PRICE 15 CENTS JULY 1912

MODERN ELECTRICS

"THE ELECTRICAL MAGAZINE FOR EVERYBODY"

MODERN ELECTRICS

"THE ELECTRICAL MAGAZINE FOR EVERYBODY"

Edited by H. Gernsback

Volume V JULY, 1912 No. 4

CONTENTS

ELECTRICITY AND MAGNETISM

WIRELESS TELEGRAPHY

MISCELLANEOUS SUBJECTS

AERONAUTIC DEPARTMENT

EXPIRATION We enclose a renewal blank with the last copy sent out on each subscription. To avoid missing valuable copies, renewals should be made at once.

CHANGE OF ADDRESS When you change your address notify us promptly, giving old as well as new address. Also notify your former postmaster, as it often happens that our mailing list is made up when your notification arrives. In such cases the copy will go to your old address, but the postmaster will forward copy to your new address.

Magazine issued monthly. Yearly subscription in U. S., $1.50. Manhattan and Canada, $1.85. Foreign, $2.00 in Gold. SINGLE COPY, 15 Cents.

NO COPIES SENT AFTER EXPIRATION OF SUBSCRIPTION.

Published by Modern Publishing Co., 231 Fulton Street, New York, U. S. A.

H. Gernsback President and Secretary. O. J. Ridenour, Vice-President and Treasurer

Trade Mark Registered June 21st, 1910.

Entered at the New York Post Office as Second Class Matter.

Classified Advertisements

Advertisements in this department 5 cents a word, no display of any kind. Payable in advance, by currency, check, money order or stamps. Count 7 words per line.

5% discount for 3 insertions
10% discount for 6 insertions
15% discount for 9 insertions
20% discount for 12 insertions
within one year.

With 65,000 subscribers, we have over 325,000 readers of MODERN ELECTRICS, which makes it one of the cheapest high grade classified mediums in the United States.

Advertisements for the August issue must be in our hands July 15th.

AERONAUTICS

CHAMPION RACER OF "CECIL PEOLI." OFficial record, 1,691 feet. Half-size drawing with instructions for building and flying, 25c.

Complete Plan, drawn to scale, with full instructions for building the only Wright 3-ft. Biplane Model that is absolutely guaranteed to fly. 25c postpaid.

Drawing and directions for 3-ft. model Bleriot Monoplane, 15c.

5 Cents brings our new up-to-the-minute catalog, 40 pp., fully illustrated; includes rules for holding Model Contests.

Ideal Aero Supply Co., 86-88 West Broadway, New York, N. Y. ★

AGENTS WANTED

AGENTS ON SALARY OR COMMISSION. THE greatest agent's seller ever produced; every user of pen and ink buys it on sight; 200 to 500 per cent. profit; one agent's sales amounted to $620 in six days; another $32 in two hours. Monroe Mfg. Co., X., 38, La Crosse, Wis.

AGENTS WANTED—FAD-A-WAY ANTISEPTIC, tooth bleacher. Removes tobacco stains, first application. Everybody needs it. Quick sales, big profits. Sample and instruction, ten cents. DR. VINETTE, Chippewa Falls, Wis. ★

IF YOU WANT TO BE A SUCCESSFUL agent, read "The Agent (His Paper)." Two specimen copies and a wealthy scheme for a dime. Send to-day and learn the art of success in the agency field to-morrow. The Agent (His Paper), Box E, Cassandra, Pa. (4)

AGENTS WANTED—SELL RICH LOOKING, imported 36x68 rugs, $1 each. R. H. Carter, Milan, Tenn., sold 115 in four days. His profit $57. You can do as well. Write for sample offer and unique selling plan; exclusive territory. L. Condon, Importer, Stonington, Maine. ★

MODERN ELECTRICS OFFERS UNUSUAL inducements to those who have the time to obtain subscriptions to "Modern Electrics." Write for full particulars to Modern Electrics, 231 Fulton St., New York City.

PERFECTION POCKET ADDING MACHINE. Lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. B, Cincinnati, Ohio.

EVERYBODY BUYS OUR PURE MINT CHEWing gum at 2 packages for 5c. Samples and wholesale prices to you, 10c. Mullin Co., 4410 Princeton Ave., Chicago, Ill.

AUTOMOBILES

AUTOMOBILES A. C. C. A. PRICES TALK! Every make, every model. Hundreds runabouts, racy roadsters, five-seven passenger touring cars. $50 up. Guaranteed five years. Shipped Freight Prepaid. Write to-day for the largest illustrated catalog published! The Automobile and Cycle Company of America, Dept. 10, 1769-1787 Broadway, New York City. (tf)★

AUTOMOBILES

AUTOMOBILES—SAVE DEALER'S PROFITS, buy direct from the owners. I have all makes runabouts from $50 up; touring cars from $100. Don't purchase any car until you get my prices; all guaranteed for one year. M. E. King, Automobile Broker, 213-217 West 125th St., New York City.

BUSINESS OPPORTUNITIES

$1.00 WILL START YOU IN BUSINESS. WE furnish magazines with your name as publisher for $1.00 per hundred. Dinsmore Pub. Co., 101 S. Chester St., Baltimore, Md.

BOOKS, BLUEPRINTS AND FORMULAS

OUR 80-PAGE BOOK, "THE WIRELESS TELEphone," will be found invaluable to those interested in this science. This book contains 57 illustrations and is considered a masterpiece. Send $.25 in stamps, coin or M. O. to Modern Electrics, Book Dept., 231 Fulton St., New York City.

NEW BOOK, "JANE," 10c; CATALOG OF books and den pictures free. Bond Pub. Co., B 4, Columbus, Ohio.

WIRELESS FIRM DIRECTORY OF UNITED States; postpaid, 25c. Kraemer, 1419 East Third, Duluth, Minn.

WE ARE DESIROUS OF OBTAINING SOME additional copies of April, 1908, and January, 1909, of Volume No. 1. Mail them in and we will remit promptly. Modern Electrics, 231 Fulton St., New York.

ELECTRICAL APPARATUS

AMMETERS, 1,000 WATCH SIZE, NICKELplated, guaranteed, battery testers, in chamois leather cases. Read 0-30 amperes, 25c postpaid. Stamps taken. E. W. Electrical Co., 3525 Broadway, N. Y.

RENEW OLD DRY BATTERIES; COMPLETE instructions, 25c; guaranteed. Clark, 824 North 20th, Philadelphia.

BOUND VOLUME NO. 3 OF "MODERN ELECTrics" is now ready, which contains 740 pages, over 1,000 illustrations and writings of 300 authors, 650 articles of unusual interest, with 1,173 questions and answers. Bound in handsome black cloth, gold stamped. $1.25.; $.30 extra by mail. Modern Electrics, Book Dept., 231 Fulton St., New York City.

FOR SALE

"WIRELESS HOOK-UPS," CONTAINING 96 pages and 160 hook-ups, is full of diagrams fully illustrating every possible wireless connection. This book will enable wireless men to get excellent results. Sent postpaid for $.25. Modern Electrics, Book Dept., 231 Fulton St., New York City.

COIL, 4" SPARK WITH E. I. Co. INTERrupter, also ½-K. W. coil. Earl Cline, Marietta, O.

PORTABLE WIRELESS SET, $5.00. WIRELESS, 1059½ Bond St., Elizabeth, N. J.

COMPLETE WIRELESS OUTFIT. FINE CONdition. Spark coil 1", Brandes receivers, cost $25.00, will sell for $15.00. For full particulars address, Kuh, 12 Sterling Pl., Brooklyn, N. Y.

FOR SALE—E. I. CO.'S ELECTROLYTIC DEtector, $1.00. Receiving Condenser, 25c. Potentiometer, 75c; hand feed arc lamp, $1.00. Jas. Leroy Hodges, Booneville, Miss.

¼-KILOWATT SET FOR CASH, SMALL A. C. motor or D. C. generator. J. W. Gore, Arlington, Md.

PICTURES AND POST CARDS

IT'S A TREAT, "KATE," 10C. CAT. OTHER classy books and pictures free. Atoz Co., C3, West Jefferson, Ohio. (1)

ADVANCE SOCIALLY — OUR MAIL WAY tells us how to exchange good motto and message cards (that really say something "worth while") among either ladies or gentlemen everywhere. It's big, world-wide, strong and reliable. Registers new members now for a year for 25 cents. We start you right. Fascinating, absorbing, profitable, results assured. All fun lovers and optimists send to Advanced Correspondence Exchange, E 714, Pitcairn, Pa. Special correspondents wanted. (2)★

REAL ESTATE

FOR SALE: 60 ACRES OF FINE LAND, ON Grand Island, N. Y., fronting on the beautiful Niagara River, right across from Buffalo; suitable for high grade development, bungalow plots, gentleman's estate or farming; nearly 600 feet shore front with riparian rights; price $300 per acre; worth $500; liberal terms will be made with responsible parties; house and barns near shore. Address W. H. Northrop, Grand Island, Erie County, New York.

STAMPS, COINS, ETC.

$7.75 PAID FOR RARE DATE 1853 QUARTERS, $20.00 for a Half Dollar. We pay cash premium on hundreds of coins. Keep all money coined before 1880, and send 10 cents at once for our New Illustrated Coin Value Book; size 4x7. It may mean your fortune. C. F. Clarke Co., Coin Dealers, Dept. 16, Le Roy, N. Y. (tf)★

GET ACQUAINTED WITH THE LARGEST philatelic supply house in the South. See Adv. on page 396. Special this month, 500 all different. P. O. Box 785, Jacksonville, Fla.
Mexican revenues for only 20c. H. Leonard.

STAMPS, 100 ALL DIFFERENT, FREE. POSTage, 2c. Mention paper. Quaker Stamp Co., Toledo, Ohio. (10)

TYPEWRITERS

TYPEWRITERS: CALIGRAPHS, $6:00; HAMmond, Yost, Densmore, Williams, $10.00; Remington, $12.00; Smith Premier, $15.00; Oliver, $24.00; Underwood, $30.00; all makes on hand; fifteen days' trial allowed, and a year's guarantee. Send for catalogue. Harlem Typewriter Exchange, Dept. M. E., 217 West 125th St., New York City. (tf)★

WIRELESS

SECONDARIES WOUND TO ORDER. WRITE for price on yours. Guarantee satisfaction. Rego Mfg. Co., Arlington, Md.

FREE—CLIMAX WIRE FOR AMMETER. WITH each order for low melting alloy for mineral detectors I will include, free, two feet of No. 36 or 40 Climax wire. Alloy, per ounce, 25c. L. C. Apgar, Carleton Road, Westfield, N. J. ★

WILL EXCHANGE COMPLETE WIRELESS telegraph outfit, also new dynamo, for motorcycle. Every article is new and guaranteed. Write for description. George Fletcher, Easton, Mass.

SNAPS—FIRST-CLASS 2 K. W. CLOSED CORE Transformer, $27.50. Rotary gap, aluminum wheel, high pitch, with motor, $4.00. 4-in. spark coil, $14.00. Will send on trial. E. H. Easton, Bellingham, Wash.

RECEIVING SETS, ENAMEL WOUND, DOUble slide 12" tuning coils, universal detector, two fixed condensers. Mounted on oak base. Price, $6.00. Wachusett Wireless Supply Co., 50 Mt. Vernon St., Fitchburg, Mass.

E. I. CO.'S TESLA COIL, $3.00. TRANSATlantic phones, $4.50. Andion detector, $3.00. Other goods. Write for list. A. Dunten, Beaver Dam, Wis.

IT IS IMPORTANT THAT ALL INTERESTED in wireless should join the Wireless Association of America, which is helpful to those interested in any way in the wireless industry. For full particulars, address, Wireless Association of America, 231 Fulton St., New York.

A $1.00 Safety Razor FREE!

WITH TWO YEARS' SUBSCRIPTION TO MODERN ELECTRICS

You Save 100%

RANDALL SAFETY RAZOR and 12 blades,	$1.00
MODERN ELECTRICS, two years . . .	3.00
Total	$4.00
Our "GET ACQUAINTED" Offer, both for	2.00

SAVING $2.00

This RANDALL SAFETY RAZOR which retails regularly at $1.00, consists of:—

The Randall Razor Frame which is made of brass, heavily nickel-plated.

Twelve Blades given **FREE** with each set, represent the highest perfection in manufacturing, being made of the highest tempered steel, skillfully ground and honed to the keenest edge.

The Case is almost identical to those supplied with the standard safety razors sold at higher prices. It is of chase leather, with a special fastening device to lock it, and is lined with a rich plush.

This Combination has created what is to-day recognized as the simplest, most useful and practical safety razor yet devised irrespective of price, and is given with the **IRON CLAD GUARANTEE** that if it does not give satisfaction in every respect your **money will be refunded without a word.**

This Razor Given Absolutely FREE with Two Years' Subscription to

MODERN ELECTRICS

MODERN ELECTRICS

"THE ELECTRICAL MAGAZINE FOR EVERYBODY.

The Brightest and Most Interesting Electrical Magazine Published. With New Departments on "Aeronautics" and "With the Inventor," NEARLY FIVE YEARS OLD. Containing 96 to 128 pages monthly, written in a popular style to interest and to be understood by everybody.

The Magazine to Read if you want to keep up to date on Wireless and progress in electricity. ACCEPT NOW this unusual offer and mail coupon TO-DAY. Add 16c. for mailing and packing razor,

15c per Copy
$1.50 per Year
SOLD ON NEWSSTANDS

MODERN ELECTRICS, 231 Fulton St., New York, N. Y.
Enclosed find $2.16 (cash, stamps or M. O.), for which send me prepaid one Standard Randall Safety Razor on terms described in this advertisement and Modern Electrics for two years to the address below.

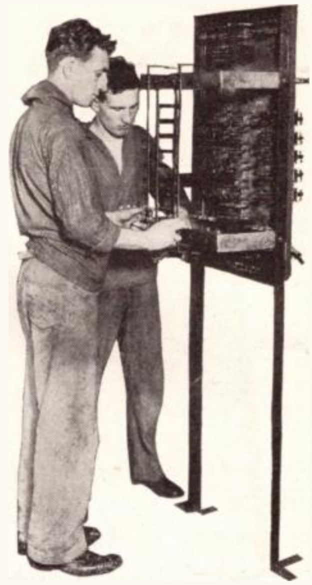
Name..............................

Street..............................

City and State..............................

Note---For N. Y. City or Canada add 35c.; Foreign, 60c.

Electrical Experience Counts



Constructing a Fire Control Telephone Board, Navy Electrical Class

IF YOU have had practical experience at electrical work, fine positions are waiting for you in the United States Navy.

If you are a telegrapher, the navy can make you a radio (wireless) operator.

If you are already a radio operator, you can be advanced promptly to important positions.

It is very much worth the while of every ambitious young man between 18 and 25, of good physique and morals, and possessed of a knowledge of electricity, to look into the work of the Electrical Branch of the Navy.

The pay is excellent, and is clear of all living expenses. The chances to learn the trade thoroughly and to be promoted to positions of responsibility are unusual. And the healthy life, the stimulating companionship of fine young fellows, the incentive to save money are unequalled anywhere in civil life.

Send for particulars. Complete information regarding the electrical schools at the New York Navy Yard and at Mare Island will be mailed you on request. Also details that will inform you fully about pay, hours, promotion, etc. Write a post card today. Address

Bureau of Navigation, Box 10, Navy Department, Washington, D.C.

UNITED STATES NAVY

Know Electric Lighting from A to Z

Whether you're electrician, contractor, building manager or just a plain, ordinary user of electricity, you need to be posted on what the best lighting systems are and how to install them, what kind of lights are most efficient in this type of building and what in that.

"MODERN ILLUMINATION" Answers Your Questions. It's a Book of Solid, Scientific Knowledge for Student, Electrician, Contractor and User.

It's the last word in illuminating science and construction—chock full of the information you want—written in a way you'll understand.

The authors, Henry C. Horstman and Victor H. Tousley, are recognized authorities on applied electrical science. Among the subjects they treat are: Nature and Properties of Light—Photometry and Illumination Calculations—Construction Uses, Advantages and Disadvantages of Different Types of Lamps—Reflectors—Fixtures—Location of Lamps—Indirect Lighting. One chapter discusses Practical Requirements for Different Rooms and Buildings, another, Directions for Drawing Up Plans and Specifications.

Modern Illumination is published in pocket size, for ready reference, handsomely bound in limp green morocco, stamped with gold, and is printed in clear type on good paper. It contains over 250 pages of reading matter, with practical tables, illustrations and diagrams.

ORDER A COPY ON APPROVAL—MONEY BACK IF YOU SAY SO

Send us $2 and we'll send you a copy of "Modern Illumination," charges prepaid. Look it through and if you don't believe it's worth the price, send it back at our expense and we'll refund your money.

DESCRIPTIVE FOLDER SENT ON REQUEST.

FREDERICK J. DRAKE & CO., 1321-27 Michigan Ave., Chicago

Modern Electrics

VOL. V. JULY, 1912 No. 4

The Practical Electrician

A Popular Course in Electricity on the Construction of Electrical Apparatus and Experiments to be Conducted with them

By PROFESSOR W. WEILER, of the University of Esslingen, (Germany)
Translated by H. GERNSBACK

CHAPTER III

(Continued)

APPLICATION OF THE FOREGOING TO THE TANGENT GALVANOMETER.

IF a circular conductor, A B C, Fig. 115, is placed in the magnetic meridian, and if there is hung in the center of the conductor a cocoon thread, to which is attached a small magnet, which is so short that its length, in relation to the diameter of the ring, is negligible, for instance if the length of the magnet is only 1-20 of the diameter of the circle, then the needle is suspended in a uniform magnetic field, produced by the current, the lines of force of which run perpendicular to the magnet. Now it is well known that the strength of the magnetic field increases in the same proportion as does the current strength; and the magnet will, therefore, be turned from its original position, through an angle which becomes greater the stronger the current. The close relations of the current and the deviation angle of the magnetic needle to each other becomes clear from the following considerations.

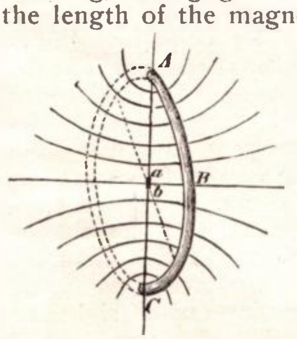


Fig. 115

The directive force of the earth on the poles of the needle is constant, and can be represented by the ordinate, OB, Fig. 116. A current, flowing in the plane of the meridian, produces a magnet field, the lines of which act perpendicular to those of the field of the earth. The action of the current can, therefore, be represented by the abscissa, OA, which is at right angles to OB.

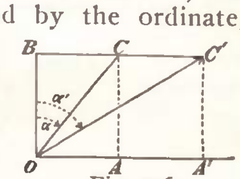


Fig. 116

On the one pole of the needle, therefore, two forces, OB and OA, are acting, and their resultant, from the law of the parallelogram of the forces, is along the diagonal, OC, and the deviation angle equals a. If one doubles the strength of the current flowing through the conductor, it is evident that its effect on the needle will be OA' = 2OA, and as the effect of the earth is constant, the needle will fall in the direction OC′ and its deviation equals a′. Straight lines going out from the needle will, therefore, cut off the line BC′ = 2BC. The lines BC, BC′, etc., are what is known, in trigonometry, as the tangents of the angles a, a′, etc. Therefore, it will be seen that it is not the turning angles which increase proportionately with

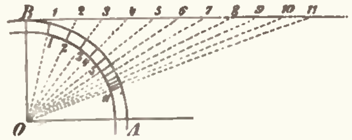


Fig. 117

the currents' strength, but with their tangents.

In order to make it unnecessary to refer constantly to a table of tangents, construct one-half of the scale as follows:

Fig. 117. Draw the quarter circle, OBA, and a tangent to the point, B. On this tangent lay off equal distances, 1 to 11, and draw lines through these points, and the center, O, and mark the points where these lines intersect the arc, AB, 1 to 11, to correspond with the divisions on the tangent. If it is desired that the parts of the arc should not alone be proportional to the tangents of the angles, see Fig. 116, but proportional to the tangents which correspond to the arcs, one arranges the tangent to be equal the radius (tangent 45° = 1; in Fig. 117 B4 = BO), divide the tangent in 45 equal parts. Now place 45 of the same parts on the continuation of the

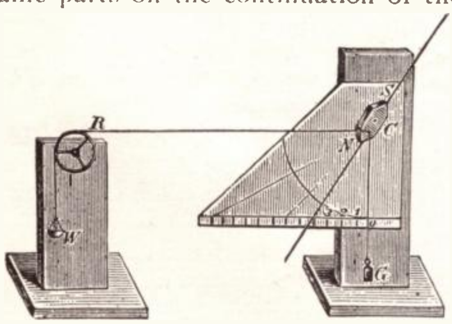


Fig. 118

tangent and connect the various points with the center.

From this it will be seen that a tangent scale is very uneven, as may be seen by studying Fig. 117. It will be seen that the parts 7, 8, 9, 10 and 11 on the scale comes very close together and opens up the higher, the scale goes.

82. Mechanical Explanation of the Tangent Law.

Construct an apparatus as shown in Fig. 118. This may be constructed entirely of wood, a small wheel and a few odds and ends.

The short wooden block, NS, represents the magnetic needle. This piece of wood turns around its center, C, which may be an ordinary nail. It will now be seen that two different forces act upon N; namely, the weight, G (one or two ounces), and the changeable weights which are placed in the scoop, W (made of cardboard).

The height of the roll, or wheel, R, is such that the cord, RN, runs horizontally, when NS stands vertically, i.e., when there is no weight in the little scoop.

If the wheel, R, is placed sufficiently far from NS, the string, RN, will always remain almost horizontal, even if NS is deviated. The thin hand on NS moves over a vertical scale, which is divided into equal parts, as shown. This scale may be made of cardboard. If the hand shows 1, if, for instance, 1 ounce is placed in the scoop, it will be pointing to two when double the weight is used. If three times as much weight is used it will point to three, and so on. This condition is best seen from the deviation angle of 45°.

At 45° the needle is deviated at its greatest angle, and this is, therefore, the sensitivity angle of the tangent galvanometer. The deviating values are, therefore, proportionate to the scale parts 01, 02, and 03, and so on; and, inasmuch as these themselves are tangents, the tangent law will hold good, inasmuch as the following requirements are covered:

1. The weight, G, does not change in direction nor size if NS is changed.
2. The deviating force always acts in the same direction and at right angles to the directionary force.

83. Voltmeter—Faraday, 1335.

Referring to Figs 106 and 107, if we fill the tangent ring with about fifty convolutions of very fine silk insulated wire, about No. 36 B. and S., in such a manner that the resistance of the ring is about 100 ohms, a deviation of 45° of the needle equals a pressure of 10 volts. If we use No. 41 B. & S., we find that 100 ohms. requires 129.5 ft.; therefore, it will be seen that for fifty convolutions only 91.5 ft. are required; therefore, the difference, 38 ft., cannot be wound on the ring. This extra wire is, therefore, wound on a small wooden spool, befilar, and this spool may be glued on a base.

An angle of deviation of the needle of 45° corresponds to five ampere turns. The same effect may be had of fifty turns through which flows 1/10 ampere, which equals 10 volts divided by 100 ohms. If we leave in the groove the original five turns of the heavy wire, and if we wind the fine wire on top of this, connecting each end, to separate binding posts, we have a combination volt-ammeter in one instrument. It should be observed that the voltmeter, Fig. 119, is connected in shunt with, or directly across, the supply line, AB, while the ammeter is connected in series. It is well to remember that the voltage, or E.M. F., of supply of current can only be measured accurately when no current, or only a very minute amount of current, flows through the measuring instrument. For this reason it is necessary that the instrument have a very high resistance, in order that the resistance of conductors of the current supply can be neglected. A voltmeter is, therefore, a galvameter, having a very high resistance. It is, therefore, possible for any galvometer, which has been gauged properly, to measure the electric tension, or E.M.F. Ordinarily, different resistances are included with such galvanometers, which makes it possible to measure different voltages.

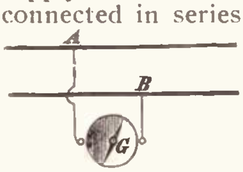


Fig. 119

84. Calibrating a Voltmeter.

One method of doing this is shown in Fig. 120.

B represents a battery of several cells in series; ac represents a German silver wire, size about No. 14 or 16, B. & S. This wire forms a part of the circuit of the battery, B. The voltmeter to be calibrated, G^1, is placed in shunt with the wire ac, in such a manner that ab = 1000 parts; in another shunt we find a key, S, a galvanometer G^2, and a precision Daniell battery, N, which is connected in opposition to the battery, B, on a length, ac = 1110 parts.

The wire, abc, is stretched over a measuring rod having 1000 divisions in the length adopted for the resistance, ab.

The contact, C, can be moved back and forth along the German silver wire. The short circuiting strip, R, is now moved back and forth till no current

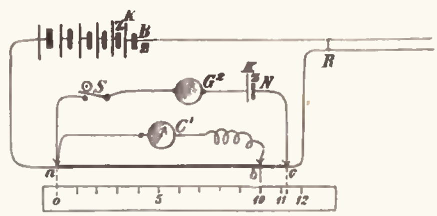


Fig. 120

can be obtained in G^2. When this point is reached there will be a difference of potential of 1 volt between a and b, as a normal Daniell battery measures 1.110 volts (1110 parts = 1.110 volts and 1000 parts = 1 volt). The circuit of G^2 is only closed, through S, temporarily, in order that the current remain constant in N.

Another method, shown in Fig. 121, is effected by means of the copper voltameter.

The principle: · A current, from the battery, B, which has a very small internal resistance, but a constant electromotive force, is sent through the voltameter, V, filled with sulphate of copper, the negative electrode having been weighed previously. The current now passes through the resistance, w,

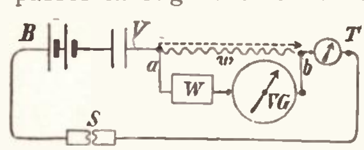


Fig. 121

which equals 1 ohm. The wires of this resistance must be heavy, so that the current will not heat same A key, to open and close the circuit, is shown at S. Between the two ends, a and b, of the eesistance, connect the voltmeter, to be calibrated, VG, and a variable resistance, W, the amount of which latter depends upon the sensitiveness of the voltmeter, VG; for instance, if VG has a resistance of 250 ohms., and if the current passing through ab is 1.8 amperes, W will have upwards of 10000 ohms. If the current flowing through ab, and which has been ascertained also through the tangent galvanometer, T, 1.8 amperes, we will have a potential difference between ab, from ohm.'s law, of 1.8 volts; for 1.8 amperes equals V divided by 1; therefore, $V = 1 \times 1.8 = 1.8$ volts. The resistance, W, is changed in such a manner that the deviation of the voltmeter, VG, remains within the scale.

The experiment: Close the circuit by means of the key, S, for 30 minutes. Note the tanget galvanometer and voltmeter deviation, every two minutes, to be certain that the current remains constant. At the end of the 30 minutes, open the current and weigh the negative electrode again. Let us say the electrode has gained p grams; therefore, it would have gained in one hour two p grams.

The average intensity, I, has now been $\frac{2p}{1.18}$ amp. because 1 ampere deposits, in one hour, 1.18 grams copper. Also, the potential difference, V, between a and b has been $\frac{1 \times 2p}{1.18}$; because $V = w \times I = \frac{1 \times 2p}{1.18}$.

If d is the average of the observed deviations of the voltmeter, VG, we will have 1 volt $= \frac{1.18 \times d}{2p}$ scale parts.

(To be continued.)

STRENGTH TESTS ON CROSS ARMS.

Recent tests made by the Forest Service of the United States Department of Agriculture upon 84 six pin six foot cross-arms, approximately 3¼ wide by 4¼ deep, these cross-arms being divided into twelve groups, according to the kind and quality of wood from which they were made, has shown that even the weakest of the cross-arms developed sufficient strength to withstand side stress due to the pull of the wires which would be attached to them in practice, to more than break the pole —in other words, the pole would fail before the cross-arms.

THE POULSEN SYSTEM IN AMERICA.

The Federal Telegraph Company, of San Francisco, Cal., which uses the Poulsen wireless system, has acquired the exclusive rights for the United States, Alaska, Cuba, Panama, Porto Rico, Hawaiian Islands and Philippine Islands, and the trans-marine rights of Valdemar Poulsen, of Copenhagen. It is stated that a speed of 400 words per minute is possible by this system. The Federal Company now has fourteen stations on the Pacific Coast and it is stated the company will establish stations throughout the United States for overland commercial service. Its factory and laboratories are at Palo Alto, Cal.

WIRELESS TELEGRAPHY AT SEA.

It is stated that since the beginning of 1909 the passengers on twenty-two shipwrecked vessels have owed their lives to the fact that the ships were equipped with a wireless telegraph system, and were consequently able to send out messages for assistance.

NEW WIRELESS BLUE BOOK.

NOTICE.

The United States has arranged to carry out the Berlin Wireless Telegraphy agreement for systematizing the call letters of American ships. So far the International Bureau has assigned the series beginning with K and W to American merchant vessels and yachts, and the series beginning with N to the vessels in the United States Navy. This means that a great many calls will be readjusted, and for this reason our Wireless Blue book, which was to come out in July, will not come out until December 1st.

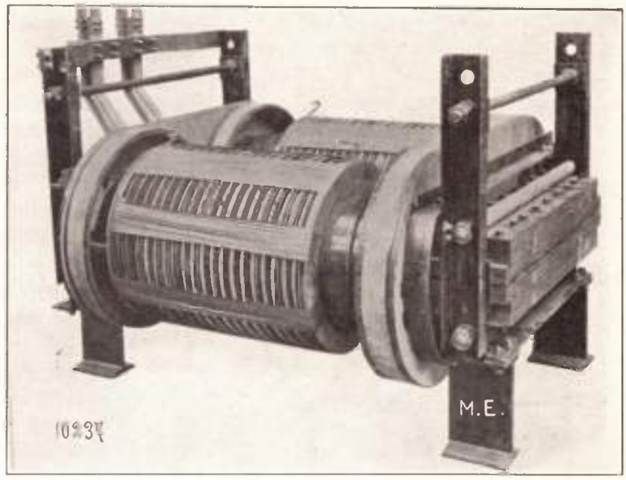
We have furthermore decided upon making a very large book of the wireless blue book, instead of the small booklet, and we will, in our August issue, announce the contents of the new book.

The members who have registered, so far, will, of course, be listed in the new book.

For further particulars as to the new book, address Blue Book Department, 231 Fulton St., N. Y.

Swiss Testing Transformer

Following the American practice, there has been a steady increase in transmission line voltages in Europe. Also, following the American idea, transmission line apparatus and insulators are tested at twice the full line pressure. This has necessitated the design of testing transformers to supply the high potential alternating current used in making the tests. The accompanying photographs show a transformer, designed and built by the Swiss Oerlikon works. It is quite different from American transformers, both as to the disposition of the windings and the position of the core, which is horizontal. In American transformers the core is, in almost every case, vertical. Just why the core of this transformer is horizontal is not apparent, for it is considered that the vertical placing of the core and windings allows a better



circulation of the oil in which they are immersed. This transformer is rated at 25 kilovolt-amperes and a voltage of 200,000. This seems rather small when compared with the 500,000 volt testing transformer, details of which were given in June number, but it is interesting to compare them in other respects.

MARCONI COMPANY BIDDING ON GOVERNMENT CONTRACTS.

The Marconi Wireless Telegraph Company of America recently started a campaign of advancement by bidding on and taking contracts to supply the U. S. Government with radio communication apparatus, and placing before the public a line of experimental radio apparatus, at the same time employing engineers capable of carrying out this and other work.

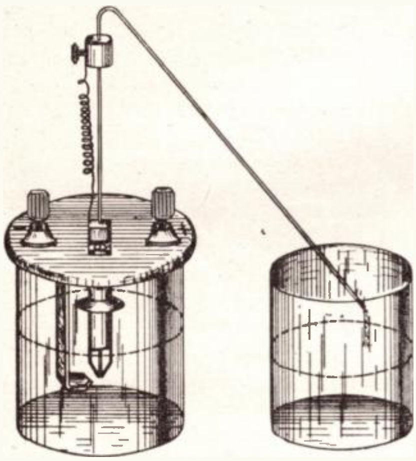
NO MORE LOVE-MAKING BY WIRELESS.

It is stated that a Government censorship of wireless messages has been established at Newport, R. I., in order to stop the sending of love messages from women ashore to sailors on ships. One Boston girl asked her "Darling Jack," who was with the fleet, to come back to her as soon as possible because she had not been kissed in so long a time that her lips were dry. The unsentimental Government authorities state that important business has been interfered with by trivial messages.

A Purely Electric Pump

By H. Gernsback.

Experimenting with the electrolytic interrupter, bearing the author's name, the idea occurred to him to use a metal tube as the anode, instead of the regular metal rod. It was thought that a more even wearing, at the lower extremity, would result. An ordinary brass tube ⅛ inch outside diameter with 1/16 inch bore was tried first. As soon as the interrupter was put in operation, a surprising phenomenon took place; the electrolyte of the interrupter rose up through the metal tube, and with such force that a fountain-like stream, over two feet in height, spurted from the upper end of the brass tube. The interrupter itself worked as well as with a solid rod, perhaps even a little steadier.



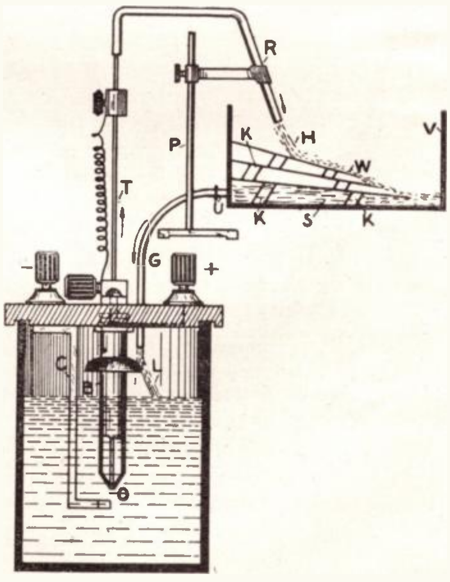
M.E. FIG. 1

It is, of course, well known that the electrolyte always tends to rise in the porcelain (or glass) tube, G, of an electrolytic interrupter, no matter what its construction, or principle. For this reason electrolytic interrupter tubes invariably have an overflow arrangement, not far from the upper end.

While the rising of the electrolyte in the interrupter has, of course, been well known, the author has never seen any mention of the subject of actually using this action for pumping electrolyte from a lower level to a higher one. At first thought, it might be reasoned that inasmuch as only an acid solution can be pumped, (the electrolytic interrupter only working well with acid electrolyte), the phenomenon, while interesting, would be useless for practical purposes. Although we have here a purely electric pump, operated solely by electricity, no motor, valves, etc., of any kind being used, it is of course obvious that, even if some industry, (for instance, a storage battery plant), could use the principle to pump acid from one floor to another, the "pump" would be pretty expensive in operation, besides which, its capacity would be ridiculously small. Furthermore, the electrolyte, when leaving the metal tube, is quite hot. The author, however, applied the principle, with success, to the electrolytic interrupter itself, to overcome one of the latter's main difficulties:—the heating of the electrolyte.

The arrangement as shown in Fig. 2, was used successfully.

A, shows the electrolytic interrupter, with the porcelain tube, B. C., is the cathode, T, the anode, the brass tube, pumping the electrolyte. The anode is prevented from dropping through the bottom of the tube, B, as the opening, O, is slightly smaller than the outside diameter of the brass tube. The anode—tube, T,



M.E. FIG.2

in the author's arrangement, is about 1½ feet long. At the upper end, connection is made with a soft rubber tube, R, which is necessary as the anode, T, wearing away, at O, becomes gradually shorter. Hence the flexible rubber tube.

On a higher level, is placed a vessel with an outlet tube, U. In this vessel a cascade arrangement is built, by means of pieces of window glass, W. These glass plates are about one inch apart, from each other, and are slightly inclined, as shown. They are kept apart by glass spacers, K. It will be seen that the glass plates are of unequal length, each being about 1½ inches shorter than the one immediately underneath it. The rubber tube, R, is held in position by the stand, P.

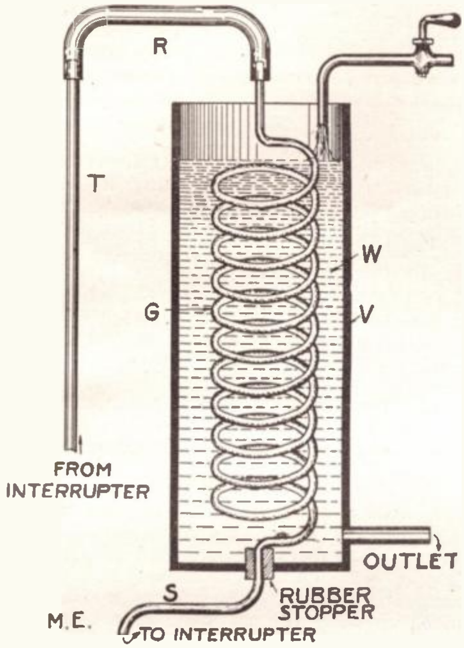


FIG. 3

As soon as the interrupter is started, the acid rises energetically, in T, flows through R, and falls on the cascade, at H. Thence it falls, over all the glass pieces, to the bottom of the vessel, V. Being distributed over a large area, the electrolyte cools rapidly, and, by the time it collects, at S, it is tolerably cool. The acid now leaves, by the tube, V, through tube G, and falls down into A, at L, after which the circulation commences anew.

It is, of course, evident that the electrolyte will circulate as long as the interrupter operates.

A simpler plan, for successfully cooling the electrolyte, is shown in Fig. 3, although water circulation, from the hydrant, is necessary in this arrangement. A glass tube spiral, G, is placed in a vessel, V, which may be of glass, or metal, or even a wooden pail will serve the purpose. To make the vessel watertight, the lower end of the glass spiral passes through a soft rubber stopper, as shown.

The electrolyte, coming from the interrupter, through the anode-tube, T, passes through the soft rubber tube, R, and thence through the glass spiral, G. It leaves, by way of S, and returns to the interrupter. The glass spiral, G, is constantly cooled by the cold water, W, supplied from the watermains. W flows out through the outlet at the bottom of V.

DO SOLAR ECLIPSES AFFECT WIRELESS?

