



# JOURNAL

DIRECTED TO BROADCAST ENGINEERS AND EXECUTIVES



Commemorating,  
and Dedicated to,  
Twenty Years of  
American-Way  
Broadcasting  
in the Public

*Interest*

*Convenience*

*Necessity*

LEFT: The modern vertical radiator at WMAQ, Chicago—a far cry from “T” and “Inverted L” antennas of 20 years ago

NOVEMBER

» »

Vol. 7, Issue 11

« «

1940

# ALL NEW YORK ACCLAIMS NEW WEA F TRANSMITTER

*NBC engineers achieve outstanding success  
increasing clarity and volume eight  
times through use of salt water path*

Friday, November 8, 1940, was a "Red Letter Day" in the annals of NBC for, sometime between dusk and dawn, the 18-year-old veteran WEA F changed its voice and came singing into Metropolitan New York more than eight times stronger and clearer than ever before. Dedicated by Niles Trammell, president of the National Broadcasting Company, in a nationwide broadcast over the Coast-to-Coast Red Network, the new WEA F transmitter, located at Port Washington, L. I., takes advantage of the salt water transmission path down Long Island Sound and carries the signal to many more millions of listeners not only in the Metropolitan area but also in Westchester, Southern Connecticut, Long Island and Northern New Jersey.

O. B. Hanson, vice-president and chief engineer, stated that the effect in Metropolitan New York and New Jersey of the station's strategic location was equivalent to raising the power of the former WEA F transmitter at Bellmore, L. I., from 50,000 watts to more than 3,000,000 watts.

Both selection of site and construction of the new transmitter, which incorporates the most modern engineering practice, were handled by Raymond F. Guy, NBC radio facilities engineer. Enumerating outstanding advantages, Guy declared they included such features as 30 decibels of negative feedback, improved and simplified circuits, low distortion and noise levels and improved frequency stability.

The signal is broadcast from twin antenna towers of the self-supporting vertical radiator type, each 320 feet high and located 475 feet and 875 feet respectively from the transmitter building. They are fed by individual coaxial transmission lines.

The new transmitter contains two stages of water-cooled tubes, first of which is grid modulated. Final amplifier tubes are each rated at 25,000 watts and cost \$3,300 per set of two. Equipment also includes seven stages of radio frequency amplification and five stages of audio frequency amplification.

The National Broadcasting Company extends a cordial invitation to visit the new WEA F transmitter at Port Washington, L. I., and see for yourself all the advantages of this most modern transmitter in the nation.

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*A Radio Corporation of America Service*

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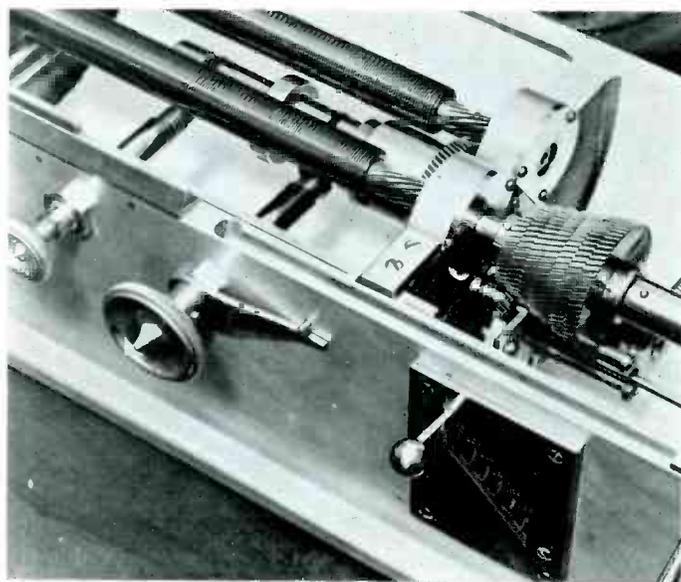
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# Televising National Political Conventions of 1940

By H. P. See

N. B. C. Television Field Supervisor

*A paper delivered before the Hollywood Fall Convention of the Society of Motion Picture Engineers, October 21-25, at the Hollywood-Roosevelt Hotel*

**T**HE National Broadcasting Company inaugurated regularly scheduled experimental Television programs in the New York City Area on April 30th, 1939, when its television Mobile Unit cameras occupied a space on the camera platforms at the Court of Peace, New York World's Fair. Thousands of persons in their homes miles away from the Fair Grounds, at Flushing, Long Island, were able to see and hear President Roosevelt dedicate the New York World's Fair of 1939. Between that date and January, 1940, these television Mobile Unit cameras were present at over ninety events of public interest transpiring within a radius of twenty-five miles of the Empire State Building, where the receiver for relay work was located. Practically every phase of sports as well as most of the major news events occurring in New York City and its suburbs has been televised during these eight months.

The program management of NBC looked forward to the coming political conventions as a source of interesting television program material. It was hoped that both major parties would choose New York City as the site of their national conventions, and thereby make available to the television audience two of the most important domestic news stories of the year. They were mindful of the fact that only sixteen years ago the then budding young radio industry had achieved great success at the Democratic convention of 1924 when the vote of the Alabama delegation of "24 votes for Underwood" had echoed for days in New York's old Madison Square Garden, and had been heard by a few thousand early radio set owners as they passed around the headphones.

The choosing of Philadelphia by the Republican National Committee early this year as the site of their convention and that of Chicago by the Democratic National Committee for theirs, made the possibility of a direct television pickup by NBC of a national political convention possible in only one case. The relay transmitters in use for field transmission could not have spanned the ninety-mile distance between Philadelphia and New York, and other relay transmitters under construction were not available. The

number of television relay transmitters required to establish a nine hundred mile circuit between Chicago and New York could not have been assembled and tested in less than two years time. A coaxial cable installed a few years ago between the Bell Laboratories Building at 32 Sixth Avenue, New York City and the Bourse Building at 4th Street, Philadelphia, was the only means of a television relay. This cable had been installed for the experimental study of multicarrier telephony. The original band pass characteristic of its associated repeaters had been established at 1,000 kilocycles. Such a frequency band is not sufficient to convey a television image of good definition. Inquiries made of the Bell System engineers revealed that they were at work on a planned extension of the band pass characteristic to 2800 kilocycles. An amplifier having such a frequency characteristic and minimum phase delay is capable of transmitting sufficient of the video frequencies comprising a 441 line television picture to result in an image of good definition.

A survey was made at Convention Hall to determine the practicability of adapting the NBC television field equipment to the use of the hall planned by the arrangements committee. Tentative permission was secured to televise the proceedings of the Convention. The engineers of the Bell System welcomed the opportunity of putting this cable to a practical test as the first cable television network link in the United States.

The first problem confronting the engineers engaged in this pioneering attempt was establishing some method of connection between the New York terminus of the cable at 32 Sixth Avenue, and the Radio City television control room, which are six miles apart; and the connection between the Bourse Building at 4th Street, Philadelphia, and the Convention Hall at 32nd Street, Philadelphia. The latter points are three and one-half miles apart. It was originally planned that the two ultra high frequency transmitters operating in conjunction with the regular video equipment used in the New York City area would be used to span these gaps. This plan was rejected in favor of an attempt to use the experience gained in experimenting with specially

selected highly equalized pairs among the regular underground telephone facilities of the Bell System. Several programs had been transmitted between Madison Square Garden and the television control room on the fifth floor of the RCA Building in New York. This distance is slightly less than two circuit miles. Through the use of the equalizers and repeaters a good degree of success had been achieved.

Two of these twisted pair circuits were set up with repeaters at one mile intervals between Convention Hall and the Bourse Building and between the Bell Laboratories Building and Radio City. The entire circuit was electrically adjusted and tested by the Bell System engineers over a period of two months. Portable television pickup equipment was shipped from Radio City to Philadelphia and used for test purposes. The first test picture was transmitted between these two eastern seaboard cities on June 14, 1940. With a cable connection established between the Convention Hall and Radio City it remained for NBC to use its limited amount of field equipment to the best advantage in covering this news event side by side with radio broadcasting and newsreel facilities.

During the preliminary surveys made at the Philadelphia Convention Hall, committee members in a sincere desire to co-ordinate facilities suggested that television cameras occupy a space on the newsreel camera platform. This suggestion was taken under advisement, but in view of the dissimilarity of equipment, adaptation, and the divergent modes of operation of the newsreel and television systems, it was decided that a special television platform should be constructed. It has often been freely stated that television is a marriage of radio broadcasting and motion pictures. While this may seem to be true in a broad sense, and in the mind of the television viewer as he watches scenes transpiring at points remote from him, the practical operating requirements at the present state of the television art, and especially in field work, are of necessity quite different from that of the newsreels. These differences were very well exemplified at the Philadelphia Convention. It is, of course, quite probable that the furtherance of the television art and improvements in pickup

tubes may change the complexion of this matter especially as regards optical systems, but the modes of operation will remain basically different.

The television camera at the present time must be located in such a manner that it achieves the greatest possible radius of action from one position. It is, for all practical purposes, tied down to one position by its cable connection to the control equipment. This is qualified to some extent when the location is in an open space and sufficient slack cable may be left to allow movement of the camera on a movable platform, or a change in its position while another camera takes over the operation. Under conditions such as existed at the Convention pickup, where the camera had to be located on a platform, little or no change in position is possible.

There are three television pickup tubes commercially available. These are the large iconoscope, the small iconoscope, and the Orthicon tubes. The large iconoscope sensitized surface is 4.81 by 3.62 inches, the small iconoscope 3 by 2.75 inches, and the Orthicon 2.33 by 1.74 inches. All three tubes are in use in NBC television field equipment. A large iconoscope camera and an Orthicon cam-

era are used with the Telemobile Unit, while two small iconoscope type cameras are used with the transportable equipment.

