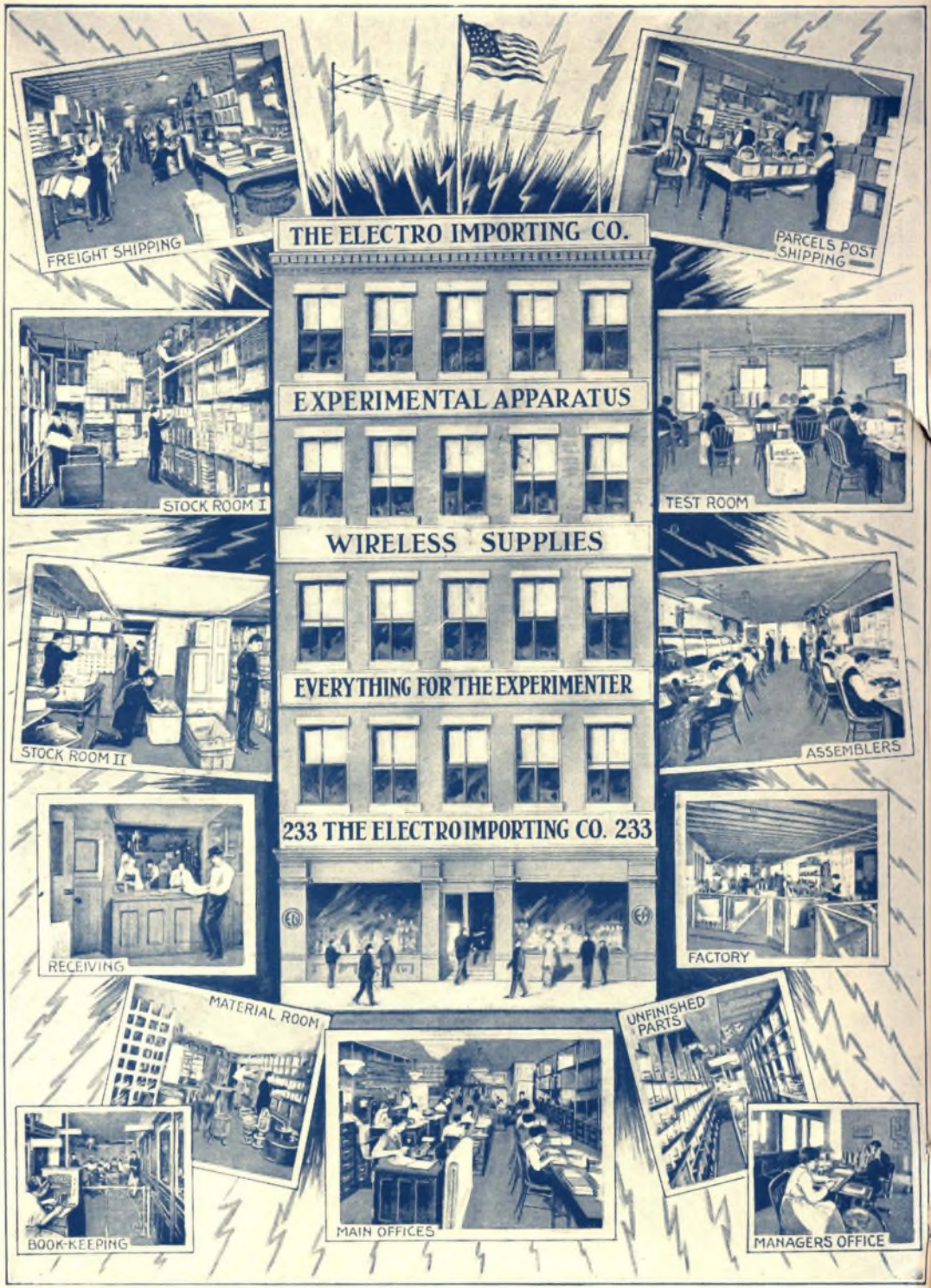
Wireless & Electrical Cyclopedia

THE ELECTRO IMPORTING CO.