Experiments to determine the effect of a solar eclipse on wireless telegraphy were made at the station in Eiffel Tower, Paris, on April 23. Messages were dispatched continuously from the moment the shadow appeared until it passed. It has long been observed that the distance over which wireless communication can be maintained varies greatly according to the time of day and the direction. Maximum results are obtained at night. It is assumed that solar influences are responsible for this variation, but just what is their nature or extent is not clearly understood. It is expected that the experimentation during the partial eclipse will reveal something of scientific value.—*Electric,* St. Louis.

EARTHQUAKE DATA BY WIRELESS.

Wireless telegraphy is to be used by the German seismological observatories to get from other such stations facts respecting the elements of earthquakes that are felt throughout the world; the object being to enable observers to give not only the distance of the quake from the epicenter, but also its exact location.

Heretofore the German observatories have depended on the announcements sent forth by the Central Telegraph Office in Berlin, either by telegraph or telephone, and these have frequently been subject to delay. Under the new system data sent by wireless will be received instantaneously. Observatories equipped with wireless have also the advantage of receiving the time signals distributed by the coast stations. —*Electric St. Louis.*

Wireless Telegraphy

By Guglielmo Marconi.

THE mystery enveloping electricity began to dissipate when it was suggested by Ampere that the theory of a universal ether, possessed of purely mechanical properties, might supply the means of explaining electrical facts. This view was upheld in America by Joseph Henry, and in England by Michael Faraday.

When Maxwell published in 1864 his splendid dynamical theory of the electromagnetic field, and worked out mathematically the theory of ether waves; and Hertz proved experimentally the correctness of Maxwell's hypothesis, we obtained perhaps the greatest insight into the hidden mechanisms of nature which have yet been made by the intellect of man.

An age of progress such as this has made wireless telegraphy possible. Its basic principles are established in the very nature of electricity itself: its evolution has placed another great force of nature at our disposal.

The phenomena of electromagnetic induction, which was chiefly revealed to us by the researches and discoveries of Ampere, Faraday, and Henry, had long since shown how it was possible for the transmission of electrical energy to occur across a small space between a conductor traversed by a variable current and another conductor placed near it; but the fact that waves of electrical energy could be created in space was not realized until Hertz proved experimentally in 1887 the correctness of the dynamical theory of the electromagnetic field enunciated by Maxwell in 1864.

I shall not take up your time in explaining what is now well known to the majority of engineers, as to the methods used for producing waves for early experimenters. I will, however, mention that Hertz first clearly demonstrated that if metallic bodies are charged with opposite electricity and then suddenly discharged, high-frequency oscillations are set up in the two bodies or plates, and as a result energy in the form of electric waves is transmitted or radiated into space.

These waves were demonstrated by Hertz and others to follow the laws of reflection, refraction, polarization, etc., in the same manner as the waves of light. The length of electric waves used in wireless telegraphy is, however, very great in comparison with light waves; and the former, although invisible to the human eye, have the advantage over light of not being absorbed by fog or mists, and of being able to go through or around obstacles which stop the propagation of light.

With the apparatus available up to 1895, it had long been possible to detect the effects of electric waves over only very short distances—not more than a few hundred yards—hardly farther, in fact, than the space over which one can make one's self heard by shouting. It is therefore not surprising that the useful application of these waves to actual telegraphy was not then attempted, or, I might say even realized.

In August, 1895, I discovered a new system which enormously increased the distance over which one could transmit and detect electric waves, and which proved at once sufficient to remove the limitations besetting the transmission and detection of electric waves over long distances.

The interference of obstacles began to disappear, and by means of suitable transmitters and receivers capable of being worked, not simply as laboratory apparatus, but as real and efficient telegraph instruments, the range over which one could telegraph was increased at a surprising rate.

* * * * * *

It is easy to understand how by pressing the telegraphic key which controls the charging current, for longer or shorter intervals, it is possible to emit a long or short series or succession of waves, which, when they reach a suitable receiver, will induce in it minute sympathetic currents for corresponding long or short periods, and in this manner faithfully reproduce the Morse or other signs transmitted from the sending station.

It is well known that rapid electrical oscillations in a wire produce two effects in external space called, respectively, electric and magnetic force. In the case of a simple vertical air-wire, the magnetic force is distributed along certain looped lines in the plane of the wire. As the currents in the air-wire reverse their direction, the magnetic and electric force in space also reverse, but not everywhere at the same moment.

The magnetic and electric forces are "affections" or states of the ether: and in virtue of the inertia or elasticity of the medium they are propagated from point to point with a definite velocity, which is the same as that of light.

In 1900 I first put into practice the arrangement which is now in general use and which consists of the inductive association of the elevated radiating wire with a condenser circuit, which may be used to store up a considerable amount of electrical energy and impart it at a slow rate to the radiating wire.

As is now well known, the oscillations in a condenser circuit, which were studied so profoundly by Franklin, Henry, Faraday, Maxwell, and Kelvin, can be made to persist for what is electrically a long period of time; and it can be arranged, moreover, that by means of suitable aerials or antennæ these oscillations are radiated into space in the form of a series of waves which, through their cumulative effect, are eminently suitable for enabling good tuning and syntony to be obtained between the transmitter and receiver.

* * * * * *

When, 15 years ago, communication was established by means of wireless telegraphy, between England and France, over a distance of 30 miles, much discussion and speculation took place as to whether or not wireless would be practicable for much longer distances than those then covered. A somewhat general opinion seemed to prevail that the curvature of the earth would be an insurmountable obstacle to long-distance transmission, in the same way that it is an obstacle to signaling over considerable distances by means of light flashes. Difficulties were also expected as to the possibility of preventing mutual interference with short distance stations, and also in regard to the practical control of the large amount of energy necessary to cover long distances.

What often happens in pioneer work repeated itself in the case of radio-telegraphy. Supposed obstacles or difficulties were often purely imaginary, or else easily surmounted; but in their place unexpected barriers manifested themselves; and recent work has been mainly directed to the solution of problems presented by difficulties which were certainly neither expected nor anticipated when long distances were first attempted.

In January, 1901, I carried out some successful experiments between two points on the south coast of England, 186 miles apart, namely, St. Catherine's Point, in the Isle of Wight, and the Lizard in Cornwall. The total height of these stations above sea level was only a fraction of what would have been necessary to clear the curvature of the earth. The results obtained from these tests, which at the time constituted a record distance, seemed to indicate that electric waves would most probably be able to make their way round the curvature of the earth, and that therefore even at greater distances, such as those dividing America and Europe, the fact of the earth's curvature would not constitute an insurmountable barrier to the extension of wireless telegraphy through space.

The belief that the curvature of the earth would not stop the propagation of the waves and the success obtained by syntonic methods in preventing mutual interference, led me, in 1900, to decide to attempt the experiment of proving whether or not it would be possible to detect electric waves over such a distance as 2,000 miles.

The experiment was, in my opinion, of great importance from a scientific point of view; and I was convinced that the discovery of the possibility of transmitting electric waves across the Atlantic Ocean and the exact knowledge of the real conditions under which wireless telegraphy over long distances could be carried out, would do much to improve our understanding of the phenomena connected with electric wave transmitting.

The transmitter erected at Poldhu on the coast of England was similar in principle to the one I have already referred to, but on a very much larger scale than anything previously attempted. The power of the generating plant was about 25 kilowatts. Numerous difficulties were encountered in radiating and controlling for the first time electrical oscillations of such power.

My previous tests had convinced me that when endeavoring to extend the distance of communication it was not merely sufficient to augment the power of the electrical energy of the sender, but that it was also necessary to increase the area, or height, of the transmitting and receiving elevated conductors.

As it would have been too expensive to use vertical wires of very great height, the only alternative was to increase their size in capacity which, in view of the facts I had noticed in 1895, seemed likely to make possible the efficient utilization of large amounts of energy.

The transmitting elevated conductor employed at Poldhu during the experiments with Newfoundland, consisted of fifty almost vertical copper wires, supported at the top by a horizontal wire stretched between two masts 160 feet high and 200 fet apart. These wires converged together at the lower end in the shape of a large fan, and were connected to the transmitting instruments which were placed in a building.

Tests were commenced by myself early in December, 1901, at a temporary receiving station erected at St. Johns, Newfoundland. On the twelfth of that month the signals transmitted from England and chiefly consisting of repetitions of the letter "S" were clearly and distinctly received by myself and my assistants in Newfoundland.

Confirmatory tests were carried out a few weeks later between Poldhu and a receiving station on the steamship *Philadelphia*, of the American Line. On board this ship readable messages were received by means of a recording instrument up to a distance of 1,551 miles, and test letters as far as 2,099 miles from Poldhu. The messages received on the *Philadelphia* at the various distances were recorded on tape and were exceedingly clear and distinct, as can be seen by the tapes in my possession.

These results, although achieved with imperfect apparatus, were sufficient to convince me and my co-workers, that by means of permanent stations and by the employment of sufficient power, it would be possible to transmit messages across the Atlantic Ocean in the same way as they were sent over shorter distances. The tests could not be continued in Newfoundland, owing to the hostility of the cable companies, which claimed the rights for telegraphy, whether wireless or otherwise, in that colony. For this reason the base of my experimental and practical work in transatlantic telegraphy was transferred to Canada.

The transmission of electric waves across the Atlantic Ocean first achieved in 1901, constituted in itself a discovery which the American Institute of Engineers was the first as a scientific and technical body to notice and commemorate.

Although it may be said that no apparatus, new in principle, was used to obtain the result, still the fact of being able to transmit and receive electric waves over a distance of 2,000 miles, constituted in itself an absolute confirmation of my views to the effect that electric waves could travel over such enormous distances, and that the curvature of the earth and other supposed obstacles would not prevent them being employed in carrying on the intercourse of human intelligence over any distance separating parts of our little planet.

It is also interesting to note that no other effect which we can produce or control has ever been detected at such great distances unless guided by some artificial conductor, such as wire or cable.

A result of scientific interest which I first noticed on the steamship *Philadelphia*, in 1902, and which still remains a most important factor in long distance space telegraphy, is the detrimental effect produced by daylight on the propagation of electric waves over great distances.

The generally expected hypothesis of the cause of this absorption of electric waves in sunlight, is founded on the belief that the absorption is due to the ionization of the gaseous molecules of the air, effected by ultra violet light, and, as the ultra violet rays which emanate from the sun are largely absorbed in the upper atmosphere of the earth, it is probable that that portion of the earth's atmosphere which is facing the sun will contain more ions, or electrons, than that portion which is in darkness, and therefore, as Professor J. J. Thomson has shown, this illuminated and ionized air will absorb some of the energy of the electric waves.

The wave length of the oscillation employed has much to do with this interesting phenomenon. Long waves are subject to the effect of daylight to a very much lesser degree than are short waves; indeed, in some transatlantic experiments, in which waves about 8,000 metres were used, the energy received by day at the distant receiving station was usually greater than that obtained by night.

The fact remains, however, that for comparatively short waves such as are used for ship communication, clear sunlight and blue skies, though transparent to light waves, act as a kind of fog to wireless waves. Hence the weather conditions prevailing in England, wintry fogs and dull skies, are usually suitable for wireless telegraphy.

Recent observations, however, reveal the interesting fact that the effects vary greatly with the direction in which transmission is taking place; the results obtained in north and south transmission being often altogether different from those observed in an east and west one.

Research in regard to the changes in the strength of the received radiation which are employed for telegraphy across the Atlantic has recently been greatly facilitated by the use of sensitive galvanometers, by means of which the strength of received signals can be measured with a fair degree of accuracy.

In regard to moderate power stations such as are employed on ships and which in compliance with the International Convention, use wave lengths of 300 and 600 metres, the distance over which communication can be effected during daytime is generally about the same whatever bearing of the ships to each other or to the land stations—whilst at night interesting and apparently curious results are obtained. Ships over 1,000 miles away off the south of Spain or around the coast of Italy can almost always communicate during the hours of darkness with the Post Office stations situated on the coasts of England and Ireland, whilst the same ships when at a similar distance on the Atlantic from the westward of these islands and on the usual track between England and America, can hardly ever communicate with these shore stations unless by means of unusually powerful instruments.

It is also to be noticed that in order to reach ships in the Mediterranean the electric waves have to pass over a large portion of Europe and in many cases the Alps. Such long stretches of land, especially when including very high mountains, constitute, as is well known, an insurmountable barrier, to the propagation of short waves during daytime. Although no such obstacles lie between the English and Irish stations and ships in the North Atlantic en route for North America, a night transmitter of 1,000 miles is there of exceptionally rare occurrence.

These conclusions have been arrived at after careful examination of the reports of the working during the last two years of several hundred ship and shore stations situated in the different parts of the world.

Although high-power stations are now used for communicating across the Atlantic Ocean, and messages can be sent by day as well as by night, there still exist periods of almost regular daily occurrence during which the strength of the received signals is at a minimum. Thus in the morning and evening when in consequence of the difference in longitude, daylight or darkness extends only part of the way across the ocean, the received signals are at their weakest. It would almost appear as if electric waves in passing from dark space to illuminated space and vice versa were reflected and refracted in such manner as to be diverted from the normal path.

Later results, however, seem to indicate that it is unlikely that the difficulty would be experienced in telegraphing over equal distances north and south on about the same meridian, as in this case, the passage from daylight to darkness would occur more rapidly over the whole distance between the two stations.

I carried out a series of tests over longer distances than had ever been previously attempted in September and October of 1910, between the stations of Clifden and Glace Bay and a receiving station placed on the Italian ship *Principessa Mafalda* in the course of her voyage from Italy to the Argentine.

During these tests the receiving wire was supported by means of a kite, as was done in my early transatlantic tests of 1901, the height of the kite varying from about 1,000 to 3,000 feet. Signals and messages were obtained without difficulty by day as well as by night up to a distance of 4,000 statute miles from Clifden.

Beyond that distance reception could only be carried out during night time. At Buenos Ayres, over 6,000 miles from Clifden, the night signals from both Clifden and Glace Bay were generally good.

It is rather remarkable that the radiations from Clifden should have been detected at Buenos Ayres so clearly at night time and not at all during the day, whilst in Canada the signals coming from Clifden (2,400 miles distant) are no stronger during the night than they are by day.

Further tests have been carried out recently for the Italian Government between a station situated at Massaua, East Africa, and Coltano, Italy. Considerable interest attached to these experiments in view of the fact that the line connecting the two stations passes over exceedingly dry country and across vast stretches of desert, including parts of Abyssinia, the Soudan, and the Lybian Desert. The distance between the two stations is about 2,600 miles.

(To be concluded.)

Paris Letter

APPARATUS FOR RECORDING THE VARIATION OF INTENSITY OF THE SUN'S RAYS DURING AN ECLIPSE.

M. Ancel, a scientist and constructor of instruments, of Paris, has gotten up a new and very ingenious apparatus for recording the variation of intensity of the sun's rays during an eclipse. The essential part of the apparatus is a sensitive selenium cell.

The photograph shows M. Ancel outside his tent at St. Germain, near Paris. He has a small wireless mast and receiving set, by which he receives time signals from the Eiffel Tower.

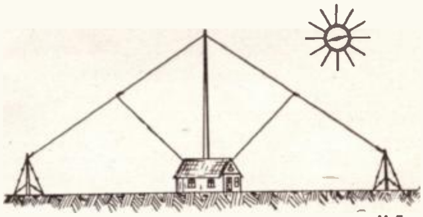
At the right hand end of the table, in front of the tent, is a heliostat, driven by clockwork, to follow the sun's apparent motion, and also on the table, to the left of the heliostat, is a fixed mirror. The light from the sun is reflected by the heliostat to the mirror, and thence to the selenium cell inside the tent. The small square bright spot at the left, inside the tent, is the selenium cell. In the circuit of the cell are a battery of accumulators and a recording instrument which registers the variation of the current through the cell. As the current varies in proportion to the amount of light falling on the cell the record on the chart of the instrument shows the variation of the intensity of the sunlight. The chart also has time interval marks to show the progress of the eclipse. These are made by a pen electrically operated by the observer.

The wireless instruments are in the box at the right of the tent door, and M. Ancel has his finger on the key which controls the pen for recording the time intervals on the instrument chart.

POSITION FINDING BY MEANS OF DIRECTED WIRELESS WAVES.

The Prussian Minister of Public Works some time ago organized an expedition on Lake Müggel, near Berlin, for experimenting with directed wireless waves. The antenna at the sending station had thirty-two masts, not very high, around the central station, these masts being set in a circle of 200 meters diameter. From each of these masts a wire was run to the top of the central tower, and from the middle of each of these wires a drop wire was led to the station and connected to a rotary switch in such a manner that any two wires on opposite sides of the central mast could be connected to the transmitter at will.

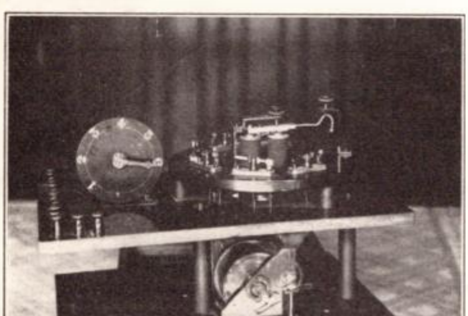
This rotary switch was revolved automatically, and connected to an automatic transmitter in such a manner that a different letter was sent out on each pair of wires. For each pair of wires there is a direction in which the strength of the signals is a maximum, and another direction in which it is a minimum, so that a receiver at a distant post receives one of the letters at maximum intensity. The receiving operator then determines which letter comes in strongest, and by reference to a chart may then find his direction from the transmitting station.



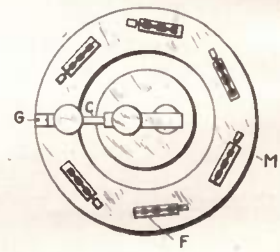
A new system has been devised, using an extra mast at the sending end. The transmitter first sounds a time signal, and then automatically sends out the same signal in each pair of wires in turn. Use is made of a synchronous speed counter at both the sending and receiving ends. The receiving operator, when he receives the time signal, pushes a button which starts his counter running in synchronism with that of the sending station. As soon as the signals die down to a minimum he stops the counter, and then the needle above the counter dial marks the direction corresponding to the minimum point. The time of rotation of the counter is one-half minute, therefore ten series of readings can be made in five minutes, and the average of the ten taken in order to find the direction from the sending station. The transmitter and the rotary switch are operated automatically by electric motor operated switches. With two such sending stations a person in the field can locate his position exactly by the usual method. It is now proposed to use a set of stations located not more than fifty meters apart along the frontier and along the coast for the use of aeroplanes passing above.

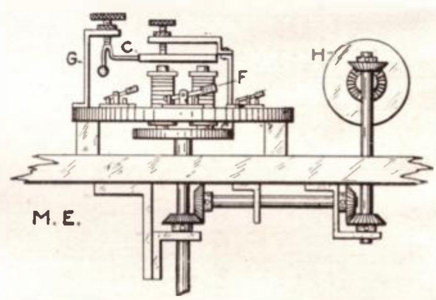
TELE-MECHANIC APPARATUS.

This apparatus, devised by M. Ancel, Paris, may be wirelessly controlled. It is used principally for demonstration purposes. Around an ebonite disc, M, are six rocker switches, each of which



controls a circuit for various electrically operated devices. Mounted on a second disc, in the middle, is a magnet device, similar to an electric bell, which works the armature, O. This disc is rotated by the clockwork under the base board except when held stationary by the stop piece, G. In the circuit of the magnet is a coherer. When wireless waves are sent through the coherer the armature, O, is pulled down and the disc rotates. If waves are sent through while the armature is over any one of the switches the latter is tripped and its contact closed. The operator may open the switch in the same manner, by rocking it back, if need be, or it may be reset by hand. In order to show the sending operator the position of the armature with respect to the various switches an indicator is provided, the pointer of which is operated through a gear train from





the clockwork which rotates the disc carrying the magnet device. This indicator appears at the left side of the apparatus in the photograph.

GENERATOR FOR HIGH FREQUENCY CURRENT.

In Fig. 1, D represents a dynamo, R the resistance, and there are also two circuits, one containing a self-inductance coil, L, and the condenser, C; the second circuit contains the arc apparatus, E, which is shown in Figs. 2 and 3. Within a coil, M, Fig. 2, are two rings, the inner one, A, is solid. while the outer ring, B, is made in segments, H. These rings, A and B, are the electrodes of an arc, G, which, by the action of the magnetic field set up by the coil, M, is propelled round and round with great rapidity. As this arc travels from segment to segment

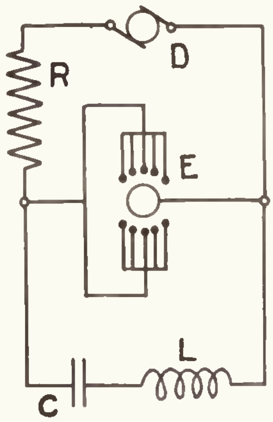


FIG. 1

its resistance changes very rapidly, and also the difference of potential at the ends of the circuit L, C, is varied with corresponding frequency, so that the condenser is charged and discharged a great number of times per second.

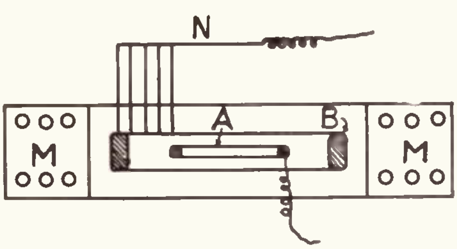


FIG. 2

The circuit L, C, is thus the seat of damped, high frequency oscillations whose period can be regulated by the capacity and inductance in C and L. If the arc can be made to travel around

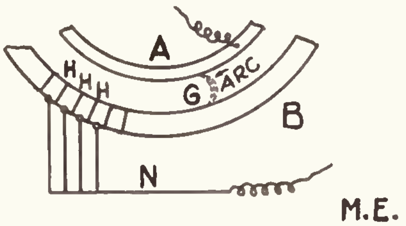
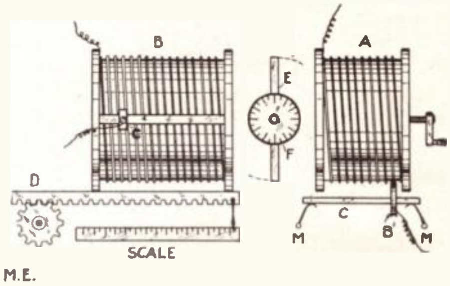


FIG. 3

with sufficient rapidity the frequency of the pulsating voltage applied to the condenser circuit can be made so high that the pulsations will nearly correspond with the charge and discharge of the condenser, and we will then almost have the effect of continuous waves, such as would be suitable for wireless telegraphy and wireless telephony.

WIRELESS APPARATUS.

This device utilizes the principle that a metal plate acts as a shield for high frequency waves and prevents their passage. In this apparatus, which is another form of loose coupled tuner, the coil, A, turned on its longitudinal axis by a crank, has a sliding contact, B, mounted on the rod, C, which is pressed upon by the springs, M, so



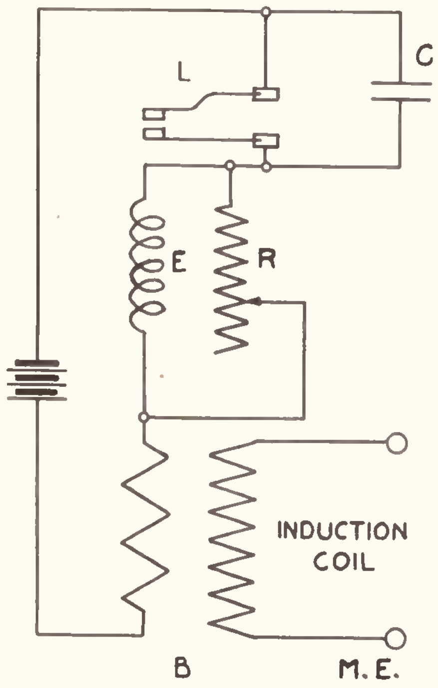
that while B is always in contact with the coil, its position is variable. Coil B is mounted, as seen, on a rack and pinion movement, so that its distance from the coil A may be varied. It is also provided with a sliding contact of the usual type. Between the two coils is mounted a metal plate, E, which may be rotated about an axis in its own plane, using the scale, as seen.

By placing this plate vertical, horizontal, etc., we have a variable shield which allows the current in the coil, B, to have more or less effect on the coil, A.

RAPID BREAK FOR INDUCTION COILS.

This is an arrangement for increasing the number of interruptions in the primary circuit of an induction coil, in order to secure a large number of sparks per second from the secondary, which will produce a musical note at the distant receiver, which is more easily read through interference and atmospheric discharges. With the old form of break, which operates at only forty to fifty times per second, this is impossible. With a vibrator the stroke must be large enough to give a good break, in spite of the mass of the moving parts, so the ordinary type, using an electro-magnet is not very good. Only a low power may be thus used, as is found, for to have a regular rate of vibration the impulses of the magnet must be made too short to allow the current in the primary to rise to a proper value before the rupture occurs.

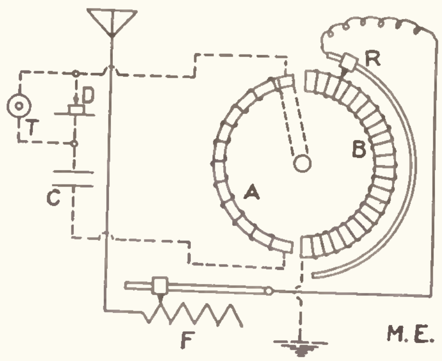
The new type has a resistance shunted around the break, and by the effect of the resistance, R, and the self-induc-



tion of the coil, E, the current in E is retarded and has a lag behind the current in the induction coil primary. It has been found that, with this arrangement and a proper adjustment of the resistance and inductance, a very high rate of interruption is secured. The condenser, C, greatly reduces the sparking at the breaker points.

WIRELESS RECEIVING TUNER.

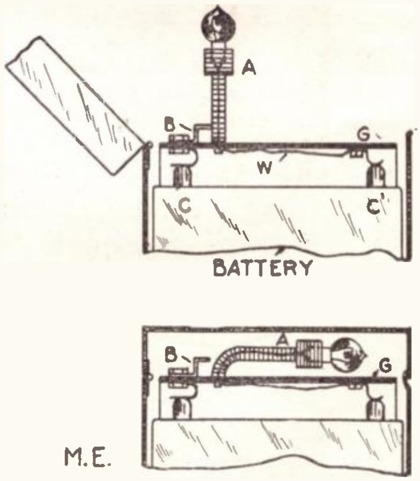
This is a very compact, loose coupled tuner, composed of two coils wound on hollow cores bent in the form of semi-circles. The secondary coil is arranged to telescope into the primary, by turning a handle, which causes the secondary to swing round a central pivot. The primary is provided with a sliding contact, mounted on the curved rod, as shown. The diagram shows the tuner



connected through a loading coil and with an ordinary detector circuit.

POCKET LAMP.

This is a little electric pocket lamp for use in dark places. The battery is easily slipped into the case, and makes contact through the studs, C, bearing against the springs, F. G is a fibre plate, separating the battery compartment from the lamp mechanism. The novelty of the device consists in mounting the lamp socket upon a flexible spring holder. One terminal of the lamp socket is connected to the wire running down through the flexible support, while the other terminal is connected to the support itself. One side of the battery is connected to the

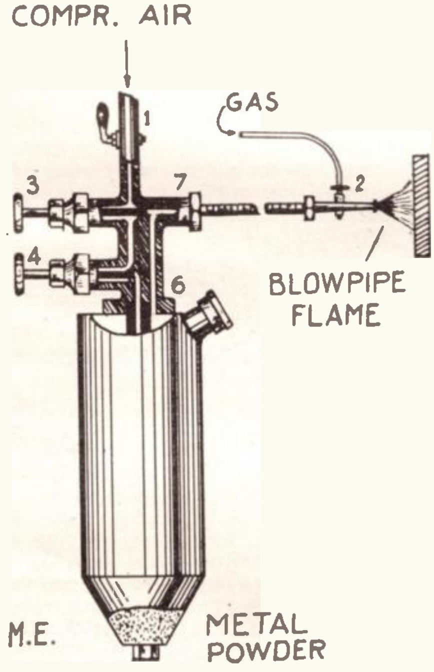


wire, while the other is connected to the fixed contact, B. When the cover is opened the support springs up into contact with B, and the lamp lights up.

When the cover is closed the support is bent down, away from the contact, B, cutting off the current from the lamp and preventing the short circuiting of the battery.

PROCESS FOR METALIZING OBJECTS.

This process, devised by a man named Schoop (Swiss), consists in forcing a metallic powder through a flame at high speed onto an object to be coated. In the accompanying diagram, at 2, in a gas flame; compressed air is admitted at 1, and goes through valve, 4, into the hopper, where it stirs up the powder, and the mixture of powder and air goes out through the passages 6 and 7, thence through the nozzle, and the flame 2. Valve, 3, also admits compressed air into the flame



itself, so that the flame will burn as a Bunsen burner. This method is somewhat remarkable, in that a coating of metal may be applied to almost any surface. An electric resistance may be made by applying a coating upon marble, mica, slate, etc., in a zigzag line and soldering terminals to the ends of the metal coating. It may be used for copper coating the tips of arc lamp carbons and other uses. We have no figures as to the cost of this process as compared with electro-plating.

SPACE.

By Moore Stuart.

While we are studying and mastering the mysteries of Wireless Telegraphy and Telephony do we ever stop and consider the infiniteness of the great ether filled space through which the wireless waves travel untrammeled?

One of the greatest sources of fascination of the starry heavens is the measurelessness of their awful abyss. The ocean of space is so pellucid that in places we seem to see its spangled bottom, but trigonometry is powerless to reach it. Here and there only some projecting reef throws a star gemmed point within reach of the astronomers' sounding line.

Such a spire, situated at a depth hitherto unfathomed, has just been charted by the astronomer Chas. Nordman, who has invented a new method of celestial soundings. The star crag that he has hit is charted by the astronomers under the name of Delta Librae. The length of the mathematical line, which now hangs between it and the earth, is two quadrillions of miles.

It is only step by step that we can comprehend a number like that. Two quadrillions of twenty dollar gold pieces would make one hundred thousand necklaces, each long enough to embrace the earth and moon in a double loop. An express train traveling at 100 miles per hour, and never stopping, would require more than two thousand, two hundred and eighty millions of years to reach it. A projectile flying 3,000 feet per second, or, in round numbers fifty thousand miles per day, would require about one hundred and ten millions of years to reach Delta Librae. Light, the swiftest thing known to exist, if we may trust the recent calculations based upon radioactivity, and which can make the round of the whole earth more than seven times per second, takes 355 years to come to us from that star.

Yet Delta Librae lies in shallow water, it is a gem cast upon a shoal, all around it the mighty deep of the ether descends to profundities unthinkable. At ten times, a hundred times, perhaps a thousand times, its depths glitter with the star sands of the Milky Way.

(Continued on page 365.)

MODERN ELECTRICS

A Magazine devoted entirely to the Electrical Arts.

H. GERNSBACK, Editor

O. J. RIDENOUR, Business Manager

Subscription Price: For U. S. and Mexico $1.50 per year, payable in advance.

New York City and Canada, $1.85.
Foreign Countries, $2.00 in Gold.

Checks on out of town Banks cannot be accepted unless the usual exchange is added.

SINGLE COPY, 15 CENTS

Forms close the 20th of the month preceding date of publication. Advertising rates on application.

The Editor will be pleased to receive original contributions of timely interest pertaining to the electrical and the affiliated arts. Articles with good drawings and clear photographs especially desired. If accepted, such articles will be paid for on publication, at regular rates.

No manuscripts will be returned unless return postage is enclosed.

Address all communications to:

MODERN PUBLISHING CO.
231 Fulton Street, New York, N. Y.

Chicago Office: 1106 Trude Bldg.
Paris Office: 12 Boulevard Arago
Brussels Office: 23 Rue Henri Maus

Modern Electrics may be had at all news stands in the United States and Canada, also at Brentano's, 37 Avenue de l'Opera, Paris.

THE MODERN PUBLISHING CO.

H. Gernsback - - President and Secretary
O. J. Ridenour - - Vice-President and Treasurer

Entered as second class matter March 31, 1908, at the New York Post Office, under the Act of Congress of March 3, 1879.

Vol. V. JULY No 4

EDITORIAL.

DURING the past few weeks we have received numerous inquiries from our readers, most of them wanting to know just how the proposed Wireless Law would affect them.

We discussed this matter, at some length, in our June issue; but are now able to give official advice, which we have been able to secure from the department of Commerce and Labor. This refers to Senate Bill 6412, and we are advised that the bill has, as yet, not passed the House, and will, furthermore, not take effect until ninety days after its enactment. Matters connected with the future administration of this act, therefore, necessarily have to give precedence to other matters in the department, requiring immediate attention.

The method of licensing amateur stations in the United States, under the new bill, will probably be substantially as follows:

Printed forms of application for licenses will be prepared by the department, covering the particulars for amateur stations described in this bill. These blank applications will be forwarded to the department's Wireless Inspectors, who are stationed at the Custom House.

The amateur who desires a license will apply for one of the blank forms of application to the Wireless Inspector, who will furnish it to him *without cost*. The amateur is then supposed to fill out the blank and arrange with the inspector, for an inspection of his station, if the inspector should deem such a course necessary. If the inspector finds the facts to be in accord with the application, he will then issue a license. Such a license is necessarily subject to the observance of the provisions of law applicable to such stations.

A certificate will also be issued to the amateur operator.

The department furthermore informs us that "it is highly probable that no license will be required of amateur stations, which merely receive messages, but do not send them out." In fact, the bill will be adjusted to meet this situation.

The application forms will, of course, not be prepared until the act has passed, but the bill contains the provisions, which will necessarily appear in an amateur's license.

The bill is so drawn as to allow amateurs the liberal use of their apparatus, conditioned on the obligation, especially near the coast or near the lakes, that their working shall not interfere with the marine commercial communication and naval communication. Thus it will be seen that the wireless situation to-day as far as the amateur is concerned is settled.

The amateur will be recognized, the same as the commercial or the Government station, and will have the same rights as these.

We have not the slightest doubt that Amateur Wireless Telegraphy, in the United States, will, within five years, expand in a phenomenal manner, now that all fears that any amateur has ever had, have been allayed.

Amateur Wireless Telegraphy is a distinct American institution, the fame of which has already traveled around the world. We have no doubt that this is but the commencement of matters, and we are equally sure that our most optimistic views as to the future of Wireless in this country will be far surpassed.

The Operation of Electric Automatic Signals on Steam Railroads

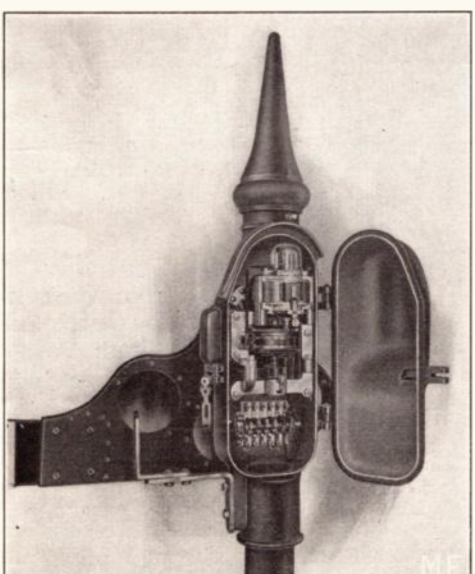
By H. E. Cline.

Railroads of to-day are installing every modern appliance for the safety of the traveling public, and the greatest of these is the *signal system.* These silent watchers are depended upon by every engineer to show him the actual condition of the track ahead that he may safely proceed at full speed, at reduced speed, or stop according to conditions ahead.

The purpose of this article is to explain in an easily understood manner the apparatus used and the method of operating the same.

Figure 1 shows a signal installed on the New York Central & Hudson River Railroad by the Hall Signal Co., of Garwood, N. J. This is the most modern type of signal in use and is rapidly being adopted by the leading railroads in this and foreign countries. These signals are *controlled completely by the condition of the track.*

Figure 2 shows the signal mechanism, which is located at the top of the signal pole. This mechanism consists of a motor which operates the blade, a



clutch which causes the gears to engage with the motor, the necessary gears, and a circuit controller. The clutch consists of an electro-magnet and an armature. When current is flowing through the coil of the electro-

magnet, the armature is attracted and the rotation of the motor armature moves the blade from the normal position upwardly. The circuit controller is connected mechanically with the gearing in such a manner that contacts are either opened or closed at predetermined positions of the blade.

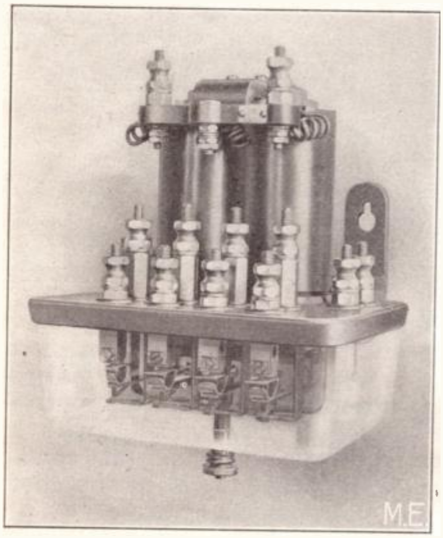
The signal shown in Fig. 1 is known as Style "K" three-position, top post mechanism. The meaning of "three-position" is that the blade assumes three separate positions i. e., the normal position, which is horizontal; the 45 degree position, which is 45 degrees from horizontal, in the upper right hand quadrant; and the 90 degree position, which is 90 degrees from horizontal, in the same quadrant.

Each of these positions indicates something to the engineer. The normal, or horizontal, position indicates that he must stop, for there is some obstruction on the track ahead.

The 45 degree position indicates that the track is clear to the next signal ahead, and that the engineer must reduce speed, expecting to stop at the next signal ahead, because it is in the horizontal position.

The 90 degree position indicates that the track is clear to the next signal ahead, and that the next signal beyond is in either the 45 degree position or the 90 degree position. As long as the engineer finds the signal in the 90 degree position, he continues at high speed.

Fig. 3 is what is known as a relay. Its purpose is to control circuits. It consists of a pair of coils, forming an electro-magnet, and an armature, to which is attached fingers. Each of these fingers operates between two contacts, never touching both at the same time. When there is no current flowing in the coils, the armature is down, away from the pole pieces of the



electro-magnet, and one end of each finger is resting upon the lower contact piece, the other end of the finger being connected to a binding post. When the armature is in this position, it is called making the back contact.