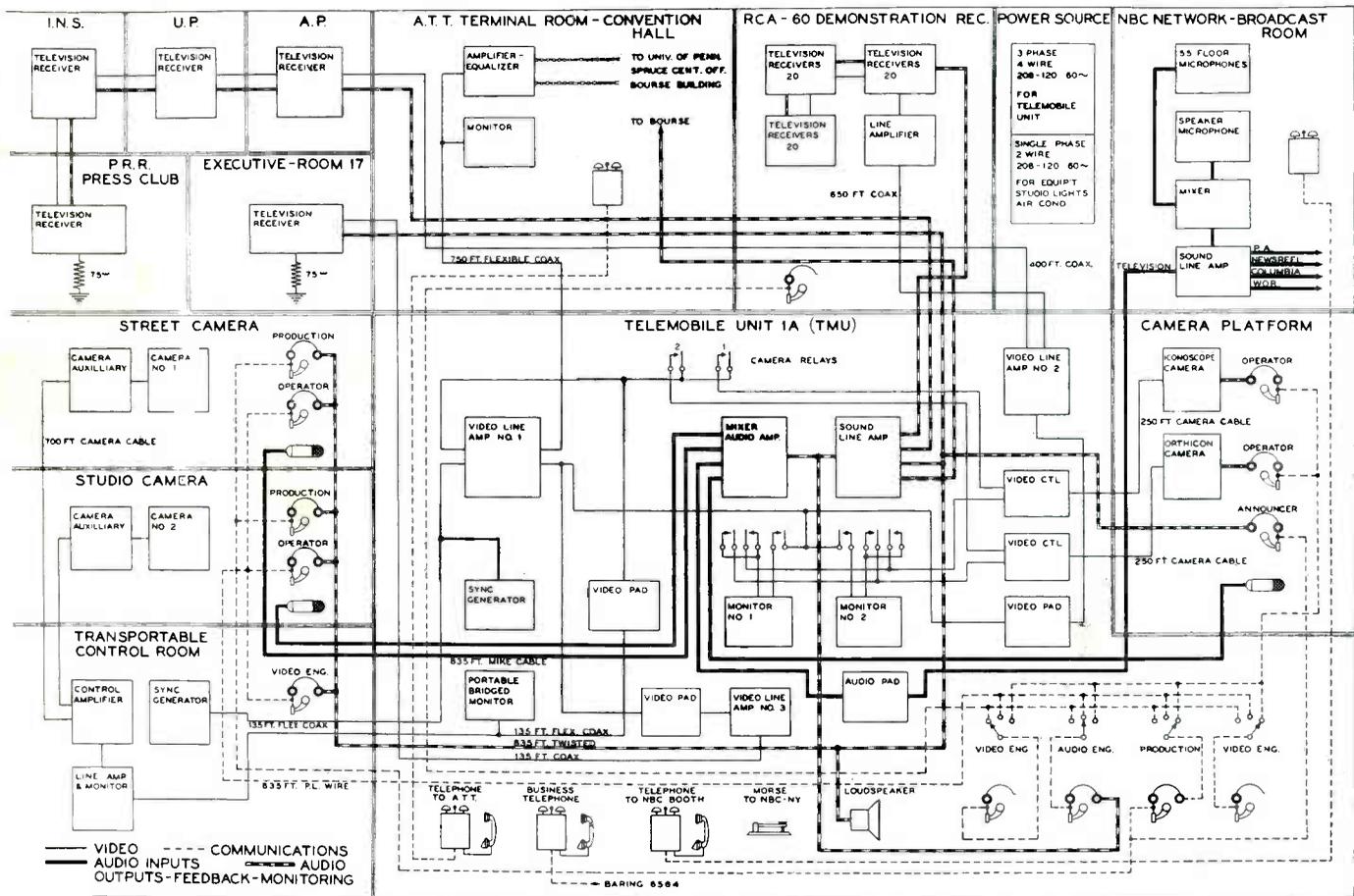
While the operating sensitivity of a pickup tube may be affected by a number of factors and a direct quantitative comparison of tubes is difficult to determine, it has been found that the Orthicon tube is more sensitive in practical operation than either of the other two types. This is particularly evident when the overall brightness of the scene is low. The characteristics of this tube are explained in the October 1939 issue of the RCA Review and in the July 1939 issue of Electronics.

In consideration of the fact that operation at Convention Hall was to take place under artificial illumination, the Orthicon represented the only tube usable under these conditions by which close-up pictures from a distance could be obtained with commercially available optical systems.

From the dimensions previously given, it is seen that the sensitized surface of an Orthicon tube is much greater than that of the 35mm film. In order to obtain an image size proportionate to the area, a television camera equipped with

an Orthicon tube must use a lens which has 2.7 times the focal length of that in use in a newsreel camera when the two cameras are located at the same distance from the subject matter. If the lens speed is to be retained under these conditions, the lens diameter is also increased by a factor of 2.7. In most lenses suitable for our purposes, these considerations involve lens diameters of magnitudes which are not commercially available and whose prohibitive cost for special construction render them economically unfeasible. Lenses may be constructed in certain large diameter ranges without correction for chromatic aberration. The use of such a lens would of course leave much to be desired. If the lens diameter is not increased, a loss factor of 7.29 in mosaic illumination will result when the focal length is increased by a factor of 2.7. It is therefore evident that a television camera using the smallest mosaic area now available should seek a location closer to the subject matter than is necessary for a newsreel camera.

At the present time, a camera capable of housing the Orthicon tube, magnetic focussing coil and deflection coil, video and deflection amplifiers, is twenty-eight inches long. When this camera is located



at a distance of from fifty to sixty feet from a speakers' rostrum, a twenty inch focal length lens is the minimum that may be used in order to achieve a semi close-up view of the average man. The addition of this lens to the camera results in a unit which is four feet long. It is inconceivable that such a unit could be crowded together with five newsreel cameras on an average size camera platform and still not be impeded or interfere with the other cameras when panned in an arc of sixty degrees.

Film editing is done in a matter of hours after the scene recorded has passed into oblivion and become history. By accepted methods, scenes may be taken in any sequence, sound added, and the final result shows the highlights of an event in a few short moments. It is therefore possible to show many varied scenes and yet not have used more than one or possibly two cameras.

Television editing is a matter of instantaneous decision and is achieved by electrically switching to another camera system, which may be focussed on the previously shown scene but using either a wider or narrower lens system. It may also be a camera located at some distance away from the first one used. Television operation is a continuous proposition and therefore more facilities must be available to maintain varied coverage of a particular event. Mistakes in the motion picture industry are found on the cutting room floor while mistakes in television operation are seen in the living room.

In order to have covered the Convention in a manner comparable to the combined facilities of the radio broadcasting and newsreel companies, we would have found it necessary to place a minimum of six cameras at the Convention Hall and two or three more at the various headquarters of political groups in the city.

The Convention was the first indoor event wherein news reel and television cameras were to be focussed on the same action over a period of hours and days and yet maintain diametrically opposed visual coverage from one minute to the next. Lighting at this Convention, therefore, had to be considered from the television standpoint as well as that of the newsreels.

As distinguished from newsreel operation, television operation is a continuous performance and thus the lighting for television must be continuously maintained. It is possible for newsreel cameramen to make the best use of their flexibility in editing and film the keynote address or at least the highlights of this speech on the day before the opening of the Con-

vention. This arrangement is made with the keynoter. The cameras are set up on the floor below the speakers' rostrum. When the keynote speech is actually given, during the Convention, the newsreels may have the light units in the hall spread upon the seated delegates, and make "shots" of the audience reaction to the keynote address. This is the first glimpse that television has had of the keynote speech, and the speaker must be adequately illuminated for the television cameras. In like manner, during nominating and seconding speeches, the newsreels may, if they desire, take only excerpts of even the most important speeches. Armed with advance script, they may take only those portions in which they are interested. These are the highlights. For such operation, it is not necessary that continuous high level lighting be maintained. For television purposes, a threshold of illumination must be maintained on the speakers' rostrum at all times.

Sufficient lighting for television was maintained at Philadelphia by increasing the specifications for fixed lighting used in the same hall in 1936. Ten 5kw solar spot lights were suspended from the ceiling and two similar 5kw units were located on each balcony. The overhead lamps were mounted on a frame above and in front of the speaker. This source of light provided an illumination of 800 foot candles incident at the speakers' platform.

Eight 150 ampere DC arc lamps were installed at points on the balcony so that they could be directed to any spot on the floor for both newsreel and television purposes. These lamps were used to illuminate an area either side and in back of the speakers' rostrum when the newsreels wished extra illumination in that vicinity. When the center of interest was transferred from the speaker to the state delegations, such as during balloting for candidates, the television cameras followed the beam of the arc lamps. If the program director desired that the cameras should be focussed on the speakers' rostrum while the newsreels were still shooting scenes of the floor, the threshold of illumination provided by the fixed lights focussed on the speakers' rostrum was still maintained for television operation.

The television field equipment available for use at the Philadelphia Convention consisted of Telemobile Units 1A and 1B and the transportable, or suitcase type of equipment. Telemobile Unit 1A and 1B are each ten ton motor vehicles and are twenty-six feet long. Telemobile Unit 1A contains the video and

audio equipment which operates in conjunction with one television camera employing a standard Iconoscope pickup tube and one camera using an Orthicon tube. The equipment, which consists of a synchronizing generator, deflection amplifiers, control amplifiers, line amplifiers and monitors, and audio system, is mounted on nine racks situated on the center line of the vehicle in the long dimension. All cables and accessories necessary for the operation of this Unit are carried within the body. Telemobile Unit 1B contains a 400 watt ultra high frequency relay transmitter licensed to operate within the channel 162-168 mc, monitoring equipment and cable accessories.

The transportable, or suitcase type of equipment, consists of eleven boxes of an average weight of fifty pounds each. When interconnected, this equipment provides two television cameras employing the small type Iconoscope, a synchronizing generator, amplifiers, monitors and a low powered ultra high frequency television relay transmitter licensed to transmit in the channels 282-288mc and 288-294mc.

The Telemobile Units were constructed in 1937 and placed in operation in 1938. The transportable equipment was placed in operation in the fall of 1939. Several distinctive features which are the result of improved design at present prevent the cameras of one set of equipment from being directly connected to the video and control apparatus of the other.

The provision of an all cable circuit between the pickup point and Radio City, as previously outlined, obviated the necessity for considering the radio frequency transmitters as part of the equipment necessary for transmission from Convention Hall. The low power transmitter was held in reserve together with its associated receiver, to provide for any contingency, such as the possibility of an acceptance speech being delivered by the party's candidate at a large outdoor stadium nearby. In that event, this transmitter would have provided the link to the cable termination at Convention Hall.

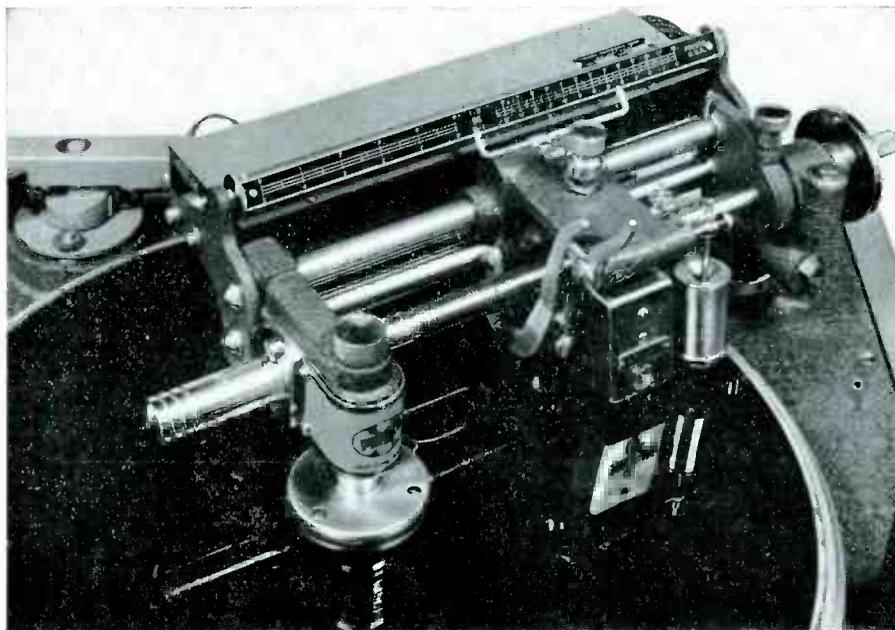
The purpose of televising the proceedings of the Convention was to bring to the television audience the greatest possible amount of program material on as wide a scope as was consistent with equipment and personnel limitations. The Main Hall, in which the 1000 or more delegates and their alternates were seated under their identifying state banners, was the focal point of interest as speaker after speaker mounted the rostrum to address the assembly. The Main Entrance to the Hall was another point of inter-

est as the crowds gathered to watch nationally known figures disembark from taxis and enter the auditorium for each of the many sessions occurring during the five day convention. The possibilities of providing a space where news commentators, political figures, and others might be interviewed before the television camera was considered as an important addition to the existing program sources.

