the air. These amateurs have done all this, and when we were actually stopped in April, 1917, we had just got into working order regular lines of little stations which bade fair to become one of the astonishing development of the times.

Is it to be wondered at that the young fellows who have been doing this sort of thing should turn out to be the soldier we have seen on the battle fields of France under the Stars and Stripes? They typify America in every way. They are perfectly willing to pull in their wires and take apart their improvised but highly ingenious apparatus, if it will help the country win the war. No sacrifice, even of life, is too great for them to make. But when the war comes to be over, and the President of the United States has said so, and the war has been won, and it is established who had a good part in winning it, they are no longer willing to leave down their wireless apparatus. They can not see the necessity for it, and it is silly attempting to make them. When you try, you are un-American, in their judgment, to express it mildly.

In order to adequately protect and assure the future of the amateur, we urge the adoption of the amendments which refer to the amateur and have been presented by the Navy Department. These amendments were decided upon at a conference between our president, vice president, secretary, and representatives of the Navy Department, and in our opinion assure the future existence of the amateur under conditions favorable to a continuation of his successful development.

Mr. HARDY. Is that this amendment here?

Mr. MAXIM. I do not know the one you have there

Mr. BANKHEAD. The one offered here by Lieut. Cooper.

Mr. MAXIM. Yes, sir.

Mr. BANKHEAD. Is that entirely satisfactory to the amateur interests?

Mr. MAXIM. Broadly speaking, that is satisfactory to us.

Mr. BANKHEAD. Have you looked at the amendment?

Mr. MAXIM. That was arrived at in conference but I did not see a copy of it until last night, but I will say this formally to you, that in our opinion it assures the future existence of the amateur under conditions favorable to a continuation of his successful development.

It is true certain additional restrictions are proposed, such as the licensing of amateur receiving stations as well as the transmitting stations, limiting amateur power at certain distances from Government receiving stations, and requiring operators' license approximately the equivalent of the present second-grade commercial license in order to be permitted to transmit signals which may be heard beyond a State border. We approve of these restrictions because we recognize they are reasonable and that unless our amateur status is based upon reasonableness, we can not expect to continue to enjoy the public sympathy and approval we now have.

We have no comment to make upon the question of Navy control and ownership of radio communication.

In this connection, I have two affidavits, Mr. Chairman, which I would like to make a part of my brief. One of them is by J. Owen Smith, who, being duly sworn, deposes and says that he did certain things as a result of his amateur training, and that a captain in the Army says that it would have been very good for England if England had had amateurs and had encouraged them. The other affidavit is a statement of some very superior receiving that was done by an amateur apparatus. (For affidavits referred to, see pp. 399-400.)

Mr. HUMPHREYS. Let me ask you a question right there. Does England, under her regulations, discourage amateurs?

Mr. MAXIM. I do not think England discourages it. I think England has them in a very, very limited way. I confess I am not familiar with the law of England.

Mr. HUMPHREYS. Then it is not due to any law, so far as you know.

Mr. MAXIM. I do not think I had better venture any comments on that because I am not familiar with the subject in England.

Mr. BANKHEAD. Mr. Maxim, could you give any intelligent or approximate estimate of the amount of capital invested by manufacturers of amateur apparatus, whose names you gave a while ago.

Mr. MAXIM. I think my estimate would compare in accuracy with that of almost any amateur. I would think the capital invested at the close of the war would probably be from two to three million dollars by the manufacturers. That is purely an estimate as I run over in my mind the number of manufacturers I can think of at the present moment.

Mr. KINCHELOE. What is the average wave length used by the Government from ships to coast?

Mr. MAXIM. Six hundred meters.

Mr. WHITE. May I ask you a question about this amendment? It refers to the Continental-Morse code, and provides that the license shall require that the operator must show his ability to send and receive at least 75 letters per minute in the Continental-Morse code. Is there any other code?

Mr. MAXIM. Yes, sir.

Mr. WHITE. Then why should this be limited to the Morse code? Why should it not provide that the licensee shall show his ability to send 75 letters per minute according to that code or an equivalent capacity? Why should you tie it down to that particular code when there are other codes?

Mr. MAXIM. I might say, sir, that if you knew the situation you would say it was tying it down pretty tight to tie it to one code, but to make it otherwise—

Mr. WHITE (interposing). I do not know the situation and that is why I ask the question. Why is it tied down to that code if there are other codes?

Mr. MAXIM. There is only one other code in normal use, and that is what we call the American landline code.

Mr. WHITE. However efficient a man may be in the use of that other code, he would not be entitled to a license under this amendment unless he could meet this requirement as to the Continental-Morse code?

Mr. MAXIM. No radio signals are transmitted on the American-Morse code that I know of. They are all transmitted on the International-Morse code, and that is tying it up pretty tight, to receive 15 words, or 75 letters, a minute on that code. For goodness sake, do not ask them to be that efficient on other codes as well, especially since the other codes are never used.

Mr. HUMPHREYS. That was not the question, as I understand it. The question was why tie him to any code? Why not state if he can send 75 letters by the Morse or its equivalent in any other code? That may be a thoroughly impracticable suggestion from your viewpoint, because you are informed on the subject and I am not, but I was just wondering why that would not be more liberal.

Mr. MAXIM. That would mean this, sir: That a man who was an expert in landline telegraphy could come in and pass his examination and he would not be able to read your QRT, your stop sending signal, nor your SOS signal in the Continental-Morse code.

Mr. BANKHEAD. As I understand the Morse code, it transmits the alphabet by dots and dashes.

Mr. MAXIM. To indicate a dot in the landline code there are two clicks coming close together, click-click; a dash is two clicks separated like this: Click—click.

Mr. WHITE. That is the same system used in telegraphy?

Mr. MAXIM. Landline telegraphy.

Mr. WHITE. Then the purpose of this language is to coordinate and standardize it; is that the idea?

Mr. MAXIM. The purpose of this is—

Mr. WHITE (interposing). This refers to the Morse code?

Mr. MAXIM. That is in the old law, and the idea of the framers of the law was this: It is not safe to have anybody operating a transmitting station unless he can read the code which is in use and be able to understand if somebody wants him to stop sending.

The CHAIRMAN. The international regulations require the Morse code?

Mr. MAXIM. Yes, sir.

The CHAIRMAN. Otherwise, we would have endless confusion in the transmission and receipt of messages?

Mr. MAXIM. Yes, sir.

The CHAIRMAN. In other words, it would be very much like the confusion of tongues at the building of the Tower of Babel, I imagine.

Mr. BURROUGHS. The amateurs, then, would not object to this requirement of 75 letters, according to the Continental Morse code, as provided in this amendment?

Mr. MAXIM. That is 15 words a minute, and 15 words a minute is the existing second-grade commercial test in order to secure a license.

Mr. BURROUGHS. And they would not object to that?

Mr. MAXIM. The A. R. R. L. is an organization, as I say, of about 4,000 members. There are other amateurs besides us, but we do not object to it.

Mr. HUMPHREYS. And it is your opinion, at least, that they should not object to it?

Mr. MAXIM. In my opinion, they should not object to it, because what we are trying to do is to look forward into the future. We are trying to so broaden this thing so that you will be proud of us amateurs in the years to come, and we do not want to be put in the position of asking for anything that is unreasonable.

Mr. EDMONDS. The requirement for an amateur here is higher than the requirement for a second-grade commercial operator, is it not?

Mr. MAXIM. My understanding is that it is not.

Mr. EDMONDS. I understand a second-grade commercial operator is required to send 12 words or 60 letters per minute.

Mr. MAXIM. Then it is too high. It should be no higher than the existing second-grade commercial license.

Mr. EDMONDS. Where do you propose that these young men should learn to send 75 letters a minute?

Mr. MAXIM. Oh, you leave it to the young man, and he will learn how to receive it or send it.

Mr. EDMONDS. And you think that can be done without interference or without any trouble?

Mr. MAXIM. I took this thing up when I was beyond the age of 40, when one's intellect is not quite as nimble as when you are younger, and it took me a good part of a year to take 20 words, which is the first-grade commercial requirement.

Mr. EDMONDS. I mean, how is he going to learn to send at all if he is restricted in the use of any apparatus until he can send so many letters?

Mr. MAXIM. He could be taught with a push button and your front doorbell.

Mr. EDMONDS. And just work inside.

Mr. MAXIM. Yes, sir; that would not infringe the law, and he would be in position to learn the code in that way.

Mr. BANKHEAD. What is the minimum cost of installing an amateur apparatus if, for instance, a country boy in my district wants to experiment with wireless?

Mr. MAXIM. A country boy or a boy of small means, whether he is in the country or in the city, will put up a wireless station with baled-hay wire. I have seen them myself; they use the wire that comes off of bales of hay, and then he will use a tree at the back of his house, and he always selects a hencoop for one end. I can not say why, but he always selects a hencoop. The other end will lead into his house and probably have no support at all. Now, so far there is no expense. Then he will go down town, or he will send to one of these

supply houses if he lives in the country, and will buy a certain number of pounds or half pounds or three-quarters of a pound—and he has got it figured down to the inch—of exactly the kind of copper wire he wants to wind the receiving tuner, which consists of a coil of wire wound on some cardboard, and inside of that another cardboard tube with wire wound on it. He will take that and will go and beg from somebody a little piece of galena. It is astonishing where he gets it, but he has a friend somewhere who knows a friend who has a piece of galena in his collection. He will get a piece of galena, and then he will take a little piece of the finest wire he can get, and he will get a little thread out of this flexible cord, which he will have attached to the electric light in the house; in other words, a little piece of fine copper wire—I have seen my own boy do this—and then he will just get a nice little contact on that piece of galena, and if he can get a pair of head telephones—he can not make them, and he has got to get those somewhere, and I have known them to borrow them for a week at a time, and I have loaned mine to all kinds of boys to help them along, but if he can borrow his head phones, after buying his wire, he will have a receiving station, and I suppose the total expense might be about \$3.50.

Mr. BANKHEAD. Suppose he has to buy those things.

Mr. MAXIM. Mr. Chambers, what is the price of a pair of head phones?

Mr. CHAMBERS. The price varies. You can buy a pretty good set for \$3.50. They generally save up for them 10 cents at a time, and when they come in to pay for them they will have a handful of dimes, which they usually dump out of a little bag.

Mr. BANKHEAD. Do you think, then, he could establish such an apparatus within the range of \$10?

Mr. MAXIM. Oh, yes.

Mr. BANKHEAD. If he is enough of a genius as a beggar and borrower.

Mr. MAXIM. A great many boys that had \$10 would expect to get a station the equal of Arlington.

Mr. KINCHELOE. If a message of a wave length of 250 meters were to interfere with another message of 600 meters, is that a fatal interference?

Mr. MAXIM. Will you mind stating that once more?

Mr. KINCHELOE. I do not know whether I am stating what I really want to know, because I do not know a thing about this proposition. If a wireless message of 250 meters wave length were to interfere with a message of 600 meters, would it be a fatal interference with the 600-meter message?

Mr. MAXIM. Of course, you presuppose it could interfere.

Mr. KINCHELOE. Yes; I say if it did interfere—on that hypothesis would it be a fatal interference to that message of 600 meters?

Mr. MAXIM. In the first place, it could not interfere.

Mr. KINCHELOE. You say it could not interfere?

Mr. MAXIM. It could not.

Mr. KINCHELOE. What messages, then, can be in interference with another?

Mr. MAXIM. The homeliest example I can state that will convey it to your mind is that if you walk up to a piano with the cover up and strike a note you will hear certain strings respond. Only those

strings will respond which are in tune with the note that you struck. If you send on 200 meters, only those strings will receive which are on 200 meters. If you are sending on 200 meters, you will not find that the soprano notes or the baser notes in your voice come back at all. There is no resonance. There is no comeback.

Mr. KINCHELOE. Now, let me learn a little further. It seems to me the contention of the Secretary of the Navy, and I heard his statement before the committee, was that the main thing he was afraid of in reinstating amateurs would be interference. Now, upon what hypothesis can there be an interference from ship to coast?

Mr. MAXIM. An infraction of the amateur law; that is, an amateur sending on a wave length in excess of what he has any right to send on.

Mr. KINCHELOE. You mean under the existing law?

Mr. MAXIM. Yes; under existing law. The existing law says that the amateur shall be permitted to send on 200 meters. I have known them to send on everything—such a broad tune that you could tune him at 2,000 and you could tune him at 200.

Mr. KINCHELOE. You mean by that, he violated the law?

Mr. MAXIM. Yes, sir. If you do not violate the law, there is no reason why you should interfere unless you are right up under the eaves of a Government station, which is receiving.

Mr. GREENE. This proposition, as it comes before us, is to broaden the opportunity of the Navy to go into the commercial business, and I want to know whether you amateurs have given any consideration to the fact of the Navy entering that field.

Mr. MAXIM. No, sir. We have no comment to make upon that, at all.

Mr. GREENE. You do not wish to make any comment on that?

Mr. EDMONDS. You do not think it will prevent boys from studying wireless because there is no place for them to go, if they want to make a business of it in the future?

Mr. MAXIM. I can see where that might be used as an argument; yes, sir.

The CHAIRMAN. You say this amendment suggested by the Navy Department is satisfactory to you?

Mr. MAXIM. It seems to us to be satisfactory; yes, sir.

Mr. SAUNDERS. I understand that was worked out by representatives of the amateurs and the Navy Department.

Mr. MAXIM. Yes, sir.

Mr. GREENE. You have not given any consideration to the development of business; that is to say, at present that is under the Department of Commerce, and I notice in the Washington Herald this morning that Secretary Redfield wants an opportunity to put on 30 more specialists for the purpose of broadening our trade, and that he has the approval of President Wilson to his scheme. He wants to broaden out the business opportunities. The Department of Commerce has done a good deal of exploiting looking toward foreign trade. I do not know that they have struck any yet, but they have been exploiting a good deal in the press about the development of foreign trade and doing a good deal of blowing, but I do not know that they have accomplished any results; but if they do want to do that, you have not given any thought to that part of it. You are simply concerned about the amateurs?

Mr. MAXIM. All I wish to ask is that you protect the future existence of the amateur.

The CHAIRMAN. You are not in the business for commercial purposes?

Mr. MAXIM. No, sir.

Mr. GREENE. You are bound up with the Navy to put this proposition through, and there is one point I want information about, if I can get any information out of the amateurs, and if they have it they ought to give it to me, and that is as to the possibilities of the development of trade. That is what this committee is for. This committee is not a naval committee. This committee is for the development of trade and business, and we have got an immense—not a very immense merchant marine—but a merchant marine at an enormous cost. That is the immensity of it. We have got a small merchant marine, hardly worth mentioning, at an enormous, outrageous cost, and I want to make use of that merchant marine if we can. I do not think we can until we do something about it in the way of law, out of this committee, to make it possible to use the merchant marine. We can not use it in its present state, because we are distanced by Japan and by England and by every other country in the world, and what I want to get at is some information out of some of you as to the development of trade and as to whether the Navy Department is in any respect interested, and, if they are interested, where they have ever had any experience in trade. Perhaps the few men you have referred to who have been in the wireless and who are now at work in the Navy have some broad ideas about the expansion of trade. I am a great believer in the expansion of trade, and I want to get something to show that this bill means expansion of trade. It means contraction of trade, as I understand it, and I want to see if I can get your idea as to that.

Mr. MAXIM. I am sorry, sir, but I do not feel myself competent to answer that.

Mr. EDMONDS. Mr. Maxim, will you go a little deeper into this power input; that is, whether limiting the power input to one-half kilowatt, in case of amateur stations within 100 miles of the Atlantic or Pacific Ocean is a satisfactory situation.

Mr. MAXIM. I think it is; yes, sir.

Mr. EDMONDS. You have had 1 kilowatt up to the present time?

Mr. MAXIM. Yes, sir.

Mr. EDMONDS. They have now reduced it to one-half?

Mr. MAXIM. Yes, sir.

Mr. EDMONDS. Will that answer all the purposes of the amateur.

Mr. MAXIM. Yes, sir; I think it is a reasonable request. I think if we amateurs verge on the greedy, we are just laying up trouble for ourselves in the future. If you will limit us to one-half kilowatt, I consider it a very healthy condition, and we will soon do with one-half kilowatt what we were formerly doing with 1 kilowatt.

Mr. EDMONDS. Then, do you approve of this one-quarter kilowatt within 5 miles of a Government receiving station?

Mr. MAXIM. That is unfortunate, because a case has been brought to my mind of stations in the interior where by no possibility could distress signals from the sea be interfered with, and I should think that would be worthy of a little further consideration. I confess that in the beginning we had not thought so much about those inte-

rior stations, and I would like to hear from some of the amateurs who live in the interior on that subject.

Mr. EDMONDS. Is there any necessity of one-quarter kilowatt within 5 miles of a Government receiving station?

Mr. MAXIM. It might be, sir. If a tug at sea were in distress and called with its short wave length, which it would have to use, and some amateur within 5 miles was using one-quarter kilowatt, it might be he would cause interference with that tug. It is barely possible he would be culpable, and we do not want the amateur to be in the position of asking for more than he really ought to have.

Mr. EDMONDS. Suppose a naval officer was living at Lakewood, N. J., or some place just a little inshore on Long Island, and had a receiving station, not a sending station. then you would have to reduce your power if you were near him, because that is what this says here.

Mr. MAXIM. Yes, sir. Did you say a naval station or naval officer?

Mr. EDMONDS. It would be a Government receiving station, because that naval officer lives in a Government house.

Mr. MAXIM. If evasion or advantage is taken of us in a thing of that kind, then we are opposed to it.

Mr. EDMONDS. Do you not think it would be a great deal better if it said a Government station, describing the station?

Mr. MAXIM. It might be well to do that; yes, sir.

Mr. EDMONDS. A Government naval station, we will say.

Mr. MAXIM. That might be.

Mr. EDMONDS. But even at that, an officer's house would be so considered.

Mr. MAXIM. If an officer's private house——

Mr. EDMONDS (interposing). You gentlemen might interfere with an officer keeping account of his social engagements over the telephone.

Mr. MAXIM. Then we are against that.

Mr. HUMPHREYS. That would not be a Government receiving station, would it, Mr. Edmonds? That would be a private receiving station. The man occupying the house might be an officer in the Navy, but that would not make it a United States Government station.

Mr. EDMONDS. We pay the rent of the house, and it seems to me it would become a Government receiving station.

The CHAIRMAN. Do you know of an instance like that?

Mr. EDMONDS. I can conceive of that being possible.

The CHAIRMAN. But you have not any knowledge of anything of the sort?

Mr. EDMONDS. No; because the Navy Department has never had it before.

The CHAIRMAN. If an officer of the Navy had a receiving station in his home, would that be a Government station?

Mr. EDMONDS. If the Government owns the house or pays rent for the house and the Government pays for the apparatus, I presume it would be.

Mr. HUMPHREYS. If we undertake to define what a radio station is and what an experiment station is, that would not be possible, and it might be advisable, according to your suggestion, to define what a Government receiving station is.

Mr. EDMONDS. That was my idea, and I wanted to get your idea about it and to get exactly what this meant. I want also to call your attention to the fact that the present law for an amateur calls for the sending of 25 letters per minute; for a second-grade commercial operator it is 60 letters, and yet in this amendment the Navy is asking for 75 letters per minute.

Mr. MAXIM. Yes; I was under the impression that it was the same as for a second-grade commercial operator.

Lieut. COOPER. It was the understanding that this was to be the same as for a second-grade commercial operator, and I misunderstood Mr. Terrell the other day, and this amendment should be made the same as the requirement for a second-grade commercial license.

Mr. EDMONDS. Do you not think that is even too much for an amateur?

Lieut. COOPER. I will go back on the stand if necessary; but I simply wanted to say at this time that it should be the same as second-grade commercial license.

Mr. MAXIM. That was the intention. Then this should be 60 letters per minute.

Mr. SAUNDERS. I believe you are devoted to the work of invention—that is your profession, is it not?

Mr. MAXIM. Yes, sir.

Mr. SAUNDERS. And have taken up in that connection this particularly fascinating art of the wireless and speak with some authority as an amateur in connection with the work you have done in that line?

Mr. MAXIM. Yes, sir.

Mr. SAUNDERS. I want to ask you this question with respect to the commercial development of the wireless: As to point-to-point use within what I will call continental United States, do you think there is a future along that line for domestic use and domestic transmission of domestic intelligence within the United States itself—used between stations as between cities or between concerns, with a chain of business houses who want to use it in a private way? Is there a field for possible useful development along that line in the United States in competition with the telephone and the telegraph?

Mr. MAXIM. I understand your question to be this: Is wireless as you describe liable to compete with existing telephone and telegraph business?

Mr. SAUNDERS. Is there a future for it if allowed free scope of development?

Mr. MAXIM. I hardly think there is. Most of our business messages must be strictly secret, because they involve questions of price and business policy, and I should think that the radio communication in continental United States would not lend itself to business as well as the telephone or telegraph lines.

Mr. SAUNDERS. That is not by reason of inherent defect in the apparatus, but because you think that the messages would be of a character that would not want to be transmitted by a medium which admitted of listening-in universally?

Mr. MAXIM. Yes, sir.

Mr. SAUNDERS. I understand that you think that would limit it.

Mr. MAXIM. That is one cause for my judgment; and the other is that radio at this stage of the game is dependent upon the weather and the season.

Mr. SAUNDERS. It is entirely conceivable that with the development of the art that that, like many other difficulties, will be removed?

Mr. MAXIM. Yes; it is one of the things we are struggling very hard to accomplish.

Mr. SAUNDERS. You are working on it now?

Mr. MAXIM. Yes, sir.

Mr. SAUNDERS. With that out of the way any physical or scientific difficulty would be removed, and it would be a question just to what extent the people in private business would use the system for purposes of communication.

Mr. MAXIM. Yes. We have instances of the Goodyear Rubber Co., at Akron, Ohio, which communicates with its branches or did communicate with some of its branch houses by radio, and the instance of John Wanamaker communicating between his New York and Philadelphia stores.

Mr. SAUNDERS. Then it was the possible development for that use that I inquired about.

Mr. MAXIM. It indicates it is at least used, with this opportunity to enlarge.

Mr. SAUNDERS. Can you conceive that if the amateur is restored to his prewar status, particularly having in mind the developments that have occurred during the period in which he has been shut out, that there can be any possible danger from the commercial interests or to the national security of the country?

Mr. MAXIM. There can be no danger from the amateur if the law is enforced.

Mr. SAUNDERS. And, again, now with respect to the development in this field: Of all the fields of possible discovery is not this one in which the very greatest opportunity ought to be given to every one by reason of the fact that the fascination of this field and the appeal that it makes to the inquiring, intelligent mind?

Mr. MAXIM. Absolutely; yes, sir.

Mr. SAUNDERS. Then nothing ought to be done, in your judgment, as a matter of broad policy, to throw over or to restrict the very largest possibility of inquiry and development in this particular field of development and discovery?

Mr. MAXIM. Absolutely; no, sir.

Mr. SAUNDERS. Just to put this in the record: It has been developed before—in these high-power transmitting stations they use a wave of very great length, and no development, however great, no number of operators of an amateur character, however large it may be, operating under any system of sensible regulations that may be provided can interfere with the work of these high-power stations?

Mr. MAXIM. No, sir.

Mr. SAUNDER. As I understand from the answer you gave a moment ago, it is just a physical impossibility?

Mr. MAXIM. Yes, sir.

Mr. SAUNDERS. What is the longest wave length that the amateur, with the instruments that he has to use, could send?

Mr. MAXIM. Transmit?

Mr. SAUNDERS. Yes; transmit or send, having in mind the ordinary amateur instruments.

Mr. MAXIM. It might be that an amateur could get up as high as 1,000 meters. It would be a rank infraction of the law. He is only allowed 200 meters, but he might be able with his chicken coop far enough away from the house to get up to 1,000 meters, but that would be a very long wave for him.

Mr. SAUNDERS. You think with some of the crude apparatus you speak of so many of them using he might get up as high as 1,000?

Mr. MAXIM. It might be that he could get up to 1,000. The long-distance stations that you speak of operate on wave lengths in excess of 10,000.

Mr. SAUNDERS. I am developing the facts in the matter. With these very great wave lengths, you say would be 1,000—

Mr. MAXIM (interposing). That would be the very highest I could imagine for an amateur.

Mr. SAUNDERS. Let us presuppose that all the conditions were exceedingly favorable for him to get up to such a length as that—1,000—would that interfere with stations operating with wave lengths of 10,000 meters?

Mr. MAXIM. No, sir; absolutely no.

Mr. SAUNDERS. So that scientifically the danger of interference between the amateurs, however much their operations may be developed, and these high-power stations is practically excluded?

Mr. MAXIM. Yes, sir.

Mr. GREENE. I would like to ask one question.

The CHAIRMAN. Right in that connection, Mr. Greene, if you will allow me, I was going to ask, How about the use of a wave length exceeding 200 meters interfering with the wave lengths necessary for ship-to-shore business in the saving of human life?

Mr. MAXIM. The ship wave length is 600 meters, and the amateur is allowed 200 under existing law. You see there is a wide difference.

The CHAIRMAN. But we have got to keep within limits in the use of wave lengths less than that necessary for ship-to-shore business?

Mr. MAXIM. Yes, sir; that is a reasonable request to safeguard life at sea.

Mr. SAUNDERS. He would just have to violate the law, as I understand, if he got up to a wave length that would interfere with that ship-to-shore business?

Mr. MAXIM. Oh, yes, sir.

Mr. SAUNDERS. This amendment which is proposed here, which has the sanction now of the Navy Department, would not keep him from violating that law, yet they seem to be satisfied with that amendment? He could still violate the law; the amendment would not stand in his way.

Mr. MAXIM. If he intended to violate the law, I do not think any amendment would stop him.

Mr. SAUNDERS. So that possibility that some trouble may be caused by violation of the law exists as well under this amendment as it would under the prewar conditions?

Mr. MAXIM. Of course.

Mr. SAUNDERS. And yet they are satisfied to take the chances under this amendment for the future?

Mr. MAXIM. Yes, sir; it is the best we can do to pass a law and endeavor to enforce those laws.

Mr. SAUNDERS. I do not know that this is exactly a scientific question. It may be an estimate of what we may call probabilities, Mr. Maxim, but speaking broadly, with a system of amateurs rigidly regulated by law with sufficient power behind it to enforce it and cut down to a maximum wave length of 200 meters, do you regard it as a matter to be seriously considered—the question of possible interference by such a system as that with the ship-to-shore communications?

Mr. MAXIM. No, sir; I do not.

Mr. GREENE. What I wanted to ask was this question: When you get away from the shore, get where you would not possibly have any trouble with the ship-to-shore stations, in the central part of the United States, whether or no there would be more possibilities of development of the wireless in ordinary trade there, and would that be possible without any interference with the Navy or anybody else?

Mr. MAXIM. No, sir; if you get into the interior you are getting away from the seacoast.

Mr. GREENE. Could there not be an amendment put into this bill to provide for an extension along that line, independent of striking at amateurs? We want to make this bill so as to have it of some use. We want any advantage we can get from it; we want to broaden out everything; we do not want to narrow the proposition. That is an objection I make to the bill; that it narrows the proposition too much. I want to broaden it out, even if the amateurs enlarge their possibilities or anybody else who has sufficient brains to enlarge its possibilities. I do not want to have the brain crushed out of it by a dynasty that becomes like autocracy.

Mr. HADLEY. If I understand your statement, Mr. Maxim, as between the amateur and the ship to shore there is no conflict under present law, if enforced?

Mr. MAXIM. That is right.

Mr. HADLEY. If this bill is passed, so far as you are concerned, the situation is satisfactory?

Mr. MAXIM. It has been proven by the last five years of experience.

Mr. HADLEY. Then this proposed amendment which is offered by the amateurs is merely offered for self-protection to reconcile the difference between the amateurs and the proponents of the bill?

Mr. MAXIM. Yes, sir.

Mr. LEHLBACH. The regulation of the amateur business in the past, before the war broke out, when the amateurs were operating, was in the hands of the Department of Commerce?

Mr. MAXIM. Yes, sir.

Mr. LEHLBACH. And the relations between that department and the amateurs were cordial and satisfactory?

Mr. MAXIM. Yes, sir.

Mr. LEHLBACH. Have the amateurs any preference to express as to whether they care to continue under the Department of Commerce, or would they be agreeable to being transferred to the Navy Depart-

ment, with whom they have not been in contact as they have been with the Department of Commerce?

Mr. MAXIM. My judgment leads me to answer that by saying that they would like very much to go back to their "old love." [Applause.]

Mr. SAUNDERS. One question, Mr. Maxim, which has been suggested by others asked: With respect to this possible commercial use, what I would style the internal commercial use of wireless in the United States, as, for instance, two concerns, one located in Washington here and the other in Lynchburg, in my State, where they have set up a wireless apparatus for the purpose of communication, they would use the same length of wave for that purpose as the amateur, would they not, or they could be required to use the same wave length?

Mr. MAXIM. Why, no; I think they would be entitled to use the ship wave length. If they were restricted to that, they could cause no interference with any Government commercial station operating on the allowed commercial wave length.

Mr. SAUNDERS. And having in mind your testimony as to the wave length, as stated to you by the gentleman whose experience you used by way of illustration, a wave length of 200 meters would be enough to allow for very considerable commercial development of the wireless—I mean scientifically speaking?

Mr. MAXIM. Scientifically, it would, but not commercially.

Mr. SAUNDERS. You would require a greater wave length?

Mr. MAXIM. Yes, sir.

Mr. SAUNDERS. Could that wave length be increased so as to be commercially feasible and still below the ship-to-shore wave length?

Mr. MAXIM. There is a well-known distance between 200 meters and 600 meters.

Mr. SAUNDERS. You mean you can go all the way up, for instance, to 500 meters and still be outside of interference with the ship-to-shore communications?

Mr. MAXIM. At 500 meters both stations must have quite efficient apparatus because they are getting close together, you see.

Mr. SAUNDERS. Yes; but they would still be easily outside a wave length that would interfere with the ship-to-shore communication?

Mr. MAXIM. Yes, sir; those 500 meters would not interfere with 600 meters if the apparatus was efficient.

Mr. SAUNDERS. What is the relation between wave lengths and the possible distances over which they may be heard; for instance what is the range, under favorable conditions, of the 200-meter wave length on land?

Mr. MAXIM. Why, the 200-meter wave length has certain physical characteristics which make it impracticable as a regular thing to cover any distance.

Mr. SAUNDERS. That is what I want to bring out, the effects.

Mr. MAXIM. Yes, sir; 200 meters is not sufficient to go any distance, as a regular thing.

Mr. SAUNDERS. I will put it this way, to get down to a concrete illustration: Here is Washington and Baltimore. Would a 200-meter wave length between these two cities be available for everyday commercial use?

Mr. MAXIM. No, sir.

Mr. SAUNDERS. You need a greater wave length than that?

Mr. MAXIM. Yes, sir.

Mr. SAUNDERS. That is about 40 miles?

Mr. MAXIM. Yes, sir.

Mr. SAUNDERS. For the purposes of satisfactory communication between two points, between cities that distance from each other, having reference to day-in-and-day-out weather conditions, what would be the required wave length?

Mr. MAXIM. The practice in the past has been to make it 600 meters.

Mr. SAUNDERS. You require 600 meters for a distance of 40 miles?

Mr. MAXIM. Yes, sir. The wave length which we are limited to is almost an experimental wave length; it is not a practical wave length for the conduct of business.

Mr. SAUNDERS. Six hundred meters would cover, you said, that distance of 40 miles. How much more than 40 miles could that be satisfactorily used for?

Mr. MAXIM. Six hundred meters?

Mr. SAUNDERS. Yes.

Mr. MAXIM. Well, now, the question is one of power. If you used a half kilowatt, or 1 kilowatt, or 2 kilowatts, for instance, 2 kilowatts would transmit 600 meters farther than 1 kilowatt.

Mr. SAUNDERS. When you say "Use more power" in your transmission, with respect to wave length, it does not make any more capable of interference with the wave lengths above it, does it?

Mr. MAXIM. No, sir; power does not change wave lengths, necessarily.

Mr. SAUNDERS. And does not increase the interference?

Mr. MAXIM. No, sir; interference is a function of wave lengths, not power.

Mr. SAUNDERS. Then, using a wave length of 600 meters for commercial purposes, you increase the range, as I understand, of your wave length and therefore its capacity for commercial use is just as you put more and more power behind it?

Mr. MAXIM. It has that effect, sir, but you have not expressed it quite scientifically. Let me try to explain it this way. Usually on a 200-meter wave length, where the waves are very close together, they say that it has "to hit it" so often that it loses a lot of its efficiency before it gets there; whereas with 600 meters it does not have to take so many steps or does not have to hit it so often, and when it arrives it is stronger; that is a very homely expression. [Laughter.]

Mr. SAUNDERS. This is a homely committee, and we want to get information in a homely way. [Laughter.] But, still, with respect to the facilities and satisfactory character of its use, you can appreciably increase the sending radius, I will say, of that 600-meter wave length by advancing the power that is behind it?

Mr. MAXIM. Yes, sir.

Mr. SAUNDERS. Without suggesting 200 meters, or 40 miles, as a reasonable limit, with respect to that 600-meter wave, if you put enough power behind it, what would be the distance over which that could be reasonably used and satisfactorily used?

Mr. MAXIM. Six hundred meters at sea?

Mr. SAUNDERS. I mean on land.

Mr. MAXIM. Six hundred meters on land and using a 3-kilowatt, shall we say?

Mr. SAUNDERS. Yes.

Mr. MAXIM. I suppose it could be counted upon to transmit a great deal of business a matter of 250 or 350 miles.

Mr. SAUNDERS. All of the information given in these answers are in reference to present conditions in this art; it is the hope, I suppose, of the men who are working on it that any day you may see developments, arrive at the perfection of devices which would increase all of these ranges and the certainty of transmission, receiving, etc.; that is part of the development which you are all working on, is it not?

Mr. MAXIM. Yes, sir; a great many of us amateurs have already partly developed inventions which will do just what you say.

Mr. SAUNDERS. And the very obvious reason that you want the freest opportunity given to the work of every one along these lines is that you may hasten the day in which these improvements will be secured?

Mr. MAXIM. That is the burden of my mind.

Mr. GREENE. What is the reason the ship-to-shore stations can not be used with more than 600 wave lengths and therefore leave more space below; instead of narrowing it, enlarge it for the development of business generally? This is going to be a business proposition, not a naval proposition alone. Why not broaden its width and put the Navy up higher than the 600 wave length? Why should the Navy desire to come down on that low level when they do not need it? Is there not some zone between these high-power stations? Is there not a greater opportunity than for them to use the radio at 600 wave lengths which will shut out the ordinary individual or the business men from using radio, which it is desired to develop? Why can they not go higher than 600 wave lengths and not be interfering all the time? That is the situation as I gather it here. They would be better off, and there would be less trouble if they use the higher wave lengths.

Mr. MAXIM. They already are higher; it goes as high as 16,000 meters.

Mr. GREENE. Oh, yes; they can go higher; but they kept down to 600. They want this 600-wave length, as I understand it.

The CHAIRMAN. That is low now. We fixed that in this committee in 1912.

Mr. GREENE. Yes; I understand.

The CHAIRMAN. We fixed the limitation.

Mr. MAXIM. The limitations were very wisely fixed, if I may say, in the judgment of amateurs.

The CHAIRMAN. The committee thinks so.

Mr. GREENE. I am not talking of the amateur end of it; I am talking of these ship-to-shore stations, those at 600 meters. That is correct, is it not?

Mr. MAXIM. Merchant marine, I think, principally, sir; the Navy uses a longer.

Mr. GREENE. I know; but the Navy bought up these ship-to-shore stations, and have them under their control, and they are going to develop them with the merchant marine. They bought these from the Marconi Co. and intend to use them. Now, they are in the way of further development above this 200-wave length that you can use in

the amateur business, and we want to get at something between them. Why can not they get up higher and use it on ship to shore, say, higher than 600, without damage to anybody and with benefit to themselves?

Mr. MAXIM. I do not know that I can give those reasons exact enough, but I do know that the records of the hearings before this committee when the law of 1912 was passed will show that reason, sir.

Mr. GREENE. We may have grown some since 1912. I thought there might have been development and that we would know something more about it now.

Mr. MAXIM. I do not know those reasons. I was wondering why the Navy stepped up or down or over 600 meters. I do not believe I am competent to answer that.

Mr. EDMONDS. I think that was agreed to by the international conference.

The CHAIRMAN. No; that was agreed to by the commercial interests—the Navy, the merchant marine interests, and the amateurs, all around—and it has proven very satisfactory.

Mr. BANKHEAD. Mr. Maxim, can you tell approximately how many wireless operators there are in employment in the United States—I mean, using that art as a regular means of livelihood, in the Navy and in commercial pursuits?

Mr. MAXIM. I would have to guess at that; I do not know. There must be upward of 4,000 amateurs or ex-amateurs.

Mr. BANKHEAD. Referring to your observation of a few moments ago, in answer to Judge Saunders's question, that you did not think there was very much chance for continental commercial development along this line, the possibilities, then, for cheaper employment as a permanent means of livelihood by wireless operators will be necessarily limited to the scheme now in operation, to a large extent?

Mr. MAXIM. So far as I can see now.

Mr. GOODWIN. What is the greatest distance that wireless messages can now be sent successfully?

Mr. MAXIM. I presume you refer to those stations——

Mr. GOODWIN (interposing). Any station. What is the greatest distance any message has ever been sent successfully?

Mr. MAXIM. You are taxing my memory, but I have heard these experts say that they have heard here in Washington the radio station at Cavite Bay, Manila, Philippine Islands, which must be a distance approaching 10,000 miles.

Mr. SAUNDERS. Mr. Maxim, it is a rather interesting matter to me that Mr. Greene referred to. They have agreed upon a wave length for ship-to-shore communication, but there was no particular logic in the wave length they agreed on; it was just that it was universally agreed on. It can be pushed up, we will say, to 1,200 meters, and it was universally agreed it would be just as satisfactory for these purposes, I suppose, at the present agreed wave length, or would it not?

Mr. MAXIM. Oh, yes. The longer the wave length the better the conditions for long-distance work.

Mr. SAUNDERS. Was this wave length agreed on at the time the agreement was made one that was thought to be the best at that time in view of the then state of advancement of the art or was it this universal acquiescence in that particular wave length without any consideration?

Mr. MAXIM. I think it was general acquiescence. Judge Alexander would know more about that than I do.

The CHAIRMAN. I will read Article II of the service regulations annexed to the International Wireless Telegraph Convention of London. (Reading:)

ART. II. *Wave lengths*.—Two wave lengths, one of 300 meters and the other of 600 meters, are authorized for general public service. Every coastal station opened to such service shall be equipped in such manner as to be able to use these two wave lengths, one of which shall be designated as the normal wave length of the station. During the whole time that a coastal station is open it shall be in condition to receive calls according to its normal wave length. * * * In addition, each Government may authorize in coastal stations the employment of other wave lengths designed to insure long-range service or any service other than for public correspondence established in conformity with the provisions of the convention under the reservation that such wave lengths do not exceed 600 meters or that they do exceed 1,600 meters.

In particular, stations used exclusively for sending signals designed to determine the position of ships shall not employ wave lengths exceeding 150 meters.

Of course, we had that in view in framing the act of 1912.

Mr. SAUNDERS. That just gives the agreement; that does not answer the question I was asking, which was whether there was acquiescence in that particular wave length in order to get a universal agreement rather than that particular wave length was suggested as the one best wave length of all the other wave lengths that might be suggested for the purposes they have in view, and I understand the witness to say it was rather an universal acquiescence to get an agreement than that scientific necessities suggested that wave length. So far as you know, Mr. Maxim, I understand you to say that there is no reason, scientifically speaking, why that wave length could not be advanced to 1,000 meters or 1,200 meters and be fully efficient for all the purposes for which it was intended.

Mr. MAXIM. Yes, sir; it could be.

Mr. SAUNDERS. If there was that universal agreement on the part of the nations in that wave length?

Mr. MAXIM. That is the whole thing, universal agreement.

Mr. SAUNDERS. And as that advanced you would get, of course, farther and farther away from any possibility of interference by domestic development along such lines as I have indicated?

Mr. MAXIM. Precisely; yes, sir, you would.

The CHAIRMAN. That would mean the equipment of ships with a higher power station than they have now, would it not?

Mr. MAXIM. Not power; it would reduce wave lengths.

The CHAIRMAN. Would they not be required to use higher power to use the greater wave length?

Mr. MAXIM. No, sir.

The CHAIRMAN. Would a 1-kilowatt station use the same wave length as a 2-kilowatt plant?

Mr. MAXIM. Yes, sir. I might say that one-eight kilowatt would send on any wave length and 10 kilowatt could send on any wave length.

The CHAIRMAN. What would be the reason why a 10-kilowatt plant should be used rather than the 1-kilowatt plant?

Mr. MAXIM. Distance.

The CHAIRMAN. Very well. The lower—the 600-meter service—for ship to shore and most purposes for saving human life is used; is that true?

Mr. MAXIM. I think, Judge, if you will go back in the discussions, I think we said that the average distance between the masts of the average ship makes it such that 600 meters are the easiest wave lengths to get and fits the average ship the best. I think that was the thing which governed in arriving at 600 meters.

The CHAIRMAN. What we wanted was some standard that would be practicable.

Mr. MAXIM. Yes, sir.

The CHAIRMAN. And that could be used by the average ship.

Mr. MAXIM. Yes, sir.

The CHAIRMAN. And in the interest of saving human life.

Mr. MAXIM. Yes, sir.

The CHAIRMAN. That is, the crews on small ships should avail themselves of this art in saving life as well as on the large ships which might carry the larger antenna.

Mr. HUMPHREYS. Mr. Chairman, is not this a fact, that the 600 wave length is simply used for calls on these ships, and, as a rule, as soon as they come in contact they shift to a different wave length to carry on their communications?

Mr. MAXIM. I think that is the practice among ships; yes, sir; because on entering New York harbor you can easily see there might be a great many ships wanting to communicate at the same time, and they have to arrange the signal between themselves which says, for example, "let us change to 500 meters."

Mr. HUMPHREYS. Or 1,500, or whatever it might be?

Mr. MAXIM. Whatever they agree on.

Mr. HUMPHREYS. So that they can then carry on the conversation on these ships with a very much longer wave length than 600?

Mr. MAXIM. Yes, sir.

Mr. HUMPHREYS. And the practice is they really use this 600-wave length very little?

Mr. MAXIM. Only enough to gain contact. You have got to be listening in on the universal pre-arranged wave length or you will not hear your call.

Mr. HUMPHREYS. As soon as you hear it you shift to some thing so that if somebody else wants to call, the 600-wave length will be available?

Mr. MAXIM. Yes, sir.

Mr. HUMPHREYS. I want to ask you some questions that were suggested to my mind by some of the other questions asked. Is it easy to locate a violator of the regulations among the amateurs? Suppose an amateur should begin to use 600 or 800 or 1,000, would it be easy to locate him so that he could be apprehended?

Mr. MAXIM. Yes, sir; there are records which show it has been done.

Mr. HUMPHREYS. So that there is no particular difficulty; in other words, it is not harder to locate a violator of this law than many other laws that we write upon the statute books?

Mr. MAXIM. Exactly.

Mr. HUMPHREYS. You did not seem to think this overland business would ever develop very much commercially, and one reason you gave

was the lack of secrecy; another was the matter of interference of the weather or the unfavorable weather conditions, as I understood it?

Mr. MAXIM. Yes, sir.

Mr. HUMPHREYS. Is that what you call static interference?

Mr. MAXIM. Yes, sir.

Mr. HUMPHREYS. From the way word was used here, I wondered what it meant.

Mr. MAXIM. Yes, sir; that means electrical weather disturbances.

Mr. HUMPHREYS. Have not some inventions already been made to eliminate that or lessen that static interference considerably?

Mr. MAXIM. Yes, sir; there have, very recently.

Mr. HUMPHREYS. And I suppose it is your hope and belief that in the reasonably near future other improvements will come that will reduce it, if not entirely eliminate it?

Mr. MAXIM. I feel absolutely sure of it; yes, sir.

Mr. HUMPHREYS. I would like to ask you about a part of your apparatus. I do not know what you call it, but I would call it a "reflector." I understand you have some sort of an instrument that you can attach to your sending machine that will direct the waves in certain directions?

Mr. MAXIM. Some of us thought we had that; yes, sir.

Mr. HUMPHREYS. I would like to know about it myself. Have you or have you not?

Mr. MAXIM. Some of us have very good evidence that has been presented indicating that they can establish the direction of their greatest power; by arranging the antenna they can make the greatest power go due east and due west and the minimum power go due north and due south.

Mr. HUMPHREYS. Some progress has been made along that line?

Mr. MAXIM. Yes, sir; there has.

Mr. HUMPHREYS. And I assume it is entirely right to say that all progress in that direction has not yet been made?

Mr. MAXIM. Oh, no.

Mr. HUMPHREYS. You spoke of an instrument that had been invented by an amateur named Armstrong, which you called the Armstrong regenerating circuit.

Mr. MAXIM. We call it the Armstrong regenerating circuit; yes, sir.

Mr. HUMPHREYS. Would it be possible, do you suppose, to describe that to us so that what Judge Hardy described as "a simple citizen" could understand it? [Laughter.]

Mr. MAXIM. That would be quite a question, but I will do my best. I have asked my fellow engineers not to smile.

Mr. HUMPHREYS. The purpose of this is not idle. I should perhaps have waited until the hearing was over, and then asked you personally to describe it to me. But in order to show to those who care to read the record that the amateurs are really doing an important work along this line, I think it desirable, if you can put this in words, so that the average Congressman, who is a "simple citizen," can understand, it will help them.

Mr. CHRISTINE. May I make a suggestion that Mr. Maxim be given a blackboard and chalk? I believe he could make this whole subject of wireless as plain to this committee as to himself if he had a blackboard, particularly when he enters upon the subject of regener-

ating circuit. It will then be very difficult for you to understand unless he does it by means of a diagram.

Mr. MAXIM. Might I suggest that I try the words first? I think I can convey the idea by words so that it will be satisfactory to you.

Mr. ARMSTRONG in his experiment disclosed the fact that we had not before understood as thoroughly as he that in a closed bulb, like an incandescent lamp, rigged up in a certain way, the energy will go across from one member to another, and can be made to pull a trigger, if you please, like the trigger of a gun, and thereby liberate considerable energy which you have here [illustrating] in any quantity you want. In other words, Mr. ARMSTRONG discovered that this very feeble, infinitely feeble, electrical impulse, which comes in from points thousands of miles away and is led to your ears, is too feeble of itself to make an audible sound, but it is not too feeble, according to his arrangement, to "pull a trigger."

This is not a scientific explanation; but it is what you want, I think. It was not strong enough to render itself audible but it was strong enough to pull the ARMSTRONG trigger, and when the trigger was pulled it liberated this energy in this little battery here [illustrating] and then he had something which he could hear and his device made the inaudible audible. Does that convey the idea?

Mr. HUMPHREYS. Oh, yes; it is very clear to me and is, as technical as I could understand it. If you went into it deeper I would not be able to understand it. It is very interesting, and I can see the great value of that. That was the invention of an amateur?

Mr. MAXIM. Yes, sir.

Mr. HUMPHREYS. There are others, of perhaps varying degrees of value, which are also the inventions of amateurs?

Mr. MAXIM. Yes, sir. I could not tell you any more than I have told you without violating confidence; but I know a great many inventions which will be brought out within a year or less time.

Mr. LEHLBACH. Is there not a device—called the heterodyne—which eliminates, in a large degree, interference from other messages excepting the one being received?

Mr. MAXIM. Yes, sir; that is a very great improvement in eliminating interference.

Mr. LEHLBACH. And the limit of development of that device has not been reached?

Mr. MAXIM. By no means.

Mr. LEHLBACH. In other words, so that interference from other messages in the air can be largely eliminated and in the future will be still more eliminated?

Mr. MAXIM. Just exactly; yes, sir.

Mr. WHITE. I would like, Mr. Maxim, to clear up something that is in my mind, or perhaps I should address my question to some of the older members of the committee, but, as I understand it, in this London convention the United States was a party either directly or by ratification?

The CHAIRMAN. We had delegates.

Mr. WHITE. And the United States was a party to this London convention. As I understand it, we bound ourselves to apply the provisions of the present convention to all radio stations. Then, under Article II, there is a provision limiting wave lengths, which provides that two wave lengths, one of 600 meters and the other of 300 meters,

are authorized for general public use. The question I want to ask is how, in view of that convention to which we are a party, can we engage in the use of this wireless by the Government for any smaller wave lengths, as this bill proposes. It is a matter I do not understand, and I would be glad to have the witness or somebody explain that.

The CHAIRMAN. I would suggest that we have representatives of the Navy here who will come back in rebuttal and take up and answer that question.

I will call attention to the hearing before this committee on H. R. 19350, in the last Congress, which were very full and complete, and I think it would be of interest to the committee to read the statement of Mr. Edwin H. Armstrong, electrical engineer and specialist in wireless receiving apparatus, and the inventor of this apparatus to which Mr. Maxim has referred, and in which he says, page 202:

I have invented the regenerative audion receiver, which is the best interference preventer that is known at the present time. It is used throughout the world in commercial and Government stations.

I take it for granted that the members who want to inform themselves will read it.

Mr. HUMPHREYS. I would like to ask the witness, if he cares to answer, this question: What is your opinion and the opinion of your organization on the proposition made by Mr. Nally the other day to have this matter regulated by a commission?

Mr. MAXIM. I should have to give that thorough thought. I had not thought of that. We had such very good regulation under the Department of Commerce that it would have to be pretty good to beat it.

Mr. GREENE. This is going into the Navy, not the Department of Commerce.

Mr. SAUNDERS. Mr. Maxim, one question in connection with the matter brought out by Mr. Humphreys in reference to the Armstrong invention: As I understand, that wave length comes in very feebly and pulls a trigger which releases stored energy, and that stored energy amplifies the feeble wave and makes it stronger; is that the way it works?

Mr. MAXIM. Exactly; yes, sir.

The CHAIRMAN. We will now hear Mr. Hamilton. [After a pause.] Gentlemen, I have just received word by telephone from the House that the presence of the members of this committee are desired on the floor.

Mr. EDMONDS. I have here a petition from a number of amateur operators which was handed to me by Henry A. Clark, Member of Congress from Pennsylvania, who asked whether we could have it placed in the record. It is from the radio department, Andrew Jackson School, Erie, Pa., and dated December 10, 1918, and is signed by seven members of the school.

The CHAIRMAN. We will be glad to file the petition for the information of the committee.

We will now take a recess, without objection, until 2 o'clock this afternoon.

(Thereupon, at 12.45 o'clock p. m., the committee took a recess until 2 o'clock this afternoon.)

AFTER RECESS.

The committee reassembled, pursuant to the taking of recess, at 2 o'clock p. m.

Mr. LEHLBACH. Mr. Chairman, in view of Mr. Maxim's interest in the Armstrong invention and the exposition of it given by the preceding witness, I thought it would be of interest to read what Prof. Pupin had to say about the invention, as it is found in the hearings held on the previous bill before the committee. This is what Prof. Pupin said, as it is found on page 158 of the hearings of January 18:

This young student by a simple transposition of circuits made the same audion 5,000 times as sensitive. With what result? With the result that everybody is using it to-day, and all the operating companies pay this young man a modest royalty. Not a very large royalty, because the operating companies are not making money—not much, anyhow. They can not afford to pay more than a very modest royalty. But it enables this young man to support his mother and two sisters. The United States Navy uses this invention more than anybody else. According to the information which an officer of the Navy gave to myself, they were using it since January, 1914. And they had it at this time—and this was a year ago—in something like 40 stations. They have not paid a cent to this young man, and they do not intend to. They all tell him, "You can go to the Court of Claims."

The CHAIRMAN. Here is what Mr. Armstrong said in the hearing of 1917, beginning on page 201:

Mr. GRIGGS. What is your business, Mr. Armstrong?

Mr. ARMSTRONG. I am an electrical engineer who makes a specialty of wireless receiving apparatus.

Mr. GRIGGS. Have you made any invention or discoveries in that field?

Mr. ARMSTRONG. I have invented the regenerative audion receiver, which is the best interference preventer that is known at the present time. It is used throughout the world in commercial and Government stations.

I would like to ask Mr. Maxim if that is the instrument to which he refers? Mr. Maxim does not seem to be here just now. I will ask Lieut. Cooper if that is the instrument.

Lieut. COOPER. That is the same one.

The CHAIRMAN. We will now hear Mr. Hamilton.

STATEMENT OF MR. FRANCIS F. HAMILTON, OF INDIANAPOLIS, IND., REPRESENTING THE HOOSIER RADIO CLUB OF INDIANAPOLIS.

Mr. HAMILTON. Mr. Chairman and gentlemen, I represent the Hoosier Scout Radio Club, of Indianapolis, and have recently been an Army instructor in the Signal Corps camp at Camp Purdue in Indiana. On December 1 that camp was discontinued, and so I came to Washington to work on this bill.

Mr. Maxim has covered very thoroughly the technical side of the subject as the amateur sees it, and I want to present a few facts further that he has not covered as thoroughly as I think it should have been covered.

We have been hearing about large things and money values running up into the millions of dollars. Now, the amateurs are here. We have small stations, and we are in the cents column instead of the dollar column, as far as the money goes. But you have heard the old saying "Take care of the pennies and the dollars will grow." So we say: "Take care of the amateurs and wireless will grow."

Mr. Chairman and gentlemen, I want you to get the point of view of the amateurs. We have been hearing about the Marconi Co. Each amateur is a little Marconi Co.; each man or boy is president, secretary, treasurer, owner, operator, and probably the inventor of his complete station. And what is he in business for? He is in business for profit, of course. It develops his mental side, his mechanical and electrical experience; his skill is developed in handling messages and tuning through static. I refer there to interference through storms. He is constantly gaining knowledge, as most amateurs do.

An ordinary amateur station may cost from \$3.50 up. Most of the amateurs spend from \$20 up to several thousand dollars for a complete sending station; they spend as much, sometimes, as several thousand dollars for wireless junk and apparatus. I put the word junk in there because there has been a lot of that sold to amateurs, and the amateurs have been imposed upon by some manufacturers putting out apparatus that is not worth putting on the market. We have been imposed upon by some of the apparatus of the German manufacturer which has been allowed to be sold on the market, and the amateurs were stung. Does not the amateur want a profit? Of course he does. Each small amateur is, as I said, a small Marconi Co., and he expects a legitimate profit.

If I may take the time of the committee, Mr. Chairman, I shall enumerate some of the profits. I have had many a father say to me, "My, I am glad Johnny is interested in wireless." I asked why? The father continued, "Why, we always know where Johnny is; he never runs around and gets into mischief. He is always here at home working." Is that not a profit to the community and to the family, and to Johnny? If I may digress here for a moment; I would like to tell you some of the actual facts that have come under my observation in regard to some of the little fellows down in the slum district in Indianapolis, who have been interested in wireless. I have been in some of their homes, and back in a dark corner this little fellow will be at work, using a little receiving outfit, the money to purchase which has been obtained by selling newspapers, or in a similar way. There he is off in that room listening to messages, hoping that some day he may have a sending outfit himself. That is a wonderful proposition, it seems to me, to see those little fellows working with so much enthusiasm and so much interest, little fellows whose fathers and mothers have had practically no education, interested in such a wonderful science as this. Their study and work is going to develop them and broaden their minds, and some of them will, in that way, get an ambition to go to college, and probably become radio engineers, as a few have already done, who have come under my instructions.

Many and many a boy who has become an electrical engineer has had a start in wireless. He learned the fundamentals when he was 15 or 16 years old, down in his wireless room.

My third point is this: In time of war where did the Navy look for operators? You can answer that as well as I.

My fourth point is this: It takes years to learn to be good at anything, any profession, if you please; to be a good lawyer, or a good doctor; that is even more truly the case with wireless telegraphy.

Imagine taking a bunch of farmers and trying to teach them wireless. I had some experience in doing that. Our first group of men were drafted men. They were selected by a selective system, and nearly all of them had been amateur operators before. Before they got through the course they were all good operators. They had the fundamentals and after they were taught how to handle the Signal Corps apparatus they were very good operators.

Our next group of men were drafted men, drafted promiscuously, according to number, without any idea of ever knowing anything about wireless. Most of them came off of farms, and we had these men under training for 13 weeks, and when they got through they knew less than when they started. That is the trouble in training men who do not have any incentive for this kind of work and who have had no experience. It takes men who have had some experience, such as the amateurs have had, two or three years to become an expert operator. There is one feature I want particularly to refer to, and that is that it is very important to the United States Government to have these amateurs coming on, and to have them in readiness in case of a national emergency such as we have recently passed through.

Mr. HUMPHREYS. There is not any special reason why a boy on a farm may not learn wireless as readily as a boy in the slums, is there?

Mr. HAMILTON. Absolutely not. I was raised on a farm myself, and I began my first amateur set on a farm, in the old woodshed.

Then, it is very profitable for Uncle Sam to have a lot of operators coming along all the time, if he needs them, and he will need them if we are going to have the great merchant marine the papers tell us about.

Another great profit to an amateur is the fostering of ambition. Many amateurs dream of the day when they may be on a large ship at sea operating a wireless station. With that in view, what is the chance of amateurs operating ship stations after they have fulfilled the requirements if this bill passes? Why, an amateur would have to join the Navy first and put himself under military authority in order to develop his commercial profession and ambition. I ask you gentlemen is that desirable, and will amateurs look upon this course as desirable? I do not believe they will.

Now, I want to say something in regard to the question of patents. I have been working on some patents myself, and I can give you my viewpoint in regard to patents.

The question of patents was so well defined on yesterday by Mr. Griggs that it is almost unnecessary for me to say much in addition. However, I want to point out that any one of these amateurs might stumble on some new, fundamental principle, as Mr. Armstrong did, that would revolutionize the development of radio, we will say, for example, in sending sets on ships. If this amateur should get a good patent, and we will presume he would, he could get capital interested in it, and that is not hard to do in these days, and he would have and should have the right to place his improved sets on ships. Under the United States laws I should think he should have that right, and they will want to buy the patents.

Mr. HUMPHREYS. What do you mean by having the right to place his apparatus on a ship?

Mr. HAMILTON. If you should get a patent on radio apparatus which would be a fundamental patent, you ought to have the right

to use that without going to the only bidder, who would be the Secretary of the Navy. There ought to be more than one bidder on that. In other words, if the Department of Commerce was operating a merchant marine, and the Secretary of the Navy was operating the Navy, you would have two departments competing, and then a third person might come along, and he might have some ships, and you would have another party to deal with. The point is that would give you another opportunity.

Mr. HUMPHREYS. If the shipowner is agreeable?

Mr. HAMILTON. If the shipowner is agreeable, yes; which he would be if the station only cost one-third what it generally would cost, and then the rentals could be less.

Mr. HADLEY. You want a broader market for the inventor?

Mr. HAMILTON. A broader market for the inventor than there would be if this bill should go through.

Mr. HARDY. Would there be any difference in the breadth of your market if a private monopoly controlled it?

Mr. HAMILTON. I should say there would not be so much in the breadth of the market as the opportunity to get the greatest amount of profit out of that particular invention. If you have half a dozen men all developing inventions and half a dozen people willing to take them, you are bound to get more money than if there are only one or two men.

Mr. HARDY. Suppose there was only one man, and that man represents a private monopoly.

Mr. HAMILTON. You would have to take what he gave you for it.

Mr. HARDY. Would it be any better if it was a private monopoly that if it was the Government?

Mr. HAMILTON. That is a question I could not answer, because I do not know what the private monopoly might be.

Mr. HARDY. If either the private monopoly or the Government were altruistic in connection with these things, they might help you?

Mr. HAMILTON. Yes.

Mr. HARDY. But, as a matter of experience, is the private monopoly more liberal than a Government monopoly to inventors?

Mr. HAMILTON. I should say so.

Mr. HARDY. Have you ever had any experience?

Mr. HAMILTON. I have not sold any patents, but that would be my feeling in the matter. If I go to the Government to sell a patent, there is a lot of red tape to go through with.

Mr. HARDY. And the Government is not interested in getting the last dollar out of your patent. Usually they are interested in the public welfare, while private interests would be interested in getting a profit. Is not that, to some extent, the difference between the two?

Mr. HAMILTON. The Navy Department is interested in the public welfare, and the private monopoly would be interested in their own welfare.

Mr. HARDY. In their own profits?

Mr. HAMILTON. Yes.

Mr. HARDY. The Navy Department would be interested in every improvement for the purpose of helping to protect life at sea?

Mr. HAMILTON. They certainly would.

Mr. HARDY. And prodded by Congress and by public sentiment, would they not be disposed to adopt every new invention that would help to protect life at sea?

Mr. HAMILTON. In the case of Apgar, that got all these messages from the German station, there were naval stations all around that, and they should have found out that there was a leak there, but they did not.

Mr. HARDY. I do not raise any question in regard to that. That is not a question that has anything to do with the marketing of your invention. You were talking about having a customer to buy your inventions, and you said you would rather have competitors for the purchase of your invention, that everybody would, if you had anything to sell. My point is if you had but one buyer, would he likely be more liberal with you if he was a private buyer than he would be if he was a representative of the Government?

Mr. HAMILTON. It seems to me it has been brought out that the Marconi Co.—that we will consider as a monopoly—paid Prof. Pupin a million dollars for a certain patent which he developed. I do not know whether the Navy Department has paid out any money at all for patents. If they have, I do not know about it.

The CHAIRMAN. Do you know of the Marconi Co. paying money for any patents except that one?

Mr. HAMILTON. No; I do not.

The CHAIRMAN. It is just absence of information on your part?

Mr. HAMILTON. Yes.

The CHAIRMAN. Your information is not based on very broad, accurate information?

Mr. HAMILTON. No; just on those two cases. I am trying to give it to you from my standpoint as an amateur.

Mr. HARDY. You never knew of a private monopoly not taking over any patents at all?

Mr. HAMILTON. Yes; I have in mind the case of the National Cash Register Co., but that was before the Sherman antitrust law was in effect, I believe.

We will say the improvement is such that a complete set would cost \$1,000 instead of \$3,000. Now, is not that an advantage to commerce, for the ship set rental would be less, and this amateur could, simply by competition, force a competing company to buy his sets or go out of business. Amateurs should have that right.

If I may say what I believe, I believe that in the future we shall see just such a thing happen, if the wireless business is not bottled and corked up by the Navy Department, as this bill proposes. I believe in the future we shall see this very thing happen, that due to the invention and improvements on ship sets and radio stations in the United States, that in three years there will be so much improvement that the old ones will all be scrapped and the new sets will be sold at a much cheaper price because of their efficiency, and the sets will not be so large and powerful as they used to be.

Mr. HARDY. You continue to speak of competitors having to go out of business unless they should adopt these new sets. Have you not heard the testimony here of Mr. Newell, who says that the purpose of his company is to secure a monopoly, and the probabilities are that some private enterprise will have a monopoly unless the Government does.

Mr. HAMILTON. Yes; I heard that testimony.

Mr. HARDY. Then where is the competitor coming in?

Mr. HAMILTON. I figure they will not be able to maintain a monopoly. I started with the supposition that the amateur would invent something which will revolutionize the ship stations, to begin with; with that supposition it would be necessary for either the Marconi Co. or some new company which might start up in competition with the Marconi Co. to buy those sets from this one firm.

Mr. HARDY. Will you tell me what likelihood there would be of a new company starting up, when it takes now many millions of dollars to get into the game?

Mr. HAMILTON. I do not agree with you on that.

Mr. HARDY. Do you believe a new company could start without—

Mr. HAMILTON (interposing). I am figuring on a manufacturing company selling the sets to the ship company. There might be a few people get together with a capital of \$5,000 or \$10,000 to manufacture the outfits.

Mr. HARDY. I am not talking about manufacturing the sets. I am talking about establishing a wireless system that would compete with this company. In other words, you have a vast monopoly of a wireless system operating in America and England and everywhere else. What chance is there for a competitor of that monopoly to start out and by buying better inventions, live? In other words, with your inventions, must you not go to the monopoly?

Mr. HAMILTON. I would make them come to me.

Mr. HARDY. How would you do that?

Mr. HAMILTON. Now, then, under this supposition the Marconi rental is now \$1,000 a year. If I could get up an invention which would cost half as much as their ship sets, that would reduce the rental. I would certainly get two ships to start with, to prove that this was satisfactory, and after I had done that—

Mr. HARDY (interposing). When your ships started out, how would they have shore stations to communicate with them?

Mr. HAMILTON. Under the law, we would have the right to communicate with the shore stations.

Mr. HARDY. You are sure that the privately owned monopolistic shore stations would cooperate with you?

Mr. HAMILTON. They would have to take the messages if we paid for them.

Mr. HARDY. Have you ever seen a private small enterprise root out a monopoly by means of patents or other methods?

Mr. HAMILTON. There were a good many firms mentioned this morning that have started from nothing and have grown to be pretty good-sized businesses in this country selling apparatus, and they have been up against the Marconi Co. and other companies.

Mr. HARDY. The Marconi Co. is not a manufacturing company, is it?

Mr. HAMILTON. Yes; it is the largest in the world, and the other companies have sold a lot of apparatus.

Mr. HARDY. As a manufacturer, has the Marconi Co. ever assumed proportions that looked like monopoly?

Mr. HAMILTON. Not to my knowledge.

The CHAIRMAN. They manufacture the apparatus on which they hold patents?

Mr. HAMILTON. I think so, and I think some of those patents are used by other firms.

The CHAIRMAN. They have to get a permit from the Marconi people to do that?

Mr. HAMILTON. I do not know about that. That may be true.

It might be and is not unreasonable to believe that men on this committee might get interested in wireless and become amateur operators. If that were true, I wonder if they would like to be under the Navy Department or under the Department of Commerce? We are of the unanimous opinion that we would much rather be under the Department of Commerce.

Right here I would like to say a few words in regard to the amendment in section 3 of the proposed bill offered by the Navy Department for the purpose of satisfying the amateurs. The amendment, so far as the fundamental principle involved is concerned, is satisfactory to the amateurs. But I want to go on record as saying that I do not see any valid reason why the present law should be changed if the law is enforced.

Mr. HADLEY. Then the corollary of that would be, from your point of view, that even if this law be enacted an amateur should be excepted from its provisions rather than be regulated by the terms of that amendment?

Mr. HAMILTON. If this bill should go through the way it is written, if they leave us the way we are it would be satisfactory.

Mr. HADLEY. You think they should be excepted from its provisions?

Mr. HAMILTON. Yes.

Mr. HADLEY. It has been represented to the committee that this amendment represents an agreement which is satisfactory to both sides.

Mr. HAMILTON. Mr. Maxim represents a certain number of amateurs. As I told you at the beginning, each amateur is a little company of his own, and each man will have his own ideas. I think Mr. Maxim said himself this morning that if it were possible he would like to see the law left as it is, but if it were not possible to do that, he would agree to this amendment.

Mr. HADLEY. I think that was the effect of his testimony.

Mr. HAMILTON. We agree with that statement in his testimony.

Mr. BESHLYN. Then there is no agreement among the amateurs as to their policy?

Mr. HAMILTON. No absolute agreement, except that I have a few telegrams from the western associations agreeing to the points in the amendment that they object to.

Mr. BESHLYN. What proportion of the amateurs do they represent?

Mr. HAMILTON. I should say these telegrams represent 400 or 500 of the western amateurs. Both of them come from the Chicago association. I represent the Indianapolis association. There are a few points of this amendment I wanted to bring out in regard to the way it is written. If this amendment goes in it will probably go in in the way it is written, and it is not satisfactory the way it is written. In the definition of the word amateur station it says, "The term amateur station means a station used for private practice or experiment in radio communications for profit." I tried to bring out that we only operate our stations for private profit. I would like to see that cut

out; that is, the word after the word communication, so that it would read, "The term amateur station means a station used for private practice or experiment in radio communications." The other part is not necessary, and it is misleading.

The CHAIRMAN. Do you want the amateur stations operated for commercial profit?

Mr. HAMILTON. Yes, sir; I do want them operated for profit. We have been doing that.

The CHAIRMAN. For commercial profit?

Mr. HAMILTON. Yes.

The CHAIRMAN. And receive so much for messages sent and received?

Mr. HAMILTON. It says here "practice or experiment in radio communications." Under the 1912 law we can not receive money for transmitting messages. We do not want to do that. The profit we want is in the experimental end of it.

The CHAIRMAN. I think we will all agree to that, that we want to give you that opportunity. When you want to strike that out we have the right to infer that you want to engage in commercial business for profit.

Mr. HAMILTON. We do as experimenters.

The CHAIRMAN. Then you say you do want to do that?

Mr. HAMILTON. Yes. We do not want to get any money for transmitting messages. The only profit we want to get is on the experimental end.

Mr. BESH LIN. Is any charge made for instructing others who may want to learn the art?

Mr. HAMILTON. I have been conducting a radio plant for a number of years and have never charged a cent. I have been doing that through the Boy Scouts. Here in Washington there are a lot of schools which charge \$75 a term for the instruction of amateurs. We do not do that.

Mr. HARDY. There would be no objection to a charge for instruction?

Mr. HAMILTON. I should not think so, but it has been my pleasure to do it free of charge, because I felt I was doing my duty. I have no way of knowing just what the Navy Department had in mind when they proposed this amendment, but I do know that when this bill was drafted it was so written that amateurs were put clear out of business. If you will look at the amendment in the light that each amateur is a small company operated for gain or profit to its owners, you will see that the Navy Department's definition is "The term 'amateur station' means a station used for private practice or experiment in radio communication and not operated for profit in either sending or receiving signals." Just see what it says, "Not operated for profit." Webster says profit means "Any increase of goods from labor or exertion, comprehending the exposition of anything valuable, intellectual, or corporal." In this light we are cut out by the very definition of the word 'amateur.' I say cut the amendment short after the word communication. It will be sufficient, and no question will arise, as I see it.