When there is current flowing through the coils of the electro-magnet the armature is attracted upwardly to the pole pieces of the magnet, and the fingers break contact with the lower contact pieces and make contact with the upper contact pieces. This is called making the front contact.

Fig. 4 shows a section of a railroad with signals located at A, B and C. At each signal there is located three relays, a, b and c, a main battery, e, and a track battery, S.

Before I proceed with the explanation of the operation of the electric circuits controlling these signals, I must tell you that, at each signal, an insulated block joint is installed in each rail, and which completely insulates one section of rail from the next one. This block joint is so constructed that it is absolutely impossible for the current to flow, except between one signal and the next, i. e., it can never flow past any signal.

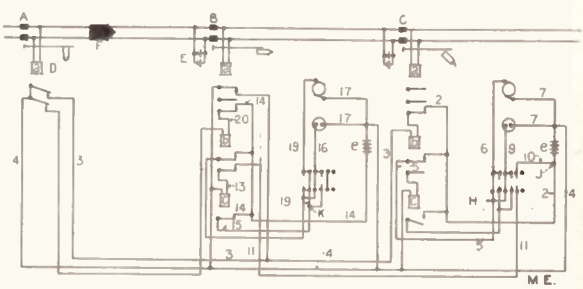
Let us snow refer to Fig. 4, at "D." There is a relay connected to the tracks by means of a copper wire from one side of the coils of the magnet to one of the rails, and from the other side of the coils to the other rail. At "E" there are two cells of gravity, or blue stone battery connected to the track by means of a copper wire, from the positive side of the battery to one of the rails, and from the negative side of the battery to the other rail. When the battery and relay are thus connected, and there is nothing across the rails, current flows from the positive side of the battery through the wire to the rail—through that rail and the wires—through the coils of the relay—through the other wire and rail to the negative side of the battery. This forms a complete circuit and the armature of that relay picks up and the front contacts are made. This is the normal condition of the track circuit. Should any conductor of electric current be placed across the tracks, touching both rails, the current will flow through it, and none will flow through the coils of the relay, and its armature will drop down, opening the front and closing the back contacts.

We will now trace the operation of the blade of signal "C" from the horizontal to the 45 degree position, and the blade at Signal "B" from the 45 degree position to the 90 degree position. With a train approaching Signal "B," as shown at "F," the track relay at "A" is making the back contacts.

Now let us start at main battery, e, at "C"; current flows from the positive side of the battery, through wire, 2—front contact of relay, a, at "C," coils of relay, b, at "C," wire, 3, back contacts of relay, a, at "A," wire, 4, to negative side of battery, e, at "C." This makes a complete circuit with the coils of relay, b, in the circuit, and the armature of relay, b, at "C," is attracted, and the front contacts closed.

The main battery, e, at "C" is now divided into two circuits. Current flows through wire, 2, front contacts of relay, b, at c, wire 5, a point in the circuit controller at "C" (which is closed until the blade reaches the 45 degree position when it is opened), wire, 6, motor, wire 7 to the negative side of the battery. This causes the motor armature to rotate.

At H the circuit is again divided, and current flows through wire, 8, a contact of circuit controller (which is closed until the blade reaches the 50 degree position, when it is opened), wire, 9, to the clutch, wire, 7, to battery. This causes the clutch magnet to attract its armature, and the motor rotating causes the blade to move to the 45 degree position, when the point of the circuit controller, to which wires 5 and 6 are attached, opens and the motor stops, but the blade is held fast by the clutch. Thus far we have moved the blade at "C" from the horizontal to the 45 degree position.



We will now move the blade at "B" from the 45 degrees to the 90 degree position.

At "C" the battery is again divided, at J, flowing through wire, 10, a point in the circuit controller that is closed between 45 and 90 degrees, wire 11, front contact of relay, b, at "B," wire, 13, coils of relay, c, at "C," wire, 4, to negative side of main battery, e, at "C." With current flowing through coils of relay, c, at "B," its armature is attracted and the front contacts closed. Current is now flowing from main battery, e, at "B," through wire, 14, front contacts of relay, c, wire, 15, contact in circuit closer (closed from 50 to 90 degrees, wire, 16, coils of clutch, wire, 17, to negative side of battery. This causes the clutch to pick up the gears. The circuit is divided, at K, and current flows through wire, 18, contact of circuit closer (made from 45 to 90 degrees), wire, 19, motor, wire, 17, to battery. The motor armature rotates and the blade is moved from the 45 to 90 degree position. When the blade reaches the 90 degrees position the contact to which wires, 18 and 19, are attached opens, the motor stops and the blade is held by the clutch.

When the train, shown at F, passes signal "B," the track relay, a, at "B," is cut out of the track circuit, because the current flows through the wheels and axles of the train. The armature drops down and the back contacts are made. The current flows from wire, 3, through the back contact of relay, a, at "B," wire, 4, to negative side of main battery at "C." This maintains the relay, b, at "C" when the relay, a, at "A" again assumes the normal position, which it will do as soon as the last pair of wheels on the train passes the insulated joints at "B."

When relay, a, at "B" is cut out of the circuit, the contacts to which wires 20 and 14 are connected are opened and the circuit, which controls relay, b, at "B" is opened, the armature of relay, b, drops, the front contacts are opened, and the circuit controlling relay, c, is opened, and the clutch being cut out of circuit the blade drops to the normal, or horizontal position, warning approaching trains that the section ahead is obstructed. Thus the operation is continued from signal to signal as the train approaches and passes.

It can readily be seen that the entire operation is controlled by the train, and should any trouble occur, such as a broken rail, a broken wire, or weak battery, the signal will fail to leave the horizontal position. Thus the failure is always on the side of safety, because the engineer must stop when the signal stands in the normal or horizontal position.

For the night indication the casting to which the blade is attached has three openings, in which are fitted colored

(*Continued on page 365.*)

A Southern Electrically Illuminated Fountain

By Frank C. Perkins.

The accompanying illustration shows the beautiful, electrically illuminated fountain which stands in the Italian terrace of the palatial residence of Lawrence Fabasher, located in St. Charles avenue, the fashionable residential section of New Orleans. The fountain is cast in solid reinforced concrete, the basin having a diameter of eight feet, with a depth of five feet, and standing six feet high over all.

In the center of the fountain are four dolphin heads supporting the large shell, in which stands three cupids supporting a rustic urn. There is a spray of water flowing from the mouth of each dolphin. Around the border of the shell in which the cupids stand are numerous jets of water. In the urn are also many jets forming a full head of water.

The water is illuminated by a 25 ampere, automatic, projecting arc lamp, which is located in the glass roof directly above the fountain, and focussed so as to cover the entire basin. There is a color disc, operated by a small motor, which changes the color of the water automatically, giving many beautiful tints and color effects.

This electric fountain was designed by W. H. B. Spangenberg, and it is of interest to note that the photograph was made by time exposure of the electric water illumination only—no flash light or other lighting being employed in taking the picture.

WIRELESS

By Emma Clark Karr.

A message came through the darkness
And startled the world from sleep,
But the messenger passed unhonored
Into silence prolonged and deep;
No blare of trumpets attended,
Nor the flash of a signal fire,
No sound of wheels or of pinions,
And no gleam of a guiding wire.

Whence came this courier phantom,
This voiceless and formless thing,
That plays o'er a mystic sounder
Till the world-wide echoes ring?
What model of modern science
Has conquered the earth and the air
Till it vies in its swift transmission
With the heavenward flight of prayer?

Each ship that sails from the harbor
Bears a Spirit of Space ensnared,
Set free for many a voyage
No mortal has ever dared,
It leaps o'er the angry billows,
And skims through the stormy sky,
Seeking through boundless circuit,
The syntony of its cry.

Somewhere expecting and waiting
Are hearts that can understand,
That can feel the thrill of vibration
Impelled by an unseen hand.
At midnight the tireless toiler,
The century's great success,
Swept out from an ocean steamer
With the signal of dire distress.

"Send succor," it pleaded, "Send succor,"
It must come ere the morning light,
Or we must go down in the blackness
And maddening horror of night,"
Then answers of hope and courage
To the Storm King defiance flung;
For that cry is so deeply human
It is known in every tongue.

The steamers of many nations
Steered straight to the drifting wreck,
And the demons of death were cheated
Of their harvest on sinking deck.
There is joy where the dawn is waking,
There is joy where the daylight dies,
For the Spirit of Space has spoken
And the Heart of the World replies.

Simple Experiments in Alternating Currents

(Continued.)

By P. Mertz.

Alternating Current Meters.

Now that you have learned something about alternating current motors and dynamos, we will take up the study of instruments for measuring this kind of current.

You will, of course, see why the principle of the ordinary D'Arsonval galvanometer (that is, a coil of wire, excited by the current to be measured, revolving in the field of a permanent magnet) cannot be used for measuring alternating currents. The needle would sway back and forth at every alternation, or if the frequency (that is, the rate of speed at which the current changes its polarity) were high enough, it would stand still at zero.

On account of this, a number of ingenious contrivances have been invented to measure alternating currents, several of which will be here described, in a simplified form, so that they can be experimented with by the reader.

12. One of the simplest of these is the *hot-wire meter,* the construction of which should be well known to readers of this magazine, as a great number have already been described in it, for use with wireless telegraph transmitting apparatus.

The working of this meter depends on the fact when a current of electricity is passed through a wire of enough resistance, the wire is heated. The wire is made of metal, and, as all metals expand when heated, it becomes a little longer, which motion is multiplied by some kind of device, such as a lever, and can then be seen by means of a pointer moving over a scale. Furthermore, the heating of the wire is proportional to the amount of current, and the lengthening of the wire proportional to the amount of heat produced, so that the elongation of the wire is directly proportional to the amount of current sent through it.

These meters are made as ammeters and voltmeters, the main difference between them being the size and composition of the wire carrying the current.

Another thing upon which the elongation of the wire depends is the frequency of the current passing through it. It is well known that, with the exception of very small wires, the resistance offered to the passage of a high frequency current is greater than that offered to the passage of a low frequency current, or to direct current; and as the heating is proportional to the resistance and to the square of the current, it is evident that the wire will be heated more by the high frequency current, and its elongation will be greater.* This increase of resistance is known as the "skin effect."

To demonstrate this you can try the following experiment:

First connect your hot-wire meter to a few batteries and note the deflection of the needle. Then connect the same batteries to it, but through the mechanical converter (§ 4† not the rotary converter), rotating it as fast as you can. If you can rotate the latter fast enough to cause skin effect you will note that the needle will be deflected more than before, although the current remains exactly the same.

For this reason, and also due to the fact that the length of the wire varies but very little, even though the amount of current be great, the hot-wire meter is inaccurate, even at its best. Also, it has to be constantly adjusted for changes of temperature, as they affect the wire just as much as the heat created by the current. It is therefore used only where comparative results are required, such as in a wireless transmitting station.

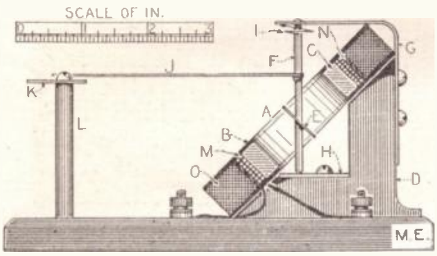
13. A type of meter that, although it cannot be used on high-frequency currents, is more accurate, is known as the *Thompson Inclined-Coil Meter.*

---

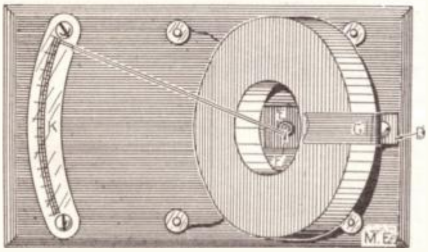
* The reason for the increase of resistance of a wire to high frequency current, is the fact that the current density is not uniform throughout the cross section of the conductor, but is greater toward the outside. The uneven density is due to counter-electromotive forces set up, in the interior of the wire, by the varying magnetic field, around the axis of the wire, which accompanies the alternations or oscillations of the current.—Ed.

† See May issue, pp. 154-155.

The construction of this meter, in a simplified form, is shown in Fig. 22. You will notice that the inclined coil, A, which gives the apparatus its name, is inclined 45° to the base. You can easily make the form for this by glueing two circular pieces of strong cardboard, B, to a hollow wooden cylinder, C. The size of wire, and the number of turns in the windings, will be discussed later. The coil is held at the angle of 45° by the support, D, which is made of a piece of wood cut to the required dimensions.



The vane, E, should be cut from a sheet of thin, transformer iron, and should be soldered, at an angle of 45° (as nearly as possible) to the shaft, F. This shaft should better be made of brass than of iron or steel, as the latter would affect the accuracy of the instrument. The shaft, F, is pivoted between two dents made with a center-punch in the brass strips, G and H, after the ends of the shaft have been pointed with a file. At I, as shown in the illustration, should be soldered a small spiral spring, one end being attached to the shaft, the other to the brass



strip. The spring should be arranged so that it will tend to turn F to the left.

The needle, J, consists of a piece of brass or aluminum wire (size about No. 22 B. & S.), one end being fastened to the shaft, F, at about the height shown in the illustration. You should take care to have this wire as straight as possible.

The scale, K, upon which, J, indicates, can be made of a piece of sheet brass (size about No. 22 B. & S.), to which is glued a sheet of good paper, upon which to draw the graduations. It is supported by two tubes, L, through which are passed bolts, the nuts of which are fastened under the base. The uprights, L, should be of such height that, J, comes to within ⅛", or less, of K. J should then be bent so that when it is farthest to the right, the plane of the vane, E, will be perpendicular to that of the coil (this is the position shown in the illustration).

The coil, A, should now be wound. This should be done the same as for the battery meter described by the writer on p. 259 of the June, 1912, issue of *Modern Electrics*. The part of the coil used for measuring amperes, M, should be wound first, and over it put a few layers of paper, N. Over this, the fine wire coil, O, should be wound for measuring volts. The ends of each coil should be connected to binding posts on the base, as shown. It might here be said that the standard, D, should be arranged so that it can be removed from the base, as the latter will be used for future experiments in A. C. meters.

We will now consider the working of this meter. You will know that if an alternating current is passed through coils, either M, or O, an alternating magnetic field will be produced. You also know that the magnetic lines of force pass through the same path, in whatever direction they may happen to be going; that is, they change only their direction, not their path (this is not strictly true when an alternator furnishes the current, for, as explained in §5*, the current is not of the same intensity throughout the cycle; it is, however, sufficiently accurate for this experiment). Now, if you place a small vane of soft iron, like E, in the field, it has a tendency to follow the directions of these lines of force. If this tendency is counteracted by a spring the vane will move in proportion to the current flowing in the coil. Therefore the needle, J, being fastened to E, will move with it. From this it will be seen that this meter is also adapted to direct

* P. 155, May issue.

current, although, on account of the hysteresis, or magnetic inertia, of the vane, E, there will be a slight difference in readings.

If you have occasion to, you can use this meter practically. One of the best uses is to find out how much current your wireless coil or transformer is consuming. If the latter happens to take more current than the capacity of your meter, you can raise the capacity as follows:

For the voltmeter, put enough resistance in series with coil, O, to reach the desired capacity. For the ammeter, shunt a suitable coil* across M to do the same thing.

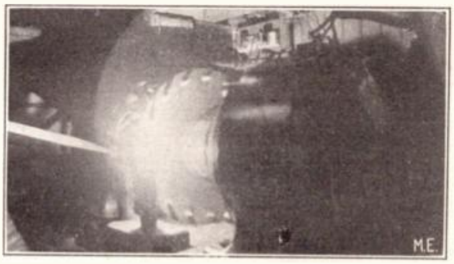
(To be continued.)

* This coil should have the same time constant as the coil in the meter, if it is to be used as an accurate multiplying shunt. By time constant, is meant the quotient of its inductance in henries, divided by its resistance in ohms.

ROTARY SPARK GAP TAKES ITS OWN PICTURE.

By Thomas Appleby.

The accompanying photograph was made while the sending spark was discharging at the rotary spark discharger used in the 5 K. W. Marconi Wireless station at the Wanamaker store, Philadelphia, Pa. The discharger disc was running at the rate of 1800 revolutions per minute, and, the diameter of the revolving stud circle being 18 inches, the studs were traveling at the rate of 9,483 feet per minute, or 110 miles per hour. A time exposure was made, and yet the revolving studs and their shadows are plainly shown in the photograph, as though they were standing still. The reason for this is that a spark took place only at the instant when the moving stud passed the stationary studs, and the operating room being dark, the disc and revolving studs were illuminated only when in exactly the same position each time a spark took place. This effect may also be observed, without the use of a camera, by darkening any wireless room where a rotary discharger is used. At some stations the studs, instead of appearing to stand still, will jump backward and forward. This might be due to uneven spacing of the moving studs or the sparking distance from the moving studs to the fixed studs being too great. The former would lead to unbalancing of the disc, so the latter is probably the cause. In either event, the result is the same; that is, the moving studs are not always in the same position at the instant the spark takes place and the effect is somewhat similar to a moving picture when the film runs off the sprocket, causing the shutter to cut off the light at the wrong time and the picture to jump up and down.



Visitors to this station are always greatly startled by the terrific noise of the spark, and it is amusing to see them jump, and often even turn and run away when the operator first presses the key; should they recover sufficiently to watch the spark for thirty seconds they are compelled to leave the apparatus room, as the rays cause the eyes to become very painful and shed a volume of tears.

Automatic Signals

(Continued from page 361.)

glass, red for the normal position, yellow for the 45 degree position and green for the 90 degree position, and a lamp is so placed that its rays shine only through whichever glass is directly in front of it, so that the engineer can tell at a glance the condition of the track ahead, according to the color of the light he can see when approaching the signal.

Space

(Continued from page 357.)

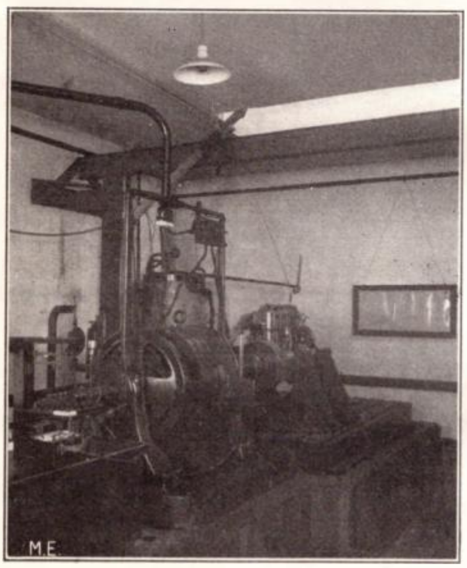
To our telescopes they appear to lie on the very bottom, drifted into heaps by mysterious currents—but the real is not even there. Beyond yawn abysses so black with the excess of depth that the stars themselves, great suns that they are, fade into invisibility.

Electric Gas Engine Testing

By Frank C. Perkins.

The accompanying illustration shows the method of testing gasoline engines by an electric dynamometer of the Diehl type as a prevention of possible motor trouble, which may later on be difficult to remedy, for many claim an absorption brake test is absolutely essential, and that an electric dynamometer is the best possible device for accurate tests.

It is claimed that with the electric testing plant shown in the photograph, with an electric dynamometer, it is possible for the operator to carry out, with exactness, a complete test from 0 to full load, of an engine of 90 to 100 horse power, and watch every important part of the machine operating under normal or maximum load.



This electric dynamometer consists of an especially wound variable speed dynamo, with steel frame, swinging very delicately in Hess Bright Ball bearings, and recording the smallest loss on the torque arm.

It will be seen that the bearings are mounted on a cast iron base plate without bearing adjustments, both bearings being rigidly fastened together and in line. These electric dynamometers absorb 60 to 90 horse power at any speed from 1000 to 2500 revolutions per minute, for the larger device, and absorb 50 to 75 horse power at any speed from 100 to 2500 revolutions for the lighter apparatus, with absolutely sparkless operation throughout the entire speed range due to "compensating pole design."

The engine is mounted on a large cast iron "T" slotted base and coupled to the dynamometer by a spider universal joint. There is a 10 inch dial tachometer used and both push button control and normal control are provided, enabling the whole test to be carried out by one operator from a position near the motor under test. The normal control board is placed where the torque scales and tachometer can be watched and has a large illuminated dial ammeter and voltmeter on swinging brackets, designed to show the operator the load in kilowatts, but not for measuring of horse power.

It is stated that the dynamometer can be run throughout its range of speed and power as a dynamo or motor, which eliminates engine cranking; and the load regulating apparatus is such that the horse power of the engine may be adjusted, from 0 to 100 horse power, in steps of less than one-half horse power each. When the load is thrown on the engine, the swinging frame of the dynamo tends to rotate, and transmits, through a torque arm, to a combination spring balance and platform scale, the actual pounds pull due to the difference in torque between the fields and armature of the machine.

Within good sight of the operator is located this balance dial, and, with one or two settings of a slide rule, the actual brake horse power at the engine shaft is available.

This electric device is also applicable to testing transmissions, as to efficiency and quiet running, and a complete electric testing plant has been installed in a large carburetor factory, to determine the best form of carburetor for a particular style of engine on test.

It is of interest to note that in fuel economy tests, the gasoline is meas-

(*Continued on page* 440.)

This department has been started with the idea to encourage the experimenter to bring out new ideas. Every reader is welcome to contribute to this department, and new ideas will be welcomed by the Editors. WHEN SENDING IN CONTRIBUTIONS IT IS NECESSARY THAT ONLY ONE SIDE OF THE SHEET IS USED. SKETCH MUST INVARIABLY BE ON A SEPARATE SHEET NOT IN THE TEXT. The description must be as short as possible. Good sketches are not required, as our art department will work out rough sketches submitted by contributors. IT IS THEREFORE NOT NECESSARY FOR CONTRIBUTORS TO SPEND MUCH TIME IN SKETCHING VARIOUS IDEAS. When sending contributions enclose return postage if manuscript is to be returned if not used. ALL CONTRIBUTIONS APPEARING IN THIS DEPARTMENT ARE PAID FOR ON PUBLICATION.

FIRST PRIZE TWO DOLLARS.

A PRACTICAL ROTARY SPARK GAP

By referring to the cut and drawings, any one should be able to build a satisfactory rotary spark gap.

The gap illustrated and described on this page is in daily use in the writer's ½ kw. station and is giving excellent results. The base is made of oak, size 4½ x 6 x ¾ inches. The uprights, AA, in which the shaft turns, are cut out of ¾ inch oak, shape and size as shown in Fig. 1. Bore a ⅝ inch hole ¾ inches from upper end to hold babbitt bearings. The standards or posts, DD, Fig. 2, are ¾ inch hard rubber, about 3 inches long, the exact length depending upon the length of binding posts used to hold the spark gap rods.

The disc, B, Fig. 3, 4 inches in diameter, is cut out of 1-16 inch sheet brass, and must be cut perfectly true on account of the high speed of rotation. About 3-16 inch from the edge of this disc bore eight holes, equally spaced, for small machine screws to pass through, also bore a 5-16 inch hole in the exact center for the shaft. The spark electrodes on the brass disc and also on the rods, are ½ inch long, cut from ordinary batttery zincs. Bore holes in all electrodes a little smaller than the machine screws. They need not be threaded, as the screw will readily cut its own thread in the zinc.

The binding posts holding the rods are E. I. Co.'s No. B 2. To secure the binding posts to the hard rubber standards bore a hole in the standard slightly smaller than the binding post screw, and put in screw about half way, then cut off the head of screw, and screw on the binding post, thus making a firm connection.

The spark gap rods may be either

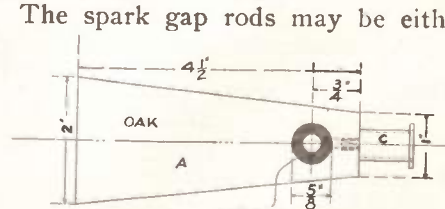


FIG. 1

brass or copper, ⅛ inch in diameter, 3 inches long; thread both ends, and on one end screw an E. I. Co.'s Electrose knob, No. 6964, with 8-32 thread, and screw spark electrodes on the other end, as shown in Fig. 2. The knobs as shown in cut are cut from ¾ inch hard rubber rods, ½ inch long, but the E. I. Co.'s Electrose knobs are still better.

The shaft is 5½ inches long, cut from 5-16 inch Bessemer steel. Thread both ends of shaft with a 32 thread. The brass pulley, F, one inch in diameter, is taken from an ordinary screw pulley

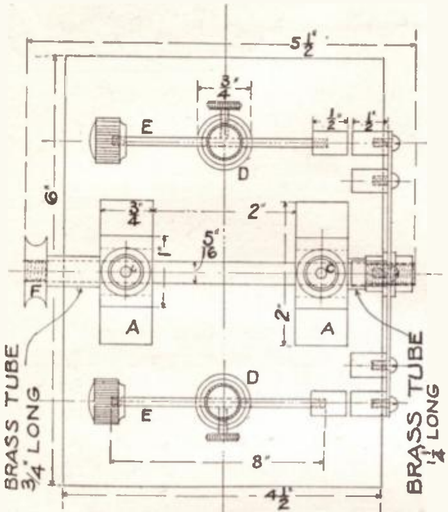


FIG. 2

which can be bought in almost any hardware store. It should be threaded, so as to screw on one end of shaft as shown in Fig. 2. The brass disc is secured to the other end of shaft by two washers and two nuts, which can be purchased in any bicycle repair shop. Fig. 2 shows how disc is attached.

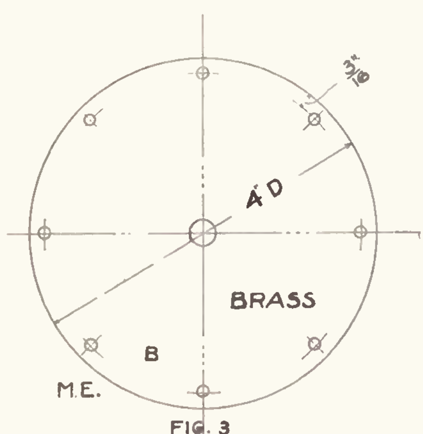


FIG. 3

The oak standards, A, A, are fastened to the base with suitable screws, and are 2 inches apart as shown. The babbit bearings are provided with oil cups, C C, which can be bought in any supply house, or can be made from brass tubing. The oil cups shown in the accompanying cut were made from common burglar alarm door springs with plunger and spring removed. These oil cups are very necessary on account of the high speed of the shaft. Cut two pieces of brass tubing approximately ¼ inch and ¾ inch long respectively and slip these over the shaft as shown in Fig. 2; these are to keep the shaft in position.

The hard rubber standards should be mounted on oak base with suitable screws, so that the electrodes on the rod are in direct line with the electrodes on the disc. This gap, with the proper condenser capacity, will give a musical tone, the pitch depending largely upon the speed of rotation. The distance between the spark gap electrodes should not be as great as with the ordinary gap, because the spark must jump two gaps instead of one. The writer has this gap belted to a fan motor, but any motor will do which is strong enough for the purpose. This gap may also be connected directly to the motor, but in such a case the disc must be carefully insulated from the shaft to protect the motor from injury by the spark.

Contributed by

BENJ. DU MEZ.

SECOND PRIZE ONE DOLLAR.
A NEW INDUCTIVE TUNER.

If carefully made, I believe the instrument here described will quickly prove its superiority over loose couplers of the sliding tube type, and, as an interference preventer, it is in a class by itself.

The wire is wound not unlike the ribbon of a pancake helix. Great care should be taken not to let the wire overlap. This may be accomplished by using a small amount of thick shellac which also adds to the insulation.

The drawings are practically self-explanatory, except for the taps. Taps should be taken out about every five feet on the primary, and every 30 feet on the secondary. Multiple point switches are placed on the backs of the coils, and the taps led to the switch points.

In Fig. 1, A and A[1], are blocks of

wood 1 x 1 x 4 inches, screwed to the base, and which hold the ¼ inch brass rods, on which the secondary slides. The primary is screwed to A. B is a block 1 x 1 x 1 inch, screwed to the sec-

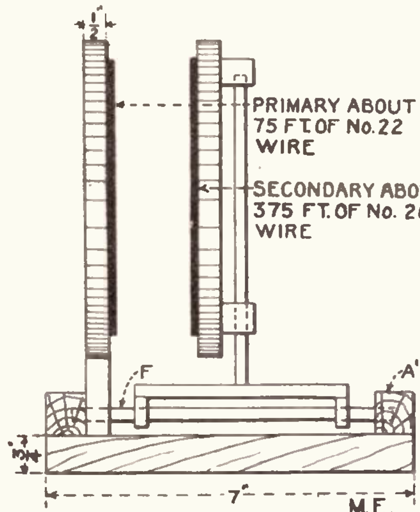


FIG. 1

ondary, with a hole large enough to easily admit a ¼ inch rod drilled half way through it. B is a block 1 x 1 x 1 inch, screwed to the secondary and has a ¼ inch hole drilled through it. C is a ¼ inch round brass rod 6½ inches long, upon which the secondary is mounted. D is a hardwood board

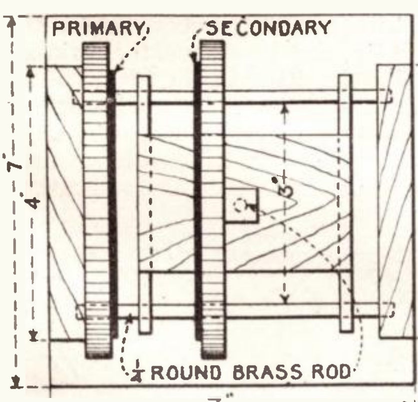


FIG. 1A

1 x 2 x 4 inches. E are four blocks 1 x 1 x 1½ inches, screwed to D, and have holes drilled through them to admit the ¼ inch rods, F. Binding posts, and the necessary switches, may be mounted on the base in the manner most convenient.

In the hook-up diagram, m is a 2-point switch, which is used to cut in the tuning coil, w, if a long wave length is desired; n is a 2-point switch allowing signals to enter either the center or outside of primary; x a 2-point switch allowing signals to be discharged through either the center or outside of secondary; s a 2-point switch to cut in the variable condenser if needed; l and k are the multiple

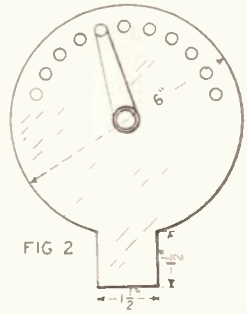


FIG 2

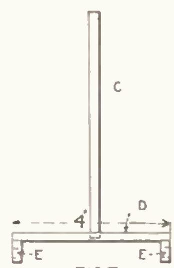


FIG. 3

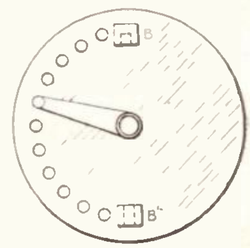
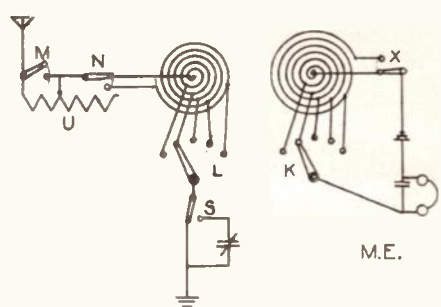


FIG. 2A

M.E.

point switches used to vary the amount of wire used on primary and secondary. The windings of the primary and sec-



ondary should be made in opposite directions.

Contributed by

R. TREWEEKE.

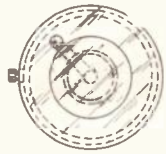
IMPROVED OIL BREAK KEY.

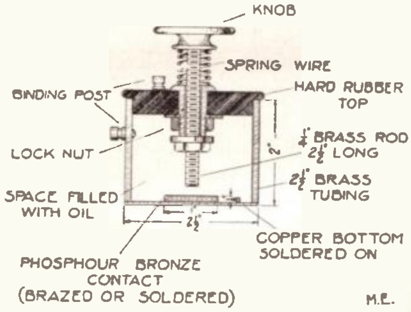
Many amateurs have no doubt at some time or other desired a telegraph key that would be easily made and at the same time carry a considerably heavier current than the average telegraph key.

This key if made according to sketch will carry more current than is ever required at any one time by the average amateur and yet is very easily constructed. Dimensions do not have to be adhered to in every sense but the parts may be constructed from material usually found in every experimental shop.

The outside cylinder is made from 2½ inch brass pipe, with a heavy sheet copper bottom soldered or brazed in place. The bottom contact may be made from a piece of brass, brazed in position before soldering the bottom in.

The top is turned from a piece of hard rubber and should be quite thick. The rod used for the other contact is a piece of ¼-inch brass rod 2½ inches long threaded for about one inch at one end. The knob is an ordinary telegraph key





knob tapped out to receive the ¼-inch rod. The spring under the knob should be made from any light gauge spring brass wire. A knurled lock nut is placed under the knob, also under cover, to regulate tension and length of stroke.

The brass bushing through cover may be made from brass turned to size, or may be made from a piece of brass tubing. A rubber gasket should be placed under the lock nut on under side of cover, to prevent oil from following the rod on the return stroke.

One binding post should be soldered or tapped into side of the brass pipe for connecting to bottom contact. Another post may be placed on top and connected to the brass bushing in the cover for contact with the movable rod.

After assembling, the brass pipe may be buffed and lacquered, and the hard rubber top polished, making a very attractive instrument.

The cylinder should be filled with transformer oil or boiled linseed oil.

Contributed by

MOORE STUART.

AIR TIGHT BOTTLES.

Often on account of a poorly sealed can or bottle some wireless bug finds his shellac, varnish, or glue all hardened, or at least unfit for use.

To prevent this, on a screw top device, cut a piece of paper large enough to cover the mouth of the can, lay it on and screw the cover on tightly turn the can upside down and the liquid will seal the top, covering the whole surface with a thin film of the liquid, which prevents any air holes. If you have a bottle with a cork in it, never forget to turn it upside down for a few seconds after you cork it up.

Contributed by

BURR VAN DEITZ.

FASTENING COILS OF LOOSE COUPLERS.

The fastening of the primary and secondary coils to the wooden supports seems to trouble almost everyone who attempts to make a loose coupler. The following is a simple yet substantial method of overcoming this difficulty.

Cut out of a piece of one-half inch wood two circular pieces, one which will fit in the inside of the primary tube and the other in the inside of the secondary tube. This can be easily done with a knife or chisel. The primary can now be laid aside, as it is ready to fasten to the tube and also to

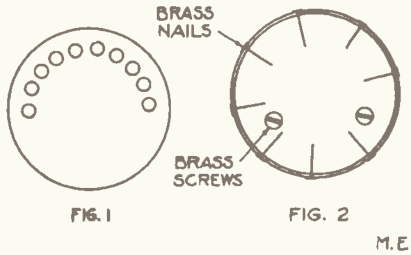


FIG. 1 FIG. 2

the supports. The method of fastening is shown in Fig. 2.

Bore in the secondary as many holes as you are to have switch points on the secondary. If a slider is used on the secondary, it will not be necessary to bore any holes. Fig. 1 explains how the holes should be bored. They should be just wide enough for wire to pass through, as the wires from the various sections of the secondary pass through them to the switch points.

The switch points on the secondary support should be fastened so that the nuts will be below the surface of the wood, in order to allow the tube to be fastened on.

Brass nails and screws should be used as steel screws, or nails will become magnetized.

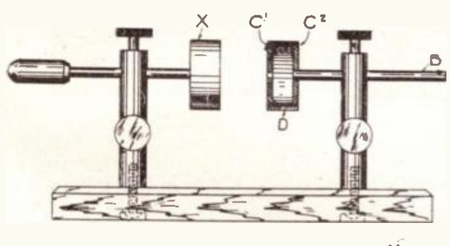
I have used this method with great success and found it to be much stronger than gluing the tubes in a groove.

Contributed by
ELMER S. LINDMARK.

AN AIR-COOLED SPARK GAP.

This gap will increase your range, and costs but a few cents to make.

Take an ordinary spark gap and remove one of the three-sixteenths inch rods, replacing it with a three-sixteenths inch by 2 inch copper tube, B. Now for the plugs.—make one solid, out of brass or zinc, one-quarter inch by one-half inch. The other plug is to be hollow. Make, or obtain, two discs one-half inch diameter by one-sixteenth inch thick, C^1 and C^2. In C^1 drill a hole in the center one-sixteenth inch

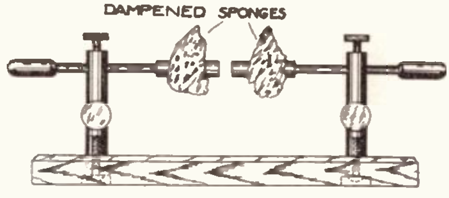


in diameter and in C^2, a hole three-sixteenths inch, to fit tube, B; now make a copper strip one-quarter inch by one and four-sevenths inches to go around C^1 and C^2, and this, when soldered to the discs, forms a hollow cylinder. Attach one end of a rubber tube to the copper tube, B, and the other end to a small bellows, which can be had for about 25 cents, and which may lie on the floor, near your foot. By working the bellows when sending the air passes through the hollow plug and out the fine hole and strikes against the solid plug, clearing the gap of ionized air and metal vapor.

Contributed by
CLARE E. TOPPING.

COOLING A SPARK GAP.

Here is a scheme that simply consists of two pieces of sponge, kept dampened, and placed around the plugs



of the spark gap. It is surprising, how the gap will be kept cool, and the arcing will be, to a large extent, eliminated.

Contributed by
ROBERT L. BROWN.

BOBBIN MATERIAL.

In articles, occasionally, it is suggested that the amateur worker procure a bobbin, etc., etc. I would like to call the attention of amateurs and others that the "D. & W." and other cartridge fuses are all standard sizes, outside measurement; by that I mean they are usually one-half inch, five-eighths inch, three-quarters inch, and one inch, outside measurement, and, by using fibre ends a most handy bobbin can be made with heads that fit tightly in a very short time, and, as a rule, there are plenty of empty or blown fuses to be had for the asking.

Contributed by
H. G. J.

CONTROLLING A BICHROMATE PLUNGE BATTERY FROM A DISTANCE.

The most objectionable feature in connection with the use of the single fluid type of bichromate battery, usually in the form known as a plunge battery, is the necessity of lowering and raising the elements or plates into or out of the electrolyte, each time they are used.