A television camera platform was constructed on the south balcony of the main arena at a distance of sixty feet from the speakers' rostrum. The platform was 8 by 5 feet and was designed to accommodate two cameras, two camera operators, and an announcer. The cameras faced the speakers' rostrum at an angle of approximately forty-five degrees and looked down at it from an angle of approximately ten degrees. The position of the platform was predicated upon the already chosen location of the newsreel camera platform and a compromise between our distance from the speaker and the angle at which the camera faced him. The newsreel platform was placed at the same proportionate position that it had occupied during the Democratic Convention held at the same hall four years ago. The television platform was fifteen feet forward from the newsreel platform. With both of these platforms built out from the balcony on the speaker's left, the fifteen foot dimension allowed sufficient spacing to prevent the television camera platform and equipment from obstructing the view of the newsreel camera man located nearest the balcony when he was using a thirty degree angle lens with his equipment.

The two cameras associated with the Telemobile Unit were mounted side by side on this platform. A  $19\frac{3}{4}$  inch focal length f. 4.5 magnesium fluoride treated lens was used on the Orthicon camera. The angle of view included a space approximately three feet either side of the speaker. When viewed on a twelve inch kinescope, a bust view of the speaker occupied five inches vertically. The Orthicon was also used to pick up floor scenes during the balloting and demonstration parades which followed the placing of a candidate in nomination. The Iconoscope camera was equipped with an eight inch focal length f.2. treated lens. The wide angle of this lens included almost the entire width of the stage when focussed on the speakers' stand. When focussed on the floor, this lens showed more than half of the state delegations. The sensitivity of the Orthicon enabled it to be used satisfactorily on scenes having a lower light level than that used on the speakers' stand.

The large Mobile Unit containing the



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video equipment necessary for the operation of the Main Hall Iconoscope and Orthicon cameras was parked on a freight loading ramp one floor below the Main Arena and inside the Hall proper. Circuit constants of the equipment and other factors limit the distance possible between the cameras and the Mobile Unit to a length of camera cable which may not exceed two hundred and fifty feet. Special holes were cut in the concrete floor in order to provide a path for the camera cable which would not exceed that limitation.

A television studio was constructed on the second floor of Convention Hall. An unused dressing room was converted into a studio for interview purposes and a control room adjoining it. The transportable equipment was located in this control room. One of the small type Iconoscope cameras was used in the studio. The studio was located so as to be readily accessible to staircases, elevators, the speakers' platform, and the state delegations. Three 5 kw portable lighting units were used to provide illumination in the studio. Air-conditioning apparatus was installed to overcome the heat generated by these lights and the warm June weather outside. The control room was left windowless in order to provide an ideal condition for viewing pictures on the kinescope monitor. The other small camera was set up at the Main Entrance to Convention Hall which is seven hundred and fifty feet away from the studio and its control room. This position was used during the daylight hours to show activities occurring there when there was little or no business being transacted in the Convention Hall. It was always used at the opening of each program.

In addition to televising the Convention and transmitting it to the television audience in New York State and surrounding areas of New Jersey, Connecticut and Pennsylvania, provisions were made to satisfy the overflow of the general public which could not gain admittance to the Main Hall. The RCA Victor Company installed sixty television receivers in a large room set aside for public viewing. Receivers were also installed at the temporary Convention Hall offices of the three leading national press associations and a Press Club Room. The picture signal and sound to these receivers were transmitted by means of cable.

Over two miles of wire were installed in Convention Hall by NBC to supply power necessary for operating the television Mobile Units, power for lighting, air conditioning, and teletypewriters in the studio and office, video circuits, audio circuits, sound monitoring, and communi-

cation circuits. This wiring was exclusive of those facilities which were installed by the Telephone Company within the building for our purposes. Such circuits included the audio connections between the Mobile Unit and the Main Frame, Morse circuit, private line connection from the Mobile Unit to the Telephone Company's video control equipment in another part of the building and an ordinary business 'phone circuit. A breakdown of our temporary wiring installation shows that two thousand one hundred and fifty-five feet of coaxial cable and one thousand two hundred and fifty feet of camera cable were used. The remainder is divided between communication, audio and power wiring facilities. These figures are referred to in order to acquaint you with the magnitude of a temporary television pickup at an event of this character. Many of our regular routine pickups in New York City at which permanent wiring facilities do not exist, necessitate the temporary installation of close to one mile of wiring for a one hour program.

It has been previously mentioned that differences in the equipment do not permit the ready interconnection of either pair of cameras with the corresponding control equipment of the other. In order to co-ordinate these cameras and provide smooth continuity of the program as the points of interest changed from the program standpoint, it was necessary that a rapid switching system be devised whereby the video signals from the transportable and Mobile Unit equipment could be transmitted to the NBC control room in New York City via the coaxial cable as well as to the special receiver monitor positions in other parts of the building.

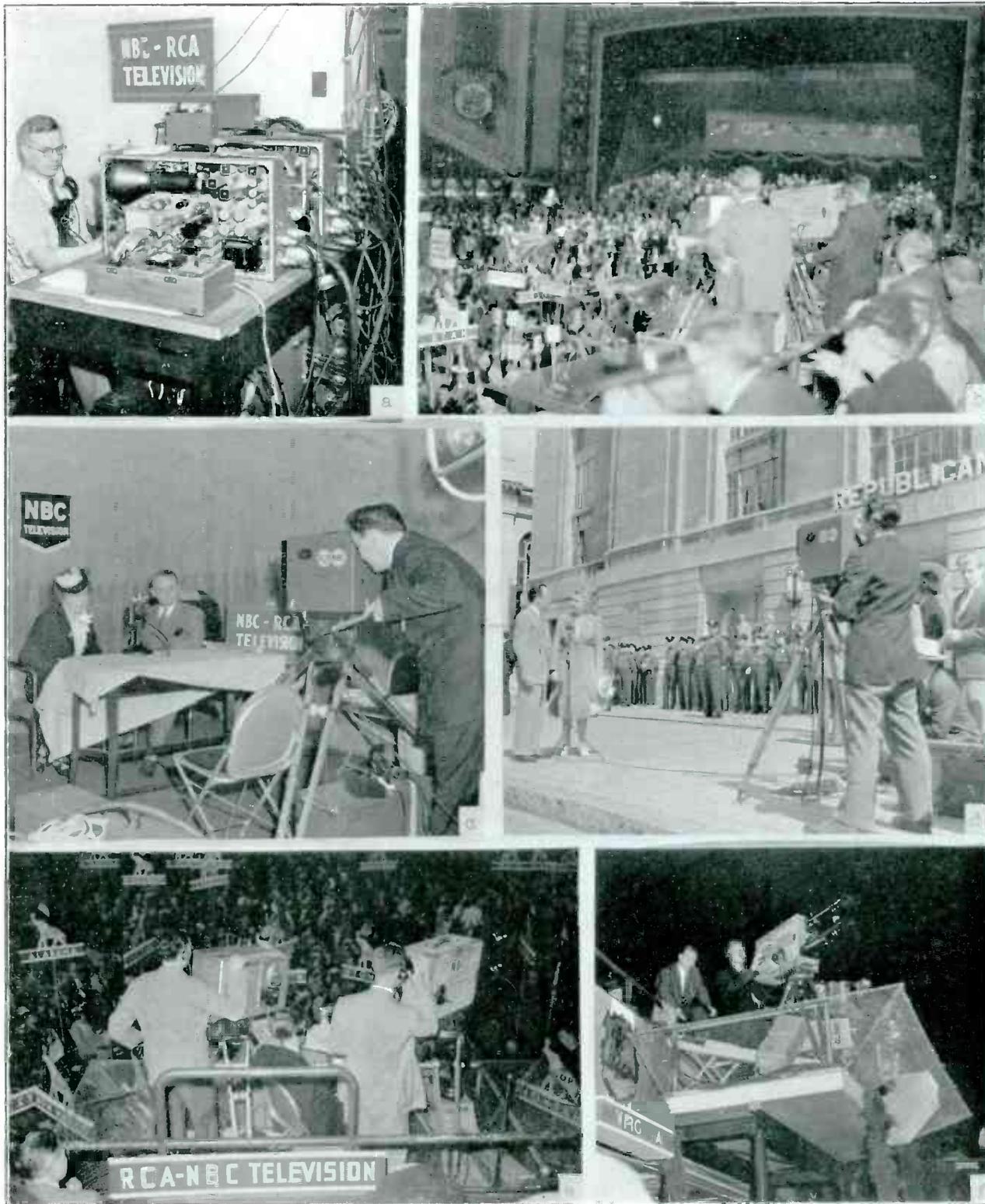
The complete video signal contains picture signals, blanking pulses, and synchronizing pulses. Both the transportable and Mobile Unit equipment are complete units, and their outputs contain the signals referred to. In addition, it must be borne in mind that each set of equipment had its own synchronizing generator. These two systems were of course not identically synchronous with each other. Had it not been for program commitments in New York which kept the Mobile Units busy up until a short time previous to the Convention, there would have been nothing to prevent a system being devised whereby the basic pulses from one generator could be used to control the other. In standard RCA television equipment, of which the Telemobile Units and the transportable equipment are an example, the video signal and blanking pulse are fed to an input tube

in the line amplifier. The synchronizing signal is fed into its own input tube in this amplifier. The resultant complete signal is the television signal which is transmitted. In the case of this installation the main feed to the Telephone Company was transmitted from the line amplifier in Mobile Unit 1A. The monitors in the Telemobile Unit received their signal from a separate output tube in the line amplifier. This signal was also transmitted to another line amplifier which in turn fed two circuits. One circuit went to the sixty receivers in the public viewing room, and the other to the three receivers in the Press Offices and the single receiver in the Press Club Room. A satisfactory switching system was devised so that the total output of the transportable equipment located on the second floor of Convention Hall was available at the input of the main line amplifier at the Mobile Unit so that this amplifier could receive either the outputs of the Mobile Unit cameras or the outputs of the transportable equipment cameras as represented by the combined transportable equipment signal. In this manner a four camera pickup was obtained. The ratios of synchronizing signals and blanking pulses in the Mobile Unit and in the transportable equipment control room were established by engineers in communication with each other by private line, so that the overall ratios transmitted to the Bell System, the local monitors, and the special monitoring positions were identical.

The audio system for television at this Convention presented little or no problem. The three major networks had combined their resources to obtain pickups from the fifty-three floor positions available for each of the state delegations. Each network provided its own pickup at the speakers' rostrum. The network feed from all these points was suitably attenuated and transmitted to one mixer position on the audio panel in Telemobile Unit 1A. Microphones were placed on the camera platform in the Main Hall, in the Television Studio, and at the street position.

Telemobile Unit 1A was designated as the Master Control point for the entire system. Three television engineers and a program director constituted the personnel at this point. One engineer was located in the control room associated with the studio. Engineers were at each camera position. The private line communication facilities necessary to interconnect all these points, plus providing communication between the Bell System Control Room, the NBC network control

(Continued on Page Eighteen)



## RCA-NBC Television in Action

- (a) Transportable control room, and all control equipment, being operated by Engineer R. W. Clark.
- (b) and (e) View of cameras at Convention Hall. The Iconoscope camera is at the left.
- (c) Transportable type camera used in specially constructed studio. View shows Mrs. Wendell Willkie being interviewed by Mr. A. H. Morton, NBC Vice-President in charge of television.
- (d) Scene showing transportable type camera in use at Main Entrance to Convention Hall.
- (f) Orthicon camera on camera platform of Convention Hall.

# Early American Broadcasting

By Tom Gootee

**T**HE History of WMAQ—Chicago's oldest radio station—so closely parallels the History of Radio Broadcasting that it reads like a chronicle of the many trials, tribulations, failures and successes that beset the first broadcasters, who were unknowingly laying the foundation for a great new industry: Radio.