There is another point in this amendment that I would like to call your attention to. The amendment says: "That when such amateur stations are licensed for receiving purposes only." Under the present

law we are not licensed for receiving purposes. That is misleading. It also says "No operator's license shall be required for the operator in charge of or operating such stations." There is an apparent contradiction there. It says when a license is required no license shall be required.

Mr. EDMONDS. Under the new law you would be required to have a license for receiving stations, and that amendment would follow that provision. It requires all receiving stations to be licensed, and if that is the case this amendment would simply follow that provision.

Mr. HAMILTON. Then I will stand corrected on that.

Mr. EDMONDS. Is there any particular objection to licensing a receiving station?

Mr. HAMILTON. I think it would be a good thing provided there was Government money to do that.

Mr. EDMONDS. As long as they made no charge for it?

Mr. HAMILTON. I mean if they provide an organization here at Washington to license receiving stations, because then everybody would be on record.

Mr. EDMONDS. Of course, they do not require any examination under this amendment?

Mr. HAMILTON. Absolutely none. I believe the Navy Department will stand corrected on this 15-word a minute proposition, or the 75. I got a telegram from the Western Association agreeing to 10 words a minute in that amendment and not 12. That means 50 letters a minute, and we will agree to 50 letters a minute. We think that is plenty strong enough. We do not want these people to be experts. The old law requires 25 letters a minute, but we are willing to make it 50.

It is further provided in this amendment that the amateurs are limited to one-quarter kilowatt within 5 miles of any governmental receiving station. In the city of Indianapolis we have a receiving station on the post office building. That means all through Indianapolis we will be cut to one-quarter kilowatt, one-fourth of what we have had before.

That station has been operated all during the war and was in operation before the war, and, as I understand it, Mr. Burluson, the Postmaster General, intends to put a lot more receiving stations on post office buildings. We can not agree to accept an amendment which would cut us to one-quarter of a kilowatt within 5 miles of a Government receiving station unless the station is defined to come within the 100-mile limit.

Mr. HARDY. How far would one-quarter of a kilowatt enable you to communicate?

Mr. HAMILTON. Not very far under average conditions, but under ideal conditions one-quarter of a kilowatt will transmit 150 miles.

Mr. HARDY. Ordinarily would it transmit half that distance?

Mr. HAMILTON. No; it will not. I think it was brought out this morning that on 200 meters 1 kilowatt of power would not be practical between here and Baltimore.

Mr. HARDY. How large a kilowatt power would possibly result in interference with the smaller receiving stations licensed by the Government?

Mr. HAMILTON. There is no reason why they should receive on the amateur wave lengths at all. If they will stay away from the amateur wave length 1 kilowatt will not interfere.

Mr. HARDY. What wave length will the Indianapolis post office station operate on?

Mr. HAMILTON. That I can not say. They would not let me in the station, not being a Navy man.

Mr. EDMONDS. This 150 to 200 is reserved for the amateurs?

Mr. HAMILTON. It is.

Mr. EDMONDS. If you use 1 kilowatt you will not interfere with anybody, even if you used it within 100 miles of the Atlantic and Pacific Oceans?

Mr. HAMILTON. We would not interfere if we used it within 100 miles of either the Atlantic or the Pacific.

Mr. EDMONDS. Because that is the reserved length?

Mr. HAMILTON. Because that is the reserved length. I do not see why they should not give us a place and let us stay there.

Mr. HUMPHREYS. Is interference affected by the kilowatt power?

Mr. HAMILTON. Not necessarily; no, sir. It is a function of the wave length.

Mr. HUMPHREYS. You said not necessarily?

Mr. HAMILTON. Under the 1912 law if you have a pure wave you are required to have a pure wave, and if you obey the law strictly and fully it will not interfere.

Mr. HUMPHREYS. Whether you use a quarter, a half, or 1 would make no difference as far as the interference was concerned?

Mr. HAMILTON. No.

Mr. LEHLBACH. This amendment, as drawn, would prevent any wireless station in Washington from using a quarter of a kilowatt, because it would be within 5 miles of Arlington?

Mr. HAMILTON. Yes.

Mr. HUMPHREYS. How much are you limited to now?

Mr. HAMILTON. One kilowatt of power all over the United States.

Mr. HUMPHREYS. And the limitation applies only to stations within 5 miles of a Government receiving station?

Mr. HAMILTON. Yes. And we were limited then to half a kilowatt, and this proposes to limit us to a quarter.

Mr. HUMPHREYS. Can you tell me why that limitation is put on, if it does not interfere?

Mr. HAMILTON. I do not believe the Navy Department meant that to be that way.

Mr. HUMPHREYS. The present law puts a different limit where the station is operated within 5 miles of a Government station.

Mr. HAMILTON. They put it at half of a kilowatt.

Mr. HUMPHREYS. If it would make no difference, why did they put it in the present law?

Mr. HAMILTON. That law was made several years ago, and at that time the amateur's apparatus was very crude and not at all pure. The waves were not pure, but to-day we have a different condition. The amateurs have some of the finest stations there are, and there is no reason for that under present conditions. As we develop the art further there will not be any reason why we should interfere with any Government business, if we do not use over 1 kilowatt of power.

Mr. HUMPHREYS. How far can an amateur communicate with a quarter of a kilowatt? All over the city of Indianapolis?

Mr. HAMILTON. Yes; all over the city of Indianapolis.

Mr. HUMPHREYS. How far do you want to go?

Mr. HAMILTON. We do not want to put ourselves—we do not have much intercity communication. When we communicate a message like that Mr. Maxim spoke about going from New York to San Francisco in two hours, that is the kind of communication the amateur is interested in as pioneer communication. That is the highest standard, and when an amateur can do that he considers himself a pretty good amateur. They do not know how to handle the traffic. When they are talking back and forth in a town they are just beginning to learn, and after they have learned they can communicate between cities. Our closest station to Indianapolis that amounted to anything was 150 miles away.

Mr. HUMPHREYS. If the Post Office Department does extend their service and puts a receiving station on the post-office buildings in all the cities of any size, that will practically limit the amateurs to a quarter of a kilowatt?

Mr. HAMILTON. Yes; in places; and I gave that example because there is a station there now. I say that is a possibility, and when it is law and they say we can do this, when they have the authority to say that, they are liable to go ahead and do it. That is one reason I made that objection.

Mr. HARDY. About what would that station at Indianapolis cost the Government?

Mr. HAMILTON. If it is only a receiving station, it should not cost them over \$150 or \$200.

Mr. EDMONDS. If the Navy handles this the same as they do patents, they would not have one quarter of a kilowatt.

Mr. HAMILTON. I would like to ask for some information on section 3, and ask why it is not possible to cut out section 3, if the Navy takes over the stations—the experimental, technical, and training-school station? If they take over everything, why is it necessary to put in the bill, in section 3, on page 2, that “no person shall maintain or operate, on land or on a permanently moored vessel (first) within any State any radio station capable of being used (a) for the transmission of signals, the effect of which extends beyond the jurisdiction of such State or causes interference with the transmission or receipt of signals to or from any place beyond the jurisdiction of such State”? The only station there will be the Government stations and these stations provided for in the amendment. Why is that necessary? I could not see why it is necessary.

Mr. HARDY. Is it not plain that if the Government is going to take all your stations along with what now exists and prevent others from being put up, that they must do that; otherwise they would have to buy them as fast as they were put. That is the plain purpose of that.

Mr. HAMILTON. What is to prevent anybody doing that? It says for the receiving of signals to or from any place, signals which originate outside of the State. What would keep me from putting a wire in my back room and receiving messages? It is not my fault if the messages come in on the roof, and I do not see how the Government can keep me from receiving these messages.

Mr. HARDY. The proposition is to let the Government own the wireless stations. If a private individual should come along and put up more, the Government would not own them.

Mr. HAMILTON. I did not know that was the section that applied to that.

Mr. EDMONDS. It says—

This section shall not apply to experiment stations and technical training school stations duly licensed, as provided by the act to regulate radio communication approved August thirteenth, nineteen hundred and twelve.

Mr. HAMILTON. There will be only two kinds of stations.

Mr. EDMONDS. We could add amateur stations to that.

Mr. HAMILTON. I have here, Mr. Chairman, a communication from the Baltimore Radio Club, offered by Mr. Donald L. Primrose, who had to leave. Everything I have said they would agree to with only one exception, that they will accept the 12 word per minute in the amendment. They are at sea regarding the Government receiving stations—that is, limiting the amateurs to one-quarter of a kilowatt within 5 miles of a Government receiving station, and they wanted it to be on record that they are against that part of the amendment, as the representative of the Baltimore Radio Club could not appear this afternoon.

Mr. HUMPHREYS. What would you think of the proposition to create a commission with power to determine the wave length and the kilowatts that could be used by amateurs?

Mr. HAMILTON. As far as I am concerned, I do not see how it would be possible to have the amateurs represented on that commission. The present law is satisfactory and sufficient. It might be that we could have a convention and elect somebody to represent the amateurs, and that commission would be satisfactory to us, because we would have a representative on it.

Mr. GREENE. This commission was to be appointed by the President.

Mr. HAMILTON. If that is the case, amateurs would not have any representative on it whatever, I mean any elective representative.

Mr. HARDY. If you have your stations from which you can send ordinarily 75 miles with one-quarter of a kilowatt power, is not that sufficient for all the projected purposes of the amateur, to learn to send messages? Can he not learn everything in operating that kind of a station that he could in operating one that had one kilowatt power?

Mr. HAMILTON. I would say absolutely not, in the section I come from, because it is 150 miles from our town to the nearest station that we can talk to, that amounts to anything. There are no stations intervening that we could get through with on one-quarter of a kilowatt, and there are times when we can not get there with one kilowatt. All the amateur stations close in the summer time, because they have not enough power to get anywhere. We only operate in the wintertime. They start in November and run until April.

Mr. HARDY. So the 1 kilowatt would limit you to talking or carrying on communication with similar stations inside of Indianapolis?

Mr. HAMILTON. Yes; except in the wintertime under very ideal conditions.

Mr. HARDY. Then you might talk to a station in Ohio?

Mr. HAMILTON. Then we might talk to a station in Ohio. We have gone further than that in ideal conditions. We have very peculiar conditions in the Middle West. There are times when the naval station at Chicago can not reach Detroit. Those conditions they call freaks.

Mr. HARDY. The purpose of the amateur is to learn the art, to study the art, and possibly add inventions to the business.

Mr. HAMILTON. Yes; and then there is a certain pleasure to it, just the same as a man goes out and plays golf, so the amateurs operate their radio stations.

The CHAIRMAN. From that point of view you do not think their interests should be paramount to those of commercial interests of the country?

Mr. HAMILTON. No, sir; I do not.

Mr. WHITE. Will you not explain briefly just why, from your standpoint, it is desirable that we should have the right, for experimental purposes, to communicate, say, with this nearest station outside of Indianapolis?

Mr. HAMILTON. From my viewpoint, it is this, that the amateurs have been considerably in competition with each other, trying to see who could send the longest and to see who could get his station so efficient that he could get the farthest distance. When they do that, they learn to get such efficiency so that in operating their instruments most of their power goes into the ether and is not lost in the machine itself. When they do that they learn a wonderful amount of radio engineering, which they would not learn if they did not have a chance to communicate at some distance. If they do not have enough power to get across the State, there are not enough stations close enough for them to do anything. They would not know how far they were getting and would not know how efficient their stations were. They would not have any incentive to improve.

We now have a marked incentive to improve our stations. In the last two years there have been developments and inventions by the use of which our stations will be much more efficient and we will probably be able to do much better work and have not so much interference among ourselves. Under present conditions, when they get of age, we will say, and get into radio engineering they can do the same thing with large stations, and they will have the experience and the benefit of all this training in fixing up their stations to a state of high efficiency, and they can do the same thing them with the Government stations.

Mr. BURROUGHS. Do you happen to know whether there are many stations that would be situated similarly to Indianapolis?

Mr. HAMILTON. All through the Middle West—Denver, St. Louis, Kansas City, I believe. We have stations in those cities. In that Transcontinental Relay League they jump from Ohio to Chicago, down and cross to Kansas City, I believe, to Denver, and then to Los Angeles. Those stations are all through the Middle West, but not as thick as they are in the East.

Mr. GREENE. As I understand it, the amateurs are satisfied with the present law, which they had before the war. They have been efficient in the war, and now they want to go back to their former

position, and here comes a new law that ties them up so they can not get back to where they were. I can not see any reason, after they have rendered good service to the Government, why they should not have a chance to return to their former status.

Mr. HAMILTON. That is absolutely the condition. None of these amateurs would be here to-day if that bill had not been written so that it would cut them clear out. We came here to fight that part of the bill. The Navy Department has been good enough to help the amateurs out and help us get an amendment, but we would much rather have it the way it was.

Mr. GREENE. You are perfectly satisfied with the management of the business as it has been carried on?

Mr. HAMILTON. The Department of Commerce has treated us fine, and we have always gotten along well with the Department of Commerce. There is no reason why we should have a change that I can see.

Mr. BURROUGHS. Your attitude toward this amendment is not that you advocate it, but you take it as a protective measure in case the bill itself is to be enacted?

Mr. HAMILTON. That is the idea exactly.

Mr. GREENE. But you prefer to leave it as it is?

Mr. HAMILTON. Yes, sir.

The CHAIRMAN. Have you any objection to the existing law?

Mr. HAMILTON. No objection to the existing law; no, sir.

The CHAIRMAN. I supposed you had, from what you said.

Mr. HAMILTON. I thank you, gentlemen, very much.

STATEMENT OF MR. EDWARD C. ANDREWS, OF PHILADELPHIA, PA., PRESIDENT OF THE WIRELESS ASSOCIATION OF PENNSYLVANIA.

The CHAIRMAN. State your name, please.

Mr. ANDREWS. Edward C. Andrews.

The CHAIRMAN. Where is your home?

Mr. ANDREWS. Philadelphia.

The CHAIRMAN. What is your business?

Mr. ANDREWS. I represent here the Wireless Association of Pennsylvania as its president to-day.

The CHAIRMAN. What is your business?

Mr. ANDREWS. Shipbuilder.

The CHAIRMAN. In what yard?

Mr. ANDREWS. The Chester Shipbuilding Co.

My experience with the art of radio dates back to about 1909. I have had classes, private classes, of Boy Scouts and other little groups and for a while I instructed at Franklin Institute of Philadelphia.

I am here to-day to represent the Wireless Association of Pennsylvania, as its president, unalterably opposed to the change in the present law. We see absolutely no reason for it and lots of reasons against it. The one paramount reason in my mind against the enactment of this law is its sponsors. Understand, gentlemen, that what I may say is of a general character, and I do not want anybody to take what I say personally. I may, without thought, call a spade

a spade, whether it is an ace or a ten spot; but please pull your feet in if I happen to step on your toes. I will try not to. [Laughter.]

This bill eliminates the amateur entirely. It makes no provision and provides no scope for his development, and it simply tends toward that Government ownership which, I am sure, nobody has shown any good reason for having. It removes the incentive for experimenters or for any amateur to experiment. While it provides for technical or training-school stations or experiment stations, I fear it has taken away the incentive.

To show more clearly what I mean—this possibly may have been expressed before—the incentive is taken away because, as we understand, there are to be no other stations operated except by the Navy Department, and consequently all experimenters or technical and training-school scholars would naturally have to come under the head of the Navy Department; or, rather, they would have to enlist in the Navy in order to carry on the studies they have undertaken, and unless they were willing beforehand to enter the service there certainly would be no scholars for the schools, and that naturally would eliminate them. If we have no incentive and no place for anyone to go to sell apparatus, naturally that puts an end to experimentation. There is nobody to sell to, except the Navy Department or the Government, and we have learned from previous speakers that they do not buy. Consequently it eliminates experimenting and it deters people from taking up the art. Consequently interest in the art will gradually die out.

I want to speak a little on the wave-length question. As we understand, there was some little discussion a while ago regarding 200 meters and 600 meters. As you know, all amateurs were restricted to 200 meters. They did give us by the enactment of the London convention a wave length of 300 meters and 600 meters for ship work, but 300 meters is very rarely used, and it has been eliminated. Why it has been eliminated I can not say, and while I do not recall having heard of anybody doing any work on that wave length, the amateur is still held to a limit of 200 meters. Then comes the 600-meters limit, but the space between these two figures is vacant.

A gentleman this morning spoke about inland commercial work, as to why they could not work on 600 meters and travel a certain distance, say from Washington to Baltimore. Well, they could go even farther than that. There is no reason why they can not work up on 1,600 meters. The Wanamaker station in Philadelphia, that operates between Philadelphia and New York, operates on, I believe, 1,600 or 1,800 meters, and there is no other ship work or naval station work on that wave length, the navy yards working on about 1,000 meters, the ships working on 600 meters, and the amateurs on 200 meters.

If the ship-to-shore work is carried on on 600 meters, sharply tuned, as the law requires it shall be, there ought to be no interference from the amateur, and if the commercial station is working on 1,600 or 1,800 meters there is absolutely no danger of interference on that score; and if they are working on the higher wave length with the power they usually use, something around five kilowatts for the commercial stations, then they could carry on all this commercial work. I can see no reason why there should be any interference.

That is all I have to say, gentlemen.

**STATEMENT OF GORDON M. CHRISTINE, M. D., 2043 NORTH
TWELFTH STREET, PHILADELPHIA, PA.**

Dr. CHRISTINE. Mr. Chairman and members of the committee, I have but a very few things to say, because I think Mr. Maxim went over the ground very fully, and I think you understand from him that the act of August 13, 1912, was eminently satisfactory to the amateur.

My interest in the wireless question came from the fact that my son, who now is a commanding officer of the photographic department of the Air Service in France, bought for 10 cents a little detector with which the advertisement said he could hear the signals from Arlington. He rigged that up in my third-story end room and asked me to listen, using a house phone. Well, we listened and we thought we heard, but we did not. It required then a wire. He purchased a wire, but still we received no signals. He then purchased another wire and put it between two poles, using the house phone. We thought then we heard signals, but we did not.

We then constructed a better aerial and procured a set of head phones, and then we thought we could hear the signals, but we could not. He then purchased, for a couple of dollars, a transformer, and then we heard the signals of the Arlington station at five minutes of 10, giving the time. We then listened for the broad signal indicating the exact second of 10 o'clock. We had then a wireless receiving outfit at an expense of two or three or four dollars.

My interest in that became very great, because I was scout master of a troop of Boy Scouts, and it was my duty to teach them semaphore, and, inasmuch as in the manual there was a provision for teaching wireless telegraphy, it was necessary for me to learn wireless telegraphy.

I became extremely interested, and I have now in my house an outfit worth \$600 or \$700, which has been held in abeyance ever since the order of the President went forth that we were to lower our aerials, and that outfit has not been used. I wrote some time ago to the Secretary of the Navy to ask him when we would be able to use our outfits, and the Assistant Secretary, Mr. Roosevelt, replied, "When the war was over."

Recently, hearing many of the boys say that now that the armistice was signed, they would probably be permitted to use their wireless, I wrote again to the proper department, and received the reply that until the proclamation went forth we would be obliged to keep our aerials and our outfits quiet.

Now, I am greatly interested in medicine and surgery; that is my profession; but I am an amateur in wireless telegraphy and have become intensely interested in it. I am a member of the board of directors of the Wireless Association of Pennsylvania, and when we sent nearly every boy we had to the Navy and to the Army to do the work of the Nation in that direction we were limited in our membership to four, five, or six. I left my work and business every night we had a meeting of the board of directors or a meeting of the association and went there in an endeavor to keep up the work of the association, so that when the war was over we would be able to say to those boys that we had kept the association alive. My hair is gray and I am 61 years of age, but I am extremely interested in

this art. I love my profession, my work, but I came here this morning and am speaking to you now in behalf of the act of August 13, 1912, to ask you with all my heart and soul that you do not disturb that so far as the interests of the radio amateur are concerned.

You have sent the boys, you have allowed them to go, and they are there doing their service. Some of them have gone to the depths of the ocean in that service. I could read you most pathetic things from the wireless journals showing you what wonderful service those boys have rendered, and I have it from those in authority that the amateur did the very best work.

Now, why, while this war is going on and most of the amateurs are away in the Army and in the Navy, this thing should be done, I can not understand. We are willing that the work should go on as it was, with our half a kilowatt, a certain distance from a naval station—5 miles.

It so happens that my friend, Mr. Andrews, can only use a quarter-kilowatt transformer. I am just outside the limit of 5 miles, and I can use 1 kilowatt, but with an aerial of 200 meters I can not put all the strength of that 1-kilowatt transformer into the aerial because of a lack of capacity. Therefore, I am obliged, when I go to work again—and I hope you will allow me to do so—to reduce my 1 kilowatt to three-quarters of a kilowatt. I can not understand why it has been reduced in this amendment to a quarter of a kilowatt within 5 miles of a naval station and half a kilowatt outside that limit.

I know two boys who, as the result of my teaching, passed the examination at the Navy Yard. At the time I gave up the Scout work I had other boys, and they are ready to pass the examinations. I went down among the boys, around a table like this, and I was examined. As the result of my studies I received an average of 100, of which I am quite proud.

I have endeavored to teach the boys that one of the grandest things they can do in their study of electricity is to study wireless. It requires knowledge in many lines. I have in my cellar a lathe, and I have worked that lathe an hour at a time when my wife said that it was time to come to bed, and with that lathe I have made a wireless apparatus myself, and my friends about me, who are interested in this matter, know how difficult it is with a lathe to make a variometer. An amateur is some one who is in love with his art; when he goes beyond that and earns his living in sending and receiving signals, then he is a professional. I am as pure an amateur as you can get, and we have thousands of them throughout the country.

Now, we can not interfere with the Navy Yard. A wave length means something, say, that long [indicating], and a wave that long does not go beyond a certain width. If we send out our pulsations, thousands and thousands of them, in a column something like that width, and if the Navy Yard is adjusted to receive a wave length that long [indicating], how in the world can it hear the wave length we send out? Simply because they disobey the law, or that I am myself abusing my privilege and going above my limit.

The Wireless Association of Pennsylvania knew of a young man in the city of Philadelphia who is a genius. He is such a genius that he does not know there is such a thing as law, and he sent out his pulsations in all sorts of waves. He does not recognize the law; he is too much of a genius. A member of our association, who is

present here to-day, incurred his everlasting enmity because he reported him to the Wireless Association and the Wireless Association said "You must stop it." We are ready to report to the Government and to the proper officials any boy, any man, or any amateur who disobeys the law.

Now, we do not like this amendment; we do not want any amendment at all—

Mr. HUMPHREYS (interposing). Will you permit me to ask a question?

Dr. CHRISTINE. Yes, sir.

Mr. HUMPHREYS. If you can explain it to me, how could you tell it was this particular genius who was violating the law?

Dr. CHRISTINE. There always is a call letter. My call letter is 3-L-O. Every wireless expert or amateur in the city of Philadelphia knows when this particular genius sends out his calls or his signals—just as you would recognize me by seeing my handwriting or looking at my face. When Mr. James uses his apparatus, I know it is Mr. James. When Mr. Serviss uses his, I know it is his. In addition to his call letter, there is a certain tone, either sharp, rough, or otherwise. Then, the distance, and the experience we have in hearing these signals, determine these points. And it was proven in that and other ways that this young man was infringing the law. Therefore, the wireless association regarded it as its duty to see that the law was obeyed, and reported him.

Mr. HUMPHREYS. You can recognize a man's sending—an individual's?

Dr. CHRISTINE. Yes, sir; we can recognize his sending and his work. I can tell you absolutely whether I am listening to the navy yard or to Arlington, and I want to say I was always pleased to hear Arlington, but the navy yard operators were pretty miserable.

Mr. HUMPHREYS. Well, they were all amateurs, as I understand it?

Dr. CHRISTINE. I doubt it.

Mr. HUMPHREYS. Their testimony has all been to that effect, practically.

Dr. CHRISTINE. Now, give us this old law. Do not disturb that. We have been very content, Mr. Chairman and members of the committee, with the treatment we have received from the Department of Commerce and Labor. We are developing a number of boys in the art of wireless telegraphy, and it is from that host of boys that the commercial stations and the Army and the Navy must receive their material. It is a world-wide university, and the boys have availed themselves of it, and that is why the amateurs are here to-day asking that we do not disturb the law of 1912.

Mr. BESHLYN. Where, in your opinion, would there be any difference in the control of this by the Department of Commerce and by the Navy Department?

Dr. CHRISTINE. I think the general opinion is—

Mr. BESHLYN. I want your opinion, not the general opinion.

Dr. CHRISTINE. My own opinion is that the treatment which the Department of Commerce and Labor has given us has been that of man to man and the treatment which the Navy would give us would be the treatment of a high official to a civilian.

Mr. BESHLYN. That is just an impression?

Dr. CHRISTINE. That is my impression; yes, sir.

Mr. BESH LIN. Not born of any experience?

Dr. CHRISTINE. Then, it is the province of the Department of Commerce and Labor to engage in business. Is the Navy going to enter the business of communicating messages here, there, and elsewhere? If so, why do they not take up the telegraph and telephone, and the post-office work? Why should they take up this particular work. They are, of course, in a warlike attitude; they are in military life; but why should they take over the commercial work? In other words, if the Navy takes this over, what is to interfere with their controlling the use of the wireless in the mines between the bottom of a mine and the top of a mine? What is to interfere with their controlling the use of the wireless in the railroad, as between train and train or between train and stations? Will the Navy Department take that up also?

Now, when the navy yard hears the amateur who is operating within the law he is simply disobeying the law himself—

Mr. BESH LIN (interposing). Does it not necessarily follow that the Navy must have a certain control of this in order to regulate the ships at sea?

Dr. CHRISTINE. No; their regulation of ships at sea has not anything to do with the matter whatever. You can make the law more stringent, if you will, regarding the amateur, so far as I am concerned. I knew a boy not far from me who, after the war was declared, thought he was doing all right to receive, and I said to him, "If you do that I shall report you." And if this law is allowed to remain as it is I can assert positively that no matter how stringent you make the law the Wireless Association of Pennsylvania will see to it that it is obeyed. And I believe there are very few of our amateurs who have disobeyed the law. You know as well as I do that there are some who will disobey any law.

Mr. HARDY. Have you any objection to the receiving stations being required to take out a license?

Dr. CHRISTINE. I would favor having the receiving stations licensed.

Mr. HARDY. Do you know that the law of 1912 does not require any license?

Dr. CHRISTINE. I know it does not, and I think that was one of its weak points. There ought to be a law to amend that.

Mr. HARDY. Over and above that, except as to the provision limiting them within 5 miles of a station to a quarter of a kilowatt power, do you see anything in this amended provision that substantially interferes with the existence and progress of amateur radio telegraphy?

Dr. CHRISTINE. No; if you limit it to a half kilowatt and a quarter kilowatt, the amateur will go on. It will probably be, in a sense, more of an incentive.

Mr. HARDY. You heard the first gentleman who spoke in behalf of the amateurs?

Dr. CHRISTINE. Yes, sir.

Mr. HARDY. It seemed as if most of the amateurs had really agreed on these terms. Have you really any serious objection to that amendment?

Dr. CHRISTINE. I have no serious objection to that amendment, except that, inasmuch as they are limited to one kilowatt far away and one-half a kilowatt within 5 miles of a naval station, I can not

see that that will in any way interfere with the ships or naval stations. I can not understand why the amendment pulls it down.

Mr. HARDY. That is really the only objection you have?

Dr. CHRISTINE. That is the only objection I have; yes, sir.

Mr. HARDY. Otherwise the amendment is all right, you think?

Dr. CHRISTINE. Except that in the latter part there I would like to change the term "Government receiving station." I would favor having that changed to read "Government military or naval station." It may make no difference, but "Government receiving station" is rather indefinite. We all understood that under the old act as being a navy yard or a station of larger sort.

Mr. HUMPHREYS. Have you a copy of the law there? What is that language?

Dr. CHRISTINE. Regulation 15 provides [reading]:

No private or commercial station not engaged in the transaction of bona fide commercial business by radio communication or in experimentation in connection with the development and manufacture of radio apparatus for commercial purposes shall use a transmitting wave length exceeding 200 meters, or a transformer input exceeding one kilowatt, except by special authority of the Secretary of Commerce contained in the license of the station: *Provided*, That the owner or operator of a station of the character mentioned in this regulation shall not be liable for a violation of the requirements of the third or fourth regulations to the penalties of \$100 or \$25, respectively, provided in this section unless the person maintaining or operating such station shall have been notified in writing that the said transmitter has been found, upon tests conducted by the Government, to be so adjusted as to violate the said third and fourth regulations and opportunity has been given to said owner or operator to adjust said transmitter in conformity with said regulations.

Lieut. Cadmus, when satisfied that the amateur was disobeying the law, would come to his station, or have some one go there, and have that station tuned. And when it was once tuned it was the duty, of course, of the amateur to keep it so tuned, and it was likewise the duty of other amateurs to notify the Government if that law was in any way violated.

Mr. HUMPHREYS. How is the inspector, whoever he is, to find out that the amateur is violating the law if he is forbidden to tune his instrument so as to answer that particular wave?

Dr. CHRISTINE. If he is forbidden?

Mr. HUMPHREYS. I understood you to say they violated the law by listening to what the amateur would say, because they have no right to get down into that 200-meter limit.

Dr. CHRISTINE. No; the Navy violates the rule by detuning his own apparatus so he will receive on 200-meter wave lengths.

Mr. HUMPHREYS. But I understood you to say the Navy Department—

Dr. CHRISTINE. The Navy Department can only hear the amateur at 200 meters by lowering his own tone; in other words; by disturbing his tuning.

Mr. HUMPHREYS. Well, some Government official would have to have that right or else they would never catch it, unless they would leave it to the amateurs to catch each other.

Dr. CHRISTINE. The point is, sir, that the amateur, if he is obeying the law, is not disturbing that naval station, and if he is disturbing that naval station the naval station is disobeying the law itself in coming down below its 300 or 600 meters.

Mr. HUMPHREYS. But should not somebody in the Government be permitted to listen and hear what he is doing?

Dr. CHRISTINE. Yes, sir; I agree with you. I say to you that we wish this law—I say “we,” but the amateurs, so far as I know, have had no gathering together. They have come here to-day to listen, each man to speak for himself and for the men whom we particularly represent. But I think we nearly all agree that this is the best proposition, and we are perfectly willing that you should put a very stringent provision in the law as regards the amateur and see to it that he obeys those injunctions.

Mr. HUMPHREYS. You object to the Navy having to ascertain that the amateurs were doing things that they ought not to have done and ascertain that by tuning their instruments down to 200 meters. That was during the war—

Dr. CHRISTINE. Oh, no; we have now no complaints. No amateur has been using his apparatus during the war.

Mr. HUMPHREYS. When was it that the Navy did this?

Dr. CHRISTINE. Prior to the war, when we had the right to use 200 and the navy yard was supposed to use 600 and 300; they could not hear our 200 unless they lowered their own tuning. Many a time there have been amateurs in the city of Philadelphia who have notified the navy yard that ships were sending to them when they could not hear them; many a time that has happened, and I think there is a witness here to-day who can prove it.

Mr. HUMPHREYS. Give us the language, please, that you were about to point out. You said you did not approve of the term “Government receiving stations.”

Dr. CHRISTINE. An officer might have simply a receiving station, and then he would come under that classification. I do not like this expression “Government receiving station.”

Mr. HUMPHREYS. You would rather have it “naval or military”?

Dr. CHRISTINE. Yes, sir; that would be my suggestion. In other words, a bona fide station and not of some officer who may have a receiving station or in any way a governmental station only for receiving purposes. In New York City there is a police wireless. I have not heard that the police find that the amateurs interfere with them in any way. And I suppose that in the city of Philadelphia and everywhere wireless will become a very common means for communication.

Mr. HUMPHREYS. You think it is proper, then, to limit the amateurs within 5 miles of a military or naval station to one-half kilowatt?

Dr. CHRISTINE. Yes.

Mr. HUMPHREYS. Then there is evidently some good reason for that; I imagine interference. If that be true, why should not that apply if the Government has a receiving station other than military or naval?

Dr. CHRISTINE. I believe that is simply an arbitrary statement. I can not see that there would be much difference between a kilowatt, if properly operated, and half a kilowatt.

Mr. HUMPHREYS. Yes; I understood you to agree that you thought that was a reasonable regulation.

Dr. CHRISTINE. It is a reasonable regulation.

Mr. HUMPHREYS. But if it is reasonable for military or naval stations, why is it not reasonable for any other Government receiving stations?

Dr. CHRISTINE. Then that would exclude the amateur all together.

Mr. HUMPHREYS. Did it exclude them altogether when you had it "naval and military?"

Dr. CHRISTINE. No, sir.

Mr. HUMPHREYS. They operated with one-half a kilowatt, although they were within 5 miles of a military or naval station?

Dr. CHRISTINE. Yes, sir.

Mr. HUMPHREYS. Why, then, would it exclude them altogether if you say "any Government receiving station?" Why can you not still operate? Suppose the receiving station is a post-office station. You can operate within 5 miles of a naval station or a military station; why is it you can not operate within 5 miles of a Government station?

Dr. CHRISTINE. The Government stations, as we understand them, would be large stations like the naval stations. The smaller stations would be scattered here, there, and elsewhere, and doubtless will be, and that would limit the amateur so much that he would have to keep down to his quarter kilowatt altogether.

Mr. HUMPHREYS. You may have some good reason for it, but I do not understand it myself. What is the reason you can operate all right within 5 miles of a military or naval station on your one-half kilowatt but you could not do it if it were some other sort of Government receiving station? Just what is the reason?

Dr. CHRISTINE. I do not catch your point.

Mr. HUMPHREYS. Here is your objection. This amendment provides the limit "within 5 miles of a Government receiving station." You want that changed to read "military or naval receiving station?"

Mr. LEHLBACH. Not "receiving"; "military or naval station."

Dr. CHRISTINE. It should be a bona fide station.

Mr. HUMPHREYS. You want to strike out the words "Government receiving" and insert in their place "military or naval?"

Dr. CHRISTINE. Yes, sir; that it shall be a bona fide station.

Mr. HUMPHREYS. Well, now, why? Why do you want that?

Dr. CHRISTINE. Because there would probably be only one bona fide military or naval station within a district. I suppose the military and naval departments are divided up into districts, whereas there might be a receiving station at every residence of a military or naval officer.

Mr. HUMPHREYS. If it does not interfere with you, what difference does it make?

Dr. CHRISTINE. It does not interfere with us in any way.

The CHAIRMAN. As I understand, Mr. Humphreys, the number of military or naval stations is now limited; hence that provision of the law limiting the use of one-quarter kilowatt by the amateurs is negligible. There are so few of those stations.

Dr. CHRISTINE. Yes, sir; we are willing to submit to that.

The CHAIRMAN. But if these stations were increased in number all over the country—here, there, and everywhere; if, as somebody has suggested, a naval officer had a receiving station in his residence that should be considered a Government station, it might limit the amateurs to the use of a quarter kilowatt if the thing should be multiplied to that extent.

Mr. HUMPHREYS. But I gathered from what he said that it did not interfere with the amateurs operating within this 5-mile limit.

Mr. ROWE. That is, on one-half kilowatt.

Dr. CHRISTINE. It does not interfere with us at all, sir. The question is, will our use of one-half kilowatt interfere with the Government under any circumstances? But there is the law, and we are willing to have it just as it is here.

Mr. EDMONDS. In other words, it is your opinion that this restriction of stations under the 1912 law could be stricken out altogether?

Dr. CHRISTINE. Yes, sir.

Mr. HUMPHREYS. You object to the words "Government receiving stations" and you want those stricken out and to insert in place of them, "naval or military station"?

Dr. CHRISTINE. Yes, sir.

Mr. HUMPHREYS. Can your one-half kilowatt or one-quarter kilowatt interfere with the sending of a message as well as receiving it?

Dr. CHRISTINE. No, sir.

Mr. HUMPHREYS. Then what difference does it make if it be a Government receiving station?

Dr. CHRISTINE. Under the present law, sir, I have a 1-kilowatt transformer in my wireless room which, if the President says I can, I shall try to operate, but the chances are I shall have to have it rearranged and turned into a three-quarter kilowatt transformer. I may disagree with my brothers here, but I doubt whether I can get the power from a 1-kilowatt transformer into a 200-meter wave length aerial. It has not the capacity. Therefore, I will reduce it to three-quarters.

I am now outside of the 5 nautical miles limit from the navy yard, but there is a receiving station at Chestnut Street. I am within 5 miles of that. I believe that under this law I would be regarded as having the liberty to use 1 kilowatt, because I am 5 miles away from a naval station. I call the naval yard a "naval station," but I do not call that receiving station at Chestnut and Twelfth Street a naval or military station. That is to say, I believe the intent in framing that law was that that should be a power station for transmitting and receiving.

Mr. HUMPHREYS. Personally, I am very anxious to protect the rights of the amateurs, and I thought maybe there was some good reason that you had for wanting to substitute "military and naval" for the words "Government receiving." I wanted to get that clear in my mind.

Dr. CHRISTINE. At Twelfth and Chestnut Street there is a receiving station. The navy yard is 5 miles away from me. Now, if this provision is applied to that receiving station, I can not use my 1 kilowatt or three-quarters kilowatt, but will have to get a quarter kilowatt transformer. The Chestnut Street station is only 3 miles from me.

Mr. HUMPHREYS. Suppose we make it a half instead of a quarter, just as it is now. What difference does it make to you whether it is a Government receiving station or a naval or military station?

Mr. LEHLBACH. Mr. Humphreys, don't you see it impairs the efficiency of his plant by reducing it from a 1 kilowatt to a one-half kilowatt power?

Dr. CHRISTINE. I was getting my apparatus so tuned that I believe in a short while I would have been able to do as good work as any other amateur in the city of Philadelphia.

Mr. HUMPHREYS. It will not impair the usefulness of your plant at all, unless that interferes with some Government receiving station. If it does interfere with Government work—

Mr. LEHLBACH (interposing). The law says that if he is within 5 miles of a Government receiving station, whether he interferes or not, he is restricted.

Mr. HUMPHREYS. Well, there must be some reason.

Mr. LEHLBACH. His argument is that there is no reason for the restriction.

Dr. CHRISTINE. I do not want the Navy to put a station within a square from me, and then say I can not use my present apparatus.

Mr. HUMPHREYS. I should not want to accuse the Navy of doing that—

Dr. CHRISTINE. I am not accusing the Navy.

Mr. HUMPHREYS. But the Navy ought to have authority to put plants wherever they want to.

Mr. HARDY. I understand you to say that if it was a naval station you would not mind that provision prohibiting you from being the possessor of such a plant within 5 miles of it. Now, if there is no trouble about your obeying that law within 5 miles of a naval station, what trouble in the world is there about your doing it within 5 miles of a receiving station?

Dr. CHRISTINE. None whatever. I think it is foolish to have the difference between a half kilowatt and a kilowatt.

Mr. HARDY. The whole of Washington practically is within 5 miles of a naval station, and all Washington is subject to this limitation of a quarter kilowatt. When you get outside of it you have privileges that these people do not have here. All New York is in the same position. Now, you think it is no burden on New York and Washington to be subject to those limitations because they are near a naval station or Army station. If it is no burden on Washington and New York City to have these limitations, why would it be any more of a burden on you if you are out in the country?

Dr. CHRISTINE. Understand me; I thought I had made it clear. My own view is that it makes no difference to the navy yard whether we use a half a kilowatt or a kilowatt; it does not disturb them.

Mr. HARDY. But Mr. Humphreys is trying to ask for your reason why you object to the words "receiving station" and want it "naval station."

Dr. CHRISTINE. Because under the present law I can use a 1-kilowatt transformer, because I am outside of the 5-mile limit. But if I am within that limit I have to use the one-quarter kilowatt, which I consider absurd. It makes no difference to the navy yard in its transmission or receiving whether we use the 1 kilowatt or one-quarter kilowatt. If I were to amend this, I would make it three-quarters of a kilowatt square.

Mr. HARDY. Then you were satisfied with the old law simply because it did not interfere with you?

Dr. CHRISTINE. No; because it did not interfere with the Navy or anything else.

Mr. HARDY. You do not get my point. It did interfere with everybody within 5 miles of a naval station, but it did not interfere with you.

Dr. CHRISTINE. No; if I were within 5 miles, I should follow the provisions of the law.

Mr. HARDY. But you are not?

Dr. CHRISTINE. If I were, I would use the provisions; I should avail myself of the provisions here for one-quarter kilowatt.

Mr. HUMPHREYS. Could you get along with that?

Dr. CHRISTINE. I would have to.

Mr. HUMPHREYS. But could you?

Dr. CHRISTINE. Yes.

Mr. HUMPHREYS. Then, if you could do it, why are you so frightened by the possibility of a Government receiving station, other than military or naval, being put within 5 miles of you?

Dr. CHRISTINE. I would make that a round figure. Instead of saying "one-half" or "one-quarter" I would say that the amateur should be permitted to use a quarter or a half, no matter where he is.

Mr. HUMPHREYS. You are speaking now of yourself as an individual?

Dr. CHRISTINE. No, sir; I am speaking for the amateurs.

Mr. HUMPHREYS. You are speaking for the amateur who lives right there where you do?

Dr. CHRISTINE. I am only using my own case as an illustration. I see no reason why that was originally put at a quarter kilowatt and a kilowatt. I can not see any reason for it, and I can not see any reason why in this amendment it should be limited to a quarter or a half.

Mr. HUMPHREYS. Most of the amateurs who have talked to me seem to be more afraid of the naval and military authorities having something to do with this than they were of the civil branches of the Government. You seem to differ with them. You are not objecting to a military or naval station, but if it is going to be a civil station, a station of the Post Office Department, for example, you become alarmed.

Dr. CHRISTINE. May I put on record my belief? Of course others have told me, "Say nothing as to belief," but I have been on the witness stand as an expert many times, and I know just how I am permitted to testify, but I believe that the Navy has it in for the amateur and wants him out. He would not have presented that original bill if he did not. But they became somewhat alarmed at the tremendous uprising of the amateurs throughout this country at the prospect of being deprived of the use of their outfits. The other night we could hardly get into our room, the young men, amateurs and others who came, and I am quite sure when the amateurs of the country hear of this there will be a tremendous protest.

Mr. HARDY. Your belief that the Navy has got something against the amateur is simply from the language of the original bill?

Dr. CHRISTINE. Yes, sir.

Mr. HARDY. Did you ever see any bill as originally framed that did not require corrections to be made in it?

Dr. CHRISTINE. I know, but this is not a correction, it is an alteration.

Mr. HARDY. Did you talk with any of the naval authorities, to see whether they were friendly toward you or had enmity toward you?

Dr. CHRISTINE. No, sir.

Mr. HARDY. Or whether they were personally willing to correct any error?

Dr. CHRISTINE. I should not know what authority to go to.

Mr. HARDY. Have not the amateurs here conferred freely with the naval representatives presenting this bill?

Dr. CHRISTINE. I came here this morning, sir, and do not know.

Mr. HARDY. You have talked with your brother amateurs. Have you seen any disposition to be unjust to the amateurs by any naval representative before this committee?

Dr. CHRISTINE. No, sir.

Mr. HARDY. So far as you have heard, has there been any unfriendly action or expression on their part?

Dr. CHRISTINE. No; I simply saw the original bill.

Mr. HARDY. You are only judging from the original bill?

Dr. CHRISTINE. From the original bill. Now, I say, they have amended that original bill by presenting an amendment which in many respects is satisfactory.

Mr. HARDY. I have not heard the naval authorities say, but I do not think the language of the bill as presented included amateurs. I do know that when representatives of the amateurs and the department got together there seemed to be a great deal of harmony and friendly disposition between them, from every expression that I have heard here.

Dr. CHRISTINE. I am very glad to learn of that, sir.

Mr. HARDY. Now, another thing. You spoke, Doctor, of wanting to have this put in the Department of Commerce and Labor. It so happens that there are two departments; Commerce is one and Labor is the other. Which one do you want it in—the Department of Commerce or the Department of Labor?

Dr. CHRISTINE. The Department of Commerce.

Mr. GREENE. When the department was created it was made the Department of Commerce and Labor, and the two branches were separated afterwards. That is how he may have been confused, because that was the original name of the department.

Mr. HARDY. I was asking the doctor if he cared which one it was, whether it was the Department of Labor or the Department of Commerce.

The CHAIRMAN. I suppose he refers now to the department that has jurisdiction of radio matters, which after the division of the Department of Commerce and Labor continued to be the Department of Commerce.

Dr. CHRISTINE. Yes, sir.

Mr. EDMONDS. Doctor, this act of 1912 has been enforced by the Department of Commerce and it has been very satisfactory to the amateur operators?

Dr. CHRISTINE. Eminently so.

Mr. EDMONDS. And they have been treating you very nicely?

Dr. CHRISTINE. Very well indeed.

Mr. EDMONDS. Now, the power of licensing amateur stations is in the hands entirely of the head of that department?

Dr. CHRISTINE. Yes, sir.

Mr. EDMONDS. He can give a license or not, just as he chooses?

Dr. CHRISTINE. You mean under the former method?

Mr. EDMONDS. Yes.

Dr. CHRISTINE. The process was simply this: I made application to Lieut. Cadmuss, or the Department of Commerce, and was furnished with blanks. Then I went to the Navy Yard and was examined. That examination was averaged, and then I was notified that if I took the oath I could get my license.

Mr. EDMONDS. Still, they had the privilege of refusing you a license if they wanted to? They were not forced under the act to give you a license?

Dr. CHRISTINE. Oh, yes; I believe they could reject my application. I am not positive of that.

Mr. EDMONDS. Under the law, that is right.

Dr. CHRISTINE. Yes; I believe they could. They may not have liked my personality or may not have liked something else.

Mr. EDMONDS. Under this new bill is it possible the Navy Department would have that same privilege?

Dr. CHRISTINE. Yes, sir.

Mr. EDMONDS. And they could give out 10 licenses or thousands of them, just as they chose?

Dr. CHRISTINE. Yes; and I see no provision there for an examination.

Mr. EDMONDS. And they need not give a license to an amateur. When you turn this over to the Navy Department that same condition exists, and if the Navy Department does not want amateurs in a certain district they can simply refuse them licenses. Now, the Department of Commerce is a business department, and it is used to handling business, and in its report it speaks very highly of the amateur operators. Undoubtedly they have got along very well together, and I do not blame the amateur operators for coming here and objecting to a change in the departments. If I were they, I would do the same thing myself, because they know what they can get from the Department of Commerce, and do not know what they can get from the Navy Department.

Mr. HUMPHREYS. It occurs to me that the law should be such that no department could arbitrarily refuse to give a man a license if he comes within the requirements of the statute. He ought to have a right to go into court and force them to give a license unless they show a good reason why they should not.

**STATEMENT OF MR. JOSEPH HEINRICH, 514 B STREET SE.,
WASHINGTON, D. C.**

Mr. HEINRICH. Mr. Chairman and gentlemen of the committee, I am only a youngster, as you express it—

The CHAIRMAN (interposing). How old are you, son?

Mr. HEINRICH. Thirteen. (Continuing) but I would like to voice the thoughts of an amateur at the proposition of so unjust a law. The man who proposed such a law could not, I am sure, have known the feelings of an amateur. As for myself, I am only a boy who got the "wireless bug" long before the war came to a happy termination, planning, as I was, to have a set of my own and counting the days until I could put up my aerial and go ahead. And then to have

such a bolt come out of the clear blue! No words can express my feelings, and I am sure all the amateurs feel the same way.

May I ask why do they want to wipe out the amateurs in the United States of America—

The CHAIRMAN. My son, nobody had any such notion as that. If they put that into your head, they put a "bug" in there that has no place there. You go home and sleep soundly to-night and take it for granted that there is nobody in this committee that is unfriendly to the amateur.

Mr. ROWE. I would like to hear what the boy has to say.

Mr. HEINRICH. They are not a bunch of boys who break the laws. They can easily be tuned out when forbidden to use a long wave.

Now, let me ask who furnished the boys for Uncle Sam and the merchant marine? When the call was sent out for more operators, who answered? The amateurs; the ones who operated their little stations in a dim cellar or attic. They are the ones who came forth and offered themselves to Uncle Sam. They helped materially to bring this war to a quick and successful termination; and, now that it is over, won't you let them operate their little stations?

And where can Uncle Sam turn for operators in case of another war? To the amateurs; and if there were none, God only knows. Every American ship, every transport loaded with soldiers, and every battleship of any sort must have at the very least two operators.

And where do the present operators get their knowledge? The majority of them were formerly amateurs. I know a number of them personally, and they are the men that believe that amateurism should not and will not be stamped out as long as there is an amateur left to fight. We want our rights. This is a free country; and, furthermore, gentlemen, to show the absolute baselessness of the law, there can be any number of receiving stations operated at the same time without any possible interference.

Then, why does that man want to cut us out? What are his reasons for proposing a law to wipe out the amateurs in the United States of America? You have given us a standing which we do not enjoy in any other country, and now will you take it away from us? The Government had no trouble with us when the war began. They simply sent around the notice that all amateur stations should be closed for the period of the war and it was abided by.

Again, may I ask, what was his reason for proposing such a law? which I hope will be as completely defeated as the one before. We, the amateurs of the United States of America, know our rights, and we will fight until we get them. And now, gentlemen, we ask you to help us to see that this law is defeated.

I thank you, gentlemen, for your kind attention. [Applause.]

STATEMENT OF MR. CHARLES H. STEWART, CHAIRMAN LEGISLATIVE COMMITTEE, WIRELESS ASSOCIATION OF PENNSYLVANIA, ST. DAVIDS, PA.

Mr. STEWART. Mr. Chairman, I have appeared before this committee on previous occasions in connection with this legislation, or legislation of a similar nature, and I have very little to say to-day. I think most of the members of the committee are familiar with what I had to say before.

All I have to say is that we favor, in times of peace, the control of radio communication being left entirely in the hands of the Department of Commerce. As that has been stated very clearly by a number of other witnesses who have preceded me, there is no use in my amplifying on that to any extent.

Mr. Maxim, in his statement to the committee this morning, very ably expressed, in my opinion, the views of a vast majority of amateurs.

There are one or two points which were not touched upon, however, so far as I heard the testimony to-day.

One is the question of the examination as to the speed of an operator. That is all regulated at present, under the act of 1912, by the regulations promulgated by the Department of Commerce under the act of 1912. So that no further legislation is actually required to change any minor points of that kind; they can all be covered under the existing law.

The second point which has not been brought out is that while a great deal of discussion has taken place in regard to interference by amateurs, I do not believe that there are any specific cases mentioned where, through such interference, if it did exist, any lives were lost; nor do I know of any specific cases where it did actually exist to any extent, so as to prevent the prompt sending of aid to a vessel.

That is about all I have to say. I do not want to take any more time of the committee; your time has been pretty well taken up already in this discussion.

The CHAIRMAN. The committee will now hear the next witness.

STATEMENT OF MR. HARRY W. DENSHAM, COLLINGSWOOD, N. J.

Mr. DENSHAM. I am secretary of the South Jersey Radio Association, an association whose members cover the district throughout the southern counties of the State of New Jersey.

Mr. Stewart and Mr. Maxim have taken quite a burden off my mind, and have relieved me of what I came to Washington to say; so that there is nothing I can say, other than that the members of our association have had very cordial relations with the Department of Commerce, and are perfectly satisfied for everything to go on as it has in the past. We have had no trouble anywhere in my district with either the Navy Department or the Department of Commerce.

There is really nothing else I can put in that would not be a repetition of what has been gone through heretofore in these hearings.

Mr. HARDY. Then you agree with Mr. Maxim, as I understand you?

Mr. DENSHAM. Yes; we have had no trouble, and there is no reason for dissatisfaction on our part.

Mr. HARDY. Are you one of those who conferred with the naval authorities in reference to that proposed amendment to the bill?

Mr. DENSHAM. No, sir; I have had nothing to do with anybody except those that I have been speaking to in this committee room.

Mr. EDMONDS. Do you mean you agree with Mr. Maxim's conclusion that it would be better to have it left in the Department of Commerce, just where it is now?

Mr. DENSHAM. Yes; in the Department of Commerce, just where it is now. We have had no trouble with anybody about it.

Mr. BURROUGHS. How do you feel toward the restrictive provisions of this measure?

Mr. DENSHAM. I am in a position where I have to keep to a half kilowatt—but that is a personal matter. If I was in a position where I would have to cut down from one kilowatt to one-half kilowatt, I would not be very well satisfied; I mean with the resulting necessity of having to throw away apparatus and buy new apparatus.

Mr. BURROUGHS. Just what would be the effect on the efficiency of your station in going down from one-half kilowatt to one-quarter kilowatt?

Mr. DENSHAM. It decreases the distance which I can transmit. One-quarter kilowatt, in the section of the country from which I come, is not good for more than 20 miles. Of course, on a clear, winter night, we have done better than that; but that would not be general by any means.

Mr. HARDY. Do you believe that these receiving stations ought to be licensed also?

Mr. DENSHAM. Only to show the strength of the amateurs, so far as I can see; so far as taking out a license for a receiving station, it is going to hurt a lot of jewelers who use it for getting their time signals. It would be a good thing for amateurs, simply because it would show the exact number of men in the field.

Mr. HARDY. Do you object to their being licensed?

Mr. DENSHAM. Positively no—provided there is no examination on the technical subjects.

Mr. HARDY. I do not understand that there is any technical examination for the issuance of a license.

Mr. DENSHAM. I do not know as to that.

Mr. HARDY. Well, I would like to know; that is a part of this proposed amendment, and I would like to know whether you oppose or favor the licensing of receiving stations. I am frank to say that I favor it; I think it would be a good thing for the amateur as well as for the Government.

Mr. ROWE. Would you be cut down under this proposed amendment to one-quarter of a kilowatt?

Mr. DENSHAM. Yes, sir; from a half kilowatt.

Mr. ROWE. And you are very much opposed to that?

Mr. DENSHAM. Well, naturally. We all want all we can get, although we do not want to cause any trouble or interference anywhere; we have not done so up-to-date, except in a few flagrant cases of violation of the rules that I have heard of.

Mr. BURROUGHS. From a scientific or technical point of view, do you see any reason for cutting it down?

Mr. DENSHAM. As Mr. Maxim said this morning—well, I might contradict him a little. There is absolutely no reason why a station operating on one-half kilowatt, as they are to-day, would interfere with any other station. In fact, we have had no trouble with commercial stations. We had trouble with the Philadelphia Navy Yard some years ago; but since then the apparatus has been perfected a good deal, and there is no trouble now.

Mr. BURROUGHS. What would you say the limit ought to be?*

Mr. DENSHAM. Well, I am not much of a technical or scientific expert. I presume it could be figured out mathematically; but that is too deep for me.

The CHAIRMAN. Are there any further questions? If not, we will hear the next witness. This will be the last witness we will hear this afternoon, then we will adjourn until to-morrow; I hope that we will finish the hearings to-morrow.

STATEMENT OF MR. FRANK B. CHAMBERS, PHILADELPHIA, PA., REPRESENTING WIRELESS ASSOCIATION OF PENNSYLVANIA; MISSISSIPPI VALLEY WIRELESS ASSOCIATION; COLORADO WIRELESS ASSOCIATION; ST. MARTIN'S COLLEGE, LACEY, WASHINGTON; AND AMATEURS OF THIRTEENTH NAVAL DISTRICT, PUGET SOUND.

Mr. CHAMBERS. My name is Frank B. Chambers; residence, 2046 R Street, Philadelphia, Pa.

I am an electrical engineer, and also a radio engineer.

I have owned and maintained a radio laboratory, and I am deeply interested in the progress of the art. I come in contact with a lot of boys, because I make a lot of pieces of apparatus and parts of apparatus for boys. A lot of boys make their own apparatus as far as they can go, but they have not the machinery to make them all; sometimes there are little things that they can not make. I myself have no big machinery; most of my machinery is operated by hand, but it answers the purpose.

If one went into a large field of manufacturing, of course my machinery would not do it.

But I have watched the boys since 1905. I got taken up with this wireless proposition about that time, and I was doing pretty well in the commercial field as an electrical engineer, and I have had a very broad training. I have worked for telegraph, telephone, electric-light, and overhead street railway companies; and, of course, after my education on the electrical end of it I am better qualified to speak of it.

Of course, for a long while I had very humble positions; but my later years, before I got deeply interested in the wireless—I have held positions as foreman, superintendent, and wire chief. I happen to be assistant wire chief of one the largest telephone exchanges in Philadelphia. So that I can look at this thing from a very broad angle. Probably if I had not got interested in the wireless, but had stuck to the other end of it, I might have been worth a good deal of money to-day. But I have done a great deal of work and have not made much money; and if I did not have some other means of income, my wife might have to go out to work. However, we have managed for her not to do that, although, of course, if it was necessary she would do it. And I will tell you some of these men have been after information, and I find that they want an humble explanation; they do not want a deep, technical explanation; they want to be able to understand it. I can give you some little illustration to explain how the wireless situation looks to the amateur. This you can understand; anybody can. Take it out on the farm. A lot of you gentlemen were probably raised on the farm. I say I can always tell a man who was, even though he has a city polish on him;

it shines through. He is supposed to be a man that usually talks too loud and says too much; that is the way you can tell he was raised on a farm. The city fellow hides behind some place and whispers.

You know what a chicken is—a hen. You have seen him run around the barnyard. The hen roosts in trees at night—out on a limb.

And then you know the screech owl. A screech owl is a little bird, about this big [indicating]. He roosts on that same limb of the tree that the chicken is on. A screech owl is a wise bird and is not going up against that chicken about that high [indicating], because that chicken would club the head off of that screech owl. And there they are on that limb together, the chicken and the screech owl. And the screech owl waits until night, when the chicken becomes sleepy and bewildered. And the screech owl sees the chicken sitting on the limb, and he says, "I can not lick this chicken; I have got to have some system in order to beat this chicken."

And the chicken does not fear the screech owl because he sees the screech owl is so little, and he is not doing anything anyhow; the screech owl has not yet done anything, and so the chicken does not object to his sitting on the limb.

But the screech owl after a while leans up against the chicken like this [indicating]. Well, the chicken is not very comfortable with the screech owl leaning up against her, so she moves farther over on the limb. Then she goes to sleep. She says to herself, "Rather than argue with this fellow I will just move over."

Then when the chicken goes to sleep the screech owl moves over some more. After a bit the chicken says, "Aint that funny; there is that screech owl up against me again; I will just move again." And the chicken moves again; and then when the chicken goes to sleep the screech owl moves over and leans on the chicken again.

And in that way, when the screech owl gets the chicken out on the limb like this [indicating]—it is funny why a chicken which flies so well is yet afraid of falling off a tree. I could never understand that.

But this chicken tries to hang on with her bill and claws to keep from falling on the ground. It would not hurt her a bit to fall, but she does not know that.

Then the screech owl gets her in that position where she is helpless. Then the screech owl gets her on the head—and there is a dead chicken. [Laughter.]

Now, of course, the owl had done nothing to hurt her, and she had no reason to think that the owl would, because the owl had acted so very politely to her when he roosted on the limb. However, the owl put one over on her when she was not looking.

Now, the amateurs are very scared of the Navy for some reason. I do not know why. The Navy has got battleships, and they clean up so good when they undertake a job that it seems that you have not got much chance. When they clean you up once you can not get back.

MR. EDMONDS. You are not trying to tell us that the Navy chases chickens, are you? [Laughter.]

MR. CHAMBERS. No; not like a screech owl. No; I have been looking around Washington to see if anything like that happens, and they do not do it.

Well, anyway, the amateur has had experience with the Department of Commerce, and they have pleased the amateurs so well that

the amateurs do not want to change. You know how you hate to leave your home that has been so pleasant; you are always doubtful whether you are going to like the new one.

Every time anybody has brought a bill up—this particular bill was brought up by the Navy Department; that is, they seem to be the ones that would like to have it put through; and that is true in almost every instance. They have kind of forgotten about the amateur and left him out.

There was a bill before this one that came up, that had the word "amateur" in it. So we thought they had left that in the bill this time; and we were very much pleased with that, and said they had probably changed their attitude of ignoring us.

But then another bill was presented in the place of that, and, of course, we looked for this word "amateur" to be in there; but we did not see it. Of course, we had nothing else to go by, but what we found in the printed bill. And when a thing becomes a law, if it is not in there, you can not say, "I thought they meant that to be in there"; because usually, in courts they do not go by what you think. You dare not think; you must simply have the facts and statements.

So you gentlemen ought not to feel funny because some of these amateurs feel antagonistic, because some of them think that the Navy Department wants to put them out of business.

If those amateurs had been put into this bill, they might not have thought anything about it; but when they saw that the word "amateur" was left out of the bill, they got scared.

I would not like to see this proposed bill go through, even with that proposed amendment, because in the past the amateur, has, without any doubt, showed that he is of some material value—beyond question. We all agree on that point.

The amateur had been think this way: We had always said the amateur would do something for the Government in time of peril; but they never had a chance to demonstrate that. So, when the war came on, we were glad of the opportunity—we were not glad there was a war; but as long as the war had to come anyhow, we were glad of the opportunity. The war went forward, and the amateurs did such wonderful service in the war that they said, "The time has come to recognize that, and we will go down to Washington with a bill of our own, and we will say to the gentlemen there, 'Gentlemen, you gave us a condition in 1912—a condition which all experts agreed was absolutely useless.'" When that bill became a law in 1912, and when the amateurs went away from this city, after having pleaded with Congress not to pass that bill as it was—they walked away with their heads hung low. I, with many others, thought that he had been trapped; we thought that we had been done.

It was not from any scientific point of view that they made that law, resulting in things being brought to such a successful issue as they are at the present time.

When the war was declared, the amateurs were able to help the Government a great deal. But when they got up that law, they provided for a certain portion of territory that, at that time, nobody thought was usable; it was practically considered as thrown away. And the amateurs kicked so hard, and asked to be left in the field, that they said, in order to quiet them a little, "We will give you amateurs this little territory, up to 200 meters."

Well, we did not like that. But finally Congress voted on it and said, in effect, "That is all you are going to get"; and they cut us amateurs down to half a kilowatt within 5 miles of a navy yard, and 1 kilowatt beyond that limit.

At that time our instruments were so poor that with one-half a kilowatt at that time we could hardly talk anyway.

So I thought, and said to myself, "All my efforts have been wasted, and I suppose the amateurs will lose interest in wireless and drop out."

But time went on and the amateur was not that kind of a man; he did not quit. He came forth, under those narrow conditions which the law allowed him—and if you gentlemen only understood the business and knew how narrow and small the channel was that we were allowed, you would wonder why an amateur would want to go into it at all.

We took this little narrow strip that was sliced off for us and developed it. We have done something, while the rest of them did not pay much attention to us. Generally, a fellow would say, "It is a little amateur up there and he does not do anything." But while the rest of them were not paying any attention, the amateur was working to develop that, because he could not do any better, and he went and developed conditions, by which he raised that condition of that little strip up to a better standard than the strip was at the time the bill was passed before; there is no doubt about that. We were useful in that respect. We proved that we could do something; the war has proven that.

We felt like a man that was handed three measures of meal; we did not take this little wave length and hide it; we took this little wave length and increased it.

And so when we came down here and found that you had another bill before you we could say, "Gentlemen, we have doubled what you gave us; can you not grant us a little bit more?" That is what we were going to ask. But instead of finding a bill broadening our territory, we found that they had squeezed it up by this new bill.

Now, the amateur is a funny person. You might think that you can catch him off his guard, like the screech owl caught the chicken. Not so.

The amateurs wanted more wave length. They got more wave length; but they squeezed the amateurs down on their power. That is not what he wants. He would prefer leaving the wave length as it is, and leaving the power as it is; he would be better off under that condition.

Because, I will admit, that with the present conditions we do not know how to take a 1 kilowatt and get it in a 200-meter aerial and use it to its full efficiency; we do not know how to do that.

But if you leave it that way there is something to work for, and we will try to do it. And who can tell? Somebody will probably find a way to do it, and we may come to you later on and say, "We did not used to do it, but we can do it now." Whereas if you draw a dead line and say we can not cross that dead line—that we can work to a certain place and then we are done—the interest in the work will stop. You gentlemen must all know that unless you have a shining target in this life, something to advance yourselves to and something

to go and get, you lose interest. When we are satisfied, and find that we have no way of developing ourselves, but have come to a place where we have everything we want, there is nothing more in this world that we desire, and we have reached some positive conclusion—when that occurs we die. That is what we are taught.

Now, we do not care to die. We have not come to that place where we think that we have thoroughly developed this thing, and we do not want you to put a fence up by which we can not go any further.

Why not leave it the way it is, gentlemen, until we can probably say, "We now have filled this little space you have given us. We can now take a kilowatt and put it into a little space, say, 200 meters. Now, we want to expand. Can you kindly give us just a little bit more?" Not a big chunk at a time, but just a little bit more, and then a little bit more later. And as we follow after it, keep giving a little bit more. You would not have to give much at a time.

It would be just like raising a man's wages. If you do not want to pay him \$20 a week at first, when he comes to you, you will scratch your head and say, "Bill, you have been here a long time, and I think I can make ends meet if I pay you a dollar more a week." You can do that with Bill's wages every once in a while, and you can be 10 years in raising that fellow's wages from \$10 to \$20 a week. And he will say, "I never had to ask my boss for a raise in my life." He will keep working.

But if you give him the whole \$10 raise all at once, he will say, "I am getting about as much as anybody in this business, and I do not believe they will ever give me any more." He might lose interest in his work.

Mr. SAUNDERS. Let me ask you, in that connection, this question: Do you mean a little more in wave length or a little more in power?

Mr. CHAMBERS. Yes, sir; I would not say right now give him more power, because, under the narrow conditions of wave length, he can not use any more at this time.

Mr. SAUNDERS. You want the amateurs given more wave length at present, do you?

Mr. CHAMBERS. Yes, sir.

Mr. SAUNDERS. What would you fix as the maximum wave length they should be allowed?

Mr. CHAMBERS. I will tell you that a very embarrassing thing stands in the way. We are facing a condition where we are going to run into an international convention which has set conditions, but probably the men that made those conditions realized that the time would come when the art would develop far enough when they would change those conditions. I do not doubt that a bit.

Mr. SAUNDERS. Well, let us be definite. We do not know just what you mean by "a little bit more." You have got a limit of 200 meters, we will say. Do you mean by that that 250 meters would give you more latitude?

Mr. CHAMBERS. Yes; if you gave us the power, but giving us a long wave length without the power would not benefit us.

Mr. SAUNDERS. Well, suppose we leave the power as it is and give you 250 meters in wave length, would that give you an additional field—would that give you a better field than the 200 meters?

Mr. CHAMBERS. Yes; then we could start and develop a little further. I will tell you men, if you only knew the art as it goes—you

do not have to legislate to cut a man to half a kilowatt; you have got it done; only you did not know you had done it. It was probably a little piece of luck on your part; and we were so discouraged, because we had to take such a little wave length that we forgot all about it and went home crying.

But we come to the point where we can improve and improve; and then we come to the point where we have to stop on account of the wave length. Now, you have got the wave length fixed at 200 meters; and I have this big kilowatt; but I come up to where I am using all of it, and the first thing I know I have overstepped my wave lengths, and I will come back. To get back, I have got to take off my condenser, and shorten up my circuit to get down to 200 meters. And what is the consequence? I have to sacrifice power; and therefore, when I have taken out inductance and power to get down to 200 meters, I am back to one-half kilowatt. You see, you are in a position where you can use 10 kilowatts if you want to stick to 200 meters. We would not have any more power than we had under the act of 1912; the power that comes out is a certain amount; and we have to have a certain wave in order to use it. So this wave length is governed by a thing called a "condenser"; and a few turns of wire are connected together, and the wave length is derived from the square root of the products of those things.

So that it would be just as reasonable for you to say to me. "There are 10 quarts of milk over there. You can have it all, provided you can carry it at one time in a quart measure." You have given me the milk, but there is a condition attached to it; you have said, "You must go after it and carry it with a quart bucket; you can have it if you can get it in a quart bucket."

Well, if I did not know about that, that you could not get it in a quart bucket, I might go and look at the milk and look at the bucket; and I would say, "How am I going to get that in the bucket?" Suppose I should pour it out anyhow in order to be spiteful; suppose I should pour out that whole 10 quarts of milk in this bucket just to spite you. That does not do me any good; for when the bucket gets full, the remaining 9 quarts will run on the ground and be lost. I would be doing that simply for spite. It would be like the fellow that walked over the railroad track because he had a grievance against the Pennsylvania Railroad. He had bought a return ticket, and the next day I saw him and he was walking back. I asked him, "Why do you walk back? Did you not have a return ticket?" He said to me, "Yes; I have a return ticket, but I am getting square with the railroad; to get square with the railroad I am walking back." He was spiting nobody but himself.

I might use a little slang once in a while, but excuse me, I do not mean to be personal. You gentlemen have misled the amateurs with a law that you have already got, that is just as tight, just as firm, and just as strong in your grip as you can get it.

But one thing I do not understand is how the Navy handed us this. Because, maybe, they figure like this: 2 and 2 are 4, and 2 and 2 are 22. You know that. But there is another way:

Naught is naught and 2 is a figger,
All for me and none for the nigger.

That is the way some people might figure. But this is six and half a dozen. They say to us, "Fellows, we are going to give you 250

meters." We say, "Hurrah!" But down further on we find the power is cut down.

Mr. SAUNDERS. In that connection let me ask you in respect to the range of your sending or transmission, do you send farther with 1 kilowatt and a wave length of 200 meters, or with half of a kilowatt and a wave length of 250 meters?

Mr. CHAMBERS. Well, I tell you, as far as that goes, technically you might prove that one might be better than the other; but it would be so close that I do not think there would be much argument, because a man could, with his own kilowatt and 200 meters, he can get equal to a half kilowatt of power. A half kilowatt of power under certain conditions will send so far and no farther. And under this amendment they extend your wave length a little and cut down your power, and I do not see that there is much difference, only this way it shuts out any chance of your broadening yourselves.