Owing to their cheapness, ease of construction and other good points, particularly their ability to deliver large currents, these batteries would be used a great deal more in wireless telegraphy, and other cases, were it possible to raise and lower the plates, from a distance, or in another room, by an operation about as simple and quick as pressing a button.

The device that will accomplish this, shown in the accompanying figure, I have used for some time. Fig. 1 is a rough sketch of a battery. In place

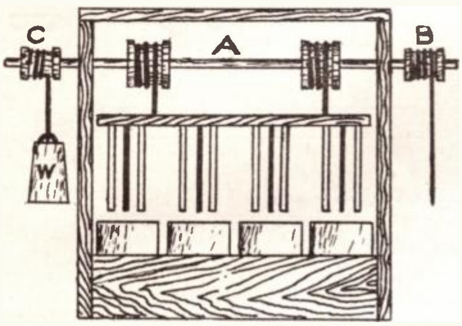


FIG. 1

of the usual crank handle on crank rod, A, a small pulley, B, is fastened. A similar pulley, C, is fastened to other end of rod. Medium sized spools will do for these pulleys. To the face of the pulley, C, one end of a strong cord is attached, then wound around the pulley several times, the other end being attached to a weight, W, heavy enough to overbalance, somewhat, the weight of plates and their supporting frame, so that they are normally held out of the electro-

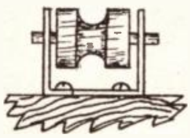


FIG. 2

M.E.

FIG. 3

lyte. Another cord is fastened similarly to pulley, B, and wound several times around it in the opposite direction. This cord should be long enough to reach to the place from which it is desired to operate the batteries. Whenever the cord turns a corner or angle small pulleys constructed as shown in Fig. 2 are used. If the cord passes through a wall a pulley on each side should be used, only a small straight hole in the wall being necessary.

Fig. 3 shows the device at the "operating end." The cord is shown coming through the wall, over a small pulley, and terminating in a sort of double ring, cut from sheet brass. To lower the elements, merely pull down on the ring, as far as it will go, and hook it over a nail driven in the proper place. When through using batteries unhook the ring from the nail, and the plates are automatically raised by the weight, W.

The frame, holding the battery jars, should be screwed or nailed to its shelf or other support.

In many cases no other switch for controlling the current is needed.

Of course, only the zincs need to be raised if desired, and the carbons could be arranged to remain in the jars permanently.

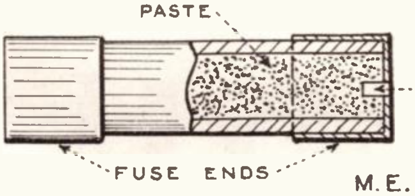
All connections and wiring have been omitted in the figure.

Contributed by

JAMES P. LEWIS.

RESISTANCE UNIT.

I enclose sketch of a resistance unit that I have constructed from an old



blown fuse. The ends are removed and the asbestos powder taken out. The old wire is cut off except about ⅛" at each end. This is left to make connection with the resistance material, which consists of lamp black and shellac, mixed to the consistency of a paste, as in the circular potentiometer described in the May issue of *Modern Electrics*. The fuse is filled with this paste, and the ends put on. It should be allowed a couple of days to harden thoroughly. It can be used in a regular fuse block, and any number can be connected to a rheostat switch, and used to regulate the current supplied to experimental apparatus, etc.

Contributed by

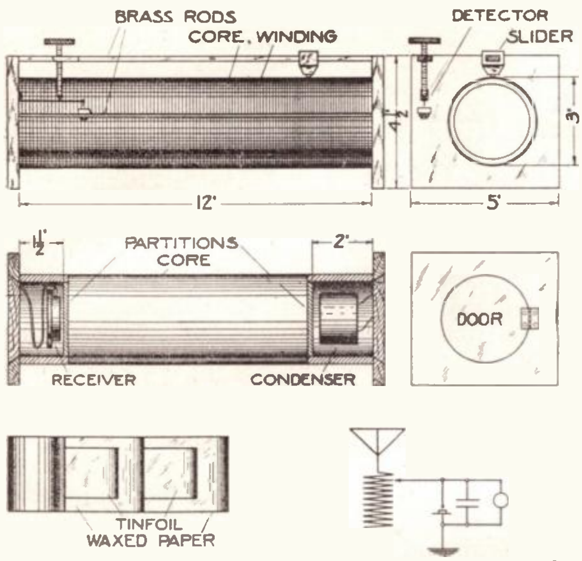
JAMES J. GREENE.

COMPACT PORTABLE RECEIVING SET.

The accompanying diagram shows a compact portable wireless receiving outfit.

The core of the tuning coil contains the condenser and is arranged to contain the receiver when not in use.

Two brass strips, two inches apart, running from end to end of the coil serve as a support for the detector. The upper rod is tapped for the adjustment screw. The lower rod is tapped to receive a brass cup, containing the mineral. It is well to have several cups, each containing a different mineral. To change minerals, unscrew the cup and replace it with another.



The condenser is made by rolling long strips of waxed paper and tinfoil tightly around a wooden core. After it is rolled, tie it up and boil in paraffine. It is then placed in the tuning coil core and paraffine poured in around it.

A long piece of No. 18 annunciator wire will do for the aerial. It can be attached to a large box kite to raise it in the air. When not in use it can be wound on a wire spool.

Contributed by

N. CLINTON YOUNGSTROM.

ELECTROLYTIC INTERRUPTER.

While experimenting with a water resistance, the other day, I ran across a very simple electrolytic interrupter.

I would like you to publish this in your magazine, so that boys who have small coils may, with the aid of this interrupter, use 110 volts A. C. or D. C. with perfect safety. No diagrams are necessary.

Take an ordinary burned-out electric lamp. Hold the globe under water and pinch off the tip with a pair of pliers. The globe will immediately fill with water. Next add a few drops of sulphuric acid to the water in the globe. Connect the globe between the coil and the key. At first no action will take place, but keep on working it, and the carbon will very soon wear off the platinum tips at the bottom of the globe, and then the interruptions will begin.

The strength of the current may be regulated by the amount of acid in the solution.

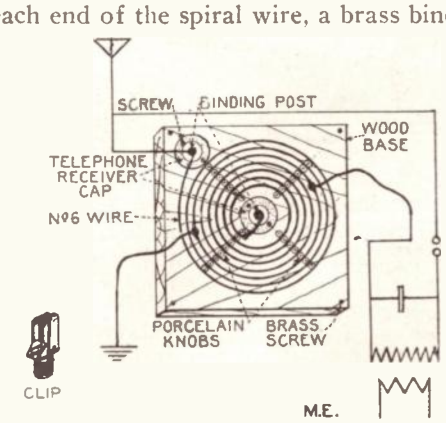
This interrupter will last a long time, for the platinum tips wear away very slowly.

Contributed by

BERNARD KNIGHT.

FLAT SENDING INDUCTANCE.

Enclosed is a diagram of a sending inductance, which I have constructed, and find quite useful. The backboard is made from pine ⅞" x 18" x 18", and is finished in weathered oak or mission. At each end of the spiral wire, a brass binding post, with a hole large enough to take the wire, is mounted in the center of a hard rubber disc. These discs are taken from the small end of telephone receivers, and have holes suitably bored. (One in the center for binding post, and two



near the edge for screwing to base). A hole ½" in diameter should be bored in base under the binding posts, to prevent the screw head from touching the wood. It will be seen that the insulation is of only porcelain and hard rubber throughout. Use ordinary single wire porcelain knobs.

The clips are made from knife switch jaws, with electrose knobs for handles.

This is a very attractive instrument, when the woodwork is finished in mission and all metal parts are brass. However, it is best to use screws with a black finish for fastening on the knobs, and screwing down the rubber discs.

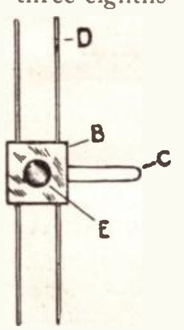
Contributed by

JAS. LEROY HODGES.

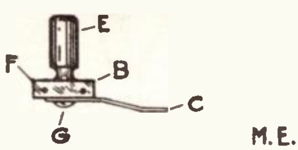
A TUNING COIL SLIDER.

The rod is made of two No. 14 brass wires, D.

The slider is made of a brass block, B, three-eighths inch square and one-eighth inch thick. Two holes are drilled one-sixteenth inch from the edge, F, so that the wires will just fit the holes.



The spring, C, is to make contact with the tuning coil wire, and is fastened to the block, B, by means of the battery binding post, G, and the hard rubber knob, E.



The brass wires are fastened to the tuning coil ends by means of brass screws.

Contributed by

BERTHEL CARLSON.

RULE FOR FINDING POLARITY OF ELECTROMAGNETS.

Draftsmen and others will find the correct direction of current to produce a north or a south pole very easy to remember if they will bear in mind the initials N. G. (no good).

As a north pole is produced when the current flows in a counter-clockwise direction, the relation may be represented

diagrammatically by a monogram containing these letters. A glance at the sketches will make this plain.

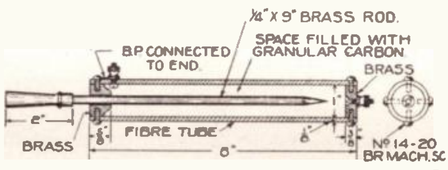
Contributed by

EDWIN C. WRIGHT.

EASILY MADE VARIABLE RESISTANCE.

The object in view in the design of this variable resistance for amateur use was simplicity, with a chance of working in as much material in the construction as is usually found in the average work shop. Dimensions do not necessarily have to be followed in every detail but are approximate only.

The outside tube or casing may be made from fibre or other insulating material, with the exception of hard rubber, (especially if a heavy current is to be carried), with an internal diameter of about one inch. The outside should be about 1¼ inches, so as to have a ⅛-inch wall, or heavier if possible. The length may run from 6 to



12 inches, depending upon the resistance required.

The plunger may be made of from ¼ to ⅜-inch brass rod, with one end sharpened to a point, so that same may enter the carbon easily. A handle may be procured from a large switch, or one may be turned up out of wood. A small pin should be driven through the handle into the brass rod, in order to hold same securely. The brass ends may be turned from a brass plug, or, if nothing else is at hand, babbitt may be poured into a mould of the requisite size. The binding posts should be as large as possible, in order to carry the maximum current required. The connection at C should be of ample size.

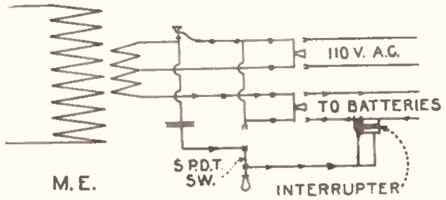
If it is desirable to mount the resistance on a base board, this may be done by means of small brass strips constructed from ⅛-inch strip brass. The sizes as given do not have to be adhered to in every detail.

The fibre tube should be filled with granular carbon, made from battery carbons crushed rather finely. This carbon should not be tamped too tightly in the tube as the resistance would be decreased by so doing.

Contributed by
MOORE STUART.

COMBINATION TRANSMITTING SET.

Herewith is a diagram of connections which I have found quite useful in op-



erating my wireless set. As we don't have city current all day, and I frequently desire to use my set during the day, I rigged up a set of batteries.

I use a closed core transformer which has two leads from the ends, and one from the middle, of the primary. As will be seen I use the whole primary for batteries, and one-half for 110 volts, a. c.

One of the chief merits of this "Hook Up," is the manipulation of the condenser, whereby, it is on the key alone at 110 volts, and on both key and interrupter when batteries are in use.

As illustrated in diagram, when using 110 volts, throw S. P. D. T. switch up, and when on batteries, throw it down.

Contributed by
JAS. LEROY HODGES.

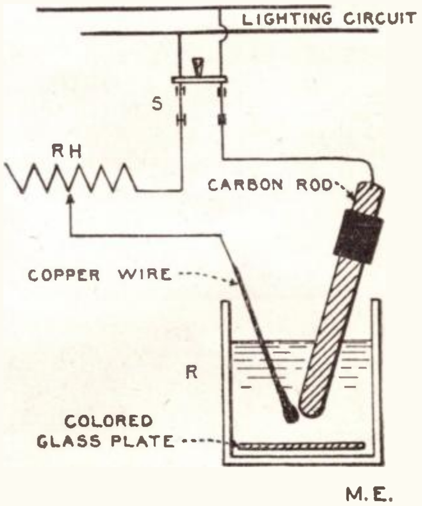
FORMATION OF IMITATION CRYSTALS BY THE ELECTRIC CURRENT.

A very interesting experiment for the making of imitation crystals, that will fool your friends, can be performed by following directions that are given below.

As shown in the diagram, the apparatus needed is a glass receptacle (an ordinary large tumbler), R; an electric light carbon, small pieces of colored glass about the size of the bottom of the tumbler, and a piece of copper wire, bare, No. 14.

The apparatus is connected up as in the diagram. Wires from the lighting circuit are led to a small switch, and then through a water rheostat, RH, to the two electrodes, consisting of the carbon rod and the copper wire.

The tumbler is nearly filled with water, and a little salt is added, to make the solution more conductive to the current. On the bottom of the tumbler is placed one of the pieces of colored glass. Some friction tape, or cloth, should be wrapped around the upper end of the carbon rod, so that, when it is held in the hand, the operator will not be shocked, as the wire is bare. Then the rod and the wire are taken one in each hand, and held about an inch from the bottom of the tumbler and touched together for a second. Upon drawing them apart a small distance, an arc will be formed between the carbon rod and the copper wire. This is all done under the water, as the



arc can be seen through the sides of the tumbler, and gives out a very brilliant green color. The arc is kept going until a small ball of white hot copper is formed on the end of the wire, and which will fall off and sink to the bottom.

As the little ball of melted copper falls to the bottom of the tumbler, it is cooled very quickly by the water, and, as it touches the glass plate, the glass is heated and a small piece cracks off; and as the copper contracts faster, as it cools, than the glass, it clinches the small glass particle. This embeds the colored glass in the copper, and the whole looks as if a jewel were imbedded in a large shot. Different crystals can be made in the same way by using different colored glass.

Five or six of these can be made in a few minutes. They will scratch a window, this probably being due to the hardening they receive upon coming into contact with the white hot copper. About 6 amperes is needed for this experiment.

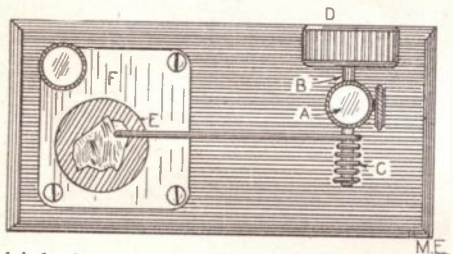
Contributed by

STANLEY E. HYDE.

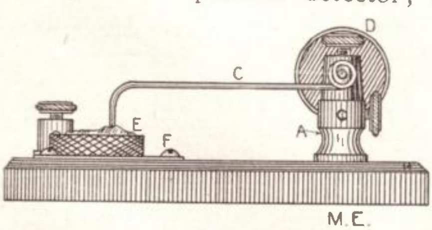
IMPROVED FORMS OF DETECTORS.

An improved form of detector, that is more convenient, and at the same time much simpler than the so-called "sensitive" detectors, which contain a mutiplicity of springs and hard-rubber knobs, and adjusting screws, is shown in the illustrations herewith.

It consists of a double binding-post, A, through the upper connection of

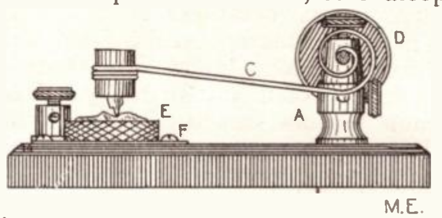


which is passed a shaft, B. On one side of this shaft is fastened a hard-rubber adjusting knob, D. On the other side is soldered a length of spring-brass wire, C, which is wound a few turns spirally, as shown in the drawing of the perikon detector; or



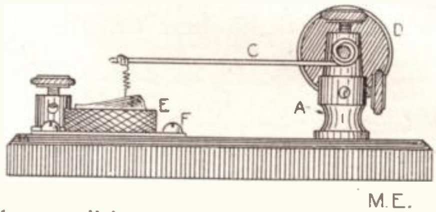
helically, as shown in that of the galena detector. The end of the wire is then brought out and bent as required.

For the silicon detector it is bluntly pointed at the end. For the galena, a small length of No. 30 copper wire is soldered, as shown. For the perikon detector, the end of the wire is wound around a piece of bornite, or chalcopy-



rite, mounted in metal, in the manner about to be described.

The lower mineral, E, is mounted in an alloy made of 3 parts solder to 1 part mercury. This is moulded into a



"button," in a mold made by boring an inch hole through a piece of ¼ inch wood, and screwing this over another flat piece of wood. The crystals are set in while the metal is yet liquid, and, when it has thoroughly hardened, the edges of the metal button are knurled by rolling under a coarse file.

This button rests on a piece of sheet brass, or zinc, F, which is screwed to the base, and has a binding-post screwed over one corner.

The advantage of mounting the mineral this way, over mounting it in a cup, is clearly evident. Any part of the mineral can be reached quickly and conveniently, and a sensitive spot, when found, can be kept, because the point does not spring away.

The writer has found this type of detector far more convenient and sensitive than the so-called "sensitive" detectors, spoken of before, besides being much more easily and cheaply constructed.

Contributed by

P. MERTZ.

MESSAGE BLANK FOR AMATEURS.

Amateurs will find that keeping a copy of all messages received adds interest to their wireless work.

Also, the practice of copying messages neatly and filing same is a great help to those who contemplate taking up commercial wireless work.

Ordinary letter-size typewriting paper of very good quality may be bought at the rate of fifty cents for five hundred sheets. These sheets, when cut in two, are of a convenient size for message blanks.

After a message is copied, the time received and station where the message originated should be marked on the blank, and same placed on file. These messages are always of interest to visitors, and, upon some occasions, may prove invaluable to the amateur operator.

A suggestion as to copying and marking a message is herewith shown:

No. 1 *K Y* *R* *RX* 10 *paid*
S. S. "Mariposa," 12.

Miss Lucille Hopkins,
San Francisco, Cal.

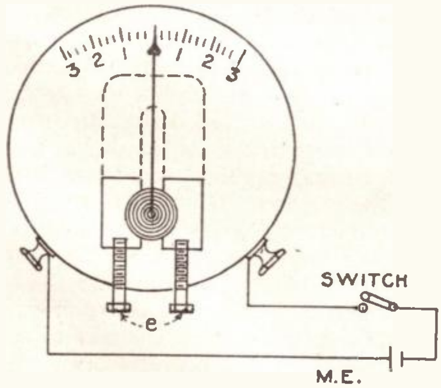
Very dusty on the ocean, ship rolling, much joy ahead.
GRANT.

10.30 *P. M.*

Contributed by
G. S. CORPE.

MAGNET TESTER.

This instrument requires a small ammeter of the D'Arsonval type, the permanent magnet of which is removed and in its place are substituted two soft iron blocks, A and B. The ends



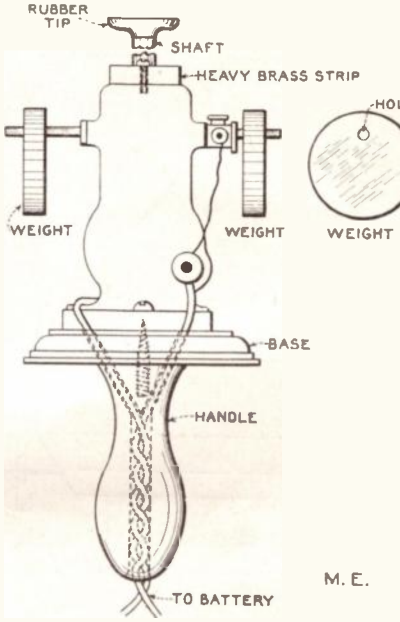
of these blocks are drilled and tapped 5-16 inch and two short iron bolts are screwed in the holes.

Connect an old dry cell in series with the ammeter and bring a strong magnet that is to be used as a standard against the two iron bolts at the point, C. When the needle comes to rest, mark the place, and, when testing other magnets of the same size, you can easily tell whether they are weak.

Contributed by
EDWARD H. HUTCHINSON.

ELECTRIC VIBRATOR.

This machine requires a motor of the 75 cent toy variety, with the shaft projecting about ⅜ inch beyond the bearings on each side.



Two weights, A, are cut from a piece of 1 inch round brass rod, ¼ inch thick, and an eccentric hole, just large enough to fit the shaft, is drilled as shown.

The weights must then be soldered on the shaft, so that they are in the same position.

The name plate must be removed from the top of the motor and, in its place, must be substituted a brass plate ¼ inch thick, in the center of which a short length of ¼ inch round brass rod, B, with a rubber tip on the end, is screwed. This rubber tip may be secured from the end of an arrow, such as is used in a parlor target pistol, and should be shellacked on.

When the vibrator is assembled, as shown, it is a good plan to put some kind of a housing around the weights, so that when they revolve there will be no chance of their hitting anything.

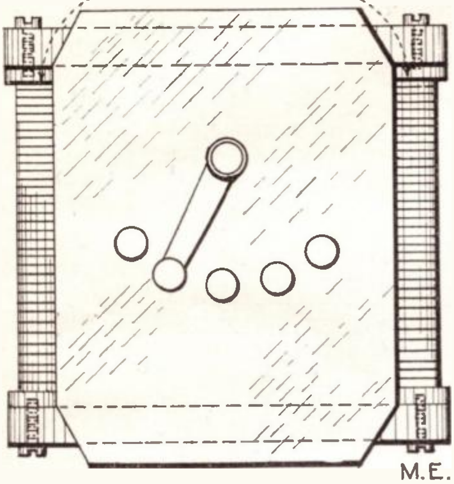
However, I will leave that to the builder.

Contributed by
EDWARD H. HUTCHINSON.

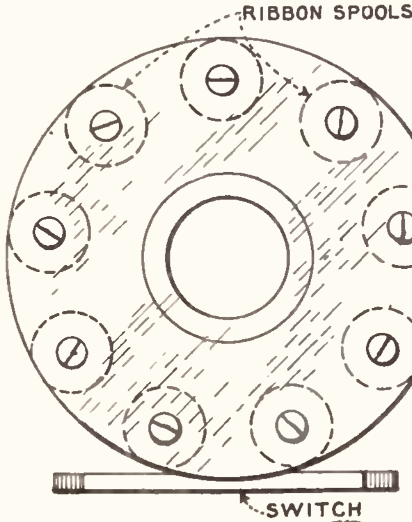
"There is no way to adjust the vibrator." FIPS.

LOADING COIL.

Procure, from any dry goods store, six or eight baby ribbon spools. Smooth them up with sandpaper, and give them a good coat of shellac. Then get an annunciator wire spool, large



enough for the ribbon spools to slip in between the heads. Arrange the spools as shown in the sketch.



Wind each ribbon spool with as much No. 24 enameled wire as it will hold, and fasten them with glue.

The coils are connected in series, and to a seven or nine point switch, as in any other loading coil that is adjustable by steps.

Contributed by
WELLINGTON E. CHRISTNAGEL.

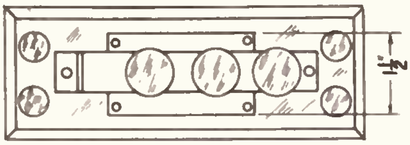
SQUARE TUNING COIL.

Here is a new idea on the construction of either a close, or loose-coupled, tuning coil. Its great advantage is, that a greater amount of wire may be wound in the same space, thus affording a larger wave-lengthed coil, in the same dimensions. It will not be worth while to give any dimensions, for the builder may make it any size he wishes. The general construction is as follows: It consists of four pieces of wood, preferably oak, or some other well dried wood, one-half inch square, running the full length of the coil, placed about ½ inch from each corner of the coil heads. The outside edges, on which the wires are to turn, should be rounded off, preventing a sharp corner, which is apt to weaken and break the wire. If these wooden strips are more than 3 inches apart, it is best to wrap a sheet of thin, hard-rolled fibre on all but the bottom side. Soak the fibre in warm water, until it becomes flexible. This should be immediately placed on the frame, and temporarily wrapped tightly with strong cord When the fibre is thoroughly dry, which will take about a day, remove the cord, and then glue the fibre covering to the inner sides of the two lower wooden strips. Then, evenly wrap No. 20 B. & S. gage enameled wire the entire length of the coil, being sure that one turn is perfectly tight before the next is wound on, for one loose turn may cause a great many turns near it to become loose. After this is finished, shellac the wire, and allow it to thoroughly dry before proceeding. The sliders may be placed down the middle of each side, or, if only two sliders are to be used, they may both be placed on one side.

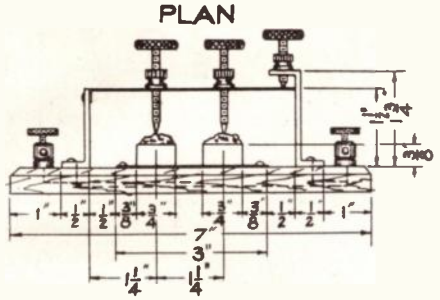
Contributed by
EVERETT DAVIS.

COMBINATION DETECTOR.

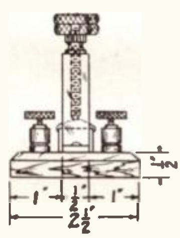
Enclosed please find a blue-print of a detector stand which I have worked out. This detector has a new idea as to the fine adjustment. Instead of having the fine adjustment screw between the contact and the standard, I have placed it on the other side of the contact, and therefore obtain a much finer adjustment. If you turn the screw down one-sixteenth of an inch the contact point will only go down



PLAN



SIDE VIEW



M. E. END VIEW

one-thirty-second of an inch or less, where, as in the other kinds, the points would go down farther than the screw.

Another scheme is in the metal plate, on which the mineral cups rest. The plate is connected to a binding post, and the cups just rest on the plate. They can be moved around until the right part of the mineral is under the contact point.

I do not know whether you could use two minerals at the same time, but you can make a quick change from one to the other in this model. Some of the dimensions are not needed, but I think the drawing is clear.

Contributed by
ROBERT GIBSON.

INCREASED RECEIVING EFFICIENCY.

In most books dealing with wireless subjects, very little is said about three-slide tuners, so a word here would not be out of place.

Experimenters using single or double slide tuning coils will find that the selectivity of their station is increased from 25% to 50% by using a three-slide tuner in conjunction with a loop aerial, connecting instruments up as in Fig. 1. Excellent results can also be had from Fig. 2.

Any single or double slide coil can be converted into a triple slide coil at a cost of from twenty-five to fifty cents. After this has been done, get a piece of sheet copper, about 1-64th inch thick, and fasten it to the body of the coil, directly under one outside slider, so that when the slider is moved off the wire, it will slide onto the copper. Then connect this piece of copper to the other outside slider. Using the hookup shown in Fig. 2, if the slider is moved from the wire to the sheet copper, the loop aerial is converted to a straightaway aerial.

The writer believes that the method of connecting 'phones and detector (in series instead of in parallel), which was shown to him by a United Wireless operator, is new to most amateurs; and, although it does not seem possible for the high frequency oscillations received by the aerial to go through the 'phones, whose inductance is very high, still such is the case.* Using crystal detectors, without a battery, such as

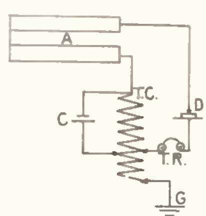


FIG. 1

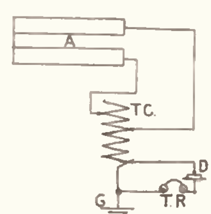


FIG. 2

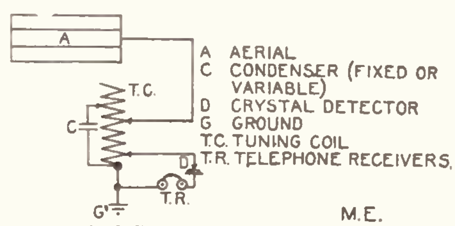


FIG. 3

perikon, galena, molybdenite, ferron, carborundum, etc., the signals come in fully 25% louder than when the 'phones are in parallel with the detector. When using a battery, the 'phones must necessarily be connected in parallel, but otherwise all connections are the same.

In case the experimenter has no loop aerial, and does not wish to convert his straightaway aerial into one of the loop type (which would amply repay him for the trouble and expense), the hook up shown in Fig. 3 gives very good results.

All of these "hook ups" were given several trials at a commercial station, as well as at the writer's station, and gave most gratifying results.

Contributed by

EDWARD B. WOOD.

**Note*.—The high frequency current does not pass through the 'phones, as stated. What does go through, in this case, is a rectified pulsating current. If the 'phones be shunted by a small fixed condenser, of about 0.002 mfd., still better results will be obtained. —Ed.

ROTATING HELIX.

The following is a description of a helix which will save the operator

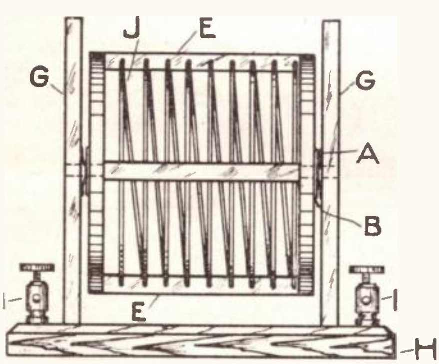


FIG. 1 M.E.

from having to reach around it every time he wants to change the clips.

A, is a copper strip about three-eighths inch wide and 4 inches long. B is a copper disc, anywhere from two and one-half inches to three and one-half inches in diameter, with a hole in the middle for the shaft to go through. C, is a lead wire from A, to post, I. D, is another lead from helix wire to B. Figs. 2, 3, 4, show how this works. The shaft, F, can be a piece of broom-stick, or any other hard wood. The standards, G, should be high enough to support the coil about two and one-half inches above the base, and extend about one and one-half inches above coil-heads, K. The base

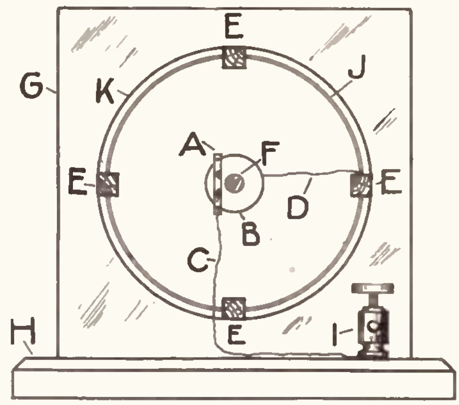


FIG. 2 M.E.

and standards should be made of hard wood about one-half inch thick. They may be beveled to look better. The wires, C and D, should be about number 10 or 12, B. & S. gauge, insulated wire.

This helix can be fastened to table or wall, but should not be placed vertically, because the weight of the coil would be all on copper strip instead of on shaft as when placed horizontally.

When contact is to be made with the wire, all you have to do is to turn the coil over till you find the right

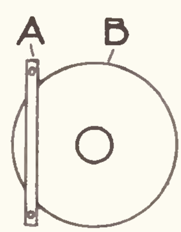


FIG. 3

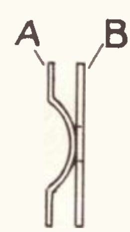


FIG. 4

M.E

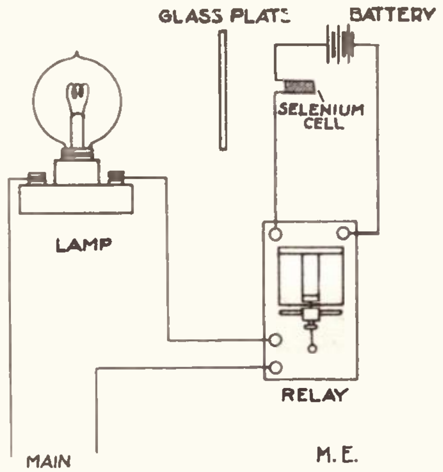
place, instead of having to reach around where you cannot see.

Contributed by

GALEN HIERONYMUS.

SIMPLE LAMP FLASHER.

Enclosed find a drawing of a simple lamp flasher. It has the merit of being used on any voltage. A relay with the points reversed is used to close the circuit, and a selenium cell is connected to its magnets. When the lamp lights, it affects the selenium cell,



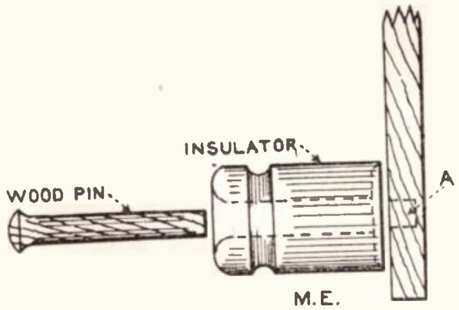
which, in turn, affects the relay, which opens the circuit. In case it should flash too fast a dark glass plate is placed between the cell and the lamp, and the speed of flashes may thus be controlled.

Contributed by

M. HURLBUT.

FASTENING INSULATORS TO A HELIX FRAME.

By fastening insulators to a helix in the following manner they do not lose their insulation, as when screws are used.



The wooden pin slips through the insulator and is fastened, by glue, in the hole in the framework.

Contributed by

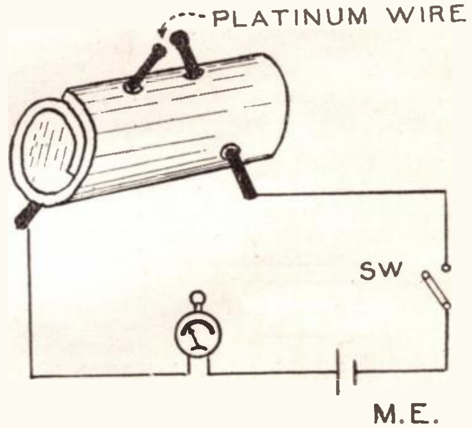
BERTHEL CARLSON.

HYGROSCOPE.

The following is a description of a hygroscope, which is easily constructed and fairly accurate. The necessary materials are: A small pocket ammeter, a small quantity of chloride of zinc, two short lengths of platinum wire, which may be obtained from an old incandescent lamp, and a piece of soft, white blotting paper.

Soak the blotting paper in a solution of two parts water to one of chloride of zinc, and allow it to dry. Then roll it into a small tube and fasten it by sticking the two lengths of platinum wire through it, about an inch apart. Next fill the tube with chloride of zinc, and seal the ends with paraffine.

Reverse the dial of the ammeter and connect as shown in the sketch. When a rain storm comes, take a reading, and when the needle comes to rest, it indicates 100% of humidity. Mark this point on the dial, and graduate the rest of the scale between zero and 100% proportionally. It is, of course, neces-



sary that the blotting paper tube be in contact with the outside air, but protected from the weather. Salt may be used instead of chloride of zinc, but the latter is preferable, as it is much more hygroscopic.

Contributed by

EDWARD W. HUTCHINSON.

BATTY NUMBER

The Wireless Screech

OUR MOTTO . . ——— . . . . . ——— .

THE ETHER THIN AND STRINGY

No. 6+⅜*! JULY Price 15 Sparks

The Wireless Screech

A preposterous screecher, screeching impertinent noises upon an unsuspecting world, with a view to improve still life on this planet.

Mohammed Ulysses Socrates Fips,
Screecher-in-Chief.

Subscription price to Screechers & Wireless "Bugs" free of charge f. o. b. New York. Other dubbs add 50% to above rates.

Single copy 15 sparks
Half a copy 7½ sparks

The Editor is always pleased to receive noisy MSS. The noisier the better. Write your dope on tin cans, copper kettles or silver platters. We guarantee to return the MSS safely and will keep the metal as renumeration for the hard labor to read your dope.

N. B. We don't care how rotten your MSS is, so long you write it on silver, or better, gold platters.

N. B. 2. We accept a good grade of cut glass also.

Address all communications, express & freight packages to FIPS, Fips Bldg., New York.

Idiotorial

To calm our impatient readers, who during the last month have clamored boisterously for a new picture of our illustrious Editor, we are overwhelmed with the suffocating pleasure of having the extraordinary privilege to present the latest pose of our unsurpassable, magnificent Editor to our esteemed friends.

The Editor

We are so pleased over the wonderful novel expression of his intellectual mug, that we have applied for a patent on that face of his in all uncivilized countries. As soon as the patents have issued, nobody will be allowed to look like our noble Editor, the great emancipator of modern screechery, the pioneer of the noiseless echo.

For a limited time, as long as our supply lasts, we will sell an original fotogravure of our Editor, size 2 x 56, mounted on an unperishable brick, ready for farming, for the cost price of 30 cancelled postage stamps.

The Praktikel Electrician

By Proffessor Z. Hokuspokus of the University of Coney Island.

A popular curse in electri*ville* on the conduction of electional apparatus and expeariments to be Kondukted with them.

Translation by Mohammed Ulysses Socrates Fips, E. E. E.

CHAPTER I.

FIRST BOOK.
FIRST PARAGRAPH.

ELECTRICITY.

ELECTRICITY is pretty thoroughly understood to-day. It is composed of eleven letters of the alphabet. It has always been well known to cats, who use it for a lubricant of their fur. Man has not yet learnt to use it on his hair, hence he is mostly bald-headed. Amber pipes are said to be full of electricity, but as amber is too expensive cats are preferred as they can be rubbed and stroked more conveniently. Besides cats do give off beautiful sparks in the dark, while amber pipes must be supplied with tobacco and matches to give off sparks. Amber pipe sparks easily burn you, while cat sparks are cold and harmless, unless the cat is stroked the wrong way.

A fairly good quality of electricity is found in lightning, but few persons aside from Hon. Ben. Franklin, care to monkey with it.

The most curious kind of electricity is found in short-circuits. This kind however is generally disliked by electricians, especially practical electricians. No practical electrician ever admits openly that he uses this form of electricity, but he uses loads of it, secretly, when nobody is looking.

There are two kinds of electricity in general. 1° *Static Electricity*, such as found in cats, your wife's switch etc. 2° * *Galvanic Electricity* first found by Galvani in a dead frog. It would be correct to term it Frogic Electricity in honor of the frog. This form of electricity is also found in the human elbow, and can be felt nicely when hitting the elbow on a certain spot. The same electricity is also found in the human eye. If struck correctly, sparks and stars can be seen most beautifully.