233 FULTON STREET NEW YORK

"EVERYTHING FOR THE EXPERIMENTER"

LOOK FOR FREE
WIRELESS COURSE
COUPONS



CATALOG No. 22

First Edition 1920

Trade Mark

The Electro Importing Co.
233 Fulton Street
New York City

No Order For Less Than 50 Cents Accepted

BEFORE ORDERING PLEASE READ CAREFULLY.

IMPORTANT

All Previous Prices Are Withdrawn With This Issue

OUR GUARANTEE:—We guarantee every article listed in this Catalogue to be equal in every detail to the illustration and printed description, but as we are constantly improving and bettering our goods there may be slight changes from details as shown in cuts. We will replace free of charge any article or part thereof, in which there may be a mechanical defect of construction if same is returned prepaid to us within five days after receipt.

CABLE AND TELEGRAPH ADDRESS "ELIMPORT," NEW YORK.
TELEPHONES 7777 and 7776 Cortlandt.

OUR TERMS:—Cash with order. We do not open accounts with private individuals, nor do we sell on the installment plan. Our low prices do not justify it.

Always allow sufficient money to cover postage. Weight of packages can be readily figured from the weights given in the catalogue descriptions. Knowing the weight and the parcel post zone in which your post office is located, measuring from New York, you can easily figure the amount of postage required from the parcel post rate table shown on page 5.

EXPRESS C. O. D. ORDERS for at least $5.00 or more will be accepted by us East of the Mississippi. **We require a deposit** of 25 per cent. of the amount purchased.

REMITTANCES should be made by N. Y. Draft, Post Office or Express Money Order by Registered Letter. Do not send money unregistered by regular mail. Out-of-town checks accepted only if 10 cents exchange is added.

U. S. STAMPS (new and in good condition) will be accepted instead of cash in amounts up to $3.00. Above this amount 5 per cent. to cover brokerage fee must be added to total.

SHIPPING DIRECTIONS should accompany each order; in their absence we will use our best judgment in making selection of routes.

WHEN ORDERING give catalogue number.

RETURN OF GOODS:—Occasionally an article does not work as you think it should, or it may become defective through mishandling in transportation. In that event don't send the goods back without first writing us a letter stating just what is the trouble. Frequently we can advise you of a remedy by mail which obviates **the wait necessarily incident to returning goods.** If we can't advise you how to remedy the trouble we will tell you how to return the goods. Never return goods without having marked on it your name and address and in the package a slip of paper with your name, address and order number. This insures the maximum of speed possible in correcting an error or trouble. Always write why you are sending goods back for we can't guess it, though it may seem very plain to you. Goods returned without our permission are returned at customer's risk. We do not accept goods which are sent express or freight collect.

GOODS BY MAIL AND PARCEL POST. We are not responsible for goods lost or broken in the mails. For your own protection, order mail goods insured.

Fragile articles will be carefully packed and duly labeled by us, but as the Parcel Post does not guarantee their safe delivery we cannot be held responsible for breakage or lost shipments. For your own protection, order Parcel Post goods **insured.** The fee for this insurance for each package is:

3c. for $10 insurance 5c. for $25 Insurance 10c. for $50 Insurance

WE CARRY A COMPLETE STOCK of all the listed goods in our New York house, and in most cases ship the same day that order is received.

OUR ENGINEERING STAFF will cheerfully answer, free of charge, any and all technical questions pertaining to our goods, if a 2-cent stamp to cover postage is enclosed. If diagrams for connections are desired an additional charge of 10 cents will be made by our drafting department. **Wireless Questions,** "Hook ups," etc., not bearing direct relation to our goods are charged for at the rate of 25 cents each. Where special calculations or special information is desired, we will inform correspondent as to the cost of such work.