Mr. SAUNDERS. Under the conditions as I have suggested do you say that the results would be practically the same?

Mr. CHAMBERS. The only thing is that under this amendment the amateur can not expand; this puts a dead line, and he will have to stay where this amendment puts him; whereas the other way there is always a possibility of his expanding, of making the messages go farther, with a given amount of power, whereas this [indicating paper in witness's hand] prohibits that.

Mr. SAUNDERS. You are referring now to these suggested amendments?

Mr. CHAMBERS. Yes; I say that I can not see that they have given anything by it. I can not see that.

Mr. SAUNDERS. Now, have you any amendment in mind to this proposed amendment? If you have one, where would it come in?

Mr. CHAMBERS. Do you mean that you want me to make a suggestion of what I think?

Mr. SAUNDERS. Yes.

Mr. CHAMBERS. Well, I am liable to ask for more power in this bill.

Mr. SAUNDERS. Suppose you did ask for more power; what would you ask for?

Mr. CHAMBERS. Not any more than we used in the past.

Mr. SAUNDERS. What is that?

Mr. CHAMBERS. They allowed us to use half a kilowatt within 5 miles of a Government radio station, and if we were beyond 5 miles they permitted us to use a kilowatt. A kilowatt is a little over 1 horsepower; it is about a horsepower and a third.

Mr. SAUNDERS. If you were within 5 miles of a Government station—

Mr. CHAMBERS. If we were outside of that 5-mile limit—and that means nautical miles—they allowed us to use 1 kilowatt to 200 meters.

Mr. SAUNDERS. Is that satisfactory to you?

Mr. CHAMBERS. We were trying to accomplish what we could accomplish with that.

Mr. GREENE. I want to ask a question.

The CHAIRMAN. All right.

Mr. CHAMBERS. If you gentlemen want to adjourn now, I can come on again to-morrow.

The CHAIRMAN. Well, we want to get through to-night; of course, you understand our time is very limited.

Mr. CHAMBERS. Yes, I know; but I understand that you wanted information, and if I can give it I will do so. I think some of the men on this committee have been asking questions that have not been fairly answered. The gentleman on my right [indicating Mr. Humphreys] asked a question that has not been fairly answered; you [indicating Mr. Humphreys] asked a question that I do not think you got the answer to that you wanted.

Mr. HUMPHREYS. Suppose you give me the answer that you think I wanted. I do not know what question you refer to.

Mr. CHAMBERS. You got into a long discussion, and there was considerable confusion, if I may call it that, and I do not believe that either you or the witness understood when you got through what either one of you wanted.

Mr. HUMPHREYS. Well, suppose you illuminate the situation. [Laughter.]

Mr. CHAMBERS. Well, I will do that, and I do not consider that I am taking your valuable time for nothing. I am here as a servant to help you out. You wanted to know why Dr. Christian objected to that word "receiving" and not to Government stations.

Mr. HUMPHREYS. You did understand what I wanted, did you?

Mr. CHAMBERS. I think I understood what you wanted.

Mr. HUMPHREYS. And you think the rest of them did not, and you think I did not?

Mr. CHAMBERS. It did not appear to me that you did, and I do not think you were satisfied with the answer that you got.

Mr. HUMPHREYS. I did not get any answer. But you understand it now, and you have guessed right.

Mr. CHAMBERS. Now, with that word in here [indicating amendment] the result is that if they wanted to enforce it, so that nobody could have over a quarter of a kilowatt, regardless of where he was in the United States, if they wanted to fix it that way. We amateurs have not only been cut from the kilowatt to one-half a kilowatt, but we have been cut clean down to one-quarter everywhere. Do you see what I mean? That is, not particularly because an amateur was near this station or that station or another station; but if they made these stations thick enough or close enough together—they would draw a 10-mile mark around them and say, "Beyond these marks you can have a half kilowatt." But if they draw these circles thick enough they would touch, and there would be no place left in between; so that eventually this bill would say, and the way this thing is drawn, "A quarter of a kilowatt is the highest you can have." It would not make any difference to this young amateur whether he was near the post office or near the Government station. That was not it. But if they would list these post-office stations with the Government stations the country could become so thick that the amateur would be legislated down to one-quarter of a kilowatt.

Mr. HUMPHREYS. Do you want a longer wave length?

Mr. CHAMBERS. Well, the Navy has shown here that, as they have abandoned the 300 meters—the Navy has shown that they would like to have from 0 to 150 meters, we can not kick about that; we have no good way to use that.

Mr. HUMPHREYS. Do you want a longer wave length? That question is plain; will you please answer it?

Mr. CHAMBERS. If it would not interfere with anybody we would like to have it. And if they do not want to use it, why not give it to us?

Mr. HUMPHREYS. Well, are you satisfied with the present wave length?

Mr. CHAMBERS. Yes; if you leave the power where it is; in the present law we have something to work for.

Mr. HUMPHREYS. Let me see if I understand this; you are going to make this perfectly clear, as I understand it.

Mr. CHAMBERS. Yes.

Mr. HUMPHREYS. Do you want this bill amended so as to give the amateurs a longer wave length? That is a question that can be easily answered.

Mr. CHAMBERS. Yes.

Mr. HUMPHREYS. You want that, do you?

Mr. CHAMBERS. Provided we do not have to sacrifice power.

Mr. HUMPHREYS. I understand; but you want a longer wave length, do you?

Mr. CHAMBERS. Yes; that would open the door for a little wider expansion.

Mr. HUMPHREYS. If you can not get the longer wave length, would you still like to have the same power that you have now?

Mr. CHAMBERS. Yes.

Mr. HUMPHREYS. Is that for the purpose of pouring the milk on the floor, to use the illustration which you have given?

Mr. CHAMBERS. No, sir.

Mr. HUMPHREYS. Well, you are still limited, according to your illustration, to the one-quarter of a kilowatt?

Mr. CHAMBERS. Well, I said when we first got the 200 meters that we could not use it to one-half of a kilowatt, but we have found the way to do it now; and it may be possible, in one or two years we may find some way to get that 1 kilowatt in that same space. If we can improve the sending apparatus we can do it. Now, we may miss it, but there is some possibility of us doing it. And if you leave that condition open we will work for it and try for it, and if we do not succeed there is no great harm done; we will be the losers, because we have been wasting good, valuable energy.

Mr. HUMPHREYS. Now, I think I understand perfectly clearly why those other witnesses said they could operate within 5 miles of a naval or military station, but could not operate within the same limits of a Government station; you have answered that, have you not?

Mr. CHAMBERS. They would not interfere with each other.

Mr. HUMPHREYS. That is the question you were going to make clear. I just want to know whether, in your opinion, you have made it clear?

Mr. CHAMBERS. Yes. If not, I will try again.

Mr. HUMPHREYS. I am entirely satisfied.

Mr. GREENE. As I understand you, you are better satisfied with the law as it is than you would be to have it changed?

Mr. CHAMBERS. Yes.

Mr. GREENE. And under the Department of Commerce, as it is, you are better satisfied than to have that changed?

Mr. CHAMBERS. Yes, sir; I would prefer to leave it alone.

Mr. GREENE. That is what I understood.

Mr. CHAMBERS. Because we did not ask for anything; the amateurs did not ask for anything; we did not bring this bill in.

The CHAIRMAN. Well, we have had your views now.

Mr. CHAMBERS. If you leave it the way it is until the rest of the boys come home, the great number of them, we can then all take part in this discussion, and I do not see why we could not come to a better conclusion than we can now.

The CHAIRMAN. You have given us your views now, Mr. Chambers.

Mr. SAUNDERS. With respect to the development of the art itself, have the experimenters in the Naval Service contributed largely to that development, either in original discovery, or in the perfection of instruments.

Mr. CHAMBERS. I think that most of the development up to the present time has been started by amateurs. Of course, a lot of things started by the amateurs were taken up by men further advanced in the art, to bring them to a commercial condition. Usually, the amateur does not bring it to a commercial condition, but he gives the higher skilled inventor the inspiration, in most cases.

If you read over the inventions from 1835—that was when the first wireless invention came out; some people are not aware that it dates back that far; however, it does. From that time all the way up to the present, you will find that all the development—that is, all the inventions—were made by men in public life; you will not find any anywhere made by other people; or if they are, they are not in the records; if there were, they were selfish and kept it to themselves. There is not in any public print that I can find any record of it.

Therefore we think that there have not been any inventions made by anybody inside of the Government service.

I remember that Marconi was an amateur when he discovered this thing; and you will find that many men are now in the Government service, as commissioned officers; and the discoveries that they claimed were made while they were amateurs; and I think that the amateur is the source of supply for inventors, for operators, and for professionals; and it is just like the good way to cure mosquitoes is to fill up the swamp where they breed. If you do anything that will stop the amateur, you will stop the progress of invention.

I ought not to dwell on the commercial side; but let me say that you gentlemen ought to leave it so that when the amateur gets proficient, he will have somebody to go to to get a job.

Mr. GREENE. Mr. Chairman, will you have the testimony in rebuttal?

The CHAIRMAN. No; we are not yet through with the opposition to the bill, I believe.

Mr. GREENE. Well, there is one matter that I would like to have borne in mind, which Commander Hooper said he would bring to the attention of Capt. Todd, and that is as to the question of the jewelers getting their time by wireless; I understand that the jewelers have not been able to get it since the war broke out; and Commander Hooper told me, as I understood, that Capt. Todd was going to arrange that matter. I make this statement so that the matter will not be overlooked when the representatives of the Navy appear before the committee.

(Thereupon, at 5 o'clock p. m., the committee adjourned until Thursday, December 19, 1918, at 10 o'clock a. m.)

COMMITTEE ON THE MERCHANT MARINE AND FISHERIES,
HOUSE OF REPRESENTATIVES,
Thursday, December 19, 1918.

The committee met at 10 o'clock a. m., Hon. Joshua W. Alexander (chairman) presiding.

The CHAIRMAN. We will now hear Mr. Davis.

STATEMENT OF GEORGE S. DAVIS, GENERAL MANAGER RADIO TELEGRAPH DEPARTMENT, UNITED FRUIT CO.

Mr. DAVIS. Although we were not among the larger companies mentioned by Commander Hooper as having contributed to the work of the Navy Department during the war, we are nevertheless a highly important factor in the development and maintenance of the radio business between the United States and Central and South America. Aside from the radio installations installed in our fleet of ships, we have shore stations in Louisiana and in the following countries of Central and South America: Colombia, Panama, Costa Rica, Nicaragua, Honduras, and Swan Island.

These stations, together with our ships, comprise the system of the United Fruit Co. radio stations, which system has been developed as an adjunct to its commercial interests in the United States and Central and South America, and it is this system which, if this bill is passed and the policy of the Navy as expressed by the Secretary of the Navy in his testimony is carried out, will be utterly destroyed and the efficiency of our great organization—an organization employing 35,000 persons—as a medium of furthering American commerce will have been impaired.

Next to the Marconi Co., the United Fruit Co. is probably more heavily interested financially in radio than any other American corporation.

The political and economic effect which the passage of this bill and the carrying out of the Navy Department's policy will have in Central America are so serious that we request an executive session of this committee to hear them. I wish to add, however, that some years ago, when the United Fruit Co. undertook the development of the banana and sugar industries and the general commerce of Central America and the West Indies, the lack of efficient means of communication was one of the greatest handicaps. At that time, and up until some nine or ten years ago, we were dependent for our communications upon the Government-owned telegraphs of those countries which, being so unreliable and inadequate to give the service demanded, literally forced us to install our own telegraphs and telephones in those countries and also to establish a system of radio stations, connecting with the United States, which would insure communication at all times.

This system of stations was just as necessary, and is to-day just as necessary, not only to our own business, but to American business in general, as is the United Fruit Co.'s continued establishment and maintenance of hospitals, schools, churches, sewerage, and water works, piers, wharves, railways and beacon lights, in the countries of Central America. In fact, our organization has been built up around our ability to communicate quickly between any of the Cen-

tral American countries and the United States and with our ships at sea, and the fact that the principal commodity handled between Central America and the United States is of a perishable nature makes it all the more important that we have the moral and physical control of all means of radio communication having to do with the handling of these ships and cargoes.

In considering our radio system it must, therefore, be taken as a whole and not as individual units, and, as I testified before this committee two years ago, if we lose control of the United States terminal of this system it impairs the efficiency of the entire system, and if the control is lost through the passage of legislation such as is proposed, the effect might easily be so far-reaching as to absolutely destroy the entire system, a system built up only after years of effort and the expenditure of great sums in the furtherance of American commerce.

The Navy Department state that if this bill is passed they will urge the governments of Central America to take similar steps; that is to say, urge those governments to take over our stations and operate them as part of an inadequate and inefficient system, and thus defeat the very purpose for which the installations were made. The Navy Department does not undertake to say where these countries are going to get the funds to take over our stations, or to erect new ones. Perhaps it is the intention to supply them with the stations the same as was done in the case of Panama. In any event, not all of the governments of Central America have such enormous funds at their command that they can, overnight, spend \$200,000 or \$300,000 in erecting a single wireless station, and even though it might be possible for some of them to erect such stations, their operations, if carried on under the same principle that some of their Government-owned land wires are, would be entirely useless for commercial purposes.

The Guatemalan Government station at Guatemala City is an example. The operation of this station by the Guatemalan Government has never been a success, and during the Guatemalan earthquakes and since the Government of Guatemala has been almost entirely dependent upon the facilities of the Fruit Co.'s radio system for their radio communication. In fact, it was through the Fruit Co.'s system that all communication was held with Guatemala during the period the cables were interrupted by earthquakes.

During the war, and especially since this country became actively engaged therein, our Government has been forced by the exacting requirements and need of prompt and energetic action, regardless of cost, to depart widely from its fundamental principles in domestic affairs. In various ways there has been a greater centralization of power set up to meet war conditions than was ever thought possible in the United States, and the greatest interest in this country at the present time, apart from the establishment of a stable peace agreement between nations, is in getting the United States back to normal democracy in its Government and restoring freedom of private enterprise in establishing and directing its industries and its trade.

The proposed bill, H. R. 13159, is against this interest, and if passed will set up a complete Government monopoly of the radiotelegraph business in the United States and its possessions, and thus

perpetuate an emergency measure adopted solely to meet war conditions and warranted by war conditions.

We have just fought a great war to make the world safe for democracy, but if legislation such as this is to be an outcome of the war, the United States will have been made unsafe for business. It would be decidedly unsafe for business to go on expanding or even to continue if a firm stand is not taken against measures such as this, which kill individual effort and initiative.

The business men of the country are being urged to expand American trade and enterprise in all directions, but even at this time we have certain departments of the Government endeavoring to seize the principal mediums of communication, without which there can be no expansion in trade, and thrust Government ownership on this country against the wishes and interest of the public.

It is un-American. It is following the principle of autocracy rather than of democracy to encourage legislation which would permit any department of the Government to extend its powers by seizing business enterprises which have reached their high state of efficiency by the individual initiative and tireless work of the man power of the country. I maintain that peace should bring certainty to every form of legitimate enterprise as a practical application of our right to life, liberty, and the pursuit of happiness rather than uncertainty under Government ownership.

Under this bill the power of the Secretary of the Navy would be almost unlimited in radio matters, and that part of the general public depending upon radio as a means of communication, either with ships at sea or with foreign countries, would be subject to his slightest whim. And it is conceivable that the perpetual censorship which Government ownership of means of communication would necessarily involve would be a source of great concern and annoyance to those using any medium of communication under Government ownership.

Admitting that the present administration of the Navy Department is the most efficient in the world, it does not follow that subsequent administrations would be equally as efficient and would not exercise in a tyrannical manner the powers given it in this bill. There is not a single provision in this bill to protect the general public from the abuses which, as has been demonstrated, particularly in Germany, always follow Government ownership; on the contrary, it empowers the Secretary of the Navy to administer the radio business of the country under whatever regulations he sees fit, even to censor communication in time of peace, if he so desires, and in effect gives him control of interstate and intrastate as well as international communication without restraint. It gives to him the power to close stations in any State in the Union, regardless of the public or economic demand for the continuance of such stations, and it is left not to public demand nor the demands of business, but to the Secretary of the Navy, to decide whether the United States may take full advantage of the commercial possibilities afforded through the development of radio communication.

Suppose that Congress does put the radio business of the United States into the hands of the Navy Department, could the Navy Department develop the commercial possibilities of radio? They haven't the commercial connections or facilities in foreign countries

to compete with foreign-owned stations, and if they had the complications sure to ensue should a department of the United States Government openly enter into competition with private interests under foreign Governments would open the door to international difficulty which might have serious consequences.

Aside from not being able to maintain a commercial organization in a foreign country, the Government has not such a permanent organization at home as is necessary to build up and take care of commercial business. The naval officers who would be in charge of various districts in the United States would continually be shifted from shore to ship and vice versa and the personnel, whose term of enlistment is four years, is an everchanging one. It is therefore perfectly obvious that it is impossible for the Navy to maintain an organization which would approach a private organization in efficiency. There would arise in this connection the question of everchanging policies in the different attitudes of various administrations toward the subject, and there is also the commercial development of inland radio.

The passage of this bill would mean that if some community of farmers or fishermen or anyone else in, say, Mississippi, Virginia, Louisiana, or Texas wanted to secure a means of communication from some isolated place and it was either too expensive or was impracticable to put in a telegraph or telephone, the privilege of installing radio would be denied them.

Prior to the war great strides were being made in the development of radio to and from moving trains. Several railroads had established stations and were conducting experiments in an endeavor to perfect this communication. Under this bill it would be unlawful to establish these stations permanently. It would be unlawful to establish a large station in the vicinity of New York and in the vicinity of San Francisco to be used for the purpose of wireless telephony, even though by the installation and operation of this station in connection with the land telephone it would materially reduce telephone charges between New York and San Francisco and other points and even though no interference would result. In short, this bill would curtail private enterprise to such an extent that it would be unremunerative for inventors and scientists to devote any considerable time to further development of the art.

The proponents of this bill contend that there is a demand for Government ownership of radio. Who is making this demand? Certainly not the general public. The steamship companies are not and neither are the radio companies. There is no demand for it by any responsible public body. On the contrary, public opinion is setting itself against Government ownership. Former Supreme Court Justice Charles Evans Hughes, speaking before the Institute of Arts and Sciences, discussing conditions following the war, asserted that "Government enterprise tends constantly to inefficiency." He characterizes as "enemies of liberty"—

All those whose interests lie simply in extending the activities of Government so as to embrace all industry. It can not fail to be observed that even in connection with the war, despite the endeavor and patriotic impulse of countless workers, inefficiency in important fields of activity has been notorious. The notion that the conduct of business by Government tends to be efficient is a superstition cherished by those who either know nothing of Government or

who know nothing of business. The instinct of the American people, I believe, can be trusted to thwart the insidious plans of these enemies of liberty who, if given their way, would not stop short of a tyranny which, whatever name it might bear, would leave little room for preference as compared with Prussianism.

In a speech before the United States Chamber of Commerce at their ninth annual dinner on December 5, Charles H. Schwab said—

Our great fleet of cargo carriers will not be developed to the extent that it should be developed and will not be in a position to compete for the business of the world as it should unless it is privately owned. Private capital and private ownership will alone develop it.

Other public men have expressed themselves in a similar manner. Mr. Schwab also said in his address before the chamber of commerce at Atlantic City on December 4—

The real development of any great enterprise depends on the individual enterprise of the American business man. I do not believe we will ever get the full economical development of any great branch of American industry that is not developed under private enterprise and by private capital.

Expressions such as these coming from men who have been so closely identified with Government ownership and operation during the past 18 months are very significant. There is only one conclusion, and that is that these men who have had greater opportunities to study the practicability of Government ownership and operation have concluded that such ownership and operation is not only undemocratic, but inefficient and is an unsafe policy for this country.

The proponents of this bill argue that Government ownership of radio is necessary in upbuilding the American merchant marine. It is true that radio is a valuable adjunct to the merchant marine, but when we have such men as Charles M. Schwab warning us that unless the merchant marine and its facilities and adjuncts are privately owned they can not be developed, it is time to take some definite and decisive action which will defeat any attempt on the part of any governmental department to set up a Government monopoly of such an important part of our merchant marine business as the radio. It is true that this particular bill does not prevent private interests from owning and operating radio apparatus on board steamships, but it does prohibit private interests from owning and operating stations on shore, which are the terminals for the radio communications from ships, and if we are to have Government ownership of these terminal facilities we might as well have Government ownership of all steamships, railroads, or telegraph lines, or any other business requiring terminal facilities.

The leading editorial in the Detroit Free Press for November 27, 1918, is entitled "And Now the Radio Companies." It says:

A statement prepared by the Navy Department tells "Why the Government regards it as necessary for the Navy to operate or control radio stations in this country." We will not attempt to refer to all the reasons offered by the Navy spokesman; none of these is especially convincing. One of them, however, is quite interesting. This is a contention that, except in very special circumstances, private radio companies have failed to make adequate financial return, but that in most cases no profit has been made except through the sale of stock. The business experts of the Navy Department state that this is because a complete monopoly is necessary. The country also is given the astonishing information that the transoceanic telegraphy is not a serious competitor of the cable. So, in a considerate, paternalistic mood, the Government has decided to save

private capital from hopelessly profitless enterprise by eliminating opportunity to engage in it. It seems pertinent in this connection to note that none of the State socialism schemes now being urged is the result of any demand by the people of the country. They are all distinctly administration urged; they are being imposed on the Nation.

In his annual report Postmaster General Burleson again asks for Government ownership of the telegraphs and declares that the principle of Government ownership has proved a success under his direction. No convincing proof of this alleged success is furnished. The telegraph business is now a Government monopoly. Individual initiative, competition, and pride of service is in the background, and like all Government monopolies the tendency is not toward efficiency but toward inefficiency and waste. In fact, Capt. Lipsner gave waste and inefficiency in the aereo mail service as the reason for his resigning from the superintendency of the air mail service, saying that he could not be party to wasting the taxpayers' money in carrying out the ideas of the Postmaster General.

Now, are you going to permit the passage of this bill, which would set up a Government monopoly of the radio business, knowing full well that it, too, will sooner or later resolve into an autocratic service and lend itself to uneconomic expenditures and perhaps waste of public funds? The Postoffice Department is for Government ownership of all telegraph business, but it is not in favor of that ownership, or any part of it, being vested in the Navy Department. If this bill were passed the Post Office Department would doubtless endeavor within a short time to have the control vested in them rather than in the Navy.

During the past year I have watched very carefully for any demand on the part of the general public for Government ownership of radio, but, aside from a demand made by the Radio Division of the Navy Department and of course the Post Office Department, there has not been, so far as I have been able to ascertain, the slightest demand for Government ownership. Not even the labor unions are in favor of Government ownership of radio. They realize that if such ownership is vested in the Navy Department it will mean that the stations will be manned by naval radio operators receiving from \$30 to \$70 or \$80 per month, whereas under private control the operators will receive from \$75 per month upward, mostly upward.

As has been stated on numerous occasions before this committee, Government ownership has been tried in various countries of Europe and has been found wanting. It was to America that Marconi brought his invention, and it is in America that the development of that invention has attained the highest perfection—a perfection which even Marconi himself seemed to realize could not be obtained in Europe. The telephone, the telegraph, the railways, in fact, all public utilities, have reached a higher state of perfection in this country than in any other. Why? Because, as Schwab says, "The real development of any great enterprise depends upon the individual initiative of the American business man." And if this bill is adopted the blame for stifling this individual initiative in one of the greatest modern developments of science will rest with the proponents of this bill. The greatest development in radio apparatus has come not from any government but from individuals in the employ of commercial radio companies. I refer particularly to the valve or audion type of receivers and sus-

tained wave transmitters, all of which had their inception under private rather than governmental enterprise. The recent discoveries of Mr. Weagant, which all of us confidently hope will go a long ways toward solving the problems of interference and static, is another example of the development by private enterprise rather than by governmental enterprise.

Government ownership of public utilities in Germany had probably reached its highest state of perfection just prior to the outbreak of the war in 1914. They had been developed as Government monopolies for years, with the sole end in view, as we now know, of the expansion of Prussianism throughout the world. Do you suppose that Germany would have dared to embark on such a wild scheme of world domination unless she had first established complete governmental monopolies of all industries which they thought would insure success? The result of years of Government ownership in Germany was to establish an autocracy which, having through these Government monopolies such absolute control of the people, brought about the greatest war in all history. Fortunately for the world, this autocracy was overthrown; but it was no sooner done than our own governmental authorities have bills introduced in Congress which, if passed, would in time tend to set up an autocracy such as the one which we have just overthrown.

This proposed bill for Government ownership of radio is only the beginning. If it passes, I believe that the cables will be next, then the telegraph lines, then the telephone lines, and then spread to other industries until we in this country are as completely dominated as were the people of Germany. I also believe that if this bill, which places control of commercial radio in the hands of the Navy Department, is passed, the Post Office Department will take that control away from the Navy Department in less than five years' time. In fact, the Post Office Department in the hearings on H. R. 19350, on January 11, 1917, stated that while they favored Government ownership of radio they did not favor such ownership being exercised through the Navy Department, but felt that it should be exercised, and ultimately would be exercised, through the Post Office Department.

As further evidence of the complete failure of Government ownership of public utilities, one needs only to refer to the book by the great French publicist, Yves Guyot, "Where and Why Public Ownership Has Failed." Guyot as vice president of the Municipal Council of Paris, Deputy to the French Parliament, minister of public works for four years, and president of the Political Economy Society of Paris, was in a most excellent position to study and compare Government ownership with private ownership over a period of years, and he says:

1. Public monopolies kill the spirit of initiative by destroying competition. The ultimate result is fatal industrial lethargy.
2. Public operation emphasizes the special demands of the community rather than fundamental necessities, and provides opportunities for graft and corruption.
3. Operation by States and local governments is more difficult than private management. This is a rule which holds good, despite a few apparent exceptions.
4. Government employees, paid for their loyalty to the public interest, come to consider their position as their own private property, and the more numerous

they are, the more they incline toward exchanging their rôle of subordinates for that of masters; from being directed they become the directors.

5. Intervention of the public power has an adverse influence upon the distribution of wealth; sometimes it is the whole body of taxpayers who must suffer for the sake of some privileged class, sometimes the consumer is defrauded to benefit the taxpayer.

6. Neither Government nor municipal monopolies are novelties; they are antiquies; they are not indicative of evolution but of retrogression. The motive behind public undertakings is often political or administrative influence for their promoters.

7. The propaganda of Government ownership has established more firmly than before the truth of the following industrial laws:

First. Neither States nor municipalities should attempt tasks especially adapted to individual effort.

Second. In the case of those utilities in which the public interest is general there must be a physical and morally responsible body accountable to the public on one hand and the service on the other, and protected by contracts against vacillations of public opinion and the extortionate demands of interested groups.

In drawing these conclusions Guyot is not influenced by theories, but by facts gleaned while he was minister of public works of France—where they have had Government ownership for years—and from travel and study in other countries where Government ownership of public utilities has been established. And yet in spite of our knowledge of the inefficiency of Government ownership in Europe, in spite of the proof of that inefficiency as compared to American commercial efficiency, in spite of the warnings of our own countrymen who have administered both private and governmental ownership and have warned us that it is only under private control that we can hope to maintain efficiency, we have certain departments of our Government urging us to try out in this country a policy which is admittedly a failure wherever it has been tried.

Statements have been made before this committee to the effect that the radio business does not pay, and for that reason commercial companies are glad to turn it over to the Government. I want to assure you that we will be anything but glad to be forced to turn over to the Government our radio business, the result of years of effort and the expenditure of large sums. Commander Hooper was in error when he stated that we favored this bill or previous bills which would destroy such an essential part of our steamship business.

The Navy Department seems to think that it is a matter of little moment to us as long as we receive "just compensation"—and "just compensation" as it can be defined under this bill would not begin to compensate us for the amounts expended in the development of this service, let alone the enormous losses to our business which are bound to ensue through lack of moral control over the operating force. As I read it, "just compensation" under this bill would be the physical value of the properties and the good will. No provision is made for reimbursing companies such as ourselves for amounts expended in the development of the entire system or of the particular unit which would be taken over. The physical value of the station may be \$100,000, but an outlay of \$300,000 may have been made in perfecting the plant to bring it to its present stage of efficiency. Nothing is said in the bill about compensation for this expenditure, but on the contrary all chance of earning even the interest on the entire amount is taken away.

For example, we at New Orleans have two pieces of property, both carried as a wireless investment. The present station is located on one piece and the other is being held pending the installation of a distant control system. There is nothing in this bill which would compensate us for the loss of the second piece of property. Certainly the Navy could not take it over under the terms of this bill, as there is no wireless apparatus located in it at the present time. Even if the bill were passed it would be decidedly unjust to the radio companies who have brought the art to its present stage of efficiency and commercial development merely to take their lands at their physical value and not provide for reimbursement of sums which have gone into the development of the property and which are not evidenced by physical property at the present station.

Among other things the Navy Department are urging the passage of this bill on economic grounds. Where or how they expect to effect economics in operation has not been clearly stated. However, it has been our experience that the operation of merchant vessels and commercial shore stations by the Navy Department is not economical.

When certain of our ships were commandeered and placed in service as transports the Navy Department took over the operation and maintenance of their radio. At the time the ships were turned over to them the radio was in good condition and repair, but within a very short time we began to receive requests to send to the commandant, navy yard, New York, certified checks for amounts varying from \$25 to \$125 to cover the cost of repairs to the radio apparatus. These letters stated that the difference between the amount remitted and the cost of the repairs would be returned to us. When the first of these letters were received we inspected the ships ourselves to ascertain just what these repairs were, and found in each case that they were minor repairs which, under our own system of inspection and repair, could have been made at the expense of a few dollars. Later, after the repairs had been made, some of them by the Navy department, we received bills for \$25 and \$30 to cover repairs which we could ordinarily make with our organization for \$4 or \$5. This is true not only in one case but in nearly each and every case which came to our attention. I do not say this as a criticism of the officials of the Navy Department, but rather of a system which lends itself to such uneconomical ways of doing business.

At our New Orleans station we maintain a night and day watch with four men. When the Navy Department took over the operation of this station I am informed 12 men were assigned there.

So, when we come down to a question of economy in operation, it seems to me there is no question but that the system under which the Navy Department are forced to carry on business is exceedingly uneconomical from a commercial standpoint.

In commercial business the law of supply and demand must govern; in the Navy military considerations must govern; and, if you turn over radio commercial business to the department they, taking, as they must, the military view first, last and always, must do things in a military way rather than in a commercial way, with consequent economic losses.

Another reason given by the proponents of this bill for Government ownership of radio is interference. This question was discussed at great length at the hearings on a similar bill some two years ago, and it was brought out at that time that the stimulus of commercial return would in time overcome this problem. Interference is caused by the sending of messages. Now, the mere fact of Government ownership is not going to reduce the sending of messages unless you also restrict the number of messages to be sent by any one station. The problem is the same to-day in radio as it was in the early days of the telephone—the problem of several messages over one wire, or, in the case of radio, several messages simultaneously through one station. In the case of the telephone science overcame the difficulty and science is overcoming the difficulty in the case of radio. None of the commercial companies that I know of have complained that they were unable to do business on account of interference. The only complaint is from the Navy Department, and certainly if the commercial companies are able to get along under present conditions, handling the volume of business they do without undue interference, the Navy Department should be able to do the same.

Prof. Pupin, who invented the means of preventing interference on the telephone, testified before this committee two years ago that science can and will, if given a chance, completely solve the problem of interference and static in radio.

You have heard Lieut. Cooper testify that in one room in the Navy Department they can send and receive from five stations simultaneously. A comparatively short time ago this was unheard of. The apparatus had not been perfected to a point to permit of it, and how can we foresee that further development will not completely eliminate this interference question? However, if you try to legislate interference out of existence, what will be the use of inventors and scientists spending valuable time on this problem? With interference legislated out of the way the development of the art would be curtailed and the use of radio communication by the public restricted.

Through its purchase of the shore stations of the Marconi Co. it seems to me that the Navy Department have gone a long way to eliminate any interference. Those stations comprise the greatest system of coast stations for ship-to-shore work in the United States, and under existing laws the Navy can open them to commercial business. I understand that in taking over these stations the Navy Department have secured an agreement from the Marconi Co. to the effect that the latter will not reerect commercial shore stations in competition with the Navy. Whether or not this is in violation of the Sherman antitrust law is not for me to say, although if we compare it to the agreement between the American Telephone & Telegraph Co. and the Western Union Co., which the Attorney General prevented being carried out, it looks as if the Marconi-Navy agreement might be in direct violation of the spirit of the Sherman law. In any event it is safe to assume that had two commercial companies entered into any such agreement they would have been in danger of prosecution by the Department of Justice.

Now, in view of the purchase of these stations, and in view of the existing laws which permit the Navy to open them up to commercial

business, where is the need for any further legislation? Why should the Navy seek to prohibit private enterprise from entering this field unless they are afraid of commercial competition? And how are the Navy, who are not a commercial body, and who are not organized along commercial lines, going to keep in touch with the commercial demands. They are trained along military lines and must consider everything from a military standpoint, with the result that commercial business would have to suffer.

What we need more than anything else in radio is a little flexibility in the international convention and in the law. Under the international convention the wave length to be used by all ships is definitely fixed, and this prevents ships taking advantage of the advances in science in the way of utilizing other wave lengths. Any law that is passed now by this Congress is not going to change the rules and regulations of the international convention. We must abide by those rules until the meeting of the next international convention and the formulation of new regulations by that body, and I want to say right here that I hope at the next radio conference the commercial interests in radio can have representation, something which, so far as I have been able to determine, they did not have in the last convention. The delegation from the United States should be large enough so as to include at least one man from a commercial operating company who can present to the convention the commercial side of the questions which will arise.

Section 3 of the bill in effect provides that no station for any purpose except experimental and technical school purposes shall be erected in any State in the Union. It does not say this in so many words, but that would be the effect of this section, as it is a practical impossibility to put up a station, which, with the delicate apparatus we have to-day, can not be heard beyond the limits of the State. This, to my mind, infringes the State's rights. Under this section you could not erect two stations in the interior of a great State like Texas regardless of whether such stations caused interference or not, merely because they might be heard in Oklahoma.

Section 5 of the bill might justly be termed a "camouflaged" section. It gives the Secretary of the Navy almost unheard-of discretionary powers, and where is the man who is going to invest \$25,000 or \$30,000, or more, in erecting a wireless station to be used only for such period as is deemed proper by the Secretary of the Navy? Under this section the Secretary is not even compelled to issue a license. It merely says he "may do so."

This bill might also and probably would be interpreted to cover sound signals transmitted through water or the ground by means of an electrical system. Most of us are aware of the work of Prof. Fessenden in this connection and know that by means of electric oscillators he has been enabled to send messages 50 or 75 miles through water or the ground, and has even telephoned a distance of 15 or 20 miles. but under the terms of this bill that system of communication would become a Government monopoly, and if private interests wanted to install some such system of communication, say between Minneapolis and St. Louis, down the Mississippi River, it would be

impossible for them to do so. They would have to apply to the Navy Department and the Navy Department would have to come to Congress to get an appropriation, and like the telegraph and telephone in early days when it was under the Post Office Department, Congress might naturally balk at spending public money on something so new and hazardous, with the result that communication would not and could not be established.

Under this bill it would be impossible to install stations for public communication between any States in the interior of the country, whether they would cause interference with sea signaling or not, except those stations be manned and operated by the Navy, and I very much doubt whether anyone in the Navy would be competent to judge whether Denver should have radio communication with Topeka, or whether a group of farmers in Missouri should have radio communication with some other group in Wisconsin. In any event, this bill removes all possibility of development along those lines—a development which, if we can judge from other means of communication, is a perfectly logical one.

I am in favor of giving the Navy all the wireless stations and wireless equipment it needs for military purposes and military training, or for anything that will enable it to maintain first place among the navies of the world.

In time of war the Navy can always exercise the same exclusive and effective control over all radio stations that it has just been exercising during the recent emergency, but if this bill is passed and the Navy undertakes the commercial development of radio, you will upset a perfectly good military organization by forcing it to engage in a field far removed from its training and proper sphere of activities, do a gross injustice to private American enterprise already actually engaged in this business, open the way for serious international complications, and artificially hamper and discourage individual initiative and inventive genius of Americans in developing and protecting one of the most important and promising discoveries of mankind.

I just want to add a word here about the London Radio Convention. Under the present convention, the London convention of 1912, two wave lengths were fixed for sea signaling; that is, for what we call general public correspondence. I think the wording of the regulation is that two wave lengths are authorized for general public service between ships at sea and shore, one of 300 meters and one of 600 meters.

Now, there is nothing in this bill, there is nothing this Congress can do, to change that regulation. And as interference is caused by the sending of messages, and as the international convention requires us to send those messages on 600 meters or 300 meters, how can you do anything now to legislate interference out of the way? You must leave it to science, and the London Radio Convention recognized that when it made that law.

Mr. BANKHEAD. Who represented the United States in that international convention?

The CHAIRMAN. I think Capt. Todd was the representative of this country to the London convention which made these regulations.

Mr. DAVIS. I referred to the London Radio Convention. I understand we had an American delegation to the London Radio Convention of 1912.

The CHAIRMAN. I say, I think Capt. Todd was a member of that conference.

Capt. TODD. I should be glad to answer any questions about that.

Mr. DAVIS. On that delegation we had any number of governmental representatives, but as far as I know we did not have a single commercial radio man.

The CHAIRMAN. I do not know that you lost anything by that; I have never heard anybody questioning the wisdom of the regulations.

Mr. DAVIS. I am not questioning the wisdom of the regulations.

The CHAIRMAN. These regulations were primarily, I think, for the ship-to-shore business. I do not know whether they extended beyond that.

Mr. DAVIS. Mr. Chairman, I have always observed that in any convention of such wide scope as the London Radio Convention if America was represented an American business man was there.

The CHAIRMAN. Do you think it would have done any good if you had been there?

Mr. DAVIS. We could probably have aided in the discussion; probably we would have aided it a good deal.

The CHAIRMAN. I do not know anything about that convention. All I wanted to do was to differentiate between that convention and the one on safety of life at sea. You seemed to be under a misapprehension about that. That was the convention in which I was chairman of the American delegation.

Mr. DAVIS. There has been a great deal of discussion before the committee about the monopoly of radio. Mr. Nally said he hoped to obtain 100 per cent. I do not like to tear down a house of cards, but I will assure you or anyone that the United Fruit Co. would have prevented, through the operation of its system, the entire monopolizing of the radio business, and will if this bill is not passed.

Mr. HARDY. And you think the United States is not big enough to prevent a monopoly as to them?

Mr. DAVIS. It is not a question of being big enough; it is a question of the demands of service.

Mr. HARDY. What I am suggesting is that your company is so powerful and strong they are not afraid of being trampled down by a powerful monopoly?

Mr. DAVIS. We were not always powerful; when we went into the radio business we were one of the smallest of the radio companies.

Mr. HARDY. As a matter of fact, a private monopoly can not crush something that is nearly as big as it is, can it?

Mr. DAVIS. I have never heard of it being done; no, sir.

Mr. HARDY. So your company is pretty nearly independent of the effects of a private monopoly?

Mr. DAVIS. Yes; we are independent, except in the sense that we must come to the Marconi Co. or somebody else to secure patent rights. The granting of a patent gives them a monopoly, and no matter how big you are you can not break that down.

Mr. HARDY. You do not maintain as many different stations on each side of the water or as many of them as may be needed, but you are in a measure independent of the Marconi monopoly?

Mr. DAVIS. We are independent of any monopoly.

Mr. HARDY. Exactly; but how many other people are in your position?

Mr. DAVIS. Any number of them, if they want to engage in the business. The Alaskan Steamship Co. did it.

Mr. HARDY. It was said that Mr. Nally's suggestion here the other day was a pipe dream.

Mr. DAVIS. If Mr. Nally or anyone else can show any big company that he can give better service and cheaper service than they can provide for themselves you may rest assured they will take it.

Mr. HARDY. Oh, all the big companies can go out for themselves, but the public generally can not do that. You understand very well that a big, powerful corporation, like the Armours, for instance, can handle a good deal of freight for themselves, and the United States Steel Corporation does not have to submit to exorbitant freight rates. But the public has to submit when competition comes in. You think the remedy against private monopoly is regulation and restriction?

Mr. DAVIS. Yes, sir.

Mr. HARDY. Do you know it has taken at least 12 years—and we have not got it yet—to obtain an interchange of transfers between the two alleged separate street car systems in the city of Washington?

Mr. DAVIS. I have heard so.

Mr. HARDY. We have regulated, but we do not accomplish anything.

Mr. DAVIS. On the other hand, Judge Hardy, we have the Food Administration and the Fuel Administration, who have administered to 100,000,000 people by regulation, and I believe it was pretty successful.

Mr. HARDY. That is one thing in this administration you seem to think is a success, but everything else you think is not?

Mr. DAVIS. No; I have not said that.

Mr. HARDY. You are criticizing the inefficiency of this administration because it has not been economical. Has anything been economical?

Mr. DAVIS. I have not criticized this administration at all. They have been forced by circumstances into enormous expenditures.

The CHAIRMAN. Let us not get so far afield; let us stick to this bill.

Mr. HARDY. I should like to ask some questions along the line on which the gentleman has been speaking. You spoke of one difficulty in the way of a Government-owned service that it could not cooperate with other countries. Is there any reason why the service owned by the Government in this country could not form the same kind of cooperation as a private monopoly could?

Mr. DAVIS. I do not think they could; no.

Mr. HARDY. You think that the naval service here could not make arrangements with other companies just like the Marconi service does?

Mr. DAVIS. They could not make as good arrangements, because they have not the authority nor the personnel to go out and solicit business.

Mr. HARDY. Your judgment, then, is that it is absolutely impossible for a government agency to accomplish anything?

Mr. DAVIS. No; I do not say that.

Mr. HARDY. They could not have the agents to go out and make these arrangements? What I want to know is why the Government can not make the same kind of arrangements, if they own the business in this country, that you could?

Mr. DAVIS. Merely because they are the Government.

Mr. HARDY. Because they are incompetent.

Mr. DAVIS. Not because they are incompetent, but because they are bound down by laws which would not permit a department of the United States Government to go into foreign countries and solicit business from privately owned concerns.

Mr. HARDY. You think, then, the laws would be more liberal toward a private corporation and private monopoly than toward the Government itself?

Mr. DAVIS. I think they would; they always have been.

Mr. HARDY. I just wanted to get your point of view. You said this bill would make inventions unremunerative, because of lack of competitive markets?

Mr. DAVIS. Yes.

Mr. HARDY. Would you not have the same condition if you had a private monopoly?

Mr. DAVIS. Well, but you can not get a private monopoly.

Mr. HARDY. That is a question between you and Mr. Nally. He thinks you can get a private monopoly, and I think, so too, except in the case of some big company like your own; you can run your own business.

But now let me ask you this: You spoke about the Government's operation of this wireless service being inefficient during the war, notwithstanding the patriotic impulse of the public generally to serve. Were not other departments—the railroads, for instance—inefficient before the Government took them over? Were they not suffering from a congestion?

Mr. DAVIS. I know, but it was not the fault of the railroads that they were inefficient.

Mr. HARDY. Oh, you are willing to excuse the railroads under private ownership, but when the Government takes charge you attribute it to Government ownership? Was not everything during this war in a condition of confusion?

Mr. DAVIS. Why perpetuate that confusion in time of peace?

Mr. HARDY. Was not the confusion the result of the conditions of the war? You are laying it to the Government, and it was applicable to private enterprise as well as to the Government, was it not?

Mr. DAVIS. I merely quoted what I did about Government ownership to bring before this committee the fact that wherever Government ownership had been tried it has proven a failure.

Mr. HARDY. But the point I am making is that you are blaming Government ownership with the conditions that existed during the war?

Mr. DAVIS. No; I quoted here from Yves Guyot, and he has shown in his writings that Government ownership in Europe prior to the war has been a failure.

Mr. HARDY. But you can find plenty of other writers who say just the contrary?

Mr. DAVIS. I have never seen any who put up any good argument for it.

Mr. HARDY. Well, of course, you did not appreciate the argument. I have seen quite a number of them that uphold the efficiency of the German railroad ownership, saying that it is economic. You quoted Mr. Schwab as being opposed to Government ownership. Would it not be just as reasonable to expect Mr. Nally there to favor Government ownership? He is the head of a wonderful combination, is he not?

Mr. DAVIS. Mr. Schwab has always been known as a very fair, broad-minded man. He was called upon by President Wilson to come down here and put his brain into this thing.

Mr. HARDY. I want you to understand that I do not attack the honesty or sincerity or patriotism of a man because he believes in his own interests. If I had a great private enterprise I would not want the Government to take it over, either. Mr. Schwab, however, is the head of one of the great combinations that has been dominating the production of all steel projects here for the last several years. Do you expect that kind of a man to favor Government ownership?

Mr. DAVIS. He has had a chance to look at it from an unbiased standpoint.

Mr. HARDY. Now, I want to know why you are not willing to trust the Marconi system with the administration of your wireless, but want to establish your own wireless?

Mr. DAVIS. Because we have tried the Marconi, the De Forest, and the Government, and they have none of them been able to satisfy us when it came down to our own radio communications. We are dealing in a perishable product, and we must have moral control over our operating forces.

The CHAIRMAN. What do you mean by "moral control"?

Mr. DAVIS. The right to dictate to them.

Mr. HARDY. If I understand you rightly, you are not willing to trust the Marconi monopoly, the Government monopoly, or any monopoly?

Mr. DAVIS. No.

Mr. HARDY. You want your business run by your own wireless system?

Mr. DAVIS. Just so long as no one else can improve that wireless system and give us the same service at less cost.

Mr. HARDY. And the minute they did give you a service to suit you at a cost to suit you, you would let them do so?

Mr. DAVIS. Yes.

Mr. HARDY. Now, if you are not willing to allow the Marconi Co. 100 per cent monopoly, but insist upon breaking it up, do you think the naval service of the United States ought to be willing to put themselves in the hands of a monopoly?

Mr. DAVIS. They are not doing that. What the naval service is doing is to make it illegal for us to engage in the radio business.

Mr. HARDY. Are you in favor, then, of the naval service maintaining its own radio system for the naval ships?

Mr. DAVIS. Certainly.

Mr. HARDY. Now, then, there is a question of economy. If the Navy has shore stations all around the United States, on which they must maintain the overhead charges and make infinite expenditures in order to be sure they would not be hindered by a private monopoly, just as you maintained your system, do you not think it would be economic to let that great system of shore stations established, and necessarily established, for the benefit of the Navy be used for commercial business also?

Mr. DAVIS. But in that connection why make it illegal for an American citizen to engage in the same business?

Mr. HARDY. Would it not involve an immense and useless expenditure to have two or three systems, all for the same class of business?

Mr. DAVIS. If there was not enough business for all systems to live and profit, they would go by the board.

Mr. HARDY. Has not the result of all competitive conditions, or a great many of them, been for the big fish to eat up the little fish?

Mr. DAVIS. Not if the little ones were efficient and could hold up their end. Some small fishes have grown to be very large ones.

Mr. HARDY. Has not that been the tendency in all these powerful, all-pervading combinations?

Mr. DAVIS. When the Government, by granting a patent, guarantees a powerful monopoly, then the little fellow has not much chance until that patent expires, but when it does expire he has just as much chance as anyone else.

Mr. HARDY. But the big fellow, by fighting the patentee and holding him in court until he surrenders, can get the advantage of all these patents, can he not?

Mr. DAVIS. That is not always the case.

Mr. HARDY. But nearly always the case?

Mr. DAVIS. No; these inventors can peddle their patents around to the highest bidder.

Mr. HARDY. Yes; but suppose you have got practically only one bidder. You would have a few companies like this that would maintain some wireless stations, but the vast public would depend upon the 100 per cent monopoly.

Mr. DAVIS. Yes.

Mr. HARDY. You say the public monopoly would destroy progress by destroying competition. Can you give a reason why the Government would be less lenient and encouraging toward inventions than a private monopoly would be?

Mr. DAVIS. The Government is handicapped at times through lack of funds. Congress is not always as liberal to the Government as they have been during this war. And they are bound by laws and regulations, which the companies are not required to observe.

Mr. HARDY. It is your judgment that a private monopoly would be more liberal toward this poor inventor than the Government would?

Mr. DAVIS. It is the record of the past 20 years in this country. They have been more liberal.

Mr. HARDY. Do you think anybody else would agree with you that that is the case?

Mr. DAVIS. I think Prof. Pupin will agree with me.

Mr. HARDY. I think you will find some others here that will not.

Mr. DAVIS. I think Prof. Kennelly will. I think Prof. Armstrong would if he were here.

Mr. HARDY. You remarked a minute ago that nobody was in favor of this bill. Did you hear the gentleman who was here one evening, about the time we adjourned, who said he represented the ship interests, and so on?

Mr. DAVIS. I did; yes.

Mr. HARDY. Did he not speak of quite a number of people in favor of this bill?

Mr. DAVIS. He spoke of three steamship companies, I believe.

Mr. HARDY. Three steamship companies?

Mr. DAVIS. Three steamship companies; yes, sir.

Mr. HARDY. Now, do you know anybody that is opposing this bill except the interests who would be interefered with—the Marconi Co., your company, and possibly some manufacturing companies?

Mr. DAVIS. I know of a number of big steamship companies in New York who are opposed to it; I do not know whether they will come before this committee and oppose it, but I know they are opposed to it.

Mr. HARDY. You heard this man the other day give the names of a number of private institutions that were in favor of it?

Mr. DAVIS. I think I could talk to those private institutions for 15 minutes and convince them they were wrong.

Mr. HARDY. Oh, you mean to say they do not understand?

Mr. DAVIS. They are in favor of it because they do not know what they are in favor of.

Mr. HARDY. I suppose everybody that differs with you does not understand this thing. However, I only want the facts. All I want to know is the exact fact, and I would like to hear somebody that is not interested on either side, instead of charging the Government with being biased and prejudiced—

Mr. DAVIS (interposing). I do not charge our Government with being biased.

Mr. HARDY. You have not done so, but others have.

Mr. DAVIS. I have pointed out that under our system of Government we can not have the same efficiency as in commercial life.

Mr. HARDY. As a member of this committee, what I want to get at is the fact, and the great question that I am concerned with now is this: It looks to me like it has got to be either a private monopoly or a Government monopoly, and if it has got to be one or the other it is a question for us to decide.

Mr. DAVIS. If you say it must come to a monopoly, then why do you have to legislate to make it a monopoly? Why do you want to make it illegal for an American citizen to engage in any legitimate business?

Mr. HARDY. That is a fair question, and I want to state to you frankly that my object is not to promote a monopoly if it can be avoided, but believing private monopoly would result in the absence of legislation of this kind, I prefer, with my present light, a Government monopoly to a private monopoly.

Mr. DAVIS. Along that line, as I have said before, we have had the Food Administration and the Fuel Administration, and they have administered the whole country by regulation.

Mr. HARDY. And I want to get out from under that just as quickly as I can.

Mr. DAVIS. It does not make any difference whether you have a naval monopoly, a post-office monopoly, or a commercial monopoly; they must all be regulated by Congress. You can not let anybody run wild.

Mr. HARDY. Do you think it would be a good idea to take the Post Office Department of this Government out from under the control of the Government and lease it by contract to some great monopoly—would you establish a post office in the hands of private ownership?

Mr. DAVIS. I will say this, that the service of the Post Office Department would probably be improved; that postal employees would probably be better paid; that you would have better post-office buildings; and you would receive more courteous treatment if you had a little competition.

Mr. HARDY. Then, as a matter of fact, you think it has been a great error to establish a Post Office Department?

Mr. DAVIS. I do not say it has been a great error to establish a Post Office Department, but it has been a great error to make it illegal for anybody to engage in that business.

The CHAIRMAN. Do you think it is a great error to provide by law that the Government should have the monopoly of the postal business?

Mr. DAVIS. I think the Postal Service would be improved by having a little competition.

The CHAIRMAN. You do not think we ought to permit competition in the Postal Service?

Mr. DAVIS. I think it would put a little "pep" in the Post Office Department.

Mr. EDMONDS. They certainly need it.

The CHAIRMAN. But monopoly is offensive to you per se, is it not?

Mr. DAVIS. I did not say it is offensive.

The CHAIRMAN. You had something to say about autocracy and Prussianism and all that. Now, what company has a monopoly of the fruit business with Central America?

Mr. DAVIS. No one company has it.

The CHAIRMAN. The United Fruit Co. has, has it not?

Mr. DAVIS. We most certainly have not.

The CHAIRMAN. What competition have you?

Mr. DAVIS. We had before the war—

The CHAIRMAN. No; I mean now—or before the war; that will be fair.

Mr. DAVIS. Before the war we had the Hamburg-American Line, the Atlantic Fruit Co., the Vaccoro Bros. We had a dozen competitors.

The CHAIRMAN. How many vessels of the Hamburg-American Line were engaged in the fruit business between Central America and this country?

Mr. DAVIS. I can not state that offhand, but I can state the competition in terms of imports. The United Fruit Co. imports about one-half the bananas brought into this country.

The CHAIRMAN. That is what I wanted to get at.

Mr. DAVIS. The competitors brought in the other half. We go down in Central America and go out into these forests and jungles, build railroads, put up wireless stations, establish communication, build hospitals and schools, put in sewerage, waterworks, and lighting plants, and bring civilization down there. Then we encourage

the natives and others to go out and open up their banana farms, and we take their products on an annual contract, and when the contracts are about to expire a competitor comes in and bids them up, and we come right along and bid against him. You can not have a more healthy condition of competition than that.

The CHAIRMAN. Are your ships common carriers? Are they open to all those who may wish to engage in the fruit business between Central America and the United States, or are they used exclusively for your own business as far as fruit is concerned?

Mr. DAVIS. We do a general business. If we can not fill up a ship—

The CHAIRMAN (interposing). Do any of your competitors in the fruit business get space on your ships?

Mr. DAVIS. Probably if that ship was coming up empty, or only half full, I do not see any reason why they should not. The high seas are free. Our competitors could provide their own ships. You could hardly expect a farmer to harvest his neighbors' grain and leave his own to rot in the field.

The CHAIRMAN. Well, have they done it?

Mr. DAVIS. I can not recall just now. You must bear in mind, Mr. Chairman, that in order to be successful in this fruit business in Central America you must own your own ships. I don't care whether it is a fruit company or anyone else.

The CHAIRMAN. I only want to develop the facts, so we can draw our own conclusions. Now, take your wireless stations. Is it true or not that they are open to general commercial business between this country and Central America?

Mr. DAVIS. We are; wherever we are permitted to open them to public business they are open to public business, and we do handle public business.

The CHAIRMAN. And where you are not permitted to open them for general public business—

Mr. DAVIS. I will go into that later, in executive session.

The CHAIRMAN. If you do not care to mention it now, very well.

Mr. DAVIS. There are certain conditions surrounding it that I do not feel like stating in an open hearing.

The CHAIRMAN. But your ships and wireless stations are a part of your plant, or your business, in developing the fruit trade between Central America and the United States?

Mr. DAVIS. Not fruit trade particularly; in developing American commerce.

The CHAIRMAN. Well, the fruit business is the particular business in which you are engaged?

Mr. DAVIS. It happens to be the biggest business, the biggest part of the business.

The CHAIRMAN. What other business are you engaged in besides the fruit business?

Mr. DAVIS. Sugar, general freight business, the development of railroads in Central America and South America, the development of Central American business in general. We look into all of their resources there and develop them and put them on their feet and bring their products into the United States.

Mr. ROWE. And carry our products there too?

Mr. DAVIS. And we carry American products into Central America, thousands of tons.

Mr. ROWE. How many stations have you down in the Gulf of Mexico and Caribbean Sea?

Mr. DAVIS. Nine.

Mr. ROWE. And do you do a general commercial business with these wireless stations?

Mr. DAVIS. As I say, wherever it has been permitted, wherever we have not been blocked through some governmental agency, we have done it.

Mr. ROWE. Do you do a ship-to-shore business with all the ships in that neighborhood?

Mr. DAVIS. We take care of all ships in the Caribbean Sea. Our wireless is free to all of them.

Mr. ROWE. Even your opponents?

Mr. DAVIS. Even our opponents. We handle our competitors' messages just the same as if they were our own. In fact, I might add that we encourage our competitors to send their messages by our system.

Mr. ROWE. And you must have a station in the United States in order to get into communication with your offices in the different cities of the United States; is not that necessary?

Mr. DAVIS. It is absolutely necessary.

Mr. ROWE. Is that the main reason for maintaining a station at New Orleans?

Mr. DAVIS. That is the sole reason for maintaining a station at New Orleans.

Mr. ROWE. Through that station then you are able to report to your New York office and other offices the movement of your ships?

Mr. DAVIS. Yes, sir.

Mr. ROWE. Does the commercial part of your wireless business pay?

Mr. DAVIS. It has been remunerative; yes, sir; excepting messages from passengers on ships. And at a rate which was less than the cable rate between the United States and Central America we have built up a very nice wireless business, in addition to handling our own business.

Mr. ROWE. You have not told the committee this time about the difficulties that you experience where your stations have been established in the ship-to-shore business, about the currents and so on—about the static.

Mr. DAVIS. Well, two years have gone by. We have not overcome static yet. We still have it, but we are doing better than we did two years ago—much better.

Mr. ROWE. Is it more difficult to handle messages there than it is along the northern Atlantic coast?

Mr. DAVIS. Much more difficult. The belt lying between the Tropic of Cancer and the Equator is a very difficult one for wireless to bridge on account of this static.

Mr. EDMONDS. I am sorry my friend from Texas has left the room. He seems to be obsessed with the idea that there is going to be a 100 per cent monopoly in wireless. That might be true with respect to the high-power stations, might it not?

Mr. DAVIS. As long as the Marconi Co. gives the best service in the world and the cheapest service in the world, perhaps it might.

Mr. EDMONDS. But would it be true in ordinary commercial business? If the Delaware & Lackawanna Railroad wanted to establish wireless along their lines, would the Marconi Co. monopolize that?

Mr. DAVIS. They could not.

Mr. EDMONDS. Do they monopolize the Wanamaker establishment in Philadelphia?

Mr. DAVIS. Not that I know of. I do not know that they use it.

Mr. EDMONDS. If these cotton factories that Judge Saunders was speaking about should put up wireless, could they monopolize that?

Mr. DAVIS. They could not.

Mr. EDMONDS. Have they monopolized you?

Mr. DAVIS. No, sir.

Mr. EDMONDS. There is no such thing as a monopoly in wireless, and no possibility of it?

Mr. DAVIS. There is no possibility of a monopoly in radio unless you legislate to make it a monopoly. The only monopoly that can exist in radio is by virtue of this bill and our patent law. We all want the patentee or inventor to get all that is coming to him. He has the monopoly for 17 years; that is the law. After 17 years anybody can go out and engage in it, but if you pass this bill they can not.

Mr. EDMONDS. No; it is just going to tie it up and make a monopoly?

Mr. DAVIS. Make a monopoly; yes, sir.

Mr. EDMONDS. But most of these patents are running out now?

Mr. DAVIS. They expire in a very short time.

Mr. EDMONDS. And it is going to be a case of service entirely?

Mr. DAVIS. Service will always be the governing factor in any business; yes.

Mr. EDMONDS. Therefore, my friend's fear of the 100 per cent monopoly that Mr. Nally hoped for, but probably did not see himself when he spoke of it, is absolutely impossible?

Mr. DAVIS. Absolutely.

The CHAIRMAN. That might be true if it were not for the fact that there are monopolies in control without patents.

Mr. DAVIS. Then they are monopolies by virtue of superior service.

The CHAIRMAN. By power of money and combination, by which they can suppress competition. If you do not know of that, you are not informed.

Mr. EDMONDS. The gentleman from Texas spoke of Mr. Schwab. He is the greatest trust buster in the country; he has established the greatest opposition to the biggest trust in the country—the United States Steel Corporation.

The CHAIRMAN. When?

Mr. EDMONDS. Why, the Bethlehem Steel Co. is the greatest opposition the United States Steel Corporation has.

The CHAIRMAN. That is all a joke. [Laughter.] You can not tell that to an intelligent audience. I am sorry we can not get the gentleman's smile in the record to show that he does not believe it himself.

Mr. GREENE. I would like to ask this gentleman a question, although I do not know that it relates to this particular controversy.

The United Fruit Co. had all its ships built in foreign countries. They did not have any built in America?

Mr. DAVIS. All of the present ships were built abroad; yes, sir.

Mr. GREENE. And had foreign officers on them?

Mr. DAVIS. Up to the time of the President's proclamation.

Mr. GREENE. Now, let us understand very plainly why you did that; why you did not come under the American flag and American regulations.

Mr. DAVIS. We came under them just as soon as we were permitted to do so.

Mr. GREENE. I know you undertook to come in earlier.

Mr. DAVIS. We made several attempts.

Mr. GREENE. I tried to prevent you from doing so, because I thought it was unjust, after having built your vessels abroad. Mr. Humphrey, of Washington, who was a very strong man on this committee, favored it, but this committee decided not to let you do it. The point that I am making is that you could build your vessels cheaper abroad than you could build them here. You could employ men on them under better regulations as long as they were under a foreign flag than you could under the American flag.

Mr. DAVIS. You must understand this, that in developing this Central American and South American trade, in which we were the pioneers, we were in competition with England, Germany, and Norway; we had to have ships and men who could compete. We could not have entered that business and competed with those countries and developed our business as we have if we had been under the American flag.

Mr. GREENE. That is it. Now, in developing a great merchant marine, which we talked so much about, we have spent enormous sums; we have put them under so many regulations and bound them up so tight that when we undertake to go out and capture the world's trade we have got to do something or other to get a chance to capture it. We are not going to capture it by wind or by whistling in this committee. We have to provide something to meet the difference between the cost of vessels abroad and the cost of manning the vessels abroad and in this country; we have got to go against Japanese competition and every other kind of competition. We have got to find some kind of method to meet that competition after spending this vast sum of \$4,000,000,000, enough to build 10 Panama Canals. We have spent or appropriated for the Shipping Board \$4,000,000,000 in money, and where are we going to be when we undertake to go out and meet that situation?

Mr. BANKHEAD. Do I understand that to be intended as a question?

Mr. GREENE. Yes; that is a question. I would like to know where we are going to be when we go out to meet that situation.

Mr. DAVIS. We are not going to be any place if we have legislation such as this, which is going to put a damper on our efforts and is going to wreck of first-line trenches—our means of communication. We can not go out and compete if you are going to do that.

Mr. GREENE. And this is an additional handicap on American enterprise?

Mr. DAVIS. It is one of the most serious handicaps, not to be able to have your medium of communication in such shape that you can regulate it.

Mr. GREENE. It is going to be another serious handicap added to the many handicaps that you find in competing for foreign trade, which we claim we are trying to foster. That is what I wanted to get after. I am correct in that, am I?

Mr. DAVIS. You are correct; yes, sir. It is going to be a very serious handicap to that development.

The CHAIRMAN. Mr. DAVIS, the United Fruit vessels were admitted to American registry under the ship registry act of August 8, 1914, were they not?

Mr. DAVIS. I believe that is correct; yes, sir.

The CHAIRMAN. That was a bill I introduced, which passed the House under a suspension of the rules, and for which I think my friend from Massachusetts voted.

Mr. GREENE. Oh, yes; in time of war, or prospective war; I foresaw war myself in 1914. I voted for a great many things after the war broke out in Europe.

The CHAIRMAN. That was the war in Europe. We were not in then.

Mr. GREENE. I understand that, but we ought to have been in it very early.

The CHAIRMAN. I know we ought to have been in it from the beginning, but that is aside from this question.

Mr. GREENE. I foresaw that trouble was coming, and I voted for a great many things that I would not have voted for under ordinary circumstances. I said so on the floor and I say so now. I voted in the line of patriotism.

The CHAIRMAN. I just thought you had forgotten that matter. [Laughter.]

Mr. GREENE. Not a bit. I take bitter medicine sometimes; and although I never took a glass of whisky in my life, if I needed it to preserve my life I would take it.

Mr. DAVIS. I have finished, Mr. Chairman.

Mr. NALLY. Mr. Chairman, may I correct one mistake? Mr. Davis said the Marconi Co. had entered into a contract with the Navy not to build any more coast stations. That is a mistake; we did not enter into such a contract. We did, naturally, agree not to build stations that would interfere with the stations we had just sold; I think it would be unethical to do otherwise; but we are still free to build stations.

Mr. DAVIS. I beg your pardon, Mr. Nally; I am glad to have my remarks in that regard amended. But there is this to be said: Mr. Nally's system covers nearly the entire coast, and if they are not going to erect stations which would compete for the business which would ordinarily go through these stations under control of the Navy, it follows they have, as a practical matter, made an agreement not to build any more coast stations.

(The committee thereupon proceeded, in executive session, to hear the statement of Mr. Walter S. Penfield, and at 1 o'clock p. m. took a recess until 2 o'clock p. m.)

AFTER RECESS.

The committee reassembled at the expiration of the recess.

STATEMENT OF MR. SAMUEL E. DARBY, NEW YORK CITY, REPRESENTING THE DE FOREST RADIO TELEPHONE & TELEGRAPH CO., OF NEW YORK.

Mr. DARBY. Mr. Chairman and gentlemen of the committee, my name is Samuel E. Darby, of New York. For the past 25 years I have been actively and continuously engaged in the practice of patent law. Prior to entering that profession I was for six or seven years an assistant examiner in the United States Patent Office. I am here to represent the De Forest Radio Telephone & Telegraph Co., of New York.

That company does not own nor operate radio stations; it is not interested or engaged in the commercial work of sending or receiving messages. It is a manufacturer of radio apparatus and confines itself exclusively to the manufacture and sale of radio apparatus under patents which it owns and has developed.

The company owns 265 patents and applications for patents. Of that number 100 have been contributed by the inventions of Dr. Lee De Forest. I regret exceedingly that Dr. De Forest is unable to present his views in connection with this matter. He is at present in Europe in connection with radio matters and therefore the responsibility of representing to a small extent the interests of that company devolves upon me.

Dr. De Forest, I may say, is one of the pioneer American inventors in the radio art, and in his absence I might perhaps say that he began his researches into the radio art while a student at Yale University. He continued his research and study of the art as a student of Armour Institute of Chicago, and it was while he was a student at Armour Institute in 1900 that he made his first invention in the radio art.

He has continued from that time to the present devoting his entire time and energy and genius to the advancement and to the improvement of the radio art, and, as I have said, has applied for and procured 100 patents for inventions which he made—many of them he has constructed and installed with his own hands.

I do not believe I can be challenged when I say that there is no man in this country, no American, who has done more in the practical work of developing the radio art than has Dr. Lee De Forest. For his achievements he enjoys the honorary degree of doctor.

The De Forest apparatus, especially, the audion detector and amplifier which has been referred to particularly in these hearings, is now standard wireless equipment in our own Navy as well as in the principal navies of the world. I might say, further, that it was the De Forest audion amplifier which made possible transoceanic radio communication. The audion amplifier has also made possible transcontinental-wire telephony. The American Telegraph & Telephone Co. is operating to-day under a license under the De Forest patents.

I think, Mr. Chairman, that it has been made perfectly clear in these hearings that if this bill is enacted into law it will mean Government monopoly of the entire radio art. I think it has been

made equally clear that if this bill is not enacted into law it will mean Marconi monopoly of the radio art. Mr. Nally has told us that the Marconi Co. to-day controls 90 per cent of the business, and they hope to make that practically 100 per cent.

Mr. NALLY. Ship-to-shore business.

Mr. DARBY. Therefore I say that the manufacturer, the little fellow who is engaged solely in the manufacture and supply and sale of radio apparatus, is confronted with the two horns of a dilemma. On the one hand he is confronted with the possibility of being hoisted on the horn of Marconi monopoly, and on the other hand, the horn of Government monopoly of this art. It is a question which is confronting the De Forest Co., and, as I conceive it, every company engaged, as it is, in a modest way in trying to live and to manufacture. The condition they are confronting to-day is whether they can survive the monopoly of the Marconi Co. on the one hand or survive the monopoly of the Government on the other hand.

For my part, speaking in behalf of the De Forest Co., I am free to say, notwithstanding the fact that it is between the devil of private monopoly on the one hand and the deep sea of the Navy on the other, that if the choice is left to my advice, we will accept the Government monopoly every time. I will explain the reason for that.

We have been told of some of the devices to which private monopoly will resort in maintaining its monopoly. They tell us of their scheme of lease contracts for their apparatus. The Marconi Co., if this bill is not enacted, will control the shore stations—and there must be shore stations or else there can be no radio apparatus or use made of it. The Marconi Co. manufactures its own apparatus. It leases its apparatus; it does not sell it.

If I recall it correctly, as to the figures given on lease prices, Mr. Humphreys of this committee figured out that it was a losing proposition to the Marconi Co. to lease their apparatus at \$1,000 a year with an average life of five years instead of selling it outright at \$3,300 per set. Nevertheless, the Marconi Co. tell us they find it more profitable to lease than to sell their apparatus outright. They must have a very good and very substantial reason, and that reason we find, of course, in private profit.

But it is not merely the leasing of this apparatus that concerns the Marconi Co. in its monopoly, but under the guise of a lease of property under patent rights they are endeavoring to extend and expand the scope of those rights, apparently secured by patents, but going far beyond the limits or the bounds of proper beneficent patent monopoly and ownership.

Under the lease system, for example, they tell us that they also insist upon having their own operators employed. They tell us they insist upon supplying their own repair parts, their own extras, articles that are not covered by patents, which ought to be open to the manufacturers of the country to supply.

It is such practices as the lease contract system that have brought the United Shoe Machinery Co., for example, into disrepute and made it an object of attack by the Government, because they sought to control not only their patent properties but also devices and apparatus which were not covered by their patents, under the guise of patent protection.

In the same way the Dick Co. attempted, under the guise of patent protection for their neostyle or duplicator, to control the sale of ink, paper, and other common commodities which anyone could supply and should have an opportunity to supply.