A special form of electricity not classified as yet is found in *startling news*. If applied to man he becomes full of electricity. Hence the term, "The news electrified him." It is conceded however that this form of electricity is not practical nor has it much commercial value. The men who have the least amount of electricity in them are usually *electrical men*. They often have an E. E. after their name, and are supposed to know all about electricity. There is not one among them, however who could tell you what electriciay really is. They admit that openly and are brazen enough not to deny it. Moreover they dont care to know, as it might upset their pet theories.

As a general rule electricity and man are enemies. Electricity forever is lurking around, trying to shock man if he does'nt look out and doesn't leave it to itself. The greatest prey of electricity is the farmer when coming to town. A farmer likes hotel souvenirs immensely and often tries to cut off electric light bulbs with a pair of scissors. I say he *tries*, but he usually does not get much further than cutting about half way through the connecting cord. After he has picked himself up out of a corner and dusted his clothes off he concludes that the hotel can use the electric light bulb to a better advantage than himself.

Another well known enemy of electricity is that obliging citizen who delights in picking up a broken trolley wire with a view of preventing people from stumbling over it, as this might damage the wire. After the obliging citizen has performed a dance that would do credit to the most agile trick dancer on the stage, he finally makes up his mind that after all he is not paid to supply amusement to the delighted bystanders, and in most cases leaves the trolley wire disgustedly to its fate.

Another sworn enemy of the mysterious fluid is the "fixer." This individual as a rule knows all about electricity. His profound knowledge is usually based on the fact that he has switched off and on the parlor lights numberless times, not to forget the time when he connected two dry cells to the electric bells of the house. It is true that they did not work after that, he having made,—unknowingly of course,—the slight mistake of connecting them the wrong way. However that was the fault of the batteries, not his.

Thus when his wife informs him that the lamp in the bedroom suddenly has gone on strike, he sallies forth to apply his knowledge to the offender. He can of course "fix it" in a minute. Why should they call the electrician, who dont know any more about such matters than himself? He performs the operation by turning off and on the switch about fifty times which however does not turn night into day. He then calls for a candle and looks at the lamp globe that seems to be intact, it is'nt even broken. How could he be expected to know that one of the fine wires was "burnt out"; he would never suspect that, for had he not bought the lamp only last Friday at a bargain sale at Cheatham & Engee's Department store? No, the trouble can't be there. Ah, of course, it must be in the socket, how stupid of him not to look there first. The bulb is promptly screwed out of its socket. His experienced eye locates the trouble in a twinkling. He knows dirt is bad, for electricity. He has read once that no electrical current can pass unless there is a good contact. He sees that the bottom of the socket is black and dusty, that's where the trouble is of course. He promptly calls for a kitchen knife to scrape the contacting part clean.

He has just gotten well under way, when suddenly a great light dawns upon him. To be sure he never expected so much light as that, nor had he ever seen so much of it together all at one time. His whole inside and outside seemed to blaze forth in a tremendous flash of blue-green light. It was however all over in a second. After the fire engine which his wife had summoned hurriedly had departed, and after the doctor has left our well bandaged friend, tucked away in his bed, he calls for his friend, Mr. Jeremiah Fleecem. Together they draw up a voluminous complaint for damages against the light company, charging that abused individual with murderous assault and battery, incendiary, and disturbers of the peace.

Electricity finds new uses every day, or rather we find new uses for it. The latest is wireless telegraphy. This is of course a swindle and merely gotten up to sell stocks. We all know that ships trail thin cables under the water to make connection with the land, else how could they send the messages. The wireless companies practically admit the swindle now, since the Government has taken a hand in the scandal, for do they not stretch long wires between the tops of the masts? Of course they do. If there really was such a thing, as Wireless Telegraphy they would not need those wires at all. That proves the swindle conclusively. Those noisy Wireless cabins on board of ships are another subtle swindle. They serve to attract lady passengers and other feeble-minded folk, who "swallow" everything that the wireless operator tells them. He usually winds up by selling them a carload of worthless wireless stock, this being his real business.

As a matter of fact Wireless Telegraphy had been known already to the old Egyptians, thus proving that there is nothing new under the sun. Recent extensive excavations near the great pyramid of Cheops revealed the fact that not a piece of wire of any sort was to be found. This proves beyond the slightest doubt that the old Egyptians had given up wire telegraphy, substituting therefore the more convenient Wireless.

(TO BE CONTINUED.)

The Orattle

This department is for the special benefit of all Wireless "bugs." Common questions will be answered at top speed by freight. Uncommon questions are answered by Wirêless via Western Union or Postal Telegraph. We pay the freight charges. We have loads of cash especially counterfeit green backs received by our correspondents. If a quick reply is wanted, don't send it to us. We have troubles enough of our own with the "slow freight."

HUMMING WIRES.

(%+68B:) A. Foxy B. Oob, White City, Ill., snorts:

Q 1. Why is it that electric light globes burn out? I always understood that the filaments *glow* but don't burn; then how can they *burn* out?

A 1. Mr. B. Oob, you are perfectly right. We have often thought about it ourselves and came to the logical conclusion that filaments don't burn out. We think they burn *in*, if they burnt *out*, why bless us, they could of course not burn *in*, so there.

Q 2. Why do telegraph wires hum and why does not an aerial hum?

A 2: Hm, rather cute question that, Foxy. Tell you the truth we didn't think it was in you. You see a modern telegraph wire, thanks to multiplex telegraphy, passes as many as 15 messages at one time. Now, when the line was built, multiplex telegraphy was not as yet invented. Now you admit 15 messages on one wire is a bit crowdy. Imagine someone is sending the following message: "Liars, malefactors, of great wealth, thieves, my cat is in the ring. Teddy." The following message is sent from the other end at the same time: "I'll save the country. Don't let 'em steal delegates. All lies. Tar & feather 'em. Billy."

Now is there any good reason that the telegraph wire should *not* hum when such messages pass each other, all on one wire? Certainly not.

An aerial sends out mostly one message at one time. As a matter of fact, most of them don't even accomplish that much. Hence aerials don't hum.

TELEGRAM AROUND THE WORLD.

($6.59NG) Hiram Blowout, Luny Park, N. Y., bays:

Q. I understand that if you send a telegram from New York at 2 P. M. it arrives at 1 P. M. on the same day in Chicago. Is this due to the great speed of electricity?

A. Certainly, Hiram. We assure you it is not only that, but if you send a wire from New York at 2 p. m. June 25, via San Francisco, around the earth, it arrives at Frisco at 10 A. M. *the same day* June 25th. It arrives in Honolulu about 6 A. M. June 25th. From this it follows that travelling all around the earth the telegram should be delivered in New York about 2 P. M. June *24th* or exactly one day before you sent it off. Now then it is obvious that if you want to send a wire around the earth, in the western direction, you had better wait a day, else you will get it before you send it off. We certainly do live in a fast age.

MESSAGES TO MARS.

(69:10?B) Archimedes Handsup, Dead Frog, Texas, yelps:—

Q. Please have the kindness to inform me through the columns of your wonderful "ORATTLE," if actual messages have ever been sent to Mars.

A. Archi, you take our breath away. Why my boy, millions of 'em, billions!! Our friend Tesla has been shooting 'em up to Mars for years. It is an everyday occurrence. To be sure the Martians have never replied so far, but nevertheless, we've been sending them actual messages. Those fellows up there are an arrogant lot. They think because they are a few million years more civilized than we, they can ignore us, however, they can't put up that bluff much longer if they hear that this planet harbors such intelligent bipeds as yourself.

Correspondence

Editor *Modern Electrics*:

Referring to 1934 in the February Oracle, Keleher, the Vibration Expert, sings certain notes and puts out fires. In Venice, California, there is a board, 1x4x12 inches, hanging between two trees by means of a wire which continually has bobbed up and down for a little over two years. This is not due to perpetual motion, or the wind, but is accounted for by the fact that the waves send forth certain sounds that are "tuned" with the board, or wire, thus causing it to vibrate.

The two telephone wires in question, undoubtedly, were in tune with some particular noise that was being sent forth at that time; for instance, a passing truck of structural steel might have made a noise that "tuned" exactly with the two wires.

R. J. KRIWANEK,
Niles, California.

New York, May 24, 1912.

Editor, Modern Electrics.

Sir:—The following are some excerpts from a wireless examination held to prepare operators for the Government License examination. They have "FIPS" skinned a mile:

Q.—Suppose the two field rheostats of your motor-generator should burn out at sea what would you do to make a temporary repair?

A.—Get a bucket of water, put a couple of monkey wrenches in it and add salt water (to suit the taste) till required resistance is obtained. A rheostat being simply a dam to check a great flow of current.

Q.—What would you do if the spark muffler should burn out at sea?

A.—I would bring it down to the engineer and tell him to run steam through it, or make a muffler out of a wood box.

Q.—How do you obtain the frequency of a motor generator?

A.—By having the fields of the motor shorten, as much as the carbon regulator could weaken, and on the generator have all the field used without shortening it. Then you will have the highest reading in your voltmeter and is called Frequency.

And again:

Q.—What would you do if the spark muffler should burn out at sea?

A.—Wake the sleepers aboard.

Yours respectfully,
No sig.

P. S.—These are actual answers.

THE STANDING OF WIRELESS ON STEAMERS.

It would seem that every seafaring man concerned directly or indirectly with the "Titanic" disaster was affected by an evil influence which blunted his senses and judgment, resulting in unpreparedness for emergencies.

The investigation into the disaster, which is now being conducted in London, reveals woeful neglect of duty and lack of judgment on the part of many of the principals immediately and indirectly concerned.

It appears that the steamer "Californian" was only a few miles from the "Titanic" when the latter sent out distress signals, and yet through some hypnotizing influence the officers of the former became dreamy and generally inactive.

While they were speculating as to the cause of the unusual appearances, the "Titanic" sank, with hundreds of lives that might have been saved had the officers of the "Californian" been possessed of their wits and on the alert.

The point we wish to emphasize in this connection, however, is that there appears to be a feeling of resentment on the part of ship captains against the wireless service on board of their ships. They seem to labor under the impression that wireless operators, in the legitimate performance of their duties, are in some way encroaching upon their authority, and they do not take kindly to suggestions from the mere lads usually employed as wireless operators.

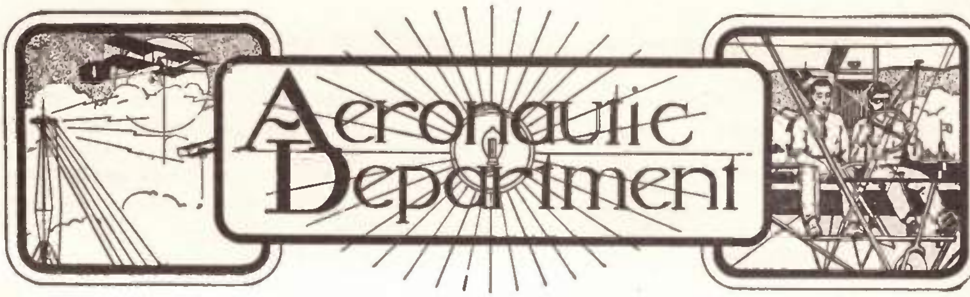
There was too much confusion and lack of organized effort in the wireless service in connection with the loss of the steamer. Everybody connected with the affair appeared to be unprepared and no one, even on the "Titanic," seemed to realize that the situation called for action.

But these delinquencies are not devoid of valuable lessons; they show the danger of becoming lax in duty, and the importance of harmony and co-operation between all the departments of a ship organization.

The wireless, if properly used, is an agency for great good, but if abused, can do much harm.—*Telegraph & Telephone Age.*

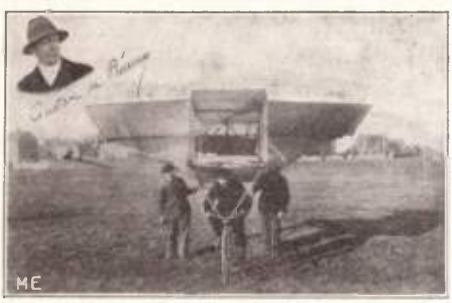
WIRELESS ON THE ISTHMUS.

The United States Government is planning to spend $1,000,000 for wireless equipment at the Isthmus of Panama, and it is stated that arrangements have been made with the Republic of Panama to prevent any private or commercial wireless companies from establishing stations in that country.



Fliers Without Motors

A prize of $2000 is to be given in France for "aviettes," or fliers without motors. The initial start is to be given by a run of not more than ten metres, by man-power. At the first contest, in Paris, none could rise from the ground, and it remains to be seen whether any will accomplish the feat in the future. Inventors are working on the subject, as shown in the accompanying photographs. The first is Count de Puiseux, in the north of France, who claims to



DE PUISEUX.

have flown several hundred feet. His machine, which is mounted on a bicycle, has a bamboo frame five metres long. In front is the propeller, 1.10

LADOUGNE.

metres diameter, two blades. The planes have a total surface of 3.50 square metres. On the ground the machine is propelled by the rear wheel of the bicycle. While in the air it is driven by the propeller, which is belted to the

CHAUVIERÉ.

rear wheel. The total weight of the machine is thirty-three kilograms.

The second is the bicycle of Ladougne. The front wheel is covered with canvas, to act as a rudder when in the air. The plane is supported by four steel tubes. There is no propeller.

The third is the monoplane glider, of Chauvieré. The width of the front plane is 9.50 metres; rear plane, 4.50 metres, and the length, 6 metres. The total surface is 17 square metres, and the weight, 35 kilos.

PUBEL AERO MOTOR.

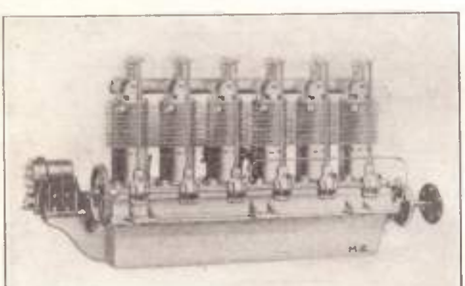
The six cylinder 50-horse power Gray Eagle motor is a new model, low priced aviation power plant, put on the market by P. O. Pubel, Jr., & Co., of Louisville, Ky., that is attracting considerable attention. It is a vertical motor of the six cylinder type, having large concentric valves in the heads of the cylinders. This particular motor is air cooled or rather cooled by means of the lubricating oil which is pumped from the oil reservoir into the crank case at the rate of three gallons per minute.

The builders claim that their motor cools successfully, due to the unique concentric valve system, which is fully patented. Both valves form a sliding sleeve, the intake working within the exhaust, which is located directly in the heads of the cylinders. These valves are slightly larger in area than the valves of water cooled motors of the same cylinder displacement.

Each cylinder of the Gray Eagle motor is machined from an ingot of semi-steel which weighs 55 pounds in the rough, and when finished they weigh less than 10½ pounds.

The crank shaft is cut from a solid bar of vanadium steel and is mounted on seven large, high speed nickel alloy bearings.

A normal speed of 1100 r.p.m. is claimed by the manufacturers, at which speed a standing thrust of 350 pounds is obtained with a seven foot diameter propeller of five foot pitch. The bore and stroke of the cylinders is 4x4½ inches, and the weight complete, with Bosch magneto, Rayfield carburetor, oiler, plugs and wires, is 260 pounds. This motor is claimed to be the lowest priced aero motor on the American market.



Aviators who wish to try them are permitted to use the private flying grounds of the Pubel School of Aviation, and free use of a motor is offered without obligations of any kind.

This particular offer has caused a number of amateur aviators to bring their aeroplanes to Louisville and learn to operate them.

Another feature claimed by the manufacturers is economy of fuel. They state that, while running under full load at 1100 r.p.m., the motor consumes but three gallons of gasoline per hour.

FRENCH MILITARY BIPLANE.

The accompanying photograph shows a portion of a biplane built at the military aeronautic laboratory by Commandant Dorand. In this machine use is made of many devices, electrical and otherwise, for taking measurements of pressures on surfaces, speed, etc. A and B are recorders of the pull of the propeller; C, speed counter for r.p.m. of propeller and recorder for

horse power used by the latter; D, indicator of aeroplane's speed in miles per hour; E, altitude indicator; F, instrument that shows whether the machine is mounting or descending; G, electric contact for photographic apparatus, and the registering instrument next to F.

HEAD RESISTANCE APPLIED TO MODEL AEROPLANES.

By Oliver M. Prentice.

Head resistance has become an important factor in model aeroplane construction; as it also has in full sized machines. In this respect the model builder can well emulate the constructors of full sized machines as a rule, for one applies to both. The model having the least head resistance requires much less power, and will make longer flights for the same weight of rubber, or with the same type of motor. Head resistance is even more important in models than in full sized machines for models have a power plant that will only last a certain length of time, and the most must be made out of the static energy thereby stored.

The most important factors which cause head resistance are: (1) Bodies such as struts, wires, framework, edges of planes, etc., which are opposed directly to the air currents; (2)

Rough and unfinished surfaces; (3) A number of bodies such as the struts, braces, etc., of a bi-plane or the braces in the fuselage of the Bleriot.

The most important factor is the first. This has been neglected a great deal in model building. Most model builders use square wood, that being the easiest to procure. With a little extra work these pieces could be reduced to a stream-like form, without materially weakening them. In bi-planes as few struts should be used as possible. The Brueguet bi-plane can be taken as a good example of this kind of construction. In this machine a very few struts are used, and although of a larger size they are much stronger than using the smaller struts in the conservative way and they also offer a great deal less resistance. A great many struts, or wires for braceing also tend to lessen the stability of the machine because of the numerous eddies they produce. This is one reason why monoplane models are generally the most successful.

As noted in number two, rough and unfinished surfaces offer a considerable resistance because the air does not flow smoothly over them. Most model builders now highly finish their machines, generally sand-papering and shellacing all the struts, braces, etc., so few models are now deficient in this respect. All surfaces such as aerofoils should be stretched out taut and if the aerofoils are of sufficient size, they should be covered on both sides and treated with a fabric-coating solution.

A number of braces, struts or bars following one another tend to produce a large head resistance, because the first produce eddies in which the others follow. This also causes the machine to be less stable. The best way to remedy this on the fuselages is to cover them with thin silk which has been treated. This is one reason why the simple stick is better than a built up fuselages, even though the latter be somewhat lighter. All wire bracing should be reduced as much as possible, a strong stick of a larger size being much better because a wire vibrates thereby offering one and a half times its standing resistance. A machine using wire bracing is also always at tension and is hard to adjust and even when adjusted easily warps out of shape.

In conclusion it may be said that all wire bracing, extra struts, etc., should be eliminated as much as possible and the landing gear should be simplified a great deal. All parts of the machine should have a stream like form and should also be highly finished. As has been proven many times in practical models the simplest is the best, so all model builders should try to simplify everything as much as possible, and the result will be, a practical, strong and successful machine.

ANOTHER ELECTRICAL ACCIDENT.

It is reported from Pittsburg, Pa., that a man, Charles Beab, a chef in one of the Pittsburg restaurants, met his death under rather peculiar circumstances. It has not been determined whether Beab was a victim of a beauty craze or whether he met death trying to escape the tortures of rheumatism. His wearing apparel indicated the former cause.

When the body was found it was encased in a long white pair of corsets, with hose supporters attached to long silk stockings. These were hidden by white striped trousers of very light material. A heavy piece of muslin covered the bust.

It appears that he had taken a ten foot length of ordinary lamp cord and had untwisted the end of one conductor to form a fan shaped electrode, which he had probably applied to his chest, while the other conductor was attached to a common needle, which was found sticking in his back when the body was discovered. The other end of the cord was attached to a plug in a lamp socket.

We report this unfortunate accident simply to call attention to the danger attending the ignorant use, upon one's person, of home-made electro-medical devices attached to the lighting circuits.

WIRELESS IN VENEZUELA.

Wireless stations are to be established at La Guaira, Puerto Cabello, Maracaibo and Cumana, Venezuela.

Our Wireless Station and our Laboratory Contest will be continued every month until further notice. The best photograph for each contest is awarded a monthly prize of Three (3) Dollars. If you have a good, clear photograph send it at once; you are doing yourself an injustice if you don't. If you have a wireless station or laboratory (no matter how small) have a photograph taken of it by all means. Photographs not used will be returned in 30 days.

PLEASE NOTE THAT THE DESCRIPTION OF THE STATION MUST NOT BE LONGER THAN 250 WORDS, AND THAT IT IS ESSENTIAL THAT ONLY ONE SIDE OF THE SHEET IS WRITTEN UPON. SHEET MUST BE TYPEWRITTEN OR WRITTEN BY PEN. DO NOT USE PENCIL. NO DESCRIPTION WILL BE ENTERED IN THE CONTEST UNLESS THESE RULES ARE CLOSELY ADHERED TO.

It is also advisable to send two prints of the photograph (one toned dark and one light) so we can have the choice of the one best suited for reproduction.

This competition is open freely to all who may desire to compete, without charge or consideration of any kind. Prospective contestants need not be subscribers for (the publication) in order to be entitled to compete for the prizes offered.

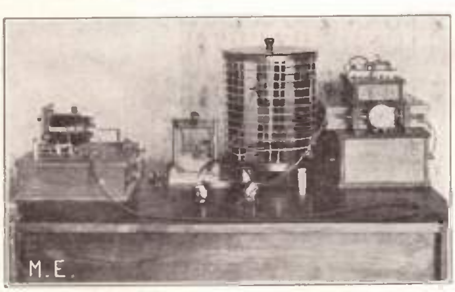
FIRST PRIZE THREE DOLLARS.

This is a photograph of my wireless station.

My receiving set consists of a loose-coupler, variable and fixed condensers, a silicon detector, and a pair of Brandes 2,800 ohm receivers.

My sending set consists of a ½ kw. closed-core transformer, glass-plate condenser, rotary spark-gap, and an aluminum-wire helix.

The aerial switch may be seen in the middle of the table.



KIRK STATION.

The aerial used with this set is composed of six strands of No. 12 copper wire, and is seventy feet long and fifty feet high.

With this set I am able to copy commercial stations within an 800 mile radius.

I have found much pleasure lately in playing checkers by wireless with Richard Ferris, an amateur living across the city from me.

I am a member of the W. A. O. A. and would be glad to have any amateur communicate with me. My call is H. K.

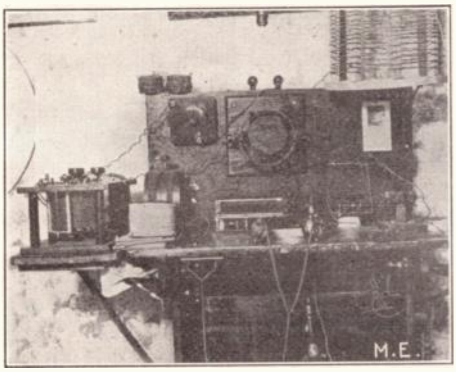
HEAGLE J. KIRK, Illinois.

HONORABLE MENTION.

Enclosed is a photo of my wireless telegraph set. My antenna, which I had considerable trouble in putting up, is 4,000 feet long, and consists of two wires. For sending I use a ½ kw. coil, an E. I. Co.'s Electrolytic Interrupter, which works very satisfactorily. Two helices are used; one, on the back of the board, I constructed myself, using 100 feet of wire; the other, to the right, and not in the picture. The coil and interrupter are on the floor and cannot be seen in the photograph.

For receiving I use a loose coupler, a variometer, and three variable condensers. The loose coupler is of the DeForest type, and constructed after same by me. The small condenser at the back of the board was constructed by the United Wireless Co., and was used for a time at one of their stations; the other two, at the left, the plates of which were made by the DeForest Co., were put together by myself. For rectifying the waves I use both galena and audion detectors; both are very sensitive, and give fine results. The variometer is of my own construction, and a litttle plug switch on the board, to the left, throws it in series. The loading coils, on the top, to the left, are used in loading the antenna for Glace

Bay. They can be put in series with the primary of the loose coupler by putting the plug in on the left side of the switch. The secondaries of the loose coupler are spools, and can be taken off, and larger or smaller inductances substituted. The spool to the right of the variable condenser, and in front of the variometer, has 300 feet of No. 20 wire on it, and is used as the secondary of the loose coupler for Glace Bay.



PEARSON STATION.

Have heard stations as far south as Colon, and ships far at sea. I can get Glace Bay winter or summer. Everybody is pleased with the selectivity of this set. I can get N. A. H. on his tune, then switch over on a boat's tune, and hear the boat loud enough to read. N. A. H. comes in so loud I can hear him on the floor below mine.

HERBERT B. PEARSON,
New York.

HONORABLE MENTION.

A short description of my wireless station, which was made entirely by myself.

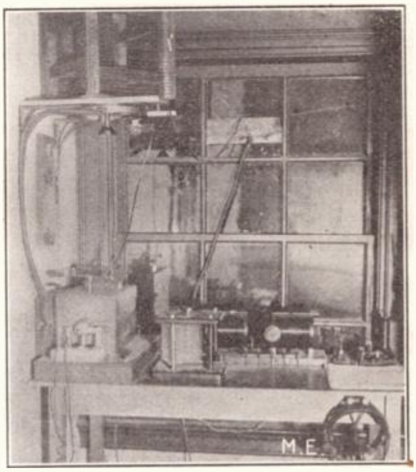
The apparatus for sending: A six inch spark coil, two storage batteries (six and eight volt), a glass plate condenser, a loose coupled spiral primary helix, a hot wire ammeter, U tube type, a nickle-steel pointed spark gap, and a break-in key, which cuts out the receiving apparatus automatically while sending.

The receiving apparatus includes: A Clapp-Eastham navy type receiving transformer with interference preventer, a rotary variable condenser, and a Holtzer-Cabot head set, the receivers of which I rewound to 1000 ohms each. The detector set includes a Ferron and an electrolytic (dip type).

The aerial, two horizontal wires, separated by spreaders, is 240 feet long and has a ground clearance of 75 feet, at the top of a pole on the roof, and 65 feet on a tree in a field. The leading-in wires connect to switches on the window, giving me a selection of one or two strands for my aerial. The house is on a hill, which makes the aerial about 190 feet above sea level.

I have tried out many types of receiving transformers and found the Clapp-Eastham navy type to be the most satisfactory.

I have obtained a distance of 1000



HOIT STATION.

miles with the receiving instruments and 20 miles with the transmitting set.

RICHARD B. HOIT,
Massachusetts.

HONORABLE MENTION.

This station is the result of three years of study and experimenting. I have made all the instruments except the 'phones, key and induction coil. The instruments are mounted on a mission oak table.

The transmitting instruments are all placed on a small shelf in the right hand corner. The receiving instruments are placed on the left side.

The transmitting instruments are: One inch spark coil, rotary spark gap (placed near the helix), sending condenser composed of eight glass plates coated with tinfoil, helix made of ten turns of No. 6 aluminum wire, and key. The transmitting instruments are run by a 6 volt 60 ampere-hour storage battery.

The receiving instruments are: Loose coupler, a large tuning coil, fixed condenser, and two slide plate variable condensers, two detectors (silicon and a standard pericon detector). I can throw either silicon or pericon detector into the circuit by a double point switch. I also have a buzzer test for the receiving set. I use a polarized relay to short circuit the detectors while sending.

My aerial is 75 feet high and 210 feet

COHEN STATION.

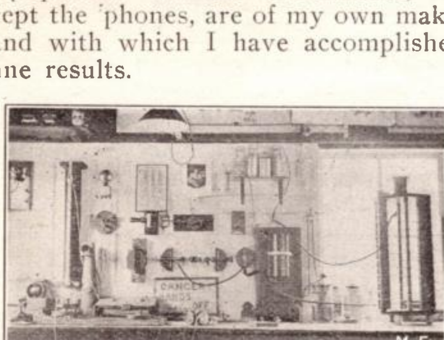
long, and is composed of two aluminum wires on 10 foot spreaders.

I am a constant reader of *Modern Electrics* and think it one of the best wireless magazines I ever saw.

SAMUEL COHEN, New York.

HONORABLE MENTION.

The photograph shows my wireless equipment. All the instruments, except the 'phones, are of my own make, and with which I have accomplished fine results.



KERSTING STATION.

For sending I use a 2 kw. closed core transformer, or a 2 inch coil, quenched or rotary spark gap, with condenser and helix.

For receiving I use a large double slide tuning coil variometer, variable and fixed condensers, eight detectors and a Brandes (2,000 ohms) head set.

My aerial is composed of 4 aluminum and 3 copper wires 112 feet long, 66 feet high at both ends. I have been experimenting for five years; during that time I have made many things described in the *Modern Electrics* which greatly improved my set.

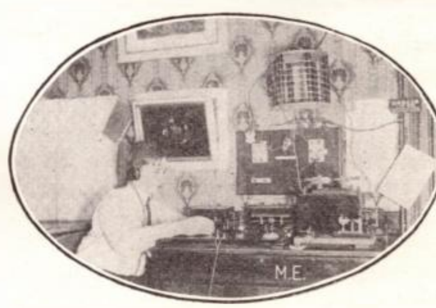
My call is M.C.1, and I will be pleased to hear from any one within range.

FERDINAND KERSTING,
Michigan.

HONORABLE MENTION.

Enclosed you will find a flashlight of my wireless outfit. My aerial is 70 feet high and consists of two divisions. Each one has four wires 25 feet long.

On the right are the sending instruments, a 1½ inch coil, plate glass condenser, key, helix and spark gap. All were made by me except the coil, which is run by a storage battery, 6 volt, 60 ampere hours, which is located in the bottom drawer of my desk. My receiving set consists of a double slide tuner,



VOELKER STATION.

variable condenser, fixed condenser, 150-ohm, phones, silicon an perikon detectors and a double point switch, used to switch from one detector to the other. On the switchboard are two D. P. D. T. switches, one fuse, and one single pole switch. Outside the house I have a D. P. S. T. switch to protect the instruments during electrical storms.

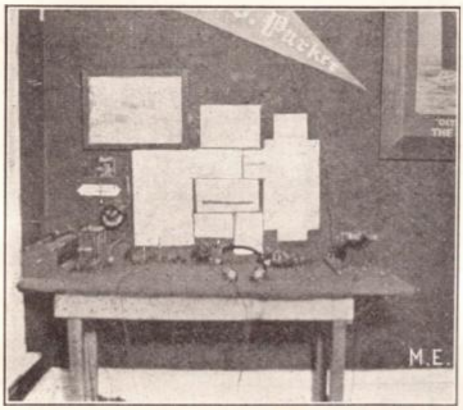
With this outfit I have had very good results. All the instruments I made were copied from articles in the experimental department of *Modern Electrics*, therefore I owe many thanks to it.

B. VOELKER, New York.

HONORABLE MENTION.

Enclosed find flashlight photographs of my wireless sets.

For receiving I use: Home made triple and single slide tuners, a Murdock 23-plate variable condenser, also a small rotary variable condenser of the same make, fixed condenser, home



WALKER STATION.

made silicon detector and a pair of C. Brande's navy type phones.

For sending: E. I. Company's 2-inch coil, E. I. Company's spark gap, two 6 volt, 60 ampere-hour storage batteries, small key and a heavy key tested to 5 K. W. My aerial switch is also home made.

My transmitting apparatus is located about ten feet from the receiving apparatus, and is connected with my key and aerial switch, which are located on the table.

My aerial is 80 feet high and 100 feet long. I have obtained excellent results, having heard the following: NAR, NAS, UFL, MCC, UFR, NY, MHI, HA, SV, CX, HX, AX, MK, DM, SH, HQ, BH, MW, GH, and GO. I have also a ticker for receiving the Federal company's Poulsen station in Chicago.

I take *Modern Electrics* and think it is a pretty good magazine. Wireless call, C. W.

CHARLES M. WALKER, JR.,
Illinois.

HONORABLE MENTION.

Enclosed find a picture of my wireless outfit. In this photo, on the table is my receiving set and on the shelf is my sending apparatus.

The sending instruments: On the right of the shelf is my helix, made of No. 8 copper wire. The variable condenser is made of four glass plates with tinfoil on each side, connections being made with spring contacts. The spark coil is a half inch, from the E. I. Co., which is run by three dry cells.

The receiving set: This is composed of two detectors, E. I. Co. electrolytic detector, and a detector of my own make, in which I use silicon and carborundum. I have an electro junior fixed condenser, and another of my own make; a double slide tuning coil and a loading coil, in which are about 800 feet of No. 24 copper wire. I also have a loose coupler and two 75 ohm receivers.

My aerial is 142 feet long, made of

GOODMAN STATION.

four strands of No. 14 copper wire, and very long lead-in wires.

I have made a good many instruments with the aid of the directions and diagrams given in *Modern Electrics*, and I realize that I owe much of my success to it.

MARK GOODMAN, Illinois.

HONORABLE MENTION.

Enclosed please find a photo of my "Portable Wireless" receiving set.

The case is one of those sold by the E. I. Co., Type B.

At the back is a double slide tuning coil.

The three binding posts at the left are for aerial and ground, the center one for the ground.

To the right of these is a silicon detector.

The switch in the center is for the testing buzzer.

KEILING PORTABLE.

The two binding posts at the right are for the 'phones.

Back of these posts is a galena detector, as described in the "Oracle" of the December, 1911, issue of *Modern Electrics*, page 634.

Back of this detector is a five point switch controlling the condenser.

Inside the case are the following: Buzzer, battery, fixed condenser, five section condenser, and a loose coupler, described on page 28, April, 1911, issue of *Modern Electrics*.

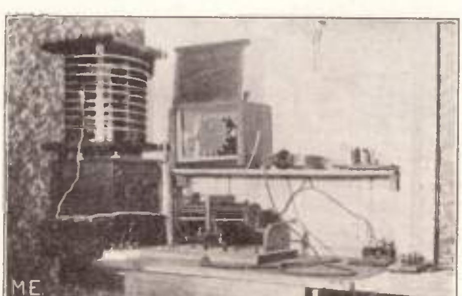
The little drawer, which cannot be seen in photo, contains crystals, wire, tape, etc.

I have done good work with this set.

FRANK X. KEILING, JR.,
New Jersey.

HONORABLE MENTION.

Enclosed find photo of my wireless station. Sending instruments consist of: Key, ¼ kw. transformer, condenser, helix, and muffled rotary spark-gap.



HAFFA STATION.

The motor and spark-gap are suspended in the muffler box, which eliminates nearly all noise and vibration when the front door is lowered.

The receiving instruments consist of: Receiving transformer, fixed and variable condenser, silicon detector and 1,000 ohm 'phone. The receiving transformer and detector are mounted on one base, with switches for condenser control, shorting detector, and buzzer test. In connection with these instruments I use a six wire antenna, 50 feet long and 50 feet high. The transformer, receiver and motor for spark gap I bought. The rest of the instruments I made, with the aid of articles published in *Modern Electrics*.

HAROLD HAFFA, Kansas.

HONORABLE MENTION.

The enclosed photo of my cabinet set should be of interest to the readers of *Modern Electrics*. The cover, when let down and side of cabinet put in, makes a fool-proof, dustless set.

GERRY STATION.

My receiving instruments are: Loose coupler, 2000 ohm phones, variable and fixed condenser, perikon and combination detectors. Sending: One inch coil, key, condenser, and helix.

The aerial is 50 feet high and 55 feet long. I have done fine work of late, but hope to do better with the aid of *Modern Electrics*.

CHURCHILL GERRY,
Massachusetts.

"Amateur Wireless"

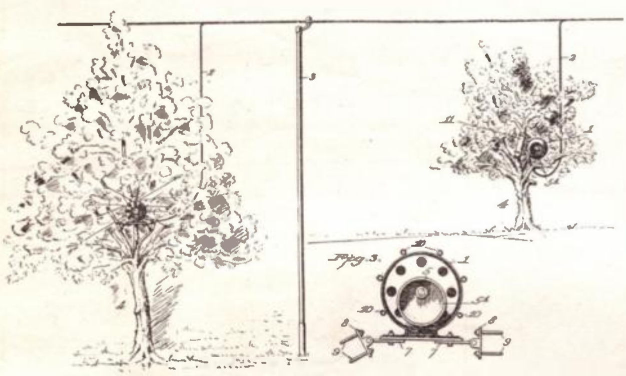
This is what "PUCK" thinks of wireless amateurs—

—AND THIS IS WHAT ***MODERN ELECTRICS*** THINKS ABOUT THE SITUATION.

HERMAN L. DARLING, OF DELTA, COLO., HAS BEEN GRANTED PATENT NO. 1,027,403, FOR A SYSTEM OF MOTOR-OPERATED TREE VIBRATION, FOR SAVING BUDS AND BLOSSOMS FROM FROST.

Wonders never cease!

It is hard to believe that people in this country run to the patent office with any old idea that strikes them as new, never considering the fact, that not every invention that is new is necessarily good, or should be patented. Some inventions are even so ridiculous that, if patented, they become preposterous, and the laughing-stock of the community at large.



The present patent, illustrated herewith, is a glowing example of this, and shows the would-be inventor what not to patent. Of course, the idea is new, else it would not have been patented. The big question is: Where does the usefulness come in, or even the practicability, let alone commercial exploitation?

We quote herewith a few extracts from Mr. Darling's patent:

"My invention relates to a new system of motor-operated tree vibration for saving buds and blossoms from frost during their fruit blossoming season.

"My new system aims to create in fruit trees a movement of the sap to the buds and blossoms that tends to vitilize them enough to resist the attacking blight of frost. This movement of the sap might be called a papillary action, and can be likened to the gentle exercising action of an electric vibrator instrument on the human system, which stimulates the flowing action of blood through the veins of a person, especially at the point where the vibrator is applied.

"The essential object of my invention is to apply to fruit trees in a structural system, a motor-operated vibratory action in such a way as to cause the limbs, twigs, buds or blossoms of the tree to vibrate through the medium of a source of power for the motor, and my invention contemplates in this respect the broadest use possible of any and every and all means, either mechanical, electrical, pneumatic, or hydraulic, or a combination of one or more of these means, and a suitable vibratory motion motor.

"My new system of generating in trees a vibratory trembling action that will render them immune from the severest frosts and freezes that they can possibly be subjected to during the months of April and May, which is the time they are subjected to danger of destruction by frosts and freezes, can be carried out and applied in an operative manner in a number of ways, and through the medium of numerous arrangements of the above-named agencies, embodied in various kinds and characters of the apparatus. I have, however, devised a simple and inexpensive system for imparting a vibratory trembling action to the bud and blossom laden twigs, slips, limbs, and branches of fruit trees, that can be installed in orchards in a very short time and at small expense, and that does not harm the trees or interfere with the working of the ground around them or with the pruning, spraying, or other characters of manipulation they require for their best development."