NEVER USE THE ORDER BLANK for communications, questions, etc. It will surely delay the answer if you do. Write on a separate sheet, which can be transferred quickly to the right Department.

FOREIGN CUSTOMERS will please make remittance by International Money Order (procurable at any Post Office), or otherwise by Bank Draft on New York. All banks sell these drafts. Note that the value must be in American dollars.

Pen Yan, N. Y.

Dear Sirs:—

Received our information that I asked of you and thank you a thousand times for the same. I would not take $10.00 FOR THE COIL I RECEIVED OF YOU AT $4.75. IT WILL JUMP AN INCH ON FOUR COLUMBIA DRY CELLS.

Yours respectfully, CHAS. CARRY.

TO WHOM IT MAY CONCERN.

WHEREAS, the Electro Importing Company is a manufacturing corporation, incorporated to do business in the State of New York, and

WHEREAS, Hugo Gernsback is the President thereof, now therefore, I, Hugo Gernsback of New York City, New York, being duly sworn depose and say that:

WHEREAS, each and every testimonial published at the foot of each page of this catalog is unsolicited, that these testimonials have been received from bona fida customers, that their names and addresses are genuine as published, that the testimonials are unaltered and undoctored, and,

WHEREAS, the testimonials as published have been taken at random from the testimonial files of the Electro Importing Company, and that they represent only a small percentage of the total number of these letters in the possession of the Company, now therefore:

It is agreed that the Electro Importing Company will pay the sum of $100.00 to anyone who will prove that the above facts are not true and correct as affirmed.

Hugo Gernsback

Sworn to before me this 24 day of October 1912

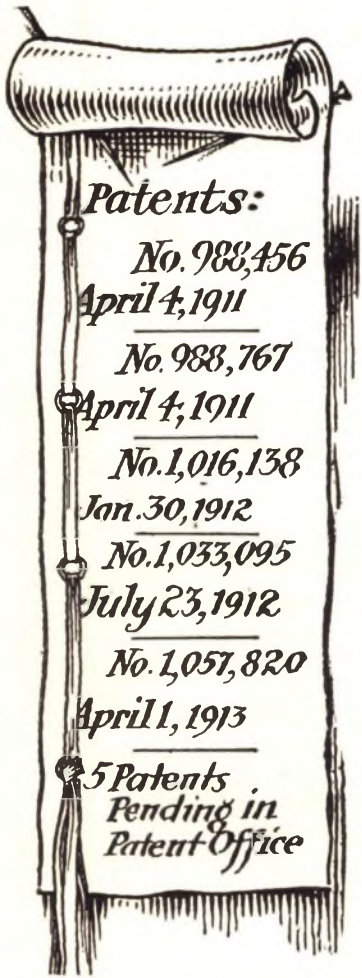
Notary Public Kings County

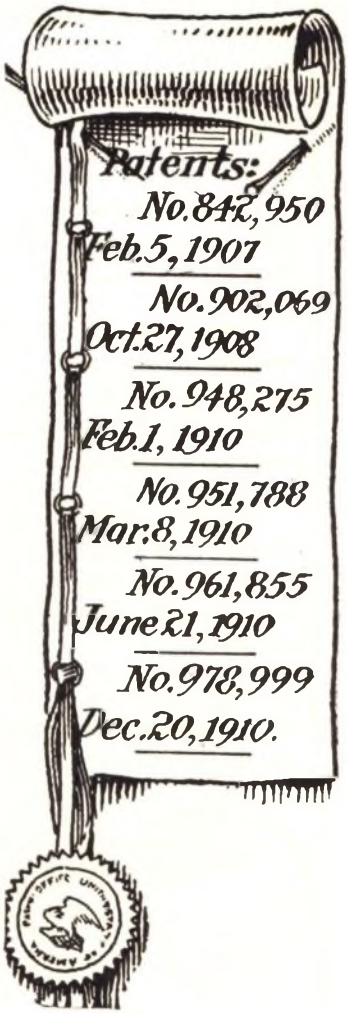
Dear Sirs: Wichita Falls, Tex.