It was under that same system of extension of patent rights that the Victor Talking Machine Co. attempted to control the manufacture and sale of the record disks for use with their patented apparatus. Under that same guise the Victor Talking Machine Co. attempted to control the resale price of their patented machines, until they were stopped by the Supreme Court.

That is one of the devices, Mr. Chairman, that is resorted to in the case of private monopoly and is being resorted to in the case of the Marconi monopoly.

I speak rather feelingly on this, because the De Forest Co. has been made a victim of the methods of the Marconi Co. There has been practically continuous litigation with the Marconi Co. on patent rights, and the Marconi Co. has not hesitated to attempt to take away from the factory of the De Forest Co. and to prostitute them, their skilled employees. That is another device of private, obnoxious monopoly, not included within the beneficent monopoly of patent protection.

They have oppressed not only the De Forest Co. but other companies; other individuals, who have dared to undertake to manufacture and sell wireless apparatus of any kind. Whether it was an infringing apparatus or not, under the guise of patent protection, they have attempted to suppress it and to maintain their grasp and control on this radio art.

Judge Hardy remarked the other day that there were a thousand and one ways in which a rich and powerful corporation could grind down opposition or competition. Whether the Marconi Co. has overlooked any of those I do not know [laughter], but I do know that they have exerted every influence that was possible to run the De Forest Co. out of business. And it has been in the face of such tremendous difficulties as that that the De Forest Co. has been able to continue in business and has supplied its absolutely necessary apparatus for the use of our Government and other governments in this audion detector and amplifier, and other devices.

Therefore, I say that if the choice is left as between the private monopoly of the Marconi Co. on the one hand and the Government monopoly on the other, there is no question where the interest—the material, substantial interest—of manufacturers lies. It is with the Government and in favor of this proposed bill.

But let us examine the other side. There is another side; that is the side of Navy control or Government control. Prior to 1910, whenever the Government saw fit to use a patented device or apparatus without the license or consent of the patent owner, there was no redress for the patent owner. That was true, because patent infringement is a tort, and the Government had never consented to be sued in tort. There was one way in which a patent owner could, prior to 1910, enforce his rights against the Government under his patent, and that was where a contract, either express or implied, between the patent owner and the Government had been violated. On the strength of that violation of a contract the patent owner had a

right to go into the Court of Claims and sue the Government for its appropriation.

The Congress recognized the injustice of that situation and enacted the law of June 25, 1910, which is entitled "An act to further extend the protection afforded to patent owners of the United States." Under its provisions, whenever the Government used a patented invention without the license of the patent owner, he had the right of action in the Court of Claims for that infringing use.

That, however, limited the right of action against the Government to the use of the invention. A patent secures to the patentee not only the exclusive right to the use of the invention but also the exclusive right to make and to sell the patented apparatus. It was thought by many in the profession and some of the courts, as I will show, that the act of June 25, 1910, carried with it an implied license in the Government to use any patented invention; and having the lawful right as an implied licensee under any patent, subject of course to recourse to the Court of Claims for the infringement, it was not, of course, incumbent upon the Government to manufacture by its employees in its own shops the patented apparatus it wanted to use. Being an implied licensee, it had the right to employ anyone else outside the Government to supply or make the apparatus for it.

A case arose in the southern district of New York, and, by a curious coincidence, it was a case involving radio apparatus. Still further, curiously, we find the Marconi Co. complainant in that action. The case that arose was that of Mr. Simon, who contracted with the Navy Department to build certain wireless apparatus for the Navy Department. The department prepared the specifications, what it wanted, and called upon Mr. Simon to construct that apparatus for it. The Marconi Co. sued Mr. Simon, with a view to collecting from him the profits that he might make in filling that contract, and, in addition, sought to enjoin Mr. Simon from making that apparatus or other apparatus, saying that they had patent rights covering that apparatus.

The defense in that action was that Mr. Simon was merely acting as an agent for the Government. The Government had prepared the specifications and plans for the apparatus it wanted to use and had employed Mr. Simon to construct that apparatus. The United States District Court for the Southern District of New York accepted that view of it, and said that under the act of 1910 the remedy was a suit against the Government for the use of the apparatus, and as the Government was an implied licensee it had the right to have the apparatus made for it by whomsoever it pleased. On appeal to the Court of Appeals for the Second District the decision of the lower court was affirmed. The case was then carried to the Supreme Court.

Meanwhile the Cramp Shipbuilding Co. undertook to build some destroyers for the Navy under specifications drawn up by the Navy Department and to install on those destroyers certain turbine engines. Those engines were claimed by the Curtis Turbine Co. to infringe its patents. A suit was brought by the turbine company against the Cramp company. As a result of that litigation, the turbine patents were sustained as valid, and the turbines installed in these destroyers were held to infringe.

The matter was referred to a special master to take an account of the profits made by the Cramp company in filling that order. At the

hearing before the master it was attempted to exclude certain of those destroyers from the accounting proceedings on the ground that the contract for their construction was not made or entered into until after the act of 1910. Practically the same defense was made there, that the Government was an implied licensee under the act of 1910 and had a right to have the Cramp company supply these engines for it. The master refused to accept that view.

The matter was taken to the District Court for the Eastern District of Pennsylvania, and the master was overruled on the authority of the Simon case.

The matter was then taken to the Circuit Court of Appeals for the Third Circuit, and that court, learning that the Simon case was in the Supreme Court, deferred a decision on the point, and for the sake of the record affirmed the district court. Whereupon the Cramp case was taken to the Supreme Court. Those two cases were heard and decided together. They are reported in 246 U. S., page 28 and page 48.

The Supreme Court held in those cases that the act of 1910 did not give to the Government the right to have apparatus made for it by outside parties without the outside parties accounting to the patent owners for the profits made in building that apparatus, thereby in effect reversing the Circuit Court of Appeals for the Second Circuit and the District Court for the Eastern District of Pennsylvania.

Mr. HUMPHREYS. May I interrupt you there? Did the court hold that the outside manufacturer could manufacture it?

Mr. DARBY. Could not manufacture it.

Mr. HUMPHREYS. You said they could not manufacture it without accounting for the profits they made?

Mr. DARBY. Yes.

Mr. HUMPHREYS. Was that the measure of damages, the profits that the outside manufacturer made?

Mr. DARBY. That was the measure of damages; yes, sir. It is usually the measure of damages in patent infringement litigation.

Mr. HUMPHREYS. If the outside manufacturer sells it at a very much smaller profit than the patentee would is the rule still the same?

Mr. DARBY. The only measure of damages is the profit he made. But that is a very small part of the substantial benefits obtained by the litigation. The most important part was the injunction restraining them from carrying on the infringement, and the Supreme Court held in effect that there was a right of injunction against the contractors, the Cramp Co., in the one case, and Mr. Simon in the other, except that in the Simon case another question came in involving what is known as contributory infringement, which was practically the turning point in the Simon case in the Supreme Court.

With that situation the war came on. Then it became necessary for the Government to acquire large quantities of apparatus to enable it to successfully prosecute the war in all directions, not alone in radio but in other arts, in the automobile art, in the aircraft art, in the motor construction art—in all directions the Government required enormous quantities of materials and apparatus and devices of all kinds.

In the contracts made—and this has been the practice, I understand, for a good many years; it was referred to, I think, by Commander Hooper—in the contracts made by the Government with the manufacturers a clause was inserted requiring the manufacturer to hold the Government harmless from patent infringement litigation. With the large quantities of apparatus required by the Government for the war it was impossible for the patent owners themselves to supply that apparatus to meet all the requirements of the Government; they had to get other manufacturers here, there, and everywhere to make and supply the necessary apparatus for the war. But these outside manufacturers were confronted with this situation created by the decisions of the Supreme Court, that in case they did manufacture for the Government patented apparatus they were liable to be sued for the profits they made on that manufacture, and in addition to pay the costs of that litigation; with the further addition—which is statutory—that the trial court in a patent infringement litigation has the authority and power to increase damages threefold.

Whereupon the manufacturers of the country were confronted with that situation, and they hesitated as between their patriotic duty on the one hand to supply everything that was necessary for the Government to carry on the war and absolute ruin on the other if they had to account for the profits they made on the apparatus they constructed for the Government.

It was under that exigency that appeal was made to the Government. It was made in the case of the De Forest Co., because when the war was declared, the De Forest Co. placed its staff at the disposal of the Government; it was operated for 24 hours a day, night and day continuously, to the highest tension and strain, to supply apparatus to the Government and only to the Government during that period.

It was necessary for those who were operating under those contracts to apply to the heads of the departments with which they were doing business for relief, and the departments were not slow to grant that relief. In some individual cases the indemnity clause in the contracts was canceled. In other individual cases—and that was the experience of the De Forest Co.—the Navy Department assumed sole responsibility for any infringement action that might be instituted. That enabled the Government to get the apparatus that it needed.

Then, in the act making appropriations for the Navy for the year 1919, ending June 30 next, the act of 1910 was amended. The purport of that amendment was that whenever the Government used a patented invention without the license or consent of the patent owner, or whenever such apparatus was manufactured by the Government or manufactured for the Government, then the entire remedy, the entire compensation, was to be recoverable by action against the Government in the Court of Claims.

You will note the expansion of the act of 1910. The act of 1910 applied only to the use by the Government. This amendment, which is now the law of the land, increased that so as to apply to apparatus made by the Government or made for the Government. That is the law under which we are operating now, so that to-day, whether this bill passes or not, if the Government wants to use any patented

apparatus it can do so and have it made for it by whomsoever it pleases, and it will assume the full burden through action in the Court of Claims for infringement.

Now, if this bill passes and becomes a law the manufacturers of the country are confronted with that situation. It is entirely possible for the Navy Department then to have made for it any apparatus, without regard to the patent ownership of anyone, leaving the patent owner to his recourse by suit in the Court of Claims. And that, I assure you, Mr. Chairman, as the result of my own personal and professional experience in that court, is but a shadow of right.

Mr. HUMPHREYS. Could the patentee in such circumstances as you have related go into the court to secure an injunction against the manufacturer who had contracted with the Navy?

Mr. DARBY. No, sir; not under the amendment to the act of 1910.

Mr. HUMPHREYS. He can continue manufacturing?

Mr. DARBY. Yes, sir.

Mr. HUMPHREYS. Let me ask you this further question. See if I get this right. Suppose there is some apparatus the Navy wants; for instance, one of these receiver sets. There are various parts of that, I assume, that have been patented at different times; A will have one patent, B another, and C another. Suppose the Navy, preferring one or the other of those parts, would provide in their contract that this receiving set shall have this particular part in it, and the manufacturer agrees to make the whole thing, including that part. He makes the complete receiver at a reasonable profit, including in that the cost of this patented item, which he puts in at actual cost. What becomes of the patentee then and his rights? There has been no profit made on that.

Mr. DARBY. The courts have passed on that question in this way. If the profits made on a patented feature of an entire structure can be segregated from the profits made on the construction of the entire article, then those profits will measure.

Mr. HUMPHREYS. Suppose there was no profit?

Mr. DARBY. If there was no profit then the measure of damages would be what profit the patent owner would have made if he had supplied it. Those are well established principles of the patent law which govern, and fairly equitably, recovery for patent infringement.

So I say, Mr. Chairman and gentlemen, that if this bill goes into effect the small manufacturer will be liable to have the Navy Department manufacture any apparatus it pleases, leaving only the right of suit in the Court of Claims to recover for that infringement. But there has never been within the range of my experience—and I speak also for the De Forest Radio Co.—any disposition on the part of the Navy Department not to recognize fairly and equitably the rights of patent owners. I say that advisedly, because I have been thrown in contact with them professionally for several years. There has never been any disposition, so far as it has come under my observation, for the Navy officials and naval officers not to deal fairly with patent owners. There was never any disposition to arbitrarily take a man's invention without giving him an opportunity. I do not believe that, if given the authority they ask under this bill, that would develop any serious obstacle.

Mr. HUMPHREYS. You mean the opportunity to make it himself?

Mr. DARBY. Yes. I do not think that the Navy Department contemplates manufacturing or is as well equipped to manufacture the apparatus as are those who have been engaged in manufacturing that apparatus from the beginning. I think they realize that and recognize it, and therefore they go out in the market and purchase it.

On the other hand, that is a difficulty that the manufacturers confront, and it as a very serious situation. It affects them profoundly. If the Navy Department has the right to have patented apparatus made for it by whomsoever it pleases without regard to patent owners, then it is going unquestionably to work a tremendous hardship on the little manufacturer.

A suggestion was made to this committee that a board has been appointed in the department to handle this patent situation, and that they are at work on it. My suggestion would be to give such a board as that statutory authority. Write such a board as that, or the one suggested by Mr. Nally, into this bill; make it an authoritative board, with power enough to straighten out matters affecting patent rights and patent owners, and giving it other powers—powers such as suggested by Mr. Nally, for example, of determining the practical working wave lengths under which this apparatus might be operated, whether by the amateur, the ship-to-coast stations, or the high-power stations. That would be my practical suggestion.

But one thing is certain: If the Government should take over this radio business and it becomes a Government monopoly—just as it has, for example, taken over the patents of the Poulsen system and the Federal Telegraph Co.—the Government would not be interested in enforcing any of its patent rights against any manufacturers throughout the country and the manufacturers then would spring up, in my judgment, all over the country, manufacturing this patented apparatus, because the Government would control the patents and the Government then would get the benefit of the very best apparatus, because it would be a case of the survival of the fittest. A keen business competition would arise among the manufacturers to supply the best quality of apparatus, and that is what the Government wants.

Now, as to the development, the future development of the art, whether it shall be through private monopoly, or I should say Marconi monopoly, or Government monopoly, I think it is beyond question that there would be greater progress made and greater advancement in this wonderful art if the Government had control than there would be if the Marconi Co. had control. I base that statement on this fact: Notwithstanding the fact that the De Forest audion detector and amplifier is standard equipment and the most important and up-to-date equipment for the receiving apparatus, the Marconi Co. has never adopted or used it except by infringement. It had the right to go to the De Forest Co. and purchase it, but it did not do so. Instead, it was not slow to undertake to manufacture it for itself in defiance of the De Forest patents, and would be manufacturing and using it to-day if it were not for an injunction. The De Forest Co. had to bring suit to enforce its rights.

And there is one point I would like to answer, suggested by ex-Attorney General Griggs. He told this committee, as illustrative of the attitude, as he expressed it, as I recall, of the Navy Department toward the Marconi Co.—and there were almost tears in his voice:

he was certainly trembling with suppressed emotion or virtuous indignation when he said it—that even the Navy Department attempted to interfere with litigation which the Marconi Co. was carrying on against infringers and referred to a case out in California.

I do not know anything about that, but I do know about the case he mentioned of the De Forest Co. It is true that there was litigation pending between the Marconi Co. and the De Forest Co. at the time we entered the war. When we entered the war the De Forest Co., as I say, started in immediately to devote its entire time, night and day, to the manufacture of apparatus for the Government, for the Government's use, for the successful prosecution of the war, working under high tension; and yet the Marconi Co. was attempting during the period of the war to suppress the De Forest Co., to press that litigation, by taking away from the supervision of the manufacturing end of it the experts—Dr. De Forest and his staff of engineers—who were absolutely necessary as witnesses in that litigation.

We either had to embarrass the Government by failing to supply it with the necessary apparatus that it required, or else let the litigation go by default. Under those circumstances, and in behalf of the De Forest Co., I appealed to the Navy Department for assistance, for pressure to be brought to hold back the Marconi Co. from pressing that litigation. So when Mr. Griggs complains that that was illustrative of the attitude of the Navy Department he is unjust. If there is any fault to be found he can find it with me, at least to that extent.

And within the past two weeks, while the signatures to the armistice are hardly dry, the Marconi Co.'s attorneys have gone into court there in New York and reinstated that litigation, which had been suspended for the duration of the war. And notwithstanding the fact they knew that Dr. De Forest was out of the country and absolutely necessary to the defense of the suit, they pressed the court for an immediate trial of that case. That, I submit, is another one of the thousand and one ways that a rich and powerful corporation can use that power under the guise of patent protection, to embarrass, to harass, and to discourage commercial business enterprises. I should think that, instead of being virtuously indignant at the Navy Department, the Marconi Co. should hang its head in shame to confess that when the Government needed this apparatus it was engaged in embarrassing the Government in getting it.

I have one further practical suggestion to make, Mr. Chairman. As I have said, in view of the fact that these small manufacturers are confronted with the prospect of being hoisted on the horn of the dilemma of Government monopoly or crucified on the horn of the Marconi monopoly I think it would be necessary to protect the interests of those manufacturers like the De Forest Co. and others situated like them. Their whole business is devoted to the manufacture of this apparatus. They would have only one purchaser for their apparatus in either case whether it was the Government or the Marconi Co. Therefore other enterprises should be included in this bill under the definition that is given of radio stations. When I first read the bill I thought that was its purpose. The term "radio station" means "any place, vessel, or vehicle containing

apparatus used or capable of being used for transmitting or receiving signals." A place where apparatus is manufactured and tested out is certainly a place containing apparatus used or capable of being used for radio purposes. When I read that definition of a radio station I gained the distinct impression that it included also manufacturers. At this hearing, however, as I understand, Capt. Todd stated most emphatically that that was not the purpose nor the intent of the bill. My suggestion, therefore, is to include in the definition of a radio station "also any factory or business enterprise engaged exclusively in the manufacture of such apparatus."

Then, in section 8, I think it is—

Mr. HUMPHREYS. Would you suggest that as an addition?

Mr. DARBY. As an addition, just write that on after the word "signals," in line 9.

Mr. HUMPHREYS. Will you again read your suggestion?

Mr. DARBY. "And any factory or business enterprise engaged exclusively in such enterprise."

Mr. HARDY. Would you not be in the position of nullifying your amendment by the use of the word "exclusive"? Because any other little business would prevent it being used.

Mr. DARBY. I had in mind this, if the chairman please: The General Electric Co., for example, is engaged in making radio apparatus for the Government, but it is not engaged exclusively in making radio apparatus, and there would certainly be no object to the Government taking over the entire General Electric Co. just because of the small side issue it has of radio. That is why I suggest that word "exclusively"—engaged exclusively in the manufacture.

Mr. HARDY. It occurs to me that if a factory wanted to be taken they would have nothing else to manufacture, and if they did not want to be taken they would put in a little something else.

Mr. DARBY. That would mean that the business enterprise, so far as it related to wireless, would be taken over, and it would leave the individuals free to embark in some other business enterprise, but they would be taken over and would be compensated as to part of the property referred to in this section 8 of the bill.

I wanted to say, Mr. Chairman and gentlemen—

Mr. HUMPHREYS. Your idea is that in the event the bill became a law it would embark the Navy Department not only in the operation of radio communication but also in the manufacture of all apparatus necessary.

Mr. DARBY. That would probably result if the Navy, after taking it over, cared to carry on that manufacturing operation. But what I had in mind was not so much the Navy Department, as they are to take care of the present manufacturer, who would be at the mercy of monopoly.

Mr. HUMPHREYS. But the bill says that the President shall requisition and take permanent possession of radio stations.

Mr. DARBY. I do not know that that would be such a bad thing for the Navy Department, because thereby it would acquire properties which have been built up and improved for manufacturing the very apparatus that they wanted to use. They would be getting the apparatus and equipment for doing that. I do not think that it would be the policy of the department to engage in manufacture, but

at least they would have the facilities for doing it, and they could lease the factory part of it out, and the machinery part out, and employ others to make it for them.

Mr. HUMPHREYS. It would prevent anybody else in the country engaging in that enterprise?

Mr. DARBY. No; I do not think so.

Mr. HUMPHREYS. But if he engages in the enterprise of manufacturing radio apparatus he immediately becomes a radio station, and thereupon is taken over at once by the Government?

Mr. DARBY. Perhaps it might be further improved by saying "any established business devoted exclusively to the manufacture of wireless."

Mr. HUMPHREYS. I do not know what that would mean. Is there a legal definition of "established business"?

Mr. DARBY. I think so. I think the legal definition of that is one that has already been created and built up.

Mr. HUMPHREYS. Then, as soon as a man undertook to establish a manufacturing plant for the manufacture of some radio apparatus, he would be permitted to go on until he got his plant completed; then he would have, under the terms of this bill, to turn it over to the Government?

Mr. DARBY. They would have the merit certainly of encouraging manufacture. [Laughter.]

Mr. HUMPHREYS. I am not discussing the "merit" of it; I am just discussing the terms of the bill. That would be the effect of it?

Mr. DARBY. That would probably be the effect of it.

Mr. HUMPHREYS. If we discuss the merits of it, it might be suggested it would encourage the establishment of manufacturing enterprise, but you would have a market then that you would not have to quibble about. The law says whenever anybody establishes this enterprise the President shall buy it.

Mr. DARBY. In any event, the manufacturers are confronted, as they are to-day, with that absolute condition.

Mr. HUMPHREYS. Nobody under those circumstances would ever engage in that business with the expectation of carrying it on.

Mr. DARBY. Probably not.

Mr. HUMPHREYS. Well, certainly not?

Mr. DARBY. Probably not; yes.

Mr. HUMPHREYS. He would engage in that enterprise solely for the purpose of transferring it to the Government as soon as the key was handed over to him by the contractor?

Mr. DARBY. That is the suggestion I make; it might be entirely untimely.

What I was principally interested in was some method or some expression that can be used in this bill which would prevent striking down and destroying existing business enterprises. In the case of the De Forest Co., in acquiring its 265 patents and the improvements which they mark in the art it has cost thousands of dollars and a tremendous amount of time and ingenuity in experimentation, and that is the most costly part of any business enterprise. It has cost a tremendous amount, and yet under the authority of the statutes as they stand to-day the act of 1910 and the amendment in the Navy appropriation bill, the Government has the right to have any of De Forest's patented apparatus manufactured for it by the Marconi Co.

without any other recourse to the De Forest Co. except the right it has in the Court of Claims.

Mr. HUMPHREYS. That is what the Navy believes in.

Mr. ROWE. Is not that the reverse of what has happened; that is, have not the De Forest people manufactured apparatus covered by other peoples' patents for the Government?

Mr. DARBY. It has, certainly, during the war; we freely admit that.

Mr. ROWE. Well, before the war.

Mr. DARBY. Before the war it manufactured under its own patents, which the other companies have contended interfered with their patents—yes; just as the Marconi Co. had the De Forest patents.

Mr. ROWE. If this line of procedure be carried out that you suggest, I should think it would be perfectly fair on the part of the Government, if they wanted any of the De Forest apparatus, to get somebody else to make it for them.

Mr. DARBY. Surely; that is the law as it stands to-day. The Government has that right to-day, to have any De Forest apparatus made for it by anybody else, and the only recourse is in the Court of Claims, and that, I say, is not satisfactory, because of the difficulties—and these are serious difficulties, when you get into the Court of Claims—difficulties of getting evidence; and, besides, the Court of Claims has only power or authority to make findings of fact and draw conclusions of law. The Court of Claims has no equity jurisdiction, and if there is any part of jurisprudence that is more important to the interests of patent owners it is the equity jurisdiction of the courts. The Court of Claims has no right to enjoin, and I doubt very much even if it had the right it would exercise it.

Mr. HARDY. Is it not a fact that patents in this as in many other lines of enterprise are almost hopelessly entangled in litigation, adverse claims, one with the other?

Mr. DARBY. That is the case here more than in any other line of business.

Mr. HARDY. Marconi and the De Forest and every other company is claiming something that the other fellow claims?

Mr. DARBY. Yes, sir; and it is a situation that at present is not only distressing, but it is agonizing. It is costing the companies engaged in that litigation practically their whole substance in the litigation.

Mr. HARDY. Under those circumstances, the litigant who has the longest purse has considerable advantage over the other litigant?

Mr. DARBY. Yes, sir; that is so, and that has been demonstrated, as I have tried to show here to-day, in the litigation between the Marconi Co. and the De Forest Co. De Forest to-day is and always has been a poor man. He has not had the millions at his back to support him that Mr. Griggs tells us is back of the Marconi Co. He has been subjected to the incessant fire of patent litigation, and, so far as I can see, the only ones who have benefited by it have been patent attorneys.

Mr. HUMPHREYS. Would you limit under the terms of the law which you advised Congress to enact the amount of business that any one company shall be permitted to do?

Mr. DARBY. No, sir; I do not think that would be right.

Mr. HUMPHREYS. Well, as the law stands now, is there any legal obstacle in the way of the De Forest people going out and selling their receiving apparatus to the ships and erecting shore stations, and then erecting high-power stations and putting the Marconi people out of business, so that they would be the people to complain?

Mr. DARBY. There is no legal obstacle, so far as I know. On the other hand, there are the conflicting claims of patents. There is no legal reason why if it was a rich and powerful company, except, as it has been made clear here to-day at these hearings, the Marconi Co., or now the Navy Department, owns all of the coast stations, and they supply apparatus to vessels who use those stations which under Marconi control could only be furnished by the Marconi Co. and not by any other company.

Mr. HUMPHREYS. But there is no law to prevent you or the De Forest people from putting up some receiving stations of their own and selling their apparatus to some shipowner who wants to buy and do business with him?

Mr. DARBY. Only the law embodied in the radio regulations as they exist to-day.

Mr. HUMPHREYS. They apply to Marconi as well as to you?

Mr. DARBY. Surely, with this difference, the Marconi Co. now has the stations; it has the business. It has the supply of apparatus.

Mr. HUMPHREYS. You would not, however, advocate that some law be written on the book to enable you or anybody else to go and take it away from them?

Mr. DARBY. No.

Mr. HUMPHREYS. What they have got, I suppose, they have purchased?

Mr. DARBY. They have purchased, surely; and have built up surely. But they have acquired that business—their status to-day—not by virtue of the monopoly of their patents, but by the practice of obnoxious monopoly. That is what I complain about.

Mr. HUMPHREYS. Wherever in those practices they overstep the laws they are subject to penalties?

Mr. DARBY. Oh, yes. But, as Judge Hardy suggested the other day, there are a thousand and one ways by which that can be accomplished without going over the lines of the law.

I want to say this in justice to the De Forest Co.: That I have expressed these views here without the benefit or advantage of conferring with Dr. De Forest with respect to that. Dr. De Forest left the country in October before this matter came on. He is still abroad. I have been unable to communicate with him, and while I am speaking in behalf of the company I do so on my own personal responsibility as counsel for the company. And I may say I have been Dr. De Forest's patent counsel from the day he took out his first patent—from 1900 down to the present time.

STATEMENT OF MR. E. J. NALLY—Resumed.

Mr. NALLY. May I correct some glaring misstatements of this witness?

The CHAIRMAN. I suppose it will be logical to do so now.

Mr. NALLY. Capt. Darby said that he thought the Marconi people ought to bow their heads in shame. I, for one, of the Marconi

Co., bow my head in shame—I am ashamed of a man of Capt. Darby's ability who should prostitute those abilities the way he has been in making such glaring misstatements as he has.

Mr. HUMPHREYS. I suggest that Mr. Nally proceed in order.

The CHAIRMAN. State the facts as you understand them and let the committee decide.

Mr. NALLY. Among other things he stated that we had attempted to steal his employees. I happen to know of one case where the Marconi Co. attempted to detach one of his employees.

Mr. DARBY. But that was a matter I had reference to.

Mr. NALLY. That was where the De Forest Co. sent this employee to break into our high-power station, which he did, to steal some of our valves, which he did, and he was indicted and would have been detached from the De Forest employ for some period if it had not been for Capt. Hooper and others of the Navy Department, who personally requested me not to push the case, because this man Myer was needed in connection with some Government work, the De Forest people having said so. That is one case.

I have other cases where I have correspondence—requests from the De Forest employees to enter our employ. But they never got into our employ; I would never think of having one of them in our service.

Capt. Darby has tried to becloud the whole issue.

He would have it so that the De Forest Co. should hide behind the skirts of the Government, so that they could continue to manufacture their apparatus and continue to infringe Marconi patents. He is remarkably silent over the fact that he is now under injunction. He did not say a word about that; he did not say he was enjoined from the manufacture of this apparatus.

He also speaks—

The CHAIRMAN. Mr. Nally, what specific apparatus have you in mind?

Mr. NALLY. Judge Mayer enjoined them, in connection with the valves—the Fleming valve—and this suit which he laid so much stress on was merely a suit in accounting. Once before when they tried to have an accounting they changed their organization over night and defrauded all just rights under the demand.

He speaks of the millions back of the Marconi Co. It can not compare with the millions put into the De Forest Co., and if it had not been for certain efforts by the Marconi Co. De Forest would not be enjoying certain immunities which he does at present.

The CHAIRMAN. We will now hear Mr. Simon. Be as brief as possible. Do not thresh over old straw, which we have been hearing every day. We heard these disputes. What we want is light.

STATEMENT OF MR. EMIL J. SIMON, NEW YORK, N. Y.

Mr. SIMON. Mr. Chairman, I am a radio engineer by profession. I have made a few inventions in the radio art, and I have been engaged in the last 10 years in the development of that art. In the last three years I have designed and manufactured radio apparatus for governmental use. I have supplied the United States during the war with radio apparatus to the approximate value of \$2,000,000. I

am a designer also of marine and aircraft wireless apparatus, many sets of which are in use by the Government at this time.

I had prepared a short statement, which was largely completed before I had heard the other gentlemen who appeared before the committee discuss several of the main points that I wished to bring out, and I have accordingly cut down my statement to some extent, on that account.

I desire first to call your attention to the notable absence of support of this bill by the other departments of the Government. The State Department, you will recall, admitted its entire satisfaction with the facilities afforded the Government for radio communication, during the war, under existing laws.

Taking up the sections in the order in which they appear in the bill, I will pass the first section relating to amateurs, inasmuch as their attitude toward the provisions of the bill affecting their interests has been fully explained to the committee.

At the risk of repetition I will make a few brief remarks in regard to Government ownership as provided for in section 2. It has been the endeavor of the proponents of the bill by repeated assertion to distinguish radio from other public utilities.

How far their efforts have been successful with the members of the committee I am not in position to state, but in my opinion and the opinion of a number of representatives of private radio interests with whom I have discussed the question, the alleged difference is not only not clearly apparent but this proposed taking over by the Government is considered and being watched carefully by many as the test case on Government ownership. The War Department, for example, could just as consistently come before Congress and repeat the same arguments with reference to Government ownership of telephones, telegraph, and cables.

Aside from this contention of the interests favoring the bill, exclusive Government ownership of radio would obviously establish a precedent that would be at once a danger and menace to all other public utilities.

Now that the Marconi Co. is no longer in possession of the ship-to-shore business, the position it takes in indicating preference for Government ownership is easily accounted for by its natural reluctance to approve or favor leaving the door open to private competing interests.

Mr. HARDY. Does the Marconi Co. favor Government ownership?

Mr. SIMON. The Marconi Co. favors Government ship-to-shore operation of radio communication, I believe. They differ as to the high-power stations, but they apparently favor the Government control or operation of ship-to-shore stations, as I recall it.

In reference to Marconi's hundred per cent control of radio and the chances of a little fellow like myself, as Mr. Darby called the independent companies, the impression seems to have been created in the mind of some of the committeemen that there is or was danger of monopoly in radio in this country by the Marconi Co.

Mr. Nally's reference to 90 per cent control of radio means 90 per cent ownership in the ship-to-shore business, which, please understand, is only a small part or portion of the radio business in this country.

The CHAIRMAN. I think that was his statement.

Mr. SIMON. As a matter of fact, the Marconi Co. has never been in control nor has there ever been real danger of a Marconi monopoly. Their main hope for control was based on a Marconi patent which will expire in 1921.

The Marconi type of patented apparatus is now being rapidly superseded by a new and better system of apparatus, which is completely outside of the scope of the Marconi patents. The patents covering this new system have now been purchased by the Navy Department, which purchase in the opinion of many, including myself, opens these inventions to the use of the public—nullifies the grant of the patents.

The CHAIRMAN. Make that clear, if you please.

Mr. SIMON. The purchase by the Navy Department of the patents of the Federal Telegraph Co. covers the newer and more improved systems being gradually adopted for ship-to-shore and long-distance communication. The purchase of these patents by the Government, in the opinion of many qualified lawyers, opened these inventions to the public and nullified the exclusive grant of the monopoly for the life of the patent.

Mr. HARDY. Your idea is that when the Government obtains it there is no more exclusive privilege, but that anybody may use it?

Mr. SIMON. I should think so. The Government now owns the patent.

The CHAIRMAN. And it would be true if the Government should buy the patent covering some shell or other munition invention necessary to the Army or Navy?

Mr. SIMON. I did not hear you.

The CHAIRMAN. I say, if the Government should buy a patent on some new machine gun or some new part of an Army or Navy airplane or something else, just as soon as the Government became the owner it would be open to everybody without danger of being liable to prosecution for infringement of the patent; is that your view?

Mr. SIMON. Mr. Chairman, I am not a patent attorney, but I have talked with Gov. Griggs and Mr. Pumphrey and other patent attorneys, and they all think that the purchase of the patents by the Government nullifies the grant by the Government for the exclusive monopoly for the life of the patent. That is a very broad and big question. I would not care to offer an opinion on it, as I am not a patent attorney.

Mr. HARDY. Was this invention you speak of, that was so superior to the Marconi, ever the subject of contention between the Marconi Co. and the inventor, and was there any litigation over it?

Mr. SIMON. No, sir; not any that I know of. I believe a suit was brought but never pressed.

Mr. NALLY. By whom?

Mr. SIMON. By the Marconi Co. against the Federal Co.

Mr. NALLY. It is still pending?

Mr. SIMON. Replying to Judge Hardy's question, I should say, from an engineering and technical point of view, it is usually considered distinct and different.

Mr. HARDY. Was there ever any attempt by the Marconi Co. to buy out the Federal Co. before the Government bought?

Mr. SIMON. I have no definite facts on that, but it is rumored, and the general understanding is that the offer by the Marconi Co. to the

Federal Co. to purchase its patents was the reason that the Government had purchased the patents from the Federal Co.

Mr. HARDY. I did not know that that was the one they spent a million dollars and something for.

Mr. SIMON. One million six hundred thousand dollars, which included some half dozen stations of the Federal Co.

Mr. HARDY. And their patent rights?

Mr. SIMON. And their patent rights. I might remark right here that those patents have never been, so far as I know, in litigation. They only have three and one-half years to run before they expire. They had never been infringed upon, if I may use that term, by the Government. So that the Government was not liable, so far as I know, to any damage by suit in a court of claims, and they have never been adjudicated as controlling patents. They are patents covering the particular use of a device, which I will admit is essential in order to operate that system successfully to-day.

In connection with the original Marconi monopoly, during the war the Marconi Co., I believe, supplied the United States Government with apparatus to the extent of some \$6,000,000, whereas the entire purchases by the Government of radio apparatus were considerably in excess of \$25,000,000. Therefore, the larger part, by far, was purchased from independent or other companies and manufacturers than the Marconi Co.

The bald suggestion of exclusive Government ownership, at this time, is crudely premature.

Most of you gentlemen will recall Prof. Pupin's testimony before this committee on the other bill, in which he likened wireless telegraphy to an infant, born and reared by private interests, and his caution not to put this infant in a Government institution, where it would pine away and die.

Why, gentlemen, it is admitted by the proponents of the bill that the infant is, as yet, of such tender age that it is only with the greatest difficulty that it is able to make itself understood. I refer to "interference," about which you have heard so much and which has been urged as the main reason why this bill should be enacted into law.

"Interference" can mean only infantile inability of this very young art to as yet function properly.

In other words, it is not old enough for adoption and needs the care and attention of its parents, the private interests, to see it through until it is able to stand alone and do credit to itself.

You will recall that in the showing made by the opponents to the other bill, it was brought to the attention of this committee that "interference," quite as serious as that here complained of, was experienced during the early stage of development of the telephone.

You will further recall that such interference was entirely overcome by the inventive efforts of private interests, as is best evidenced by the present efficiency of the telephone now in general use.

Give the radio art a fair chance and private interests will, at their own expense and within reasonable time, overcome the difficulty complained of here by the proponents of the bill.

Another thought: Is this interference, so bitterly complained of by the Navy, as serious as they would have you think it is? Some

of you may have heard the little story about a lady in an automobile inquiring of her companion whether she thought pedestrians were as sensitive to pain as they were? [Laughter.] That inquiry, in my opinion, illustrates, without much exaggeration, the position taken by the Navy with relation to the operation of wireless by private interests.

Now, as to this very objectionable interference complained of by the Navy, let us assume that private interests have equal cause for complaint. Do they come to you for relief? No. What they do is to put the trouble up to their engineers, with instructions to overcome it and the engineers get busy.

If the problem proves a difficult one, it very naturally takes time to solve, and that is precisely the situation we are facing to-day. Many very able engineers, in the pay of private interests, are working on the problem; and if undisturbed will, in due course of time, work out a satisfactory solution; but if Government ownership steps in, disrupts the outside organizations, and scatters the engineers, no further progress will be made.

Some gentlemen, in opposition to the bill, made the very pertinent inquiry as to the further need by the Navy of the high-power or transoceanic stations, pointing out that, in times of peace, our fleets seldom go far from our shores, and we were told by the Assistant Secretary of State that during the present war the State Department, in order to insure greater secrecy in the transmission of its messages, mainly used the cables and only occasionally resorted to wireless.

From all I gather from what has been said, so far as Government ownership of present existing radio stations is concerned, the purchase of the few remaining high-power or transoceanic stations would put the Government in full possession of the field.

That brings me to section 3 of the bill. Section 3 prohibits the maintenance or operation on land or on a permanently moored vessel, etc., of any radio station, etc.

It may be helpful to you to keep in mind that the term "station" as used in the discussion of the bill before the committee applies to any wireless apparatus, whether receiving or transmitting, or receiving and transmitting, wherever set up for operation, on land or on ships.

Under the prohibition provided in section 3 it would be a penal offense against the law for anyone excepting the Navy to operate wireless telegraph apparatus anywhere in the United States.

What would that mean? Here, now, we have a dozen or more well-known and well-established manufacturers of wireless apparatus, each employing a number of radio engineers and others skilled in radio manufacture.

What is to become of these organizations? The only outlet for their product will be the Navy Department, as all ships required to have wireless have been equipped with it by the Navy for purposes of the war, and, with care, such equipment may be made to last for years, so that there will be practically no market for wireless other than that created by the needs of the Navy Department.

If the calls to be made for wireless apparatus by the Navy do not exceed the prewar calls, and there is no reason to believe they will, there will not be enough business to justify existing organizations continuing in business; and they will therefore either go out of busi-

ness or reorganize for the purpose of taking up other lines of manufacture.

In either case, their radio engineers and workmen skilled in radio manufacture, will shortly become scattered and lost sight of, and of the present exceptionally efficient radio force there will be left only one or possibly two companies of necessarily limited output.

It must not be lost sight of that the invention and development of radio to its present state was by private interests and not by Navy or Government employees. That was admitted by Commander Hooper in his testimony before the committee. He was unable to cite a single radio invention of any importance that had been made by a Navy man.

It is also important to bear in mind that the work of the Navy in establishing ship and shore stations for war purposes, about which the gentlemen of the Navy spoke with considerable pride, was made possible of accomplishment only by reason of the existence of private manufacturing companies, which companies designed, developed, and made available for use of the Navy all the wireless apparatus now in its possession.

Without the aid of these outside sources of development and supply of radio apparatus, the position of the Navy at the outbreak of the war would have been extremely critical; yet the Navy, in its ambition for expansion and power, now proposes, by way of return, to sacrifice these loyal interests that made its success possible.

The threatened scattering of the present forces and their necessary abandonment of radio for other branches of engineering, can have only one effect on development, and that will be to bring it practically to a standstill. There will be no inducement for engineers to devote themselves to improving radio apparatus, which, under the terms of the present bill, can not be used, unless purchased by the Navy, and then only for governmental purposes.

I can not pass without comment Commander Hooper's amazing statement to the committee that radio patents are essentially different from patents on other things, and must, therefore, be treated differently, or words to that effect. He did not make clear how, why, or in what respect radio patents differ from other patents, and we are left somewhat in the dark as to the process of reasoning under which he arrived at that conclusion.

Inasmuch as patents, to the lay mind, are ordinarily both mysterious and confusing, it is suggested, by way of explanation, that perhaps the only patents that have come under Commander Hooper's notice have been those relating to radio. You will, of course, understand that, as a matter of fact, all patents are alike under the law, and differ only as to subject matter.

Commander Hooper's further statement, in substance, that the Marconi Co. has been unable to get the right kind of decisions from the courts on their patents was certainly not the fault of the courts, but was due, rather, to the limitations of the patents as brought out by the defense.

The chairman of the committee remarked that he would certainly not favor the bill if, as Mr. Edmonds stated, its effect would be disastrous upon radio patents. There can be no question or doubt that Mr. Edmonds was entirely correct in the statement made, as we shall now show.

Let me assume the bill to be enacted into law and that the existing radio patents, numbering over 1,000, are submitted by their owners, for adoption and use by the Navy Department, the only market, under the bill, open for such apparatus. Let us say, for purposes of illustration, that the Navy accepts 100 of the patented improvements and rejects, for various reasons, the remaining 900. Of what possible value or use are the rejected patents to their owners?

It is true that every patent is supposed to be a grant, presumably made in good faith by the Government to the patentee, for the term of seventeen years, of the exclusive right to make, use, and sell the invention throughout the United States, etc., but this bill nullifies the grant, by imposing a fine, imprisonment, and forfeiture of the apparatus, whenever and wherever the invention of the patent is used in the United States, unless such use is by the Navy.

The effect, therefore, of the bill on all existing and future radio patents, not adopted and used by the Navy, would be to prohibit their use and thereby render them valueless.

It is readily conceived that some of these blacklisted patents might disclose very important advances in that branch of the art relating to wireless telephone service abroad moving trains, which would be of inestimable value, if use and development were permitted, but the proposed law says "No," and that settles it.

Many other advances in the art, making possible, for example, the combination of the wireless telephone with the present wire lines, in general use in residences and offices, thus providing public telephone service with ships at sea, would likewise be barred.

As a result of the operation of such a law, our American radio inventors would undoubtedly be driven into those foreign countries, where opportunity is given them to develop and exploit their inventions in their own way and free of Government restrictions.

Section 4 of the bill, giving the Navy, a military branch of the Government, power to carry out the provisions of the law, would be a dangerous experiment in a democratic country such as ours and a decided step toward military domination or Prussianism.

The recent raids in New York and other eastern cities by the Army and the Navy in rounding up slackers, and incidentally including with them hundreds of innocent citizens, illustrates the heavy-handed methods likely to be employed by the military against the people if given authority under the law.

The CHAIRMAN. You do not think the slackers ought to have been gathered up, then?

Mr. SIMON. I do, but I do not think they ought to have been gathered up in that way.

The CHAIRMAN. I do not know what way was employed to gather them up, but I think they ought to have been gathered up just the same.

Mr. SIMON. But by due process of law.

The CHAIRMAN. We had to adopt some special measures to provide for patriotism of some people during the period of the war.

Mr. SIMON. It would appear absurdly inconsistent, while President Wilson is in Europe preaching "Peace on earth, good will to man." for Congress, in time of peace, to authorize the use of the "mailed fist against the American people."

The special licenses for emergency use in cases where no other rapid means of communication are available, provided for by section 5 of the bill, appear to be intended mainly, if not entirely, for military purposes as an aid in maintaining order and control under abnormal conditions, such as in cases of floods, fires, riots, strikes, etc. No provision is made for granting such licenses in time of peace, with conditions normal, and this section is objected to as further and unnecessarily increasing the power of the military branch of the Government and as wholly superfluous in the bill in view of the sections above discussed, which give the Navy full power for all purposes.

It was agreed by the gentlemen of the Navy that section 6 should be canceled, and comment with reference to this section is therefore unnecessary.

Mr. HARDY. I do not know whether I understood you to say that if there is a question of prohibition of the erection of private stations you would object to the right of the Secretary to grant a special license under emergencies and things of that sort.

Mr. SIMON. No; I did not say that. You mean the statement I just made about section 6?

Mr. HARDY. No; section 5, I thought you said was objectionable because it allowed the Secretary to grant special licenses.

Mr. SIMON. Only for emergency purposes, and I interpret that to mean cases of floods, fires, riots, etc., not for general peaceful purposes.

Mr. HARDY. Do you want to take away that power?

Mr. SIMON. I say the section is useless in that the power has already been taken away.

The CHAIRMAN. I believe you are not a lawyer?

Mr. SIMON. No; I am not.

The CHAIRMAN. That would not be susceptible of that view, is my opinion.

Mr. SIMON. I may be entirely wrong.

The meaning and purpose of section 7 is not clear. If the Navy is to own all radio stations, under the provisions of section 2, and no additional stations can be operated, in view of the provisions of section 3, then there would be no other stations to which licenses could be issued under the act entitled "An act to regulate radio communication," approved August 13, 1912.

Section 8 has, I believe, been fully discussed, excepting the last clause providing for an appropriation sufficient to make "just compensation," in an amount, as yet, undetermined definitely, but known to run into many millions of dollars.

This uncertainty would appear to cast doubt upon the wisdom of such legislation.

Mr. HUMPHREYS. Do you think Congress should make an appropriation to pay just compensation for stations that might be taken over?

Mr. SIMON. Yes; I do; but I say there are so many elements entering into patent rights and the cost of development that it is uncertain how much the Government will have to pay eventually for the taking over of this property.

Mr. HUMPHREYS. You think they ought to pay just compensation, however much that may run up.

Mr. SIMON. Exactly. But I believe there is a great deal more involved than the mere phraseology of the bill indicates.

Mr. BURROUGHS. Your idea is against the whole policy of taking over anything at all?

Mr. SIMON. Exactly. I am in favor of the continuation of existing law, or possibly a modification of that law to meet the requirements of the present day, as would be brought out by an international commission, which undoubtedly will meet in a year or two.

With regard to sections 9 and 10, I wish to say that I believe the Secretary of Commerce should be substituted for the Secretary of the Navy, as is the case in existing law.

Mr. ROWE. How long have you been in the manufacturing business in this line?

Mr. SIMON. Individually, 3 years; with other companies, 10 years.

Mr. ROWE. Thirteen years in all?

Mr. SIMON. No; I beg your pardon—7 with the other parties and 3 individually, and that makes 10 years.

Mr. ROWE. You have built up quite a large business, have you not?

Mr. SIMON. During the war, of course, the demands of the Government were so great that they called on everyone who was qualified to build as much apparatus as they could produce, and during that period I turned out all I could for the Government.

Mr. ROWE. You have not felt that there was more competition in this line than there is in other lines of manufacture, have you?

Mr. SIMON. I have never been in any other line, but I have enjoyed competition. I am a great believer in competition as being an incentive to greater effort.

Mr. ROWE. Did you start with large capital?

Mr. SIMON. I started with nothing.

Mr. ROWE. There is still a chance for other people to build up a business in this line if they want to, as you think?

Mr. SIMON. I certainly think there is. I had associated with me during the war and still have a large number of the younger class of radio engineers who have exactly the same future before them, I hope, that I have had, and opportunity to do exactly what I did; that is, eventually to leave the employ of companies and develop their own inventions and ideas and obtain the profit for it that is due them.

Mr. ROWE. Then you do not think the Marconi Co. is monopolizing the business?

Mr. SIMON. I do not. The Marconi Co., as you have heard, has brought suit against me here, and in Canada, and I have been able to properly defend myself in all such cases, I believe.

The CHAIRMAN. We will now hear Mr. McClellan.

STATEMENT OF MR. GEORGE McK. McCLELLAN, REPRESENTING THE HONOLULU CHAMBER OF COMMERCE, HONOLULU, HAWAII.

Mr. McCLELLAN. My name is George McK. McClellan, and I represent the Chamber of Commerce of Honolulu.

The Honolulu Chamber of Commerce, Mr. Chairman, is very loath to enter any appearance here to oppose any measure that has been introduced by the chairman of this committee, because of our personal regard for him and the confidence we have in his work.

The CHAIRMAN. You need not have any compunction on that score.

Mr. McCLELLAN. But this bill is so far reaching—

The CHAIRMAN (interposing). My impressions on this question, as in the case of all bills that come before this committee for consideration, are open to conviction.

Mr. McCLELLAN. A part of one of the cablegrams which I have received from the chamber of commerce states in regard to this matter that I am asked to oppose the bill providing for the Government taking over point-to-point transoceanic radio systems, that Hawaii has had no commercial radio service during Navy control, but now that peace prevails there is no need of radio control; that there is no apparent attempt on the part of the Navy to take care of commercial business since the armistice has been declared; that with cables congested we are without rapid communication, and we request that you protest against any measure placing the Government in control of either the cables or the radio service.

The CHAIRMAN. I will just say that the clerk has handed me a telegram from Hawaii, which I believe is in exact terms with the one which you referred to, and hence it will not be necessary to put this in the record.

Mr. McCLELLAN. Mr. Chairman, it is perhaps worth noticing that in the Hawaiian Islands was first made a successful commercial use of the wireless telegraph. We are not novices in Hawaii on the question of wireless telegraphy. We had the first successful operating system, so far as my information goes—I believe I am correct in that—that there was anywhere in the world. We had local men who have participated in the improvement of the apparatus, and at the present time in addition to that old established wireless, the inter-island system, we have four high-power stations on the islands of Oahu, on which Honolulu is located. There is the high-power station constructed by the Navy Department at Pearl Harbor, which is tuned and powered to communicate directly with the Arlington station and Panama and all the long-distance stations. Two are high-power Marconi stations and one of the Poulson system, referred to as the Federal, which has been purchased by the Navy Department.

There have been a good many statements made here, gentlemen, before this committee about the interference which has been met with in the operation of these systems. I call your attention to this fact that in the Hawaiian Islands, all within a scope of 200 miles, the longest range of the interisland system, you have located these other four high-power stations, and those have been operated, as I say, since the beginning of wireless operation and have been coordinated successfully, which would seem to indicate that there is no inherent necessary conflict.

The CHAIRMAN. Did you state where these stations are located?

Mr. McCLELLAN. I did not state on what part of the islands they are located, Mr. Chairman. One is located on the windward or eastward side of Oahu, one at Cocoa Head, and one at Pearl Harbor, and one at Kahuku.

The CHAIRMAN. Within what radius?

Mr. McCLELLAN. Well, there is a total radius there of, I should say, offhand, 40 or 50 miles airline, but the stations at Cocoa Head and Pearl Harbor are close to the interisland station, so that, although some of the others are far away, they have not found serious

difficulty in the question of coordinating those high-power stations with the lower, which convinces me that the statements made here, that it was physically necessary for the Navy Department to have charge of all these systems in order to coordinate the question of wave lengths, is not well founded in fact.

If the Wanamaker intercommunicating stations are interfering with the Navy, it is either because they are not conforming with the regulations, which should properly be laid down, or else because the Navy operators are incompetent or have improper apparatus; one or the other. The interference is not necessary, and achievement enough has already been made so that there is no necessary conflict between those things, and I do not think that this committee should proceed in their decision on whether or not they will adopt this bill with any representations made here that is necessary from a physical point of view, because it is not.

One man can get up here and say one thing and another man can get up here and say another, but I am citing to you, gentlemen, the point in the world where wireless has been operated longer than any other, and I am telling you facts of what has occurred, not my theory of what may or may not be done; I am not a wireless operator and I can not tell you exactly about the meters, and wave lengths, but I can tell you that those two systems have been working side by side without interference, which is the important thing after all.

Mr. ROWE. Do you mean they work side by side or that no interference, as a matter of fact, exists of operation?

Mr. McCLELLAN. No serious conditions arise from working side by side.

Mr. ROWE. How do you know that?

Mr. McCLELLAN. I live there and the thing has gone on year after year.

Mr. ROWE. And you have heard no complaints by the operators of these particular stations as to any interference in the operation of their particular plant?

Mr. McCLELLAN. There may have been individual cases and there were difficulties as the system was being worked up, but the point is that the interisland system has been working continuously from the very founding, as I say, of the commercial.

Mr. ROWE. Do you know why there should be any difference in respect to those four stations in Hawaii than existed with respect to four similarly located stations on the Atlantic seaboard?

Mr. McCLELLAN. I do not know; I can not speak for the Atlantic seaboard, but I can imagine it.

Now, then, it is to be considered that after the interisland wireless system was first established came the Marconi long-distance stations. After that was in operation came also the Poulson or Federal system, and they succeeded in operating. I can not tell you in detail what their relation or coordination was, but both have been operating commercially and they must have been doing so without interfering. They have sent messages back and forth. I have done so frequently; I have occasion constantly to be communicating with the islands; and I suppose I have sent ordinarily, say, 25 or 30 messages a month. That is just simply in the day's work, and our merchants do the same thing, and the newspapers carry news twice a day,

or, they have—I am speaking of previous to war conditions—the newspapers carry twice a day the Associated Press dispatches transmitted by wireless. They have depended exclusively on the wireless, and have thrown over the use of the cable entirely for news. They have received all of their press dispatches by wireless and have gotten them just the same as we have our milk delivered at the house in time for breakfast, which does not look as though there was very much interference.

Mr. ROWE. I just want to understand if you take the emphatic position that, for instance, the naval station at Pearl Harbor and the commercial station located near Pearl Harbor, if they were operating on the same wave lengths, would have absolutely no interference in the transmission of messages on those two respective stations?

Mr. McCLELLAN. I am citing the fact that after the Marconi was already in operation that the Poulson system came in and operated alongside of it satisfactorily, and that subsequent to that the Navy itself came in and established a high-power station of its own at Pearl Harbor and that they operated successfully without interference.

As to the question of ship to shore business, I believe I am correct when I state—I have had that confirmed by one of the Navy men since these hearings have been going on—that these are all taken by the interisland company in Hawaii.

In Hawaii we lead a very peculiar, isolated life. We are out there in the middle of the Pacific Ocean, cut off from the world by 2,000 miles of ocean, under the necessity of carrying on our commercial affairs with those limitations, and it must be evident that any limitations on our communication is a very serious matter, because, due to vessels sailings and merchants in Honolulu must do more cabling and use more wireless communication than would be the case in this country where a shipment could be made any day or several times a day.

During the war the Government has taken over all of the high-power stations, as you know. The commercial business has been entirely excluded from those lines. It would perhaps be useless to enter now into discussion on whether that policy was necessary or not. The people of Hawaii were so interested in this war, so willing to do everything that they could for it, that they submitted to that thing while they believed very freely that it was not necessary. But, however that may have been, if the Navy was not willing to accept a commercial message from a man who had sent his sons into the aviation service or into the ranks of the army in France, whether or not they trusted his loyalty or thought it inadvisable to allow any commercial message to go, that at least does not apply to the messages since the armistice has been concluded. But to-day the Navy still has control of these systems and commercial business is still excluded from these lines, although it is difficult to imagine any way by which the use of those lines now could give aid or comfort to the German Army.

The CHAIRMAN. It would be a pretty good way to demonstrate it.

Mr. McCLELLAN. In what way?

The CHAIRMAN. By opening up the lines to commercial business.

Mr. McCLELLAN. It would seem a golden opportunity to illustrate to the world how wonderfully efficient they could be in operating in an efficient way.

Mr. HARDY. Have you made any application to the Navy to open up the wireless for messages, or anything of the kind, in Hawaii? A gentleman here tells me that they were opened last night.

Mr. GREENE. They heard the sound from here.

Mr. McCLELLAN. It may have been an echo from these hearings.

Mr. HARDY. You realize, Mr. McClellan, that at the close of this war a great Nation like this could not do everything the next morning?

Mr. McCLELLAN. That is very true, but an order of that sort is one of the shortest things that could be done quickly and readily and spells itself so freely that there is not a private enterprise on earth that would not have had that thing done the next morning, and that comes right to the very foundation of this whole question, Judge Hardy, as to whether or not the Government should handle the commercial business of this country.

Mr. HARDY. How long before you applied to the Navy Department?

Mr. McCLELLAN. If I was in Honolulu instead of here I could answer that question, but I would answer it in this way, that in my opinion, the Navy having taken the initiative in appropriating those lines, it was up to them to open the wireless communication without anybody making a request.

Mr. HARDY. Still, if you wanted them you should have asked for them.

The CHAIRMAN. I would say that within 30 days or a little over is not a very long time.

Mr. McCLELLAN. I have made similar requests in the past.

Mr. HARDY. I am talking about this matter, not "similar" matters. Do you know anything about whether they asked to have the wireless opened up or not?

Mr. McCLELLAN. I can not answer, but I would risk my hope of Heaven on the assertion that they have.

Mr. HARDY. Some of us, you know, have not got very high hopes in that regard. [Laughter.]

Mr. McCLELLAN. That, of course, is an open question.

Mr. ROWE. Mr. McClellan, right on that point, do you think it is a conservative position, looking at it from the standpoint of national security and sense, that it is entirely prudent for the Navy Department, with all its responsibilities, to look at this particular matter from a different angle from what you would as a commercial viewpoint, and probably would exercise more caution in throwing those wireless stations open to the public than you would likely do from the standpoint of a commercial interest?

Mr. McCLELLAN. I could answer that question by illustrating—

Mr. ROWE (interposing). In other words, you are looking at it entirely from the angle of a commercial man and you do not seem to give consideration to the element of caution and prudence that might have been desirable to use by the Navy.

Mr. McCLELLAN. I want to say this in answer to that question, that in this war Hawaii showed her interest and devotion to the cause of the country, although only a territory, remote, in the middle of the Pacific Ocean, and that she placed more men in the service in proportion to her citizen population than any other State of the Union; Hawaii has subscribed more money for Liberty loan bonds, has given

more money per capita for the Red Cross, and furnished more men participating in the Red Cross per capita basis than any State of the Union, and has had, of course, numerous of her sons killed and wounded in the war. That much is to show you what her interest in the war was.

In addition to that Hawaii, in order to show her willingness to cooperate with any request, when the Food Administration started out, accepted—which we did not under the conditions have to accept—the regulations as set forth by the Food Administration for her chief product, which is sugar, on the basis, which, if it had been made in the same way with respect to cotton and wheat would have made a difference of \$50,000,000.

Mr. ROWE. I am not impugning Hawaii.

Mr. McCLELLAN. Hawaii was interested in this war and consequently would not want to interfere, but when you get down to the question of the actual situation there are certain things we all know. A man on the street knows some things just as well as a college professor, and a clerk in a dry goods store knows some things as well as a Justice of the United States Supreme Court.

When it came to cutting out all messages from San Francisco to Honolulu, irrespective of the dependability of the person who sent them or the nature of that message, it may have been necessary from the Government's standpoint, but if you will put yourself in our place in Hawaii you can answer the question for yourself. Having cut out all of the wireless—

Mr. HARDY (interposing). It seems to me, if you will pardon me, you are now discussing the policy of the Government during the war.

Mr. McCLELLAN. That is the question the gentleman asked.

Mr. HARDY. I do not see what it pertains to with respect to this bill.

Mr. McCLELLAN. I am not here for that purpose. I am here only for the purpose of showing that when the Government is in control of a public utility what actually happens in this, gentlemen, that a set of Government employees are in control. So far as the actual needs of the Government are concerned Hawaii, like any State of the Union, is willing to make any sacrifice—there is not any question about that—but when it comes to a question of sacrificing necessary things to meet the ideas of a certain number of Government officers or employees who have the "say" about that thing, you are facing then a practical question which a business man has a right to discuss on its merits and to present on its merits. That is the question at issue; it is not a question of whether you are loyal to the Government. It is a question of whether you are capable of considering matters involving citizens who are paying taxes and all that sort of thing, whether they are just as loyal to the Government and whether their judgment is just as good as that of these Navy men, who are a fine, loyal set of men, and we are all proud of them. But, after all, they are human men; and they are subject to errors of judgment, certainly as much as business men who carry large affairs and who have done so for many years.

Mr. HARDY. Somehow you think that a monopoly in the hands of the Government will be more irksome than if it were in the hands of a private concern?

Mr. McCLELLAN. I was going to proceed to tell you why I thought so, Judge Hardy. In this case in Hawaii where we were cut off from the use of wireless, we were also cut off from the use of the cable in the matter of a personal message of any sort whatsoever, so that, for example, if I were in Washington, representing the chamber of commerce, and my wife and boy remained in Honolulu, or if a merchant in Honolulu was kept there by the emergencies of the war and his wife had to come over here to keep their children in college, and one of those children should be sick and at the point of death, that child might die and be buried and the wife could by no manner of means communicate with the father, although they were well known.

Mr. HARDY. You must have had some very cruel people over there in charge of the wireless or cable?

Mr. McCLELLAN. That, sir, is just exactly what I am coming to—not that I was there, it is true—but that you put in the hands of one man in the Hawaiian Islands the power to say whether or not any message should go, and he said “no”; and those cases I cite have occurred again and again, Judge Hardy, during this war. People have died and been buried and their families did not know about it and could not find out.

Mr. HARDY. I think you ought to have court-martialed the man in charge of things over there.

Mr. McCLELLAN. I want to say to you that if you should go into executive session I could tell you more than I am saying now.

Mr. HARDY. You ought to make a complaint against that officer.

Mr. McCLELLAN. Gentlemen, so far as I am concerned, representing the chamber of commerce, I am not here for the purpose of making a complaint about what has been done. I am stating these things to illustrate to this committee what inevitably happens as a part of bureaucratic administration of affairs, and it must necessarily be bureaucratic; you can not have Government control of anything except by bureaucracy, by any device I have heard of.

Mr. ROWE. Do you not imagine that France and Italy and England and all the other belligerent nations exercised arbitrary control over the cables and wireless during the war and the period of hostilities?

Mr. McCLELLAN. The point is that when the Government had control of anything that is what it comes down to in the end, that certain officers and employees have the “say” and that those officers and employees are not responsible to the public in the same way that an employee of a corporation is, for the very good and simple reason that most of them hold positions practically for life and it does not make a great deal of difference whether things go one way or another way. That is not the case under a commercial system, where a man must make a certain response to public conditions under private ownership.

So far as the situation there is concerned, I can not see any reason—and my belief is that if the communication system of those countries had been under private control when the armistice was declared and it was known two or three days before it was to be declared approximately on Monday, the 11th day of November, every one of them would have had an order ready and it would have been in effect by

12 o'clock on Monday, November 11th, to reopen those communications to the public. As it is, the officer informed me it was done—

The CHAIRMAN (interposing). They should all have been opened up the next day regardless of where the German submarines were and what was necessary for the protection of our country; that would have been your conception of the national defense and sound national policy?

Mr. McCLELLAN. I am looking at it—

The CHAIRMAN (interposing). You are just looking at it from a cold blooded, commercialism point of view.

Mr. McCLELLAN. There was not a German submarine in the Pacific Ocean.

The CHAIRMAN. If those stations had been open generally they could have communicated with Japan or South America or even with Europe from the wireless stations in Honolulu—they are high-power stations?

Mr. McCLELLAN. Yes. I have spoken in part on the question of necessity, but I want to make this point, that so far as the practical necessity of having the Government take over this control, that seems to me to be finally answered by the fact that the largest shipping stations in the world have not given wireless over to the Government control; and, so far as I am concerned, I have more confidence in the experience than in the prediction, even, of men who are very much abler and brighter than I am.

I do want to say, Mr. Chairman, however, that so far as the comment as to things commercial are concerned, that the questions involved in that have been only commercialism which was absolutely necessary to the winning of the war, and not of the making of money. I think it would be unfair to Hawaii and to other parts of the country to have it stated otherwise, because that is the question involved. The Army and the Navy could not operate without food. The Food Administration has been beseeching us all through the period of the war to keep up and increase the output of sugar, and yet these very restrictions here have been putting on the brakes to interfere with the very production of foodstuffs which the Food Administration were begging us to work out. It was not a question of commercialism, but a question of carrying on the world's necessary work and business in a way that would not interfere with the Government's affairs, but what should be actually constructive help to it, and it was not a question of commercialism without regard to the welfare of the country.

So far as the statements that have been made here as to the alternative of a Government monopoly or Marconi monopoly, I have no interest in that matter, except the interest of the Hawaiian Islands. We are not stockholders in the Marconi Co.—I mean the people of the Hawaiian Islands—to anything more than a possible negligible extent. So that I hold no possible brief for the Marconi Co., but I want to point out the fact that individual and single companies like the Kilbourne and Clarke Co., of Seattle have become very large manufacturers of apparatus. That the whole Federal system was developed, the Polsom system, after the Marconi people were in the field all goes to show that there is no natural or inherent monopoly in wireless communication, and that any statements made to

this committee that the alternative lies in the Government taking over this whole thing as a single monopoly or having one company have the monopoly is unfounded in fact, in the light of experience of the art and the business use of the art up to the present time.

Mr. HARDY. Mr. McClellan, you understand monopolies do not grow up in a week or a month?

Mr. McCLELLAN. Yes.

Mr. HARDY. You understand in the beginning of wireless there could not have been a monopoly with only a half dozen stations, but as time goes on—you heard Mr. Nally's statement—was there anything unreasonable in what he said?

Mr. McCLELLAN. I did not hear Mr. Nally's statement.

Mr. HARDY. He said as to the ship-to-shore business they controlled 90 per cent of it when the war broke out, and that he expected to control 100 per cent of it in this country. That may not be a monopoly in your judgment, but it is in mine. That is his statement, and he is the head of the Marconi Co.

Mr. McCLELLAN. With all due respect to Mr. Nally, I would say he is probably not inclined to minimize the participation of the Marconi Co. in the business.

Mr. HARDY. Do you not think he knows more about it than you do?

Mr. McCLELLAN. It is quite possible he does, and it is also possible that others know more about the outside business, too, than he does, which he may not have given very much attention to.

Mr. HARDY. He was speaking of this ship-to-shore business.

Mr. McCLELLAN. I understand, but it has just been stated here uncontroverted that out of the business furnished to the Government out of this war about 24 per cent—

Mr. HARDY. I am not talking about those wireless messages.

Mr. McCLELLAN. There was a time, Judge Hardy, when the Western Union Telegraph Co. had an actual monopoly of commercial telegraphy in this country. But even after having been established many years it did not prevent the Postal company becoming a real competitor, and I would say that when the time comes that the Marconi Co. does achieve a monopoly, and if they use that monopoly in a way that will interfere with the transaction of business it will be time enough to meet that situation. But so far as our experience in Hawaii is concerned, our judgment is that the development of that sort would be much more desirable than to have the Government have the monopoly.

I want to speak about that question of desirability.

The CHAIRMAN. Be as brief as you can. I would like to get through with a couple more of these men this evening.

Mr. McCLELLAN. I believe I have occupied considerably less time, Judge Alexander, than most of the other speakers, and I would like to cover two or three more points.

The CHAIRMAN. I say, be as brief as you can, and do not repeat too much of the argument we have already heard.

Mr. McCLELLAN. It is a fact too well established to be argued here that whatever activities the Government may have engaged in they can not deal strictly on a business basis. I do not think there are very many people who contend that it can do so, and just as an illustration of that is the difference which has been shown in the re-

sourcefulness of private business meeting the situation and necessity of developing the dyestuff business in this country after war was declared as compared with the Government's efforts with unlimited money and power to commandeer and give priority orders for every part of their business, to develop gases for warfare. The other evening a very extensive dinner was given to the commander of that department of the Government's work and he told about the wonderful things that would have happened from American producers of gases if the war had gone on. But as a matter of fact, not very much had been done during the history of the war. However, when the same situation came before private business, with the necessity of developing the dyestuff industry, they did it and did it quickly, and did not have priority orders and unlimited capital at their disposal to work it out.

The CHAIRMAN. That was done before we became active in the war, and yet the gas business has been developed in the last twelve months—a marvelous development—and I can not imagine any private concern having done what the Government did, and I think you would agree with that if you were familiar with the facts.

Mr. McCLELLAN. I have kept somewhat in touch with that, and my judgment was that so far as the accomplishment was concerned, that greater quickness in meeting the situation was achieved by the private initiative in the case of dyestuffs.

So far as the statement which has been made to this committee, which is a very important one—I refer to the statement made by the Secretary—that the Government's taking over a great system would mean reduction of rates and better service to the public, I wish to say that I do not see how that expectation could be fairly entertained. We have before us the actual experience of the Government's taking over the carrier lines of the country and giving an increase of rates beyond the dreams of any railroad president who has ever lived, and yet those railroads are showing reduced earnings at the present time; and I do not believe there are more than a handful of trained business men in this country who believe that the Government should operate these lines, however necessary it might be from other points of view. It might be necessary as a national policy to have it done, but to say they can do it and save money on it is appealing, in my opinion, to the credulity of this committee and the country.

The CHAIRMAN. I do not think it is necessary to criticize the activities of the Government during the prosecution of this war to determine whether or not this bill has merits, because in all these agitations the very best civilian expert talent in the United States has been called into the employment of the Government, and these achievements have been under their impulse and by virtue of their experience. You are going too far in your effort to make your case, and it is not necessary.

Mr. McCLELLAN. I am not unnecessarily, Judge Alexander, slamming anybody; I am pointing to a fact which is certainly very vital, and this question of whether or not this country shall embark on general Government control of wireless—

The CHAIRMAN (interposing). It is not necessary to do that to criticize these activities of the Government through these civilian agencies which were called into the service of the Government. be-

cause they have been the greatest contribution to the successful prosecution of the war.

Mr. McCLELLAN: I am referring simply here to the results of experience.

Mr. HARDY. If I understand you aright, Mr. McClellan, as soon as these great civilian administrators like Schwab and the rest of them got into the Government employ they became inefficient and the Government employ made them poor and sorry executives. The Government utilized the best talent that the country was supposed to have, but you say their administration of affairs was wonderfully crippled as soon as they got under the Government?

Mr. McCLELLAN. If the stenographer finds anything in the record where I said the administration of the Government was crippled, I would be glad to have it read back.

Mr. HARDY. You said the railroad service deteriorated in quality while it increased in cost of operation, and all because it was under the Government.

Mr. McCLELLAN. If there was a statement that I made that the quality of the service deteriorated, I would be glad to have it read back to me. I would rather not have myself misrepresented in the record.

Mr. HARDY. If you did not state that, I withdrew that part, but you certainly said there was increases in cost of operation.