It is a far cry from the Early Twenties to Present Day Broadcasting. No industry has ever moved so quickly, so efficiently to the high state of perfection that Broadcasting enjoys today. It is difficult for most of us—who have lived and worked through this Change—to fully comprehend the historical and sociological significance of our progress. Yet all this happened within a span of less than twenty years—two amazing decades.

It is hard to say exactly when broadcasting first began. Before the First World War there were a few thousand radio amateurs—most of them boys and young men—who tinkered occasionally with "spark" sets and established crude forms of purely local telegraphic communication.

During the War, however, the radio art underwent the first of its many radical changes. The army became interested in radio as a means of field communication, and experimentation began on a more important scale. The vacuum tube was developed and used with some fair success, and this opened the path for many new circuits never possible before. Many of the radio amateurs received further training from the Government, and, in addition to serving their country both here and abroad, they gained a great deal of practical experience in radio communication.

After the War was over there were well over twenty thousand men in this country with a technical working knowledge of radio. Some of these found immediate employment as ship or land commercial operators. But a much greater number returned to their former employment, and looked upon radio—specifically amateur radio—as just an interesting hobby. The ban on amateur activity was lifted in the summer of 1919, and new "ham" stations using new equipment began to appear—variously scattered from 50 to 250 meters. They were still primarily interested in radio telegraphy, because telephony was too new and much too expensive for experimentation. Vacuum tubes could neither be bought nor

manufactured—except by the Government—due to frozen patent rights, held by competing companies.

But in spite of these adverse conditions, many amateurs went ahead with radiotelephonic experimentation. The priceless "E" tubes, "CG" tubes, and others were occasionally obtained by some amateurs—usually "from a friend in the Coast Guard," or other slightly illegal sources. The many difficulties blocking the paths of the early radio amateurs in their experimentations did little to shake their enthusiasm.

By the time winter had arrived, in 1919, there were many amateurs on the air "actually talking." And from that time Morse code was destined to take a back seat in radio, to be used principally for communication.

Not satisfied with merely talking to other local amateurs—and, incidentally, not being "tied down" by any federal regulations—the "hams" soon conceived the idea of broadcasting entertainment. And so, using their home-made "rigs" and makeshift equipment, they began transmitting programs to their friends—and to the public.

This condition was particularly so in the Chicago area, where a great many amateurs resided within a comparatively small radius. One of the largest of these stations was owned and operated by Austin A. Howard, an influential "ham," who not only had the best equipment available but also constructed a small studio in his home. Other well-known stations in this same vicinity were operated by Thorne Donnelly, Arthur Leonard, Jr., and even our own Larry Dutton (NBC, Chicago).

All through the spring of 1920 interest in amateur radio broadcasting continued on the gradual increase. "Hams" gladly built and sold small crystal receiving sets for their neighbors and friends, but there were relatively few people who knew—or even cared—about the possibilities of radio.

Then a remarkable thing happened. And radio underwent another radical change.

A Pittsburgh engineer, Frank Conrad, had spent most of the spring developing and perfecting a radio-telephone transmitter in the Westinghouse Laboratories at East Pittsburgh, Pennsylvania. He was assigned an experimental call by the Government, and began transmitting speech and test programs late in the spring. Only

a few amateurs with receiving sets heard his programs, then others began to listen. Soon Dr. Conrad had an enthusiastic following of listeners, and he began a more-or-less regular experimental schedule.

Late in the spring of 1920 Pittsburgh department stores advertised and quickly sold "receiving apparatus for listening to Dr. Conrad's radio programs." The general public was finally becoming conscious of radio broadcasting. Every program, no matter how irregular, was assured of a large audience—and the Westinghouse Electric Company began to take an interest in the possibilities of broadcasting.

With the 1920 fall election approaching, the Westinghouse Company conceived the idea of broadcasting the election returns. Accordingly, a large studio was built and equipped with the latest carbon microphones, and the original transmitter was overhauled, further adjusted and relocated nearer the studio. A new call was assigned to the station: KDKA—indicating that the transmitter was no longer considered as experimental equipment. There was a line installed between the new studio and the editorial offices of the Pittsburgh Post, and the election results were broadcast throughout the evening. The broadcasting idea was an instant success, and drew national attention to KDKA. A new industry was rapidly in the making.

KDKA continued to operate on regular schedules of a few hours a day, and almost immediately the way was cleared for other radio stations—in other localities—to erect and operate broadcasting equipment. Radio patents held by the General Electric Company, the Western Electric Company, the American Telephone and Telegraph Company, and the newly formed Radio Corporation of America were pooled together—and arrangements were completed for the construction of radio tubes, radio equipment, and complete broadcast transmitters for sale to private individuals, as well as to the Government.

The Westinghouse Company, itself, was not slow to realize the immense possibilities of broadcasting, and set to work developing and constructing transmission equipment. In September, 1921, there was a grand total of four stations in the United States, and a fifth was put on the air in October. But it was not until November of that year that Chicago welcomed its first radio station.

The City of Chicago presented an ideal servicing area for broadcasting, due to the compact downtown business section—as opposed to New York and other cities. Consequently, the Westinghouse Company sent their engineers to the Windy City in the fall of 1921, and a site for the proposed station in the Commonwealth Edison Building was agreed upon. Much of the equipment was shipped from Pittsburgh, and the Department of Commerce issued a license for operation of the new station—using the call: KYW on the 360 meter wavelength. That wavelength, incidentally, was common to all broadcasting stations in the United States at that time, and radio communication was under the Federal jurisdiction of the Department of Commerce, Bureau of Navigation. It was not until almost a year later that a second wavelength—420 meters—was allotted to radio broadcasting by the Department of Commerce.

KYW continued to operate through the Christmas season and well into the year 1922 before other parties became interested in the possibilities of also constructing and operating radio stations in the Chicago area. Throughout the winter there had been some agitation around the City Hall and Federal Building for a

city-owned radio station, and in February a “large” 100 watt ship transmitter was purchased by the City of Chicago. The equipment was overhauled and rebuilt, and put on the air with the call: WBU. This station shared time with KWY, but the combined daily time of both stations seldom exceeded two hours. WBU continued to operate for several years, but was finally abandoned as an expensive luxury of the City Government.

Early in the spring of 1922 the Chicago Daily News decided to investigate the possibilities of radio broadcasting—mainly as a means of news dissemination. At about the same time the Fair Department Store, in downtown Chicago, also became interested in broadcasting—as a means of advertising their various wares. Late in March the Fair Store and the Chicago Daily News reached an agreement whereby the Fair Store would construct a transmitter, and the completed station would be owned jointly by the two parties.

Accordingly, early in April the Fair Store and the Daily News drew up plans, applied for a Federal radio license and proceeded to buy and install the necessary equipment. Donald A. Weller was hired as the new station’s first—and only—engineer.

A De Forest marine transmitter—of questionable age—was acquired and adapted for voice transmission. As a functioning piece of communication equipment it left much to be desired—but it was the only kind of radio equipment available, and as such it served its purpose. One tube—type unknown, but of De Forest make—comprised the entire tube complement. It was rated for 250 watts input, which probably accounts for the optimistic rating of 250 watts for the entire transmitter. Actually only about 100 watts was fed to the antenna, a quantity which could only be estimated. The single tube was modulated by means of a transformer inserted in the grid circuit; the primary being coupled to a small telephone transmitter mounted on the end of an insulated handle. The insulation was necessary because part of the transmitter was “hot” with radio frequency energy, which fed back from the grid circuit.

The antenna was a typical ship installation, mounted on the roof of the Fair Building. It was a four-wire flat top suspended between the top of the water-tank at the east end of the building and a brick chimney at the west end of the building.

(Continued on Page Twelve)

## Recording Engineers!

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R. W. Clark was born in Salinas, California. Being a native son, he can say what he likes about the climate, and he does! He graduated from Stanford University in 1927, and obtained a degree in 1928. This was followed by two years of employment at the Bolinas, California, transmitting station of RCA Communications, and in 1931 he joined the NBC Engineering Staff in San Francisco. After a year a

studio engineer, he was transferred to the KPO transmitter where he remained as transmitter engineer until he was transferred to New York in 1937 as television engineer, where he has become recognized as one of the "Key Men" in the new industry.

Russell C. Thompson has been interested in amateur radio since 1912, and has been continuously identified with broadcasting since 1921, culminating in his association with NBC in 1934 in the capacity of transmitter engineer at KOA, Denver. He has also been active in A.T.E., and was elected Secretary-Treasurer of the Denver Chapter, 1934 - 1935; National Secretary-Treasurer for 1936; Chairman of the Denver Chapter from 1938 to date. His hobbies include amateur radio and stamp collecting. In the field of sports, his preference runs to bowling and golf.



E. C. Horstman, National President of A.T.E., has literally "grown up" with the N.B.C., the A.T.E. and the radio broadcasting industry. Completing thirteen years of consecutive service in the Chicago office of the N.B.C., he has seen the radio broadcasting art develop from its early experimental days to the present-day efficient industry. Ed, a native of Grand Island,

Nebraska, spent over a half a decade as land-line operator

# NBC Pers

before he came to N.B.C., and has wide experience in the communication field. He was elected President of the A.T.E. in 1938 and is the first president to serve two consecutive terms. For the past three years he has been Chapter Chairman of the Chicago Chapter of the A.T.E., and as such has guided the destinies of the organization.

C. F. Rothery was born in Washington, D. C., and attended graded and high schools in that city and Florida. He tried several jobs including auto sales, newspaper reporting, and grocery store managing before deciding that radio was the coming thing. He then attended radio school in Washington, D. C., and graduated into the U. S. Navy, and after four years, entered the employment of



NBC in 1928. He was elected Secretary-Treasurer of the Washington A.T.E. Chapter from 1935 to 1937. He was transferred to NBC's San Francisco office in 1937, and was elected Chairman of the San Francisco A.T.E. Chapter in 1940. His interests, other than radio and A.T.E., are his family and horticulture.



Sidney N. Strotz, former manager of the Central Division of the National Broadcasting Company, is now vice-president in charge of the program department in New York following an appointment announced by Niles Trammell early in October. Mr. Strotz, who has been vice-president in charge of the Central Division at Chicago, succeeds John F. Royal, recently promoted to vice-president in

charge of new activities and developments in broadcasting. A native of Chicago, Mr. Strotz was formerly vice-president of the Automobile Supply Company, and later the Wrap-Rite Corporation. In 1928 he organized the Chicago Stadium Corporation, which built and operated the largest indoor sports

# Personalities...

arena in the country. During Mr. Strotz's association with NBC, the Central Division has become one of the most important network program origination points in the United States, and in many fields, such as that of daytime dramatic serials, the NBC Chicago studios originate more programs than any other broadcasting studio in the country.



At the time of Mr. Strotz's appointment, it was also announced that **Harry C. Kopf**, Red Network sales manager in Chicago, had been promoted to the position of manager of the Central Division. Mr. Kopf, a native of Shawneetown, Illinois, was graduated from the University of Illinois in 1925, and until 1927 was in the advertising sales department of the Hearst organization in Chicago. In 1927 he

joined the A. W. Shaw Publishing Company as a representative of "System" Magazine. In 1929 he joined the staff of the "Literary Digest" and in 1931 became a salesman for NBC in Chicago. He was appointed sales manager of the Central Division on January 1, 1939, and on the following July 1 he became sales manager of the Central Division for the Red Network.