There are several statements in the foregoing which we doubt, one of them being that the trembling action will render the trees immune from the severest frosts, and we are of are firm conviction that if there is a good frost the buds will be killed, whether there is one motor in the tree or 500.

The most astonishing part about the patent is that Mr. Darling has overlooked the only good feature that the patent really possesses, and that is: If the motor is quite strong enough, and if the tree shakes well enough, such a device could be used to shake down fruit, like apples, pears, plums, etc., when they are ripe. It is astonishing that Mr. Darling should not have thought of this.

GREENLEAF WHITTIER PICKARD, OF AMESBURY, MASS., HAS BEEN GRANTED PATENT NO. 1,027,755 FOR AN AMPLIFIER.

Here is a new patent of the well-known inventor, relating to a liquid amplifier, for use as a relay, or a repeater, in any electrical circuits employing minute amounts of energy, and particularly in receiving circuits of installations for the communication of intelligence by electromagnetic waves. At the same time, the present invention may be used as a detector in wireless telegraphy.

In Fig. 1 the part A and its dependent conducting part F constitute the movable low-inertia member which is operated by

Fig. 1.

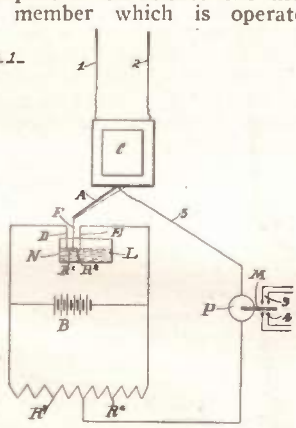
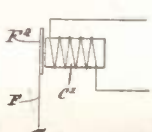


Fig. 2.



the feeble received energy. This member is connected to the battery B by the wire 5 on one side, and on the other side by either of the portions R^1 or R^2 of the conducting liquid L in the receptacle N. The terminals D and E are fixed in the liquid L, and may be a few hundredths of an inch apart, the part F lying normally midway between them, so that R^1 and R^2 each possesses the same resistance.

The circuit includes a Wheatstone bridge, of which the fixed resistances R^3, R^4 constitute one arm, and the variable resistances R^1, R^2 the other. The circuit includes also the polarized relay or electromagnet P, having a contact-controlling-arm or tongue M.

The movement of the conducting part F to the left or right from its midway position, will vary resistances R^1 or R^2, increasing one and decreasing the other, thus throwing the bridge out of balance and operating the relay P, throwing its contact arm or tongue in one or the other direction to close a circuit 3 or 4 of a local auxiliary source of electromotive force and operate any desired indicating mechanism.

The bridge circuit may be adjusted so that a resistance change of one per cent. in the circuit (as at R^1 or R^2) will operate the relay P. The part F may conveniently be placed within a hundredth of an inch of terminals D and E. In such case, a movement of F of one ten-thousandth of an inch will vary R^1 or R^2 sufficiently to operate the bridge relay P, and so give the desired signal.

The only opposition to the motion of the part F is the damping of the liquid, which is too slight to hinder effectual working, but may be made sufficient to insure uniformity of operation by acting as a governor.

The arm F may, among its various possible modes of use, be mounted on and moved by the suitably suspended oscillatable coil C, which may be such as is commonly used with the siphon recorder. The terminals 1, 2, of coil C may be connected to the terminals of any telegraph of cable system, or to the circuit of a detector of oscillations produced by electromagnetic waves used to communicate intelligence: or the part C may be the movable coil of an electro-dynamometer of suitable construction and windings for direct insertion in a wireless telegraph receiving circuit, without the use of any other detector.

When used in telegraphy for recording purposes, the movement of the coil C and arm A, and of tongue M, in two directions, to alternately close circuits 3 and 4, may be for dot and dash records; or when used with electromagnetic waves, only one movement of arm A may be used, of short and long durations for dots and dashes, the tongue M of relay P being used to close a local indicating circuit, either 3 or 4, through a telephone or recording-indicating mechanism, and a source of electromotive force therefor.

When the parts C. A and F return to their normal position midway between D and E, upon the cessation of a received impulse, the relay P will stop acting, its tongue M being returned to its inoperative position with respect to the circuits 3 and 4. The tongue M may have considerable inertia by weight and by return-spring, and any suitable means of eliminating contact-sticking, because it is operated by the energy of a battery B. and not by the feeble energy received in coil C.

Instead of being moved by the coil C, the arm F may be made telephonically movable, as shown in Fig. 2, a portion of F^2 of the arm F serving as the telephone armature, in co-operation with a suitable coil and core C'; the coil being supplied with current the effects of which it is desired to amplify, such as those used in connection with a wireless telegraph detector. In this case, the device P M, 3. 4 of Fig. 1 may be a telephone receiver, as that shown in Fig 2, the coil C^1 thereof being in the circuit in place of the coil P, and the parts F. F^2 of Fig. 2, representing the complete telephone diaphragm.

Obviously, since there are no metallic contacts at the parts moved by the coils C or C′, there can be no sticking of contacts which will interfere with perfect independence of the coil of all action except that due to received impulses.

JOHN McINTYRE, OF JERSEY CITY, N. J., HAS BEEN GRANTED PATENT NO. 1,029,388, FOR ELECTROMAGNETIC APPARATUS.

The present invention, which appears to us to be an excellent one, seems to do away with sticking of the ordinary hammer vibrator on a spark coil.

Mr. McIntyre accomplishes his purpose quite nicely, and the following is an extract from the patent:

"On the base A of the electromagnetic apparatus is mounted the usual electromagnet B carrying the primary and secondary wires and the central core C, opposite the outer end of which is arranged the armature D′ held on the free end of a spring armature lever D fixed at its other end in a suitable post E carried by the base A.

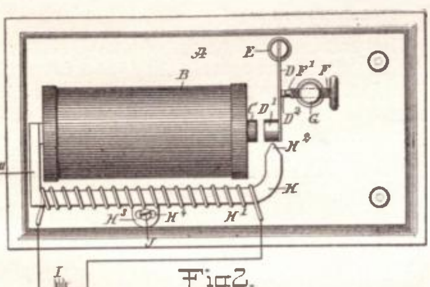
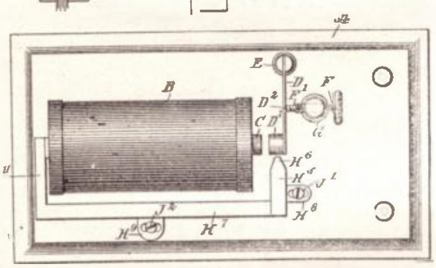


Fig2.



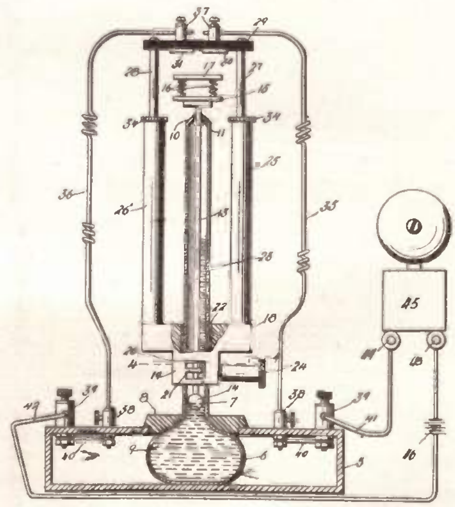
Although I have shown a spring armature lever D, it is evident that any other form of vibratory armature may be employed. On the armature lever D between the armature D′ and the fixed end is held a contact D^2 opposite a contact F′ secured or formed on one end of a bar F adjustably secured in a post G attached to the base A. On the base A is mounted a magnet H which may be in the form of a permanent magnet or in the shape of an electromagnet by having a wire H′ coiled around a piece of iron and connected with a suitable source of electrical energy, such as a battery or the like. The pole H^2 of the magnet H is in close proximity to but spaced from the the armature D′, to permit of an exchange of energy through the space between the armature and the said magnet. In order to obtain the most efficient result, I prefer to arrange the pole H^2 in such a manner that the line or path of the energy is approximately at right angles to the movement of the armature D'. The magnet H is wholly separate from the armature D' and its lever D, and is adjustable on the base A to permit of bringing the pole H² as close as possible to the armature D', without, however, touching the latter and impeding its vibratory motion. For the purpose mentioned the magnet H is provided with a flange H^3 having an elongated aperture H^4 engaged by a screw J screwing into the base A, so that on loosening the screw J the magnet can be adjusted to bring the point H^2 into the desired relation to the armature D'. When this has been done the screw J is screwed up to secure the magnet H in position on the base A."

In Fig. 2, the core, H^7, receives its magnetism from the coil core, C. Inasmuch as the magnetic path is quite long, in this case, the idea is not quite as good as the one shown in Fig. 1.

THURSTON H. SMITH, OF PEEKSKILL, N. Y., HAS BEEN GRANTED PATENT NO. 1,030,025 FOR THERMOSTATIC DEVICE.

The present invention relates to improvements in thermostatic fire indicating devices, whereby the abnormal increase of temperature in the room will close an electrical circuit and energize an alarm instrument, or bell, and notify the occupant of the abnormal increase in temperature.

Another object of the invention is the provision of a resiliently supported contact member in a thermostatic device and an indicating contact member moved under the influence of a thermostatic fluid, such as mercury, whereby an electrical circuit will be closed by the contacting of the two

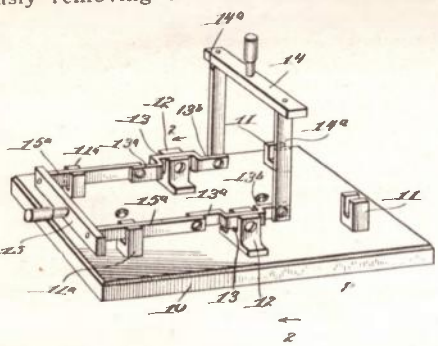


contact members when an abnormal temperature has been reached.

The supply of mercury, 9, is arranged in the bowl, 6, and there is a float, 14, attached to a rod, 13. As the mercury expands, it is evident that the rod, 13, is made to raise up in the enclosing tube, 10. If the mercury expands enough, the small contact plate, 17, will touch the contacts, 31 and 30, which will operate the bell, 45. There is also a scale, 23, and by adjusting the hand, 21, by means of knob, 24, the bell can be made to ring at different temperatures.

PATENT NO. 1,030,185, FOR AN ELECTRIC SWITCH, HAS BEEN GRANTED TO ABRAM JACOBSON, OF LANESVILLE, MASS.

This invention relates to a new switch, and has for its object the construction of a switch which will permit a new set of batteries to be switched into the circuit, namely, the circuit in connection with the internal combustion engines, without previously removing the old or worn batteries

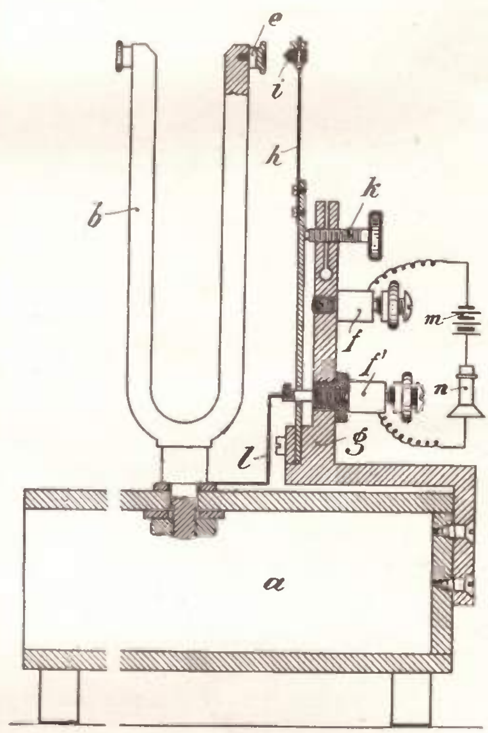


in the circuit. The object of the switch is to do away with the engines missing fire during the change. It can be readily seen that the switch illustrated herewith accomplishes this purpose. Aside from this, we do not think that the switch has any other usefulness.

PATENT NO. 1,028,165, FOR RESONATOR FOR EXAMINING THE HUMAN VOICE, HAS BEEN GRANTED TO SUSANNE WEBER-BELL, OF PALNEGG, GERMANY.

This is one of the few electric patents granted to the female sex, and it is quite strange that the device really shows a good deal of ingenuity, usually not found in patents issued to women. The patent application itself is quite interesting, and we quote an extract herewith:

"The tone of the human voice in singing consists of an accumulation of simple air-waves (sinus waves), as in all tones known to the science of acoustics. These simple waves are on the one hand the characteristic components of the vowels, on the other hand (and this is the more important point in singing) they consist of the following simple air-waves: 1, a definite, especially intensive wave, of which the periods of oscillation are intended and defined in the notes of the music, and which gives the name of the note sung; physically this wave is called the fundamental tone. 2, Over this fundamental tone other waves are accumulated as further components, designated physically as the over-tones of the fundamental tone; these give the note its characteristic coloring; for instance, the note may be "sonorous," "soft," "thin," or "shrill," etc. Now it has been determined by the analysis of the tones that when the human voice containes that characteristic quality known as "fullness," the over-tones accompanying the fundamental tone stand in a definite relation to this over-tone and consist of tones forming the natural sequence to this tone; that is to say, if the fundamental tone performs one vibration or wave in a certain unit of time, the next higher over-tone will perform two vibrations in the same time, the next four and so on. In other words, the over-tones consist of waves having a periodicity which is the



multiple of the periodicity of the fundamental tone, beginning with two. It must be remarked that a fine, full voice contains only the lower over-tones, while the higher over-tones are suppressed; especially the first over-tone (octave) and the second (octave-fifth) are necessary, and must be present in perfect pitch and intensity.

"In order to insure a regular formation of the voice it is necessary that singing master and pupil are personally able to examine their voices and to determine whether the tone given forth contains, above all, the first over-tone (octave) in sufficient power and of perfect pitch. This can only be attained with the help of physical accessory devices, since the ear cannot distinguish the over-tones, on account of the intensive sound of the characteristic tone.

"The present invention relates to a device which makes it possible to form the vowel-tone according to the mathematical theory, and to examine accurately its overtones during singing, and to ascertain whether the octave tone is present in the necessary fullness and strength.

The device consists of a special form of resonator or analysator in which a tuning-fork arranged on a sounding-box and tuned to the same pitch is combined with a telephone receiver in such a manner that the tuning-fork when vibrating periodically makes and breaks the circuit of the telephone receiver. The sounding-box is the analystor, of which the tone may be increased at will by the circuit of the telephone.

In the accompanying drawing a form of construction of the present invention is shown, partly in section and partly in view.

On the resonator a, tuned to a certain pitch is arranged in perfect acoustic combination a tuning fork b, tuned to the same pitch, of which the one arm is provided with a contact e. On one side of the sounding-box is arranged a support g, containing two terminal screws f, f′, insulated from each other, and a contact spring h, of which the contact piece i, is opposite to the above-mentioned contact e of the tuning fork b. The regulating screw k completes the electrical connectlion between the spring h and the terminal screw f, while the terminal f′ is connected to the tuning-fork by means of the wire l. To the terminals f and f′ are further connected a battery m and a telephone receiver n.

"The manner of working the device is as follows: When a sound contains as a component that tone to which the resonator a and the tuning-fork b are tuned the latter will be caused to vibrate and will make contact between e and i, so that the person examining the sound can hear said tone in the telephone, which is of especial importance in the case of the shrill higher tones."

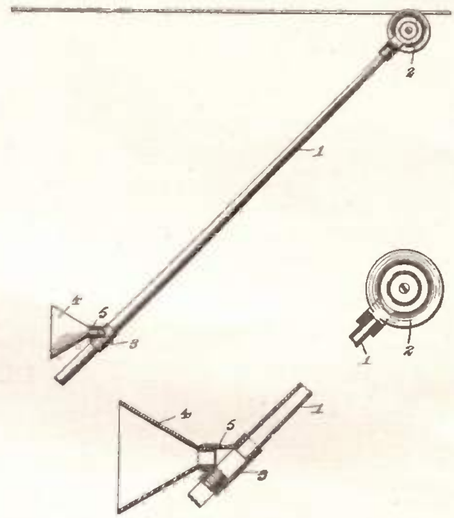
PATENT NO. 1,027,756, FOR COOLING DEVICE FOR TROLLEY-WHEELS, HAS BEEN GRANTED TO HENRY PRACK, OF OTTAWA, ILL.

At last, something new under the sun in trolleys!

We had felt that everything worth while patenting in trolley-wheels had been invented, but we see now that we were greatly mistaken.

It is well known that trolley wheels, when running over long stretches, become heated, not alone through the friction of the wheel upon the trolley wire, but also the current, which heats the wheel to quite a considerable extent. While it has, of course, been known right along that trolley wheels heat up, we have never known that such heating may, in any manner, shape or form, be harmful to the wheel itself, or to the wire. As a matter of fact, in the winter-time, when there is sleet or ice on the trolley wire, we had an idea that a heated trolley wheel would be a good thing to have. Mr. Prack does not seem to think so, hence his patent.

The idea is, to force a draught of air through the funnel, 4, which is accomplished quite readily, as the trolley car

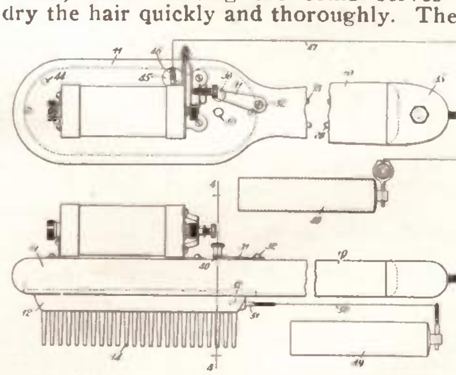


moves fast, and a good suction will result in the tube, 1, filling the wheel, 2.

Our illustration is self-explanatory, and we need say nothing further about it, except that we are of the firm conviction that the device will not be used in practice.

HENRY C. FOLGER, OF SOMERVILLE, MASS., HAS BEEN GRANTED PATENT NO. 1,029,861, FOR AN ELECTRICAL HAIR AND SCALP TREATING INSTRUMENT.

This is something new in electrical hair and scalp treating instruments, combining several new ideas as to brush and comb. One of the novel points is that the brush, connected to the lighting circuit, heats up, through a heating element inside of the brush, while heating the comb serves to dry the hair quickly and thoroughly. There



is also a medical coil connected on top of the comb, which, acting on the metal bristles of the comb, 14, gives the scalp electric treatment at the same time.

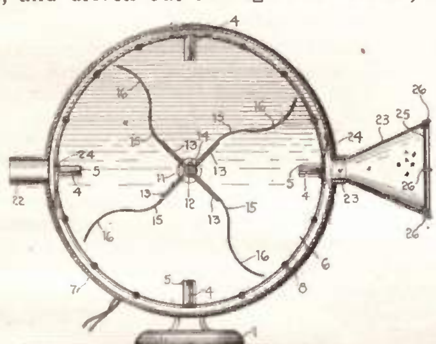
It is stated that the user may employ the device, in place of the ordinary medical battery, by using two handles grasped in the hand, or by using one handle in the hand and attaching a wet sponge to the hair combing device, and using the sponge on the body.

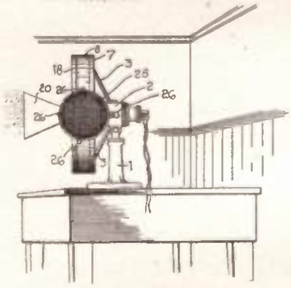
It would seem, however, to us that the electric combined hair brush and comb as described by us in our March issue would have a few points of superiority over this one, as no outside current is required, the battery being fastened direct to the brush.

PATENT NO. 1,029,972, FOR AN ELECTRIC SUCTION INSECT-TRAP, HAS BEEN GRANTED TO FRANCIS M. BRITTON, OF MINOT, N. D.

This device, which is being used to catch and kill insects, is provided with a funnel, 20, and fan blades, 16, which, revolving at high speed, causes a suction, which draws the insects inside the fan, thereby killing them. An ordinary motor, 2, serves to revolve the plates. In practice, the apparatus works as follows:

The insects are sucked into the funnel, 20, and driven out through the sleeves, 21,





into the funnel, 23, where they will be held until they are removed. The guide plates, 24, assist in directing the air and insects into the sleeves, 21 and 22.

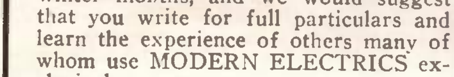
If desired, bait of any nature may be placed near the catching device so that the insects will be attracted to the device.

MARCONI SCHOOL OF INSTRUCTION.

The Marconi Wireless Telegraph Company of America is establishing a school of instruction for operators at 29 Cliff street, New York. The theory as well as the practice of wireless telegraphy will be taught.

MASTER SLIDE RULE.

This is a new type of extension rule, which posssesses many advantages over extension rules of other types. It is not a slide rule at all, as the name is ordinarily understood. It takes its name from the fact that the sections, instead of folding, slide in or out in a straight line.



It is graduated differently on the two sides, and therein lies its chief advantage over other rules. In taking inside measurements, the inside width of a door or window frame, for instance, the left hand end of the rule, as the rule is shown in the illustration, is placed against one side of the opening, and the sections pulled out from the bottom to the right until the end of the bottom section reaches the other side of the opening. The width of the opening is then shown at the point indicated by the arrow.

The rule can be very quickly extended, and each section locks as it is pulled out. It is now made in lengths of two to six feet, and the manufacturer expects to make it in longer lengths shortly.

Advice on Patents

SELENIUM CELL.

(46) F. Thompson, of Atlanta, Ga., sends in a drawing of a new selenium cell, which appears to us as being quite novel in construction, and for this reason we do not care to give details. We are quite sure that a patent can be obtained upon this device, as we have never seen such a selenium cell before, and on account of the increased intensity of the light rays it would appear that such a selenium cell would be a great deal more sensitive than other cells on the market now. If the cell is filled well with a good grade of selenium, we have not the slightest doubt that it will be very successful.

SLIDER OPERATING DEVICE

(47) Daniel Zorger, of Harrisburg, Pa., asked us to give our advice on a device which does away with the hand actually touching the slider.

A. The invention shows a lever arrangement to move an ordinary tuning coil slider, and we think that the invention has some merit.

We are not quite sure as to its patentability, as we think that a similar device is being used by a Massachusetts company. We, therefore, would advise our correspondent to get in touch with a patent attorney, as we think it would pay to have a search made for patentability made first.

AEROPLANE STABILIZER.

(48) Milton Powers, of Cudahy, Wis., wishes to have advice on an aeroplane stabilizer, and encloses sketch.

A. While the device would be fairly satisfactory for stabilizing an aeroplane sideways, we are afraid it would hurt far more than it would help, if the aeroplane should pitch forward or backward. Outside of this, we do not think that perpendicular devices on aeroplanes are successful.

SHORT CIRCUITED ROTOR.

(49). George T. Clark, Saco, Maine, wants to have our advice, and asks of he is infringing on any patent by using a certain short circuited rotor on a single phase induction motor.

A. We are afraid our correspondent would get into trouble with his invention, as a number of devices of this kind have been patented in the past, and are well known and understood.

WRENCH.

(50) Ralph F. Drake, Jewell, Kans., encloses sketch of a wrench on which he asks our opinion.

A. We have stated before that *Modern Electrics* only can give advice on patentability, if the devices are electrical or pertaining to aeroplanes. *Modern Electrics* cannot undertake to give advice on mechanical devices.

ELECTRIC ANIMAL TRAP.

(51) R. Michaelis, Ridgeway, Mo., sends in description and sketch of an electric ani-

mal trap. He says he has noted our answers relating to this kind of trap where we criticize the inventors for not preventing short circuiting of the device itself through the dead body of the rodent.

A. Our correspondent, however, has overlooked the other important point, which is, that no rat trap can be called successful or can be produced unless it does away, not alone with the objections just cited, but also does away with the body of the rodent after it has been killed. This is fully as important, as rat traps that do not automatically do this will only kill the rat and no more, the reason for this being that rats, which are highly organized animals, will never allow themselves to be killed if a dead rat lays around a strange device, of which they are naturally suspicious.

The device shown in our correspondent's sketch, it is true, does away with short circuiting the body, but does not remove the body after it has been killed.

WIRELESS OUTFIT.

(52) E. G. Fitzgerald, New York, sends in description and sketch of an apparatus he has constructed, to transmit wireless messages without the use of an aerial, spark gap or jump spark coil.

A. The device as illustrated shows absolutely nothing new whatsoever, it having been used numberless times, also being described in former volumes of this magazine.

ANOTHER RAT TRAP.

(53) Earl Deardorff, of Lents, Oregon, sends in a device with which to kill rats.

A. This idea is about the poorest we have seen as yet, and not alone has all the faults described in the one just discussed, but also has numerous others, as follows:

Our correspondent employs a few dry cells and hopes to kill a rat herewith.

We might say that a good rat trap ought to be operated with at least 110 volts. Our correspondent's trap is also made in such a way that it will not only short circuit the device, but also deprives other rats of the privilege of coming near the trap in order to be killed.

We advise Mr. Deardorff to study the various rat traps we have discussed in the past six issues of *Modern Electrics.*

WIRELESS OPERATORS IN THE NAVY.

Expiring enlistments in the navy are causing a scarcity of wireless operators, and special efforts are being made to secure new recruits for this branch of the service.

RAPID WIRELESS PREPARATIONS.

It is stated that the signal corps at Ft. Meyer, Va., can unpack its wireless machine, erect the antenna, forty feet high, and begin work in sixty-eight seconds.

SENDING AND RECEIVING WIRELESS OUTFITS

COMPLETE — PORTABLE

IDEAL SETS FOR HOME, PICNICS, CAMPING OR BOATING

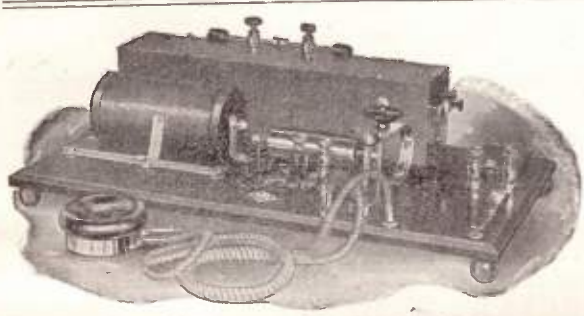
Mounted on solid oak base, size 7 x 12

No. 796—$5 Value $3.90

Sends ½ to 1 Mile—Receives up to 500 Miles

This new, up-to-date, guaranteed, portable set, consisting of one ¼-inch spark coil, equal to the average ⅜-inch coil, and high tension vibrator, 1 combination universal detector; one 75-ohm. nickeled case, exceptionally sensitive telephone receiver and cord; 1 large high efficient flat plate secondary condenser; 1 sending key; 1 condenser switch; 1 spark gap with lathe turned ⅜-inch zinc spark ends; 1 tuner 4½ x 2 inches, latest type, wound with bare copper wire; 1 special primary condenser; 1-inch wollaston wire; 1 double throw double pole aerial switch; 120 feet aluminum aerial wire; 2 insulators, complete directions, diagrams and code. The raw material alone would cost you this amount were you to build the set yourself. *Operates on two batteries* ....Price......................**$3.90**

No. 798—Same as above, with ½-inch coil. Sending radius 1 to 2 miles. Price......................**$5.00**



Mounted on solid oak base, size 8 x 14 inches

No. 800 : $8.50

$15.00 Value

Sends 8 to 10 Miles. Receives 600 to 800 Miles

New—Up-to-Date—Guaranteed

This set consists of a guaranteed 1-inch spark coil, the best type ever placed on the market for wireless; 1 sending key; special flat plate secondary condenser, extra large size; primary condenser; combination universal detector; very fine 1000 ohm, silk copper wire wound receiver and flexible receiver cord; the newest type bare copper wire wound tuner, exceptionally large capacity; spark gap with lathe turned 3.8-in. zinc ends; 1 condenser switch; 120 feet aluminum aerial wire; double pole; double throw switch; 2 insulators; 1-inch Wollaston wire; proper capacity sending helix; diagrams. 8 to 10 miles sending, 600 to 800 miles receiving. Regular $15.00 Value. *Operates on 6 batteries.* Price complete...............**$8.50**

WIRELESS SPARK COILS

We give a greater value in spark coils than any other firm in America. Our coils are larger than other coils of the same quoted spark length as we put more working material inside of them. Our vibrator platinum points are PLATINUM AND WON'T STICK by welding together as alloy points are bound to do. We guarantee the spark lengths given below and you can have your money back if they don't come up to the values promised. These coils are put up in hard wood cases finished in an elastic varnish and then rubbed down to a dead finish making the handsomest coil on the market.

No. 200	¼	in. coil	**$2.00**
No. 201a	⅜	" "	**3.00**
No. 201b	½	" "	**3.30**
No. 201c	¾	" "	**3.65**
No. 202	1	" "	**3.95**
No. 203	1½	" "	**5.50**
No. 204	2	" "	**7.75**
No. 205	3	" "	**15.50**
No. 206	4	" "	**25.00**
No. 207	6	" "	**50.00**
No. 208	8	" "	**75.00**

For the Beginner

No. 797 $1.75

Mounted on Solid Oak Base
........$2.50 VALUE..........
Receives up to 500 Miles

This consists of a combination universal detector; 75 ohm nickeled case; exceptionally sensitive receiver and telephone cord; tuner 4½ x 2-inch latest type, wound with bare copper wire; 1-inch Wollaston wire; 2 insulators; 65 feet aluminum aerial wire. **Price**..........................**$1.75**

By Mail 32c Extra

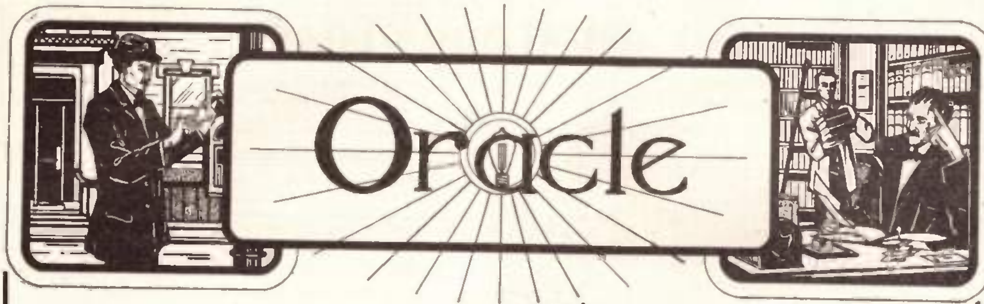
DON'T BUY BEFORE WRITING US. SEND AT ONCE FOR CIRCULAR M.

HUNT & McCREE

(The House of Wonderful Values)
NEW YORK

Laboratories
255 Washington St.

General Offices
92-94 Murray St.



Queries and questions pertaining to the electrical arts, addressed to this department, will be published free of charge. Only answers to inquiries of general interest will be published here for the benefit of all readers.

On account of the large amount of inquiries received, it may not be possible to print all the answers in any one issue, as each has to take its turn. Correspondents should bear this in mind when writing.

Common questions will be promptly answered by mail if 10 cents to cover expenses have been enclosed for each question. We can no longer undertake to furnish information by mail free of charge as in the past. There are as many as 150 letters a day now, and it would be ruinous for us to continue acting as a free correspondence school.

If a quick reply is wanted by mail, a charge of 15 cents is made for each question. Special information requiring a large amount of calculation and labor cannot be furnished without remuneration. THE ORACLE has no fixed rate for such work, but will inform the correspondent promptly as to the charges involved.

NAME AND ADDRESS MUST ALWAYS BE GIVEN IN ALL LETTERS. WHEN WRITING ONLY ONE SIDE OF QUESTION SHEET MUST BE USED; DIAGRAMS AND DRAWINGS MUST INVARIABLY BE ON A SEPARATE SHEET. NOT MORE THAN THREE QUESTIONS MUST BE ASKED, NOR SHALL THE ORACLE ANSWER MORE THAN THIS NUMBER. NO ATTENTION PAID TO LETTERS NOT OBSERVING ABOVE RULES.

WE CANNOT ANSWER QUESTIONS REGARDING SENDING AND RECEIVING RANGES.

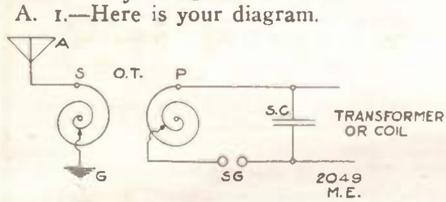
If you want anything electrical and don't know where to get it, THE ORACLE will give you such information free.

GROUND CONNECTIONS. ROTARY GAP.

(2049.) Paul Elliott, New York, writes:

Q. 1.—Give diagram of connections for Oscillation Transformer described in Supplement to the June M. E.

A. 1.—Here is your diagram.



Q. 2.—Which is the better ground for receiving and sending; one to the radiator system about three feet from the instrument table, or one composed of a No. 4 copper wire direct to the ground about 45 feet down, instruments in top floor about 20 feet below antenna?

A. 2.—For sending and receiving the radiator ground will probably be better, but to comply with the underwriters' requirements it will be necessary to install the No. 4 copper wire direct to ground, the wire being run on the outside of the building.

Q. 3.—Is it advisable to make a rotary gap to be used on an open core transformer, electrolytic interrupter, 110 volts direct current? Will it give a high note?

A. 3.—It certainly is advisable to use a rotary gap in preference to an ordinary gap on any kind of transmitting set. Inasmuch as the open core transformer operated on direct current through an electrolytic interrupter is only a spark coil, the chances are that the rotary gap will not produce a musical note, although it may possibly do so if run fast enough.

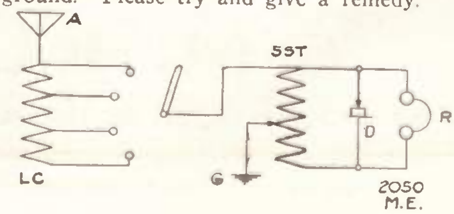
IRON WIRE IN AERIALS.

(2050.) Earl H. Swanson, New York, writes:

Q. 1.—Explain the magnetic effect of an iron wire aerial.

A. 1.—When an alternating current is passed through an iron wire there is set up around the wire a magnetic field which expands from and contracts toward the center of the wire, as the current flows to and fro, the magnetic field changing its direction in accordance with the reversals of the current. This alternating magnetic field in turn sets up electromotive forces in the wire, which oppose the current which set up the field at the beginning, and these counter electromotive forces naturally hold back the current and prevent its flowing freely over the wire. Of course, this alternating magnetic field is also present when copper or other wire is used, but on account of the high permeability of iron for the magnetic lines of force, the field is much more concentrated when the iron wire is used and its choking effect proportionately greater.

Q. 2.—I have made a small receiving set connected as per diagram and consisting of the following instruments: Silicon detector, single slide tuner, loading coil, and 75 ohm receiver. When I connect to ground and aerial I cannot hear a thing, though my large set operates perfectly on same aerial and ground. Please try and give a remedy.



A. 2.—You have no means of adjusting the wave length of your detector circuit; also your detector circuit shows no fixed condenser. If you will equip your single slide tuner with another slider, so that you may vary the amount of inductance in your detector circuit and also place a small fixed condenser in series with the detector and the tuning coil, you will probably have no trouble with the set.

Q. 3.—Can a ⅛" spark coil be used up to ¼ of a mile. If so, what other instruments (sending) should be used with it?

A. 3.—A ⅛" spark coil may possibly send over a distance of ¼ mile, but it is doubtful. The only other instruments which it would be advisable to use in connection with your small coil, would be a spark gap, a key and the necessary batteries. The terminals of the spark gap should be connected directly to the aerial and ground.

LOOSE COUPLER.

(2051.) Leonard Postill, Canada, writes:

Q. 1.—Would the following work as a loose coupler tuner: Primary, single slide tuner, twelve inches long, wound with No. 20 enameled wire, 3" in diameter. Secondary, tube 2½" diameter, 9" long wound with two layers No. 29 double silk covered wire, with no adjustment except that it slides inside the primary?

A. 1.—We think not. The secondary tube should have only one layer of wire on it, and should be either equipped with a slider or the winding divided into sections and connected to a multiple point switch, in which case it will also be necessary to use a variable condenser connected directly across the secondary terminals.

Q. 2.—Give diagram of connections for the following set: 1,000 ohm phone, E. I. Co.'s Electro Jr., Fixed condenser, condenser variable in steps, single slide tuner, silicon detector, E. I. Co. 1" Bull-dog spark coil, four 1 pint Leyden jars, water rheostat to cut down the 110 volt to operate the coil, spark gap.

A. 2.—Here it is.

Q. 3.—Should I be able to receive 30 miles at night and send 5 miles at night with an aerial consisting of 4 wires, 50 ft. long and 40 ft. high using the above set?

A. 3.—You ought to be able to receive at least 30 miles at night, but your sending range with an untuned set, such as you describe, should not be more than 2 or 3 miles.

DISTRESS SIGNAL.

(2052.) Andrew A. Love, Jr., North Dakota, writes:

Q. 1.—During and before a thunderstorm by putting a piece of metal across my aerial and ground, I get a jump spark about ⅛"; is that dangerous, if I have a water pipe ground?

A. 1.—There is no danger from this spark, but we call attention to the underwriters' requirements, with reference to ground connections for wireless aerials, in the June issue of *Modern Electrics*, page 252.

Q. 2.—What does SOS mean?

A. 2.—This is the international distress signal as adopted by the Berlin Radio Telegraphic Convention of 1906. The letters themselves have no significance.

Q. 3.—What is the wave length of a loose coupler with a primary 4" in diameter and 7" long No. 22 double cotton covered, secondary 6" long, 3¾" diameter, with eight variations on secondary and one on primary?

A. 3.—The wave length of a tuning coil of any sort depends entirely upon what it is connected to, and it is useless to try to figure out a wave length for a coil alone.

SPARK COIL CAPACITY.

(2053.) Alfred H. Roberts, Australia, writes:

Q. 1.—What size spark coil would I need to send 3-5 miles with an aerial 30 ft. off ground each strand 20 ft. long?

A. 1.—If you use an untuned sending set, you will probably need a 1½" or a 2" coil, while if your sending set is tuned, you may possibly do it with a 1" coil.

Q. 2.—Could a 2" E. I. Co. coil be mailed to Australia; if so, what cost?

A. 2.—A 2" E. I. Co. coil may be mailed to Australia by Parcels Post. The coil itself weighs 5½ lbs., and when packed up for mailing it will probably weigh about 8 lbs., which at 12c a pound would cost you about 96c for postage.