Mr. McCLELLAN. I stated that after increases had been made greatly beyond what any railroad president has known—

Mr. HARDY (interposing). The income depreciated?

Mr. McCLELLAN. Still I know the income of some of these roads, and the most important ones, is showing a decreasing rate of earnings.

Mr. HARDY. And yet the Government had the best experts the railroads could furnish them to run these trains, did it not?

Mr. McCLELLAN. My judgment, sir, is that the Government can not in the form of Government agencies use the best talent. Of course the Government does everything—

Mr. HARDY. Then there is something about the fact that it is the Government that causes defective administration, although they have the same men?

Mr. McCLELLAN. I think there is an inherent incapacity for the Government to carry on business affairs as compared with private interest.

Mr. HARDY. Even though employing the very same men?

Mr. McCLELLAN. Even though employing the very same men, because—

Mr. HARDY (interposing). What is the mystery that these men can not do as well for the Government as they do for private concerns?

Mr. McCLELLAN. I do not think it is a "mystery." As Theodore N. Vail has pointed out, one of the fundamentals is that in the Government system men, for the most part, have a life tenure of their position. There is not the same incentive to work, and that the human being is not sufficiently far advanced but what he still needs the incentive of necessity and personal competition to bring out the best there is in him.

Mr. HARDY. Did anybody employed in the running of these railroads have a life position?

Mr. McCLELLAN. The men under them—

Mr. HARDY (interposing). We are talking about the railroads. Stick to that.

Mr. McCLELLAN. The men who are running the railroads, of course, have been dealing with a new situation.

Mr. HARDY. Is not that the whole thing, or very largely so? Were not the railroads breaking down when the Government took over transportation? That was the condition that was producing confusion everywhere. Is it fair to hold that up as a stigma against any of the officials under the conditions the railroads were taken over and attempted to be run?

Mr. McCLELLAN. I think that, of course, the question of the condition of the railroads is too long a story to go into.

Mr. HARDY. You brought it out by these references that seemed to me to be unfair to the administration.

Mr. McCLELLAN. My contention is that the Government can not do—

Mr. HARDY (interposing). But you were giving this as an illustration.

Mr. McCLELLAN. And the reason for it is that the Government necessarily does its work through a system of bureaucracy and in the main with a life tenure, and there is not a member of this committee who does not know that you can go into any department of this Government and see employees there who are simply there because they have been with the Government a long while and the Government will not discharge them.

Mr. HARDY. I happen to have been on the Committee on Reform of the Civil Service, and I know that the heads of departments have kept old men under the pitiful plea that it was hard to "turn the horse out after old age," and that was for the purpose of building up the question of old-age pensions. I grant there has been some of that, but if I had been the head of the department I might too have been guilty of saying "Here is a man walking down life, and I do not like to turn him out." And the tendency of the Government has caused some extravagance, I grant that.

Mr. McCLELLAN. One point is that the Government, so far as I can understand the policy of the Navy Department in acquiring these lines that have already been acquired for Government operation, has never been authorized by Congress although funds for their purchase was authorized by Congress. If I am mistaken in that, I would be glad to be corrected.

It has been argued before this committee that because the Government department has done something heretofore unauthorized by Congress and has reached a certain stage, because they have acquired a certain amount of these shore stations, that therefore for that reason Congress should now go on and authorize further acquisition—that seems to me to be a very poor line of argument and rather a subversion of the mental idea that the just powers of Government are derived from the consent of the governed. It seems to me, gentlemen, that that is rather a fundamental question which is directly involved here.

In addition to that, as has been pointed out—and I think it is worth repeating—you are dealing with the last element now. You talked always about the "freedom of the air." The air is free, but if you are going to give an absolute monopoly of the use of the air

to the Government, so far as wireless telegraphy is concerned, it will inevitably follow that you will also find the Government demanding and receiving the absolute, the monopoly, of the use of the air for transmission, for use by airships, and you are going on from one step to another to make the Government the thing instead of the private initiative of this country.

And I want to say to you, gentlemen of this committee, that at a time when we are closing a great war which is supposed to have been for the benefit of the individual, the freedom of the individual, that it would be a very grave and serious mistake to have any such policy as this adopted. To go to the proposition of having the Government secure absolute monopoly of a utility of this far-reaching import, because it will mean that just as it has meant in many cases, that an individual employee of the Government who happened to join the service 25 or 30 years before and is still kept on the pay rolls, will have the power of saying in certain cases, "You shall do this; you shall not do that." And while we are everyone of us willing to do anything that is necessary to support the Government, we do not want a state of affairs where the individual employee whom the President can not check up and the Secretary of the Navy does not have the time to check up, that that one man has the power of saying practically what a community shall do.

The CHAIRMAN. We will now hear Mr. Israel.

STATEMENT OF MR. LESTER L. ISRAEL, NEW YORK CITY, N. Y.

The CHAIRMAN. What is your business?

Mr. ISRAEL. Radio engineer, by profession.

The CHAIRMAN. Are you connected with any firm?

Mr. ISRAEL. I am now associated with Mr. Simon, in New York.

I worked for the Navy Department for four years, or from 1913 to March 1918, and since that time I have been out in the commercial field developing radio apparatus for war purposes.

I wish to place myself on record as a man who started out fresh in life to go into a Government institution and find there the possibility of a life work. I was very enthusiastic about it the first year. I was in perhaps the most efficient military or governmental establishment that there is in the United States, the Navy—I have great respect for it. But, after the first year, I began to see that work and development were definitely and seriously limited by the dead wood of the life jobbers, the intrigue of politics, and the ever changing direction of naval officers. I was very successful and the work followed me around. Soon I was charged with the duty of determining what new things should be used by the Navy, the investigation of them to find out their possibilities. I worked in the New York Navy Yard for over three years and when the war seemed imminent I was called to Washington, where I stayed for a year. In February of this year, when the war clouds of Europe looked pretty black, I threw up the job in despair. I can tell many reasons why I did that, but to do so would occupy many hours. Perhaps one illustration will suffice.

A man came to the Navy Department with an idea that he could paralyze the magneto of aeroplanes by wireless. Eventually he was sent to me to find out whether it would work or not, and I examined

him and I found that either he was a crook or a German spy, and I so reported. My time was valuable and the organization I had around me was busy. We were trying to do things. Instead of following the recommendation that I made, an officer stepped in and to please somebody else work was done upon that fellow's idea. Time was spent on it with no result, as any engineer could have foreseen.

It has been mentioned here that the Naval Radio Department has not patented or invented anything. This is true, not because the civilians in naval employ, or the naval officers, have no ability, but because of the showy wasteful system under which they live. Their ideal is not the ideal of service to the whole country or service to any art; it is the ideal of immediate military efficiency.

After leaving the Navy I went out into the commercial field to see whether something could not be done there to improve our poor Army and Navy communication apparatus. I looked around to find a live organization. I believe I found one in Mr. Simon's; and I can safely say I have accomplished a whole lot more there than I ever could have accomplished in the Navy Department.

There were many other expert young men who had started along with me who threw up their hands in disgust and left, some joining the Army and some taking over work with commercial companies.

I would like to be questioned on any phase of this work that might interest the committee. I feel I am in a peculiar position in that before the war and during the greater part of the war I was in the employment of the Government, and then I had the opportunity of going out and being in commercial employ.

• Mr. GREENE. In what line of business?

Mr. ISRAEL. Radio engineering, developing the radio art, trying to make communication better: trying to serve not only the Navy but also the Army or any other agency of the Government that this art would be valuable to.

Mr. GREENE. Where did you go, what part of the country did you go to in order to develop this?

Mr. ISRAEL. My stations were New York and Washington Navy Yard, and at times I was sent out on various battleships.

Mr. GREENE. You said you left the Navy and went into commercial life; that is what I want to get at. I understand you went into some commercial business?

Mr. ISRAEL. I went to New York where I have recently been engaged on an Army job. A real live lieutenant was sent back by Gen. Pershing to have designed and built some field radio equipment that could be used. This lieutenant had worked for several other departments of the Government besides the Army; he wanted the best, in an impossibly short time, so he came to a commercial establishment to get results, and he has got them.

Mr. BURROUGHS. How long have you been engaged on this work?

Mr. ISRAEL. Six years.

Mr. BURROUGHS. Where were you educated?

Mr. ISRAEL. In the College of the City of New York.

Mr. BURROUGHS. You graduated there?

Mr. ISRAEL. Yes, sir.

Mr. BURROUGHS. As an electrical engineer?

Mr. ISRAEL. I started off as an electrical engineer and specialized for a year on radio and then took a half year's postgraduate course.

Mr. BURROUGHS. Can you tell me and the committee whether you know of any reason, from a technical standpoint or a scientific standpoint, why this matter of interference can not be handled by regulation as well as in any other way, as well as through Government ownership?

Mr. ISRAEL. It can be handled by regulation?

Mr. BURROUGHS. Yes.

Mr. ISRAEL. I know of no reason why it can not be handled by regulation. I do not regard the problem of interference as serious. The art is in its infancy, and there are, I should say, at least ten systems which are now known which, if properly used, would eliminate the major part of the interference and what is left could be regulated out.

Mr. BURROUGHS. You say you do not think it is serious at present?

Mr. ISRAEL. No, sir—it may be serious at present, I am not familiar with the operating end; I am connected with the engineering development. But if it is serious at all it is only because of some inefficiency in the apparatus.

Mr. BURROUGHS. How would you get rid of that?

Mr. ISRAEL. My present idea is to adopt a liberal attitude toward all private enterprise and possibly all Government enterprise to invent new apparatus, and improve existing apparatus, so as to eliminate it.

When I was with the Navy I offered in one year to develop a system so that radio messages could be sent in English in a way that no outsider would be able to read them. I did not get much encouragement. I know I can do it. It would not have cost the Government more than \$50,000; but no one in that service would plan work of this nature for a whole year ahead.

The CHAIRMAN. Put it up to the Marconi Co. and probably they will regard it with more favor.

Mr. ISRAEL. I may in time. I am at present engaged on the tail end of war problems, and when the proper times comes perhaps I shall do that.

The CHAIRMAN. We shall now be glad to hear Mr. Cutting.

STATEMENT OF FULTON CUTTING, CAMBRIDGE, MASS.

Mr. CUTTING. I am connected with the Cutting & Washington Corporation, of Cambridge, Mass., which is a radio manufacturing and engineering company.

I want to just say a word or two protesting against this bill, because, in the first place, if the bill goes into effect I will close out my company. I do not care to go into a business where I only have one customer and where that customer is the United States Government. I do not consider the prospects good. If the bill does not pass I have no fear of competition with our company.

One thing perhaps has not been brought out with reference to high-power stations. I am exceedingly optimistic about the future of radio and the possibilities of accomplishment. I believe in the present state of the art it is a very serious undertaking, and if the Government goes into it either one of two things might happen.

Either it will not develop, so that the public will not get the use of it, or it will develop and it will be such a serious competitor that if they give the public the rates which the system allows it will seriously endanger the cable companies, or if they keep the rates up it will seriously injure the public, and the only way out of it is that the public might take over the cables, and that will be a good start on general Government ownership. That is all I have to say. [Laughter.]

The CHAIRMAN. Mr. Godley, we will now hear you.

**STATEMENT OF PAUL F. GODLEY, OF THE ADAMS-MORGAN CO.,
MONTCLAIR, N. J.**

Mr. GODLEY. I am a radio engineer and a member of the firm of The Adams-Morgan Co., of Montclair, N. J.

I am appearing here on behalf of the amateurs, and possibly an explanation of my failure to request a hearing at an earlier date may be in order.

In executive session last week, the Board of Directors of the Radio Co. of America, the body which I am here to represent, concluded that the amateurs as a whole would be represented to a sufficient extent and in a satisfactory manner by Mr. Maxim of the American Radio Relay League, whom the committee has heard, I believe. But it has since occurred to the board, due to the developments, that it might be of advantage, by way of clearing the atmosphere as it concerns the radio amateur, to again bring the subject before the committee for brief reconsideration.

It might be of interest to the committee, and of interest as a matter of record, for me to give the names of the executive officers and the members of the board of directors, as well as their present addresses; with the permission of the chairman, these names follow:

President, Capt. E. H. Armstrong, Inspection and Research Section, Signal Corps, Army, Radio Laboratory, Paris, France; vice president, David S. Brown, master signal electrician, Signal Corps, Radio Laboratory, Little Silver, N. J.; treasurer, Lieut. Earnest V. Amy, Engineering Section, United States Army, American Expeditionary Forces; corresponding secretary, Ensign E. J. Styles, Naval Radio for Aircraft, Bureau of Steam Engineering. Board of Directors, Lieut. Harry Sadenwater, Naval Radio for Aircraft, Bureau of Steam Engineering; Ens. Frank King, Naval Radio for Aircraft; Theophilus Johnson, jr., expert radio aide, Bureau of Steam Engineering; L. G. Pacent, consulting engineer for radio contractor; and your orator, a radio engineer, designer, and radio contractor.

The showing of the executive officers and board of directors is representative of the showing made by the membership of the club as a whole with respect to their loyalty and fitness for service as evidenced by positions held.

The Radio Club of America wishes to go on record as firmly opposed to the bill now before this committee—bill H. R. 13159—for the reasons which follow:

First, because Department of Commerce regulation as provided under the law now in effect has been entirely satisfactory to both amateur and commercial interests, and thoroughly fair to all interests concerned including those of the Navy Department.

Statements made by Commander Hooper before this committee on last Thursday in regard to the controversy between the Navy Department and the Wanamaker Co. over the interference with naval radio traffic caused by operation of the New York Wanamaker station will serve to bring out the point which I have in mind. In effect, Commander Hooper's statement was as follows:

That the naval station in the Brooklyn Navy Yard, New York, was continually interfered with by the Wanamaker station. That numerous efforts on the part of the Department of Commerce failed to clear the situation because each time determinations as to wave length and decrement were made by the Department of Commerce representatives, it was found that the station was operating on its assigned wave length and that the decrement or damping of the emitted wave was of the proper value, and that, therefore, nothing could be done about it. Now, it is the firm conviction of the members of this club that, had the Navy Department been intrusted with the control of this station, that the station would have been shut down, and a license to operate refused, notwithstanding the fact that proof was to be had—at this very time—that, not only was it possible to operate the Brooklyn yard station without interference with the Wanamaker station, but, a very simple matter, even perhaps with the apparatus then in use at the Brooklyn yard station.

In this connection and with the permission of the chairman, I wish to read a brief extract from the minutes of the hearing before this committee on bill H. R. 19350 in January, 1917—an extract from a statement of Mr. Armstrong, the president of the organization which I represent—and to be found on page 202 of the minutes of this hearing. It reads in part as follows [reading]:

My particular interest in this legislation began several months ago, when I was asked by one of the Government inspectors at the port of New York to investigate the question of interference between the Wanamaker station and the Brooklyn Navy Yard, when the Brooklyn Navy Yard was receiving signals from Arlington. Now, the conditions of that service are these: The Brooklyn Navy Yard is 2 miles from the Wanamaker station. They desire to receive signals and messages from Arlington, which is 200 miles away from the Brooklyn Navy Yard. The Arlington station operates on 2,300 meters; the Wanamaker station operates on 1,800 meters. That is a difference of wave length of 25 per cent. The power of Arlington and the power of the Wanamaker stations are of the same order. The Brooklyn Navy Yard station can not receive from Arlington while the Wanamaker station is transmitting. That is an established fact. The Government inspectors of the port of New York know that, because the Navy has complained of the interference of the Wanamaker station.

At the request of Mr. Sadenwater, I set up some of my apparatus at Columbia University, which is about 5 miles from the Wanamaker station. I had absolutely no difficulty in receiving messages from Arlington while Wanamaker's was transmitting. I could put the telephones on the table and read the messages from Arlington. In order to hear the messages from Wanamaker's you had to take the telephones up and put them on your ears and then had to wait until Arlington stopped before you could detect they were there.

In order to duplicate the conditions under which the Brooklyn naval station was working, I went over to the Lackawanna Station. The Lackawanna Station is just the same distance from Wanamaker's that the Brooklyn Navy Yard is; that is 2 miles. I took with me a set of amateur apparatus. Part of it I had purchased from amateur manufacturers and part of it I had knocked together myself, and part I had borrowed from amateurs—amateur apparatus. And I set the apparatus up at the Hoboken Station and we received messages from Arlington while the Wanamaker station was sending without the slightest interference. That was witnessed by the Government inspector, Mr. Sadenwater, and by the Marconi engineer, Mr. Elenschneider. I can not understand why the Brooklyn Navy Yard can not duplicate what I

did with amateur apparatus, because I know I can pick out at least half a dozen amateurs who can do exactly what I did. And I can guarantee to repeat that 24 hours of the day; I can guarantee that with the apparatus which I used we can receive Arlington on 2,300 meters while Wanamaker's is working and never miss a dot.

What, beyond a possibility of a doubt, might have happened in the case of the Wanamaker station under the conditions just outlined, were the Navy Department in control, would most certainly happen to any amateur who, no matter how strictly he might hold himself to the provisions of the law, and no matter how conscientious he might be in carrying out the letter and spirit of that law, might find himself the victim of circumstances such as these.

The point is, that the amateur would rest much easier, feel a decidedly greater sense of security, were the regulation, as it applied to him, allowed to rest in the hands of the Department of Commerce, because experience has shown that that department can and does give him a square deal, and that his representations to the Department of Commerce are given the same careful and just consideration as is given to the representations of the commercial companies or the Navy Department.

I do not wish to insinuate that the officers or the enlisted men of the Navy Department would deliberately give the amateurs other than a square deal, but even the experiences of the past few weeks, to wit, the framing of a bill by Navy people which entirely overlooked the amateur and gave him no place in the scheme of things radio, is very decided evidence that he is not given much consideration by the men of the Navy; because, perhaps, their entire attention is (and it should be) given to things military. I wish here to bring out the point that the amateur as a body has no quarrel with the Navy Department. Without the possibility of a doubt amateurs as a whole have a high regard and great respect for the ability and accomplishments of the Navy personnel.

It has been brought out before this committee that the Navy is very seriously concerned over the possibility of interference from the amateur, and the amateur in turn is very seriously concerned over the possibilities of another kind of interference from the Navy, namely, interference by legislation, and they—the amateurs—have yet to hear a convincing argument as to why it is necessary or desirable from the standpoint of anyone concerned for the Navy to control the regulation of the amateur.

Second, will you please consider the subject from the standpoint of the inventor? Whether he knows it or not, every serious amateur is potentially and at heart an inventor, and I wish to call your particular attention to the fact that the possibilities of development tending toward the improvement of the art from this direction are not to be passed over lightly. As an inventor, it is decidedly to his interest to do everything in his power to prevent the monopoly of radio by the Navy, as has already been brought out before this committee, both at the present hearing and previously.

Third, every amateur is, or is potentially, a thorough-going, energetic citizen, willing and ready to bear the burdens of full citizenship, and as such and as one with whom radio is a hobby, takes particular interest in the quality of the service and the state of development of radio as it is actually applied to the branches of the military

service on which he depends to protect his citizenship. He is firmly anchored in his beliefs that continual changes should be taking place in the radio equipment employed by these military arms to the end that absolutely the best, and nothing but the best, be at all times available and in service ready for emergency.

Were the Navy to take over and operate the radio systems of the country as a commercial proposition, on the grounds that it will effect a great economy and a conservation of effort and resources, he most seriously, gentlemen, asks this question: "Is it not most likely, that the Navy Department in its effort to bring credit to itself for an economic administration of commercial radio traffic, yield to temptation, and in so doing seriously neglect development in efficiency of equipment, and is not this apt to lead to a serious situation in times of national peril?"

Should this bill, against the wishes of the amateur, be passed in any form, the Radio Club of America wishes to recommend that its passage be in such form as to include in detail the following points:

That all amateur stations be licensed to transmit, only when the operator, upon examination, is found to be able to effect transmission and reception of messages at the rate of 60 letters per minute, Continental Morse Code.

That all receiving stations be licensed, but that no operator's license be required for the operation of a receiving station.

That amateur transmitting stations be restricted to wave lengths of 250 meters and below, except in cases where operation above these wave lengths will not interfere with handling of commercial and naval radio traffic, and where good cause for the operation at longer wave lengths can be shown.

That, excepting within a radius of 5 miles of a naval receiving station no geographical limitation be placed upon the power used by the amateur transmitting station.

That the power restrictions governing amateur radio transmitting stations be allowed to remain as defined by "The Act to Regulate Radio Communication" of 1912, pending a national conference of amateur radio organizations, which may be called to take place in the near future, and at which the Navy Department and possibly the commercial interests should be represented, this conference to be called for the purpose of launching a policy with regard to amateur radio activities, satisfactory to the Navy, commercial and amateur interests alike.

The CHAIRMAN. Mr. Vreeland, if you would like to be heard, we will hear you.

STATEMENT OF MR. FREDERICK K. VREELAND, MONTCLAIR, N. J.

Mr. VREELAND. My residence is Montclair, N. J., and occupation is research in electro physics.

I feel very hesitant in coming before you at this late hour when your patience is already sorely tried. My only excuse in doing so is that I represent a viewpoint that has not been presented to the committee thus far, and that is the viewpoint of the inventor and worker in developing the art. If you care to have that viewpoint presented, I shall be glad to do it very briefly.

I am not much interested in the operating end of radio telegraphy. My sphere is in the laboratory, and my work consists in learning what I can of the secrets of nature and trying to apply them to some useful purpose in the progress of the art. I am interested in this bill, because I think it provides the means of greatly stimulating the progress of research in the development of the art.

In order to explain why I feel thus, let me outline very briefly the situation that confronts the inventor. I have felt for many years that a monopoly in the operation of radio telegraphy was inevitable. I feel to-day that it is right at hand. It has been very frankly admitted that the monopoly exists already in the ship-to-shore field, and I think the danger of monopoly is even greater in the long-distance field, because of the greater expenditures involved and because of the more complex patents situation.

The reasons for the monopoly are not only the physical limitations, that have been very fully pointed out, arising from the use of just one medium of communication, but are found more particularly in the very complex patent situation.

It should be clearly borne in mind that radio telegraphy is not the work for any one man, but of a great many men.

Mr. Marconi was the first to make radio telegraphy a practical success. I give him all honor for that. But his early apparatus went into the scrap heap long ago, and the apparatus that we have to-day is the work of a great many contributors all over the world. Each one of those workers has taken out patents. Those patents overlap and interlace, in a manner that is well-nigh hopeless. If it be left to the courts to straighten out the tangle, I think I am safe in saying that many of the devices would become obsolete before the matter could be settled.

The consequence is that the only way to carry on successfully radio telegraphy is to have the patent rights acquired by some concern which is rich enough to buy them, or which is strong enough to snap its fingers at the inventor and let him spend his energies, if he will, in litigation.

That situation, I think, is unavoidable. Nobody to-day can operate a practical radio station without infringing a number of patents owned by scattered individuals or concerns, and the worst of it is that it is very difficult to know just whom you are infringing. The only way I can see to straighten out the tangle is to cut the Gordian knot and so perform a great service in the development of the art.

So much for the present and past situation.

As to the future, I think that if the control of radio were put in the hands of the Navy Department, instead of in the hands of a private monopoly having only its self-interest to serve, it would greatly stimulate research and invention, because it would offer to the worker a reasonable hope of receiving a fair reward for his work.

You know, gentlemen, that inventions in this art are not made by a man sitting in a dark room knitting his brows, and then emerging with an invention full fledged. In nearly every case they are worked out by a long process of painstaking research.

That research costs money and it costs time. The research worker is usually poor. He is almost always a poor business man, and

when he has produced something useful, the only chance of reward that he has is through a patent.

When he gets a patent, in the present situation, it is very difficult for him to realize on it, unless he is willing to spend great sums in litigation. And, furthermore, he falls an easy prey to the promoter representing various interests, who usually get the lion's share of the bargain.

Both of these difficulties could be cleared away, I believe, in the way that has already been outlined by Commander Hooper. I believe that if the Navy Department were given a free hand in this art, they would be able, by means of such a committee or board of patent investigation as has been proposed, to offer to the inventor a reasonable prospect of putting his invention into practice and receiving such reward as will enable him to go on and make new inventions.

I do not mean by this that the Navy Department itself should take up the technical development of the art; I do not understand that they have any intention of doing so. But, by gathering under one head the various interests involved, and giving the inventor a reasonable opportunity to present his claim, and if it were found worth while and the means for putting it into operation were provided, a very great service would be performed.

There is one point on which I differ from the suggestion of Commander Hooper, and that is as to the manner in which agreements that might be reached between the inventor and such a commission should be adjusted. I think it would be very unfortunate if this matter were thrown back into the Court of Claims.

Mr. GREENE. I was going to suggest that that seemed to be the idea on behalf of the Navy, to go to the Court of Claims; and they would probably be as white haired as I am before they would get a decision. [Laughter.]

Mr. VREELAND. That is precisely my point, Mr. Greene. I wish some adjustment might be reached whereby such agreements as might be entered into between the inventor and the patent board might be carried out and the inventor get his just dues in a reasonable time, without having recourse to the Court of Claims.

Mr. EDMONDS. If a patent is purchased by the Navy Department, to whom does it belong?

Mr. VREELAND. I am not a patent lawyer, sir. Mr. Dyer can answer that question much better than I can.

Mr. EDMONDS. Would it be your idea that a patent bought by the Navy Department would become public property and anybody could use it?

Mr. VREELAND. I am not informed on that point.

Mr. EDMONDS. Well, it is only a question of whether the public money should be used for the purpose of procuring a patent which anybody could use, because I do not think anybody in the Navy ought to own it.

Mr. VREELAND. Mr. Dyer, who will follow me, has had wide experience in patent law, and I think he can answer that question.

Mr. EDMONDS. All right; I will ask him.

Mr. VREELAND. And I think, furthermore, that a Government monopoly would not mean, in any sense, a monopoly of manufacture. On the contrary, I think if the Government had control of the patent

rights it would throw the manufacturing field open free to all, for normal, healthy, competitive manufacturing.

Mr. EDMONDS. You answered my question right there, then.

Mr. VREELAND. I thought you referred to the legal question; and my point is—

Mr. EDMONDS (interposing). You said if the Government controlled the patent, it would throw the manufacturing open to everybody.

Mr. VREELAND. For this reason: That they would all be manufacturing for the Navy Department, which would be the owner of the patents. A manufacturer has a perfect right to manufacture for a patentee, or the owner of a patent, who orders the articles from him. Therefore, I say the Navy Department can order from anybody it pleases, and he will be free to manufacture without infringing any patent rights, if the Navy Department owns the patent rights.

Mr. EDMONDS. You mean that any manufacturer making the article for the Government, which owned the patent, could not patentee may lose his rights.

Mr. VREELAND. Yes, sir. You see that is quite a different matter from the question as to whether ownership by the Navy Department would make the patent public property.

Mr. EDMONDS. Yes, that is quite different from what I was asking about.

Mr. VREELAND. Yes, I see.

Mr. GREENE. Well, it would be a sort of autocracy—the thing that we are trying to get rid of.

The CHAIRMAN. No, his idea is that if the Government owned the patents, the Government could then let out the manufacture of the patented articles to as many different agencies as it desired.

Mr. GREENE. Well, that is all theoretical.

The CHAIRMAN. Well, any patentee can do that, can he not?

Mr. VREELAND. Can do what?

The CHAIRMAN. Let anybody he chooses manufacture the article of which he controls the patent.

Mr. VREELAND. Yes, sir; but if the patents are controlled by private interests, the private interests which control the patents are not likely to do that; they are likely to keep the rights to themselves.

Mr. GREENE. Well, they have the opportunity which should be given to every American citizen to try to earn a dollar.

Mr. EDMONDS. When he gets a patent, the Government guarantees him a monopoly of it for 17 years, and if he can not exercise that monopoly he is deprived of his rights under the law.

Mr. GREENE. Well, if we turn it over to the Navy Department, the patentee may lose his rights.

Mr. EDMONDS. Yes, they might abolish the patent laws as to inventions in this art.

The CHAIRMAN. I do not think you understand what the witness meant; I do not think he has that in view.

Mr. GREENE. I do not know what he meant; I know what he said.

The CHAIRMAN. Well, it is very clear to my mind what he meant.

Mr. VREELAND. But that is an incidental point, to my mind. The main point I want to make is that, from the viewpoint of the development of the art, I think that the control of the situation by the Navy Department, rather than by private monopoly, which I think

is otherwise inevitable, would greatly aid in the development of the art by stimulating workers to put forth their best efforts.

Mr. GREENE. Well, you had better get elected to Congress, and come here and try to put a bill through in that way. [Laughter.]

Mr. BURROUGHS. Did I understand correctly that you had sold out any patents yourself?

Mr. VREELAND. I have not sold any outright; I have sold some devices under license.

Mr. BURROUGHS. To whom?

Mr. VREELAND. The Government is using several of my devices; they are paying a nominal royalty, or license fee, pending adjustment after the war. Being a patriotic citizen, I thought it my duty not to press the Government for an adjustment during the war; that adjustment is pending; they are simply paying a nominal fee at present.

Mr. EDMONDS. Are other companies using your devices?

Mr. VREELAND. Yes, sir. Nearly every high-power receiving station in the world is using a device covered by one of my patents, and thousands of minor stations in addition.

Mr. EDMONDS. And they are not paying you?

Mr. VREELAND. The Government is the only one that is paying me a cent.

The CHAIRMAN. Have you anything further to submit, Mr. Vreeland.

Mr. VREELAND. No, sir; I am through.

The CHAIRMAN. Mr. Dyer, we will hear you briefly now.

STATEMENT OF MR. FRANK L. DYER, MONTCLAIR, N. J.

Mr. DYER. Mr. Chairman and gentlemen: I practiced for a good many years as a patent lawyer but am now retired.

For many of those years I was intimately associated with Mr. Edison, at Orange, N. J., and was general counsel for Mr. Edison and the various Edison companies from 1897 to 1912; and for a number of years I was the president of the various Edison concerns at Orange. I am in the manufacturing business independently at the present time. I am also an inventor myself and for many years have been very much interested in inventions and inventors.

I hope that I can say, in a few words, something that has not as yet been said to the committee, first, in reference to the patent situation in this art that I think the Navy Department was confronted with; and second, with regard to my own experience and my own knowledge of the extent to which inventions have been developed and are being developed by the Navy Department.

In expressing any opinions as to patents, I am doing so largely from memory, because when I came down here I did not expect to address the committee.

But it has been very obvious to me, Mr. Chairman, that the committee has not been informed correctly as to the patent situation, even to the remotest extent.

I will take a device in which I am personally interested, with Mr. Vreeland, merely as an example of the point I wish to make. And that is the modern high power receiving apparatus, employing un-

damped waves, used in these stations that you have been told about during the hearings on this bill. And I will tell you how that device was developed, and who contributed to its development; what patents cover it; and who owns those patents, so that you may see how tremendously complicated the whole patent situation is, and how obviously impossible it would have been for the Navy Department, confronted with that patent situation, to attempt to decide the questions presented to it. But I want to repeat, Mr. Chairman, that I am relying entirely upon my memory as to the patents, and my purpose is not so much to discuss the scope and bearing of particular patents as it is to illustrate the difficulties of the situation.

The modern high power receiver using undamped waves involves, in the first place, as I am informed, an arrangement invented by Marconi, known as four-circuit tuning, the patent on which is owned by the Marconi Co. I cordially indorse, of course, all that Mr. Vreeland has said concerning Mr. Marconi; he stands as the great shining light of this art. And I know, from my own association with Mr. Edison, that he also looks upon Mr. Marconi as one of the world's great inventors. Thus, at the very start, we find that every receiving apparatus using the undamped wave infringes this four-circuit tuning patent owned by the Marconi Co.

The second patent involved in this apparatus is the so-called undamped wave patent of Fessenden, owned by the International Co. I do not know whether that patent has been sustained or not; my recollection is not clear as to that.

In the third place, these undamped wave receivers utilize the so-called heterodyne system; that is to say, the oscillations generated in the antenna of a certain frequency have superimposed upon them oscillations of a slightly different frequency, so that beats are secured, which are heard as an audible note in the telephone. But the heterodyne receiver, invented by Fessenden, was not the perfected device of modern times; it was a very crude arrangement that occupied very much the same relation to the modern art that the original Bell telephone did to the perfected art of telephony. The Bell telephone as a commercial device was made possible by the later invention of Berliner, but Prof. Bell discovered the broad principle and he was, therefore, entitled to the patent, by which the Bell Co. dominated the telephone field until 1898. The heterodyne receiver, as developed by Fessenden, was a device in which the oscillations in the antenna circulated in one coil of a so-called dynamometer telephone and the oscillations of slightly different frequency circulated in the second coil of the dynamometer telephone. But that showed the principle. Mr. Fessenden also stands very high in the wireless art. He was an experimenter with Mr. Edison at one time. All modern receivers using the undamped wave involve the heterodyne principle.

The fourth step in the development of the undamped wave receiver was made by Mr. Vreeland away back in 1907. Mr. Vreeland was the man who first combined in one and the same circuit the effect of the oscillations in the antenna circuit and the oscillations of slightly different frequency generated in the local circuit, so as to obtain in this way electrical beats as distinguished from magnetic beats, as proposed by Fessenden. Those electric beats could be detected by extremely delicate detectors, and thus the sensitiveness of

the receiver was increased, making it possible to transmit signals over a long distance. Thus, this invention of Mr. Vreeland's was a further advance in the art.

The fifth step was also made by Mr. Vreeland, and that was the discovery that the beat current generated by the interaction of the two sets of oscillations of slightly different frequencies could be rectified by means of a rectifying detector, making it possible to use a magnetic telephone as a receiver and further increasing the sensitiveness of the device. That was the fifth step; and all of these undamped wave receivers embody that invention.

The sixth step goes back again to the Marconi Co. They have a patent on a device called the "Fleming valve," which was the forerunner of the modern audion, and all of these undamped wave receivers employ this invention as a special kind of detector to permit the highest practical results to be secured.

The seventh step was the use of the De Forest audion, a special refinement of the Fleming valve, the patent on which is owned by the De Forest Co. Audions are used in all undamped wave receivers to secure a further measure of sensitiveness.

And the eighth and final step, so far as I know, was the so-called regenerative audion invented by Mr. Armstrong and covered by his patent, by which the effect at the receiver will be greatly magnified, or in other words, by which a further degree of sensitiveness to the apparatus will be secured.

So that we have in this one apparatus, which is not much larger than a small music box, eight separate patents, all of which are used, and all the result of the work of different inventors; and owned, respectively, by the Marconi Co., International Co., Mr. Vreeland, De Forest, and Armstrong.

Now, it is perfectly understandable to me, Mr. Chairman, how greatly mystified the Navy Department must have been in the face of this situation. Naval officers are not patent lawyers; I doubt very much if they know what patents are. They were waited upon by the Marconi Co., who said "You infringe our patents." They were waited upon by the International Co., who said "You infringe our patents." They were waited upon by us, and we said "You infringe our patents." The De Forest and Armstrong people also waited upon them, and said "You infringe our patents." And they did; they infringed the patents of all five of those interests.

So that the situation, as Mr. Vreeland has said, was so intricate, so absolutely and utterly intricate, that I do not see how it possibly could have been straightened out.

It became intricate largely because of the peculiar situation underlying this art when it had its inception; and that was, that we all thought that wireless had a much greater field than it turned out to have. It was looked upon as a very wonderful thing, an improvement on the cables, a probable substitute for cables. Naturally, very many men entered the field and began to do experimental work and make inventions, for which a very great number of patents were secured. To mention only two names, I believe that Mr. Fessenden has secured upward of 100 patents and Mr. Shoemaker has obtained, perhaps 60 patents. So that in this small art, which does not amount to very much, we have an unusually large number of patents. Consequently when a device is finally perfected, it is found to embody

not the patents and inventions of one man, but generally the patents and inventions of a large number of men. When I say that the art is small, I mean that it does not amount to very much compared to many other industries, such as the talking machine business for example. I doubt if the entire value of the entire wireless industry in this country, including all the naval stations, all the privately owned commercial stations, all the amateur stations, and all the factories employed for manufacturing wireless apparatus, is as large as a single year's output, for instance, of the Victor Talking Machine Co., to mention only one concern of many engaged in the phonograph business.

I want to say a word also as to what I know about what the Navy has done in the development of inventions within my own experience or knowledge. Of course, we all know the extent to which armor-plate has been developed by the steel companies in cooperation with the Navy. I know, myself, through professional connections, that the E. W. Bliss Co., of Brooklyn, N. Y., cooperating with the Navy Department, has been able to increase the range of the automobile torpedo in 20 years from 2,000 yards to 8,000 yards. The public prints tell us of the magnificent work of the Navy Department, cooperating with the General Electric Co., in the development of the electric drive for battleships, and I have no doubt that many hundreds of other inventions have been developed in the same way. I know that the Navy Department has cooperated with the Sperry Co., Mr. Sperry being a personal friend of mine, in the development of the gyroscopic compass, range finders, and other special types of apparatus used in the Navy. I know that the Navy Department has cooperated with the Western Electric Co. in the development of inventions. Admiral Fiske was at one time a client of mine; he is an inventor of prominence and I know that through his cooperation with the Western Electric Co., a great deal of experimental development was done for the Navy's use. So that I think the gentlemen who are opposing the bill on the ground that the Navy Department will not develop inventions are probably of the belief that the development is to be undertaken by the department alone and they may not be aware of the fact that the practice of the Navy is to develop inventions in cooperation with the large concerns, to which I have referred, and whose facilities for the purpose are the finest in the world.

Before closing I want to refer to the question put by Mr. Edmonds to Mr. Vreeland, namely, whether the assignment of a patent to the United States does not in fact open the monopoly to any one. I am frank to say that I know of no case where that question has ever been judiciously answered. But I should say that since the United States Government has the unquestioned right of ownership in property generally, I can see no reason why its right of ownership should not extend to the particular kind of property that is represented by a patent, with all the rights that go with it, including the right to prevent infringements of its property, just as it may prevent trespass on its lands, wharves, docks, and buildings. If it is the desire of the patentee to give the public the right to unrestricted use of the patent, that is done, not by assignment to the Government, but by a dedication to the public. This has been done in a number of instances where patentees have been sufficiently influenced by mo-

tives of altruism and public spirit to forego their own possible profit for the general good.

I thank you very much for hearing me.

The CHAIRMAN. Capt. Todd, the committee will now hear you.

ADDITIONAL STATEMENT OF CAPT. D. W. TODD, DIRECTOR NAVAL COMMUNICATIONS.

Capt. TODD. I have not much to say, Mr. Chairman; I can finish what I have to say in 10 minutes.

There are a few points in connection with the bill that have been covered in a way which might leave a false impression in the minds of the committee. I do not want to go into details, but to bring out the principal points.

I will follow the division of the different kinds of stations that have been made by some of the witnesses—the amateur station, the ship-to-shore station, and the high-power station.

In the first place, the bill has nothing to do with patents, about which you have heard a great deal. It has nothing to do with manufacturing in itself. If there is anything in the bill that seems to indicate that a manufacturer may not test his apparatus to the limit, that means that there is a defect in the bill which should be corrected.

The bill has nothing to do with development. The market would be just the same as it is at present, unless there is a possibility of a vast multiplicity of stations. At the present time we have reached our practical limit of ship-to-shore stations and are close to the limit for high-power stations.

The number of high-power stations needed by commerce and by the Government increases faster than the art. Of course, without this proposed legislation, should there be a multiplicity of stations, there would be more opportunity for the manufacturers to sell their wares. Present indications are that there can be no multiplicity of stations for overland or overseas work.

The Navy must continue to buy new sets for the shore stations, so as to keep up to date all the time. The Navy must still buy sets for its ships and keep replacing them as the art advances.

The merchant marine must still have its sets. The amateur must still get parts of sets and put them together, and have his home station.

As to the amateurs, I am glad they have been stirred up about the bill, because it has helped them to clear their own minds and has taught all of us how very difficult it would be for them to agree among themselves—extremely difficult.

I have been told that they have tried since these hearings to get together, with very poor success.

Mr. GREENE. May I say a word just there? There was only a limited number of amateurs here, and of course you could not expect these men to undertake to agree for men whom they could not confer with, unless they had had a wireless apparatus available, so that they could confer with them. They were not able to confer with the large number of amateurs who did not come here; they had a few men representing them here, and there was some difference of opinion among them.

But from the men that I have been conversing with, I did not find any great lack of unanimity or agreement on the bill. They were

largely against it, and some of them very fiercely against it; and some of them went away because they had it explained to them, so that they were satisfied; others that had not had it explained were not very well satisfied; and then, after they had had it explained, they were not very well satisfied; and then they said that they could not undertake to subscribe to an agreement without conferring with some of the vast number of men engaged in the radio art; it would have been ridiculous for them to have undertaken to bind other people without conferring with them; they could not do it.

Capt. TODD. The point I was trying to bring out is, that it is just as well that we did not try in the beginning to incorporate in this bill anything that would please the entire number of amateurs; but I have every confidence that the great majority of them will be satisfied with the provisions of any bill which will be acceptable to your committee, as any such bill will surely recognize them and their needs.

Mr. GREENE. They do not know what this committee is going to do, and we do not ourselves know what it is going to do; it has not been decided yet what this committee will do.

Capt. TODD. From the earnestness with which the amateurs talked, I think it probable that you will pay considerable attention to them.

The second lot of stations is the ship-to-shore stations. The present status is that there are only five of those, if I am not mistaken, within the continental limits of the United States that we do not own. Of those five, the owner of two only have appeared here, the United Fruit Co. The owners of the others have not opposed the bill.

The CHAIRMAN. Who owns the other three stations?

Capt. TODD. The International Radio Co.

Mr. GREENE. Have you not bought any part of their apparatus?

Capt. TODD. No; not that in their stations. It is not for sale—except their patents.

Mr. GREENE. You have bought their patents?

Capt. TODD. No, sir. I do not know about patents, but I do know that they are trying to sell their patents to the Navy Department.

The ship-to-shore station business, then, is practically in the hands of the Navy, and I am thoroughly convinced that it will continue to be so, because there is not enough money in it for private interests; we have maintained that again and again, and we believe it more every time we say it.

There is one point about ship-to-shore work that has not been clearly brought out: That is, that the ship-to-shore work is conducted according to an international agreement and covered by the international convention signed in London in 1912. The act of 1912 was originally based on the Berlin convention. It was the hope at that time that the United States would ratify the Berlin convention and join the great family of nations in getting the most effective regulations for doing the ship-to-shore work, so that the needs of commerce would be served, no matter what coast a ship might be on, and life at sea might be safe.

Before Congress passed that bill the provisions of the London conference were cabled over here; so that any changes from the Berlin convention might be incorporated in the bill.

All of this talk about operating on one or two wave lengths—300 or 600—is beside the question, since, by the ratification of the London convention, it became the law of the land, and must await a

coming international conference, which was scheduled for Washington last year and will follow the treaty of peace in about a year, undoubtedly. Of course it is quite possible for one nation to denounce the convention, and then after a space of time, leave the society of other nations and handle radio the way it pleases; but that is not practicable.

I will just touch on the question of interference: Considering all of the sad things that have been said about the inefficiency of naval operators and the tendency of naval officers to reach out, perhaps I am taking a chance in saying that I have had the administration of cable censorship, in addition to my duties in connection with radio communication. There is one cablegram that passed through our hands that saved the Government \$7,000,000. That paid for all the expenses of the censorship for the entire war many, many times over. And it justified the cable censorship in itself.

In addition to that there is no way of telling how many schemes of German agents and enemy plans were upset by the cable censorship. That is a very intangible thing, and we will never know just how many transports and cargo ships we have saved from enemy submarines. We know that we did accomplish some very interesting things.

The thought I am trying to bring out is this: If you do not pass some legislation which will make ship-to-shore work safer by putting further limits on amateur operation, which become necessary on account of the increased efficiency of apparatus and the advance of the art; and if you do not concentrate in one authority the operation of all coast stations and take care of the question of interference in every way possible there is always the chance of the station which is trying to save life at sea being interfered with. There is always that chance; and the loss of a single ship, with her cargo and her crew, due to some cause that was not unavoidable, some point which might have been covered by legislation—even that alone would be a justification for some action by Congress in this matter. Some immediate congressional action is also necessary in the line of licensing all receiving stations, otherwise all radio traffic will continue to be public property.

The Navy Department has been, possibly, a little on the defensive before this committee. It should be understood that it is the duty of somebody to advise the Government on all matters connected with it. The department of the Government which should advise Congress, or the Government generally, on radio matters is that department which has the greatest operating experience. It is not the Patent Office that should do it; it is not the department that licenses stations; nor is it the Post Office Department, which is interested in communications in general. The department to which radio communication is a very practical thing, a vital necessity, and which has, from the very nature of things, an interest in progress in the art and knows most about it, should be the department whose opinion should be most valuable in framing new legislation, and may be expected to be first in sounding an alarm when new legislation is necessary.

With regard to high-power stations, I will say that there are, outside of those owned by the Government and those on United States soil, only three high-power stations in the world. Two of them are British Marconi, and one of them is Canadian Marconi.

On our own soil, we have five high-power stations. Four of them are Marconi stations and one is Tuckerton. Of the three high-power stations that are not on American soil, two are the original Marconi high-power stations, Clifden and Glace Bay, with apparatus that I am sure even the Marconi Co. admits is obsolete; in fact, they have said it was obsolete, and they have said it was withdrawn from their latest stations, New Brunswick and Marion, and replaced by later apparatus, which they call the "time spark." The efficiency of that, as compared with the continuous wave apparatus which the Navy Department has been using for some time—under patents which we have purchased, so that we would be sure to have it without any argument—all radio engineers would say that any comparison between the time-spark apparatus and the Navy apparatus would be very much in favor of the naval apparatus, and that the other is out of date already, before it has had a good chance to do any real work.

On the Pacific coast, however, between Honolulu and the California coast, those Marconi stations have apparatus earlier than the "time spark," similar to those of the original stations I spoke of, which is very much out of date; and when they operate, they disrupt not only all the stations receiving on the island of Oahu, but the station on the California coast sometimes stops high-power communication along the entire coast.

That is the high-power transmitter which some witness has said had been removed from New Brunswick and from Marion as being obsolete; they are still in operation on the Pacific coast, or would be if we had not silenced them for a while. The act of 1912 does not cover their case. All United States high-power stations use American-developed and American-built transmitters, except Marconi, which uses English type and English-built transmitters.

I was sorry to hear a gentleman representing the Chamber of Commerce of Honolulu oppose this bill, because we need absolute control in the Hawaiian Islands. They are our key to the Pacific; their strategic value can not be overestimated; and there is nothing more abhorrent to our ideas than to find three high-power stations on one little island in the Pacific Ocean, especially when one of them is equipped, confessedly, with an out-of-date transmitter. If we should obtain the Kahuku Station, we should probably not operate that station at all with its present outfit. We could handle much more work without it than with it.

Of course, the answer is that other people could make it work; and the gentleman from Honolulu says there is no such thing as interference there, because he gets his dispatches there every day. The business of the entire Hawaiian Islands is small, and the two high-power circuits, plus the cable service, can handle all the business naturally in a day; and the radio business certainly can be handled by two stations keeping quiet while the other is working, taking turns, in other words. That is not a proper use of facilities; that is exactly what we wish to avoid by putting all of these stations under one control, and by keeping all stations equipped with apparatus combining power and efficiency.

As to the shutting off of private messages, that was entirely dependent upon the congested conditions, and we relieved the situation as much as we could by handling Government business by high-power stations. The messages they would send could be read in

Germany, which would have been a very great menace; and that had to be stopped. By agreement of all the departments interested, we had to do that. As a result there was further congestion on the Pacific cable, which had its traffic enormously increased on account of the war. The shutting down of private messages was an absolute necessity and not an arbitrary Government measure.

There is one final thing I should like to say about the next international conference. I have shown you how few high-power stations there are that are not Government controlled. Norway, Italy, France, Japan, and Germany all have their high-power stations in their own hands. No other nation has any high-power stations except Great Britain and ourselves. I have no doubt but that the next international conference will internationalize all high-power stations; and it would be a wonderful thing if, by the passage of this bill, we could be in a strong position for that conference, by being prepared in advance with stations equal or superior in equipment to any in the world; and I want to say very emphatically that one of the most important things which must in time be accomplished by a bill similar to this will be the absolute prevention of the building of foreign-owned or foreign-controlled stations on American territory anywhere for the extension of foreign systems to our shores. Since it has been shown in the past that this thing is possible, that it has been done, it should be absolutely and positively prevented for the future.

I thank you, gentlemen.

Mr. NALLY. Mr. Chairman, may I have just one minute to make a statement?

The CHAIRMAN. Is there anybody else to be heard on behalf of the Navy Department?

Capt. TODD. No, sir.

The CHAIRMAN. Then you may make your brief statement now, Mr. Nally.

ADDITIONAL STATEMENT OF MR. E. J. NALLY, VICE PRESIDENT AND GENERAL MANAGER MARCONI WIRELESS TELEGRAPH & TELEPHONE CO.

Mr. NALLY. I merely wanted to ask, first, if Messrs. Vreeland and Dyer would not, in the interest of truth, change their testimony and relieve the Marconi Co. of the charge of infringing the heterodyne and the Vreeland improvements? Because we do not use the undamped wave; we use the damped wave, and consequently we have not utilized the heterodyne improvement, and therefore have not utilized the Vreeland improvement.

I also want to say, in passing, that while I will not argue with Capt. Todd that the equipment of the Japanese Marconi circuit is the latest thing, yet it is true that it is doing to-day very, very effective work, or was up to the time the Navy took it over; and we think, in the hands of our trained men it could continue to do very effective work. We think if we could continue to work it now we could very greatly relieve the present congestion on the Pacific coast, where it now takes seven days to send a message to Japan.

Mr. DYER. Mr. Chairman, in reference to Mr. Nally's statement, I made no charge of infringement in my statement. I merely attempted to explain what patents were used in the apparatus which I referred to as the modern high-power receiver with undamped waves. Of

course, if the Marconi Co. does not use that, then it does not infringe the patents.

MR. GREENE. Mr. Chairman, I have a number of letters and a number of documents that have been sent to me in connection with this hearing that I should like to have inserted in the record.

The CHAIRMAN. Very well; we can go over them later and have them inserted.

Representative LUFKIN. Mr. Chairman and members of the committee, I am not here to either favor or oppose this bill. I am not familiar enough with the details of the proposed legislation to do this at the present time. But I do want to call the attention of the committee to the views of the thousands of amateur radio operators in this country as expressed in a very interesting and remarkable letter which I have just received from a boy residing in my congressional district, who is one of these amateurs.

I ask permission of the committee to print his letter in the records of the hearings:

[Copy.]

ESSEX, MASS., December 9, 1918.

Congressman W. W. LUFKIN,

House of Representatives, Washington, D. C.

DEAR SIR: As a radio amateur I am writing you a protest against the Alexander bill (H. R. 13159), which may prohibit amateur wireless. I understand that this bill provides that the Navy shall take over all radio stations, and it entirely ignores the amateur. This means that we will not be allowed to operate our stations again.

I wish to bring out some of the points in favor of the amateur. When the United States entered the war the Army and Navy were in great need of trained operators. The result was that thousands of our best radio amateurs enlisted their services for our United States. Most of these men needed but little training in radio to assume active duty. It would have been impossible for the Army or the Navy to train men in the short time that they would be required for active duty.

There are at present many former radio amateurs in the service of our country. When they are discharged from the service they will want to reopen their radio stations. If they can not, do you think they will think the same of our Government as they did before we entered the war?

The present high stage of development of radio communication is largely due to discoveries made by radio amateurs. One of the greatest of these is the regenerative receiver invented by Edwin H. Armstrong, now captain in the United States Army. This system is used in every naval station of the United States, and has more than doubled the distance over which a station can operate. Another great invention is that of the wireless controlled torpedo, by John Hays Hammond, jr. The Navy recently purchased his invention. At the time it was being tested and developed Mr. Hammond was an amateur.

Many high governmental positions are now held by men who were radio amateurs before the war. Many of the amateur stations have cost the owners a considerable sum of money. If we are closed up for good, what are we to do with our apparatus, which we worked hard to get? Probably the Government would not care to purchase our apparatus, because theirs is designed in various units, so that stations for the same system will be alike in construction and operation.

Perhaps you remember it was due to an amateur that spies were detected at Sayville, N. Y., and Tuckerton, N. J., stations that transmitted messages to Germany before we entered the war. This amateur recorded these messages on phonograph records, which he handed over to the United States authorities, and they found that they were not like the messages which were passed by the United States censor.

Naval radio experts will admit that amateur radio telegraphy can be carried on without interfering with naval stations. Before we entered the war, the amateurs formed a relay league, and by our organization we were able to trans-

mit messages from coast to coast or from the Gulf to the Canadian boundary without interfering with stations operated by the Government.

The amateurs have saved towns and cities threatened by fire and floods when all other telegraphic communications were cut off from the outside world. The amateurs always tried to obey the laws of radio communication of the United States. In case there were some that were ignorant of the law, they were informed by the more advanced amateurs. These are only a few of the reasons why the amateur should be allowed to reopen his station. I think that action on this bill should be delayed until such time as the radio amateurs who are now in the service of their country—and some do not even know of the existence of the bill—shall have been given an opportunity to be heard.

Trusting that you will do all in your power in the cause of the amateurs of the United States, I remain,

Very truly, yours,

CARL G. RICKEY.

The CHAIRMAN. Gentlemen, the hearings are now closed.
(Thereupon, at 6 o'clock p. m., the committee adjourned.)

APPENDIX.

(The chairman submitted the following letters from the executive departments of the Government for the record:)

DEPARTMENT OF COMMERCE,
OFFICE OF THE SECRETARY,
Washington, December 10, 1918.

SIR: I have received your letter of the 4th instant, inclosing a copy of bill H. R. 13149 to further regulate radio communication, and requesting that I give your committee my views as to whether or not it would be advisable to enact the same into law. You state that the public hearings on the bill are to commence on the 12th instant, and you state that you would like to have my views on the bill by that time.

In reply, it appears to me that the essential features of the bill are:

1. The purchase by the Government of all coast commercial radio telegraphic stations and permanent Government ownership (secs. 2, 8).
2. The permanent operation by the Navy Department of all commercial-coast radio stations (sec. 9) involving permanent naval control of all commercial-radio communication between the land and ships at sea as well as control of communication between the United States and other countries through Government ownership and operation of high-powered stations at American terminals.
3. The prohibition of private or corporate-radio activities (sec. 3).

This department regards Government ownership and operation of commercial-radio service as necessary and inevitable and is convinced that one department of the Government should have full control of the entire matter except as it may delegate to other departments minor fields of control and operation. The Commerce Department, I think, has done fairly well in carrying out in ordinary times of peace the purposes of Congress in establishing a limited system of wireless regulation, but as you are aware, during the period of the war, the operations of the Department of Commerce have properly and necessarily been subordinated to military exigencies requiring full control by the Navy Department.

In war times the Navy Department should unquestionably be supreme and undisputed in this field. Since we entered the war the Navy Department has developed a large personnel and the administrative machinery, and it has accordingly an organization ready for Government ownership, if Government ownership is to come. Furthermore, radio communication is essentially the means of communication at sea and between ships and the shore, so the Navy at all times necessarily has a large interest in its highest development and orderly operation.

If the two fundamental principles, Government ownership of all agencies of radio communication and the operation of those agencies by the Navy Department, commend themselves to the judgment of your committee, I am quite

sure that in all administrative details you would be disposed to defer to the judgment of that department. For this reason, an expression of opinion on my part concerning the mere administrative details of the measure seems unnecessary. The measure, however, as a whole has my approval.

Respectfully,

WILLIAM C. REDFIELD,
Secretary.

HON. J. W. ALEXANDER,
*Chairman Committee on Merchant Marine and Fisheries,
House of Representatives, Washington, D. C.*

TREASURY DEPARTMENT,
OFFICE OF THE SECRETARY,
Washington, December 11, 1918.

The CHAIRMAN COMMITTEE ON THE MERCHANT MARINE AND FISHERIES,
House of Representatives.

SIR: I am in receipt of your letter of December 5, 1918, inclosing copy of bill, H. R. 13159, "to further regulate radio communication," and requesting that the committee be given the views of this department as to whether or not it will be advisable to enact the bill into law.

This bill, providing for Government ownership and operation of all radio stations on land engaged in commercial business, has the unqualified approval of this department. It is not desired, however, that this approval of Government ownership in this specific instance shall be taken to indicate in any degree whatever the views of this department concerning the general principle of Government ownership of public utilities other than radio communication.

The peculiar property associated with radio signals, whereby such signals traverse space in all directions and register their effect on all receiving apparatus within range, would quickly result in confusion and very materially reduce service which mariners may justly expect of this valuable discovery, were stations permitted to operate without adequate Government regulation of radio traffic.

The vast increase in our merchant marine that is now under way will bring about a corresponding increase in the volume of business handled by radio along our shores, and unless efficient Government control of radio traffic is provided for, increased volume of business will be accompanied by an increase in interference between stations both ashore and afloat that will render the handling of this increased volume of business a very difficult task.

Experience has shown, and the principles approved by the International Radio Telegraphic Convention indicate, that competition for business between rival coastal stations is inimical to the efficient development of reliable communication between ship and shore. The monopoly by one system of the coastal radio traffic of the country is essential to the control of radiotelegraphic communication required to give the best service. Such monopoly has been attempted in the United States by at least one commercial concern, but, due to meager revenues from land stations, it has been found impracticable to maintain in operation the chain of stations necessary to the success of such a monopoly.

It is believed that the few companies owning commercial radio stations will welcome this opportunity to dispose of their property for a just compensation and to quit the field of commercial radiotelegraphy, in which, after 18 years of effort, they have learned that the successful conduct of radio traffic and the financial return necessary to give life to the enterprise require a monopoly of the radio communication and traffic afloat and ashore, which they have been powerless to construct.

It is considered that the Government of the United States is the only agency by which is feasible the necessary monopoly of land stations for commercial traffic under one administrative head. The Government can maintain such stations and can guarantee efficient service to the people of the country at large at reasonable rates and to vessels at sea with certainty and dispatch. Should the bill become a law, the Government will be in a position whereby it can issue orders and regulations that will make possible the handling without confusion of the maximum amount of radio business along the shores of the United States, and particularly within certain congested areas. This orderly control of traffic along our shores, guaranteeing as it does the prompt and reliable response to distress calls in time of disaster at sea, is viewed by this

department as a measure of insurance that our merchant marine may rightly demand of the Government.

Since the outbreak of the war the Navy Department has been handling in a very efficient manner all radio traffic between ship and shore in the United States, as well as all transoceanic radio traffic to or from the United States. It has built up an establishment for radiotelegraphy that can supply operators and apparatus to carry out efficiently all the obligations to be imposed upon that department by the contemplated legislation.

The present time is considered opportune for the enactment of the legislation embodied in the attached bill. At present no land stations are in operation under private control, so that no change in the existing status of affairs pertaining to radio traffic will result from Government purchase and operation of radio stations for commercial traffic should this bill become a law prior to the proclamation of peace.

In view of the great benefits that will accrue to the maritime interests of the United States and to the public at large through the passage of this bill, its speedy enactment into law in the form submitted is earnestly recommended.

Respectfully,

W. G. McADOO,
Secretary.

DEPARTMENT OF LABOR,
OFFICE OF THE SECRETARY,
Washington, December 11, 1918.

HON. J. W. ALEXANDER, M. C.,
Chairman Committee on the Merchant Marine and Fisheries,
House of Representatives.

MY DEAR MR. ALEXANDER: I have received your letter of the 5th instant, inclosing a copy of the bill H. R. 13159 to further regulate radio communication, and asking for an expression of my views as to whether or not it would be advisable to enact said bill into law.

When the bill H. R. 19350 was under consideration, that being a bill having a similar object in view, I wrote you, under date of January 9, 1917, as follows:

"I have the honor to acknowledge the receipt of your letter of the 23d ultimo in which you call attention to the bill (H. R. 19350) to regulate radio communication, a copy of which you inclose. You ask that I give your committee the benefit of such suggestions as I may care to make regarding the desirability of enacting the bill into law.

"Taking the bill as a whole, I regard it as a very desirable measure—one which is very much needed and which will go a long way toward remedying evils and difficulties which the experience so far had with radio communication has demonstrated to exist and to require some well-devised and comprehensive action on the part of the Federal Legislature.

"When an interdepartmental committee was formed something over a year ago with the purpose of having a thorough study made of the problems which have arisen and which are likely to arise in connection with the recently developed method of electrical communication, and when selecting a representative of this department to serve upon that committee I expressed the opinion that, in view of the fact that radio communication can not be confined to definite channels to which specific title could be conveyed to individuals or corporations, it ought to be owned and controlled by the Government. Soon after the interdepartmental committee met and organized it requested the heads of the various administrative departments to express a definite opinion as to whether the committee in carrying on its work should have in view the actual acquirement of all existing radio stations, or how far in that direction the bill which it was proposed to draw should go. To this communication I replied by restating the opinion which I had expressed at the outset in detailing a representative. The report submitted to this department by its representative after the committee had completed its labors, the results of which constitute the draft of the proposed measure now under consideration by your committee, shows that the said representative and those serving upon the committee as representatives of the military branches advocated throughout the deliberations of that body the ownership by the Government of the wireless telegraph; that the drafted measure, like all productions of its kind, in the formulation of which a number of individuals take part, is to a considerable extent in a number of its features the outcome of compromises between the

members of the committee who entertained various views concerning this subject.

"I have had no reason to change my mind on this very important question. Upon reading the report of the department's representative and considering the various provisions of the measure produced in the manner above described by the interdepartmental committee, I am more than ever convinced that Government ownership is the real solution of our radio communication problems. I observe that there are many provisions in the drafted bill that tend toward ultimate Government ownership; but I wish to direct attention to two provisions in particular, one of which I think logically constitutes an argument in favor of going further in that direction than the bill at present does, and the other of which I think should be materially changed in order to hasten the ownership by the Government of at least that part of the wireless telegraph business which it is of the greatest importance that the Government shall absolutely control, for reasons of a military, neutrality, and commercial nature.

"It is provided in the next to the last paragraph of section 5 (p. 6, line 16, to p. 7, line 2) that in the Philippine Islands, in the Canal Zone, in certain United States territory in the West India Islands, and in a geographically defined section of the Pacific Ocean, no private radio station shall hereafter be operated on land or on a permanently moored vessel. It is understood, of course, that this step toward Government monopoly can readily be taken because the field involved has been occupied quite completely with Government stations and that stations controlled as private enterprises have not been erected within such territory. But it seems to me that if it is sound upon principle to contend that the Government should have a monopoly of wireless telegraph in these particular sections, by the same token that system of electrical communication should be a Government monopoly elsewhere.

"Section 6 of the proposed measure (p. 7, lines 7-13), I think, would be very much improved if changed to read substantially as follows:

"SEC. 6. That after three months from the passage of this act the Government, through the Navy Department, shall have authority to acquire by condemnation proceedings any radio station now in operation in the United States."

"Commending to the very careful consideration of your committee the suggestion made above, I beg to subscribe myself."

Since the above-quoted letter was written I have had no reason to change my views with regard to the Government ownership of radio communication.

Very truly, yours,

W. B. WILSON, *Secretary.*

DEPARTMENT OF STATE,
Washington, December 14, 1918.

The honorable JOSHUA W. ALEXANDER,
House of Representatives.

SIR: I have the honor to acknowledge the receipt of your letter of December 5, 1918, inclosing a copy of H. R. 13159, Sixty-fifth Congress, second session, entitled "A bill to further regulate radio communication," and requesting my views as to the advisability of enacting the bill into a law.

In reply I beg to inform you that I am in accord with the policy of Government ownership of radio stations in the United States and its possessions, and, in my opinion, it will be to the advantage of the United States in its international relations to have enacted into a law some bill such as H. R. 13159, providing for the acquisition by the Government of radio stations on land or on permanently moored vessels within the jurisdiction of the United States or any of its possessions, and for the regulation and censorship of all radio stations and radio apparatus within the jurisdiction of the United States in time of war or national emergency.

I would suggest that, in the definition of the term "person" on page 2, line 7, the word "Individuals" be added immediately after the word "includes," so that this definition will read "The term 'persons' includes individuals, partnerships, corporations, and associations."

I note that section 2 provides "That the President shall requisition and take permanent possession of, for the use of the Government," certain classes of radio stations. The word "requisition" under existing usage implies the

taking or use of private property for belligerent purposes. If, as would appear to be the case, the present bill is not intended to be a war measure it is possible that it may be desired to substitute for the word "requisition," on page 2, line 9. of the bill some such word as "acquire," or phrase as "to acquire title to."

I have the honor to be, sir,
Your obedient servant,

FRANK L. POLK,
Acting Secretary of State.

(The chairman also submitted the following telegrams for the record:)

NEW YORK, N. Y., December 14, 1918.

Judge J. W. ALEXANDER,
*Chairman Committee Merchant Marine and Fisheries,
House of Representatives, Washington, D. C.:*

We are in favor of the provisions of House bill 13159 and strongly urge its passage as in the national interest. All radio stations on land should be taken over and permanently operated by the Government. ✓

P. A. S. FRANKLIN,
President International Mercantile Marine Co.

NEW YORK, N. Y., December 11, 1918.

Hon. J. W. ALEXANDER,
*Chairman Committee on Merchant Marine and Fisheries,
Washington, D. C.*

The Maritime Association of the Port of New York reaffirms its previous action regarding the regulation of radio communication and strongly urges that H. R. 13159 be favorably reported by the Committee on the Merchant Marine and Fisheries, believing that the enactment of this measure would be of great value to shipping in general. ✓

MARITIME ASSOCIATION OF THE PORT OF NEW YORK,
EDGAR E. LOTHBRIDGE, *President.*

(The chairman also submitted the following letter for the record:)

PANAMA RAILROAD COMPANY,
PANAMA RAILROAD STEAMSHIP LINE,
New York, December 13, 1918.

CHAIRMAN MARINE AND FISHERIES COMMITTEE,
House of Representatives, Washington, D. C.

SIR: We have been asked by representatives of the Navy Department to advise you whether or not our company has any objections to offer to bill No. 13159 relative to the regulation of radio communication.

Our company, as you know, is owned by the Government of the United States. We are operating 12 steamers of a dead-weight capacity, ranging from 4,500 to 15,000 tons; 2 of our steamers are equipped with 5 kilowatt Kilbourn & Clark sets, and the remaining 10 are equipped with Telefunken sets, most of which are 2 kilowatt.

We have no objections to offer to any of the provisions of the bill.

Yours respectfully,

T. H. ROSSBOTTOM,
Assistant to Vice President.

(The chairman submitted for the record the following letters, which cover the grounds of the many protests from the amateurs all over the country to the bill:)

WARRENSBURG, Mo.,
December 19, 1918.

Hon. J. W. ALEXANDER,
Washington, D. C.

DEAR SIR: I see you are the author of a bill (H. R. 13159) whereby all amateur radio stations shall be closed for all time. May I have the privilege of

asking you why you omitted the clauses referring to amateurs as outlined in Mr. Padgett's bill? Now, to my knowledge, the amateurs are a very beneficial set of fellows to the United States. How many of them that were eligible joined the Signal Corps when our country entered the great struggle? Already having much knowledge of electricity and experience as operators, they could be put in the field immediately. The great fascination of wireless has drawn many young men into the electrical field, there to make many useful inventions. How many ideas or great inventions were first born in attic radio station and laboratory? These are a very few reasons why the amateurs must stay. How about the great business of constructing and distributing amateur instruments? How about keeping young men at home at night who otherwise might go out on the streets in bad company? Hoping you will see the amateurs in a new light and change your mind in regard to their being wiped off the map forever, I remain,

CARL C. GREIM.

WARREN, ARIZ.,
December 16, 1918.

HON. J. W. ALEXANDER,
Washington, D. C.

DEAR SIR: The protest against the injury that will be done many young men of this country if House bill 13159 and Senate bill 5306—which may prohibit amateur wireless—are passed without a full and free hearing.

It will take time for the amateurs to present their case, because most of them are in the Army and Navy. The bill should be held up until their return.

Why were the clauses referring to amateurs, as outlined in Mr. Padgett's bill, struck out?

Yours very truly,

MEADE W. POWELL.

SANTA CRUZ, CAL., December 17, 1917.

HON. J. W. ALEXANDER,
House of Representatives.

DEAR SIR: Of recent date there has been a very severe debate upon the subject of the reopening of amateur wireless stations. Although I am not an expert on this subject, I am very deeply interested in it, and it would mean a great loss to me if a bill were passed closing we amateurs out for good. I am only one in many thousands who are also in this same frame of mind and who would rejoice at the reopening of the amateur station, and on account of this I would feel it would mean the ceasing of this object in the upgrowing generation. I hope you will not overlook these few hasty points which are so valuable to we American boys and girls. I remain,

Very respectfully,

EARL H. HARRIS,
Secretary-Treasurer Santa Cruz Radio Association.

REDLANDS, CAL., December 16, 1918.

HON. J. W. ALEXANDER,
Washington, D. C.

DEAR SIR: I have been reading some of the laws as to effect of closing amateur radio stations, and for one I do not think it proper.

I have been an amateur for sometime, and was under the impression that we were only to dismantle our sets for the duration of the war, and now I see we have the honor of being done away with.

I would like to bring in my statements to the effect that I want to see the amateurs remain as before. I have found my set an education to me in two forms, as I might state: First, it gave me an improvement in the electrical line and also far more improvement in the apparatus.

I know a friend of mine who had a set before the United States entered the war and he has, I might state, invented some small instrument. I do not know what it was, as he does not tell, but it improved the set almost 80 per cent.

If we are cast out, it will mean that there won't be so many new inventions found in the radio line as there might be discovered if we all were to stay to-

gether; also it will help to get radio operators for government use in case of emergency at a least cost to the Government to educate them for such service, as they already have some knowledge from their own sets.

Now, if we were cast out, and in the future radio men should be needed for emergency, look what expense it would be to teach them the game.