**Ralph G. Denechaud** (Christened Raphael, but what kid can pretend to be tough with a name like that?) Born April 18, 1897, at Mission, British Columbia, and attended public schools in British Columbia, French boarding school in Quebec, winding up at Columbian Methodist College at New Westminster, B. C., carefully avoiding graduation. He was taught telegraphy at age of five by his father, an agent for the Canadian Pacific Railway. At conclusion of schooling, he worked as telegrapher, in turn, for the C. P. Railway, Western Union, U. S. Army (World War I), International News Service, and Associated Press, followed by



several years with Logan & Bryan and E. F. Hutton & Co., stock exchange houses. He became interested in radio as a hobby and study in 1919, shortly after discharge from the army, and joined the engineering staff of KFI, Los Angeles, in 1929, going to N.B.C., Hollywood, in 1936. "Denny" says he is very happy with wife first class, kid, cat and Contax. He is now serving his third consecutive term as Chairman of the Hollywood ATE Chapter.

**Gerald M. Sellar** tells his own story, as follows: —

Someone has said that a mountain labored and brought forth a mouse. In this case the earth labored and brought forth the San Francisco earthquake, — and a mouse — Sellar, some 900 miles away in Tacoma, Washington. Thus the eventful year 1906. Followed the customary period of trying contact between parents and child. Finally, feeling he had gained the upper hand through education, not to mention periods in steel rolling mills and other lusty pursuits, the youth fared forth to make the first million. Equipped with a license, several years were spent on most of the trade routes of the world. After closing up old WSA-WSH at Easthampton, L. I., came the day when NBC said yes in May, 1928. Came another day when the lady said yes and time marched on. With it marched an increasing number of feet till today even the draft board would hesitate to disrupt our well ordered existence. The ATE Constitution provides for the office of Councilman, Secretary-Treasurer, both local and national; Chairman and President. Each has been held.



**Allan T. Powley** is age 37.

He was graduated from Kingston High School, N. Y., in 1922, and attended the East Side Radio School, New York City, in 1923, and was graduated in 1924. Volumes could be written about his professional career, but the high spots include a year with Federal Tel & Tel at San Francisco, a year with I. W. T. in New York; after a month with WGBS, he left to join WOR in October, 1926, which he in turn left in July, 1928, to join NBC New York. Then came the call (Continued on Page Nineteen)



## Early Broadcasting

(Continued from Page Nine)

The transmitter was installed on the fourth floor of the Fair Building, and the studio was located directly under it, on the floor below. The station was assigned the call: WGU, and licensed to operate on the common wavelength of 360 meters (833 kilocycles). This measurement could only be approximated, as the only frequency meters that were then available consisted of a coil of wire, a condenser, and a thermo-milliammeter calibrated against the Federal Radio Inspector's wave-meter.

A trial program—actually the first broadcast—was put on the air the afternoon of April 12th, from 4:30 to 5:45 p.m., and all the equipment was checked and tested for the Grand Opening of WGU the following evening.

The First Formal Broadcast was put on the air the night of April 13th, 1922. It consisted of a musical program lasting about thirty minutes, from 7:00 to 7:30 p.m., and featured Sophie Braslau, Leon Sametini and a few other Chicago artists and musicians. The program was directed, produced and announced by Miss Judith Waller—a name destined to be synonymous with the Daily News station for many years to come.

There has always been a question as to whether anyone ever actually heard that initial program from WGU. With the large building surrounding the decidedly inefficient transmitter and antenna, it was a miracle if the 360 meter signal ever crossed State Street. In fact, the program was not only the First Broadcast, but also the Last Broadcast—using the venerable De Forest transmitter. WGU was closed down the next day, and negotiations were soon begun to acquire newer and finer equipment, built especially for radio broadcasting. In spite of difficulties, there were a few optimistic persons at the new station who firmly believed in the possibilities of radio. Particularly, they were Miss Judith Waller and the Radio Editor of the Daily News: William Hedges. And with their help, the idea of continuing the station did not die down with the closing of WGU. The Daily News made arrangements to broadcast news bulletins and feature programs over the more successful KYW station, and an order was immediately placed with the Western Electric Company for new equipment.

But manufacturing processes were slow in 1922—due mainly to the increased demand for radio equipment—and it was several months until a new 500 watt transmitter was delivered to the station atop the Fair Building.

In the meantime, other new stations came to Chicago. In May, 1922, a station was opened in the Palmer House using the call: WAAF. Early in June, WDAP began operation in the Wrigley Building, and later in the same month Walter A. Kuehl's station WQX went on the air. Other stations had applied for licenses to go on the air that fall, and the problem of allocating so many stations on two single wavelengths became an impossible feat. Finally, the Department of Commerce, under Secretary Herbert Hoover, reorganized the entire broadcast band. New and separate channels were set aside for different classes of stations, according to operating power, and according to geographical location. The old 360 meter channel had at last ceased to exist as a catch-as-catch-can boiling pot for all stations—and this meant that a new frequency would have to be assigned to the Fair-News station when it again went on the air.

Early in September the new Western Electric transmitter was shipped to Chicago, and installed in the control room above the third floor studios of the station. It was a Type 1A 500 watt broadcast type transmitter, the first of its kind to be built by Western Electric. The speech input equipment consisted of a single Western Electric type 8-A amplifier, operated entirely from batteries. Inasmuch as no high voltage battery supply in compact form was available, it was necessary to use 350 volts of No. 6 dry cells—which made quite an impressive array of batteries. The actual studio equipment consisted of one Western Electric double-button carbon microphone—and the studio itself was a room about 25 feet square and 14 feet in height. The floor of the studio was carpeted and the walls were covered with a treatment of light scrim; the ceiling was covered with ozite, held in place by wooden strips. Operator Weller continued as the only operator, engineer, technician and general maintenance man.

There had always been some confusion between the two similar Chicago calls: WGU and the city-owned WBU. So at the time a new station license was applied for a change of call letters was also requested. The result was a new Chicago call: WMAQ. The 500 watt transmitter was assigned to operate with a frequency of 750 kilocycles on a clear channel, replacing their old allocation. After a thorough testing—which included "listening tests"—the new station was at last ready to return to the air.

With a great flourish of publicity WMAQ went on the air again with two special dedicatory broadcasts, the eve-

ning of October 2nd, 1922. Two elaborate programs were directed by Miss Waller, and the new transmitter operated to perfection under the guidance of Engineer Weller. The first broadcast was from 7:00 to 7:30 p.m., and featured the comedian Ed Wynn. The second period was from 9:30 to 10:00 p.m., and presented various local opera stars and musicians. Fully publicized by the Daily News, the program had a large listening audience—and the new station WMAQ was a complete success.

All during the following months WMAQ maintained a regular daily schedule—except Sundays—of two broadcast periods: 7:00 to 7:30 p.m. and 9:30 to 10:00 p.m. On December 6th a third period was inaugurated in the afternoon from 4:30 to 5:00 p.m.

During the late days of 1922 there were many and various artists and entertainers heard over WMAQ, and the celebrity list was about as interesting as could be imagined. A great many stage stars, musicians and entertainers graciously consented to come up to the top of the Fair Building and talk or sing into the "little tin can." It is possible that much of the co-operative spirit was urged on by curiosity, but a great many prominent and famous entertainers were heard from the small one-room studio. Fred Waring's Pennsylvanians made their first broadcast over WMAQ that winter. And a few of the other artists heard were George Arliss, Rosa Raisa, Ben Hecht, Giacomo Rimini and Arthur Kraft. Don Weller, in telling about these early days at WMAQ, said that "most of the celebrities that performed over the air were badly afflicted with mike fright. Strange as it may seem, the actors and actresses were the most severely afflicted. I recall the complete exhaustion of Fritz Lieber after several Shakespearian readings, and I also recall that Maurice Gest was completely overcome and relaxed for fully a half hour after his broadcast. Jackie Coogan, who had just completed 'The Kid,' was not at all affected, however, inasmuch as he was only about five years old at the time."

On November 28th WMAQ began the first of a regular series of educational programs, presented by the University of Chicago. These programs continued almost unbroken until the present day.

Since talent for most of the broadcasts was often recruited at the last minute, the use of phonograph records became quite popular for fill-in purposes. Pick-ups were made acoustically from the horn of the phonograph, with the microphone often suspended far down into the bell

of the horn in order to pick up "low-level" recordings.

The sale of radio receivers—generally at fabulous prices—was very great during the winter of 1922-23, although the actual peak was yet several years away. Receiving sets had just passed from the "Crystal Set" era of the early days of radio to the "Tube Set" era that began about this time. Receivers made their appearance in many Loop stores, but local amateurs were still building and selling their own sets. Anyone with even the slightest knowledge of radio was considered an "expert" during this period in radio. Everyone was talking about "neutrodyne," "hetrodyne" and "regeneration" without a conceivable idea of what they meant. Radio listeners would strike up conversations in the street-cars or elevateds and brag about their new Fried-Eiseman, Radiola or Browning-Drake receiver—or discuss the merits of the leading tubes, the X99, the 200, the 200A, and the 201 and 201A. There were no pentodes nor screen-grid tubes, and few sets had more than three or four tubes at most. Only a few higher-priced receivers used loud-speakers—winding horns, generally made of cast bakelite, or occasionally tin. And all sets were powered with batteries—the acid from the "wet" A battery generally eating large holes in the costly living-room rug. Those were the glorious days of radio!

Listeners considered it a pleasure to listen to each of the various brief operating schedules of the different local stations. And from this group of radio enthusiasts came still another kind of listener: the DX fan. DX'ing in those days was done under much more favorable atmospheric conditions, but it was really an accomplishment. There was an unexpected thrill in hearing such far distant stations as St. Louis or Davenport, Iowa. And it was a major event when the weather and varying receiver factors permitted a signal from WOW in Omaha, or stations as far away as Kansas City or Cincinnati.

In order to encourage DX'ing on a greater scale—and thereby encourage the sale of receiving sets—all Chicago radio stations agreed to remain silent one night every week. By mutual agreement Monday night was selected, and this new schedule arrangement began the night of February 26th, 1923. The idea was popular immediately, and continued every week until late in 1927.

Late in the spring of 1923 the Chicago Daily News felt the need for owning WMAQ independently. Looking around Chicago then, they saw many new stations popping up almost everywhere, and

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in May there were over twenty stations where a year previous there had been only two. Radio broadcasting was still a new thing, but its possibilities were beginning to develop. With the future in mind the Daily News arranged to buy out the 51 per cent interest in WMAQ owned by the Fair Department Store. This was done the third week in May, and plans were immediately made to move the station to a new and better location. New buildings were being erected in Chicago, and the coverage of the city from the Fair Building left much to be desired.

At that time the La Salle Hotel was the highest structure in the Loop, and presented an ideal transmitter location. Accordingly, the Daily News leased the top floor of the hotel and started the construction of two new studios and a high antenna late in May. The last broadcast of WMAQ from the Fair Building was made the night of May 26th. The transmitter was then shut down, partially dismantled by Operator Weller, and moved piecemeal to the new La Salle location. This process was a rather slow one, however, and while WMAQ was off the air, its regular programs were broadcast over WJAZ, the uptown Zenith—Edgewater Beach Hotel Station.

Despite the large number of stations in Chicago, and the resultant competition, there was a great spirit of neighborliness among most of the stations during these early days, and most of the stations were always willing to co-operate with one another in meeting emergencies or changes. This gesture of courtesy by WJAZ permitted the regular news and feature programs of WMAQ to still reach their Chicago audience during the move to the La Salle Hotel.