I wish to thank you for YOUR PROMPT ATTENTION in sending out my wireless telegraph outfit; and wish TO RECOMMEND YOUR FIRM to any one who is interested in electric goods.

Yours truly, A. L. JACKSON, JR.

The E. I. Co. owns and controls 14 patents. They guarantee you valuable and exclusive features and construction.





Gentlemen:— Kenosha, Wis.

The instruments arrived a few days ago and after giving them a pretty thorough test, I think I can justly say, THAT THEY ARE SATISFACTORY IN EVERY RESPECT.

Let me say to whom it may concern, that this statement is absolutely unsolicited on the part of the ELECTRO IMPORTING CO., being entirely voluntary on my part. Yours respectfully, SIDNEY DERBYSHIRE.

OUR SIXTEENTH YEAR

A FEW FACTS THAT YOU SHOULD KNOW ABOUT THE E. I. CO.

WE WANT you as a customer and would like to tell you a little about ourselves so you will know us better.

The Electro Importing Co. was organized in 1904, starting with a small office at 32 Park Place, New York, 10 feet square At that time it was the **only** and **first concern** in America to sell solely experimental electrical goods.

The first amateur wireless outfit in America was made and sold by us and on this account the writer has been called "The Father of Amateur Wireless."

The E. I. Co. grew rapidly because it gave everybody a square deal, and in 1905 we moved to larger quarters at 87 Warren Street, to improve manufacturing facilities.

Early in 1908 we again had outgrown our facilities and moved to 80-82-84-86 West Broadway, with six times as much floor space as before.

These quarters in less than one year proved inadequate, and in 1910, when conditions became intolerable, when every inch of floor, wall, and even ceiling space was at a premium, we moved to our 5-story building at No. 233 Fulton Street, which we now occupy from basement to roof.

It must be plain to everyone that there must be a good reason for such a growth. The answer is: **Greatest Value For the Money, and the Famous E. I. Co. Square Deal.**

Maybe you wonder how the E. I. Co. can offer its wonderful values—how it can afford to sell much cheaper than anyone else. Our policy has always been

Offices of E. I. CO.

WHERE ORDERS ARE RECEIVED AND RECORDED

to make a very small profit on a large amount of orders, relying on a tremendous volume of business to make enough to "get by." This policy means better value for you at a cheaper price than possible anywhere else.

Another important point is that by doing such a tremendous business as we do, we can buy in larger quantities and so afford to give you the benefit of the saving in the price of raw materials.

You ought to know with whom you are dealing—confidence begets friendship.

The writer is also Publisher and Editor of the **Electrical Experimenter, Science and Invention** and **Radio Amateur News,** two magazines sold on every newsstand and too well known to need any introduction.

You need therefore never hesitate about ordering from the E. I. Co. You can bank on our reliability and our desire to do the square thing. Honesty always pays—and the **E. I. Co. Always Makes Good.**

Supplying experimenters for such a long period all over the world with reliable goods, at a price to meet their pocketbooks, has built up a reputation which we cherish very highly and which we would not, by a single act, destroy or damage.

THE ELECTRO IMPORTING CO.,
H. Gernsback, President.

"AMERICA'S OLDEST ELECTRICAL EXPERIMENTAL AND RADIO SUPPLY HOUSE"

How to Figure Parcel Post Rates

With every article in our catalogue, we state the exact shipping weight of same.

Having this weight, and knowing the zone in which your post office is located, measuring from New York, you will find the correct amount of postage applying to the goods you are ordering, in consulting the Parcel Post Table below.