Hoping this letter is a mite to our success and that we will be on the map again and in our little, happy chair, in the attic, with a receiver on our head, I am as ever,

Yours, respectfully,

HARRY WILLIAMSON,
10 South Church, Redlands, Cal.

1227 NORTH CALVERT STREET, BALTIMORE, MD.,
November 6, 1918.

CHAIRMAN COMMITTEE ON THE MERCHANT MARINE AND FISHERIES,
Washington, D. C.

Subject: The Alexander bill, H. R. 13159.

SIR: My attention has been called to the bill of above number and common title which I understand has been referred to your committee for consideration and report.

I desire to vigorously protest against the passage of this proposed measure, which is plainly an attempt to give the Navy absolute control over all radio communication and another governmental ownership or control proposition, of which there are already too many. My reasons of protest are specifically as follows, viz:

1. The bill ignores the amateurs, who, in the approximate number of over 5,000, now in the Army and Navy service alone, constitute the backbone of the radio branches of those arms of the military machine and who required practically no additional training to fit them for the recent emergency of the Nation. These men are the best in the service.

The measure in question is also presented at a time when these men are absent in the service of their country, and whose lips are sealed in their defense by military restrictions or etiquette.

2. The bill, if passed, will also discourage the interest and initiative of thousands of men in the amateur field who have been the principal contributors to the development of radio telegraphy and telephony.

3. The practical working effect of the bill would deprive the amateurs of their radio plants, resulting in the loss of hundreds of thousands of dollars now invested by them, and would unquestionably engender a feeling of antagonism against the Government, especially among the men now in the service, who expect to resume their radio activities and research work in the amateur field on their return to civilian life. In most instances these men are ignorant of the bill proposed, and this is true of the majority of the amateurs in civil life.

4. Another effect of the bill will be to seriously delay the war machine in an important branch in any future national emergency, due to the lack of skilled radio operators.

5. The bill is an unjust abridgment of civil rights and liberties, and another step toward radical paternal government which our Constitution never contemplated, nor is it desired by the people.

I write the above particularly in behalf of my only son and his two best friends, all three in the radio branch of the Navy through voluntary enlistment at the very beginning of the war, and in active sea duty up to this time.

I speak for them and thousands of other radio amateurs in the Nation's service, as they would if given the opportunity. I believe it best that the present law of August 13, 1912, defining the status of amateur radio operators be allowed to stand without revision and the present jurisdiction of the Department of Commerce in such matters remain invested in that branch of the Government, and trust that your committee will report unfavorably on the bill now before it.

Yours, very truly,

C. F. HEWITT.

MARIETTA, OHIO, December 10, 1918.

CHAIRMAN COMMITTEE ON THE MERCHANT MARINE AND FISHERIES,
Washington, D. C.

DEAR SIR: We, the members of the Marietta Radio League, protest against House bill 13159 and Senate bill 5306, because it will do a great injury to the young men of this country.

As there are a great number of the amateur wireless men in the service the bills should be held up until they can be informed of the impending disaster which threatens them and all the young men of the country who take an interest in wireless activities.

When the United States entered the war the Army and Navy drew from the amateur field approximately 5,000 operators who were highly skilled in the art and needed practically no additional training before assuming active duties. These men are considered the best in the service. With these facts in mind, do you not think that the amateurs in this country, as well as the amateurs now in the service, are entitled to some consideration?

Very respectfully, yours,

STANLEY W. CARROLL,
President of the Marietta Radio League.

NEW ORLEANS, LA., December 17, 1918.

HON. JOSHUA W. ALEXANDER,
Washington, D. C.

DEAR SIR: I note House bill 13159, introduced by you, which will have the effect of closing all amateur wireless stations.

You are no doubt well aware that nearly all the amateurs are away from home, in the Army and Navy, and that regulations prohibit them from voicing their sentiments against this un-American act, which would deprive the valiant men who so nobly manifested their spirits of patriotism by volunteering immediately upon the call to arms as radio men.

So badly was the Government in need of operators that most of the amateurs were given commissions as officers and petty officers, their knowledge being derived from the experimenting done on their amateur sets.

The Government would have been in a rather compromising position had it not been for the amateur. You will also note that all the great radio men were developed from the ranks of amateurs.

I, as an amateur, am not interested as to whether the Government takes over the commercial stations or not; only have a clause which will eliminate the amateur from this bill and permit him the rights he enjoyed before the war.

This bill if passed would, however, stifle all the ambition and interest of men who are interested in the development of this science and cause quite a loss of American dollars invested by the thousands of amateurs in stations.

Government records will bear me out that all the amateurs are not small boys in knee breeches, who love to tinker with the electric switches and telegraph keys, but as a whole are hard-thinking and earnest men, who devote many hours to this science.

Wireless among the amateurs, from a social standpoint, has an efficacious influence in developing the moral standard of the young men of our country. They remain at home many evenings, instead of being associated with people of questionable characters.

Let us have clean American men, straightforward in all their actions. The amateur has proved this during the past year.

Give him the same rights he has always enjoyed. He can do no harm, but lots of good, and please modify your bill so as to recognize the amateur and his want.

Thanking you, I am,
Yours, very respectfully,

JOS. C. BEHRE.

BOY SCOUTS OF AMERICA,
New York City, December 10, 1918.

HON. JOSHUA W. ALEXANDER,
Washington, D. C.

MY DEAR SIR: I was very much surprised on examining your bill, H. R. 13159, which was introduced in the House of Representatives November 21, 1918, and referred to the Committee on the Merchant Marine and Fisheries, to find that

its provisions would make it impossible for Boy Scouts and other radio amateurs to continue their work which has been so useful to our Government.

Consultation with the district communication service office of the Navy Department in New York City has confirmed our belief that the Navy is in favor of giving the radio amateur an opportunity to continue his studies and experiments. In fact, an officer in the Navy Department stated that the Navy needed the radio amateur and would be at a loss to know where to turn for a source of personnel if your bill should pass in its present form.

Certainly it is desirable to so restrict the radio amateur as to reduce to the minimum the possibility of his interfering with Government or commercial radio communication. An officer of the Navy has suggested to us that it might be desirable to put an amateur on a 150-meter wave length and confine him to a sending radius of 20 to 30 miles.

In view of the fact that there are more than 100,000 radio amateurs in the United States, and that their investment in radio apparatus, at a very low estimate, exceeds \$5,000,000, I believe that the passage of your bill in its present form would be most unfortunate. In fact, it would be saying to the citizens of the United States that this whole interesting subject of radio communication was closed except to those who enlisted in the Navy and those who could afford an expensive course in a technical school.

The Boy Scouts of America were of material assistance to the Navy Department, as no doubt you know, at the beginning of the war. They discovered and reported to the Navy investigators hundreds of cases of illegal radio apparatus.

Our organization will be represented at the hearing on Thursday of this week. We sincerely hope that you will feel inclined to favor an amendment which will permit Boy Scouts and other radio amateurs to continue their work under such restrictions as may be reasonably imposed.

Sincerely and cordially, yours,

JAMES E. WEST,
Chief Scout Executive.

BOY SCOUTS OF AMERICA,
New York City, December 16, 1918.

Mr. PAUL SLEMAN,
Colorado Building, Washington, D. C.

MY DEAR MR. SLEMAN: In accordance with your suggestion made this morning, I drafted the following proposed amendment to take the place of section 5 in H. R. 13159, a bill to further regulate radio communication:

"Sec. 5. That from the date of the passage of this act the Secretary of the Navy shall be charged with the execution of the provisions of the act to regulate radio communication approved August thirteenth, nineteen hundred and twelve, which provide that radio amateurs shall be allowed to erect, maintain or operate for experimental and private use, radio stations if properly licensed, as provided by said act to regulate radio communication approved August thirteenth, nineteen hundred and twelve; and with the continuance in full force and effect of the system of examinations and licenses for radio amateurs provided for in said act to regulate radio communication approved August thirteenth, nineteen hundred and twelve."

I have just read this over the phone to Radio Inspector Guthrie, of the United States Customhouse Service, and he says it meets the situation. If you have an opportunity to present it to any authority in Washington, I wish you would do so. I know even less about legislation than I do about radio and I would like to make sure that the wording of the section is correct.

Your help in this matter will be appreciated by the radio amateurs. There are more than 100,000 of them and they will be very hard hit if the bill goes through without an amendment in their favor.

Very truly yours,

W A. PERRY,
Editor of Scouting.

(Mr. Greene submitted the following letters to be incorporated in the record:)

COLONIAL NAVIGATION Co., PIER 39, NORTH RIVER,
New York, December 12, 1918.

HON. WILLIAM S. GREENE,
House of Representatives, Washington, D. C.

SR: We understand there is a movement looking toward the Government taking over the radio communication of the country, and on behalf of my steam-

ship line, The Colonial Navigation Co., I wish to most emphatically record my protest against this being done.

Our company operates a daily line of passenger steamers between New York and Providence, R. I., and the steamers are all equipped with wireless apparatus and operators. Prior to the war we received excellent service, feeling we were in immediate communication with our steamers at all times, placing us in a position not only to render assistance to our own vessels, but to those of any other line on the route which might require it, keeping us fully posted as to just when the vessels would arrive at dock, enabling us thereby to advise the public awaiting the arrival of friends or relatives on the steamers as to just when the steamer would dock, and thus making it possible not only for ourselves but the public both on land and on the vessels to transmit any messages to or from the steamers, which has proved of great value and convenience.

Our experience for the past 18 months, during which time the Government has had charge of the radio service, has been very unsatisfactory and the service which we have received from this source practically nil. If, therefore, you can do anything which will assist in the retaining by the owners of their several radio companies or other properties we urgently request that you do so and from a practical service-receiving, service-giving standpoint you will be taking the right course.

As an instance, to-day one of our steamers, on account of fog, due in New York at 7 o'clock a. m., was late. The captain sent us a wireless advising us that he would dock at 9 a. m. He did dock promptly at 9 o'clock and we had received no message from him. The steamer sailed at her usual time from our dock for Providence at 5 o'clock, and about 5.30 a messenger boy came in with a telegram from the wireless station in New York City giving us the captain's message that he would dock at 9 o'clock a. m. In other words, the boat arrived and sailed and a day had gone by before the message was delivered which should have reached us not later than 7 o'clock in the morning. This is a sample of the efficiency of the service to commercial interests which, of course, is the standpoint from which the proposition interests the ship owner and the public.

Respectfully, yours,

F. M. DUNBAUGH, *President.*

FALL RIVER, MASS., *December 5, 1918.*

HON. WILLIAM S. GREENE,
Washington, D. C.

DEAR SIR: As one of the 5,000 amateur radio operators who enlisted in the Navy at the beginning of the war when the Government vitally needed us, I wish to protest to you concerning the injustice of the Alexander bill, H. R. 13159, which is now before the House of Representatives in Washington.

The bill provides that the Navy shall take over all radio stations and entirely ignores the radio amateur. "Radio amateur" is merely a name given to a certain class of radio operators who are in the game for fun and for development of radio. They include persons between the ages of 14 and 65, embracing, among others, many prominent men in various professions and businesses.

Under the law of August 13, 1912, the radio amateur was provided for and allowed to own and operate a radio station under certain reasonable restrictions and limitations. The leading Navy radio receiver of to-day is based on the regenerative principle which was discovered and developed by Edwin Armstrong, an amateur, now a captain in the United States Army. The Navy recently purchased the invention of John Hays Hammond, jr., the wireless controlled torpedo, the idea of which was originated during his experiments as a radio amateur. If this bill goes through and the radio amateur is annihilated, the development of radio telegraphy in this country will decrease so much that other countries will soon lead us in the development instead of our leading them, which up to this time is the case.

Besides depriving the amateur of a chance to help develop the science of radio, this bill would have four other bad effects:

1. To give the absolute control over all radio communication to the Navy. This would be little short of imperialism.

2. Eliminate the initiative tending toward improvements, inventions, and progress in art.

3. Seriously delay the war machine in any future emergency due to the shortage of skilled operators.

4. Will create a feeling of antagonism against the Government on the part of amateurs now in the service who expect to reopen their stations when they come back home.

Of the 5,000 radio amateurs who entered the service, there are but few who have a chance to protest against this injustice which will forbid them from reopening their former stations and thus bring all their former research work to naught.

Hoping that I have not taken up too much of your valuable time and that you will help stop this injustice to radio amateurs, I remain,

(Name withheld by request.)

Yours, very truly,

P. S.—I have been a radio amateur for eight years and entered the Navy the day war was declared.

(Memorandum prepared by Capt. Todd in response to a question by Mr. Edmonds on p. 145:)

Relative to your request for a comparative statement of wages paid to radio operators, both Navy and commercial, at shore stations, the following is taken as a basis of the average shore station.

The operator is not usually detailed to a shore station unless he has had at least two or three years' practical experience both in the commercial and naval service. The operator first obtains his experience as assistant operator aboard ship:

Naval operator (clothing to the extent of \$100 is furnished on first enlistment only):	
Chief electrician (radio).....	\$137
First-class electrician.....	115
Second-class electrician.....	104
Third-class electrician.....	98
Commercial operator (at some places quarters are furnished):	
Manager of station.....	100
Operator.....	80
Do.....	60
Do.....	60

(Affidavits referred to by Mr. Maxim on p. 252.)

AFFIDAVIT.

STATE OF NEW YORK,
City and County of New York, ss:

J. Owen Smith, being duly sworn, deposes and says: For the past 10 years I have been a student of radio telegraphy and telephony in an amateur way. During that time I learned enough about the art to enable me to serve during the war as a radio aeronautical engineer in the radio branch training section, Division of Military Aeronautics, Washington, D. C.

During the early summer of 1918 I purchased the material necessary for the construction of a radio station and supervised the erection and operation of this station at the headquarters of the Division of Military Aeronautics. A copy of the formal order placing me in charge of the station is attached.

One of the principal reasons for erecting the station, in addition to voice-commanded flying, was to copy-press daily from English, French, German, and Italian stations for the radio executives of the division. Considerable difficulty was experienced in copying trans-Atlantic press, however, with the standard receiving sets furnished by the Government, owing to interference from the Arlington station, static induction from a nearby substation, and trolley cars.

I therefore had my own receiving set designed by an amateur, Mr. P. F. Godley, and manufactured for amateur use, with a range of 200 to 20,000 meters, sent to Washington, and after its installation the enlisted operators detailed to the station had no difficulty in copying several thousands of words of press each day from transmitting stations across the Atlantic, which was made up into book form daily and delivered to the radio executives of the Division of Military Aeronautics.

It was necessary at one time to take the Godley set out of service for some slight repairs, and although a standard Cohen receiving set, which cost \$500 as against \$300 in the case of the Godley set, was put in use in its place, the enlisted officers reported to the commanding officer of the radio branch that they could not successfully and connectedly copy trans-Atlantic press with it.

The copying of several thousand words of trans-Atlantic press daily is a really unusually good achievement, considering Washington latitude and consequent static during the summer and fall months, and the nearness of Arlington, which transmitted almost continuously.

I was successful in handling this through the experience I gained as an amateur radio experimenter.

J. OWEN SMITH.

Sworn and subscribed to before me this 10th day of December, 1918.

DAVID HERSHFELD,
Commissioner of Deeds, New York City.

AFFIDAVIT.

STATE OF NEW YORK,
City and County of New York, ss:

J. Owen Smith, being duly sworn, deposes and says:

In October, 1918, while serving as a radio aeronautical engineer in the Division of Military Aeronautics at Washington, D. C., I had a conversation with Capt. Ferguson, R. A. F., bearing on the work done by amateur radio operators in the war.

Capt. Ferguson expressed surprise at the number of radio amateurs who had done good work during the war, and expressed much appreciation of their expertness in the art and their ability to hold important and confidential positions in various branches of the Government.

He further said that the ability of the United States to get her war program under way so quickly was due to a certain extent to the fact that so many self-trained radio operators were instantly available for service here. There had been no trained amateurs in England to rely upon at the beginning of the war. They had to be trained after war was declared. He said that the advantage in allowing radio operators to experiment, under intelligent supervision, was obvious.

J. OWEN SMITH.

Sworn and subscribed to before me this 10th day of December, 1918.

[SEAL.]

DAVID HERSHFELD,
Commissioner of Deeds, New York City.

MARCONI WIRELESS TELEGRAPH CO. OF AMERICA,
NEW YORK, December 30, 1918.

Mr. J. C. BAY,
*Clerk Committee on the Merchant Marine and Fisheries,
United States House of Representatives, Washington, D. C.*

DEAR MR. BAY: In response to a request, on page 184 of the hearings, for copies of data in our files touching laws relating to ownership and control of wireless in Mexico and Central America, I beg to send you herewith copies of translations of constitutional provisions for Mexico, Nicaragua and San Salvador; translation from the law of telegraphs of Costa Rica, and clippings from the 1918 issue of the Year Book of Wireless Telegraphy, which give information concerning Mexico, Guatemala, Nicaragua, Panama, San Salvador, and British Honduras.

You will note that we have no information about the wireless regulations in Spanish Honduras.

Very truly, yours,

E. J. NALLY,
Vice President and General Manager.

(For additional information concerning wireless laws and regulations see 1918 Year Book of Wireless Telegraphy and Telephony, published by the Wireless Press (Ltd.), Marconi House, Strand, London, and 42 Broad Street, New York.)

GUATEMALA.

[Clipping from Year Book of Wireless Telegraphy, 1918.]

The Republic of Guatemala lies southeastward of Mexico, and is almost shut off from the Atlantic Ocean by British Honduras on the north and by the Republic of Honduras on the southeast. Puerto Barrios and Livingston constitute the chief ports of the Republic on the Atlantic seaboard (San José, the chief port), Champerico and Ocos on the Pacific.

The Republic in its present form was established on March 21, 1847, after having formed part, for 26 years, of the Confederation of Central America. The constitution dated from December, 1879, modified in 1885, 1887, 1889, and 1903. At the present moment radiotelegraphy is represented by a pair of American stations at Guatemala City and Puerto Barrios, respectively.

This installation is nominally under the supervision of the minister of public works, but is entirely under the personal direction of the President. An American operator named Mr. J. H. Watts, of the United States Navy, has been lent to the Government for the purpose of superintending the working.

No laws and regulations have up to the present been issued in Guatemala to regulate the use of wireless.

PANAMA (CANAL ZONE.)

[Clipping from Year Book of Wireless Telegraphy, 1918.]

The idea of a canal through the Isthmus of Panama originated with a Spanish engineer in 1530. Monsieur de Lesseps labored on its construction from 1882 to 1904, when the United States Government took over the undertaking. This action of the United States of America followed closely on the establishment of a separate Republic of Panama (a secession from the United States of Columbia), which took place on November 23, 1903. The American canal was opened for traffic on August 15, 1914.

The American-controlled zone consists of a strip of land 10 miles in width, extending across the Isthmus a distance of 50 miles. The rights of sovereignty are vested in the United States of America under a treaty signed on February 26, 1904.

The zone is ruled by a governor, who reports through the Secretary of War to the President and conducts the government according to the authority invested in him by acts of Congress and Executive orders. In periods of crisis or times of war the supreme command is vested in the commanding officer of the troops, designated as the Panama Canal Department of the United States of America Army. Radiotelegraphy in the zone is administered by the Navy Department of the United States, who detach a naval officer designated as radio officer for the purpose of its supervision.

The first radio station erected was situated in the Republic of Panama, within the municipal limits of the city of Colon, in 1906, and the reservation there established is still the site of a successor to this pioneer station.

Under agreement between the Republic of Panama and the United States of America radiotelegraphic communication within the Republic, as well as in the Canal Zone, remains under the control of the United States of America. This arrangement rests on decree No. 130 of August 29, 1914, signed by the president of the Panama Republic.

The small station established at Porto Bello, Panama, in 1909 was closed on May 13, 1914. The Colon station, established on March 1, 1910, was reequipped with improved apparatus and opened to commercial traffic in January, 1913. At Balboa (Pacific end of the canal) there stands a station opened for commercial business in June, 1913, and replaced by an improved installation on the same site in 1914. The well-known "Darien" station (located alongside the canal, midway between the oceans) is a high-power installation designed primarily for communication with Washington and for naval vessels at sea. It possesses a sending radius of 3,000 miles and was placed in regular service on April 5, 1915.

There are no wireless clubs or radio societies, the whole of the wireless operations being controlled and administered by the United States Navy.

The "Darien" station sends out time and weather signals daily (see under "Time and weather signals" section of the Year book). The radio stations at Colon and Balboa send broadcast at 4 a. m., at noon, at 4 p. m., and 8 p. m.

any notices to mariners which may be supplied by the port captains for the respective ends of the canal. An unofficial news service for the benefit of persons at sea is carried on by the Colon station, which each day at 3.30 p. m. radiates broadcast about 200 words of news made up of extracts from the Panama morning papers.

We publish below the text of the various acts and decrees affecting radiotelegraphy in the Canal Zone in accordance with the following list:

A. Act to regulate radio communication issued August 13, 1912. (See pp. 410-415.)

B. Section 6 of the act to provide for opening, maintenance, protection, and operation of the Panama Canal (dated Aug. 24, 1912).

C. Extracts from rules and regulations for the operation and navigation of the Panama Canal dated July 9, 1914.

D. Notice concerning commercial service at naval stations dated September 1, 1913.

E. Circular re compulsory wireless dated July 23, 1914.

F. Circular re free radio service dated November 17, 1914.

G. Circular re suspension of radio service dated May 12, 1917.

H. Extract from supplement to Panama Canal rules dated May 23, 1917.

EXTRACT FROM ACT—TO PROVIDE FOR OPENING, MAINTENANCE, PROTECTION, AND OPERATION OF THE PANAMA CANAL.

[Dated August 24, 1912.]

B. SEC. 6. That the President is authorized to cause to be erected, maintained, and operated, subject to the International Convention and the act of Congress to regulate radio communication, at suitable places along the Panama Canal and the coast adjacent to its two terminals, in connection with the operation of said canal, such wireless telegraphic installations as he may deem necessary for the operation, maintenance, sanitation, and protection of said canal, and for other purposes. If it is found necessary to locate such installations upon territory of the Republic of Panama, the President is authorized to make such agreement with said Government as may be necessary, and also to provide for the acceptance and transmission by said system of all private and commercial messages and those of the Government of Panama on such terms and for such tolls as the President may prescribe: *Provided*, That the messages of the Government of the United States and the departments thereof, and the management of the Panama Canal, shall always be given precedence over all other messages. The President is also authorized in his discretion to enter into such operating agreements or leases with any private wireless company or companies as may best insure freedom from interference with the wireless telegraphic installations established by the United States.

EXTRACT FROM RULES AND REGULATIONS.

[Dated July 9, 1914.]

C. 40. *Radio communication and report.*—As soon as radio communication can be established with the canal, vessels should report their names, nationality, length, draft, tonnage; whether or not they desire to pass through the canal, require coal, provisions, supplies, repairs, to go alongside of a wharf, the use of tugs, probable time of arrival, length of stay in port, or any other matters of importance or interest. If this information has been previously communicated through agents or otherwise to the captain of the port, it will not be necessary to report by radio; but the probable time of arrival should always be sent.

41. Control of radio communication is entirely in the hands of the radio shore stations. No vessel will be allowed to interfere in the slightest degree with the canal radio stations; upon an order being received by a vessel at any time while within the waters under the control of the canal to discontinue using radio, even if in the midst of transmission of a message, she shall immediately comply.

42. Upon a ship's arriving within the 15-mile limit, and until leaving the 15-mile limit of the Canal Zone, she shall transmit only with low power, not exceeding one-half kilowatt.

43. Messages to stations will be sent only to Colon station (NAX) when in Gatun Locks and to northward thereof, and only to Balboa station (NPJ) when in Miraflores Locks and to southward thereof; between these two points ships may work to either station, preferably to the nearer one; the high-power station (Darlen) at Radio will not handle commercial work and will not be called for canal business except in case of emergency.

44. All messages between ships in the Canal Zone and ships at sea must be forwarded through the nearer shore station.

45. Messages from ships in the Caribbean Sea for ships in the Pacific waters, or vice versa, shall be routed through the Canal Zone shore stations.

46. All vessels fitted with radio, after leaving the terminal harbor to pass through the canal, shall keep an operator on watch until the further terminal harbor has been reached; this applies to the time when they are anchored in Gatun Lake, while passing through the locks, or moored to the lock walls, or to any of the wharves in the canal proper, as well as when they are under way. Messages relating to the ship's movements and the canal business shall take precedence over all commercial messages.

47. Pilots on vessels passing through the canal shall have the right to use a vessel's radio freely for the transaction of the canal business.

48. Under the direction of the pilots, vessels will from time to time report their progress through the canal; accidents to machinery, propellers, steering gear, equipment, or anything else that may delay them or require assistance; any sickness or casualties that require medical attendance from canal officials; or any other matters of importance that may arise.

49. No charges will be imposed against the canal by vessels receiving or sending messages in relation to canal business.¹

50. No vessel will be allowed to communicate with any lock or signal station while in transit through the canal, except through the pilot; all messages of any kind must be sent through him. This does not apply to vessels moored at the terminals at Cristobal or Balboa, before entering or after having passed through the canal, which may wish to communicate through the terminal stations.

51. Vessels in transit through the canal can communicate with the locks and signal stations, through the pilots, both by the international code and special signals; information on this subject may be obtained from the governor of the Panama Canal.

52. *Accidents or defects.*—If any defect in any part of a vessel's hull, machinery, steering gear, or equipment be discovered while in transit through the canal, of such a serious nature that it might interfere with the further passage of the vessel or be liable to block the canal, the vessel shall stop and, if practicable, be anchored or moored at the first available place. A full report shall immediately be made to the superintendent of transportation,² through the captain of the port, stating fully the cause and nature of the trouble, probable delay, and request for assistance if it be necessary.

53. Under any and all circumstances, whenever a vessel is liable to become unmanageable from any weakness, or damage to her machinery, steering gear, or for any other reason, she shall immediately, through the pilot, request the assistance of a tug.

54. *Firearms.*—No firearms of any kind shall be discharged while in transit through the canal or in canal waters, and every precaution will be taken to prevent this.

55. *Subsistence of pilots.*—Pilots and other authorized persons on duty, belonging to the canal service, shall be subsisted without charge while on board vessels in transit through the canal.

56. *Maintenance of tugs and other floating equipment.*—No vessel, company, nor individual will be authorized to maintain or operate permanently any tugs, launches, lighters, or floating equipment of any kind within the canal waters

¹ Amended by Executive order of Nov. 4, 1914, to read: "No radio tolls, either coast station or forwarding, will be imposed against ships on radiograms transmitted by ships on canal business. There will be no charge made against the Panama Canal, by Canal Zone land lines or radio stations, for the transmission of radiograms to ships on canal business."

² Title changed to marine superintendent.

without permission from the governor; nor shall any small craft or boat of any kind be operated without the proper authority from him.

118. In thick and foggy weather vessels will not be allowed to enter the canal or leave the locks or mooring station until the weather has cleared. Vessels in transit, when overtaken by thick or foggy weather, must immediately take every precaution and make preparation to anchor or moor at the first available place, and so remain until the weather clears. Vessels equipped with radio, when overtaken by thick or foggy weather, should immediately so report, in order that the proper fog signal may be made at the mooring stations on the approach of such vessels.

EXTRACT FROM SUPPLEMENT TO RULES—COMMERCIAL SERVICE AT NAVAL RADIO STATIONS.

[Dated Sept. 1, 1913.]

D. Beginning September 1, 1913, the radio stations of the United States Navy at Colon and Balboa are handling special classes of commercial radiograms, heretofore prohibited, as follows:

1. Reply paid messages (where both messages and answer can be prepaid by the sender).
2. Messages calling for repetition of messages (for verification only). Charge for repeating back is one-fourth the charge for the original message.
3. Radiograms to be delivered by mail. (If received from a ship, these will be mailed from the radio station. "Ocean letters" will be mailed by the ship at the first port of call, or at any port of call designated.)
4. Multiple radiograms. These are messages addressed either to several persons at same address, or to same person at several addresses served by the same radio station. These messages when received from sea will be separated and sent as so many individual messages over the land wire.
5. Radiograms calling for acknowledgment of receipt. (Such acknowledgment is restricted to notification of date and hour at which the coast station delivered the radiogram to ship addressed, and may be sent by either mail or telegraph.)
6. Paid service notices. (Sent in order to correct address or text, to cancel a message, etc.)

Both stations—Colon and Balboa—are connected by direct wire with the Panama railroad telephone system and radiograms can be filed at any local office. Attention is invited to the fact that no collect messages are handled, and no commercial messages are handled between stations which are connected by cable or telegraph, as, for instance, to Key West or Port Limon.

The time of arrival of all Panama railroad boats is given to the telephone central at Colon as soon as received, and can be obtained there upon request without calling the radio station at Colon.

EXECUTIVE ORDER—WIRELESS APPARATUS ON OCEAN-GOING VESSELS.

[Published in circular No. 601-16, dated Culebra, Canal Zone, July 23, 1914.]

E. To require ocean-going vessels to be fitted with wireless apparatus.

By virtue of the authority vested in me, I hereby establish the following order for the Canal Zone:

SECTION 1. From and after the first day of July, 1915, it shall be unlawful for any ocean-going steamer of the United States, or of any foreign country, carrying 50 or more persons, including passengers and crew, to leave or attempt to leave any port of the Canal Zone unless such steamer shall be equipped with an efficient apparatus for radio communication in good working order in charge of a person skilled in the use of such apparatus, which apparatus shall be capable of transmitting and receiving messages for a distance of at least 100 miles, night or day: *Provided*, That the provisions of this order shall not apply to steamers plying only between the Canal Zone and ports less than 200 miles therefrom.

SEC. 2. The master or other person being in charge of such vessel which leaves or attempts to leave any port of the Canal Zone in violation of any of the provisions of this order shall, upon conviction, be fined in a sum not to exceed

five thousand dollars (\$5,000), and any such fine shall be a lien upon such vessel, and the vessel may be liable therefor in the District Court of the Canal Zone, and the leaving or attempting to leave by any vessel from each and every port of the Canal Zone shall constitute a separate offense.

Sec. 3. This order shall take effect from and after this date. July 9, 1914.

EXECUTIVE ORDER—FREE RADIO SERVICE FOR CANAL BUSINESS.

[Published in circular No. 601-38, dated Balboa Heights, Canal Zone, Nov. 17, 1914.]

F. Amending paragraph 49 of the "Rules and regulations for the operation and navigation of the Panama Canal and approaches thereto, including all waters under its jurisdiction."

By virtue of the authority vested in me under the Panama Canal act, paragraph 49 of the "Rules and regulations for the operation and navigation of the Panama Canal and approaches thereto, including all waters under its jurisdiction," promulgated by Executive order No. 1990, dated July 9, 1914, is hereby amended to read as follows:

49. No radio tolls, either coast station or forwarding, will be imposed against ships on radiograms transmitted by ships on canal business. There will be no charge made against the Panama Canal, by Canal Zone land lines or radio stations, for the transmission of radiograms to ships on canal business.

NOTICE TO MARINERS—SUSPENSION OF RADIO SERVICE IN CANAL-ZONE WATERS.

[Published in circular No. 643-38, dated from Balboa Heights, Canal Zone, May 12, 1917.]

G. For the information of ships' masters, it is desired to explain the cause of the general suspension of radio (wireless) service in Canal Zone ports. The objects are to protect merchant ships from capture and to leave the air free for radio orders to warships. All merchant ships should avoid the use of radio as much as possible for the reason that to a ship properly equipped it gives accurate indication of the bearing and distance of a ship sending out radio messages. The Canal Zone radio stations have orders not to exchange messages with merchant ships, although an exception is made when a ship arrives off the entrance to either terminal port, at which time she is permitted to notify the captain of the port, by radio, of her arrival. Thereafter, while in Canal Zone waters, she is forbidden to use radio except as directed by the pilot in communicating with Canal Zone officials on Government business.

EXTRACT FROM SUPPLEMENT TO RULES.

[Dated May 23, 1917.]

H. RULE 12.—The radio installation of any public or private vessel or of any auxiliary vessel of a belligerent, other than the United States, shall be used only in connection with the canal business to the exclusion of all other business while within the waters of the Canal Zone, including the waters of Colon and Panama Harbors.

BRITISH HONDURAS.

[Clipping from Year Book of Wireless Telegraphy, 1918.]

The Crown colony of British Honduras lies in Central America within 18° 29' 5" to 15° 53' 55" north latitude and 89° 9' 22" to 88° 10' west longitude. Its extreme length and breadth are 174 miles and 68 miles, respectively; it abuts on the Atlantic and is bounded on the north by Yucatan (Mexico), on the west and south by Guatemala, and on the east by the Caribbean Sea. The total area is about 8,598 square miles.

Wireless telegraphy has seen some developments here since its first introduction, and both the ownership and working of the radiotelegraphic stations are vested in the Government. The administration of wireless telegraphy is carried out under the following regulations:

A. Consolidated law.

B. Schedule.

Wireless telegraphy in British Honduras is regulated by Chapter CXCIX of the Consolidated Laws of British Honduras (revised edition), the text of which will be found below.

CHAPTER CXIX OF THE CONSOLIDATED LAWS OF BRITISH HONDURAS (REVISED EDITION)—TO REGULATE WIRELESS TELEGRAPHY.

A. 1. *Interpretation.*—In this chapter “wireless telegraphy” means any system of communication by telegraph without the aid of any wire connecting the points from and at which the messages or other communications are sent or received: *Provided*, That nothing in this ordinance shall prevent any person from making or using electrical apparatus for actuating machinery or for any purpose other than the transmission of messages.

2. *License to install, etc., wireless telegraphic apparatus.*—(1) A person shall not establish any wireless telegraph station or install or work any apparatus for wireless telegraphy in any place or on board any ship registered in the colony except under and in accordance with a license granted in that behalf by the governor.

(2) Every such license shall be in such form and for such period as the governor may determine and shall contain the terms, conditions, and restrictions on and subject to which it is granted.

3. *Apparatus not to be worked on merchant ship except in accordance with regulations.*—A person shall not work any apparatus for wireless telegraphy installed on any merchant ship, whether British or foreign, while that ship is in the territorial waters of the colony, otherwise than in accordance with regulations under this chapter.

4. *Regulations.*—(1) The governor may from time to time make regulations for carrying into effect the purposes of this chapter, and such regulations shall on publication in the Gazette have the same effect as if enacted in this chapter.

(2) The regulations in the schedule to this chapter shall have effect except in so far as they may be amended or rescinded by regulations made under the authority of this section.

(3) If at any time in the opinion of the governor an emergency has arisen in which it is expedient for the public service that His Majesty's Government should have control over the transmission of messages by wireless telegraphy the use of wireless telegraphy on board merchant ships while in the territorial waters of the colony shall be subject to such further regulations as may be made by the governor from time to time, and such regulations may prohibit or regulate such use in all cases or in such cases as may be deemed desirable.

5. *Search warrants.*—If a district commissioner is satisfied by information on oath that there is reasonable ground for suspecting that a wireless telegraph station has been established without a license in that behalf or that any apparatus for wireless telegraphy has been installed or worked in any place or on board any merchant ship contrary to the provisions of this chapter or of any regulations made under this chapter, or of any license granted under this chapter, he may grant a search warrant to any police officer or any person appointed in that behalf by the superintendent of police and named in the warrant, and a warrant so granted shall authorize the police officer or person named therein to enter and inspect the station, place, or ship, and to seize any apparatus which appears to him to be used or intended to be used for wireless telegraphy therein.

6. *Penalty for contravention of chapter.*—(1) Any person who shall offend against any provision of this chapter or any regulations made thereunder shall be liable on summary conviction for every such offense to a fine not exceeding \$250, and upon such conviction the court may order that any apparatus for wireless telegraphy in connection with which the offense was committed shall be seized and forfeited.

(2) *Procedure.*—Proceedings shall be taken before the district commissioner for the Belize district on the complaint of the superintendent of police or of any person thereto authorized by him in writing, and the procedure shall be the same as the procedure for the time being in force in respect of offenses punishable on summary conviction.

SCHEDULE—SEC. 4 (2)—REGULATIONS

B: 1. All apparatus for wireless telegraphy on board a merchant ship in the territorial waters of the colony shall be worked in such a way as not to interfere with—

(a) Naval signaling, or

(b) The working of any wireless telegraph station lawfully established, installed, or worked in the colony or the territorial waters thereof, and in particular the said apparatus shall be so worked as not to interrupt or interfere with

the transmission of any messages between wireless telegraph stations established as aforesaid on land and wireless telegraph stations established on ships at sea.

2. In these regulations "naval signaling" means signaling by means of any system of wireless telegraphy between two or more ships of His Majesty's Navy, between ships of His Majesty's Navy and naval stations, or between a ship of His Majesty's Navy or a naval station and any other wireless telegraph station whether on shore or on any ship.

3. No apparatus for wireless telegraphy on board a merchant ship shall be worked or used while such ship is in any harbor or bay of the colony except with the special or general permission of the governor.

4. For the purpose of any proceedings under these regulations the master or person being or appearing to be in command or charge of any ship shall be deemed to have authorized and to be responsible for the use or working of any apparatus on board such ship.

5. Any summons or other document in any proceedings under these regulations shall be deemed to have been duly served on the person to whom the same is addressed by being left on board the ship on which the offense is charged to have been committed with the person being or appearing to be in command or charge of the ship.

6. These regulations shall not apply to the use of wireless telegraphy for the purpose of making or answering signals of distress.

MEXICO.

Occupying an important position in the southern part of the continent of North America, with an extensive seaboard both on the Atlantic and Pacific Oceans, Mexico stretches from 15° 0' to 32° 30' north latitude, and lies between 87° 0' and 117° 0' west longitude. It covers an area of 768,883 square miles, and comprises 27 states and three territories, besides the Federal District of Mexico.

As will be seen by reference to our "Land stations" section, Mexico contains a number of wireless installations; but owing to the period of internecine strife through which the country has passed during recent years, it is not possible under present conditions to print in these pages any legislative enactments or sets of rules governing their administration.

[Translation from Mexican Constitution of 1917.]

ARTICLE 28. There shall be no private nor governmental monopolies of any kind whatsoever in the United States of Mexico; nor exemption from taxation; nor any prohibition even under cover of protection to industry, excepting only those relating to the coinage of money, to the postal, telegraphic, and radiotelegraphic services; to the issuance of bills by a single banking institution to be controlled by the Federal Government, and to the privileges which for a limited period the law may concede to authors and artists for the reproduction of their work; and lastly to those granted inventors or improvers of inventions for the exclusive use of their inventions.

The law will accordingly severely punish and the authorities diligently prosecute any accumulating or cornering by one or more persons of necessities for the purpose of bringing about a rise in price; any act or measure which shall stifle or endeavor to stifle free competition in any production, industry, trade, or public service; any agreement or combination of any kind entered into by producers, manufacturers, merchants, common carriers, or other public or quasi public service, to stifle competition and to compel the consumer to pay exorbitant prices; and in general whatever constitutes an unfair and exclusive advantage in favor of one or more specified person or persons to the detriment of the public in general or of any special class of society.

Associations of labor organized to protect their own interests shall not be deemed a monopoly. Nor shall cooperative associations or unions of producers be deemed monopolies when, in defense of their own interests or of the general public, they sell directly in foreign markets national or industrial products which are the principal source of wealth of the region in which they are produced, provided they be not necessities, and provided further that such associations be under the supervision or protection of the Federal Govern-

ment or of that of the States, and provided further that authorization be in each case obtained from the respective legislative bodies. These legislative bodies may, either on their own initiative or on the recommendation of the executive, revoke, whenever the public interest shall so demand, the authorization granted for the establishment of the associations in question.

NICARAGUA.

[Clipping from Year Book of Wireless Telegraphy, 1918.]

This Central American State lies between Costa Rica on the south and Honduras on the north. Its area is estimated at 49,200 square miles, and it possesses a coast line of about 300 miles on the Atlantic, while that on the Pacific Ocean stretches for about 200 miles.

The present constitution came into force on April 5, 1913. It vests the executive functions in a president, and the legislative power in a congress of two houses. On February 18, 1916, a treaty between Nicaragua and the United States was ratified, which laid down the conditions for the acquisition by the latter of naval bases on the Pacific and Atlantic coasts, and of the projected canal route.

With regard to wireless telegraphy, none of the installations at present existing in Nicaragua are owned by the Government. The United States Government possess a station in Managua, the capital of the Republic, and there are two stations owned by private companies on the Atlantic coast. These stations (with the exception of that owned by the American Government) have been erected under contract with the Government of the Republic, and are subject to the provisions of the London Radiotelegraphic Convention of 1912.

The control of any stations which the Government might establish on its own account would be vested in the minister of progress and public works (Ministerio de Fomento) and the postmaster general. No special legislation bearing on the subject has, however, been promulgated in the country. The above-mentioned convention constitutes the only law at present applicable to Nicaragua in the case of wireless telegraphy.

[Translation from the constitution.]

ARTICLE 61. All private monopoly is prohibited.

Under the law of Nicaragua telegraph and telephone lines and radio stations are established under special concessions granted by the Government. No telephone, telegraph, or radio apparatus may be brought into the country except by special permission.

SAN SALVADOR (REPUBLIC OF).

[Clipping from Year Book of Wireless Telegraphy, 1918.]

The independent Republic of San Salvador originated in the course of dissolution of the Central American Federation (Guatemala, Salvador, Honduras, Nicaragua, and Costa Rica), which took place in 1839. Its constitution dates from 1824 (during federation days) and has been modified on various occasions, ranging from 1859 to 1886. The President directs the executive, whose legislative functions are exercised by a Congress annually elected under universal suffrage. The 14 Provinces, of which San Salvador is composed, possess a total area estimated at 13,176 square miles. The capital city possesses the same name as the Republic.

The consular report made by the United States Consul-General, published on August 21, 1911, contains the following clause:

"Wireless stations have been installed at La Libertad and Lomas de Candalaria, the latter on a mountain ridge several miles from San Salvador, to which messages are now relayed by telegraph, although the ultimate plans embrace a station here as well. The tests having proved satisfactory, the Government will install an apparatus capable of maintaining communications with Bluefields (Nicaragua) and Limon (Costa Rica)."

The station at La Libertad was withdrawn as communication with ships at sea can easily be maintained by the installation now working at Lomas de Candelaria.

The prognostications of the United States consul general were fulfilled this year, and close by the city of San Salvador at a place known as Finca Modelo there was erected in May, 1917, a wireless station presented by Senor Carranza, the Mexican President.

At the time of going to press we were not in receipt of the text of any laws and regulations affecting radiotelegraphy in this Republic.

[Translation from the constitution.]

ARTICLE 34. All industrial enterprises are open to all, and only spirits, saltpeter, and gunpowder may be monopolized for the benefit of the nation and administered by the national executive.

There can not be monopoly of any kind nor prohibition from engaging in any business under pretext of protecting the industry. The only exceptions to this shall be in the matter of coining money and the special privileges for limited periods which the law concedes to inventors and those who make improvements in industrial processes.

COSTA RICA.

[Translation from the Fiscal Code, Law of Telegraphs, Chapter I, General Regulations.]

ARTICLE 369. Besides the national telegraph lines now established or which may in future be established, there may be others of private ownership in accordance with concessions which may be granted for that purpose by Congress.

RADIO COMMUNICATION LAWS OF THE UNITED STATES AND THE INTERNATIONAL RADIOTELEGRAPHIC CONVENTION, TOGETHER WITH REGULATIONS GOVERNING RADIO OPERATORS AND THE USE OF RADIO APPARATUS ON SHIPS AND ON LAND.

[Prepared by the Bureau of Navigation, Department of Commerce.]

Part I.—RADIO COMMUNICATION LAWS AND INTERNATIONAL TREATIES.

AN ACT Approved July 23, 1912, amending section 1 of an act entitled "An act to require apparatus and operators for radio communication on certain ocean steamers," approved June 24, 1910.¹

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, * * **

SECTION 1. That from and after October first, nineteen hundred and twelve, it shall be unlawful for any steamer of the United States or of any foreign country navigating the ocean or the Great Lakes and licensed to carry, or carrying, fifty or more persons, including passengers or crew or both, to leave or attempt to leave any port of the United States unless such steamer shall be equipped with an efficient apparatus for radio communication, in good working order, capable of transmitting and receiving messages over a distance of at least one hundred miles, day or night. An auxiliary power supply, independent of the vessel's main electric power plant, must be provided which will enable the sending set for at least four hours to send messages over a distance of at least one hundred miles, day or night, and efficient communication between the operator in the radio room and the bridge shall be maintained at all times.

The radio equipment must be in charge of two or more persons skilled in the use of such apparatus, one or the other of whom shall be on duty at all times while the vessel is being navigated. Such equipment, operators, the regulation of their watches, and the transmission and receipt of messages, except as may be regulated by law or international agreement, shall be under the control of the master, in the case of a vessel of the United States; and every willful failure on the part of the master to enforce at sea the provisions of this paragraph as to equipment, operators, and watches shall subject him to a penalty of one hundred dollars.

¹ The amended act applies to vessels licensed to carry as well as those actually carrying 50 or more persons, etc.

That the provisions of this section shall not apply to steamers plying between ports, or places, less than two hundred miles apart.

SEC. 2. That this act, so far as it relates to the Great Lakes, shall take effect on and after April first, nineteen hundred and thirteen, and so far as it relates to ocean cargo steamers shall take effect on and after July first, nineteen hundred and thirteen: *Provided*, That on cargo steamers, in lieu of the second operator provided for in this act there may be substituted a member of the crew or other person who shall be duly certified and entered in the ship's log as competent to receive and understand distress calls or other usual calls indicating danger, and to aid in maintaining a constant wireless watch so far as required for the safety of life.

The remaining sections of the act of June 24, 1910, which are unchanged, read as follows:

SEC. 2. That for the purpose of this act apparatus for radio communication shall not be deemed to be efficient unless the company installing it shall contract in writing to exchange, and shall, in fact, exchange, as far as may be physically practicable, to be determined by the master of the vessel, messages with shore or ship stations using other systems of radio communication.

SEC. 3. That the master or other person being in charge of any such vessel which leaves or attempts to leave any port of the United States in violation of any of the provisions of this act shall, upon conviction, be fined in a sum not more than five thousand dollars, and any such fine shall be a lien upon such vessel, and such vessel may be libeled therefor in any district court of the United States within the jurisdiction of which such vessel shall arrive or depart, and the leaving or attempting to leave each and every port of the United States shall constitute a separate offense.

SEC. 4. That the Secretary of Commerce shall make such regulations as may be necessary to secure the proper execution of this act by collectors of customs and other officers of the Government.

[PUBLIC—No. 264.]

[S. 6412.]

AN ACT To regulate radio communication, approved August 13, 1912.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That a person, company, or corporation within the jurisdiction of the United States shall not use or operate any apparatus for radio communication as a means of commercial intercourse among the several States, or with foreign nations, or upon any vessel of the United States engaged in interstate or foreign commerce, or for the transmission of radiograms or signals the effect of which extends beyond the jurisdiction of the State or Territory in which the same are made, or where interference would be caused thereby with the receipt of messages or signals from beyond the jurisdiction of the said State or Territory, except under and in accordance with a license, revocable for cause, in that behalf granted by the Secretary of Commerce upon application therefor; but nothing in this act shall be construed to apply to the transmission and exchange of radiograms or signals between points situated in the same State: *Provided*, That the effect thereof shall not extend beyond the jurisdiction of the said State or interfere with the reception of radiograms or signals from beyond said jurisdiction; and a license shall not be required for the transmission or exchange of radiograms or signals by or on behalf of the Government of the United States, but every Government station on land or sea shall have special call letters designated and published in the list of radio stations of the United States by the Department of Commerce. Any person, company, or corporation that shall use or operate any apparatus for radio communication in violation of this section, or knowingly aid or abet another person, company, or corporation in so doing, shall be deemed guilty of a misdemeanor, and on conviction thereof shall be punished by a fine not exceeding five hundred dollars, and the apparatus or device so unlawfully used and operated may be adjudged forfeited to the United States.

SEC. 2. That every such license shall be in such form as the Secretary of Commerce shall determine and shall contain the restrictions, pursuant to this act, on and subject to which the license is granted; that every such license shall be issued only to citizens of the United States or Porto Rico or to a company incorporated under the laws of some State or Territory or of the United States or Porto Rico, and shall specify the ownership and location

of the station in which said apparatus shall be used and other particulars for its identification and to enable its range to be estimated; shall state the purpose of the station, and, in case of a station in actual operation at the date of passage of this act, shall contain the statement that satisfactory proof has been furnished that it was actually operating on the above-mentioned date; shall state the wave length or the wave lengths authorized for use by the station for the prevention of interference and the hours for which the station is licensed for work; and shall not be construed to authorize the use of any apparatus for radio communication in any other station than that specified. Every such license shall be subject to the regulations contained herein, and such regulations as may be established from time to time by authority of this act or subsequent acts and treaties of the United States. Every such license shall provide that the President of the United States in time of war or public peril or disaster may cause the closing of any station for radio communication and the removal therefrom of all radio apparatus, or may authorize the use or control of any such station or apparatus by any department of the Government, upon just compensation to the owners.

Sec. 3. That every such apparatus shall at all times while in use and operation as aforesaid be in charge or under the supervision of a person or persons licensed for that purpose by the Secretary of Commerce. Every person so licensed who in the operation of any radio apparatus shall fail to observe and obey regulations contained in or made pursuant to this act or subsequent acts or treaties of the United States, or any of them, or who shall fail to enforce obedience thereto by an unlicensed person while serving under his supervision, in addition to the punishments and penalties herein prescribed, may suffer the suspension of the said license for a period to be fixed by the Secretary of Commerce not exceeding one year. It shall be unlawful to employ any unlicensed person or for any unlicensed person to serve in charge or in supervision of the use and operation of such apparatus, and, any person violating this provision shall be guilty of a misdemeanor, and on conviction thereof shall be punished by a fine of not more than one hundred dollars or imprisonment for not more than two months, or both, in the discretion of the court, for each and every such offense: *Provided*, That in case of emergency the Secretary of Commerce may authorize a collector of customs to issue a temporary permit, in lieu of a license, to the operator on a vessel subject to the radio ship act of June twenty-fourth, nineteen hundred and ten.

Sec. 4. That for the purpose of preventing or minimizing interference with communication between stations in which such apparatus is operated, to facilitate radio communication, and to further the prompt receipt of the distress signals, said private and commercial stations shall be subject to the regulations of this section. These regulations shall be enforced by the Secretary of Commerce through the collectors of customs and other officers of the Government as other regulations herein provided for.

The Secretary of Commerce may, in his discretion, waive the provisions of any or all of these regulations when no interference of the character above mentioned can ensue.

The Secretary of Commerce may grant special temporary licenses to stations actually engaged in conducting experiments for the development of the science of radio communication, or the apparatus pertaining thereto, to carry on special tests, using any amount of power or any wave lengths, at such hours and under such conditions as will insure the least interference with the sending or receipt of commercial or Government radiograms, of distress signals and radiograms, or with the work of other stations.

In these regulations the naval and military stations shall be understood to be stations on land.

REGULATIONS.

NORMAL WAVE LENGTH.

First. Every station shall be required to designate a certain definite wave length as the normal sending and receiving wave length of the station. This wave length shall not exceed six hundred meters or it shall exceed one thousand six hundred meters. Every coastal station open to general public service shall at all times be ready to receive messages of such wave lengths as are required by the Berlin convention. Every ship station, except as hereinafter provided,

and every coast station open to general public service shall be prepared to use two sending wave lengths, one of three hundred meters and one of six hundred meters, as required by the international convention in force; *Provided*, That the Secretary of Commerce may, in his discretion, change the limit of wave length reservation made by regulations first and second to accord with any international agreement to which the United States is a party.

OTHER WAVE LENGTHS.

Second. In addition to the normal sending wave length all stations, except as provided hereinafter in these regulations, may use other sending wave lengths: *Provided*, That they do not exceed six hundred meters or that they do exceed one thousand six hundred meters: *Provided further*, That the character of the waves emitted conforms to the requirements of regulations third and fourth following.

USE OF A "PURE WAVE"

Third. At all stations if the sending apparatus, to be referred to hereinafter as the "transmitter," is of such a character that the energy is radiated in two or more wave lengths, more or less sharply defined, as indicated by a sensitive wave meter, the energy in no one of the lesser waves shall exceed 10 per cent of that in the greatest.

USE OF A "SHARP WAVE."

Fourth. At all stations the logarithmic decrement per complete oscillation in the wave trains emitted by the transmitter shall not exceed two-tenths, except when sending distress signals or signals and messages relating thereto.

USE OF "STANDARD DISTRESS WAVE."

Fifth. Every station on shipboard shall be prepared to send distress calls on the normal wave length designated by the international convention in force, except on vessels of small tonnage unable to have plants insuring that wave length.

SIGNAL OF DISTRESS.

Sixth. The distress call used shall be the international signal of distress

USE OF "BROAD INTERFERING WAVE" FOR DISTRESS SIGNALS.

Seventh. When sending distress signals the transmitter of a station on shipboard may be tuned in such a manner as to create a maximum of interference with a maximum of radiation.

DISTANCE REQUIREMENT FOR DISTRESS SIGNALS.

Eighth. Every station on shipboard, wherever practicable, shall be prepared to send distress signals of the character specified in regulations fifth and sixth with sufficient power to enable them to be received by day oversea a distance of one hundred nautical miles by a shipboard station equipped with apparatus for both sending and receiving equal in all essential particulars to that of the station first mentioned.

"RIGHT OF WAY" FOR DISTRESS SIGNALS.

Ninth. All stations are required to give absolute priority to signals and radiograms relating to ships in distress; to cease all sending on hearing a distress signal; and, except when engaged in answering or aiding the ship in distress, to refrain from sending until all signals and radiograms relating thereto are completed.

REDUCED POWER FOR SHIPS NEAR A GOVERNMENT STATION.

Tenth. No station on shipboard, when within fifteen nautical miles of a naval or military station, shall use a transformer input exceeding one kilowatt, nor, when within five nautical miles of such a station, a transformer input exceeding one-half kilowatt, except for sending signals of distress, or signals or radiograms relating thereto.

INTERCOMMUNICATION.

Eleventh. Each shore station open to general public service between the coast and vessels at sea shall be bound to exchange radiograms with any similar shore station and with any ship station without distinction of the radio systems adopted by such stations, respectively, and each station on shipboard shall be bound to exchange radiograms with any other station on shipboard without distinction of the radio systems adopted by each station, respectively.

It shall be the duty of each such shore station, during the hours it is in operation, to listen in at intervals of not less than fifteen minutes and for a period not less than two minutes, with the receiver tuned to receive messages of three hundred meter wave lengths.

DIVISION OF TIME.

Twelfth. At important seaports and at all other places where naval or military and private or commercial shore stations operate in such close proximity that interference with the work of naval and military stations can not be avoided by the enforcement of the regulations contained in the foregoing regulations concerning wave lengths and character of signals emitted, such private or commercial shore stations as do interfere with the reception of signals by the naval and military stations concerned shall not use their transmitters during the first fifteen minutes of each hour, local standard time. The Secretary of Commerce may, on the recommendation of the department concerned, designate the station or stations which may be required to observe this division of time.

GOVERNMENT STATIONS TO OBSERVE DIVISION OF TIME.

Thirteenth. The naval or military stations for which the above-mentioned division of time may be established shall transmit signals or radiograms only during the first fifteen minutes of each hour, local standard time, except in case of signals or radiograms relating to vessels in distress, as hereinbefore provided.

USE OF UNNECESSARY POWER.

Fourteenth. In all circumstances, except in case of signals or radiograms relating to vessels in distress, all stations shall use the minimum amount of energy necessary to carry out any communication desired.

GENERAL RESTRICTIONS ON PRIVATE STATIONS.

Fifteenth. No private or commercial station not engaged in the transaction of bona fide commercial business by radio communication or in experimentation in connection with the development and manufacture of radio apparatus for commercial purposes shall use a transmitting wave length exceeding two hundred meters, or a transformer input exceeding one kilowatt, except by special authority of the Secretary of Commerce contained in the license of the station; *Provided*, That the owner or operator of a station of the character mentioned in this regulation shall not be liable for a violation of the requirements of the third or fourth regulations to the penalties of one hundred dollars or twenty-five dollars, respectively, provided in this section unless the person maintaining or operating such station shall have been notified in writing that the said transmitter has been found, upon tests conducted by the Government, to be so adjusted as to violate the said third and fourth regulations, and opportunity has been given to said owner or operator to adjust said transmitter in conformity with said regulations.

SPECIAL RESTRICTIONS IN THE VICINITIES OF GOVERNMENT STATIONS.

Sixteenth. No station of the character mentioned in regulation fifteenth situated within five nautical miles of a naval or military station shall use a transmitting wave length exceeding 200 meters or a transformer input exceeding one-half kilowatt.

SHIP STATIONS TO COMMUNICATE WITH NEAREST SHORE STATIONS.

Seventeenth. In general, the shipboard stations shall transmit their radiograms to the nearest shore station. A sender on board a vessel shall, however, have the right to designate the shore station through which he desires to have his radiograms transmitted. If this can not be done, the wishes of the sender are to be complied with only if the transmission can be effected without interfering with the service of other stations.

LIMITATIONS FOR FUTURE INSTALLATIONS IN VICINITIES OF GOVERNMENT STATIONS.

Eighteenth. No station on shore not in actual operation at the date of the passage of this act shall be licensed for the transaction of commercial business by radio communication within fifteen nautical miles of the following naval or military stations, to wit: Arlington, Virginia; Key West, Florida; San Juan, Porto Rico; North Head and Tatoosh Island, Washington; San Diego, California; and those established or which may be established in Alaska and in the Canal Zone; and the head of the department having control of such Government stations shall, so far as is consistent with the transaction of governmental business, arrange for the transmission and receipt of commercial radiograms under the provisions of the Berlin convention of nineteen hundred and six and future international conventions or treaties to which the United States may be a party, at each of the stations above referred to, and shall fix the rates therefor, subject to control of such rates by Congress. At such stations and whenever and whenever shore stations open for general public business between the coast and vessels at sea under the provisions of the Berlin convention of nineteen hundred and six and future international conventions and treaties to which the United States may be a party shall not be so established as to insure a constant service day and night without interruption, and in all localities wherever or whenever such service shall not be maintained by a commercial shore station within one hundred nautical miles of a naval radio station, the Secretary of the Navy shall, so far as is consistent with the transaction of governmental business, open naval radio stations to the general public business described above, and shall fix rates for such service, subject to control of such rates by Congress. The receipts from such radiograms shall be covered into the Treasury as miscellaneous receipts.

SECURITY OF MESSAGES.

Nineteenth. No person or persons engaged in or having knowledge of the operation of any station or stations shall divulge or publish the contents of any messages transmitted or received by such station, except to the person or persons to whom the same may be directed, or their authorized agent, or to another station employed to forward such message to its destination, unless legally required so to do by the court of competent jurisdiction or other competent authority. Any person guilty of divulging or publishing any message, except as herein provided, shall, on conviction thereof, be punished by a fine of not more than two hundred and fifty dollars or imprisonment for a period of not exceeding three months, or both fine and imprisonment, in the discretion of the court.

PENALTIES.

For violation of any of these regulations, subject to which a license under sections one and two of this act may be issued, the owner of the apparatus shall be liable to a penalty of one hundred dollars, which may be reduced or remitted by the Secretary of Commerce, and for repeated violations of any of such regulations the license may be revoked.

For violation of any of these regulations, except as provided in regulation nineteenth, subject to which a license under section three of this act may be

issued, the operator shall be subject to a penalty of twenty-five dollars, which may be reduced or remitted by the Secretary of Commerce, and for repeated violations of any such regulations the license shall be suspended or revoked.

Sec. 5. That every license granted under the provisions of this act for the operation or use of apparatus for radio communication shall prescribe that the operator thereof shall not willfully or maliciously interfere with any other radio communication. Such interference shall be deemed a misdemeanor, and upon conviction thereof the owner or operator, or both, shall be punishable by a fine of not to exceed five hundred dollars or imprisonment for not to exceed one year, or both.

Sec. 6. That the expression "radio communication" as used in this act means any system of electrical communication by telegraphy or telephony without the aid of any wire connecting the points from and at which the radiograms, signals, or other communications are sent or received.

Sec. 7. That a person, company, or corporation within the jurisdiction of the United States shall not knowingly utter or transmit, or cause to be uttered or transmitted, any false or fraudulent distress signal or call or false or fraudulent signal, call, or other radiogram of any kind. The penalty for so uttering or transmitting a false or fraudulent distress signal or call shall be a fine of not more than two thousand five hundred dollars or imprisonment for not more than five years, or both, in the discretion of the court, for each and every such offense, and the penalty for so uttering or transmitting, or causing to be uttered or transmitted, any other false or fraudulent signal, call, or other radiogram shall be a fine of not more than one thousand dollars or imprisonment for not more than two years, or both, in the discretion of the court, for each and every such offense.

Sec. 8. That a person, company, or corporation shall not use or operate any apparatus for radio communication on a foreign ship in territorial waters of the United States otherwise than in accordance with the provisions of sections four and seven of this act and so much of section five as imposes a penalty for interference. Save as aforesaid, nothing in this act shall apply to apparatus for radio communication on any foreign ship.

Sec. 9. That the trial of any offense under this act shall be in the district in which it is committed, or if the offense is committed upon the high seas or out of the jurisdiction of any particular State or district the trial shall be in the district where the offender may be found or into which he shall be first brought.

Sec. 10. That this act shall not apply to the Philippine Islands.

Sec. 11. That this act shall take effect and be in force on and after four months from its passage.

Approved, August 13, 1912.

LONDON INTERNATIONAL RADIOTELEGRAPHIC CONVENTION, PROCLAIMED BY THE PRESIDENT JULY 8, 1913.

The International Radiotelegraphic Convention was signed at London July 5, 1912. The convention was ratified by the Senate of the United States on January 22, 1913, with the proviso set forth in the following resolution of concurrence:

"Resolved (two-thirds of the Senators present concurring therein), That the Senate advise and consent to the ratification of the radiotelegraphic convention signed at London on July 5, 1912, with the final protocol and service regulations connected therewith: Provided, That the Senate advise and consent to the ratification of said convention with the understanding to be expressed as a part of the instrument of ratification that nothing in the Ninth Article of the Regulations affixed to the convention shall be deemed to exclude the United States from the execution of her inspection laws upon vessels entering in or clearing from her ports."

The London Convention was proclaimed by the President, and took effect July 8, 1913, "to the end that the same and every article and clause thereof may be observed and fulfilled with good faith by the United States and the citizens thereof," and supersedes the Berlin Radiotelegraphic Convention.

The London Convention and Regulations do not modify or repeal the act of August 13, 1912, to regulate radio communication or the acts of June 24, 1910, and July 23, 1912, to require apparatus and operators for radio communication on certain ocean steamers.

INTERNATIONAL RADIOTELEGRAPH CONVENTION, LONDON, 1912.

[Translation.]

International Radiotelegraph Convention concluded between Germany and the German Protectorates, the United States of America and the Possessions of the United States of America, the Argentine Republic, Austria, Hungary, Bosnia-Herzegovina, Belgium, the Belgian Congo, Brazil, Bulgaria, Chile, Denmark, Egypt, Spain and the Spanish Colonies, France and Algeria, French West Africa, French Equatorial Africa, Indo-China, Madagascar, Tunis, Great Britain and the various British Colonies and Protectorates, the Union of South Africa, the Australian Federation, Canada, British India, New Zealand, Greece, Italy and the Italian Colonies, Japan and Chosen, Formosa, Japanese Sakhalin and the leased territory of Kwantung, Morocco, Monaco, Norway, the Netherlands, the Dutch Indies and the Colony of Curacao, Persia, Portugal and the Portuguese Colonies, Roumania, Russia and the Russian Possessions and Protectorates, The Republic of San Marino, Siam, Sweden, Turkey, and Uruguay.

The undersigned, plenipotentiaries of the Governments of the countries enumerated above, having met in conference at London, have agreed on the following Convention, subject to ratification:

ARTICLE 1.

The High Contracting Parties bind themselves to apply the provisions of the present Convention to all radio stations (both coastal stations and stations on shipboard) which are established or worked by the Contracting Parties and open to public service between the coast and vessels at sea.

They further bind themselves to make the observance of these provisions obligatory upon private enterprises authorized either to establish or work coastal stations for radiotelegraphy open to public service between the coast and vessels at sea, or to establish or work radio stations, whether open to general public service or not, on board of vessels flying their flag.

ARTICLE 1.

By "coastal station" is to be understood every radio station established on shore or on board a permanently moored vessel used for the exchange of correspondence with ships at sea.

Every radio station established on board any vessel not permanently moored is called a "station on shipboard."

ARTICLE 3.

The coastal stations and the stations on shipboard shall be bound to exchange radiograms without distinction of the radio system adopted by such stations.

Every station on shipboard shall be bound to exchange radiograms with every other station on shipboard without distinction of the radio system adopted by such stations.

However, in order not to impede scientific progress, the provisions of the present Article shall not prevent the eventual employment of a radio system incapable of communicating with other systems, provided that such incapacity shall be due to the specific nature of such system and that it shall not be the result of devices adopted for the sole purpose of preventing intercommunication.

ARTICLE 4.

Notwithstanding the provisions of Article 3, a station may be reserved for a limited public service determined by the object of the correspondence or by other circumstances independent of the system employed.

ARTICLE 5.

Each of the High Contracting Parties undertakes to connect the coastal stations to the telegraph system by special wires, or, at least, to take other measures which will insure a rapid exchange between the coastal stations and the telegraph system.

ARTICLE 6.

The High Contracting Parties shall notify one another of the names of coastal stations and stations on shipboard referred to in Article 1, and also of all data, necessary to facilitate and accelerate the exchange of radiograms, as specified in the Regulations.

ARTICLE 7.

Each of the High Contracting Parties reserves the right to prescribe or permit at the stations referred to in Article 1, apart from the installation the data of which are to be published in conformity with Article 6, the installation and working of other devices for the purpose of establishing special radio communication without publishing the details of such devices.

ARTICLE 8.

The working of the radio stations shall be organized as far as possible in such manner as not to disturb the service of other radio stations.

ARTICLE 9.

Radio stations are bound to give absolute priority to calls of distress from whatever source, to similarly answer such calls and to take such action with regard thereto as may be required.

ARTICLE 10.

The charge for a radiogram shall comprise, according to the circumstances:

1. (a) The coastal rate, which shall fall to the coastal station;
- (b) The shipboard rate, which shall fall to the shipboard station.

2. The charge for transmission over the telegraph lines, to be computed according to the ordinary rules.

3. The charges for transit through the intermediate coastal or shipboard stations and the charges for special services requested by the sender.

The coastal rate shall be subject to the approval of the Government of which the coastal station is dependent, and the shipboard rate to the approval of the Government of which the ship is dependent.

ARTICLE 11.

The provisions of the present Convention are supplemented by Regulations, which shall have the same force and go into effect at the same time as the Convention.

The provisions of the present Convention and of the Regulations relating thereto may at any time be modified by the High Contracting Parties by common consent. Conference of plenipotentiaries having power to modify the Convention and Regulations, shall take place from time to time; each conference shall fix the time and place of the next meeting.

ARTICLE 12.

Such conferences shall be composed of delegates of the Governments of the contracting countries.

In the deliberations each country shall have but one vote.

If a Government adheres to the Convention for its colonies, possessions or protectorates, subsequent conferences may decide that such colonies, possessions or protectorates, or a part thereof, shall be considered as forming a country as regards the application of the preceding paragraph. But the number of votes at the disposal of one Government, including its colonies, possessions or protectorates, shall in no case exceed six.

The following shall be considered as forming a single country for the application of the present Article:

- German East Africa
- German Southwest Africa
- Kamerun
- Togo Land
- German Protectorates in the Pacific

Alaska

Hawaii and the other American possessions in Polynesia
 The Philippine Islands
 Porto Rico and the American possessions in the Antilles.

The Panama Canal Zone

The Belgian Congo

The Spanish Colony of the Gulf of Guinea

French East Africa

French Equatorial Africa

Indo-China

Madagascar

Tunis

The Union of South Africa

The Australian Federation

Canada

British India

New Zealand

Eritrea

Italian Somaliland

Chosen, Formosa, Japanese Sakhalin and the leased territory of Kwantung.

The Dutch Indies

The Colony of Curacao

Portuguese West Africa

Portuguese East Africa and the Portuguese possessions in Asia

Russian Central Asia (littoral of the Caspian Sea)

Bokhara

Khiva

Western Siberia (littoral of the Arctic Ocean).

Eastern Siberia (littoral of the Pacific Ocean).

ARTICLE 13.

The International Bureau of the Telegraph Union shall be charged with collecting, coordinating and publishing information of every kind relating to radio-telegraphy, examining the applications for changes in the Convention or Regulations, promulgating the amendments adopted, and generally performing all administrative work referred to it in the interest of international radio-telegraphy.

The expense of such institution shall be borne by all the contracting countries.

ARTICLE 14.

Each of the High Contracting Parties reserves to itself the right of fixing the terms on which it will receive radiograms proceeding from or intended for any station, whether on shipboard or coastal, which is not subject to the provisions of the present Convention.

If a radiogram is received the ordinary rates shall be applicable to it.

Any radiogram proceeding from a station on shipboard and received by a coastal station of a contracting country, or accepted in transit by the administration of a contracting country, shall be forwarded.

Any radiogram intended for a vessel shall also be forwarded if the administration of the contracting country has accepted it originally or in transit from a non-contracting country, the coastal station reserving the right to refuse transmission to a station on shipboard subject to a non-contracting country.

ARTICLE 15.

The provisions of Articles 8 and 9 of this Convention are also applicable to radio installation other than those referred to in Article 1.

ARTICLE 16.

Governments which are not parties to the present Convention shall be permitted to adhere to it upon their request. Such adherence shall be communicated through diplomatic channels to the contracting Government in whose territory the last conference shall have been held, and by the latter to the remaining Governments.