The transmitter was relocated and made ready for use at the new location late in June. Two new studios were opened on the eighteenth floor of the Hotel, providing every modern facility then available. Radiating towers were constructed on the roof of the building, and the tip of the highest tower was 400 feet above La Salle Street—at that time the highest structure in Chicago, and visible for miles around.

WMAQ had been using the 750 kilocycle channel while in the Fair Building, but for the La Salle location a new frequency was applied for and authorized by the Department of Commerce. This frequency was 670 kilocycles, which WMAQ has used ever since.

The equipment was finally installed and ready for operation the first of July. After a test broadcast that evening, the

new WMAQ was formally dedicated the following night, July 2nd, 1923.

There were two broadcast periods on the opening night, the first from 7:00 to 8:00 p.m., and the second from 9:00 to 10:00 p.m. Under the direction of Miss Judith Waller—still at the helm of WMAQ—an elaborate program was produced. Willie and Eugene Howard were the featured artists. Myrna Harlow of the Chicago Civic Opera, and Vera Poppe, the famed British cellist, were also heard. Miss Poppe had come to Chicago especially for the dedicatory program; just eight weeks before she had participated at the opening of WJZ's new Aeolian Hall Studios in New York City. The future success of WMAQ seemed assured within a few days after the premiere.

The new frequency of 670 kilocycles was not a clear channel in 1923, and WMAQ shared time every night with another local Chicago Station: WQJ, owned jointly by the Calumet Baking Powder Company and the Rainbo Gardens. It was not until several years later that WQJ was gradually monopolized by WMAQ and finally bought by the Daily News—leaving a clear channel for WMAQ.

Four weeks after moving to the La Salle location, WMAQ scored a great triumph by broadcasting the address of President Harding—by wire from San Francisco, over a special Telephone Company network. And thereby hangs a tale!

During 1923 and 1924 the American Telephone and Telegraph Company provided the only kind of national network service for radio stations—in the sense of what we consider a national network today. For all special events, in any large city, they would pick up the proceedings with portable amplifiers at the point of origination, and then sell this service individually to any one radio station in any one city. There was no duplicate service to rival stations in the same city. A few days before each special event was to transpire, the Telephone Company would send wires to all Chicago stations informing them of the details of the proposed "Nemo" pickup—and soliciting their air time for the event. Then, the first local station to acknowledge their telegram would be granted the exclusive rights for the entire city, for that particular event. This meant that the various station managers had to be constantly on the alert in notifying the Telephone Company, in order to "scoop" other local stations. And this method of arranging out-of-town pickups was the chief cause of worry for

most of the Chicago stations—WMAQ included.

In line with the aforementioned policy, WMAQ exclusively broadcast the memorial services for President Harding on August 10th, shortly after his untimely death.

Late in August, by agreement with the La Salle Hotel, Jack Chapman's Orchestra began to broadcast dance music daily. Chapman's Orchestra was playing at the Hotel at that time.

During the summer and fall the operating schedule consisted of three regular periods every day, except Sunday: noon to 2:00 p.m. (5:00 to 6:00 p.m., and 8:00 to 10:00 p.m. at night.

Alone, Donald Weller had guided the somewhat uncertain technical destiny of WMAQ from its inception. But by the fall of 1923 plans for expansion of the daily broadcasting schedule demanded additional operators. It might be mentioned that the demand for experienced operators and technicians in Chicago was very great during these years—and good operators were conspicuous by their absence. For the most part, radio operators were drawn from two general sources: amateur radio and marine or ship operating. There were few technical schools of any kind in existence, particularly in Chicago, with the lone exception of Dodge's Institute at Valparaiso, Indiana, just southeast of Chicago. Radio operating jobs were far from scarce back in those days.

Onto this scene came a young radio operator, Walter Lindsay. He had just completed two years of work with the Government doing airmail installation work, and had come to Chicago. He was undecided whether to return to his home in California or to look for work in the Windy City. Walking west on Madison Street one November afternoon he happened to notice the antenna towers above the La Salle Hotel, and decided to investigate the possibilities—if any. He walked into the studios of WMAQ, asked for a job, and got it! That was seventeen years ago, and Mr. Walter R. Lindsay is still guiding the destiny of WMAQ as transmitter engineer—which is probably an all-time long service record with one broadcast station.

He and Mr. Weller worked together at first, and later alternated shifts. But less than six months later Mr. Lindsay took over full technical charge of WMAQ, which he still holds today.

At that time WMAQ was not incorporated, and was treated merely as a department of the newspaper. Miss Judith Waller was director of the station, as-

sisted by Mr. William S. Hedges, who at that time was radio editor of the Daily News. Mr. Hedges later was made President, when the station was incorporated in 1929, and is now a Vice-President of the National Broadcasting Company in New York.

Operation of WMAQ settled into a schedule routine early in 1924, with three regular broadcast periods every day except Sunday. The first Chicago Nemo's were installed by WMAQ at Lyon and Healy's Music Store, and at the Chicago Civic Opera House. In the summer of 1924 WMAQ broadcast the Democratic and Republican Conventions exclusively to Chicago, by arrangement with the A. T. and T.

The 1924 World Series baseball games were also broadcast by WMAQ in October, and a new field of sports reporting was opened to radio broadcasting. Public interest in these baseball programs was very much apparent, and the Daily News decided to look closer into this new field of radio. All during that fall and winter plans were completed for broadcasting the local Chicago games of both the American and National League teams for the next season. Miss Waller, incidentally, first sold P. K. Wrigley on the idea of broadcasting games from Wrigley

Field. WMAQ was the first station in the United States to broadcast regularly every home baseball game, an arrangement which began on June 1st, 1925, and continued for many seasons.

The Daily News and WMAQ also took an active interest in all other sports, both collegiate and professional. Football games from the University of Chicago's Stagg Field were begun in the fall of 1925, the first game being played October 3rd, between Chicago and Kentucky, and believed to be the first regular football game broadcast in the United States.

Chicago, at that time, was devoid of qualified announcers as it was of experienced operators. In order to accurately broadcast these various sports activities, it was necessary for the Daily News to draft two of its experienced sports reporters for radio work. The two chosen were: Harry Beardsley and Hal Totten—and Hal is still doing sports broadcasts for NBC.

Another sports reporter, Kenneth Fry of the Chicago Evening Post, was also doing occasional stints for WMAQ in 1925. Ken is now Director of Special Events for the NBC Central Division.

WMAQ was the only Chicago station to broadcast the Coolidge inaugural from

Washington in March, 1925, and all other local stations courteously remained silent during the special broadcast so that listeners would not be detracted from the important event.

In the same month the Victor Phonograph Company presented the first of a series of concerts over an improvised network of some twenty stations scattered between WEAF in New York and WMAQ in Chicago. This probably was the first "commercial" network broadcast, and was the forerunner of the present-day independent network systems.

The year 1925 was one of decided prosperity in Chicago. There was a great deal of construction completed in the Loop, and the absorption of the WMAQ signal by these new office buildings reduced the operating efficiency considerably. WMAQ had been operating with the same Western Electric 500 watt transmitter ever since the station had moved to the La Salle Hotel, and the need for later and more efficient equipment became more pronounced with each passing day. Arrangements were accordingly completed in the fall of 1925 for a new and more powerful transmitter: a 1000 watt Western Electric Type 6A. At the same time there were many radical changes made in studio design and

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control room layout, so that WMAQ was brought up-to-date in every respect.

On December 10th, 1925, the first program was broadcast from the new studios and the new transmitter. Sophie Braslau was again the guest of WMAQ on the dedication program, together with Alfred Wallenstein and the Chicago Symphony Orchestra.

From that date the new hours of operation were from noon to 1:00 p.m., 2:00 to 3:00 p.m., 4:00 to 6:00 p.m., and 8:00 to 10:00 p.m. Monday night was still acknowledged by all Chicago stations as Silent Night. And WMAQ continued its policy of not broadcasting on Sunday.

The new transmitter met with instant success after its inception, and greatly increased the coverage of WMAQ. On a number of occasions reception was reported and verified from England, Ireland and Australia.

During 1926 and 1927 WMAQ continued along its normal operating ways, while all around it radio broadcasting had worked itself into a hopeless maze of confusion. Beginning late in 1924 there were entirely too many stations in Chicago. With little Government control—there was no provision in the Federal Laws for the establishment of any kind of a controlling body to regulate radio broadcasting—there was a resulting chaos. More and more stations came on the air, and any person with a little money was certain to build a radio station—sooner or later—and start “broadcasting.” Many frequencies were clogged with three, four or even five stations in the same area going full blast at the same time. This condition was general all over the country, but it was particularly bad in Chicago. Many of the smaller 50 and 100 watt stations had absolutely no regard for frequency allocation or any time-sharing arrangement. There was a need, at least in Chicago, for more and separate channels—and not a few stations in this area moved over to Canadian frequencies and continued operation. In July, 1926, alone, twenty-three new stations took to the air in the Chicago district—all of them less than 100 watts in power.

The larger stations, such as KYW and WMAQ, were not greatly concerned or particularly worried over the multitude of low-powered stations that surrounded them on both sides of their allotted frequency. They pursued a normal operating course—confident that sooner or later the Government would step in and straighten out the tangle of confusion. This was finally done, but not until February, 1927, when a new Government body took over the control of radio communication and radio broadcasting. This

was the Federal Radio Commission. It proceeded immediately to designate radio zones and allot new frequencies to radio broadcasters. Many stations around Chicago were denied a license to transmit, and others went off the air voluntarily. Within a few months broadcasting was back on the “straight and narrow path”—where it has since remained.

This radio cycle is significant. While the ether was overburdened with so many unnecessary station signals, it caused the larger stations to considerably improve the quality of their entertainment and educational programs.

In November of 1926 station WEAF was purchased from the Telephone Company by the Radio Corporation of America—to be incorporated as The National Broadcasting Company. RCA and NBC together were trying to develop a new idea in radio: network broadcasting, whereby a single program could be simultaneously broadcast by many different transmitters and stations—thus lowering the cost of individual performances for each station. The idea was not quick to catch on, but gradually stations began to sign up for this “new service”—and at the same time the quality of these network programs was being improved and developed.

In January, 1927, WMAQ carried the first of these NBC programs in Chicago—by wire line from WEAF in New York. This, and later, sustaining programs were sold to any station at \$45 per hour program—but to only one outlet in any one city. When broadcasting a “sponsored” program, each station of the network received \$50 for putting the program on the air in that city. WMAQ carried sustaining programs largely, as did most of the other member stations of the network—since radio sponsors were far from prolific in 1927.

Since 1923 WMAQ had been operating with a frequency of 670 kilocycles—that channel being shared with WQJ, a station owned jointly by the Calumet Baking Powder Company and the Rainbow Gardens. All during 1923 and 1924 WQJ operated regularly, equalling if not exceeding WMAQ's time on the 670 kilocycle channel. However, in 1925 and 1926 WQJ operated only a few hours each week, and WMAQ dominated the channel almost exclusively. On March 1st, 1927, the Daily News bought WQJ, and both stations were thereby consolidated under one ownership and management. One proviso of the contract was that the Calumet Baking Powder Company would receive courtesy announcements for eight years thereafter—and this was done by WMAQ until 1935, ac-

ording to the letter of the contract. The Federal Radio Commission permitted the use of one set of call-letters for the 670 kilocycle frequency in 1928, and since then WMAQ has been operating with a clear channel.

In September, 1927, WMAQ severed relations with the National Broadcasting Company and joined the newly formed Columbia Broadcasting System. The first CBS network broadcast—a musical program from WABC in New York—went on the air from WMAQ the night of September 18th. Eight weeks later, the night of November 14th was observed as the last Silent Night by all Chicago stations, and from that date WMAQ operated on a daily schedule.