U. S. Parcel Post

POSTAGE RATE TABLE FOR PARCEL POST SHIPMENTS

Zones	Local	1 & 2	3	4	5	6	7	8
Weight	**The Parcel Post Rate to Pay Is:**							
1 lb.	$0.05	$0.05	$0.06	$0.07	$0.08	$0.09	$0.11	$0.12
2 "	.06	.06	.08	.11	.14	.17	.21	.24
3 "	.06	.07	.10	.15	.20	.25	.31	.36
4 "	.07	.08	.12	.19	.26	.33	.41	.48
5 "	.07	.09	.14	.23	.32	.41	.51	.60
6 "	.08	.10	.16	.27	.38	.49	.61	.72
7 "	.08	.11	.18	.31	.44	.57	.71	.84
8 "	.09	.12	.20	.35	.50	.65	.81	.96
9 "	.09	.13	.22	.39	.56	.73	.91	1.08
10 "	.10	.14	.24	.43	.62	.81	1.01	1.20
11 "	.10	.15	.26	.47	.68	.89	1.11	1.32
12 "	.11	.16	.28	.51	.74	.97	1.21	1.44
13 "	.11	.17	.30	.55	.80	1.05	1.31	1.56
14 "	.12	.18	.32	.59	.86	1.13	1.41	1.68
15 "	.12	.19	.34	.63	.92	1.21	1.51	1.80
16 "	.13	.20	.36	.67	.98	1.29	1.61	1.92
17 "	.13	.21	.38	.71	1.04	1.37	1.71	2.04
18 "	.14	.22	.40	.75	1.10	1.45	1.81	2.16
19 "	.14	.23	.42	.79	1.16	1.53	1.91	2.28
20 "	.15	.24	.44	.83	1.22	1.61	2.01	2.40
21 "	.15	.25						
22 "	.16	.26						
23 "	.16	.27						
24 "	.17	.28						
25 "	.17	.29						
26 "	.18	.30						
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45 "	.27	.49						
46 "	.28	.50						
47 "	.28	.51						
48 "	.29	.52						
49 "	.29	.53						
50 "	.30	.54						

Parcel Post Rates are computed according to weight of the parcel to be shipped and according to the distance between the shipping point and the delivery point. For this purpose the U. S. is divided into 8 Zones, with different rates of postage applicable to each.

The table shows the amount of postage by parcel post, according to the weight of the package and according to distance by zones.

If you don't know the Zone in which your post office is located measuring from New York, the Postmaster will tell you.

Parcels weighing 4 ounces or less are mailable at the rate of 1 cent for each ounce or fraction thereof, regardless of distance. Parcels weighing more than 4 ounces up to 16 ounces must be mailed as a full pound. If in figuring out the cost of your order, we discover that you made a mistake, and that your remittance was short we will forward the shipment by Parcel Post C. O. D., including in your shortage the U. S. Postal Fee. We trust that this manner of handling your orders will meet with your approval as it enables you to obtain your goods without long correspondence and the necessity of sending in the difference, so that the few additional cents for C. O. D. fees can hardly be considered.

Books are accepted at **Parcel Post Rates.** (One cent for each two ounces up to eight ounces, over eight ounces same rate as other Parcel Post Matter.)

In some instances Express Rates are cheaper than Parcel Post Rates, consult the table:

Between NEW YORK and the following points:	5 lbs. Express	5 lbs. Insured	10 lbs. Express	10 lbs. Insured	20 lbs. Express	20 lbs. Insured
Chicago, Ill.	$0.31		$0.42		$0.64	
St. Louis, Mo.	.32		.44		.68	
Denver, Col.	.47		.75		1.30	
Butte, Mont.	.58		.96		1.72	
Dallas, Tex.	.45		.70		1.20	
San Francisco, Cal.	.71		1.22		2.24	

The weights given in our catalogue are the exact shipping weights: this means the apparatus or article packed and boxed ready for shipment. In some instances, as with glassware, etc., it is easily understood that the wrapping must be heavy so as to insure the safe arrival of the goods. In other instances a paper wrapping only is needed with some excelsior, which amounts to fractions of an ounce.