The adherence shall carry with it to the fullest extent acceptance of all the clauses of this Convention and admission to all the advantages stipulated therein.

The adherence to the Convention by the Government of a country having colonies, possessions or protectorates shall not carry with it the adherence of its colonies; possessions or protectorates unless a declaration to that effect is made by such Government. Such colonies, possessions and protectorates, as a whole or each of them, separately, may form the subject of a separate adherence or a separate denunciation within the provisions of the present Article and of Article 22.

ARTICLE 17.¹

The provisions of Articles 1, 2, 3, 5, 6, 7, 8, 11, 12 and 17 of the International Telegraph Convention of St. Petersburg of July 10-22, 1875, shall be applicable to international radiotelegraphy.

ARTICLE 18.

In case of disagreement between two or more contracting Governments regarding the interpretation or execution of the present Convention or of the Regulations referred to in Article 11, the question in dispute may, by mutual agreement, be submitted to arbitration. In such case each of the Governments concerned shall choose another Government not interested in the question at issue.

The decision of the arbiters shall be arrived at by the absolute majority of votes.

In case of a division of votes, the arbiters shall choose, for the purpose of settling the disagreement, another contracting Government which is likewise a stranger to the question at issue. In case of failure to agree on a choice, each arbiter shall propose a disinterested contracting Government and lots shall be drawn between the Governments proposed. The drawing of the lots shall fall to the Government within whose territory the international bureau provided for in Article 13 shall be located.

ARTICLE 19.

The High Contracting Parties bind themselves to take, or propose to their respective legislatures, the necessary measures for insuring the execution of the present Convention.

ARTICLE 20.

The High Contracting Parties shall communicate to one another any laws already framed, or which may be framed, in their respective countries relative to the object of the present Convention.

ARTICLE 21.

The High Contracting Parties shall preserve their entire liberty as regards radio installations other than provided for in Article 1, especially naval and military installations, and stations used for communications between fixed points. All such installations and stations shall be subject only to the obligations provided for in Articles 8 and 9 of the present Convention.

However, when such installations and stations are used for public maritime service they shall conform, in the execution of such service, to the provisions of the Regulations as regards the mode of transmission and rates.

On the other hand, if coastal stations are used for general public service with ships at sea and also for communication between fixed points, such stations shall not be subject, in the execution of the last named service, to the provisions of the Convention except for the observance of Articles 8 and 9 of this Convention.

Nevertheless, fixed stations used for correspondence between land and land shall not refuse the exchange of radiograms with another fixed station on

¹ See translation of articles of the International Telegraph Convention.

account of the system adopted by such station; the liberty of each country shall, however, be complete as regards the organization of the service for correspondence between fixed points and the nature of the correspondence to be effected by the stations reserved for such service.

ARTICLE 22.

The present Convention shall go into effect on the 1st day of July, 1913, and shall remain in force for an indefinite period or until the expiration of one year from the day when it shall be denounced by any of the contracting parties.

Such denunciation shall affect only the Government in whose name it shall have been made. As regards the other Contracting Powers, the Convention shall remain in force.

ARTICLE 23.

The present Convention shall be ratified and the ratifications exchanged at London with the least possible delay.

In case one or several of the High Contracting Parties shall not ratify the Convention, it shall nevertheless be valid as to the Parties which shall have ratified it.

In witness whereof the respective plenipotentiaries have signed one copy of the Convention, which shall be deposited in the archives of the British Government, and a copy of which shall be transmitted to each Party.

Done at London, July 5, 1912.

[Translation.]

FINAL PROTOCOL.

At the moment of signing the Convention adopted by the International Radiotelegraph Conference of London, the undersigned plenipotentiaries have agreed as follows:

I.

The exact nature of the adherence notified on the part of Bosnia-Herzegovina not yet being determined, it is recognized that one vote shall be assigned to Bosnia-Herzegovina but that a decision will be necessary at a later date as to whether this vote belongs to Bosnia-Herzegovina in virtue of the second paragraph of Article 12 of the Convention, or whether this vote is accorded to it in conformity with the provisions of the third paragraph of that article.

II.

Note is taken of the following declaration:

The Delegation of the United States declares that its government is under the necessity of abstaining from all action with regard to rates, because the transmission of radiograms as well as of ordinary telegrams in the United States is carried on, wholly or in part, by commercial or private companies.

III.

Note is likewise taken of the following declaration:

The Government of Canada reserves the right to fix separately, for each of its coastal stations, a total maritime rate for radiograms proceeding from North America and destined for any ship whatever, the coastal rate amounting to three-fifths and the shipboard rate to two-fifths of the total rate.

In witness whereof the respective plenipotentiaries have drawn up the present Final Protocol, which shall be of the same force and effect as though the provisions thereof had been embodied in the text of the Convention itself to which it has reference, and they have signed one copy of the same, which shall be deposited in the archives of the British Government, and a copy of which shall be transmitted to each of the Parties.

Done at London, July 5, 1912.

SERVICE REGULATIONS AFFIXED TO THE INTERNATIONAL RADIOTELEGRAPH CONVENTION, LONDON, 1912.

[Translation.]

ORGANIZATION OF RADIO STATIONS.

ARTICLE I.

The choice of radio apparatus and devices to be used by the coastal stations and stations on shipboard shall be unrestricted. The installation of such stations shall as far as possible keep pace with scientific and technical progress.

ARTICLE II.

Two wave lengths, one of 600 meters and the other of 300 meters, are authorized for general public service. Every coastal station opened to such service shall be equipped in such manner as to be able to use these two wave lengths, one of which shall be designated as the normal wave length of the station. During the whole time that a coastal station is open it shall be in condition to receive calls according to its normal wave length. For the correspondence specified under paragraph 2 of Article XXXV, however, a wave length of 1,800 meters shall be used. In addition, each Government may authorize in coastal stations the employment of other wave lengths designed to insure long-range service or any service other than for general public correspondence established in conformity with the provisions of the Convention under the reservation that such wave lengths do not exceed 600 meters or that they do exceed 1,600 meters.

In particular, stations used exclusively for sending signals designed to determine the position of ships shall not employ wave lengths exceeding 150 meters.

ARTICLE III.

1. Every station on shipboard shall be equipped in such manner as to be able to use wave lengths of 600 meters and of 300 meters. The first shall be the normal wave length and may not be exceeded for transmission except in the case referred to under Article XXXV (paragraph 2).

Other wave lengths, less than 600 meters, may be used in special cases and under the approval of the managements to which the coastal and shipboard stations concerned are subject.

2. During the whole time that a station on shipboard is open it shall be able to receive calls according to its normal wave length.

3. Vessels of small tonnage which are unable to use a wave length of 600 meters for transmission, may be authorized to employ exclusively the wave length of 300; they must be able to receive a wave length of 600 meters.

ARTICLE IV.

Communication between a coastal station and a station on shipboard shall be exchanged on the part of both by means of the same wave length. If, in a particular case, communication is difficult, the two stations may, by mutual consent, pass from the wave length with which they are communicating to the other regulation wave length. Both stations shall resume their normal wave length when the exchange of radiograms is finished.

ARTICLE V.

1. The International Bureau shall draw up, publish, and revise from time to time an official chart showing the coastal stations, their normal ranges, the principal lines of navigation, and the time normally taken by ships for the voyage between the different ports of call.

2. It shall draw up and publish a list of radio stations of the class referred to in Article I of the convention, and from time to time supplements covering additions and modifications. Such list shall contain for each station the following data:

(1) In the case of coastal stations: Name, nationality, and geographical location indicated by the territorial subdivision and the latitude and longitude of

the place. In the case of stations on shipboard: Name and nationality of the ship. When the case arises, the name and address of the party working the station.

(2) The call letters (the calls shall be distinguishable from one another and each must be formed of a group of three letters).

(3) The normal range.

(4) The radio system with the characteristics of the transmitting system (musical sparks, tonality expressed by the number of double vibrations, etc.).

(5) The wave lengths used (the normal wave length to be underscored).

(6) The nature of the services carried on.

(7) The hours during which the station is open.

(8) When the case arises, the hour and method of transmitting time signals and meteorological telegrams.

(9) The coastal rate or shipboard rate.

3. The list shall also contain data relating to radio stations other than those specified in Article I of the convention as may be communicated to the International Bureau by the management of the Radio Service ("administration") to which such stations are subject, provided that such managements are either adherents to the convention or, if not adherents, have made the declaration referred to in Article XLVIII.

4. The following notations shall be adopted in documents for use by the International Service to designate radio stations:

PG station open to general public correspondence.

PR station open to limited public correspondence.

P station of private interest.

O station open exclusively to official correspondence.

N station having continuous service.

X station having no fixed working hours.

5. The name of a station on shipboard appearing in the first column of the list shall be followed, in case there are two or more vessels of the same name, by the call letters of such station.

ARTICLE VI.

The exchange of superfluous signals and words is prohibited to stations of the class referred to in Article I of the convention. Experiments and practice will be permitted in such stations in so far as they do not interfere with the service of other stations.

Practice shall be carried on with wave lengths different from those authorized for public correspondence, and with the minimum of power necessary.

ARTICLE VII.

1. All stations are bound to carry on the service with the minimum of energy necessary to insure safe communication.

2. Every coastal or shipboard station shall comply with the following requirements:

(a) The waves sent out shall be as pure and as little damped as possible;

In particular, the use of transmitting devices in which the waves sent out are obtained by means of sparks directly in the aerial (plain aerial) shall not be authorized except in cases of distress.

It may, however, be permitted in the case of certain special stations (those of small vessels for example) in which the primary power does not exceed 50 watts.

(b) The apparatus shall be able to transmit and receive at a speed equal to at least 20 words a minute, words to be counted at the rate of five letters each.

New installation using more than 50 watts shall be equipped in such a way as to make it possible to obtain with ease several ranges less than the normal range, the shortest being approximately 15 nautical miles. Existing installations using more than 50 watts shall be remodeled, wherever possible, so as to comply with the foregoing provisions.

(c) Receiving apparatus shall be able to receive, with the greatest possible protection against interference, transmissions of the wave lengths specified in the present Regulations, up to 600 meters.

3. Stations serving solely for determining the position of ships (radiophares) shall not operate over a radius greater than 30 nautical miles.

ARTICLE VIII.

Independently of the general requirements specified under Article VII, stations on shipboard shall likewise comply with the following requirements:

(a) The power transmitted to the radio apparatus, measured at the terminals of the generator of the station, shall not, under normal conditions, exceed one kilowatt.

(b) Subject to the provisions of Article XXXV, paragraph 2, power exceeding one kilowatt may be employed when the vessel finds it necessary to correspond while more than 200 nautical miles distant from the nearest coastal station, or when owing to unusual circumstances communication can be established only by means of an increase of power.

ARTICLE IX.

1. No station on shipboard shall be established or worked by private enterprise without a license issued by the Government to which the vessel is subject.

Stations on board of ships having their port of registry in a colony, possession, or protectorate may be described as subject to the authority of such colony, possession, or protectorate.

2. Every shipboard station holding a license issued by one of the contracting governments shall be considered by the other governments as having an installation fulfilling the requirements stipulated in the present regulations.

Competent authorities of the countries at which the ship calls may demand the production of the license. In default of such production, these authorities may satisfy themselves as to whether the radio installations of the ship fulfill the requirements imposed by the present regulations.

When the management of the radio service of a country is convinced by its working that a station on shipboard does not fulfill the requirements, it shall, in every case, address a complaint to the management of the radio service of the country to which such ship is a subject. The subsequent procedure, when necessary, shall be the same as that prescribed in Article XII, paragraph 2.

ARTICLE X.

1. The service of the station on shipboard shall be carried on by a telegraph operator holding a certificate issued by the government to which the vessel is subject, or, in case of necessity and for one voyage only, by some other adhering government.

2. There shall be two classes of certificates:

The first-class certificate shall attest the professional efficiency of the operator as regards:

- (a) Adjustment of the apparatus and knowledge of its functioning;
- (b) Transmission and acoustic reception at the rate of not less than 20 words a minute;
- (c) Knowledge of the regulations governing the exchange of radio correspondence.

The second-class certificate may be issued to operators who are able to transmit and receive at a rate of only 12 to 19 words a minute, but who, in other respects, fulfill the requirements mentioned above. Operators holding second-class certificates may be permitted on:

(a) Vessels which use radiotelegraphy only in their own service and in the correspondence of their crews, fishing vessels in particular;

(b) All vessels as substitutes, provided such vessels have on board at least one operator holding a first-class certificate. However, on vessels classed under the first category indicated in Article XIII the service shall be carried on by at least two telegraph operators holding first-class certificates.

In the stations on shipboard transmissions shall be made only by operators holding first or second class certificates, except in cases of necessity, where it would be impossible to conform to this provision.

3. The certificate shall furthermore state that the Government has bound the operator with secrecy with regard to the correspondence.

4. The radio service of the station on shipboard shall be under the superior authority of the commanding officer of the ship.

ARTICLE XI.

Ships provided with radio installations and classed under the first two categories indicated in Article XIII are bound to have radio installations for distress calls, all the elements of which shall be kept under conditions of the greatest possible safety, to be determined by the Government issuing the license. Such emergency installations shall have their own source of energy, be capable of quickly being set in operation, of functioning for at least six hours, and have a minimum range of 80 nautical miles for ships of the first category and 50 miles for those of the second. Such emergency installations shall not be required in the case of vessels the regular installations of which fulfill the requirements of the present article.

ARTICLE XII.

If the management of the radio service of a country has knowledge of any infraction of the convention or of the regulations committed in any of the stations authorized by it, it shall ascertain the facts and fix the responsibility.

In the case of stations on shipboard, if the operator is responsible for such infraction, the management of the radio service shall take the necessary measures, and, if the necessity should arise, withdraw the certificate. If it is ascertained that the infraction is the result of the condition of the apparatus or of instructions given the operator, the same method shall be pursued with regard to the license issued to the vessel.

2. In cases of repeated infractions chargeable to the same vessel, if the representations made to the management of the country to which the vessel is subject by that of another country remain without effect, the latter shall be at liberty, after giving due notice, to authorize its coastal stations not to accept communications proceeding from the vessel at fault. In case of disagreement between the management of the radio service of two countries, the question shall be submitted to arbitration at the request of either of the two Governments concerned. The procedure is indicated in article 18 of the convention.

2. HOURS OF SERVICE OF STATIONS.

ARTICLE XIII.

(a) Coastal stations:

1. The service of coastal stations shall, as far as possible be constant, day and night, without interruption.

Certain coastal stations, however, may have a service of limited duration. The management of the radio service of each country shall fix the hours of service.

2. The coastal stations whose service is not constant shall not close before having transmitted all their radiograms to the vessels which are within their radius of action, nor before having received from such vessels all the radiograms of which notice has been given. This provision is likewise applicable when vessels signal their presence before the actual cessation of work.

(b) Stations on shipboard:

3. Stations on shipboard shall be classed under three categories:

- (1) Stations having constant service;
- (2) Stations having a service of limited duration;
- (3) Stations having no fixed working hours.

When the ship is under way the following shipboard stations shall have an operator constantly listening in; 1st, Stations of the first category; 2nd, Those of the second category during the hours in which they are open to service. During the remaining hours the last-named stations shall have an operator at the radio instrument listening in during the first ten minutes of each hour. Stations of the third category are not bound to perform any regular service of listening in.

It shall fall to the Governments issuing the licenses specified in Article IX to fix the category in which the ship shall be classed as regards its obligations in the matter of listening in. Mention shall be made of such classification in the license.

3. FORM AND POSTING OF RADIOGRAMS.

ARTICLE XIV.

1. Radiograms shall show, as the first word of the preamble, that the service is "radio."
2. In the transmission of radiograms proceeding from a ship at sea, the date and hour of posting at the shipboard station shall be stated in the preamble.
3. Upon forwarding a radiogram over the telegraph system the coastal station shall show thereon as the office of origin the name of the ship of origin as it appears in the list, and also when the case arises, that of the last ship which acted as intermediary. These data shall be followed by the name of the coastal station.

ARTICLE XV.

The address of radiograms intended for ships shall be as complete as possible.

It shall embrace the following:

- (a) The name or title of the addressee, with additional designations, if any;
- (b) The name of the vessel as it appears in the first column of the list;
- (c) The name of the coastal station as it appears in the list.

The name of the ship, however, may be replaced, at the sender's risk, by the designation of the route to be followed by such vessel, as determined by the names of the ports of departure and destination or by any other equivalent information.

2. In the address the name of the ship as it appears in the first column of the list shall in all cases and independently of its length be counted as one word.

3. Radiograms framed with the aid of the International Code of Signals shall be transmitted to their destination without being translated.

4. RATES.

ARTICLE XVI.

1. The coastal rate and the shipboard rate shall be fixed in accordance with the tariff per word, pure and simple, on the basis of an equitable remuneration for the radio work, with an optional minimum rate per radiogram.

The coastal rate shall not exceed 60 centimes (11.6 cents) a word, and the shipboard rate shall not exceed 40 centimes (7.7 cents) a word. However, each management shall be at liberty to authorize coastal and shipboard rates higher than such maxima in the case of stations of ranges exceeding 400 nautical miles, or of stations whose work is exceptionally difficult owing to physical conditions in connection with the installation or working of the same.

The optional minimum rate per radiogram shall not be higher than the coastal rate or shipboard rate for a radiogram of ten words.

2. In the case of radiograms proceeding from or destined for a country and exchanged directly with the coastal stations of such country, the rate applicable to the transmission over the telegraph lines shall not, on the average, exceed the inland rate of such country.

Such rate shall be computed per word, pure and simple, with an optional minimum rate which shall not exceed the rate for ten words. It shall be stated in francs by the management of the radio service of the country to which the coastal station is subject.

In the case of countries of the European system, with the exception of Russia and Turkey, there shall be but one rate for the territory of each country.

ARTICLE XVII.

1. When a radiogram proceeding from a ship and intended for the coast passes through one or two shipboard stations the charges shall comprise, in addition to the rates of the shipboard station of origin, the coastal station and the telegraph lines, the shipboard rate of each of the ships which have participated in the transmission.

2. The sender of a radiogram proceeding from the coast and intended for a ship may require that his message be transmitted by way of one or two stations on shipboard; he shall deposit for this purpose an amount equal to the radio and telegraph rates and, in addition, a sum to be fixed by the office of origin, as surety for the payment to the intermediary shipboard stations of the transit rates fixed by paragraph 1. He shall further pay, at his option, either

the rate for a telegram of five words or the price of the postage on a letter to be sent by the coastal station to the office of origin giving the necessary information for the liquidation of the amounts deposited.

The radiogram shall then be accepted at the sender's risk; it shall show before the address the prepaid instruction, to wit: "X retransmissions telegraph" or "X retransmissions letter" according to whether the sender desired the information necessary for the liquidation of the deposits to be furnished by telegraph or by letter.

3. The rate for radiograms proceeding from a ship intended for another ship and forwarded through one or two intermediary coastal stations shall comprise:

The shipboard rates of the two ships, the coastal rate of the coastal station or two coastal stations, as the case may be, and the telegraph rate, when necessary, applicable to the transmission between the two coastal stations.

4. The rate for radiograms exchanged between ships without the intervention of a coastal station shall comprise the shipboard rates of the vessels of origin and destination, together with the shipboard rates of the intermediary stations.

5. The coastal and shipboard rates accruing to the stations of transit shall be the same as those fixed for such stations when they are stations of origin or destination. In no case shall they be collected more than once.

6. In the case of every coastal station acting as intermediary, the rate to be collected for the service of transit shall be the highest coastal rate applicable to direct communication with the two ships concerned.

ARTICLE XVIII.

The country within whose territory a coastal station is established which serves as intermediary for the exchange of radiograms between a station on board ship and another country shall be considered, so far as the application of telegraph rates is concerned, as the country of origin or of destination of such radiograms, and not as the country of transit.

5. COLLECTION OF CHARGES.

ARTICLE XIX.

The total charge for radiograms shall be collected of the sender, with the exception of:

(1) Charges for special delivery (Art. LVIII, Par. 1, of the Telegraph Regulations); (2) Charges applicable to inadmissible combinations or alterations of words noted by the office or station of destination (Art. XIX, par. 9 of the Telegraph Regulations) such charges being collected of the addressee.

Stations on shipboard shall to that end have the necessary tariffs. They shall be at liberty, however, to obtain information from coastal stations on the subject of rates for radiograms for which they do not possess all the necessary data.

2. The counting of words by the office of origin shall be conclusive in the case of radiograms intended for ships and that of the shipboard station of origin shall be conclusive in the case of radiograms proceeding from ships, both for purposes of transmission and of the international accounts. However, when the radiogram is worded wholly or in part, either in one of the languages of the country of destination, in the case of radiograms proceeding from ships, or in one of the languages of the country to which the ship is subject, in the case of radiograms intended for ships, and contains combinations or alterations of words contrary to the usage of such language, the bureau or shipboard station of destination, as the case may be, shall have the right to recover from the addressee the amount of charge not collected. In case of refusal to pay, the radiogram may be withheld.

6. TRANSMISSION OF RADIOGRAMS.

(A) SIGNALS OF TRANSMISSION.

ARTICLE XX.

The signals to be employed are those of the Morse International Code.

ARTICLE XXI.

Ships in distress shall use the following signal: . . . — — — . . . repeated at brief intervals, followed by the necessary particulars.

As soon as a station hears the signal of distress it shall cease all correspondence and not resume it until after it has made sure that the correspondence to which the call for assistance has given rise is terminated.

Stations which hear a signal of distress shall conform to the instructions given by the ship making such signal as regards the order of the messages or their cessation.

In case the call letters of a particular station are added at the end of the series of calls for assistance the answer to the call shall be incumbent upon that station alone unless such station fails to reply. If the call for assistance does not specify any particular station, every station hearing such call shall be bound to answer it.

ARTICLE XXII.

For the purpose of giving or requesting information concerning the radio service stations shall make use of the signals contained in the list appended to the present regulations.

(B) ORDER OF TRANSMISSION.

ARTICLE XXIII.

Between two stations radiograms of the same order shall be transmitted one by one by the two stations alternately or in series of several radiograms, as the coastal station may indicate, provided the duration of the transmission of each series does not exceed fifteen minutes.

(C) METHOD OF CALLING RADIO STATIONS AND TRANSMISSION OF RADIOGRAMS.

ARTICLE XXIV.

1. As a general rule, it shall be the shipboard station that calls the coastal station whether it has radiograms to transmit or not.

2. In waters where the radio traffic is very great (British Channel, etc.), a coastal station should not, as a general rule, be called by a shipboard station unless the former is within normal range of the shipboard station and not until the distance of the vessel from the coastal station is less than 75 per cent of the normal range of the latter.

3. Before proceeding to call, the coastal station or the station on shipboard shall adjust its receiving apparatus to its maximum sensibility and make sure that no other correspondence is being carried on within its radius of action; if it finds otherwise, it shall wait for the first pause, unless it is convinced that its call will not be likely to disturb the correspondence in progress. The same applies in case the station desires to answer a call.

4. For calling, every station shall use the normal wave of the station it wishes to call.

5. If in spite of these precautions the transmission of a radiogram is impeded at any place, the call shall cease upon the first request from a coastal station open to public correspondence. The latter station shall in such case indicate the approximate length of time it will be necessary to wait.

6. The station on shipboard shall make known to every coastal station to which it has signaled its presence the moment at which it proposes to cease its operations and the probable duration of the interruption.

ARTICLE XXV.

1. The call shall comprise the signal — . — . — the call letters of the station called transmitted three times, the word "from" (de) followed by the call letters of the sending station transmitted three times.

2. The called station shall answer by making the signal — . — . — followed by the call letters of the corresponding station transmitted three times, the word "from," its own call letters, and the signal — . — .

3. Stations desiring to enter into communication with ships, without, however, knowing the names of the ships within their radius of action, may employ the signal — . — . — . — . — (signal of inquiry). The provisions of paragraphs 1 and 2 are likewise applicable to the transmission of a signal of inquiry and to the answer to such signal.

ARTICLE XXVI.

If a station called does not answer the call (Article XXV) transmitted three times at intervals of two minutes, the call shall not be resumed until after an interval of fifteen minutes, the station issuing the call having first made sure of the fact that no radio correspondence is in progress.

ARTICLE XXVII.

Every station which has occasion to transmit a radiogram requiring the use of high power shall first send out three times the signal of warning — — . . . — — with the minimum of power necessary to reach the neighboring stations. It shall not begin to transmit with high power until 30 seconds after sending the signal of warning.

ARTICLE XXVIII.

1. As soon as the coastal station has answered, the shipboard station shall furnish it with the following data in case it has messages to transmit; such data shall likewise be furnished upon request from the coastal station:

(a) The approximate distance, in nautical miles, of the vessel from the coastal station;

(b) The position of the vessel indicated in a concise form and adapted to the circumstances of the case;

(c) Her next port of call;

(d) The number of radiograms, if they are of normal length, or the number of words, if the messages are unusually long.

The speed of the ship in nautical miles shall also be given if specially requested by the coastal station.

2. The coastal station shall answer stating, as provided in paragraph 1, either the number of radiograms or the number of words to be transmitted to the ship, and also the order of transmission.

3. If the transmission can not take place immediately, the coastal station shall inform the station on shipboard of the approximate length of time that it will be necessary to wait.

4. If a shipboard station called can not receive for the moment, it shall inform the station calling of the approximate length of time that it will be necessary to wait.

5. In the exchange of messages between two stations on shipboard, it shall fall to the station called to fix the order of transmission.

ARTICLE XXIX.

When a coastal station receives calls from several shipboard stations, it shall decide the order in which such stations shall be admitted to exchange their messages.

In fixing this order the coastal station shall be guided exclusively by the necessity of permitting each station concerned to exchange the greatest possible number of radiograms.

ARTICLE XXX.

Before beginning the exchange of correspondence the coastal station shall advise the shipboard station whether the transmission is to be effected in the alternate order or by series (Article XXIII); it shall then begin the transmission or follow up the preliminaries with the signal — . . . — .

ARTICLE XXXI.

The transmission of the radiogram shall be preceded by the signal — . . . — . and terminated by the signal . — . — . followed by the name of the sending station and by the signal — . . . — .

In the case of a series of radiograms, the name of the sending station and the signal — . — . shall only be given at the end of the series.

ARTICLE XXXII.

When a radiogram to be transmitted contains more than 40 words, the sending station shall interrupt the transmission by the signal . . . — . — . . after

each series of about 20 words and shall not resume it until after it has obtained from the receiving station a repetition of the last word duly received, followed by the said signal, or, if the reception is good, by the signal — . —

In the case of transmission by series, acknowledgment of receipt shall be made after each radiogram.

Coastal stations engaged in the transmission of long radiograms shall suspend the transmission at the end of each period of 15 minutes, and remain silent for a period of 3 minutes before resuming the transmission.

Coastal and shipboard stations working under the conditions specified in Article XXXV, par. 2, shall suspend work at the end of each period of 15 minutes and listen in with a wave length of 600 meters during a period of 3 minutes before resuming the transmission.

ARTICLE XXXIII.

1. When the signals become doubtful every possible means shall be resorted to to finish the transmission. To this end the radiogram shall be transmitted three times, at most, at the request of the receiving station. If in spite of such triple repetition the signals are still unreadable, the radiogram shall be canceled.

If no acknowledgment of receipt is received, the transmitting station shall again call up the receiving station. If no reply is made after three calls, the transmission shall not be followed up any further. In such case, the sending station shall have the privilege of obtaining the acknowledgment of receipt through the medium of another radio station, using, when necessary, the lines of the telegraph system.

2. If in the opinion of the receiving station the radiogram, although imperfectly received, is nevertheless capable of transmission, said station shall enter the words "reception doubtful" at the end of the preamble and let the radiogram follow. In such case the management of the radio service of the country to which the coastal station is subject shall claim the charges in conformity with Article XLII of the present regulations. If, however, the shipboard station subsequently transmits the radiogram to another coastal station of the same management, the latter can claim only the rates applicable to a single transmission.

(D) ACKNOWLEDGMENT OF RECEIPT AND CONCLUSION OF WORK.

ARTICLE XXXIV.

1. Receipt shall be acknowledged in the form prescribed by the International Telegraph Regulations; it shall be preceded by the call letters of the transmitting station and followed by those of the receiving station.

2. The conclusion of a correspondence between two stations shall be indicated by each of the two stations by means of the signal . . . — . — followed by its own call letters.

(E) DIRECTIONS TO BE FOLLOWED IN SENDING RADIOGRAMS.

ARTICLE XXXV.

1. In general, the shipboard stations shall transmit their radiograms to the nearest coastal station.

Nevertheless, if a shipboard station has the choice between several coastal stations at equal or nearly equal distances, it shall give the preference to the one established on the territory of the country of destination or normal transit for its radiograms.

2. A sender on board a vessel shall, however, have the right to designate the coastal station through which he desires to have his radiogram transmitted. The station on shipboard shall then wait until such coastal station shall be the nearest.

In exceptional cases transmission may be made to a more distant coastal station, provided that:

(a) The radiogram is intended for the country in which such coastal station is situated and emanates from a ship subject to that country;

(b) Both stations use for calling and transmission a wave length of 1,800 meters;

(c) Transmission with this wave length does not interfere with a transmission made by means of the same wave length by a nearer coastal station;

(d) The station on shipboard is more than 50 nautical miles distant from any coastal station given in the list. The distance of 50 miles may be reduced to 25 miles provided the maximum power at the terminals of the generator does not exceed 5 kilowatts and that the station on shipboard are established in conformity with Articles VII and VIII. This reduction in the distance shall not be admissible in the seas, bays or gulfs of which the shores belong to one country only and of which the opening to the high sea is less than 100 miles wide.

7. DELIVERY OF RADIOGRAMS AT THEIR DESTINATION.

ARTICLE XXXVI.

When for any cause whatever a radiogram proceeding from a vessel at sea and intended for the coast can not be delivered to the addressee, a notice of nondelivery shall be issued. Such notice shall be transmitted to the coastal station which received the original radiogram. The latter, after verifying the addressee, shall forward the notice to the ship, if possible, by the intervention, if need be, of another coastal station of the same country or of a neighboring country.

When a radiogram received by a shipboard station can not be delivered, the station shall notify the office of the origin by official notice. In the case of radiograms emanating from the coast, such notice shall be transmitted, whenever practicable, to the coastal station through which the radiogram has passed in transit; otherwise, to another coastal station of the same country or of a neighboring country.

ARTICLE XXXVII.

If the ship for which a radiogram is intended has not signaled her presence to the coastal station within the period designated by the sender, or, in the absence of such designation, by the morning of the 8th day following, the coastal station shall so notify the office of origin which shall in turn inform the sender.

The latter shall have the right to ask, by a paid official notice, sent by either telegraph or mail and addressed to the coastal station, that his radiogram be held for a further period of 9 days for transmission to the vessel, and so on. In the absence of such request the radiogram shall be put aside as not transmissible at the end of the 9th day (exclusive of the day of posting).

Nevertheless, if the coastal station is certain that the vessel has left its radius of action before it has been able to transmit the radiogram to her, such station shall immediately so notify the office of origin, which shall, without delay, inform the sender of the cancellation of the message. The sender may, however, by a paid official notice, request the coastal station to transmit the radiogram the next time the vessel shall pass.

8. SPECIAL RADIOGRAMS.

ARTICLE XXXVIII.

The following radiograms only shall be accepted for transmission:

(1) Radiograms which answer prepaid. Such radiograms shall show before the address the indication "Answer prepaid" or "R P" supplemented by a statement of the amount paid in advance for the answer, thus: "Response payee fr. x," or "R P fr. x."

The reply voucher issued by a station on shipboard shall carry with it the right to send, within the limits of its value, a radiogram to any destination whatever from the station on shipboard which has issued such voucher.

(2) Radiograms calling for repetition of message (for purposes of verification).

(3) Special-delivery radiograms. Only, however, in cases where the amount of the charges for special delivery collected of the addressee. Countries which can not accept such radiograms shall make a declaration to this effect to the international bureau. Special-delivery radiograms with charges collected of the sender may be accepted when they are intended for the country within whose territory the corresponding station is located.

(4) Radiograms to be delivered by mail.

(5) Multiple radiograms.

(6) Radiograms calling for acknowledgment of receipt. But only as regards notification of the date and hour at which the coastal station shall have transmitted to the station on shipboard the radiogram addressed to the latter.

(7) Paid service notices. Except those requesting a repetition or information. Nevertheless, all paid service notices shall be accepted in transmission over the telegraph lines.

(8) Urgent radiograms. But only in transmission over the telegraph lines and subject to the application of the international telegraph regulations.

ARTICLE XXXIX.

Radiograms may be transmitted by a coastal station to a ship, or by a ship to another ship, with a view to being forwarded by mail from a port of call of the ship receiving the radiogram.

Such radiogram shall not be entitled to any radio retransmission.

The address of such radiogram shall embrace the following:

(1) The paid designation "mail" followed by the name of the port at which the radiogram is to be mailed;

(2) The name and complete address of the addressee;

(3) The name of the station on shipboard by which the radiogram is to be mailed;

(4) When necessary, the name of the coastal station.

Example: Mail Buenosaires 14 Calle Prat Valparaiso Avon Lizard.

The rate shall comprise, in addition to the radio and telegraph rates, a sum of 25 centimes (.048 cents) for the postage on the radiogram.

9. FILES.

ARTICLE XL.

The originals of radiograms, together with the documents relating thereto retained by the managements of the radio service, shall be kept, with all the necessary precautions as regards secrecy, for a period of at least fifteen months beginning with the month following that of the posting of the radiogram.

Such originals and documents shall, as far as practicable, be sent at least once a month by the shipboard stations to the management of the radio service to which they are subject.

10. REBATES AND REIMBURSEMENTS.

ARTICLE XLI.

1. With regard to rebates and reimbursements, the International Telegraph Regulations shall be applicable, taking into account the restrictions specified in Article XXXVIII and XXXIX of the present regulations and subject to the following reservations:

The time employed in the transmission of radiograms and the time that radiograms remain in a coastal station in the case of radiograms intended for ships, or in the station on shipboard in the case of radiograms proceeding from ships, shall not be counted as delays as regards rebates or reimbursements.

If the coastal station notifies the office of origin that a radiogram can not be transmitted to the ship addressed, the management of the radio service of the country of origin shall immediately instigate reimbursement to the sender of the coastal and shipboard rates relating to the radiogram. In such case, the refunded charges shall not enter into the accounts provided for by Article XLII, but the radiogram shall be mentioned therein as a memorandum.

Reimbursements shall be borne by the different managements of the radio service and private enterprises which have taken part in the transmission of the radiogram, each management or private enterprise relinquishing its share of the rate. Radiograms to which Articles 7 and 8 of the Convention of St. Petersburg are applicable shall remain subject, however, to the provisions of the International Telegraph Regulations, except when the acceptance of such radiograms is the result of an error made by the telegraph service.

2. When the acknowledgment of receipt of a radiogram has not reached the station which has transmitted the message, the charges shall be refunded only if the fact has been established that the radiogram is entitled to reimbursement.

11. ACCOUNTS AND PAYMENT OF CHARGES.

ARTICLE XLII.

1. The coastal and shipboard charges shall not enter into the accounts provided for by the International Telegraph Regulations.

The accounts regarding such charges shall be liquidated by the managements of the radio service of the countries concerned. They shall be drawn up by the radio managements to which the coastal stations are subject, and communicated by them to the radio managements concerned. In cases where the working of the coastal stations is independent of the management of the radio service of the country, the party working such stations may be substituted, as regards the accounts, for the radio management of such country.

2. For transmission over the telegraph lines radiograms shall be treated, so far as the payment of rates is concerned, in conformity with the International Telegraph Regulations.

3. For radiograms proceeding from ships, the radio management to which the coastal station is subject shall charge the radio management to which the shipboard station of origin is subject with the coastal and ordinary telegraph rates, the total charges collected for answers prepaid, the coastal and telegraph rates collected for repetition of message (for purposes of verification), charges relating to special delivery (in the case provided for in Article XXXVIII), or delivery by mail, and those collected for additional copies (TM). The radio management to which the coastal station is subject shall credit, when the case arises, through the channel of the telegraph accounts and through the medium of the offices which have participated in the transmission of the radiograms, the radio management to which the office of destination is subject with the total charges relating to answers prepaid. With respect to the telegraph rates and the charges relating to special delivery or delivery by mail, and to additional copies, the procedure shall be as prescribed in the Telegraph Regulations, the coastal station being considered as the telegraph office of origin.

For radiograms intended for a country lying beyond the country to which the coastal station belongs, the telegraph charges to be liquidated in conformity with the above provisions shall be those which result either from tables "A" and "B" annexed to the International Telegraph Regulations, or from special arrangements concluded between the radio managements of adjacent countries and published by such managements, and not the charges which might be collected in accordance with the special provisions of Articles XXIII, par. 1, and XXVII. par. 1, of the Telegraph Regulations.

For radiograms and paid service notices intended for ships, the radio management to which the office of origin is subject shall be charged directly by that to which the coastal station is subject with the coastal and shipboard rates. However, the total charges relating to answers prepaid shall be credited, if there is occasion, from country to country, through the channel of the telegraph accounts, until they reach the radio management to which the coastal station is subject. As regards the telegraph charges and the charges relating to delivery by mail and additional copies, the procedure shall be as prescribed in the Telegraph Regulations. The radio management to which the coastal station is subject shall credit that to which the ship of destination is subject with the shipboard rate, if there is occasion, with the rates accruing to the intermediary shipboard stations, the total charge collected for answers prepaid, the shipboard rates for repetition of message (for purposes of verification), and the charges collected for the preparation of additional copies and for delivery by mail.

Paid service notices and answers prepaid shall be treated in the radio accounts in all respects the same as other radiograms.

For radiograms transmitted by means of one or two intermediary stations on shipboard, each one of such stations shall charge the shipboard station of origin, in the case of a radiogram proceeding from a ship, or that of destination, in the case of a radiogram intended for a ship, with the shipboard rate accruing to it for transit.

4. In general, the liquidation of accounts relating to correspondence between stations on shipboard shall be effected directly between the companies working such stations, the station of origin being charged by the station of destination.

5. The monthly accounts serving as a basis for the special accounts of radiograms shall be made out for each radiogram separately with all the necessary data within a period of six months from the month to which they refer.

6. The governments reserve the right to enter into special agreements among themselves and with private companies (parties operating radio stations, shipping companies, etc.) with a view of adopting other provisions with regard to accounts.

12. INTERNATIONAL BUREAU.

ARTICLE XLIII.

In additional expenses resulting from the work of the international bureau so far as radio telegraphy is concerned shall not exceed 80,000 francs a year, exclusive of the special expenses arising from the convening of the international conference.

The managements of the radio service of the contracting States shall, so far as contribution to the expenses is concerned, be divided into six classes, as follows:

1st class: Union of South Africa; Germany; United States of America; Alaska; Hawaii and the other American possessions in Polynesia; Philippine Islands; Porto Rico and the American possessions in the Antilles; Panama Canal Zone; Argentine Republic; Australia; Austria; Brazil; Canada; France; Great Britain; Hungary; British India; Italy; Japan; New Zealand; Russia; Turkey.

2nd class: Spain.

3rd class: Russian Central Asia (littoral of the Caspian Sea); Belgium; Chile; Chosen, Formosa, Japanese Sakhalin, and the leased territory of Kwantung; Dutch Indies; Norway; Netherlands; Portugal; Roumania; Western Siberia (littoral of the Arctic Ocean); Eastern Siberia (littoral of the Pacific Ocean); Sweden.

4th class: German East Africa; German Southwest Africa; Kamerun; Togo Land; German protectorates in the Pacific; Denmark; Egypt; Indo-China; Mexico; Slam; Uruguay.

5th class: French West Africa; Bosnia-Herzegovina; Bulgaria; Greece; Madagascar; Tunis.

6th class: French Equatorial Africa; Portuguese West Africa; Portuguese East Africa and the Portuguese possessions in Asia; Bokhara; Belgian Congo; Colony of Curacao; Spanish Colony of the Gulf of Guinea; Eritrea; Khiva; Morocco; Monaco; Persia; San Marino; Italian Somaliland.

ARTICLE XLIV.

The management of the radio service of the different countries shall forward to the International Bureau a table in conformity with the annexed blank, containing the data enumerated in said table for stations such as referred to in Article V of the regulations. Changes occurring and additional data shall be forwarded by the radio managements to the International Bureau between the 1st and 10th day of each month. With the aid of such data the International Bureau shall draw up the list provided for in Article V. The list shall be distributed to the radio managements concerned. The list and the supplements thereto may also be sold to the public at the cost price.

The International Bureau shall see to it that the same call letters for several radio stations shall not be adopted.

13. METEOROLOGICAL RADIOGRAMS, TIME SIGNALS, AND OTHER RADIOGRAMS.

ARTICLE XLV.

1. The managements of the radio service shall take the necessary steps to supply their coastal stations with meteorological radiograms containing indications concerning the district of such stations. Such radiograms, the text of which shall not exceed 20 words, shall be transmitted to ships upon request. The rate for such meteorological radiograms shall be carried to the account of the ships to which they are addressed.

2. Meteorological observations made by certain vessels designated for this purpose by the country to which they are subject, may be transmitted once a day, as paid service notices, to the coastal stations authorized to receive the same by the managements concerned, who shall likewise designate the meteoro-

logical offices to which such observations shall be addressed by the coastal stations.

3. Time signals and meteorological radiograms shall be transmitted one after the other in such a way that the total time occupied in their transmission shall not exceed ten minutes. As a general rule, all radio stations whose transmissions might interfere with the reception of such signals and radiograms, shall remain silent during their transmission in order that all stations desiring it may be able to receive the same. Exception shall be made in cases of distress calls and of state telegrams.

4. The managements of the radio service shall give to agencies of maritime information such data regarding losses and casualties at sea or other information of general interest to navigation, as the coastal stations may properly report.

14. MISCELLANEOUS PROVISIONS.

ARTICLE XLVI.

The exchange of correspondence between shipboard stations shall be carried on in such a manner as not to interfere with the service of the coastal stations, the latter, as a general rule, being accorded the right of priority for the public service.

ARTICLE XLVII.

Coastal stations and stations on shipboard shall not be bound to participate in the retransmission of radiograms except in cases where direct communication can not be established between the stations of origin and destination.

The number of such retransmissions shall, however, be limited to two.

In the case of radiograms intended for the coast, retransmission shall take place only for the purpose of reaching the nearest coastal station.

Retransmission shall in every case be subject to the condition that the intermediate station which receives the radiogram in transit is in a position to forward it.

ARTICLE XLVIII.

If the route of a radiogram is partly over telegraph lines, or through radio stations subject to a noncontracting Government, such radiograms may be transmitted provided the management of the radio service to which such lines or stations are subject have declared that, if the occasion should arise, they will comply with such provisions of the convention and of the regulations as are indispensable to the regular transmission of radiograms and that the payment of charges is insured. Such declaration shall be made to the International Bureau and communicated to the office of the Telegraph Union.

ARTICLE XLIX.

Modifications of the present regulations which may be rendered necessary in consequence of the decisions of subsequent telegraph conferences shall go into effect on the date fixed for the application of the provisions adopted by each one of such conferences.

ARTICLE L.

The provisions of the International Telegraph Regulations shall be applicable analogously to radio correspondence in so far as they are not contrary to the provisions of the present regulations. The following provisions of the telegraph regulations, in particular, shall be applicable to radio correspondence: Article XXVII, paragraphs 3 to 6, relating to the collection of charges; Article XXVI and XLI, relating to the indication of the route to be followed; Article LXXV, paragraph 1, LXXVIII, paragraphs 2 to 4, and LXXIX, paragraphs 2 and 4, relating to the preparation of accounts. However: (1) The period of six months provided by paragraph 2 of Article LXXIX of the telegraph regulations for the verification of accounts shall be extended to nine months in the case of radiograms; (2) The provisions of Article XVI, paragraph 2, shall not be considered as authorizing gratuitous transmission, through radio stations, of service telegrams relating exclusively to the telegraph service, nor the free

transmission over the telegraph lines of service telegrams relating exclusively to the radio service; (3) The provisions of Article LXXIX, paragraphs 3 and 5, shall not be applicable to radio accounts. As regards the application of the provisions of the telegraph regulations, coastal stations shall be considered as offices of transit except when the radio regulations expressly stipulate that such stations shall be considered as offices of origin or of destination.

In conformity with Article XI of the Convention of London, the present regulations shall go into effect on the 1st day of July, 1913.

In witness whereof the respective plenipotentiaries have signed one copy of these regulations, which shall be deposited in the archives of the British Government, and a copy of which shall be transmitted to each of the parties.

[Supplement to Article XLIV of the regulations.]

Radio management of ——— Service particulars of radio stations.

(a) COASTAL STATIONS.

Name.	Nationality.	Geographical location: E. East longitude, O. West Longitude, N. North latitude, S. South latitude. Territorial subdivisions.	Call letters.	Normal range in nautical miles.	Radio system with the characteristics of the transmitting system.	Wave lengths in meters (the normal wave length to be underscored).	Nature of service furnished.	Hours during which station is open (local standard time).	Coastal rate, per word in francs, minimum rate per radiogram, in francs.	Remarks. (When necessary hour and manner of sending time signals and meteorological radiograms.)

(b) SHIPBOARD STATIONS.

Name.	Nationality.	Call letters.	Normal range. In nautical miles.	Radio system with the characteristics of the transmitting system.	Wave lengths in meters.	Nature of service furnished.	Hours during which the station is open.	Shipboard rates per word in francs, minimum rate per radiogram, in francs (1) War vessels, (2) Merchant vessels.	Remarks. (When necessary name and address of the party working the station.)

[Supplement to Article XXII of the regulations.]

List of abbreviations to be used in radio communications.

Abbreviation.	Question.	Answer or Notice.
C Q	-----	Signal of enquiry made by a station desiring to communicate.
T R	-----	Signal announcing the sending of particulars concerning a station on shipboard (Art. XXII).
(I)	-----	Signal indicating that a station is about to send at high power.
PRB	Do you wish to communicate by means of the International Signal Code?	I wish to communicate by means of the International Signal Code.
QRA	What ship or coast station is that?	This is.....
QRB	What is your distance?	My distance is.....
QRC	What is your true bearing?	My true bearing is.....degrees.
QRD	Where are you bound for?	I am bound for.....
QRF	Where are you bound from?	I am bound from.....
QRG	What line do you belong to?	I belong to the.....Line.
QRH	What is your wave length in meters?	My wave length is.....meters.
QRJ	How many words have you to send?	I have..... words to send.
QRK	How do you receive me?	I am receiving well.
QRL	Are you receiving badly? Shall I send 20 ¹	I am receiving badly. Please send 20.
	for adjustment?	for adjustment.
QRM	Are you being interfered with?	I am being interfered with.
QRN	Are the atmospherics strong?	Atmospherics are very strong.
QRO	Shall I increase power?	Increase power.
QRP	Shall I decrease power?	Decrease power.
QRQ	Shall I send faster?	Send faster.
QRS	Shall I send slower?	Send slower.
QRT	Shall I stop sending?	Stop sending.
QRU	Have you anything for me?	I have nothing for you.
QRV	Are you ready?	I am ready. All right now.
QRW	Are you busy?	I am busy (or, I am busy with.....). Please do not interfere.
QRX	Shall I stand by?	Stand by. I will call you when required.
QRY	When will be my turn?	Your turn will be No.
QRZ	Are my signals weak?	Your signals are weak.
QSA	Are my signals strong?	Your signals are strong.
QSB	Is my tone bad?	The tone is bad.
	Is my spark bad?	The spark is bad.
QSC	Is my spacing bad?	Your spacing is bad.
QSD	What is your time?	My time is.....
QSF	Is transmission to be in alternate order or in series?	Transmission will be in alternate order.
QSG		Transmission will be in series of 5 messages.
QSH		Transmission will be in series of 10 messages.
QSI	What rate shall I collect for.....?	Collect.....
QSK	Is the last radiogram canceled?	The last radiogram is canceled.
QSL	Did you get my receipt?	Please acknowledge.
QSM	What is your true course?	My true course is.....degrees.
QSN	Are you in communication with land?	I am not in communication with land.
QSO	Are you in communication with any ship or station (or, with.....)?	I am in communication with.....(through.....)
QSP	Shall I inform.....that you are calling him?	Inform.....that I am calling him.
QSQ	Is.....calling me?	You are being called by.....
QSR	Will you forward the radiogram?	I will forward the radiogram.
QST	Have you received the general call?	General call to all stations.
QSU	Please call me when you have finished (or, at..o'clock)?	Will call when I have finished.
QSV ¹	Is public correspondence being handled?	Public correspondence is being handled. Please do not interfere.
QSW	Shall I increase my spark frequency?	Increase your spark frequency.
QSX	Shall I decrease my spark frequency?	Decrease your spark frequency.
QSY	Shall I send on a wave length of.....meters?	Let us change to the wave length of..... meters.

¹ Public correspondence is any radio work, official or private, handled on commercial wave lengths.

When an abbreviation is followed by a mark of interrogation, it refers to the question indicated for that abbreviation.

Examples.**Station.**

- A Q R A ? What is the name of your station?
 B Q R A Campania This is the Campania.
 A Q R G ? To what line do you belong?
 B Q R G Cunard Q R Z I belong to the Cunard Line. Your signals are weak.

Station A then increases the power of its transmitter and sends:

A	Q R K?	How are you receiving?
B	Q R K	I am receiving well.
	Q R B 80	The distance between our stations is 80 nautical miles.
	Q R C 62	My true bearing is 62 degrees, etc.

Extract from the International Telegraph Convention, signed at St. Petersburg, July 10-22, 1875.

[See article 17 of the convention, p. 20.]

ARTICLE 1. The high contracting parties concede to all persons the right to correspond by means of the international telegraphs.

ART. 2. They bind themselves to take all the necessary measures for the purpose of insuring the secrecy of the correspondence and its safe transmission.

ART. 3. They declare, nevertheless, that they accept no responsibility as regards the international telegraph service.

ART. 5. Telegrams are classed in three categories:

1. State telegrams: Those emanating from the head of the nation, the ministers, the commanders in chief of the army and naval forces, and the diplomatic or consular agents of the contracting Governments, as well as the answers to such telegrams.

2. Service telegrams: Those which emanate from the managements of the telegraph service of the contracting States and which relate either to the international telegraph service or to subjects of public interest determined jointly by such managements.

3. Private telegrams.

In the transmission, the State telegrams shall have precedence over other telegrams.

ART. 6. State telegrams and service telegrams may be issued in secret language, in any communications.

Private telegrams may be exchanged in secret language between two States which admit of this mode of correspondence.

The States which do not admit of private telegrams in secret language upon the expedition or arrival of the same, shall allow them to pass in transit, except in the case of suspension defined in article 8.

ART. 7. The high contracting parties reserve the right to stop the transmission of any private telegram which may appear dangerous to the safety of the State, or which may be contrary to the laws of the country, to public order or good morals.

ART. 8. Each Government also reserves the right to suspend the international telegraph service for an indefinite period, if deemed necessary by it, either generally, or only over certain lines and for certain classes of correspondence, of which such Government shall immediately notify all the other contracting Governments.

ART. 11. Telegrams relating to the international telegraph service of the contracting States shall be transmitted free of charge over the entire systems of such States.

ART. 12. The high contracting parties shall render accounts to one another of the charges collected by each of them.

ART. 17. The high contracting parties reserve, respectively, the right to enter among themselves into special arrangements of any kind with regard to points of the service which do not interest the States generally.

PART II.—REGULATIONS GOVERNING SHIP AND LAND RADIO STATIONS.

SHIP STATIONS.

1. On vessels coming under the ship acts, an emergency power supply, independent of the vessel's main electric power plant, must be provided which will enable radio messages to be sent for at least four hours over a distance of at least 100 miles day or night. The emergency power supply and equipment should be located and installed in such manner as to afford maximum protection against accident.

2. The radio transmitting apparatus, operated from the emergency power supply, should be capable of functioning within two minutes after unexpected notice to the operator.

3. The complete equipment must be maintained in an efficient condition at sea.
4. The complete emergency equipment should be tested before each sailing and daily at sea by the operator or an inspector and a note of its performance entered in the radio log.
5. Radio inspectors or other duly authorized officers of the Government will occasionally call for test messages, to be sent by means of the emergency apparatus, while the vessel is at sea.
6. An "induction coil" connected to "plain aerial" is not recommended as emergency apparatus, on account of the high voltages produced which frequently damage the antenna insulation and on account of "vibrator troubles."
7. A motor generator or rotary converter operated by storage battery is probably the most satisfactory means available at present of energizing the transmitting apparatus.
8. Any auxiliary engine for wireless purposes must operate on a fuel which will fulfill the requirements of Rule XI, section 5, of the General Rules and Regulations of the Steamboat-Inspection Service, reading as follows:
 "None of the inflammable articles specified in section 4472, Revised Statutes, or oil that will not stand a fire test of 800° F. shall be used as stores on any pleasure steamer or steamer carrying passengers except that vessels not carrying passengers for hire may transport gasoline or any of the products of petroleum for use as a source of motive power for motor boats or launches of such vessels." (Sec. 4472, R. S.)
9. Every ship station shall carry a reasonable number of spares of such parts of both the main and emergency radiotelegraph equipments as are subject to undue wear, deterioration; or liability to accident.
10. One extra pair of head telephones, extra cords, and extra detectors must always be kept on hand.
11. A storage battery voltmeter, hydrometer, a supply of electrolyte, and distilled water should be a part of the regular equipment, but are not prescribed in terms by statute. The absence of these and similar inexpensive emergency articles will be brought to the attention of the master and of the company installing the apparatus by the radio inspector, in writing, and if after a reasonable interval they have not been supplied, the inspector will communicate the fact to the Commissioner of Navigation.
12. The vessel's electric power for the operation of the main equipment shall, at all times while the steamer is under way, be available for the radio operator's use. On steamers where the dynamo is not run continuously there should be an efficient means of communication between the radio room and the dynamo room, in order that the radio operator may signal for power, as the law provides that he may not leave his post of duty.
13. Efficient communication between the radio room and the bridge must be maintained. A speaking tube or telephone will comply with this requirement. A bell and messenger service will not be acceptable unless there are special conditions justifying this equipment. The speaking tube or telephone must terminate in the radio room and on the bridge, or in the chart room if readily accessible from the bridge. If the radio room is adjacent to or accessible from the bridge so that orders may be transferred direct, no means of communication will be required. Any arrangement calling for the services of a third person to transmit the message will not be satisfactory. The radio inspectors will notify the ship authorities whether the means of communication provided is satisfactory at the time of inspection.
14. On vessels of the United States it is the statutory duty of the master to see that one operator is on duty at all times. The radio service of the ship is under the supreme authority of the master.
15. Masters should require operators on duty to communicate with the officer on the bridge every half hour.
16. Operators must make entries on the radio log every 15 minutes, as evidence that a continuous watch is being maintained. The entries must, if possible, consist of the call letters of other stations communicating and a few words of the intercepted messages.
17. When vessels are in port the key to the radio room must at all times be on board in charge of the proper officer and the radio equipment shall be in such condition as to facilitate Government inspection.

CLASSIFICATION OF SHIP STATIONS AND GRADES OF OPERATORS REQUIRED.

18. First class: Vessels having a continuous service. There shall be placed in the first-class vessels which are intended to carry 25 or more passengers—(1)

If they have an average speed in service of 15 knots or more; (2) if they have average speed in service of more than 13 knots, but only subject to the twofold condition that they have on board 200 persons or more (passengers and crew); and that, in the course of their voyage, they go a distance of more than 500 sea miles between any two consecutive ports.

19. Second class: Vessels having a continuous watch but a service of limited duration. Other vessels placed in the second class must, during navigation, maintain a continuous watch for at least seven hours a day, and a watch of ten minutes at the beginning of every other hour.

20. Third class: Vessels which have no fixed periods of service. All vessels which are placed neither in the first nor in the second class shall be placed in the third class.

21. Service may be defined as preparedness to transmit and receive radio messages or signals at the rate of at least 20 words per minute.

22. Watch may be defined as preparedness to receive distress signals and call letters slowly. A "watcher" or cargo-grade operator will summon a first or second class operator if necessary.

23. All American vessels required by the act of July 23, 1912, to be equipped with radio apparatus, and operators must at all hours maintain a continuous watch; that is to say, an operator or watcher must be "listening in" continuously. This requirement is outside of and above the requirement based on the classification under which the ship's station is licensed.

24. Vessels voluntarily equipped are not required to maintain this continuous watch. Vessels voluntarily equipped are, however, subject to the following requirements as to watch according to the class assigned to them in their station licenses.

25. If a license of the second class be issued to a voluntarily equipped vessel, the station must maintain a continuous watch for at least seven hours a day and a watch of ten minutes at the beginning of every hour.

26. The grade of operators required on vessels of each class are prescribed in the London Convention Service Regulations, Article X. A continuous watch may be maintained by one commercial second-grade operator and one cargo-grade operator on cargo steamers.

27. Passenger vessels coming under the act of July 23, 1912, which carry or are licensed to carry 25 or more passengers, must be placed in the first class: "(a) If they have an average speed in service of 15 knots or more; (b) if they have an average speed in service of more than 13 knots, but only subject to the twofold condition that they have on board 200 persons or more (passengers and crew), and that in the course of their voyage they go a distance of more than 500 sea miles between any two consecutive ports." The service shall be carried on by at least two commercial first-grade operators.

28. Cargo vessels coming under the act of July 23, 1912, which are required to maintain a continuous watch, must be placed in the second class if continuous service is not maintained. On cargo steamers a continuous watch may be maintained by at least one commercial second-grade operator and one cargo-grade operator.

29. Passenger vessels coming under the act of July 23, 1912, but which are not required to be entered in the first class, may be entered in the first or second class, according to whether continuous service or continuous watch is maintained. The number and grade of operators required is determined by service or watch. On passenger vessels coming under the ship act but entered in the second class at least two second-grade operators are required to maintain continuous watch.

30. Cargo vessels which come under the act of July 23, 1912, and are required to maintain a continuous watch may be placed in the first class, if continuous service is maintained. (For operators, see par. 28.)

31. All vessels voluntarily equipped with radio apparatus and which have no specified hours of service or watch must be placed in the third class.

32. Any vessel voluntarily equipped may be placed in the first class if continuous service is maintained, or in the second class if a continuous watch, or a watch of limited duration, such as specified above for vessels of the second class, is maintained.

33. In all ship stations transmissions shall be made only by operators holding commercial first or second grade licenses or higher.

34. Continuous service shall be maintained by not lower than commercial first-grade operators.

35. Vessels which are voluntarily equipped with radio apparatus for their own convenience and for the correspondence of officers and crew must employ at least one commercial second-grade operator or higher.

36. Radio telephone apparatus on vessels not coming under the act of July 23, 1912, must be operated by a person holding a cargo-grade license or higher.

37. The owners of ship stations desiring to change the classification of a ship must apply for a new license.

LAND STATIONS.

38. Coast stations are stations which transmit messages to vessels at sea or on the Great Lakes, or whose operations can interfere with the exchange of messages between ship and ship or ship and coast. The principal purpose of the regulation of radio communication, international and national, is to secure the greatest efficiency of maritime communication through this agency, especially as a means of promoting safety to life.

39. Inland stations are stations which can not transmit messages to vessels at sea or on the Great Lakes and whose operations can not affect the transmission of messages between ship and ship or ship and coast. This may be due to their geographical location or to their range, dependent on power and aerial, or conditions. In some instances actual inspection may be necessary to determine whether a station should be licensed as a coast station or an inland station. An operator or owner in doubt as to the classification of his station should communicate the facts to the radio inspector of his district when applying for a license.

40. Stations are bound to give absolute priority to calls of distress from ships, to similarly answer such calls, and to take such action with regard thereto as may be required.

41. The working of stations shall be organized as far as possible in such manner as not to disturb the service of other stations.

42. All coast stations (par. 38), excepting general and restricted amateur stations, are required to be able to transmit on the wave lengths of 300 and 600 meters for the purpose of transmitting or relaying distress messages or signals and messages relating thereto, if necessary.

43. Coast stations primarily intended for long waves and long-distance transmission may install an auxiliary antenna and auxiliary transmitter to comply with the short wave length requirements.

44. The international standard wave length is 600 meters, and the operators of all coast stations are required, during the hours the station is in operation, to "listen in" at intervals of not less than 15 minutes and for a period of not less than 2 minutes, with the receiving apparatus tuned to receive this wave length, for the purpose of determining if any distress signals or messages are being sent and to determine if the transmitting operations of the "listening station" are causing interference with other radio communication.

45. General public service may be defined as "paid business," conducted on commercial wave lengths between ship and shore or ship and ship.

46. Limited public service may be defined as "paid business" between certain designated land stations, ships or lines of ships, and must be conducted on some authorized wave length other than 300 or 600 meters.

47. All special service must be conducted on some authorized wave length other than 300 or 600 meters, not interfering with general public service.

48. Limited commercial, special amateur, and all stations which have no authorized rates, shall not transmit or accept public correspondence from other stations, except in case of emergency.

49. If a general public-service coast station also maintains a limited commercial service with other stations on land or with vessels at sea the limited commercial service must be conducted on some authorized wave length other than 300 or 600 meters, but this service can be authorized on a general public-service coast-station license without stating the specific hours, it being understood that the limited commercial service is conducted only when no general public-service business is on file.

50. If a general public-service coast station also maintains a public service between fixed points on land the service between the land stations must be conducted on some authorized wave length other than 300 or 600 meters, and a separate form, No. 761, should be submitted covering "Limited public service," giving the exact hours of such service.

CLASSIFICATION OF LAND STATIONS AND GRADES OF OPERATORS REQUIRED.

51. Both coast stations (the words "coast stations," "shore stations," and "coastal stations" are used interchangeably) and inland stations are divided for the purposes of the administration of the act into the following classes: (1) Public-service stations, (a) general, (b) limited; (2) limited commercial stations; (3) experiment stations for the development of radio communication; (4) technical and training school stations; (5) special amateur stations; (6) general amateur stations; (7) restricted amateur stations.

52. CLASS 1.—(a) *Public-service stations, general*, are those open to general business between coast and ships, and include those operated by common carriers under the act of February 4, 1887, to regulate commerce, amended June 18, 1910. They are required to maintain a constant service when open. Every coastal station open to public service shall at all times be ready to receive messages of such wave lengths as are required by the international convention in force. (Sec. 4, first regulation, act of Aug. 13, 1912.) The station rates are authorized in the license and published in the Official Berne List. Whenever such stations do not insure a constant service, transmitting and receiving day and night without interruption, the Secretary of the Navy is directed to open naval radio stations within 100 miles thereof to public business. (Sec. 4, eighteenth regulation, act of Aug. 13, 1912.) The Secretary of War is authorized by the act of May 26, 1900 (31 Stat., 206), to open Alaskan military stations to public service.

53. General public service shall be conducted only by operators holding commercial first-grade licenses or higher.

54. CLASS 1.—(b) *Public service stations, limited*, are reserved for a limited public service, determined by the object of the correspondence or other circumstances independent of the system employed. Stations of this class transmit and receive public messages to and from certain stations only, which are designated in the license. The rates are authorized in the licenses, and if not published in the official list they may be obtained from the licensee.

55. The service of limited public service coast stations shall be carried on by commercial first-grade operators or higher.

56. The service of limited public service inland stations shall be carried on by commercial second-grade operators or higher.

57. CLASS 2.—*Limited commercial stations* are not open to public service and are licensed for a specific commercial service or services defined in the license. Stations of this class must not transmit to or accept public messages from other stations. No rates are authorized.

58. If a coast station, the operators shall hold a commercial second-grade license or higher. (Par. 57.)

59. CLASS 3.—*Experiment stations*.—The Secretary of Commerce is authorized by section 4 of the act to grant special temporary licenses "to stations actually engaged in conducting experiments for the development of the science of radio communication, or the apparatus pertaining thereto, to carry on special tests, using any amount of power or any wave lengths, at such hours and under such conditions as will insure the least interference with the sending or receipt of commercial or government radiograms, of distress signals and radiograms, or with the work of other stations." Applicants for such licenses should state any technical result they have already produced, their technical attainments, etc. The fact that an applicant desires to experiment with his equipment does not justify or require a license of this class. Most experiments can be made within the limitations of general and restricted amateur station licenses or by use of an artificial antenna to prevent radiation.

60. Experiment stations may be operated by a person holding an experiment and instruction grade license or higher.

61. CLASS 4.—*Technical and training-school stations* will be licensed, according to the degree of technical training attained and imparted and to local conditions.

62. The grade of operators required will be specified when the license is issued.

63. CLASS 5.—*Special amateur stations* may be licensed by the Secretary of Commerce to use a longer wave length and a higher power on special application. Applications for this class from amateurs with less than two years' experience in actual radio communication will not be approved. The applicant on must state the experience and purpose of the applicant, the local conditions of radio communication, especially of maritime radio communication in the vicinity of the station, and a special license will be granted only if some sub-

stantial benefit to the art or to commerce apart from individual amusement seems probable. (Sec. 4, fifteenth regulation, act of Aug. 13, 1912.)

64. Special amateur coast stations must be operated by a person holding a commercial second-grade license or higher. Inland stations may be operated by persons holding amateur second-grade licenses or higher.

65. CLASS 6.—*General amateur stations* are restricted to a transmitting wave length not exceeding 200 meters and a transformer input not exceeding 1 kilowatt. (Sec. 4, fifteenth regulation, act of Aug. 13, 1912.)

66. CLASS 7.—*Restricted amateur stations* with a 5 nautical miles of a naval or military station are restricted to a wave length not exceeding 200 meters and to a transformer input not exceeding one-half kilowatt. (Sec. 4, sixteenth regulation, act of Aug. 13, 1912.)

67. Amateur first or second grade operators or higher are required for general and restricted amateur stations.

68. The license does not specify the number of operators required, but provides that the station shall at all times while in operation be under the care of an operator licensed for that purpose. The grade and number of operators as required by law is determined by the service of the station.

69. *Special stations for exceptional distances* are land stations designed to carry on transoceanic radio communication on as between the United States and European countries, or between the Pacific coast and Hawaii, or from the United States over similar long distances at sea to another land station, or (inland) to carry on radio communication overland over exceptional distances. These stations will all come under one of the classifications named above and the license will indicate the stations for which communication is authorized and indicate the range.

REGULATIONS COMMON TO LAND AND SHIP STATIONS.

70. Any change in the characteristics of the radio apparatus or service of the station must be authorized by the Secretary of Commerce.

71. In order to comply with section 2 of the act of June 24, 1910, as amended July 23, 1912, every land station open to general public service, and every station on board an American vessel of the first or second class engaged in the foreign trade or transoceanic service, shall have as a part of the station equipment a copy of the official Berne list and supplements thereto as issued. Information concerning the use of this list and method of procuring it is given on page 72, paragraph 196.

72. The service regulations of the London convention, Article VII, paragraphs 1 and 2b, require a reduction of power or range under certain conditions. A proper resistance, impedance coil, or reactance regulator in the primary circuit is recommended. In certain cases the reduction of voltage or decreasing of coupling may be approved upon recommendations of radio inspectors.

73. Persons or corporations holding licenses for radio stations, either land or ship, should notify the radio inspector for the district whenever the station or vessel goes out of commission for a period exceeding three months. The Commissioner of Navigation should be notified promptly of any intention to suspend or discontinue the service of any commercial station.

74. If there is no intention to resume the same service, or if the station or vessel will enter a different service from that indicated by the license, the radio inspector will submit the license to the bureau, together with a statement of the facts, so that the license may be amended.

75. When the station goes into commission the radio inspector will satisfy himself that the station corresponds to the schedule of the station as shown in the license.

76. Stations desiring to conduct tests should communicate with the radio inspector by letter or telephone, stating the probable length of time that will be required. Stations conducting such tests or temporary experiments should "listen in" to determine that no interference is being caused, and during the tests should "listen in" frequently for the interference signal "Q R M." Stations conducting tests should transmit their official call signal frequently. Attention is invited to the act of August 13, 1912, section 5:

"That every license granted under the provisions of this act for the operation or use of apparatus for radio communications shall prescribe that the operator thereof shall not willfully or maliciously interfere with any other radio communication. Such interference shall be deemed a misdemeanor, and upon a

conviction thereof the owner or operator, or both, shall be punishable by a fine not to exceed five hundred dollars or imprisonment for not to exceed one year, or both."

77. The department holds that interference caused by tests of the character described above (par. 76) is "willful" when no "listening in" precautions are taken and the call signal of the station sending is not repeated at intervals.

APPLICATIONS FOR SHIP AND LAND STATION LICENSES, RENEWALS, AND DUPLICATES.

78. The act does not apply either afloat or ashore to—(a) Apparatus for radio communication which merely receives radiograms and is not equipped for sending; (b) apparatus for the transmission of radiograms exclusively between points in the same State, if the effect of such transmission does not extend beyond the State (so as to interfere with the radio communication of other States), or if the effect of such transmission does not interfere with the reception of radiograms from beyond the State (so as to interfere with the interstate radio communication of that State); (c) apparatus for radio communication which has been issued to the Organized Militia by the War Department or to the Naval Militia by the Navy Department and is used for official purposes only.

79. The owner or operator of any apparatus who may be in doubt whether his apparatus, under this paragraph, is exempt from license may write the facts to the radio inspector for his district before applying for a license.

80. The apparatus for transmission of radiograms or signals on any vessel of the United States not permanently moored requires a license.

81. Apparatus for radio communication on land within the jurisdiction of the United States (excluding the Philippine Islands and excluding apparatus of the Government of the United States) must be licensed if—(a) the apparatus is a means of commercial intercourse among the several States or with foreign nations; or (b) the apparatus transmits radiograms or signals the effect of which at any time extends beyond the State; or (c) the apparatus interferes with the receipt of messages in any State from beyond such State.

82. Station licenses for the use and operation of apparatus for radio communication under the act may be issued only to citizens of the United States or Porto Rico, or to a company incorporated under the laws of some State or Territory or of the United States or Porto Rico.