New Year's Eve was quite an event for WMAQ that year, as the station established a new record for continuous broadcasting: 43 hours and 48 minutes, running from December 31st until the night of January 1st, 1928. The program consisted mainly of recorded dance music—for which event an extra large supply of wax discs was transported to the La Salle Hotel studios.

During 1927 and 1928 prosperity arrived in Chicago with a bang! Business was good, and local industries were operating with a wide financial profit. As a result, new buildings and skyscrapers were making their appearance in the Loop District. New office buildings and commercial structures loomed higher and higher above the Chicago skyline, until the WMAQ towers that had once dominated the Loop were no longer visible. By early fall the 1000 watt transmitter was only 50 per cent effective in the coverage of the city. It was quite evident, then, that the WMAQ transmitter would have to be moved outside of Chicago where a greater coverage efficiency could be obtained. Since the art of radio broadcasting was also undergoing constant change, it was also felt that newer and more efficient equipment would greatly improve WMAQ's broadcasting service. Accordingly, application was made to the Radio Commission to change the location of the transmitter, and to increase the power.

Ground was broken at Elmhurst, Illinois, for a new transmitter site in February, 1928, and construction of the buildings was begun. A new 5000 watt Western Electric type 104-B transmitter was purchased and installed at Elmhurst, and twin radiating towers were erected—but this work was not completed and tested until late in May.

In passing through 1928 it might be interesting to note that on the evening

(Continued on Page Eighteen)

## A Ham Receiver De Luxe

**T**HE 1941 "Super Skyrider" communications receiver recently introduced by Hallicrafters is one of unusual interest to the ham (or commercial service) who demands the very last word in communication equipment, and who can afford to indulge his desire to the extent of investing something more than the amount for which the average receiver sells.

The point of special interest is not alone the tremendous variety of features incorporated in this SX-28 model, but the lengths to which design was carried to wring every last ounce of merit out of each. The noise limiter system, for instance, employs not just a diode, but a total of four tubes, two of which serve this purpose only, while two others also have other functions. Then, instead of the conventional detector-ave arrangement, there are two distinct ave systems, one of them amplified, which make overloading at any point absolutely impossible. The tuning range of 550 kc. to 43mc. is broken up into 6 bands instead of the usual 3 or 4, with the result that, except in the standard broadcast band, the individual bands have less than a 2-to-1 spread, and better L/C ratios are maintained throughout.

Selectivity is variable in 6 steps, 3 by means of the i.f. expansion system and 3 by variations of the crystal filter circuit. This crystal circuit is unusual, too, in that the crystal is built directly into the circuit to minimize capacity and reduce socket losses.

This receiver was not designed for the ham alone, but to meet the specifications of various government agencies and commercial services as well. Development costs are therefore spread over a triple market with the result that the price is considerably lower than would be possible were sales limited to a single field.

The receiver includes 15 tubes in all, with 2 tuned r.f. stages on all ranges above 3.0 mc. One result of this is an image ratio of 45 to 1 at 28 mc., 350 to 1 at 14 mc., etc. Separate 6SA7's are employed for mixer and h.f. oscillator in a circuit arrangement which minimizes the effect of tube differences and line-voltage variations. In addition the oscillator circuit is temperature compensated to minimize drift.

Tuning is by means of main and band-spread dials, both inertia controlled with main shafts revolving on ball-bearings at each end for complete smoothness and freedom from backlash. The ganged band-spread condenser includes 12 sections, with different sections employed on different ranges to provide appropriate spread for each. The band-spread dial is directly calibrated for the 80, 40, 20 and 10 meter bands. The main dial has an auxiliary micrometer scale so that it can always be set precisely for any desired frequency. Provision is also made for locking this dial in any position so that it cannot be inadvertently detuned. This illustrates something of the extent to which refinements have been carried in the design of this receiver.

# New 1941 hallicrafters the Skyrider S-22R

**S**PECIFICALLY designed for service, in the range from 16.2 to 2150 meters (18.5 mc. to 110 kc.). Improved image rejection at the higher frequencies is achieved through the use of 1600 kc. IF Transformers. The directly calibrated main tuning dial eliminates the use of complicated charts and tables. An efficient mechanical bandspread with separate dial provides easy logging.

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## Early Broadcasting

(Continued from Page Sixteen)

of March 19th two unknown radio characters made their first broadcast over WMAQ—locally. They were introduced simply as “Amos ‘n’ Andy.”

On June 2nd the new Western Electric transmitter was formally dedicated and put into operation at Elmhurst. WMAQ continued to use the La Salle Hotel studios, but the towers above the Hotel were removed later.

In February, 1929, the transmitter was slightly revamped to incorporate duplicate crystal control—and 100 per cent low-level modulation. WMAQ, incidentally, was the first Chicago station to employ complete crystal control and 100 per cent modulation.

The studios remained in the La Salle Hotel until late in August of 1929. The need had been quite apparent for new and enlarged studios, and arrangements were made for the construction of entirely new studio units in the Chicago Daily News Building, at 400 West Madison Street, just west of the Loop. Most of the La Salle equipment was moved to the new location, and the studios were formally dedicated August 18th. They consisted of three main studios and two smaller ones, and were in constant operation from that time until May, 1932. WMAQ was fully incorporated at this same time.

Finally, in November of 1931, WMAQ was taken over by the National Broadcasting Company, under whose management it still operates. And in May of 1932 the entire WMAQ studios were moved from the Daily News Building to the Merchandise Mart, where they have since remained.

In September of 1935 the last important change was made at WMAQ. With new, modern studios operating downtown the need was felt for a more powerful radiating transmitter. Application for a fifty kilowatt license was approved, and a new transmitter site was selected at Bloomingdale, Illinois. A Westinghouse 50B transmitter was installed at that location—housed in a large new building on a twenty-seven-acre tract about twenty-eight miles from the city of Chicago. The transmitter and related equipment was formally dedicated and put into service on September 15th, 1935, and has been in continuous operation ever since: feeding a 490 foot vertical radiator. Mr. Walter R. Lindsay is still in charge of the station.

WMAQ has been on the air from Chicago for well over 100,000 hours—in seventeen years of operation—approaching, if not equalling, any record for con-

tinuous service coverage of any region by a broadcast station. And much of the credit for the long operation of WMAQ must go to Engineer Lindsay. But there were many other operators—a few that have gone on to other work, a few that still remain with NBC, and a few unknown or forgotten—all of whom had a hand in guiding the technical destiny of WMAQ.

Next oldest in point of service at the transmitter is A. J. Schroeder, who came to WMAQ in January, 1929. Byron Speirs, now in the NBC Chicago Studios, came to WMAQ in 1928.

Not a few of the old-timers have gone on to other work. Donald Weller, the first WMAQ operator, is now Chief Engineer at WISN in Milwaukee. Charlie Pease is in New York, Don Johnson and Bill Leverett are both doing recording work in Hollywood, and there are, of course, many others deserving of mention.

The writer wishes to gratefully acknowledge assistance given him by Miss Judith Waller and Walter R. Lindsay of NBC, and by Donald A. Weller of WISN, in the preparation of this History of WMAQ. Research in this neglected field would not have been possible without their help in properly chronicling the story of WMAQ, Chicago's Oldest Radio Station!

## Televising Conventions

(Continued from Page Six)

room, the public viewing room, and the Mobile Unit surpassed any communication installation set up to date for either radio broadcasting or television. The master system was subdivided so that the video engineers and camera engineers at the Mobile Unit were able to converse together without interference from conversations going on between video engineers and camera engineers at the transportable equipment. On a separate ear-phone, however, calls could be established between these two circuits after a switch was thrown. The same sort of system was carried through in the case of the audio engineer to the public viewing room, etc. The Program Director at the Mobile Units had a separate communication circuit to his assistants at the camera positions.

The announcing technique in television is considerably different from that practiced in radio broadcasting. It is customary in sound broadcasting for an announcer to maintain a running comment, and bring to his listeners, through words, that which they cannot see. In television the running commentary is unnecessary. In the Main Hall, the sequence of

events on the speakers' stand and among the delegates not alone predetermined the sound coverage, but in many cases dictated the movements of the cameras. The only time that the announcer in the Main Hall was heard was during lulls, or when events occurring within the range of the camera needed some special explanation. The Program Director located in the Mobile Unit was able, by means of the monitor system, to see the scenes on which both cameras were focussed. According to his discretion, and predetermined program plans, he directed both television camera operators and the announcer, when the order of events did not logically predetermine both the visual and aural coverage.

Perhaps the most rapid fire television editing by means of electrically switching cameras equipped with different lens systems occurred when ballots were taken. As the Chairman called the name of the state delegation, he was seen by means of the Orthicon camera. A switch was then made to the Iconoscope camera equipped with the wide angle lens. This camera was focussed on the general floor scene. As soon as the switch was made, the Orthicon camera operator panned his camera to pick up a close-up scene of the state delegation. As soon as this had been brought into focus it was switched to the line amplifier. By means of the intricate communication facilities, camera operators, directors, announcers, and video control engineers were at the peak of their cooperation during these balloting periods.

In addition to the communication facilities, it is NBC practice to provide a headset at each point remote from the main control position by which members of both the program and engineering staffs are able to hear the sound transmission accompanying the picture. This system is known as “feedback monitoring.” A loud speaker system in the Mobile Unit is used by the video engineers and program directors. By means of this monitoring system, the announcer may lead the camera by his descriptions and other expressions which will indicate the content of the scene to follow.

While the position of all our facilities could not be determined until the Convention Committees had formulated all their plans, it was not possible for the Bell System engineers to delay their additional installations and tests necessary before the cable would be usable. They started their work in April. The special twisted pair circuit was terminated in the Telephone terminal room on the northwest corner of the Convention Hall Building. At a later date, when the positions of the

(Continued on Page Twenty)

## NBC Personalities

(Continued from Page Eleven)

of sound movies, and Al was off to spend a month with De Forest Sound Pictures, and then to Fox Movietone News in October of 1928. He made the first and only sound movies of President-elect Hoover's home town in 1929; he made the sound track that caused the argument when Howard Taft swore in Hoover as President in March, 1929. In August, 1929, Movietone sent him to Washington, D. C., where he made all the trips with the President's party while Hoover was in office, and all the trips with Roosevelt up until September, 1936. Al says, "I was fired from Movietone in September, 1936, and I mean fired!" Versatility and experience are always in demand, and in February, 1937, he joined NBC's Washington Engineering Staff, and in March, 1940, he was elected Chairman of the Washington A.T.E. Chapter.

**W. C. Pruitt**, Cleveland Engineer, was born in Bainbridge, Indiana, in 1902. Mr. Pruitt has been actively engaged in radio broadcasting and its allied communications field, since 1923. His radio career started like many other prominent persons—serving as wireless operator on the high seas. Early in 1927, opportunity knocked, and he joined the Engineering Staff at WTAM, Cleveland. He was elected Secretary of Cleveland's ATE Chapter in 1935, and he is now serving his second term as their Chapter Chairman. (We regret that Mr. Pruitt's photograph was not available to us at the time we went to press.)

**Jeanne Holzer**, former secretary to Division Engineer G. O. Milne, paid us a visit after a three year absence. Miss Holzer proved herself as efficient as ever, calling us all by name. She looks better than ever, and is enjoying her association with the Lehn & Fink Drug Company.