Q. 3.—Have you any distributing agents in Australia?

A. 3.—We have three distributing agents, all of whom are in Melbourne: Will Andrade, 201 Bourke St.; E. W. Cole, Bourke & Collins Sts.; P. H. McElroy, 265 Swanston St.

WIRELESS OPERATORS' LICENSE.

(2054.) Arthur A. Azzopardi, Philippine Islands, writes:

Q. 1.—Does a man who has served three years in the Signal Corps, United States Army, as a wireless operator and held many military offices in the Philippines during this time, have to pass a Government examination for a wireless diploma in order to work with some wireless company or on any U. S. merchant steamer in the U. S.?

A. 1.—So far as we know it is necessary to pass a government examination for wireless operator's license unless you have been an operator in the United States Navy.

Q. 2.—If so, which is the best wireless school that I can procure such a diploma, in less than two months, and how much will it cost me?

A. 2.—We cannot undertake to recommend any particular wireless school in preference to others. Our advertising columns contain the announcements of several good schools, and we refer you to them for particulars as to the length of the course, and its cost.

CHARGING HUMAN BODY FROM STATIC MACHINE.

(2055.) Herbert Street, Maryland, writes:

Q. 1.—How can I charge a person's body for a public performance with an electrostatic machine?

A. 1.—The person should stand upon an insulated support such as a piece of dry board supported on four glass tumblers or other equally good insulators and should hold in one hand a metal rod with rounded ends, one end of the rod should then be brought near one of the spark terminals of the machine, the terminals being separated so that the sparks do not jump across from one to the

Auristophone No. 1 Magnifier

A loud sounder for telephone or telegraph with 4 Ohm reproducer.....$3.50

with	75-150	Ohm reproducer	..$4.00
Long	175-200	" "	..$4.25
Distance	225-350	" "	..$4.50
	400-625	" "	..$5.00

Auristophone Loud Speaking Telephone or Telegraph Reproducers

(Adapted to be Attached to Standard Horns)

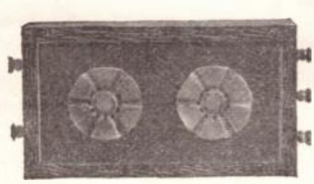
Local, 4 Ohms		....................$1.50
75-150	Ohm reproducer	...........$2.00
175-200	" "	...........$2.25
225-350	" "	...........$2.50
400-625	" "	...........$3.00

Auristophone Model A Loud Speaking Transmitters

	With Pushbutton	Without Pushbutton
4-7 Volts	...........$7.50	$7.00

Auristophone Opera Receivers

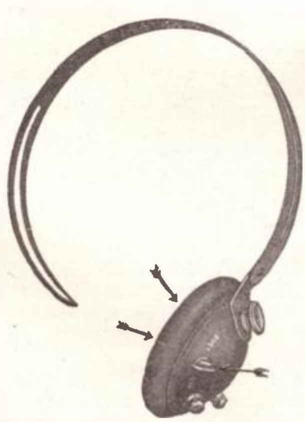
(A Super-Sensitive Transmitter)



	Without Induction Coil.	With Special Induction Coil.
Single	.........$12.00	$15.00
Double	.........$22.00	$25.00

Auristophone Long Distance Operators Receivers

Acoustic Focus Regulating Resistance	Single	**Featherweight Comfortable**	Double
75-150 Ohms	$2.00	150- 300 Ohms	$4.50
175-200 "	$2.25	350- 400 "	$5.00
225-350 "	$2.50	450- 700 "	$5.50
400-625 "	$3.00	800-1250 "	$6.50



Our Specialties

Acoustic, Microphonic and Magnetic Hearing, Speaking, Dictating, Announcing, Communicating, Duplicating, Recording, Signaling, Amplifying, Intensifying, Opera, Concentrating and Vigorating Devices of Scientific Reliability.

"AURISTOPHONE"
Trade-Mark

"RESULTS"
Our Motto

H. G. Pape Electric & Mfg. Company

(Incorporated 1905)
BUFFALO, N. Y., U. S. A.

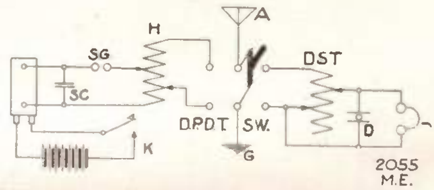
other, and the rod held there until the sparks cease to jump from the terminal to the rod.

Q. 2.—I have broken one of the Leyden jars of my machine. Kindly tell me what price the E. I. Co. charge for a new one?

A. 2.—A new jar will cost you 35c, plus postage.

Q. 3.—Give hook-up for following: Peroxide of lead detector, 2 slide tuner, 2 No. 75 ohm phones, d.p.d.t. switch, ½" coil, spark gap key, helix, sending condenser and batteries.

A. 3.—Here it is.

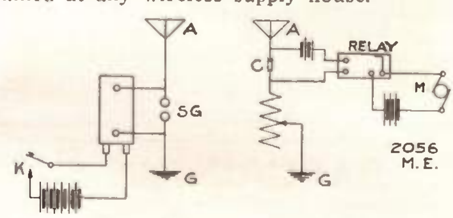


WIRELESS CONTROL FOR MOTOR.

(2056.) E. W. Bray, Michigan, writes:

Q. 1.—How can I operate a small battery motor, etc., by wireless transmission? I have a one-inch spark coil, what are the other instruments needed to operate the motor and where can I get them? If you can, will you draw me a diagram relating to the above?

A. 1.—You cannot operate a motor directly by wireless transmission of energy, but you may control it wirelessly by connecting the motor with its batteries in place of the sounder, in a coherer set. You will need batteries, coherer tapper, relay, and the apparatus should be connected up as shown in the accompanying sketch. These may be obtained at any wireless supply house.



Q. 2.—What voltage is needed to operate a 1" coil? Would you advise me to get a storage cell, but would dry cells do? How many?

A. 2.—A 1" coil requires 6 volts. A six volt storage battery would be the best thing to use, but dry cells may also be used, in which case it will be necessary to connect up four cells in series.

ROTARY SPARK GAP WHEEL.

(2057.) Ray C. Armstrong, Illinois, writes:

Q. 1.—What should be the diameter and number of points in a rotary spark gap wheel for a 1" coil?

A. 1.—The disc may be made three or four inches in diameter and may have as many as 12 points and should be run at from 2,000 to 3,000 r.p.m.

Q. 2.—Do you think a variable condenser of 23 sheets of copper, each 3 x 4, is sufficient for a receiving condenser?

A. 2.—The capacity of the condenser will depend entirely upon the distance between

the plates. If the plates are close enough together the capacity will probably be high enough.

Q. 3.—With an aerial 45 ft. high of four No. 14 aluminum wires, each 2 ft. apart, a D. S. tuner, a variable condenser, a fixed condenser, silicon detector and 1,000 ohm phones, don't you think I should be able to receive 400 miles?

A. 3.—You have not told us the length of the aerial. If your aerial is 100 ft. long, you should be able to receive 400 miles.

SENSITIVENESS OF A RELAY.

(2058.) George W. Day, California, writes:

Q. 1.—Will a coherer work any distance at all without a relay?

A. 1.—No.

Q. 2.—Does the sensitiveness of the relay depend on the higher resistance?

A. 2.—It does if the relay is so designed that the length of the outside turn of the windings is not more than three times the length of the inside turns on each core. When the length of the outside turns is greater than three times that of the inside turns the resistance of the winding increases much faster than the ampere turns and the relay loses instead of gains in sensitiveness.

Q. 3.—With a Slaby-Arco coherer, and a sensitive relay and recorder, what distance could I possibly hear a commercial station? A 3" coil?

A. 3.—You may possibly be able to receive from a commercial station 50 miles away and possibly 5 miles for a station using a 3" coil.

AERIAL.

(2059.) Henry Bernard, Colorado, writes:

Q.—If I put up an aerial between two cliffs about 250 feet high, over a river, do you think it would work as good as one on poles 100 feet high with the same measurements? Aerial 100 ft. long, four wires, two feet apart, aluminum wire of right size. Would it be good to put ground into the river?

A.—There is no advantage in installing your aerial in the manner described. If you will put it up on a couple of poles on top of one of the cliffs, you will get much better results. Ground in the river is O. K. if the water is salt; if not, there is no advantage in doing this.

VOLTAGE OF CHARGING DYNAMO.

(2060.) L. W. Stickney, Vermont, writes:

Q. 1.—Can you tell me the voltage of the regular spark coils for wireless? The voltage of secondary coils from ½" to 2".

A. 1.—Secondary voltage ½", 10,000; 1", 20,000; 1½", 30,000; 2", 35,000.

Q. 2.—How many batteries, giving two volts apiece, will be needed for each?

A. 2.—Coils up to 1" require 6 volts and from 1" to 2", 12 volts.

Q. 3.—Can you give me the reason for the drop in voltage of my 110 volt generator giving from 10 to 12 amperes? When connected in series with 15 storage batteries, the voltage drops to 40 or 42 volts. Can I charge 50 two volt batteries in series with the generator?

A. 3.—When connected to and charging a set of storage batteries the voltage of the gen-

erator drops to a little more than the voltage of the storage batteries. You will find the voltage gradually increases as the batteries charge. This is usual, and you need not be afraid. There is nothing the matter with the generator. We see no reason why you should not charge 50 cells in series with this machine.

PACIFIC STEAMERS' CALLS.

(2061.) Gordon Farmer, California, writes:

Q. 1.—Would the transformer for Poulsen ticker published in April, 1912, copy, in the Experimental Dept., work connected with Gernsback Interrupter and a one inch spark coil?

A. 1.—We do not understand how you would expect to connect this transformer with a Gernsback interrupter and a 1" spark coil, nor what advantage you would expect to gain from its use.

Q. 2.—What does the signal in Wireless mean (.— .—. —)?

A. 2.—This is the continental signal AR and it stands for "another." The dash following the AR simply being the finish or closing signal. The signal AR is usually sent after the signature of a message, and it indicates to the receiving operator that the sending station has another message for him.

Q. 3.—Please tell me which steamship company on the Pacific Coast has their call letters ending with two (. . — — —) as LA2, A2, L2, etc.?

A. 3.—A2 is the steamer Acapulca, of the Pacific Mail Steamship Co. L2 is the Leelanaw, of the California and Atlantic Steamship Co. The call LA2 is not listed.

GROUND ON LIGHTNING ROD.

(2062.) Herbert Staab, Wisconsin, writes:

Q.—Would like to ask you if it would make any difference if my ground wire would be put on the lightning rod?

A.—It won't make any particular difference except that lightning rod grounds as a rule are not good enough for wireless work.

LONG LEAD IN.

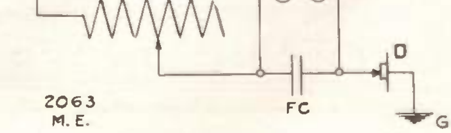
(2063.) Wayland Stockdale, Ohio, writes:

Q. 1.—I am between two hills and cannot receive any at all; would it be advisable to place the aerial on the hill about one-fourth mile away?

A. 1.—The aerial may be placed on the hill one-quarter of a mile away and connected to your station in its present location, but this will make your wave length very long and it will be necessary for you to use a variable condenser in your ground lead in order to receive from stations having ordinary wave lengths.

Q. 2.—Please give me diagram for wiring the following instruments: Silicon detector, fixed condenser, single slide tuning coil, 80 and 75 ohm receivers.

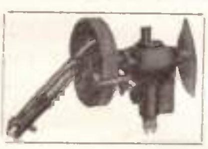
A. 2.—Here it is.



New Rapid Tool Grinder Great Time and Work Saver

THIS tool sharpening outfit lowers your expense, saves tools, time and money, and increases production. You can prove it by 30 days' free trial.

The Hummer is all metal with bevel gear drive like an automobile—the most indestructible grinding machine ever built—and the fastest. Power can be applied, but it runs 4000 revolutions per minute by foot power as easy as a bicycle down grade. The most difficult job of grinding is the work of only a few minutes, and



with the tool rests and special attachments your apprentice can do it as well as a master mechanic.

Luther Hummer Tool Grinder

The new Luther Hummer is mechanically perfect. The angle iron frame is strong and rigid; ball-bearing, shaft and bevel gears are enclosed in dust-proof housing and run in oil bath.

The Hummer can be converted into a drill, turning lathe, jig or rip-saw, has flexible shaft attachments, etc. Saves money in more different ways than any tool in your shop. Will not draw temper—no water cooling necessary.

Dimo Grit Wheels—"The Wheels for Steel"

This wonderful, new artificial diamond abrasive is the most suitable for all steel grinding. Cuts hardest steel as emery does copper—25 times faster cutting than the grindstone—6 times more efficient than emery wheels. No need of cooling with water—no danger of drawing temper. Carborundum wheels furnished if desired.

30 DAYS' FREE TRIAL

Write to-day for our 30 days' Free Time offer on our big 14 Tool Shop Sharpening Outfit and big free illustrated book showing the many uses of the Luther Hummer Outfit and how it pays for itself—also McClure's Magazine story of the discovery of artificial diamond abrasives.

WRITE FOR 30 DAYS' FREE TRIAL OFFER TODAY

LUTHER GRINDER MFG. CO. 799 Michigan Street MILWAUKEE, WIS.

Q. 3.—Give diagram for proper aerial for these instruments, what length and number of wires.

A. 3.—See answer to No. 1985 in the May issue. Six wires 100 feet long gives good results.

ELECTROMAGNETIC REPULSION.

(2064.) Wm. H. Kibbe, New York, writes:

Q. 1.—Does magnetism repel aluminum? If so, how many volts on a magnet of large size would repel it?

A. 1.—Aluminum is a non-magnetic metal and constant magnetic fields have no effect on it. The alternating current magnet on the other hand will repel the aluminum plate in the same manner that it would repel a copper plate or a copper ring.

Q. 2.—What is about the estimated voltage of lightning of ordinary size

A. 2.—This is too much for us, William; we cannot even guess at it.

Q. 3.—What is a Wheatstone bridge? Is it used in wireless?

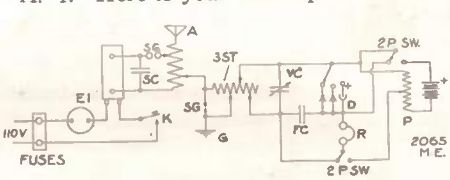
A. 3.—The Wheatstone bridge is an apparatus for measuring resistance and is not used in wireless.

HOOK-UP.

(2065.) William Irvin, Missouri, writes:

Q. 1.—Please give me a hook-up with the necessary switches which will give me the best results with the following instruments: Receiving: Triple slide tuning coil, variable condenser, fixed condenser silicon, electrolytic and iron pyrite detectors, potentiometer and battery. Sending: 1½" auto coil, helix made of 15 ft. of No. 8 copper wire and a glass plate condenser, the sending is run by 110 volts alternating current (city power) with an interrupter.

A. 1.—Here is your hook-up.



Q. 2.—Are there any instruments which would help my receiving or sending much? If so, please mention them.

A. 2.—So far as receiving goes you have a pretty good set. As to the sending we would recommend the use of a transformer instead of the coil and an oscillation transformer such as was shown in the supplement to the June issue in place of the helix.

LOOSE COUPLER; VARIABLE CONDENSER.

(2066.) Floyd S. Meck, Ohio, writes:

Q. 1.—Please give me the size of the primary and secondary size of base, number of points of the switch on the end of the secondary size of each section, size of end pieces, and the size of wire on the primary and secondary of a loose coupler, of the best size?

A. 1.—Primary coil, 4" diameter, 6" long, length of winding 5½"; secondary 3½" diameter; 6" long, length of winding 5½". Wind the primary with No. 22 bare wire as closely as possible without touching. Wind the sec-

ondary with No. 24 single silk covered wire. Equip the primary with a slider and divide the secondary into 10 sections and connect them to a 10 point switch. The end pieces and the base may be made of ½" stuff and may be of any size that is convenient.

Q. 2.—How many and of what size are the movable and stationary plates made of sheet brass of the rotary variable condenser used by the United Wireless Co. and of what distance apart are they?

A. 2.—This condenser consists of about 10 stationary plates and 9 movable plates about 5" in diameter and about 1/16" apart.

Q. 3.—Please give me the hook-up of the instruments used by the United Wireless Co.

A. 3.—Their transmitting hook-up and their type "D" "close coupled" receiving hook-up are given in answer to 1945 in the March issue. The wiring of their type "E" "loose-coupled" tuner is given in answer to 2011 in the June issue.

THREE-SLIDE TUNER.

(2067.) Chas. W. Kimball, Massachusetts, writes:

Q. 1.—I have a 2 slide tuning coil 3½" in diameter and 13" long wound with No. 22 wire. Can it be used with such dimensions with 3 slides?

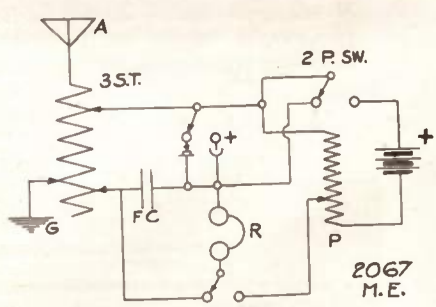
A. 1.—Yes; the coil may be converted into a three slide tuner by simply adding another slider.

Q. 2.—If so, would it be more efficient than it is now with 2 slides?

A. 2.—Yes; the three slide tuner is much more efficient than a two slide tuner, in that it is possible to do very much closer tuning; in fact, a three slide tuner is almost as good as a loose coupled tuner.

Q. 3.—If so, will you please give me the most beneficial way to hook-up with silicon and electrolytic detectors?

A. 3.—Here is your hook-up.



PILOT LAMP ON HELIX.

(2068.) Richard Coleman, Texas, writes:

Q. 1.—How is the pilot light on a helix connected? Give diagram.

A. 1.—The pilot light is connected to one or two turns of wire on the inside of the top head of the helix. This pilot lamp coil has no connection with the helix winding. For diagram see answer to 2026 and 2030 in the June issue.

Q. 2.—Please tell me if you can use a re-

corder on a silicon or an electrolytic detector?

A. 2.—No.

3. Is copper sheeting as good as brass to make a variable condenser out of?

A. 3.—Yes.

CHARGING STORAGE BATTERIES.

(2069.) Wyly Dewy Nelson, Louisiana, writes:

Q. 1.—Please give data for charging the storage battery described in the November issue.

A. 1.—Follow the directions given with the description of the battery.

Q. 2.—How many volts does the generator described in the December issue give?

A. 2.—This depends upon the number of turns in the armature winding, the speed of the armature, and the strength of the magnets.

Q. 3.—Will it run a 1-inch spark coil?

A. 3.—No.

INSULATING WHEELS OF HAND-CARS.

(2070.) Harold S. Day, Wisconsin, writes:

Q. 1.—I have a friend who is a lever-man on one of the railways of Wisconsin. He says that near Chicago the hand cars and push cars are insulated so that they do not short the track circuits which govern interlocking devices. Please explain how the insulating is done?

A. 1.—The usual practice is to insulate one of the wheels on each axle by a fibre bushing in the hub, and fibre washers between the hub and any collars which may be on the axle.

Q. 2.—How large must a photograph be to send in to the Wireless Contest in *Modern Electrics,* and if a prize is taken can E. I. Co. instruments be taken instead of the cash? Subscriptions to M. E. instead of cash?

A. 2.—Photographs submitted in the Wireless Contest should be at least post-card size. Where the contestant prefers to receive subscriptions to M. E. in place of cash prize, we are willing to make this arrangement, but otherwise prefer to issue the prize in cash or check.

Q. 3.—Kindly give the call letters of the nearest commercial stations excluding MW and MK.

A. 3.—PA, Waupaca; SC, Scandinavian, Wis.

BUZZER TEST. AERIAL INSULATION.

(2071.) Eldredge Travers, Texas, writes:

Q. 1.—How to use a buzzer as a detector test?

A. 1.—The usual practice is to connect the buzzer with a battery and push button and to connect the vibrator contact to the ground wire. For diagram, see 1905 in the January issue.

Q. 2.—Are porcelain cleats and tubes all right for a long-distance receiving station, that is to insulate the aerial lead-in?

A. 2.—Yes.


TELEPHONY
DYNAMO ELECTRIC MACHINERY
ELECTRIC WIRING and LIGHTING


PRACTICAL LESSONS IN ELECTRICITY
THE ELECTRIC TELEGRAPH
ELECTRIC RAILWAYS

ELECTROLYTIC INTERRUPTER WITH BATTERIES.

(2072.) Stanley Breese, New Jersey, writes:

Q. 1.—How many batteries will it take to run a 2-inch spark coil?

A. 1.—A 2-inch spark coil requires a 12 volt battery. This may be either 6 cells of storage battery or 8 cells of dry battery.

Q. 2.—Could I use a Gernsback Interrupter with the batteries; if so, would it take more batteries to run it?

A. 2.—Yes; the battery must have a voltage of 30 or 40.

Q. 3.—Could you tell me whether wireless operators are in demand?

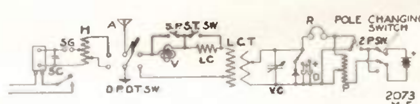
A. 3.—There is a good demand for wireless operators at the present time.

MAGNETIC DETECTOR.

(2073.) L. Falconi, Virginia, writes:

Q. 1.—What is the best hook-up for the following instruments: Spark coil, key, helix, S condenser, spark gap, loose coupler, variable condenser, variometer, loading coil, silicon and two electrolytic detectors, potentiometer, D. P. D. T. switch, three-point switch, pole changing switch for detectors, and storage battery. The potentiometer is like the one described in your book, "How to Make Wireless Instruments," and has an electrolytic detector mounted on one end of it. I have also a 1000 ohm receiver?

A. 1.—Here is your hook-up.



Q. 2.—What is the wave length of the following loose coupler: Primary 7 inches long, 5 inches in diameter, and wound with enclosed sample of wire. Secondary 6 inches long, 4½ inches in diameter and wound with No. 26 wire. The primary has 1 slider and the secondary a 3-point switch?

A. 2.—The sample of wire was not received. See answer to 2052.

Q. 3.—Please sketch and describe a Marconi magnetic detector, as I wish to construct one.

A. 3.—See page 638 of the December, 1911, issue.

WAVE LENGTH OF SENDING SET.

(2074.) Howard McMillin, Ohio, writes:

Q. 1.—How can I tell the wave length of my sending station?

A. 1.—The only exact method is to measure it, using a reliable wave meter. It may be computed, roughly, by calculating, first, the capacity of the sending condenser, using the formula:

$$C = \left(\frac{2248 \times K \times a}{t \times 10{,}000{,}000{,}000} \right)$$

Where: C, is the capacity in microfarads;

THESE PHOTOGRAPHS REPRODUCED BY COURTESY OF P. F. COLLIER & SON, PUBLISHERS

The Few That Will Stay—The Crowd That Will Go

Digging the "Big Ditch"

When the Panama Canal is finished, the few to be retained will be the experts. The crowd that will go are the 28,536 untrained workers.

No more striking example of the relative value of trained and untrained men can be found anywhere than this. Here you see exactly what happens when a large working force is to be reduced. The **trained men stay**—the **untrained go.**

You can get out of the **crowd** of untrained workers, and join the **few** whose training keeps them always in demand. The International Correspondence Schools will help you win success in your own chosen line of work.

It is immaterial who you are, what you do, where you live, what you earn, or how little schooling you have had. So long as you can read and write, and are ambitious, there is an I. C. S. way for you. All you have to do is to show your ambition by marking and mailing the attached coupon today. The only thing between you and success is the coupon.

Then, Mark and Mail the Coupon NOW

International Correspondence Schools
Box 992, Scranton, Pa.

Please explain, without further obligation on my part, how I can qualify for a larger salary and advancement to the position, trade, or profession before which I have marked **X**.

Electrical Engineering	Mechanical Engineer
Electric Lighting	Mechanical Draftsman
Electric Railways	R. R. Constructing
Electrician	Concrete Construction
Electric Car Running	Architect
Dynamo Foreman	Contracting & Building
Wireman	Architectural Draftsman
Mining Engineer	Plumbing & Heating
Telephone Expert	Chemist
Surveyor	Bookkeeper
Civil Engineer	Advertising Man
Automobile Running	Civil Service Exams.
Agriculture	Salesmanship

Name __________

St. and No. __________

City __________ *State* __________

Present Occupation __________

K, is the inductivity of the dielectric (about 3. for ordinary glass); a, is the total active area of the dielectric, in square inches; t, is the thickness of the dielectric sheets, in inches. The inductance of the turns of the helix which are included in the condenser circuit is then found from the formula:

$$L = \frac{(5 \times D \times T)^2}{1000(M + 1/3\ D)}$$

Where: L, is the inductance, in microhenries; D, is the diameter of the coil; T, the number of turns; M, is the length of the coil. This last formula applies only to cylindrical coils like the common helix. If a pancake helix, or an oscillation transformer is used, the following formula should be employed:

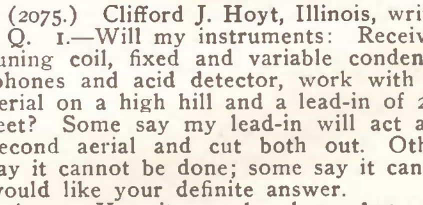
$$L = \frac{(5 \times D \times T)^2}{1000(1/3\ D + 3/2\ M + 5/4\ N)}$$

Where: D, is the average diameter of the coil; M, is the length of the coil; N, is the depth of the coil; and T, is the number of turns. Having solved the formulæ for capacity and inductance, the values obtained are substituted in the following formula, which gives you the wave length, in meters:

$$W = 1885 \sqrt{LC}$$

Q. 2.—Please give me diagram of best hook-up for the following instruments: A single slide tuning coil, 75 ohm receiver, E. I. Co. Junior fixed condenser, peroxide of lead detector and batteries. Please remember that the binding posts on the detectors are marked by the + and — signs, and it must be connected up in regard to that, so please mark the binding posts in this manner on the diagram.

A. 3.—Here it is:



LONG LEAD-IN AGAIN.

(2075.) Clifford J. Hoyt, Illinois, writes:

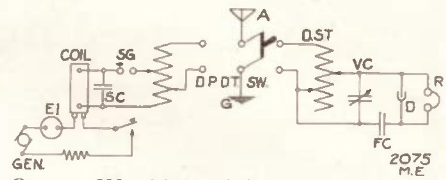
Q. 1.—Will my instruments: Receiving tuning coil, fixed and variable condenser, 'phones and acid detector, work with my aerial on a high hill and a lead-in of 2200 feet? Some say my lead-in will act as a second aerial and cut both out. Others say it cannot be done; some say it can. I would like your definite answer.

A. 1.—Yes, it can be done; but your wave length will be about 2700 meters. See answer to 2063. Also to get the best results with your electrolytic detector, you will need a potentiometer.

Q. 2.—Taking the current of a 2 k.w. direct current generator, would there be any loss of energy in such a long lead-in, to make any difference to my sending? Please give hook-up with the following sending instruments: 4-inch spark coil, key, spark gap, condenser, helix, using a DPDT switch with my receiving instru-

ments named above, using the 2 k.w. direct current.

A. 2.—Yes; the long lead will cut down your efficiency somewhat, unless it is composed of a number of wires. Here is your hook-up:



Q. 3.—Would a 6-60 storage battery work in this case?

A. 3.—No; a 4-inch coil needs a 12-volt battery.

ADJUSTABLE SENDING CONDENSER

(2076.) Louis Stephens, Illinois, writes:

Q. I am about to construct a condenser and want some pointers or advice. I have 50 photographic plates 8 x 10, and propose to mount them upright between two ⅝ x 12 x 48 inch oak boards on ½ x ½ x 48 inch strips of oak. They are to be covered on both sides with tinfoil 6 x 8 inches, and spaced ¾ inch apart, separated by air. Please draw a diagram showing the best way to connect up the plates in multiple so that I can run the connections to a multipoint switch; also, what is the best thing to use for connectors between plates and terminals? I propose to enclose the ends and sides with ½-inch oak boards, which will make the condenser heavy, though dustproof. Can you suggest something better?

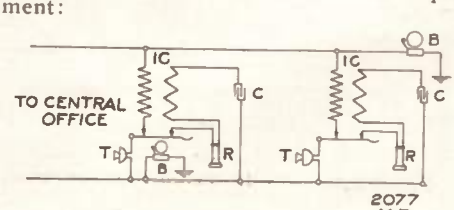
A. You cannot use the multipoint switch, but a number of single pole, single throw switches connected in parallel. Flexible leads, from alternate coatings, should be connected to a bus, and the remaining leads should be connected to the jaws of the switches, the blades of the switches being connected to another bus. The best means of making connection to the tinfoil coatings is a flat phosphor bronze or a spring brass strip bent into such a form that it will make contact with the tinfoil coatings, facing each other on adjacent plates, and to this contact piece a flexible copper lead should be run to the switch jaw or the bus, as already described.

PARTY LINE TELEPHONE CIRCUIT.

(2077.) Bernhard Koch, New York, writes:

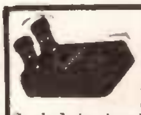
Q. Please give me connection for common battery 'phone two party line, using batteries exclusively. Show hook, bell, etc., in the diagram.

A. Here is your diagram. We show battery bells, as requested, but this type of bell is never used in commercial equipment:

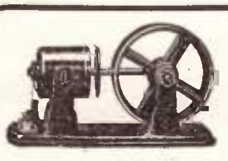


FREE PREMIUMS

We offer below a complete assortment of FREE Premiums, any one of which may be obtained by a little extra effort. You are now reading **MODERN ELECTRICS**, which means it must be good, then show it to your friends. Help yourself and help us to build up the biggest circulation of any electrical paper in the United States. You don't have to be a subscriber to take advantage of this chance to obtain a valuable instrument for nothing; it only takes just a few minutes of your time. Show the magazine to your friend, give him a few pointers on the magazine and nine times out of ten, he will subscribe. Get the subscription, send it to us and we will forward by return mail the premiums you select. Your own (NEW) subscription will count. Now get busy and get something practical FREE.

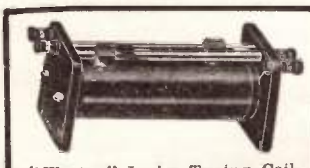


Junior Fixed Condenser. Used in all modern receiving sets. Special dielectric giving extra high capacity. Sealed in hard rubber base with binding posts, as shown. Sells for $0.50. (Add 6 cents for postage).
Given free for 1 subscription.



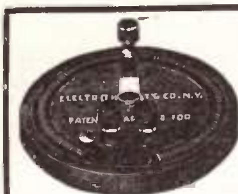
Wireless Engine. The Slickest little engine ever placed on the market. You cannot see a piece of wire. Has two fly-wheels and beautiful balancer. Cast iron base; works on one dry cell. The engine sells for 45 cents. (Add 14c. for postage)
Given free for 1 subscription.

Zinc Spark Gap mounted on hard rubber base. Electrodes fitted with rubber handles. Pure zinc rods. Used in all of the best stations. Spark gap sells for 60 cents. (Add 7 cents for postage.)
Given free for 2 subscriptions.



"Electro" Junior Tuning Coil. Slickest tuning coil on the market. Has solid hard rubber ends, bare copper winding, hard rubber sliders. Size, 8 x 3¾ x 3¾ in. Weight, 1½ lbs. The most beautiful and most practical coil made. "Electro" Tuner sells for $2.00. Sent by express only.
Given free for 5 subscriptions.

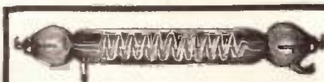
Pony Telephone Receiver. This is the receiver you have long wanted. The best one on the market. Hard rubber case. Single pole, powerful magnet. Hook can be screwed off. Standard resistance of 75 ohms. Receiver sells for 40 cents. (Add 7 cents postage.)
Given free for 1 subscription.



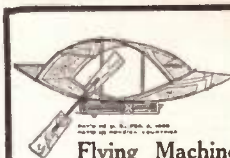
'Electro' Rheostat Rotary adjustment. Air cooled. Very useful to vary the speed of motors and small lamps. Wound with nonrusting wire.
Given free for 1 subscription.

"Electro" Medical Coil. A1 quality. No end of fun with one of these coils, besides its therapeutic properties. Complete with cords and handles Medical Coil sells for 70 cents. (Add 12 cents for postage.)
Given free for 3 subscriptions.

"Electro" Amateur Phones, 2000 ohms resistance. Wound with No. 50 copper wire. Thin diaphragms. Leather covered adjustable headband. Weight 15 oz. 80 per cent. better than 75 ohm phones. Phones sell for $4.50. (Add 25 cents for postage)
Given free for 10 subscriptions.



Six Inch Geissler Tube With Liquid. A fine tube; works on any spark coil. Gives the most beautiful, astounding colors. Tube sells for 50 cents. (By mail extra ten cents)
Given free for 1 subscription.



Areo-Flying Machine A practical miniature aeroplane; byplane type Guaranteed to fly 100 feet. A well constructed machine. Aluminum propeller; rubber motor Sells for 75 cents. (Add 12 cents for postage.)
Given free for 3 subscriptions.

"Electro" Lytic Bare Point Detector. Holds the world's record for long distance receiving. Mounted on hard rubber base Finest adjustment. Increase your receiving range 30 to 40 per cent. "Electro" Lytic Detector sells for $1.25 (Add 12 cents for postage.)
Given free for 3 subscriptions.

One Inch Bull Dog Spark Coil. This is the coil that has sent a message 90 miles with a suitable aerial. None better made. None better looking. Has French vibrator and fibre casing. Sells for $1.50. Can go by express only.
Given free for 12 subscriptions.

Please understand that we have an invariable rule that premiums cannot be given unless you ask for them, when sending in the subscriptions.

We are sure you can get any of the above premiums by showing this magazine to your friends, doing a little talking. Then is your chance, get the subscription before the other fellow gets it. Strike while the iron is hot. Act Now. Don't delay, the offer is new now and lots of people will get busy at once.

This is the best season of the year for subscriptions. **Everybody reads. Everybody subscribes.**

Send money order, draft, express money order, cash or stamps; no checks please.

MODERN PUBLISHING COMPANY, 231 Fulton St., New York

TESLA COIL FOR WIRELESS.

(2078.) Curtiss Lawter, Indiana, writes:

Q. 1.—If wireless waves radiate at right angles to the aerial, why wouldn't it be better to make a vertical aerial, so as to send it in all directions?

A. 1.—It would; but the mechanical difficulties would prevent making an aerial very high. In the ordinary flat-top aerial it is the vertical part which radiates the useful energy. The top simply acts as a capacity area to increase the useful current in the vertical part.

Q. 2.—Would the large demonstration Tesla coil described on page 44 in Construction of Induction Coils and Transformers be all right for wireless with a 1 k.w. closed transformer?

A. 2.—No. The voltage generated by this coil is entirely too high for wireless use, and the current is too small. It would be practically impossible to insulate the aerial to withstand this voltage, at a reasonable expense.

Q. 3.—Please show me the hook-up for the following: Duplex wireless aerial 4 wires, 60 feet long and 50 feet high, small set of sending instruments, 1-inch coil, 4-quart Leyden jar, key, Gernsback interrupter, and anchor and spark gap. Large set sending, 1 k.w. closed core transformer, key anchor gap and rotary spark gap, two helices, adjustable condenser, impedance coil and Gernsback interrupter. Small receiving, silicon detector, single slide tuning coil, pony receiver and condenser. Large set: large tuning coil, double slide, loose coupler two silicon, carborundum peroxide of lead and electrolytic detectors, fixed condenser, potentionmeter, head receivers and batteries.

A. 3.—This is no puzzle department, Curtiss. We are willing to give you a hook-up for any reasonable amount of apparatus, but object to being asked to connect up a whole wagon load of it.

SPARK COIL ON 110 VOLTS, with WATER RHEOSTAT.

(2079.) Charles F. Jacobs, New York, writes:

Q. I have a 1-inch spark coil, which I purchased from the Electro Importing Co., and I wish to know whether I can operate this coil on 110-volt direct current with a water rheostat, and, if so, if you would be kind enough to describe what kind of water rheostat is preferable?

A. The coil may be operated on 110-volt with a water rheostat, but the vibrator contacts will be rapidly destroyed by the arc which will form there. However, if you wish to operate this coil on 110 volts, the better plan would be to use a Gernsback interrupter, fitted with a 5-ampere tube.

RECEIVING HOOK-UP.

(2080.) Nicholas Keller, Ohio, writes:

Q. 1.—Could you give me a better diagram than the one herewith? I use one fixed condenser (contains 196 square inches tinfoil), loose coupler, single sliders on primary and secondary, silicon detector, and 2000 ohm E. I. Co. 'phones. My aerial is

NOTICE

Members Wireless Association of America

THE Annual Official Wireless Blue Book of the WIRELESS ASSOCIATION OF AMERICA goes to press soon.

The new Blue Book will be a radical departure from others that have been issued and will positively be the most complete book of the kind published anywhere. The book will be at least twice as large as heretofore and will contain the greatest number of wireless amateur stations in the United States.

Hereafter it will be an honor for the amateur to be licensed in the United States as it gives him a recognized standing not possessed heretofore.

We refer to this month's editorial which should be of utmost interest to every amateur in the United States.

Listing in the Wireless Blue Book will be 25 cents, the same as heretofore. This includes one copy of the Blue Book and the Wireless Chart which is given with the Blue Book. Inasmuch as the Blue Book lists at $.15 the listing consequently is only $.10.

OFFER EXTRAORDINARY

We will make the following unparalleled offer:
1st. Send you MODERN ELECTRICS for an entire year beginning with the July issue.
2nd. List your name in the new Wireless Blue Book.
3rd. To send you copy of the Blue Book and Chart.

ALL FOR $1.15

IMPORTANT—When sending application for listing, give name and address, location, power used type of aerial, also any other information to enable us to figure your wave length, etc., correctly.
Remit by Cash, Stamps or Money Order, to

WIRELESS ASSOCIATION OF AMERICA
231 FULTON STREET NEW YORK CITY

Learn by Doing

THAT'S THE WAY HERE

YOU learn ELECTRICITY in all its modern applied forms by DOING—not by theory from books. You are taught by "this is the way to do it" Teachers and then you work it out with your own hands right in the school. And what you learn, you know "for keeps."
No classes. You get individual instruction and go ahead without hindrance. Day and night sessions the year 'round.
Fill out the coupon and receive our illustrated prospectus free, telling of our practical course and easy payment plan.