83. Licenses can be issued to clubs if they are incorporated or if a member will accept the responsibility for the operation of the apparatus, carrying with it the possibility of being penalized for infraction of the laws.

84. Applications for station licenses of all classes should be addressed to the United States radio inspector for the district in which the station is located, who will forward the necessary blank forms and information. The limits of the districts and addresses of radio inspectors are given on page 450, paragraph 166.

85. Upon receipt of the forms, properly completed, the radio inspector will make a thorough inspection of the station if practicable.

86. When applications and forms have been properly submitted, the stations may be operated in accordance with the laws and regulations governing the class of station for which application for license has been made, until such time as the application can be acted upon unless the applicant is otherwise instructed and provided temporary official call letters are assigned.

87. General and restricted amateur-station licenses are issued directly by radio inspectors. Station licenses of all other classes are issued from the office of the Commissioner of Navigation, Department of Commerce. Applications and forms are forwarded by radio inspectors with recommendations by them.

88. Stations desiring to operate different portions of the day under different classifications shall submit application for each service, giving exact hours for each. If approved, each classification will be specified in the license.

89. The owner of an amateur station may operate his station in accordance with the laws if his application for a license has been properly filed but has not been acted upon. An application for an operator's license must also have been filed and every effort made to obtain the license before the station may be operated.

90. "Provisional" station licenses are issued to amateurs remote from the headquarters of the radio inspector of the district in which the station is located. These licenses are issued as a matter of convenience and record. If, upon inspection, the station is found to comply with the law, the inspector will

strike out the word "Provisional" and insert the date of inspection and his signature at the bottom of the license.

91. If such a station is found not to comply with the law the provisional license may be canceled until such time as the apparatus is readjusted to meet the requirements of the law: *Provided, however*, That consideration will be given to any reports of interference filed against such a station.

92. All persons are warned that it is unlawful to operate stations after licenses have expired unless application for renewal has been properly made.

93. Hereafter expired station licenses of all classes, commercial and amateur, need not be returned to the radio inspectors with applications for renewals. Owners desiring a renewal license must complete new forms, as prescribed for original applications. New licenses will be issued in every case of renewal.

94. Any person applying for a duplicate license to replace an original which has been lost, mutilated, or destroyed will be required to submit an affidavit to the Bureau of Navigation, through the radio inspector of the district, attesting the facts regarding the manner in which the original was lost. The Commissioner of Navigation will consider the facts in the case and advise the radio inspector in regard to the issue of a duplicate license, or a duplicate will be forwarded through the inspector's office.

95. A duplicate license will be issued under the same serial number as the original and will be marked "Duplicate" in red across the face.

PART III.—REGULATIONS GOVERNING RADIO OPERATORS.

GRADES AND REQUIREMENTS.

96. (1) Commercial extra first grade; (2) commercial first grade; (3) commercial second grade; (4) commercial cargo grade; (5) commercial temporary permit; (6) experiment and instruction grade; (7) amateur first grade; (8) amateur second grade.

97. The Service Regulations of the International Convention require that "the service of the station on shipboard shall be carried on by a telegraph operator holding a certificate issued by the Government to which the vessel is subject."

98. Such certificate shall attest the professional efficiency of the operator as regards—(a) Adjustment of the apparatus and knowledge of its functioning; (b) transmission and acoustic reception at the rate of not less than 20 words a minute (Continental Morse) for commercial first-grade operators and not less than 12 words per minute for second-grade operators; (c) knowledge of the regulations governing the exchange of wireless telegraph correspondence; (d) the certificate shall furthermore state that the Government has bound the operator to secrecy with regard to the correspondence.

99. The International Convention has been ratified by the principal maritime nations, dominions, and provinces. Radio operators holding valid certificates issued by foreign Governments which are parties to the convention will be recognized by this department as persons "skilled in the use of such apparatus" within the meaning of the act, unless in the case of a specific individual there may be special reason to doubt the operator's skill and reliability. Such certificates should be ready at hand for the inspection of radio inspectors or customs officers before the steamer departs from the United States.

100. In the case of a vessel subject to the act under the flag of any nation not a party to the International Convention, the radio operator, before the departure of the vessel from the United States, must furnish to the inspector evidence that he is "skilled in the use of the apparatus." This evidence shall consist of an examination on board by the radio inspector.

101. *Commercial extra first grade.*—The Department of Commerce will issue a special license, to be known as commercial extra first grade, to radio operators whose trustworthiness and efficient service entitle them to confidence and recognition.

102. These licenses will be given consideration by the Civil Service Commission in examinations for positions requiring knowledge of radiotelegraphy, when experience is rated as a part of such examinations.

103. Applicants for the commercial extra first-grade license must pass a special examination. To be eligible for this examination they must hold commercial first-grade licenses, and their certificates of skill in radio communication, issued under the act of June 24, 1910, or licenses under the act of August 13, 1912, must record 18 months' satisfactory commercial service at

sea or at land stations, either or both, during the two years previous to the filing of the application for examination, as shown by indorsement on the license service records, or other satisfactory evidence, and provided that the applicants have not been penalized for a violation of the radio laws and regulations.

104. A speed of at least 30 words per minute, Continental Morse, and 25 words per minute, American Morse (five letters to the word), must be attained. The technical questions and the questions on the radio laws and regulations will be considerably wider in scope than those for commercial first grade, and a higher percentage will be required.

105. All examination papers, including the code-test sheets, will be marked and forwarded to the Commissioner of Navigation, with a recommendation by the radio inspector or examining officer. Examination papers will be marked upon the basis of 100, and licenses will be recommended only if 80 or better is attained.

106. Licenses of this grade will be issued by the Commissioner of Navigation, indorsed by the Secretary of Commerce, and delivered to the successful applicant through the examining officer.

107. *Commercial first grade.*—The applicant must pass a satisfactory examination in—(a) The adjustment, operation, and care of the apparatus, including correction of faults and change from one wave length to another; (b) transmitting and receiving by ear at a speed of not less than 20 words a minute in Continental Morse (five letters to the word); (c) use and care of storage battery or other auxiliary power apparatus; (d) knowledge of the international regulations in force applying to radio communication; (e) knowledge of the requirements of the acts of Congress to regulate radio communication (secs. 3, 4, 5, 6, and 7 of the act of Aug. 13, 1912).

108. The commercial extra first grade and the commercial first grade licenses qualify holders for employment at any ship or land station of any class.

109. *Commercial second grade.*—The applicant must pass a satisfactory examination in all the subjects prescribed above for the first grade, with the exception that the minimum speed in transmitting and receiving shall not be less than 12 words a minute in Continental Morse, and the examination in the subjects will not be as comprehensive as that given first-grade operators.

110. *Commercial cargo grade.*—Section 2 of the act of July 23, 1912, provides: "On cargo steamers, in lieu of the second operator provided for in this act, there may be substituted a member of the crew or other person who shall be duly certified and entered in the ship's log as competent to receive and understand distress calls or other usual calls indicating danger, and to aid in maintaining a constant wireless watch so far as required for the safety of life."

111. The examination will be conducted so as to determine the following facts: (a) That the applicant is sufficiently familiar with the Continental Morse Code to recognize the distress signal (SOS), when included in a list of other words or signals sent slowly (approximately five words a minute); (b) that the applicant is sufficiently familiar with the Continental Morse Code to recognize radio call letters of the vessel on which he desires to operate when sent slowly and repeated several times; (c) that the applicant is sufficiently familiar with the type of the receiving apparatus of the vessel on which he desires to operate to determine by a buzzer or similar test that the detector or receiving apparatus is properly adjusted to receive signals.

112. Examining officers and radio inspectors are authorized to issue a certificate, in the form of an amateur first-grade license, after examination, to indicate the facts above enumerated in the case of a member of the crew or other person, and experience under this form will be credited by examining officers if the holder later applies for examination for a commercial license. These licenses will be marked "Cargo" in the upper right-hand corner under the serial number.

113. *Commercial temporary permit.*—Section 3 of the act of August 13, 1912, provides: "In case of emergency the Secretary of Commerce may authorize a collector of customs to issue a temporary permit, in lieu of a license, to the operator on a vessel subject to the radio ship act of June 24, 1910."

114. The temporary permit, in the form of a letter to the operator, is to be issued only in cases of emergency and will be valid for one voyage from _____ to _____, beginning _____, unless the proper license or properly licensed operator can be obtained en route.

115. The permits should be issued only to persons who the collector of customs has reason to believe are skilled in the use of the apparatus, but have not had the opportunity to present themselves for examination before Government officers authorized to conduct examinations and furnish licenses.

116. The collector of customs will forward to the Department of Commerce (Bureau of Navigation) a report covering each temporary permit issued and the reasons for its issue.

117. *Experiment and instruction grade.*—Experimenters and instructors of scientific attainments in the art of radio communication whose knowledge of the radio laws satisfies the radio inspector or the examining officer may obtain this grade license, provided they are able to transmit and receive in the continental Morse code at a speed sufficient to enable them to recognize distress calls or the "keep-out" signals.

118. The operator's license for this grade is a commercial license, indorsed by the Secretary of Commerce with a statement of the special purpose for which it is valid.

119. If the applicant qualifies, the radio inspector or examining officer will forward a blank commercial license, with the papers, to the Commissioner of Navigation, with his recommendation. If approved, the license will be properly indorsed by the Secretary of Commerce and delivered to the licensee through the recommending officer.

120. This license has no reference to the instruction of radio operators as such, but is required by those operating apparatus licensed as experimental stations but who are unable to obtain commercial grade operators' licenses.

121. Amateurs before applying for licenses should read and understand the essential parts of the International Radiotelegraphic Convention in force and sections 3, 4, 5, and 7 of the act of August 13, 1912. The department recognizes that radio communication offers a wholesome form of instructive recreation for amateurs. At the same time its use for this purpose must observe strictly the rights of others to the uninterrupted use of apparatus for important public and commercial purposes. The department will not knowingly issue a license to an amateur who does not recognize and will not obey this principle. To this end the intelligent reading of the international convention and the act of Congress is prescribed as the first step to be taken by amateurs. A copy of the radio laws and regulations may be procured for this purpose from the radio inspectors or from the Commissioner of Navigation, Department of Commerce, Washington, D. C., but they are not for public distribution. Additional copies may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a nominal price.

122. *Amateur first grade.*—The applicant must have a sufficient knowledge of the adjustment and operation of the apparatus which he wishes to operate and of the regulations of the international convention and acts of Congress in so far as they relate to interference with other radio communication and impose certain duties on all grades of operators. The applicant must be able to transmit and receive in continental Morse at a speed sufficient to enable him to recognize distress calls or the official "keep-out" signals. A speed of at least five words per minute (five letters to the word) must be attained.

123. *Amateur second grade.*—The requirements for the second grade will be the same as for the first grade. The second-grade license will be issued only where an applicant can not be personally examined or until he can be examined. An examining officer or radio inspector is authorized in his discretion to waive an actual examination of an applicant for an amateur license, if the amateur for adequate reasons can not present himself for examination but in writing can satisfy the examining officer or radio inspector that he is qualified to hold a license and will conform to its obligations.

EXAMINATIONS.

124. The following requirements and method of conducting examination for radio operators' licenses will be adopted at all examining offices.

125. The test shall consist of messages with call letters and regular preambles, conventional signals and abbreviations and odd phrases, and shall in no case consist of simple, connected reading matter. The test will be conducted by means of the omnigraph or other automatic instrument wherever possible.

126. The code test shall continue for 5 minutes at a speed of 20 words, 12 words, and 5 words a minute, respectively, for the commercial first, second, and lower grades, 5 letters, numerals, or other characters to the word, and to

qualify the applicant must receive 20, 12, or 5 words in consecutive order accurately and legibly written. Operators will not be permitted to break or interrupt while receiving or to correct or alter the transcription after it has been submitted to the examining officer.

127. The code test sheets written by the applicant will be forwarded to the Commissioner of Navigation with other papers and the speed attained noted in the lower left-hand corner of the first sheet.

128. An applicant will be given credit for the maximum speed he can attain.

129. The practical and theoretical examination shall consist of seven comprehensive questions under the following headings and values:

	Points, maxi- mum value.
(a) Experience.....	20
(b) Diagram of receiving and transmitting apparatus.....	10
(c) Knowledge of transmitting apparatus.....	20
(d) Knowledge of receiving apparatus.....	20
(e) Knowledge of operation and care of storage batteries.....	10
(f) Knowledge of motors and generators.....	10
(g) Knowledge of international regulations governing radio communica- tion and the United States radio laws and regulations.....	10

100

130. Seventy-five constitutes a passing mark for the first grade commercial. Sixty-five constitutes a passing mark for the second grade commercial.

131. Applicants who fail to attain 20 words in the code test but who attain a mark of between 65 and 75 in the written examination may be issued second-grade licenses, if they can receive at least 12 words per minute.

132. Question (a) shall determine the applicant's practical knowledge and experience in handling radio apparatus. An applicant's experience will be determined largely from the personal question sheet and from satisfactory letters or references submitted. Experience, operating first-class amateur apparatus, or the apparatus provided in good training schools, will be given a reasonable value, but applicants who have had experience as apprentices at commercial shore stations or on board vessels will receive higher marks.

133. No applicant who fails to qualify will be reexamined at any examining office within three months from date of the previous examination. All examination papers, whether the applicant qualifies or not, will be forwarded to the Bureau of Navigation for filing as "Operator's record." When the records of the bureau develop the fact that an applicant has failed to qualify and has applied for reexamination or been reexamined at the same or another office within three months his existing license may be suspended or revoked by the Secretary of Commerce. Applicants to whom are issued second-grade licenses will not be examined for first grade within three months under the same rule.

PLACES WHERE EXAMINATIONS ARE HELD.

134. United States navy yards: Boston, Mass.; New York; Philadelphia, Pa.; Norfolk, Va.; Charleston, S. C.; New Orleans, La.; Mare Island, Cal.; Puget Sound, Wash.

135. Naval radio stations: San Juan, P. R.; Colon, R. P.; Honolulu, H. T.; Key West, Fla.

136. United States Army stations: Fort Omaha, Nebr.; Fort Wood, N. Y.; Fortress Monroe, Va.; Fort St. Michael, Alaska; Fort Valdez, Alaska.

137. Bureau of Navigation, Department of Commerce, Washington, D. C.

138. Radio inspectors, at their offices and elsewhere, by special arrangement.

139. Additional opportunities for taking the examination will be afforded as may be deemed necessary, and these special dates and places may be ascertained by communication with the Commissioner of Navigation or nearest radio inspector.

140. All licenses, when awarded, will be delivered through the officer who conducted the examination.

141. Examinations for the commercial extra first-grade licenses will be held at the following offices only by appointment.

142. Commandants, navy yards: Boston, Mass.; Brooklyn, N. Y.; Philadelphia, Pa.

143. United States radio inspectors, customhouses: New Orleans, La.; San Francisco, Cal.; Seattle, Wash.; Cleveland, Ohio; Chicago, Ill.

144. Commissioner of Navigation, Department of Commerce, Washington, D. C.

145. In special cases, upon application to the Commissioner of Navigation, arrangements may be made for examinations at other points.

APPLICATIONS FOR EXAMINATIONS FOR RADIO OPERATORS' LICENSES, RENEWALS, AND DUPLICATES.

146. An operator's license may be granted to any person without regard to sex, nationality, or age if the applicant can fulfill the requirements for the class of license desired.

147. Applicants for licenses should communicate in writing with the commandants, commanding officers, or officers in charge, at navy yards and Army posts, with the Commissioner of Navigation, or radio inspectors, in order to fix the date when they can be examined. (See pars. 134-145.)

148. Commercial licenses can only be obtained by personal examination. Where applicants are at remote points or can not proceed to examining offices, efforts will be made to examine them through radio inspectors when they are in that vicinity, but special trips can not be made for that purpose.

149. Amateurs should write to the nearest examining officer in their vicinity (see pars. 134-145) for Form 756 "Application for operator's license," and to the radio inspector in their vicinity for Form 762 "Amateur applicant's description of apparatus."

Foreign-born applicants for station licenses must submit satisfactory evidence of their citizenship.

150. Amateur operators at points remote from examining officers and radio inspectors may be issued second-grade amateur licenses without personal examination. Examinations for first-grade licenses will be given by the radio inspector when he is in that vicinity, but special trips can not be made for this purpose. (See par. 123.)

151. Persons holding radio operators' licenses, amateur second grade, should make every effort to appear at one of the examination points to take the examination for amateur first-grade license or higher.

152. Persons holding radio operators' licenses of any grade should, before their licenses expire, apply to the nearest radio inspector or examining officer for renewal and submit Form 756 in duplicate.

Holders of commercial extra first-grade radio operators' licenses may be issued renewal of such licenses without examination, provided the service records on the backs of the licenses properly certify to 12 months' satisfactory service in a land or ship station open to general public service, at least 6 months of which must have been served during the last 12 months of the license period.

However, holders of commercial extra first-grade licenses now employed as radio inspectors, radio instructors, or similar occupations requiring exceptional qualifications where the duties require the testing, or demonstrating, or otherwise using commercial radio apparatus and the telegraph codes, may be issued renewals of their licenses without reexamination, provided, in addition to the above, they can show satisfactory evidence of such service covering a period of 18 months out of the two-year license period. Where the applicant has not used regularly the telegraph codes, he will be given the code examination required in the original examination or, if he has used only one code, he will be examined in the code not used.

The service record shown on the licenses must be transcribed on Form 756.

The license may be marked "Expired" in red across the face and returned to the operator, if desired. The action taken should be noted on Form 756.

Where the record on the reverse side of the license does not show the service performed, the evidence submitted as proof of such service must be transmitted to the bureau with Form 756.

Transcriptions of code tests must be submitted to the bureau.

153. (a) Renewal licenses may be issued to commercial-grade operators without examination, provided the service records on the backs of licenses properly certify to three months' satisfactory commercial service during the last six months of the license term. If expired licenses have been lost or destroyed, an affidavit must be submitted attesting the facts regarding the manner in which the license was lost. In such cases evidence of the required satisfactory commercial service may be submitted in the form of letters, signed by masters and employers.

(b) Operators holding licenses of grades other than commercial, who submit satisfactory evidence to the examining officer, showing actual operation of radio apparatus for three months during the last six months of the license term, may be issued new licenses without examination. Otherwise, applicants for renewals will be examined in the usual manner.

(c) Renewals or new licenses may be issued a reasonable length of time previous to the expiration of existing licenses, but must bear the exact date of issue, which must correspond with the date on the back of Form 756 forwarded to the commissioner of navigation.

(d) Operators who fail to apply for renewal of their licenses on or prior to the date of expiration must be reexamined. If, because of circumstances over which the applicant has no control, an operator is unable to apply for renewal of license on or prior to the date of expiration, an affidavit may be submitted to the commissioner of navigation, through the radio inspector or examining officer, attesting to the facts, which will be considered by the commissioner of navigation, who will advise the radio inspector or examining officer in regard to the issue of a renewal of the license without reexamination.

(e) Service records must be completed and signed only by masters, employers, or the duly authorized agents of either.

(f) Any improper alteration of the service record or the forgery of masters' or employers' signatures constitute a violation of the regulations, and the operator may suffer suspension of license for a period not exceeding one year, at the discretion of the Secretary of Commerce.

154. Whether or not a new license is issued, the radio inspector or examining officer will forward one copy of Form 756, properly completed, to the Commissioner of Navigation, Department of Commerce. If a new license is not issued, the reason therefor will be stated on the back of the form.

155. Any operator applying for a duplicate license to replace an original which has been lost, mutilated, or destroyed will be required to submit an affidavit to the Bureau of Navigation through the radio inspector or examining officer who issued the original, attesting the facts regarding the manner in which the original was lost. The Commissioner of Navigation will consider the facts in the case and advise the radio inspector in regard to the issue of a duplicate license. A duplicate license will be issued under the same serial number as the original and will be marked "Duplicate" in red across the face.

156. Operators' licenses are not valid until the oath for the preservation of the secrecy of messages is properly executed before a notary public or other officer duly authorized to administer oaths. Licenses must indicate on their faces that the oath has been taken and the officer administering the oath on the back of the license should sign also in the blank provided on the face. Licenses will not be signed by examining officers until the oath of secrecy has been properly executed.

157. Operators' licenses should be framed and posted in the radio room, and licenses for stations should be accessible at all times to inspectors.

158. Under the supervision of a licensed operator an apprentice or unlicensed person may learn the art by the actual use of the apparatus, but the licensed operator who fails to enforce obedience to the regulations by the apprentice or unlicensed person serving under his supervision is liable to penalties as if he had himself violated the regulations.

159. An individual record is kept in the Bureau of Navigation, Department of Commerce, at Washington, of each licensed operator. Each operator's examination papers and all reports in regard to interference or violations of the radio laws and regulations are filed for reference.

160. Radio operators holding licenses of any grade or class and applying for examination for any other grade or class must submit to the examining officer Form 756 in duplicate. Licenses held by them must be submitted to the examining officer.

161. Radio operators who pass the examination for a higher-grade license are required to submit their existing licenses to examining officers, to be marked "Canceled."

162. Expired or canceled licenses will be returned to the licensees, marked "Canceled" or "Expired" in red across their faces, provided the particulars on Form 756, submitted herewith, are found correct by the examining officer. The service record shown on the reverse side of the license must be transcribed on Form 756.

PART IV.—GENERAL INFORMATION.

ADMINISTRATION AND ADMINISTRATIVE DISTRICTS.

163. The department has established, for the purpose of enforcing, through radio inspectors and others, the acts relating to radio communication and the international convention, the following districts, with the principal office for each district at the customhouse of the port named.

164. Communications for radio inspectors should be addressed as follows, and not to individuals: Radio Inspector, Customhouse, _____ (city), _____ (State).

165. Communications for the Bureau of Navigation should be addressed as follows, and not to individuals: Commissioner of Navigation, Department of Commerce, Washington, D. C.

166. (1) Boston, Mass.: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut.

(2) New York, N. Y.: New York (county of New York, Staten Island, Long Island, and counties on the Hudson River to and including Schenectady, Albany, and Rensselaer) and New Jersey (counties of Bergen, Passaic, Essex, Union, Middlesex, Monmouth, Hudson, and Ocean).

(3) Baltimore, Md.: New Jersey (all counties not included in second district), Pennsylvania (counties of Philadelphia, Delaware, all counties south of the Blue Mountains, and Franklin County), Delaware, Maryland, Virginia, District of Columbia.

(4) Savannah, Ga.: North Carolina, South Carolina, Georgia, Florida. Porto Rico.

(5) New Orleans, La.: Alabama, Mississippi, Louisiana, Texas, Tennessee, Arkansas, Oklahoma, New Mexico.

(6) San Francisco, Cal.: California, Hawaii, Nevada, Utah, Arizona.

(7) Seattle, Wash.: Oregon, Washington, Alaska, Idaho, Montana, Wyoming.

(8) Cleveland, Ohio: New York (all counties not included in second district), Pennsylvania (all counties not included in third district), West Virginia, Ohio, Michigan (lower peninsula).

(9) Chicago, Ill.: Indiana, Illinois, Wisconsin, Michigan (upper peninsula), Minnesota, Kentucky, Missouri, Kansas, Colorado, Iowa, Nebraska, South Dakota, North Dakota.

REPORTING OF VIOLATIONS.

167. The regulations established by law, or by the authority of law, or of the international convention, will be enforced by the Secretary of Commerce through collectors of customs, radio inspectors, and other officers of the Government.

168. The service regulations of the radiotelegraphic convention in force provide that "no station on shipboard shall be established or worked by private enterprise without authority from the Government to which the vessel is subject." Such authority shall be in the nature of a license issued by said Government. Stations on foreign ships will be licensed by their governments, respectively. Inspectors will report to the Commissioner of Navigation stations on foreign ships not so licensed.

169. A radio inspector is authorized in exceptional cases to act outside of his district for the convenience of commerce. In such cases he will communicate before or after acting with the inspector in whose district he has acted. Radio inspectors are authorized to communicate directly with collectors of customs and to cooperate with them in the enforcement of the law.

170. Violations of the laws and regulations will be reported to the chief customs officer of the district in which the offense occurs, who will report the case to the Secretary of Commerce (Bureau of Navigation), according to the procedure followed in violations of the navigation laws. Misdemeanors will be reported to the United States district attorney in the usual manner.

171. Collectors of customs and radio inspectors are enjoined that the reports required by paragraph 170 must be precise statements of the facts as the basis for possible proceedings by the United States attorney.

172. Violations by the master of a vessel of the United States of the provisions of the second paragraph of section 1 of the ship act will be reported to the collector of customs directly, and the usual procedure in cases of fines and penalties will be followed.

INSPECTION OF SHIP STATIONS.

173. The radio inspectors and customs officers, as far as practicable, shall visit steamers subject to the act before they leave port and ascertain if they are equipped with the apparatus in charge of the operators prescribed by law and regulation.

174. When the radio apparatus is certified as complying with the requirements of law by the competent authorities of a foreign Government, such certificate will be recognized by this department, but the radio inspector or customs officer may, if he deem it necessary or desirable, satisfy himself that the apparatus is in good working order.

175. Whenever practicable the radio inspector shall satisfy himself on his visit before the departure of a steamer subject to the act of June 24, 1910, as amended July 23, 1912, that the radio apparatus is efficient and in good working order within the meaning of the act. If the apparatus does not comply with the law, the radio inspector will furnish the master with the stub of Form 771 "inspection record" on which will be noted the particulars in which the apparatus does not comply with the law. Where apparatus is found to be in compliance with the law, the stub of Form 771 will not be detached.

176. Masters of vessels entering a port of the United States and expecting to leave under the act of June 24, 1910, as amended July 23, 1912, should file Form 753a "Radio declaration" (Appendix A) in duplicate with the customs officer at the time of entry. The customs officer will furnish one copy to the radio inspector in order that proper inspection of the radio equipment may be made before departure.

177. For each departure of a steamer under the act of June 24, 1910, as amended July 23, 1912, the master is required to furnish to the customs officer a certificate in the form of Appendix B (Form 753b) "Master's certificate of radio apparatus." Such certificates shall be retained in the files of the collectors of customs. The collector of customs will arrange for the collection of these certificates at all times.

178. Where a steamer subject to the radio law is without the apparatus and the operators prescribed, or either of them, and is about to attempt to leave port, the radio inspector or customs officer visiting the vessel shall—(a) furnish the master with a memorandum (stub of Form 771) of the particulars in respect of which the law has not been complied with and the penalty; (b) if convenient, notify the vessel's agents or the proper person in charge of the apparatus so that the necessary corrections may be made before sailing.

179. If a steamer clears in violation of the law, the radio inspector or customs officer shall submit to the collector of customs of the port a written report, stating the exact nature of the violation, the section of the law violated, and the penalties involved and all of the circumstances in connection therewith which will be of service to the collector and to the Secretary of Commerce in determining what action shall be taken. A copy of the report will be forwarded to the Commissioner of Navigation.

180. Statements should be obtained from operators, ship's officers, or other witnesses at the time the violation is discovered and should accompany the report to the collector of customs.

181. The collector of customs will report the case to the Secretary of Commerce in the usual manner as a navigation fine case.

182. Merchant vessels chartered by the United States Government are subject to the act of August 13, 1912, in every case, if the radio apparatus is owned and operated by a commercial company.

183. Merchant vessels chartered by the United States Government for the transportation of persons or supplies are subject to the requirements of the ship act (act of July 23, 1912), if the vessel is controlled and operated by the owners. Vessels commanded wholly or in part by Government officers are not subject to the ship act.

184. Government vessels or vessels chartered by the Government are subject to the act of August 13, 1912, if the radio equipment is owned and operated by private interests.

185. The ship act does not authorize the refusal of clearance in case of violation of its provisions, but specifically provides for the imposition of a fine in a sum not more than \$5,000.

186. The act does not apply to a vessel at the time of entering a port of the United States. Radio inspectors and customs officers may, however, accept as

evidence of the efficiency of the apparatus and the skill of an operator messages shown to have been transmitted and received by him over a distance of at least 100 miles, by day, during the voyage to the United States.

OPERATORS ON FOREIGN VESSELS.

187. In so far as licensed operators are concerned a sharp distinction should be drawn between the act of July 23, 1912, which requires apparatus and operators for radio communication on steamers, and the act of August 13, 1912, to regulate radio communication.

188. The act of July 23, 1912, amending the act of June 24, 1910, is designed to promote safety at sea through the employment of apparatus and operators to transmit and receive distress calls and other calls relating to perils and aids to navigation. It provides that in the case of American and foreign vessels subject to its provisions "the radio equipment must be in charge of two or more persons skilled in the use of such apparatus." This act does not require that the operators shall be licensed, and the penalty prescribed in section 3 of the act is not incurred by the master of a vessel whose operators are "skilled in the use of such apparatus," even though they may not be licensed.

189. The act of August 13, 1912, is designed to execute in behalf of the United States the International Radiotelegraphic Convention and thus to promote orderly exchanges by radio communication. For this purpose the International Radiotelegraphic Convention (Service Regulations) provides that the service of the station on shipboard shall be carried on by a telegraph operator holding a certificate issued by the Government to which the vessel is subject.

190. Section 3 of the act of August 13, 1912, carries out this provision of the International Convention by providing licenses for operators on American vessels. If an unlicensed person serves in charge or in supervision of the use and operation of the apparatus both he and his employer are liable to a fine of not more than \$100 or imprisonment for not more than two months or both. This section and penalty do not apply to operators on foreign ships. But operators on the ships of foreign nations signatory to the International Radiotelegraphic Convention, as shown above, are required to have certificates or licenses from their own governments, and if not so certificated, the obligations of the convention have not been observed. The convention in the Service Regulations provides for this situation.

191. The act of July 23, 1912, as stated, requires that on American and foreign ships the operators must be "skilled in the use of such apparatus," but does not require that they must be licensed. To facilitate commerce and simplify administration, operators presenting American licenses or foreign certificates are accepted as "skilled in the use of such apparatus," except where there may be special reasons to doubt the operator's skill or reliability. Where operators on American or foreign ships do not have such licenses or foreign certificates, radio inspectors or customs officers under the act of July 23, 1912, may accept other competent evidence of skill or may examine such operators.

OFFICIAL INTERNATIONAL LIST OF COAST AND SHIP RADIO STATIONS OF THE WORLD AND STATION RATES.

192. The list of land and ship stations of the United States, including amateurs, giving call letters, wave lengths, nature of service, etc., can be procured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a nominal price.

193. Supplements to this list are issued monthly under the title "Radio Service Bulletin," and the list is revised annually as of July 1. These monthly supplements contain information concerning Government, commercial, and special stations only, and information regarding amateur stations appears only in the annual edition of the list of Radio Stations of the United States. Amendments to or changes in the Radio Laws and Regulations of the United States are printed in this bulletin in such a manner that they may be clipped and pasted in their proper places in that publication. Items of general interest concerning the enforcement of the radio laws are printed in the bulletin from time to time, as occasion warrants.

194. The introduction to the list of "Radio Stations of the United States" contains information concerning the assignment of international and amateur call letters.

195. A copy of the official Berne list and supplements as issued are required as a part of the equipment of every land station open to general public service and every ship station of the first or second class on American vessels engaged in foreign trade or the transoceanic service.

196. The International List of Radio Stations of the World (edition in English) can be procured from the International Bureau of the Telegraphic Union (Radiotelegraphic Service), Berne, Switzerland.

197. In addition to the information contained in the pamphlet of the United States stations, published by the Bureau of Navigation, the international list shows geographical locations, normal ranges in nautical miles, radio systems, and rates.

198. The international list includes the Government and commercial land and ship stations of the United States. The list is divided into three parts. The first part contains a list of ship stations, grouped by countries and arranged alphabetically; the second part contains a list of land stations arranged in the same manner; and the third part contains tables of land line and cable charges from coast radio stations to inland and various other points. In computing the total word rate applicable to a radiogram from a ship station to an inland point or vice versa, the three rates must be added. The rates in the international list are stated in francs. For approximate purposes 1 franc equals 20 cents and 5 centimes equals 1 cent. Supplements to the international list will be issued monthly, and will contain new stations and tables of alterations.

199. The International Alphabetical List of Call Letters (stations of the world) is also issued by the international bureau at Berne, and supplements will be issued monthly.

200. Neither the international list proper nor the supplements will contain a list of amateur stations.

201. Inquiries as to the subscription price of these lists should be made direct to the Berne bureau, at the address given above. (See par 196.) Remittances to Berne should be made by international postal money order.

MISCELLANEOUS INFORMATION.

202. Stations equipped to receive only do not require licenses.

203. Operators of receiving stations do not require licenses, but all persons are required to maintain secrecy in regard to messages, as provided in the act of August 13, 1912, nineteenth regulation of section 4.

204. Distances under the radio laws are computed in nautical miles.

205. No fees are charged for any operator or station license.

206. Licensed stations must be operated by or under the direct supervision of properly licensed operators.

207. Amateur stations within 5 miles of naval or military stations need not have been in actual operation on or before August 13, 1912, to obtain a license for a restricted amateur station.

208. The master of a vessel shall have the right to censor all messages addressed to or transmitted by a radio telegraph station on board his vessel, but such master shall not divulge to any person (other than the properly authorized officials of the Government, or a competent legal tribunal) or make any use whatever of any message coming to his knowledge through the exercise of such censorship, nor shall the master or any operator divulge to any person (other than the properly authorized officials of the Government, or a competent legal tribunal) or make any use whatever of any message (other than a message of distress) coming to his knowledge and not intended for the said station.

209. The transmission of superfluous signals by any ship or coast station is absolutely prohibited; trials and practices are forbidden except under such circumstances as to preclude the possibility of interference with other stations.

210. No person shall transmit or make a signal containing profane or obscene words or language.

211. Additional or amendatory regulations will be issued from time to time as they may appear necessary.

APPENDIX TO RADIO COMMUNICATION LAWS.

[Appendix A.—Radio Service Form 752.]

CERTIFICATE OF RADIO INSPECTION.

PORT OF _____,
 _____, 191____.

This is to certify that I have to-day examined the apparatus for radio communication on the S. S. _____, of which _____ is master, about to leave this port for _____, and I have found the same efficient and in good working order, as prescribed by the act of June 24, 1910, as amended by the act of July 23, 1912.

(Signed) _____,
Radio Inspector.
 (Or) _____,
Customs Inspector.

[Appendix B.—Radio Service Form 753.]

MASTER'S CERTIFICATE OF RADIO APPARATUS.

NOTICE.

The radio equipment must be in charge of two or more persons skilled in the use of such apparatus, one or the other of whom shall be on duty at all times while the vessel is being navigated. Such equipment, operators, the regulation of their watches, and the transmission and receipt of messages, except as may be regulated by law or international agreement, shall be under the control of the master, in the case of a vessel of the United States; and every willful failure on the part of the master to enforce at sea the provisions of this paragraph as to equipment, operators, and watches shall subject him to a penalty of one hundred dollars. (Act of July 23, 1912.)

PORT OF _____,
 _____, 191____.

This is to certify that I have to-day examined the apparatus for radio communication on the S. S. _____, of which I am master, about to leave this port for _____, and I have found the same efficient and in good working order, as prescribed by the act of June 24, 1910, as amended by the act of July 23, 1912.

(Signed) _____, *Master.*

No. _____.

LICENSE FOR GENERAL PUBLIC SERVICE COAST RADIO STATION.

[Department of Commerce. Bureau of Navigation. Radio Service.]

Pursuant to the act to regulate radio communications, approved August 13, 1912, _____, a citizen of the State of _____

_____ a company incorporated under the laws of the State of _____, having applied therefor, is hereby granted by the Secretary of Commerce for a period of _____ on and subject to the restrictions and conditions hereinafter stated and revocable for cause by him, this License to use or operate the apparatus for radio communication (identified in the schedule hereinafter) located in the State of _____, city or town of _____, for the purpose of transmitting to and receiving from ship stations and other land stations general public correspondence, Government and service correspondence, and distress signals and messages, at rates of compensation not in excess of those fixed by the international agreement to which the Government of the United States has adhered, which have been submitted to and approved by the Secretary of Commerce, as included in the schedule hereinafter.

2. The use or operation of apparatus for radio communication pursuant to this License shall be subject also to the articles and regulations established by the International Radiotelegraphic Convention, ratified by the Senate of the United States and caused to be made public by the President "to the end that the same and every article and clause thereof may be observed and fulfilled with good

faith by the United States and the citizens thereof," and shall be subject also to such regulations as may be established from time to time by authority of subsequent acts and treaties of the United States.

3. The authority conferred by this License is subject to the provisions of the act of February 4, 1887, entitled "An Act to regulate commerce," as amended by the act of June 18, 1910, so far as the Licensee may be within the operation of said act, and except as provided in the act of August 13, 1912, or in the International Radiotelegraphic Convention and regulations made part thereof, the station shall transmit all messages offered by those who tender lawful rates on equal terms without discrimination, whether as regards rates, order of transmission, or otherwise.

4. The licensee shall render to the Secretary of Commerce such accounts as the Secretary of Commerce shall direct in respect of all charges due or payable under the International Radiotelegraphic Convention in respect of messages exchanged between the station hereby licensed and other stations and shall pay to the Secretary of Commerce, at such times and in such manner as the Secretary of Commerce shall direct, all sums which shall be due from the Licensee under such accounts.

5. The apparatus shall at all times while in use and operation be in charge or under the supervision of a person or persons licensed for that purpose by the Secretary of Commerce, and the operator of the apparatus shall not wilfully or maliciously interfere with any other radio communication.

6. The station shall give absolute priority to signals and radiograms relating to ships in distress; shall cease all sending on hearing a distress signal; and, except when engaged in answering or aiding the ship in distress, shall refrain from sending until all signals and radiograms relating thereto are completed.

7. The station during the hours of operation shall listen in at intervals of not less than 15 minutes and for a period of not less than 2 minutes with the receiver tuned to receive messages of 300 meters wave length.

8. The station shall use the minimum amount of energy necessary to carry out any communication desired, except in case of signals or radiograms relating to vessels in distress.

9. The station shall exchange radiograms with any other commercial station and with any ship station without distinction of the radio systems adopted by such stations.

10. The station shall not use a transmitter during the first 15 minutes of each hour, local standard time, except for distress signals, whenever the Secretary of Commerce by notice in writing shall require it to observe a division of time, pursuant to the Twelfth Regulation of the act of August 13, 1912.

11. The President of the United States in time of war or public peril or disaster is authorized by law to close the station and cause the removal therefrom of all radio apparatus or may authorize the use or control of the station or apparatus by any department of the Government upon just compensation to the owners.

12. The Secretary of Commerce and Collectors of Customs or other officers of the Government authorized by him may at all reasonable times enter upon the station for the purpose of inspecting and may inspect any apparatus for radio communication of such station and the operation and operators of such apparatus.

13. The apparatus shall not be altered or modified in respect of any of the particulars mentioned in the following schedule, except with the approval of the Secretary of Commerce.

Schedule of station and apparatus.

Location: State, _____; County, _____
 City or Town, _____; Street, _____ No. _____

Geographical location: Latitude, N. ____° ____' ____"; Longitude, W. ____° ____' ____"
 Specific hours authorized during which the station must be open to service (local standard time): _____

Power: Transformer input, _____ KW.

Normal day range in nautical miles with ships at sea, _____
 Time and method, if any, of sending time signals and hydrographic and meteorological radiograms: _____

 ----- Call letters, -----
 -----; Coast charges: per word -----; minimum per radiogram -----
 -----; Coast charges: per word -----; minimum per radiogram -----
 -----; Coast charges: per word -----; minimum per radiogram -----

Radiotelegraphic system employed: _____
 Characteristics of transmitting system:
 Type of spark gap, -----
 Approximate spark frequency, -----

Characteristics of receiving system:
 Type of receiver, -----
 Wave length of receiving system: From ----- meters ----- meters.
 Antenna: Number of masts, -----; Height, -----

Type of aerial, -----
 Wires: Number, -----; Size and kind, -----
 Essential dimensions, -----

Wave lengths.

The normal sending and receiving wave length shall be ----- meters, and no other wave length shall be used for general public correspondence with any foreign ship or foreign coast station, except for long-range public service or purposes other than general public correspondence.

The station shall at all times, except as provided in the seventh paragraph of this License, be ready to receive messages of such wave lengths as are required by the International Radiotelegraphic Convention; shall be prepared to use two sending wave lengths, one of 300 meters and one of 600 meters, as required by the International Radiotelegraphic Convention in force; and tuning positions on the receiver shall be plainly marked: *Provided*, That the Secretary of Commerce may, in his discretion, change the limit of wave length reservations to accord with any international agreement to which the United States is a party.

For long-range public service and for any service other than general public correspondence the station is authorized to use the following additional wave lengths under 600 or over 1,600 meters:
 Meters, -----; Meters, -----; Meters, -----; Meters, -----

The energy, if radiated by the transmitter in two or more wave lengths as indicated by a sensitive wave meter, shall not in any one of the lesser waves exceed 10 per cent of that in the greatest; and the logarithmic decrement per complete oscillation in the wave trains shall not exceed two-tenths, except when sending signals or messages relating to vessels in distress.

Sending wave length.*	Antenna current (amperes).	Logarithmic decrement.	Reading of wave meter indicating instrument.†	
			Principal wave.	Wave next in energy.
600 meters.....
300 meters.....
meters.....
meters.....
meters.....

* Underscore normal.
 † Type of indicating instrument,

The station insures rapid exchange with land wire stations of the

(Company) (Location telegraph office)

(Company) (Location telegraph office)

in the following manner:

Satisfactory proof has been furnished that the station was actually operating August 13, 1912.
 This license will expire on the _____ day of _____, 191__

Secretary of Commerce.

Commissioner of Navigation.

Washington, D. C., _____, 191__

INSPECTIONS.

Date.	Inspector.	Remarks.
.....
.....
.....
.....

No. _____

LICENSE FOR SHIP RADIO STATION.

[Department of Commerce. Bureau of Navigation. Radio Service.]

Pursuant to the act to regulate radio communication, approved August 13, 1912, _____, a citizen of the State of _____,

a company incorporated under the laws of the State of _____, having applied therefor, is hereby granted by the Secretary of Commerce for a period of _____, on and subject to the restrictions and conditions hereinafter stated and revocable for cause by him, this License to use or operate the apparatus for radio communication (identified in the schedule hereinafter) on the _____

(Type of vessel.)

called _____, a vessel of the United States, official number _____, (Name of vessel.)

for the purpose of transmitting to and receiving from other ship stations and land stations general public correspondence, Government and service correspondence, and distress signals and messages, at rates of compensation not in excess of those fixed by the international agreement to which the Government of the United States has adhered, which have been submitted to and approved by the Secretary of Commerce, as included in the schedule hereinafter.

2. The use or operation of apparatus for radio communication pursuant to this License shall be subject also to the articles and regulations established by the International Radiotelegraphic Convention, ratified by the Senate of the United States and caused to be made by the President "to the end that the same and every article and clause thereof may be observed and fulfilled with good faith by the United States and the citizens thereof," and shall be subject also to such regulations as may be established from time to time by authority of subsequent acts and treaties of the United States.

3. The authority conferred by this License is subject to the provisions of the act of February 4, 1887, entitled "An Act to regulate commerce," as amended by the act of June 13, 1910, so far as the Licensee may be within the operation of said act, and except as provided in the act of August 13, 1912, or in the International Radiotelegraphic Convention and regulations made part thereof, the station shall transmit all messages offered by those who tender lawful rates on equal terms without discrimination, whether as regards rates, order of transmission, or otherwise.

4. The Licensee shall render to the Secretary of Commerce such accounts as the Secretary of Commerce shall direct in respect of all charges due or payable under the International Radiotelegraphic Convention in respect of messages

exchanged between the station hereby licensed and other stations, and shall pay to the Secretary of Commerce, at such times and in such manner as the Secretary of Commerce shall direct, all sums which shall be due from the Licensee under such accounts.

5. The apparatus shall at all times while in use and operation be in charge or under the supervision of a person or persons licensed for that purpose by the Secretary of Commerce, except when in case of emergency the Collector of Customs by authority of the Secretary of Commerce shall issue a temporary permit, in lieu of a license, to the operator. The operator of the apparatus shall not willfully or maliciously interfere with any other radio communication.

6. The station shall give absolute priority to signals and radiograms relating to ships in distress; shall cease all sending on hearing a distress signal; and, except when engaged in answering or aiding the ship in distress, shall refrain from sending until all signals and radiograms relating thereto are completed.

7. The station shall be prepared to send the international signal of distress and distress signals on the normal wave length designated by the International Radiotelegraphic Convention in force with sufficient power to enable them to be received by day over sea a distance of 100 nautical miles by a ship station equipped with apparatus for sending and receiving equal in all essential particulars to the apparatus of the station herein licensed.

8. The station shall use the minimum amount of energy necessary to carry out any communication desired, except in case of signals or radiograms relating to vessels in distress.

9. The station shall exchange radiograms with any other ship station without distinction of the radio systems adopted by such stations.

10. The station shall not use, except for sending signals of distress or signals and radiograms relating thereto, or when, owing to unusual circumstances, communication can be established only by means of an increase of power, a transformer input exceeding one kilowatt, or exceeding one-half kilowatt when within 5 nautical miles of a naval or military station.

11. The President of the United States in time of war or public peril or disaster is authorized by law to close the station and cause the removal therefrom of all radio apparatus, or may authorize the use or control of the station or apparatus by any department of the Government upon just compensation to the owners.

12. The Secretary of Commerce and Collectors of Customs or other officers of the Government authorized by him may at all reasonable times enter upon the station for the purpose of inspecting, and may inspect any apparatus for radio communication of such station and the operation and operators of such apparatus.

13. The apparatus shall not be altered or modified in respect of any of the particulars mentioned in the following schedule, except with the approval of the Secretary of Commerce.

Schedule of station and apparatus.

Ship: Name, _____; Owner, _____
Home port, _____; International code letters, _____

Radio call letters, _____

Nature of service: _____

Hours of operation: _____

Power: Transformer input, _____ K W. Primary source of power, _____

Normal day range in nautical miles with other ships at sea, _____

Ship charge: Per word, _____; Minimum per radiogram, _____

Per word, _____; Minimum per radiogram, _____

Radiotelegraphic system employed: _____

Characteristics of transmitting system:

Type of spark gap, _____

Approximate spark frequency, _____

Characteristics of receiving system:

Type of receiver, _____

Wave length range of receiving system: From _____ meters to _____ meters

Antenna : Number of masts, ----- ; Height, -----
 Type of aerial, -----
 Wires : Number, ----- ; Size and kind, -----
 Essential dimensions, -----

Auxiliary apparatus : Type, -----
 Power : Source, ----- ; Normal day range with ships, -----

Wave lengths.

The normal sending and receiving wave lengths shall be 600 meters, and the station shall be prepared to use two sending wave lengths, one of 600 meters and one of 300 meters, as required by the International Radiotelegraphic Convention in force; and tuning positions shall be plainly marked: *Provided*, That the Secretary of Commerce may, in his discretion, change the limit of wave length reservations to accord with any international agreement to which the United States is a party.

A wave length of ----- meters and the following additional wave lengths not exceeding 600 meters may be employed as authorized by law and treaty: Meters, ----- ; Meters, ----- ; Meters, ----- ; Meters, ----- ; Meters, -----

The energy, if radiated by the transmitter in two or more wave lengths as indicated by a sensitive wave meter, shall not in any one of the lesser waves exceed 10 per cent of that in the greatest, and the logarithmic decrement per complete oscillation in the wave trains shall not exceed two-tenths, except when sending signals or messages relating to vessels in distress and in sending distress signals when the transmitter may be tuned to create a maximum of interference with a maximum of radiation.

Sending wave length.*	Antenna current (amperes).	Logarithmic decrement.	Reading of wave meter indicating instrument.†	
			Principal wave.	Wave next in energy.
600 meters.....
300 meters.....
meters.....
meters.....

* Underscore normal.

† Type of indicating instrument,

The station in general shall transmit its radiograms to the nearest coast station. The sender shall have the right, however, to designate the coast station through which he desires to have his radiograms transmitted, and his wishes shall be complied with only if the transmission can be effected without interfering with the service of other stations, or the shipboard station shall wait until such coast station shall be the nearest as provided by the International Convention in force.

Satisfactory proof has been furnished that the station was actually operating August 13, 1912.

This License will expire on the ----- day of -----, 191..
 [SEAL.] -----

Secretary of Commerce.

Commissioner of Navigation.
 Washington, D. C., -----, 191..

INSPECTIONS.

Date.	Inspector.	Remarks.
.....
.....
.....
.....

No.-----

LICENSE FOR LAND RADIO STATION.

Class.-----

[Department of Commerce. Bureau of Navigation. Radio Service.]

Pursuant to the act to regulate radio communication, approved August 13, 1912, _____ a citizen of the State of _____ a company incorporated under the laws of the State of _____, having applied therefor, is hereby granted by the Secretary of Commerce for a period of _____ on and subject to the restrictions and conditions hereinafter stated and revocable for cause by him, this License to use or operate the apparatus for radio communication (identified in the schedule hereinafter) for the purpose of transmitting to and receiving from ship stations and other land stations public correspondence, Government and service correspondence, and distress signals and messages, at rates of compensation not in excess of those fixed by the international agreement to which the Government of the United States has adhered, which have been submitted to and approved by the Secretary of Commerce, as included in the schedule hereinafter, or for the purpose of conducting experiments for the development of the science of radio communication or the apparatus pertaining thereto, to carry on special tests, using any amount of power or any wave lengths, at such hours and under such conditions as will insure the least interference with the sending or receipt of commercial or Government radiograms, of distress signals and radiograms, or with the work of other stations, the purpose of the station being designated by the classification at the head of this License.

2. Public correspondence or limited commercial correspondence authorized by this License shall be limited to certain stations, ships or lines of ships named hereinafter, which designation is authorized in view of the nature of the service and is independent of the radio system employed.

3. The use or operation of apparatus for radio communication pursuant to this License shall be subject also to the articles and regulations established by the International Radiotelegraphic Convention, ratified by the Senate of the United States and caused to be made public by the President, and shall be subject also to such regulations as may be established from time to time by authority of subsequent acts and treaties of the United States, in so far as they apply to the class of station indicated by this License.

4. The authority conferred by this license is subject to the provisions of the act of February 4, 1887, entitled, "An act to regulate commerce," as amended by the act of June 18, 1910, so far as the licensee may be within the operation of said act, and except as provided in the act of August 13, 1912, or in the International Radiotelegraphic Convention and regulations made part thereof, the station shall transmit all messages offered by those who tender lawful rates on equal terms without discrimination, whether as regards rates, order of transmission, or otherwise.

5. The Licensee shall render to the Secretary of Commerce such accounts as the Secretary of Commerce shall direct in respect of all charges due or payable under the International Radiotelegraphic Convention in respect of messages exchanged between the station hereby licensed and other stations and shall pay to the Secretary of Commerce, at such times and in such manner as the Secretary of Commerce shall direct, all sums which shall be due from the Licensee under such accounts.

6. The apparatus shall at all times while in use and operation be in charge or under the supervision of a person or persons licensed for that purpose by the Secretary of Commerce, and the operator of the apparatus shall not willfully or maliciously interfere with any other radio communication.

7. The station shall give absolute priority to signals and radiograms relating to ships in distress; shall cease all sending on hearing a distress signal; and, except when engaged in answering or aiding the ship in distress, shall refrain from sending until all signals and radiograms relating thereto are completed.

8. The station shall use the minimum amount of energy necessary to carry out any communication desired, except in case of signals or radiograms relating to vessels in distress.

9. The station shall not use a transmitter during the first 15 minutes of each hour, local standard time, except for distress signals, whenever the Secretary

of Commerce by notice in writing shall require it to observe a division of time, pursuant to the Twelfth Regulation of the act of August 13, 1912.

10. The President of the United States in time of war or public peril or disaster is authorized by law to close the station and cause the removal therefrom of all radio apparatus or may authorize the use or control of the station or apparatus by any department of the Government upon just compensation to the owners.

11. The Secretary of Commerce and Collectors of Customs or other officers of the Government authorized by him may at all reasonable times enter upon the station for the purpose of inspecting and may inspect any apparatus for radio communication of such station and the operation and operators of such apparatus.

12. The apparatus shall not be altered or modified in respect of any of the particulars mentioned in the following schedule, except with the approval of the Secretary of Commerce.

Schedule of station and apparatus.

Name of owner -----
Location: State, -----; County, -----
City or town, -----; Street, -----; No. -----

Geographical location: Latitude, N. ___° ___' ___"; Longitude, W. ___° ___' ___"
This station is licensed for communication only, with the following land stations, ships, or lines of ships:

Specific hours during which the station must be open to service (local standard time):

Power: Transformer input, ----- KW.
Normal day range in nautical miles, -----
Time and method, if any, of sending time signals and hydrographic and meteorological radiograms:

Call letters, -----
-----; Coast charges: per word -----, minimum per radiogram -----
-----; Coast charges: per word -----, minimum per radiogram -----
-----; Coast charges: per word -----, minimum per radiogram -----

Radiotelegraphic system employed, -----
Characteristics of transmitting system:
Type of spark gap, -----
Approximate spark frequency, -----

Wave length range of receiving system: From ----- meters to ----- meters.
Antenna: Number of masts, -----, Height, -----, -----, -----
Type of aerial, -----
Wires: Number, -----; Size and kind, -----
Essential dimensions, -----

Wave lengths.

The normal sending and receiving wave length shall be ----- meters.
If the station be classified as a coast station, it shall be prepared to transmit or relay distress calls or messages using the distress wave length as provided by the International Radiotelegraphic Convention in force.
In view of special conditions the station is authorized to use for communication exclusively with stations licensed by the United States the following additional wave lengths under 600 or over 1,600 meters:
Meters, -----; Meters, -----; Meters, -----; Meters, -----

The energy, if radiated by the transmitter in two or more wave lengths as indicated by a sensitive wave meter, shall not in any one of the lesser waves exceed 10 per cent of that in the greatest; and the logarithmic decrement per complete oscillation in the wave trains shall not exceed two-tenths, except when sending signals or messages relating to vessels in distress.

Sending wave length.	Antenna current (amperes).	Logarithmic decrement.	Reading of wave meter indicating instrument.*	
			Principal wave.	Wave next in energy.
300 meters.....
600 meters.....
..... meters.....
..... meters.....
..... meters.....

* Type of indicating instrument,

The station insures rapid exchange with land wire stations at

(Company.)

(Location telegraph office.)

(Company.)

(Location telegraph office.)

in the following manner:

Satisfactory proof has been furnished that the station was actually operating August 13, 1912.

This License will expire on the _____ day of _____, 191__.

[Seal of Department of Commerce.]

Secretary of Commerce.

Commissioner of Navigation.

Washington, D. C., _____, 191__

INSPECTIONS.

Date.	Inspector.	Remarks.
.....
.....
.....
.....
.....

No. _____

LICENSE FOR _____ AMATEUR RADIO STATION.
(General or restricted.)

[Department of Commerce. Bureau of Navigation. Radio Service.]

Pursuant to the act to regulate radio communication, approved August 12, 1912, _____, a citizen of the State of _____, having applied therefor, is hereby granted by the Secretary of Commerce, for a period of _____ year____, on and subject to the restrictions and conditions hereinafter stated and revocable for cause by him, this License to use or operate the apparatus for radio communication (identified in the Schedule hereinafter) for the purpose of transmitting private radiograms or signals, notwithstanding the effect thereof extends beyond the jurisdiction of the State or Territory in which the said station is located: *Provided*, That no interference other than may result under the restrictions contained in this License shall be caused with the radio communication of stations of the Government of the United States or licensed stations.

2. The use or operation of apparatus for radio communication pursuant to this License shall be subject also to the articles and regulations established by the International Radiotelegraphic Convention, ratified by the Senate of the United States and caused to be made public by the President, and shall be subject also to such regulations as may be established from time to time by authority of subsequent acts and treaties of the United States.

3. The apparatus shall at all times while in use and operation be in charge of a person or persons licensed for that purpose by the Secretary of Commerce, and the operator of the apparatus shall not wilfully or maliciously interfere with any other radio communication.

4. The station shall give absolute priority to signals or radiograms relating to ships in distress; shall cease all sending on hearing a distress signal; and shall refrain from sending until all the signals and radiograms relating thereto are completed.

5. The station shall use the minimum amount of energy necessary to carry out any communication desired, and the transformer input shall not exceed one-half kilowatt.*

6. The station shall not use a transmitting wave exceeding 200 meters.

7. The station shall not use a transmitter during the first 15 minutes of each hour, local standard time, whenever the Secretary of Commerce by notice in writing shall require it to observe a division of time, pursuant to the Twelfth Regulation of the act of August 13, 1912.

8. The President of the United States in time of war or public peril or disaster is authorized by law to close the station and cause the removal therefrom of all radio apparatus, or may authorize the use or control of the station or apparatus by any department of the Government upon just compensation to the owners.

9. The Secretary of Commerce and Collectors of Customs or other officers of the Government authorized by him may at all reasonable times enter upon the station for the purpose of inspecting and may inspect any apparatus for radio communication of such station and the operation and operators of such apparatus.

10. The apparatus shall not be altered or modified in respect of any of the particulars mentioned in the following Schedule except with the approval of a radio inspector or other duly authorized officer of the Government.

Schedule of station and apparatus.

Name of owner, _____; Age, _____

Location: State, _____; County, _____

City or town, _____; Street, _____; No. _____

Official call, _____

Name of naval or military station, if within 5 nautical miles, _____

Power: Transformer input _____, W. †

Antenna: Type (T, T, fan, umbrella, etc.), _____

Height, _____; Horizontal length, _____

(Above ground.)

Wires: Number in vertical part, _____; In horizontal part, _____

The normal sending and receiving wave length shall be _____ meters
(Not exceeding 200.)

and the station is authorized to use the following additional wave lengths, not exceeding 200 meters: _____ meters, _____ meters.

Satisfactory proof has been furnished that the station was actually operating August 13, 1912.

This License expires on _____, 191__

EDWIN F. SWEET,
Assistant Secretary of Commerce.

E. T. CHAMBERLAIN,
Commissioner of Navigation.

Delivered by _____

(Radio inspector.)

Place, _____, Date, _____, 191__

* Strike out "one" if the station be within 5 nautical miles of a naval or military station; otherwise strike out "one-half."
† Not to exceed 1,000; or if the station be within 5 nautical miles of a naval or military station, not to exceed 500.

No.-----

[The United States of America. Department of Commerce. Bureau of Navigation.]

LICENSE TO RADIO OPERATOR, COMMERCIAL EXTRA FIRST GRADE.

This is to certify that -----
 has been examined and passed, pursuant to the Radiotelegraphic Convention, in
 (a) adjustment, operation and care of apparatus;
 (b) transmitting and sound reading at a speed of ----- words a
 minute, Continental Morse, and ----- words a minute
 American Morse;;
 (c) use and care of storage battery or other auxiliary;
 (d) Knowledge of international regulations and Acts of Congress to regulate
 radio communication;
 (e) knowledge of United States Naval Radio Regulations;
 and is hereby licensed, as required by law, a Radio Operator, Commercial Extra
 First Grade, for two years.

In testimony of trustworthiness and efficient service as Radio Operator for
 ----- months, of which ----- months were service at sea, and of
 superior knowledge and skill, ascertained by special examination, this extra
 grade license is granted.

Oath of Secrecy executed. -----
 (Examining officer.) Secretary of Commerce.

 Title. Notary Public. -----
 Place ----- Date ----- 191----- Commissioner of Navigation.

No.---

[The United States of America. Department of Commerce. Bureau of Navigation.]

LICENSE TO RADIO OPERATOR, COMMERCIAL ¹ ----- GRADE.

This is to certify that -----
 has been examined and passed, pursuant to the Radiotelegraphic Convention, in
 (a) adjustment, operation and care of apparatus;
 (b) transmitting and sound reading at a speed of not less than ² ----- words
 a minute, Continental Morse;
 (c) use and care of storage battery or other auxiliary;
 (d) knowledge of international regulations and Acts of Congress to regulate
 radio communication;
 and is hereby licensed as required by law a Radio Operator, Commercial ¹ -----
 grade for two years. The candidate's practical knowledge of adjustment was
 tested on a ----- set of apparatus. His knowledge of other systems is
 shown below.

 Oath of Secrecy executed. WILLIAM C. REDFIELD,
 (Examining Officer.) Secretary of Commerce.

 (Title.) Notary Public. E. T. CHAMBERLAIN,
 Place ----- Date ----- 191----- Commissioner of Navigation.

¹ First or Second.² Twenty or Twelve.

No. _____
[The United States of America. Department of Commerce. Bureau of Navigation.]

LICENSE TO RADIO OPERATOR, AMATEUR FIRST GRADE.

This is to certify that _____ has been examined and shown to have a knowledge of the adjustment and operation of apparatus and of the regulations of the Radiotelegraphic Convention and the Acts of Congress in so far as they relate to interference with radio communication and impose certain duties on all grades of operators sufficient to entitled him to a license, and he is hereby licensed as required by law Radio Operator, Amateur First Grade for two years.

The candidate was examined and shown to have knowledge (excellent or good) in the following additional subjects:

- (a) general adjustment, operation and care of apparatus¹ _____
- (b) transmitting and sound reading Continental Morse at a speed of ² _____ words a minute;
- (c) general knowledge of international regulations and Acts of Congress to regulate radio communication¹ _____

Oath of Secretary executed.

(Examining Officer.)

(Title.)

Notary Public.

Place _____, Date, _____, 191_____

WILLIAM C. REDFIELD,
Secretary of Commerce.
E. T. CHAMBERLAIN,
Commissioner of Navigation.

No. _____

[United States of America. Department of Commerce. Bureau of Navigation. Radio service.]

LICENSE TO RADIO OPERATOR, AMATEUR SECOND GRADE.

This is to certify that _____ has presented satisfactory evidence that he has a knowledge of the adjustment and operation of apparatus and of the regulations of the Radiotelegraphic Convention and the Acts of Congress, in so far as they relate to interference with radio communication and impose certain duties on all grades of operators, sufficient to entitle him to a license, and he is hereby temporarily licensed as RADIO OPERATOR, AMATEUR SECOND GRADE, for the period of eight months or until he has been duly examined.

He has also shown that he has knowledge (excellent or good) of the following additional subjects:

- (a) General adjustment, operation, and care of apparatus _____ (Excellent or good.)
- (b) Transmitting and sound reading Continental Morse at a speed of _____ words a minute.
- (c) General knowledge of international regulations and Acts of Congress to regulate radio communication _____ (Excellent or good.)

Oath of secrecy executed:

(Certifying officer.)

(Title.)

Notary Public.

Place _____, Date, _____, 191_____

WILLIAM C. REDFIELD,
Secretary of Commerce.
E. T. CHAMBERLAIN,
Commissioner of Navigation.

¹ Excellent or good.

² Insert speed.

[Operators licenses are not valid until the following oath has been executed on the backs of the licenses:]

I, _____, do solemnly swear that I will faithfully preserve the secrecy of all messages coming to my knowledge through my employment under this license; that this obligation is taken freely, without mental reservation or purpose of evasion; and that I will well and faithfully discharge the duties of the office: So help me God.

(Signature of holder.)

Date of birth, _____ Place of birth, _____
Sworn to and subscribed before me this _____
day of _____, A. D., 191____.

Notary Public.

[SEAL.]

SERVICE RECORD.

This is to certify that the holder of this license has served satisfactorily as radio operator under my orders during the period named.

Name of Ship or Land Station.	Period.	Master, Manager, or Superintendent.
-----	From -----, 19--, to -----, 19--	-----
-----	From -----, 19--, to -----, 19--	-----
-----	From -----, 19--, to -----, 19--	-----
-----	From -----, 19--, to -----, 19--	-----
-----	From -----, 19--, to -----, 19--	-----
-----	From -----, 19--, to -----, 19--	-----
-----	From -----, 19--, to -----, 19--	-----
-----	From -----, 19--, to -----, 19--	-----
-----	From -----, 19--, to -----, 19--	-----
-----	From -----, 19--, to -----, 19--	-----

Operators must have the service record on the backs of their licenses properly completed and signed by the master of their ship or their employer.

[Department of Commerce. Radio service.]

INTERNATIONAL MORSE CODE AND CONVENTIONAL SIGNALS.

[To be used for all general public service radio communication. (1) A dash is equal to three dots; (2) the space between parts of the same letter is equal to one dot; (3) the space between two letters is equal to three dots; (4) the space between two words is equal to five dots.]

A . —	Period.....
B — . . .	Semicolon.....
C — . . .	Comma.....
D — . . .	Colon.....
E .	Interrogation.....
F . . . —	Exclamation point.....
G — . . .	Apostrophe.....
H . . .	Hyphen.....
I . . .	Bar indicating fraction.....
J . — — —	Parenthesis.....
K — . —	Inverted commas.....
L . — . .	Underline.....
M — . . .	Double dash.....
N — .	Distress Call.....
O — . . .	Attention call to precede every transmission.....
P — . . .	
Q — . . .	
R — . . .	
S . . .	
T —	
U . — . .	
V . . . —	
W — . —	
X — . . .	
Y — . . .	
Z — . . .	
<hr/>	
Ä (German)	General inquiry call.....
À or Á (Spanish-Scandinavian)	From (de).....
CH (German-Spanish)	Invitation to transmit (go ahead).....
É (French)	Warning—high power.....
Ñ (Spanish)	Question (please repeat after)—interrupting long messages.....
Ö (German)	Wait.....
Û (German)	Break (Bk.) (double dash).....
<hr/>	
1 . — — —	Understand.....
2 . . . — —	Error.....
3 . . . — —	Received (O. K.).....
4 . . . —	Position report (to precede all position messages).....
5	End of each message (cross).....
6 —	Transmission finished (end of work) (conclusion of correspondence).....
7 —	
8 —	
9 —	
0 —	

(The chairman submitted the following letter for the record:)

NAVY DEPARTMENT,
Washington, January 2, 1919.

MY DEAR JUDGE ALEXANDER: Referring to the recent hearings on H. R. 13159, I inclose herewith a copy of the letter from Prof. Pupin with the request that, if you have no objection, it be printed in the hearings as an appendix.

You will recall that Prof. Pupin appeared in opposition to H. R. 19350, in January, 1917, arguing that Government operation of all radio stations would retard radio development very seriously. The inclosed letter shows that, in addition to others, his ideas on the subject have changed. I consider this letter especially interesting in view of the fact that a number of opponents of the bill referred to Prof. Pupin as an authority in this particular matter, also referring to his testimony before your committee, mentioned above.

Sincerely, yours,

JOSEPHUS DANIELS.

The CHAIRMAN HOUSE COMMITTEE ON THE
MERCHANT MARINE AND FISHERIES,
House Office Building.

DECEMBER 20, 1918.

The Hon. JOSEPHUS DANIELS,
Secretary of the Navy, Washington, D. C.

DEAR SIR: I beg to submit to you the following memorandum, which embodies the substance, somewhat amplified, of our conversation of to-day:

It is the opinion of our naval authorities that the development of some of the submarine signaling and detection devices, which was inaugurated during this war under the auspices of the Navy, should be continued, and when completed the resulting new arts should remain under the control of the Navy. This opinion is shared by the scientific men, including myself, whose research work contributed to this development. This opinion is an expression of the general desire that arts which are essential to the efficiency and to the development of the Navy should be controlled by it.

A logical consequence of this desire is the belief, practically universal among our highest naval authorities, that other signaling devices, like wireless telegraphy and telephony, submarine cabling, fog signaling, etc., should also fall within the control of the United States Navy. The development of these and similar arts is a part of the development of the United States Navy and of the United States merchant marine. The scientific men of this country, and I count myself as one of them, will certainly become faithful followers of this belief provided that this control by our Navy of the above-mentioned young arts is a natural and not an artificial control. What I mean is this: A natural control is based upon results obtained by scientific research and development and not upon legislative enactments alone. The United States Navy will and can control any new art which is essential to its own development and to the development of the United States merchant marine if it is provided with adequate facilities for scientific research and development. No organization, industrial or educational, is as scientific in its structure as the United States Navy. Our modern battleships are the most concrete glorification of everything which is best in our American sciences and technical arts. It is unthinkable that such a highly scientific organization as our Navy can go on much longer without a naval laboratory for scientific and engineering research.

Research laboratories are the best investments which our great industrial organizations like the Western Electric Co., and the General Electric Co. have made during the last 20 years. The naval laboratory for scientific and engineering research, will be the most profitable investment ever made by the United States Navy. I believe that I interpret correctly the views of naval men when I say that they would heartily support this last statement of mine. It should also be observed that through its research laboratory and its scientific research men the Navy and the United States merchant marine would be brought into the closest touch with American science, which is now being organized by the National Research Council. You were kind enough, Mr. Secretary, to assure me to-day that such a laboratory was contemplated by the United States Navy, and that by next spring it would be an accomplished fact. I assume that you had in mind a research laboratory sufficiently large to take

care of the most pressing problems now before the Navy and not of all the problems that will present themselves in the course of time. Submarine signaling, wireless telegraphy, cabling, and fog signaling, offer some of the most pressing naval problems, and a naval research laboratory, capable of handling these problems, can, with sufficient and speedy push, be organized and started in motion by next spring. With such a laboratory in view, to take care of the young arts mentioned above, the opposition to Government ownership of these arts falls to the ground, granting, as I do, that a natural control by the Navy of these arts is essential to the progress of an organization. To illustrate, some two years ago I was opposed to Government ownership of the wireless stations and my opposition was based principally upon the ground that the United States Navy did not possess an organization capable of developing the wireless art and of taking care of the meritorious inventor who contributes to this art. The prospect of a naval research laboratory removes the very ground upon which my opposition rested, and, moreover, it urges me to favor what I formerly opposed. Other scientific men, with whom I have discussed this matter, have the same mental attitudes.

Yours, very respectfully,

M. I. PUPIN.

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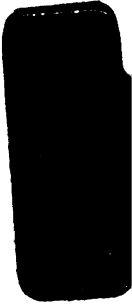
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