**John J. Kulik**, age 39, started his career in the NBC Engineering Department, New York, on January 28, 1929, as a Studio Engineer. In 1938 his ability was recognized when he was transferred to Master Control. John's talents included an excellent singing voice, and for several years he sang baritone on that well-known quartette, The Balladeers. His musical training qualified him to handle the first NBC series of Toscanini symphony broadcasts in 1937. In the field of sports, he prefers bowling, and for years he has been a member of the New York Engineering Team No. 1. The old saying, "once a ham, always a ham" includes W2ARB, John's world-famous amateur radio station, which he has been operating since 1919. Effective November 15th, it has been necessary for John to leave us on a three month leave-of-absence in order to devote the time required to administer an estate recently left to him and his sisters. For the next few months, John will be "at home" in Passaic, N. J., with his wife and five-year-old son. Whether or not John returns, we all wish him success and peace of mind, and look forward to his future visits with us.—Ed. S.

## Anniversary

November, 1940, marks the 20th anniversary of American-Way broadcasting. From very humble beginnings, with inadequate equipment and rule-of-thumb engineering, American Broadcasting forged its way through a brief score of years to lead the world as one of Technology's greatest benefits to mankind. The A.T.E. Journal will not attempt the almost impossible task of enumerating here the myriads of technical advances that have been made during these twenty years.

Advanced thinkers believe that World Peace can only be achieved through mass education. Localized formal education down through the ages has sharpened many minds, but invariably these minds were handicapped by "local" sympathies, complexes, culture, and ideologies. To date, history records a disappointingly few minds that truly understood the "brotherhood of man" and the futility and fallacy of efforts directed toward racial or political supremacy.

Radio Broadcasting has been the greatest single agency for the instantaneous dissemination of world news, facts, happenings, and "foreign" (the other fellow's) points of view. If and when television is permitted to progress in the American Way, it will provide the second Great Advance toward world culture, brotherhood, and sympathetic understanding,—the true prerequisites to world peace.

Rather than reminisce about "the good old days" of radio broadcasting, we prefer to look to the future, and hope that we may be a part of the greater broadcasting service of tomorrow, which, when weighed in the balance of time, will stand out as one of humanity's greatest benefactors.

—Ed. S.

In the Sunday News (NY) of November 17th, **President Niles Trammell** answers the question many of us must have asked ourselves at some time or other, i.e., "How does it feel to get to the top?" He says, "Reaching the top, to me, means the end of all effort, so I decline your compliment. However, it is a trait of human nature to think, 'It must be wonderful to get to the top'; but when you make some progress, you find that there is no difference in feeling, just more responsibilities."

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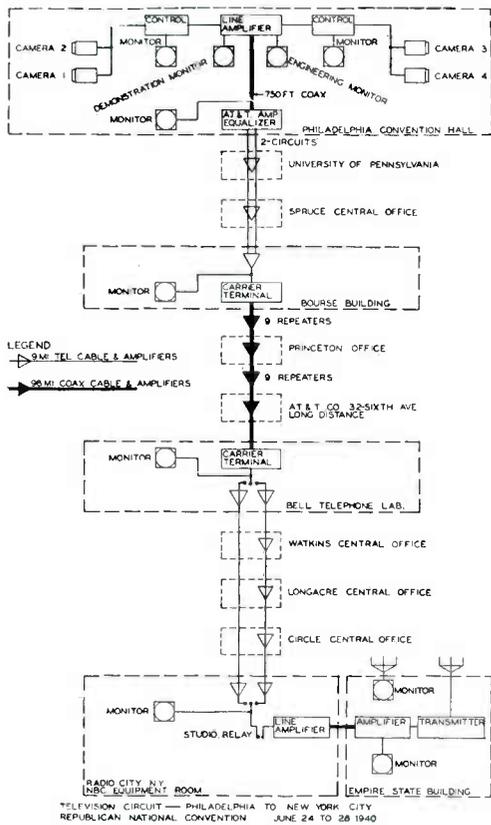
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## Televising Conventions

(Continued from Page Eighteen)

studio, camera platform, and other factors had determined the location of the Mobile Units, a connection had to be made between the terminal room and the Mobile Unit. Seven hundred and fifty feet of flexible coaxial cable was needed to complete this installation.

The completed picture signals from all four cameras were transmitted to the terminal room over the seven hundred and fifty foot piece of cable. At the terminal room the Bell Laboratory engineers were equipped with a monitor, an ampli-



fier and video equalizer. Two special twisted pair circuits had been installed between the Convention Hall and the Bourse Building. There were two repeater stations on these circuits. One was at the University of Pennsylvania, and the other at the Spruce Central Telephone Office. At the Bourse Building a carrier system was used, the video frequencies were transposed so that the lowest frequency being transmitted through the coaxial cable and the twenty repeater stations between Philadelphia and New York was in the order of 300,000 cycles per second. These picture circuits and repeaters were capable of transmitting a band of frequencies from 30 to 2,800,000

cycles per second. At the New York terminal of the cable, this signal was restored to the normal video range and placed on two separate twisted pair circuits and transmitted simultaneously to the NBC television control room in Radio City. One circuit was of the same type as that used between Madison Square Garden and Radio City, and the two between Convention Hall and the Bourse Building. This circuit required repeaters at approximately one mile intervals. They were located at the Watkins, Longacre, and Circle central offices. The second circuit was a special shielded cable undergoing tests at the time. Intermediate amplifiers were not required on this circuit, even though its length was approximately four miles. In all, the picture signal travelled 104½ miles between the pickup and the Empire State Transmitter.

The combined facilities of NBC and the Bell System were used for a total of thirty-three program hours during the five day Convention. Persons and events heretofore known to many and yet seen by few were made available in close-up upon the many television receivers in the New York area. The Convention's candidate became the first Presidential nominee to be seen by a television audience as he acknowledged the greetings of the delegates.

Faced with the lack of either radio frequency or coaxial cable relay facilities between Chicago and New York, all thoughts of the direct pickup method of bringing the proceedings of the Democratic Convention to our television audience had to be abandoned. The original consideration of obtaining special motion pictures at each session of this Convention and transporting them by Air Express to New York for television film scanning was adhered to.

The New York television audience was provided with scenes of the first day's activities of the Democratic National Convention, held at Chicago, June 15 through 18, within twenty-four hours of the beginning of the first session. Special newsreel releases were made up for NBC by a newsreel company. At the end of each day's session, these newsreels were flown to New York. Developed and edited the next morning, they were available for film scanning as a part of the regular afternoon NBC television programs. The same releases were shown on the regular evening television programs.

While this method of coverage was not immediate, and lacked some of the spontaneity felt by viewers who looked on the Philadelphia Convention, several scenes were available which had no par-

allel at the Philadelphia pickup. The motion pictures included not alone scenes within the Hall, interviews with nationally known political figures and street scenes all of which were provided by the television cameras at Philadelphia, but included pictures taken at the headquarters in Chicago of the many potential candidates, arrival of colorful figures at railroad stations and other atmosphere "shots." The mobility of a small number of motion picture camera units was evident. This is in contrast to the lack of flexibility of the television camera at the Convention Hall, and bears out the contention made in the early part of this paper that from six to ten television cameras would have been necessary at Philadelphia in order that we would have been able to present the wide and varied coverage of an event of this character in like manner to that of the newsreels.

It is estimated that the television audience witnessing the scenes attendant to both the Republican and Democratic National Conventions of 1940 numbered in excess of 40,000 persons scattered over an area of 10,000 square miles. Persons located over 300 miles distant from Philadelphia were able to see and hear events transpiring in that city through the combined facilities of the NBC television field pickup equipment, the Bell System coaxial cable between Philadelphia and New York, the NBC television transmitter, atop the Empire State Building tower in New York City, and the special receiving equipment and television transmitter of the General Electric Company, located just outside the city of Schenectady, New York. The latter station rebroadcast most of the NBC programs in the Schenectady area. The Philadelphia transmission which was the 175th NBC outside television pickup since April, 1939, was the forerunner of future television network operation and provided the earliest television network facilities in the United States with their first practical operating test.

## Christmas Yearbook

Through your cooperation, we are looking forward to the next issue of the A. T. E. Journal—our Christmas Yearbook—as a fitting climax to our seventh year of publication. To allow the distribution of the Yearbook before Christmas, we are closing forms on Monday, December 9th. From all indications, the 1941 Journal will exceed the high standards we have maintained through 1940!



# Check

The AR-77 is one of the most stable, most sensitive receivers of its type ever built. It has more features for the money. It has finer performance as gauged by any test you care to name. Before getting that new receiver for your shack, we suggest that you check the AR-77, feature for feature, point for point, against any other outfit on the market at anywhere near the price. You be the judge!

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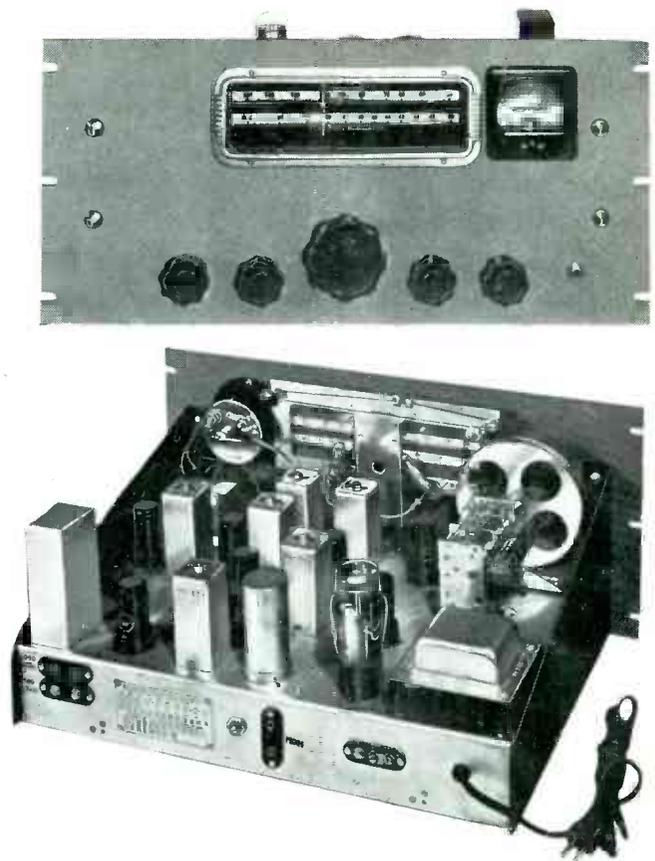
**SELECTIVITY:**  
Band 1 (AM)—25 kc. at 1000 times down at 1000 kc.  
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Band 1 (AM)—10 microvolts at 6 milliwatts output  
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1—1853 2nd I.F. Ampl. (1.3 mc)  
1—6SJ7 Limiter  
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1—6SR7 2nd Det., A.V.C., Audio  
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A 15" Loudspeaker System in a coaxial assembly of two PM Loudspeakers complete with frequency dividing network, delivering good performance to 12,000 cps. with substantial contribution even

in the 14,000 to 15,000 cycle range. Power handling capacity up to 15 watts. For home, professional or public address use; ideal for FM receivers. Recommended for use only with good amplifiers, microphones, pickups, and correlated equipment.

**JENSEN High Fidelity REPRODUCER**

**With Bass-Reflex**

This reproducer is a factory built combination of Jensen's new handsomely designed and finished walnut Bass-Reflex cabinet and JHP-51 Dual Loudspeaker. Quality of material and workmanship is unsurpassed, yet cabinet is moderately priced. Frequency response is essentially flat from 35 to 14,000 cycles. Price..... **\$55.42**

Equipment described on this page may be seen and heard at TERMINAL.



Model JHP-51

**\$27.34**

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