The New York Electrical School
26 West 17th Street
OPEN FROM 9 A. M. TO 9 P. M,

NOT A CORRESPONDENCE SCHOOL

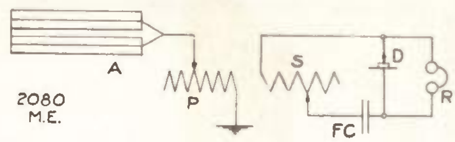
The New York Electrical School
26 West 17th Street, New York
Please send me full information about your course in ELECTRICITY.

NAME ....

ADDRESS ....

....

100 feet long, 6 wires 2 feet apart, aluminum wire No. 14. When I get my detector sensitive, and throw in my aerial switch, in my receivers I get a static click where the stations ought to come in, and then again, on other days, they come in just as loud and clear as ever. What do you think is the cause of the trouble?



2080 M.E.

A. 1.—Your receiving hook-up is O K, except that the condenser is rather large; also, you will find, when using a silicon detector, much better results are secured by connecting the 'phones across the condenser, instead of across the detector.

Q. 2.—Is my aerial connected up right for best results in sending and receiving, as shown in above diagram?

A. 2.—Yes, if your lead-in wire has a carrying capacity equal to that of all your aerial wires in parallel.

Q. 3.—My aerial comes near a tree. Some of the twigs are only several feet away. Does this affect the sending or receiving any?

A. 3.—Yes. The presence of the tree should affect your sending and receiving ranges quite a little.

AERIAL HEIGHT. DETECTORS.

(2081.) Paul J. Hoffman, New York, writes:

Q. 1.—When the aerial is raised higher, is the efficiency of the set increased?

A. 1.—Yes.

Q. 2.—I have a three bar magneto generator; would it be possible to re-wind same to get 5-6 volts? Foot power to be used.

A. 2.—Yes.

Q. 3.—What is the best kind of a detector to use?

A. 3.—The perikon combination is the most sensitive of the crystal detectors; but the audion is still more sensitive than the perikon when properly adjusted.

NAME WANTED.

We have received from a reader in Pikeville, Ky., two photographs and description of his wireless outfit, and would like him to send in his name and a duplicate of one of the photographs, in order that we may identify them, as neither the photographs nor the description bore the name of the sender.

NOT ALWAYS!

"That's another story!" as the bricklayer said when he finished his day's work.—*July Woman's Home Companion.*

TURNED DOWN.

A Tragic Tale in Four Chapters, Wherein is Set Forth Certain Correspondence Between a Poor Inventor and a Heartless Corporation.

CHAPTER I.

NEW ORLEANS, LA., Nov. 27, 1911.
WESTERN ELECTRIC COMPANY,
New York, N. Y.

Dear Sirs:—I have an idea for the use of electricity applied to a simple household necessity, which I am sure will mean large returns to the holder when completed and patented. I have not patented it yet, as it requires much time for an unknown individual to get patents through the office at Washington. This you could easily do, with the number of patents you must already hold. I would be glad to make known this idea to you, provided you are interested and will give me some assurance of a fair compensation for the suggestion when the article itself is completed and ready for sale, with the understanding that a "square deal" will be given me if the idea proves worth using.

Awaiting your reply, I am,
Very truly yours,
MRS. ——— ———.

CHAPTER II.

Western Electric Company
463 West Street
NEW YORK, Dec. 14, 1911.
MRS. ——— ———,
New Orleans, La.

Dear Madam:—Replying to your favor of the 27th inst., we have noted the contents of your letter, and if you will send us a sketch or description of the article you have in mind, we can then correspond with you more intelligently on the subject.

Yours truly,
WESTERN ELECTRIC COMPANY,
Supply Sales Department.

CHAPTER III.

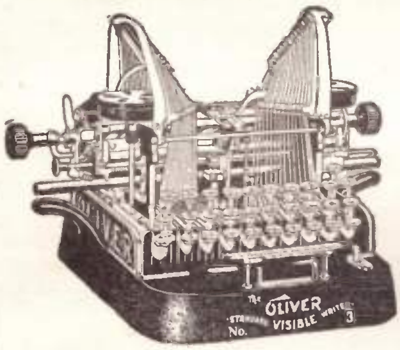
NEW ORLEANS, LA., Jan. 26, 1912.
WESTERN ELECTRIC CO.,
New York City.

Dear Sirs:—With further reference to my letter of November 27th:

What I have in mind is a trap for rats and mice, which will electrocute the rodents before they can escape. I have not the mechanical skill to actually complete the model, but will describe it as it seems to me would be effective, with the exception that I cannot estimate measurements.

There should be two chambers, called for convenience the entrance and death chambers. The latter should be screened from the observation of the rats from the outside, and lighted by a tiny electric bulb within. It should be some inches higher than the entrance chamber, which would be merely a small area, invitingly open. As rats like to climb, it would be easier to lead them into the death chamber, if the ascent from the entrance chamber was made of soft wood. The bait, of scraps of cheese, or other things,

$5.00 Per Month



Buys This Visible Typewriter

Here is the offer that astounded the typewriter world:

The Famous Model No. 3 Oliver—The machine with the type bars that strike downward—that makes the "write-in-sight" principle mechanically practical. It is so simple children learn to operate it in ten minutes—so fast the experts choose it—so strong a shrewd business man insists upon it—The World's Standard.

You Can Make It Yours So Easy—it's a shame to do without it.

No Cash Until You See It—until you try it in your home or office, then you make your decision—no salesmen to influence or hurry you—if you keep it you pay only $5.00 down—it will earn its own way thereafter.

Stop Paying in Nine Months, Only $50 in All — no interest—no chattel mortgages—no collectors—no publicity—no delay. Positively the best typewriter value ever given—the best selling plan ever devised.

If You Own a Typewriter Now—
trade it in to us as first payment—we will be liberal with you.

Send your name and address on coupon and we will tell you more about this unusual offer—more about this splendid typewriter—it won't cost you anything and you will be under no obligation—we won't send a salesman.

Tear out the coupon now—you might forget.

Typewriters Distributing Syndicate
159 ME N. STATE STREET
CHICAGO

[74]

Typewriters Distributing Syndicate
159 ME N. State St., Chicago

You may send without placing me under any obligation, further information of your typewriter offer.

NAME.......... ....

ADDRESS..

My old machine is a.......... ....No. ....

should be scattered about the death chamber, so that the scent of same will entice the rats and mice into the death chamber. That chamber should be so magnetized (if that is the correct word) within a certain area that death would be inevitable immediately the rodents came within that area. There would be no need of any trap to prevent their escape, as they would be beyond escape when once within the circle described. Now, whether it is possible to electrify a trap sufficiently to kill the rodents without destroying the bait, is something I am not sufficiently versed in electrical lore to know; in the event there was difficulty in that respect, bait holders of aluminum could be provided. If the scheme for the trap as proposed herein would make it too expensive, doubtless it can be arranged cheaply and effectively by the experts in your employ who are familiar with electricity, its best conductors, etc. The floor of the death chamber should be a trap door, so that when the rodents were to be removed all that would be necessary would be to drop the door and let them fall right into a garbage can, thus saving the handling of the beasts, which is an extremely disagreeable feature of most traps at the present time.

The trap should be so arranged that it could be attached with string and knob to the electric fixtures as supplied in the average home.

I enclose a rough diagram of what I am trying to explain to you. Also a bit of the material which it seems to me it would be a good scheme to use for the traps.

Kindly advise me promptly, as if you do not care to handle it, I will see if I cannot myself put it on the market.

Very truly yours,

Mrs. ——— ———.

P. S.—I am unable to make a drawing which would be clear, so will not send one. The trap could be either round or square.

CHAPTER IV.

Western Electric Company
463 *West Street*
New York, Jan. 31, 1912.

Mrs. ——— ———,
New Orleans, La.

Dear Madam:—Replying to yours of the 26th inst., we have noted with interest the description of your invention, but regret to state that this is an article in which we are not interested.

Thanking you very much for offering it to us, we remain,

Yours truly,
Western Electric Company,
Supply Sales Department.

(The End.)

WIRELESS TELEGRAPHY IN CENTRAL AMERICA.

The National Electric Signal Company, of Pittsburgh, Pa., is taking up the matter of establishing a number of wireless stations along the Atlantic coast of Mexico and Central America with the purpose of obtaining constant communication between these countries and the United States.

SECOR

Permanent Alignment

Visible Writing

Positive Type Bar Control—the "Why" of Permanent Alignment

Inbuilt Decimal Tabulator and Billing Device

Ribbon Feeds Only When Type Bars Move—A Great Saver of Ribbons

Removable and Reversible Platen

Type Protector on Each Type Bar

Complete Keyboard Control That Makes for Speed

Line Finder at Printing Point

Paragraphing Keys

Back Space Key

Automatically Reversed Two-Color Ribbon

Uniform, Light Touch

Fast Escapement

Automatically Adjusted Gear Driven Carriage

Removable Escapement

Independent and Flexible Paper Feed

The Secor Typewriter Company

General Sales Offices, 302-304 Broadway, New York

FACTORY AT DERBY, CONNECTICUT, U. S. A.

ELECTRIC GAS ENGINE TESTING

(*Continued from page 366.*)

ured by the apparatus shown. A tank, connected to the carburetor supply pipe by flexible rubber tubing, rests on a sensitive platform scale. The beam is graduated in pounds and tenths, and reads by estimation to hundredths. Readings are taken by measuring the time for a definite number of pounds to be consumed, rather than the number of pounds consumed in a definite time, the former method requiring less attention by the operator, and being facilitated by an electrically operated stop watch. The scales are wired to a battery in such a way that a point on the scale beam dips into a cup of mercury when the scale beam falls, thus closing a circuit which rings a bell, and stops an electrically operated stop watch.

If, just before starting a test, the tank and contents weigh a little over 54 pounds, with weights and rider set at just 54 pounds, the beam stays up. Suppose the weight decreases to 54 pounds, the beam drops and at that instant, the watch is started by hand. The rider is then slid back to 53 pounds and the beam rises.

The operator closes switches in the bell and watch circuits and takes other readings, and when a pound of fuel has been consumed the beam drops again, completes the circuits, and this starts the bell ringing, to attract attention, and stops the split second hand of the watch. The operator then sets the scale beam for 52 pounds, enters the elapsed time on the log, snaps the split-second hand forward into step with the main hand, and goes about his other work until the bell rings again and the operation is repeated.

It is of interest to note that elapsed time from the start, and the weight of fuel fed, are noted on a sheet, ruled with special reference to the probable limits of fuel consumption of the motor under test, and, in case the rate is not uniform, the irregularity is indicated.

MAGAZINES AT CUT PRICES

For the benefit and convenience of our readers, we have prepared a number of attractive offers in combination magazine subscriptions. The offerings cover a selection of the leading publications in electricity, mechanics, aeronautics, photography, fiction and all topics which would be of general or particular interest to our readers. While our list is compiled to meet the general demand, any publications not listed can be quoted on by us, on request.

The prices given below are for American subscribers only. Periodicals sent to Canada and foreign countries are subject to the additional postage charges, which may be quoted on application. The individual publications incorporated in one offer may be sent to separate addresses if so desired.

Aside from the **GREAT SAVING IN PRICES** on the publications listed below, the advantage in sending subscriptions to us and receiving the magazines regularly is a point not to be overlooked. We adjust complaints and changes of address promptly, inasmuch as we are in direct communication with the various publishers. Subscriptions sent through agents or agencies often prove a source of dissatisfaction, the transaction being handled through a number of different concerns who do not hold themselves responsible directly to the subscriber.

FOR THE ELECTRICIAN.
Modern Electrics.
Popular Electricity.
Electrician and Mechanic.
Regular Price.............. $4.50
Our Price.................. $3.40

FOR THE BOY.
Modern Electrics.
American Boy.
Boy's Magazine.
Regular Price.............. $3.50
Our Price................. $2.70

FOR THE BUSINESS MAN.
Modern Electrics.
System.
Business and Bookkeeper.
Regular Price.............. $4.50
Our Price................ . $3.80

FOR THE MACHINIST.
Modern Electrics.
American Machinist.
Machinery.
Regular Price.............. $4.50
Our Price.......... .... $3.95

FOR THE FICTION READER.
Modern Electrics.
Cosmopolitan.
Everybody's.
Regular Price.............. $4.50
Our Price $2.95

FOR THE AERO ENTHUSIAST.
Modern Electrics.
Aircraft.
Fly.
Regular Price.............. $4.00
Our Price... .... $2.95

FOR THE HOME.
Modern Electrics.
Woman's Home Companion.
Cosmopolitan.
Regular Price.............. $4.50
Our Price .. .. $2·95

FOR THE FARMER.
Modern Electrics.
Farmer.
Farmer's Home Journal.
Regular Price.............. $3.25
Our Price.................. $2.60

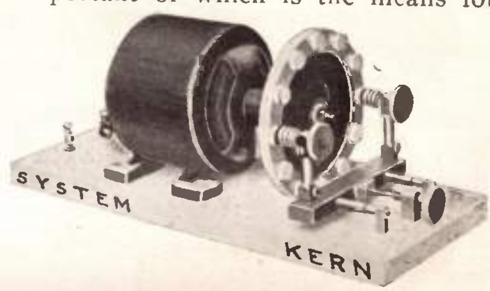
Send today 2c. stamp for our 32 page Magazine book giving complete list and prices of over 2000 American periodicals, the most complete book of this kind published.

Address All Communications and Remittances to

MODERN ELECTRICS
231 Fulton St., New York, N. Y.

INWESCO ROTARY SPARK GAP.

The International Wireless Signai Co., of West New York, N. J., have gotten out a new rotary spark gap, cut of which we show herewith. The gap has a number of novel features, most important of which is the means for



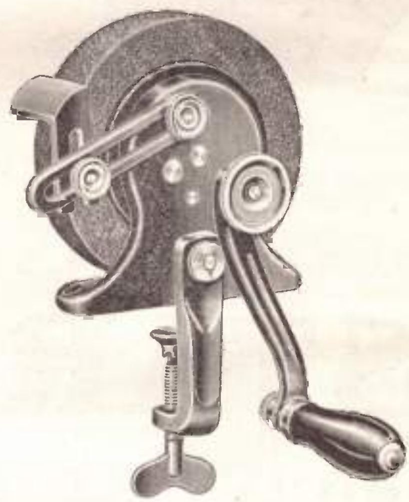
adjusting the position of the fixed elec trodes. Each plug is adjustable independently, as well as the two together. Suitable stops are provided which prevent the stationary plugs coming into contact with those on the revolving disc.

ANOTHER LUTHER GRINDER.

A new machine just put out by the Luther Grinder Mfg. Co., Milwaukee,

Wis., fills a long felt demand for an efficient sharpening machine that can be packed into small space. This new Dimo Grit Grinder No. 35 incorporates these points in a unique and interesting way.

All the mechanism of the machine is contained within the wheel itself. The wheel is hollowed out to contain a series of four driving gears and pinions. These produce a speed of twenty revolutions of the grinding wheel to every turn of the handle, which is



higher than most of the other sharpening machines on the market to-day. All bearings are constructed in one piece and everything is enclosed and dust proof. The machine is finished in red and black enamel. The wheel is of Dimo-Grit, the new "diamond" sharpening substance.

The space required for carrying this grinder is scarcely greater than the wheel itself. The wheel is 5½ inches in diameter, and the entire machine packs in a box 5¾ inches long. All the different parts, including the handle, clamp, tool rest, etc., can be easily and quickly taken apart for packing. Its particular use is to be found with carpenters, for their tool chest; for miners, surveyors, prospectors, woodsmen and sportsmen; in fact, all who have tools to be kept sharp, but who cannot have them in a permanent workshop.

CASSELL'S CYCLOPÆDIA OF MECHANICS

6,500 ILLUSTRATIONS 30,000 INDEXED ARTICLES

Edited by PAUL N. HASLUCK	If You Want to Make Anything Consult These Volumes	Assisted by 100 Practical Experts

EVERY Mechanic, Engineer, Scientist, Farmer, Handyman and Man with a Hobby should own a set of these books. The work is not only of priceless value to Mechanics, Electricians and Scientists, but contains thousands of articles written for the Handyman about the house, farm and shop; for anyone who likes to make things, from a match-holder to a suite of furniture—from a wheelbarrow to a carriage or motor body. The boy who is learning how to use his brains and hands will find these volumes a never ending inspiration. Read the description below; then let us send you the set for examination before you purchase.

This Famous Mechanical Library Sent You for Examination on Receipt of $1.00

Sign your name to the coupon below and let us send you this complete five volume work at once on approval. If you don't keep the books, the set is returnable AT OUR EXPENSE, and we will refund your $1.00, plus any expenses.

Cassell's Cyclopaedia of Mechanics is an authoritative work, well printed and handsomely bound in five volumes. Written by a staff of skilful and talented mechanical and technical writers, under the direct editorship of Paul N. Hasluck, the foremost living writer on mechanical subjects, every item the paid contribution of an expert. The complete work contains over 6500 illustrations and 30,000 separately indexed articles; over 2,500,000 words. The five volumes number 1760 pages in all; each volume measuring 7½x10½ inches; strongly bound in stout extra durable cloth binding, with lettering in gold. We know you will be amazed by the scope and completeness of this work. A leisurely examination is the only method of sale that will do it justice. That is why we make you this out-and-out offer to place the five volumes in your home at our expense, without obligation to keep them unless you are satisfied.

For the Practical Mechanic The practical mechanic will find in this work thousands of articles such as: Spindle molder for treadle power; cramps used in drilling holes; chucks for holding small tools in lathe; electric motor connections; boiler covering compound; forging swivels; reducing high pressure of electric circuit; tail vice for wood-worker's bench; truing emery wheels; regulating speed of electric motors; tool for cutting round holes in sheet metal; tube ignition for small oil engine; oxy-acetylene blow pipe or torch for welding and cutting metals; rustless coating for iron patterns; uses of shunt coils, spacing dynamo brushes; heat gauge for use in hardening steel; fitting electro ignition to gas engine; grinding and polishing metals for a high finish; calculating weight of rolled metal, etc., etc.

Some General Subject-Headings which indicate the exceptional range and comprehensiveness of the work include: Acetylene—Acids—Alabaster—Alloys—Barometers—Boat Building—Bookbinding—Building—Cements—Chemicals and Chemistry—Cleaning and Renovating—Coach-building—Concrete—Cycles—Drawing Instruments—Dyeing—Electricity—Embossing—Enameling—Engineering—Engraving—Entomology—Etching—Explosives—Filters and Filtering—Fireproofing—Floors—Furnaces—Gas—Gauges—Gilding—Glass—Granite—Guns and Firearms—Heating-Apparatus—Illuminating—Inlaying—Ivory—Jewelers' Work—Lamps—Lantern Slides—Leather Working—Lenses—Lithography—Lubricating—Machinery—Marble—Metal Working—Metals and Metallurgy—Modelling—Motors—Moulding Machines—Paints—Paper—Paving—Photography—Pipes—Plaster—Plumbing—Pottery—Poultry Appliances—Presses—Printing—Pumps—Refining—Refrigeration—Roofing—Ropes—Sand—Sanitation—Saws—Screws—Surveying—Sign Writing—Soaps—Solder—Staircasing—Stone—Stoves—Tanning—Taxidermy—Terracotta—Tiling—Timber—Tools—Upholstery—Valves—Veneering—Water—Wireworking—Woodworking.

Examine This Great Set of Books at OUR Expense We want you to see this famous five volume work, for we know that you will be pleased with its binding, paper and printing, and the wonderful fund of information it contains. We want you to examine it thoroughly, for we know you will be quickly impressed with its practical value. The price of this complete work in five volumes as above described, is $18.00. Just mail us the coupon opposite with $1.00 and you will receive the set, carriage paid. Examine it five days. If at the end of that time you do not want it, notify us and hold subject to our order, and we agree to return the dollar you have sent us. If you keep the books, pay us $1.00 within five days, and the balance $2.00 a month until paid.

MODERN PUBLISHING CO.
231 Fulton Street, New York

231 Fulton St.
N. Y. C.

GENTLEMEN:—I enclose herewith $1.00 for which kindly send me carriage prepaid, for free examination, one complete set of Cassell's Cyclopædia of Mechanics, in five volumes. It is understood that I may examine the work five days, and if I do not wish to keep it, I agree to notify you and hold subject to your order. If I keep it, I agree to pay you $1.00 within five days and the balance of $16.00 in instalments of $2.00 per month until paid. It is further understood that you will refund the dollar paid if I decide not to keep the books.

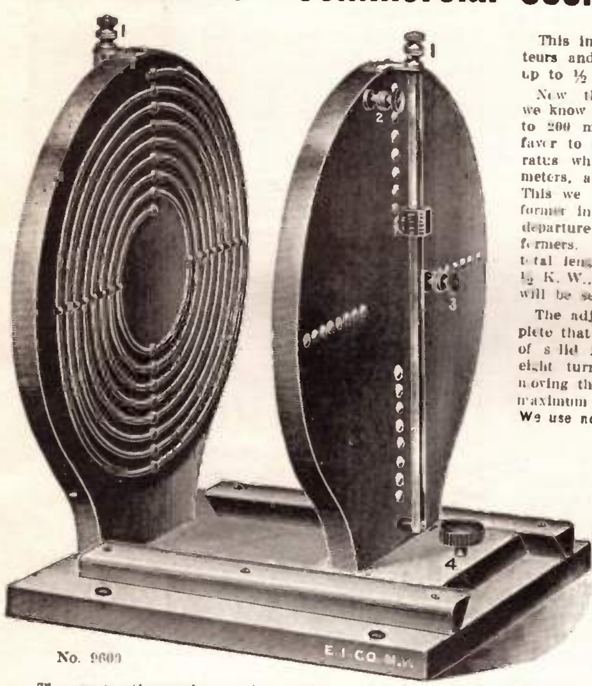
NAME..

ADDRESS..

OCCUPATION OR EMPLOYER..

Send this coupon or copy of it

The "Electro" Commercial Oscillation Transformer



No. 9600

This instrument fills a long felt want among amateurs and has been designed to be used with power up to ½ K. W.

Now that the Wireless situation is clear and we know that the amateur may use a wave length up to 200 meters, we thought we could do no greater favor to the American amateur than build an apparatus which would confine the wave length to 200 meters, and at the same time obtain high efficiency. This we have accomplished in our Oscillation Transformer introduced herewith, and it presents a radical departure from other similar Oscillation Transformers. In connection with a four wire aerial, total length of fifty feet with any transformer up to ½ K. W., a wave length of not more than 200 meters will be sent out.

The adjustment of this apparatus is the most complete that could be thought of. There are two spirals of solid No. 6 Aluminum Wire, each spiral having eight turns. The two spirals can be separated by moving the spiral on the right back and forward, the maximum separation being 10 inches.

We use no helix clips of any kind, but the adjustment is made by means of a **slider mounted directly on the back of each spiral.** By means of these sliders, **adjustments which vary the inductance to a half turn**, are readily accomplished. This feature cannot but recommend itself and has never been attempted before **in any** other similar instrument. By means of the handle 4, the movable spiral can be adjusted back and forth, which assures practically any adjustment that may be wanted.

This apparatus is especially recommended for close tuning and is **invaluable for Wireless Telephony** work, where it positively stands unequalled.

The construction and general execution of the apparatus is of the highest order and stands distinctly by itself.

The wood is cherry throughout, mahogany finish, hand rubbed polish, ⅝ inch thick.

The Oscillation Transformer is shipped flat and takes up but little space when shipping.

The full size of the instrument is 16" x 14" x 12"; weight 8¾ lbs. All metal parts are brass nickel plated, except the Aluminum Wire.

There are six generous nickel binding posts. The Aluminum wire spirals are fastened by a unique process, never attempted before. The whole instrument will make a valuable addition to any wireless station.

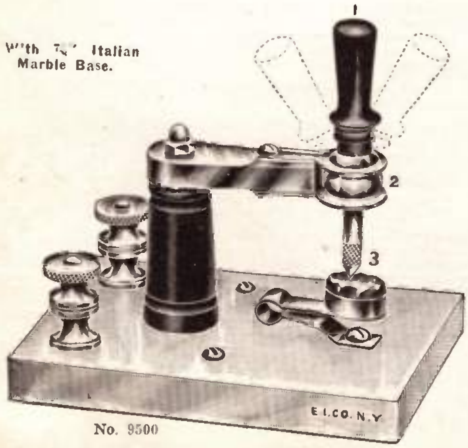
We positively guarantee the working efficiency and wave length of this instrument, and will cheerfully refund the purchase price if not entirely satisfactory and equal to our description.

No. 9600 ELECTRO COMMERCIAL OSCILLATION TRANSFORMER as described $10.00

CAN ONLY GO BY EXPRESS OR FREIGHT.

THE ELECTRO COMMERCIAL DETECTOR STAND

With ¾" Italian Marble Base.



No. 9500

Size over all 4½" x 3" x 5". Weight 1 lb.

This instrument lately perfected by us stands in a class all by itself. It is the highest grade Detector Stand ever introduced in the United States. It will appeal to all who wish a high grade instrument at a reasonable price.

Specification: Heavy marble base ⅞" thick, size 4½ x 3". Hard Rubber Pillar, on which is supported a nickel plated casting, which holds the ball-swivel 2. As will be noted, the handle, 1, may be moved sideways in any direction on account of the swivel-ball arrangement; a feature not found in any other detector. This is quite an important feature, as it is often necessary with certain substances to "feel" over the surface in order to find the most sensitive spot.

The handle, 1, **can also be pulled up vertically**, as it is held back by a spring inside of the ball. Any amount of tension of the spring may be had by adjusting knurl, 3. This gives to the contact point on the detector substance any required tension. Therefore this detector is capable of the greatest variations, not alone in its free movement, but it can be adjusted **from the lightest contact to the heaviest.**

Only the best materials are used in the construction of this detector, all metal parts being finely nickel plated and highly polished.

There are two heavy nickel binding posts and there is a **FELT COVERING ON THE BOTTOM OF THE MARBLE BASE.**

No. 9500 ELECTRO COMMERCIAL DETECTOR STAND as described, price $3.75

BY MAIL EXTRA 25 CENTS.

"Electro" Ball Antenna Insulator

We are pleased to present to our friends herewith the latest addition to the "Electro" family.

We have had an urgent demand for a lower price Ball Antenna Insulator and the one we are presenting herewith solves the problem.

10007

The size of this Insulator over all is 3¼ x 2½ inches, weight 7½ ounces. The Insulator is made entirely of porcelain in one piece and has a triple coating of brown glaze. The insulating value of this Insulator is of the highest order and greater than similar Insulators. All the grooves are undershot and this feature is responsible for the fact that the new Insulator "sheds the water like a duck."

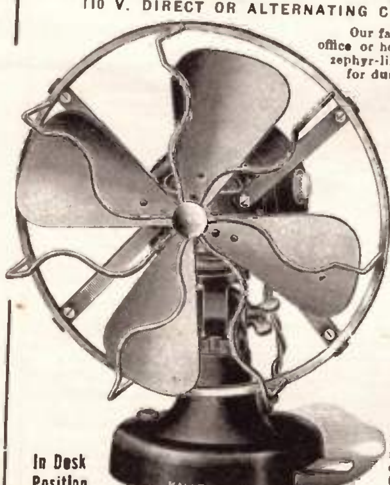
We guarantee that you will be pleased with this Insulator. It is the cheapest high-grade Insulator ever placed upon the American market and stands in a class by itself.

We recommend one Insulator on each end of an aerial strand for receiving. For sending there should always be two of the Insulators in tandem; this will afford sufficient insulation up to 1 K. W. transformer.

NO. 10007 "ELECTRO" BALL INSULATOR, AS DESCRIBED, EACH 16 CENTS; IN LOTS OF EIGHT (ENOUGH FOR A 4 WIRE AERIAL) $1.25

The "Electro" 8 Inch Fan

110 V. DIRECT OR ALTERNATING CURRENT.



In Desk Position

Our fans bring to your office or home the cooling zephyr-like breeze sought for during the humid months in the mountains or at the seashore. With 110 volt circuit available who would not spend one-quarter of a cent per hour to be comfortable during the excessive heat?

If your office is hot and stuffy, one of our "Electro" fans will change it immediately to a cool and comfortable temperature.

A hot, unhealthy bedroom is immediately converted into a dormitory where the cooling breeze from our "Electro" fan enchances the much needed sleep.

They are portable, adjustable, and easy to operate, circulating sufficient breeze to be refreshing but not objectionable, as is the case with larger types.

They are convertible and readily adjusted to the wall or desk; a special feature not found in the regular one position fan.

Motor finished in black enamel has wick feed oil cups and is fitted with a two speed starting switch. By adjusting the swivel and trunnion the breeze may be thrown in any direction. The guard is exceptionally strong and durable.

INTRODUCTORY PRICE $6.80

"Electro" Name Plates

Pursuant to many requests from our customers we have placed on the market a line of name plates which will make a handsome addition to any instrument table. Our plates are made in two stlyes, German Silver and Brass finish, 1-64 inch thick. The lettering is **CHEMICALLY ETCHED**, lettering in relief. There are two holes to fasten the plates to the table or instrument box.

The large size plates measure 1¼ x ½. The small ones measure ⅝ x ½.

Prices the same for either Brass or German Silver finish.

Large size lists at	10c.
Small size at	7c.
Complete set, all the seven plates	55c.
By mail extra	3c.

Storage Battery Plates

We have recently adopted new sized plates for our type R. E. and H. O. Storage Battery and have on hand a number of the old style plates formerly used. These plates are absolutely new and ready for use and we will dispose of them while they last at 50 per cent. below cost.

IF YOU EVER WANTED TO MAKE YOUR OWN STORAGE BATTERY, NOW IS THE TIME. TAKE ADVANTAGE OF THIS EXCEPTIONAL OPPORTUNITY BEFORE THESE PLATES ARE ALL GONE.

Type R. E. positive or negative plate, size 4½ x 5¼ inch, each	$.20
Type H. O. positive or negative plate, size 2¾ x 4½ inch, each	.13

ALL PLATES ARE 3-16 INCH THICK.

Phosphor Bronze Aerial Wire

Everyone interested in Wireless realizes the wonderful conductivity and extreme tensile strength of Phosphor Bronze Aerial Wire used in connection with Wireless Aerials.

Commercial and Government Wireless Stations use no other wire for the construction of their aerials. They understand the importance of using a wire giving the greatest amount of active surface for the reception or transmission of Wireless signals.

We have just taken in an enormous stock of 200,000 feet Phosphor Bronze Aerial Wire from one of the largest factories in the business whose output we control.

As an introductory offer we are going to dispose of some of this wire during this month only at almost **UNHEARD OF PRICES.**

SPECIFICATIONS: 7 strands No. 22 B. & S. gauze Phosphor Bronze Wire. Will stand a rupture test of over 800 lbs. Not less than 100 feet sold. **SPECIAL PRICE 90. PER 100 FEET. THIS MONTH ONLY.**

Order at once, prompt shipment guaranteed during the month of July. The regular price of this quality Phosphor Bronze Wire is 1½c. per foot.

M. E. 7-12

FOLD AND TEAR HERE

I enclose herewith 4c stamp for which please send me your 196 page Electrical Cyclopedia No. 10 at once.

Name........................

Address........................

City........................

The Electro Importing Company "Everything for the Experimenter"

233z Fulton St., New York City, Retail Store at 69 W. Broadway

THE GREATEST WIRELESS

BOOK VALUES EVER OFFERED

HOW TO MAKE WIRELESS INSTRUMENTS, by Twenty Wireless Experts, 96 Pages, 75 Illustrations, Third Edition.

This book is check full of information and shows how to make different instruments and wireless appliances and information not usually found in other books. You will be surprised how carefully this book is gotten up and how easy it is to make your own instruments. **Price by mail, 25c.**

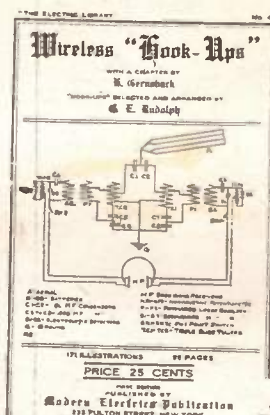
$1.00

for the Four Best Books of their kind published.

CONSTRUCTION OF INDUCTION COILS AND TRANSFORMERS, by H. Winfield Secor, 96 pages, 72 illustrations, second edition. If you want to build your own induction coil or transformer we unhesitantly say that this book will give you more information on the subject than any other one irrespective of price. Important tables for spark coils from 1 inch to 20 inch and for transformers from ½ K. W. to 3K. W., both closed core and open core are given. A multitude of information is found in this book which cannot be found in others.

Price by mail, 25 Cents

WIRELESS HOOK UPS, 100 Pages, 171 Illustrations, with a chapter by H. Gernsback. This book fills a distinct want and is the most valuable adjunct to a wireless station. 171 different hook-ups receiving and transmitting, and giving incidentally a lot of information about other things in the wireless station and about connections. Once you have this book you wonder how you could be without it before. Price by mail, **25 Cents.**



$1.00

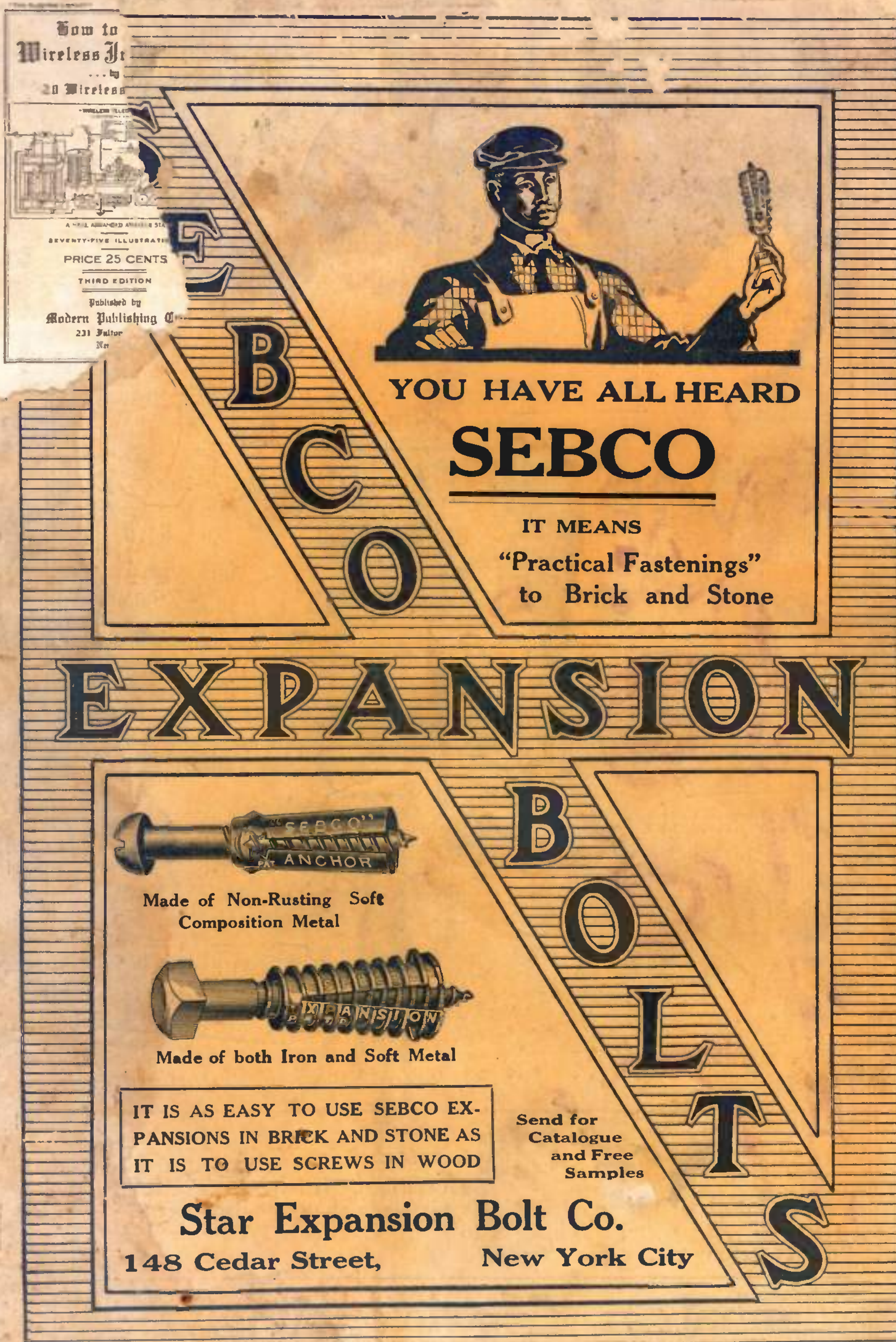
for the Four Best Wireless Books for the Wireless Amateur.

THE WIRELESS TELEPHONE, by H. Gernsback, second edition, 86 Pages, 57 Illustrations. A unique book giving the student a good insight of the wireless telephone as it is today. In the next five years wireless telephony will play a tremendous role in the progress of the World, and the wireless student who has given the subject any thought at all will do well to obtain this book as it will give him a close insight of the intricate problems as yet to be solved. The book is written non-technically and even the layman will have no trouble to thoroughly understand it.

Price by mail, 25 Cents

Tear Off Here and Mail With Money

Modern Electrics, 231 Fulton St. N. Y. City.
Please send at once (cross off books NOT wanted)
"How to Make Wireless Instruments"
"Construction of Induction Coils and Transformers"
"Wireless Hook-Ups"
"The Wireless Telephone"
for which I enclose $______
Name______
St.______
City______
M E 7-13


How to
Wireless
PRICE 25 CENTS
THIRD EDITION
Published by
Modern Publishing
SEBCO
YOU HAVE ALL HEARD
SEBCO
IT MEANS
"Practical Fastenings"
to Brick and Stone
EXPANSION
BOLTS
SEBCO
ANCHOR
Made of Non-Rusting Soft Composition Metal
EXPANSION
Made of both Iron and Soft Metal
IT IS AS EASY TO USE SEBCO EXPANSIONS IN BRICK AND STONE AS IT IS TO USE SCREWS IN WOOD
Send for Catalogue and Free Samples
Star Expansion Bolt Co.
148 Cedar Street, New York City