(over)

Parcel Post
(Continued)

If you send in an order calling for different items of our goods all to be packed and shipped together, in one package or box, it is understood that you will benefit a good deal on the transportation charges, as it will not take much more packing material for three or four small articles than for one. The saving which we can effect in all these cases is to your advantage as **we will return to you in every case the over-payment of your transportation charges,** if there is any.

Note.—Be very careful in figuring out the transportation charges for goods weighing, for instance, four ounces. If you order two items calling for four ounces each, this would make eight ounces shipping weight, **but in reality you are required to pay for one pound,** as the Parcel Post Law states that articles which exceed four ounces up to 16 ounces must be mailed as a full pound. The same holds true if one article weighs one pound and another four pounds and six ounces. This means that you would have to send in money enough to cover six pounds at the Parcel Post rate.

Parcel Post Service to Foreign Countries

Parcel Post Rates to: **PORTO RICO, CANAL ZONE (Isthmus of Panama), HAWAII, PHILIPPINE ISLANDS, TUTUILA (Pago-Pago)** and other parts of **SAMOA,** in possession of the U. S. and **GUAM (Ladrone Islands),** are the same in all respects and conditions as **DOMESTIC RATES** for the "Eighth Zone."

Rates for **CANADA, CUBA** and **MEXICO** are 12 cents per lb. Limit of weight is **4 lbs. 6 oz.**

Rates for Europe, including **GREAT BRITAIN** and **IRELAND,** most of the British possessions, also **NEWFOUNDLAND, AUSTRALIA,** etc., and **all other countries** to which the Parcel Post extends are 12 cents per lb. Limit of weight is **11 lbs.**

How to Return Goods to Us by Parcel Post

When you return goods by parcel post, put the letter you write in an envelope and paste or tie the envelope securely to the outside of the package. In addition to the postage you put on the package, put a 2-cent stamp on the envelope.

"Don't return goods without asking first our permission."

View of One of Our Five Stock Rooms

ENORMOUS STOCKS MAKE PROMPT SHIPMENTS POSSIBLE

Educational Institutions That Buy Our Goods

The following Educational Institutions have been supplied by us **REGULARLY** for years with our goods. The list which we give here is only a partial one; we have many hundred more institutions on our books, but lack of space prevents us from publishing same. We hardly need say that the names speak for themselves and no higher tribute to the quality of our goods and our excellent service which we give could be presented:—

Adrian Public School, Adrian, Mich.
Allegheny College, Meadville, Pa.
American International College, Springfield, Mass.
Aurora Public Schools, Aurora, Ill.
Board of Education, Dover Plain, N. J.
Baltimore Dept. of Education, Baltimore, Md.
Berlin School Dept., Berlin, N. H.
Billings Board of Education, Billings, Mont.
Bloomfield Theological Seminary, Bloomfield, N. J.
Board of Education, Huron, So. Dak.
Board of Education, Neodesha, Kans.
Brattleboro High School, Brattleboro, Vermont.
Brookville Board of Education, Brookville, Pa.
Brown University, Providence, R. I.
Carnegie Institute of Technology, Pittsburgh, Pa.
Cherokee County High School, Columbus, Kans.
College of Emporia, Emporia, Kans.
Columbia University, New York City
Colt Memorial High School, Bristol, R. I.
Connecticut Agricultural College, Storrs, Conn.
Cornell University, Ithaca, N. Y.
Dakota Wesleyan University, Mitchell, S. Dak.
Darlington Public School, Darlington, S. C.
Dartmouth Medical College, Hanover, N. H.
Delaware College, Newark, Del.
Department of Education, New York City.
Dubuque German College and Seminary, Dubuque, Iowa.
Elder High School, Cincinnati, Ohio.
Ferris Independent School District, Ferris, Tex.
Findlay College, Findlay, Ohio.
Georgia School of Technology, Atlanta, Ga.
Gonzago University, Spokane, Wash.
Grove City College, Grove City, Pa.
Heidelberg University, Tiffin, Ohio.
High School of Memphis, Memphis, Tenn.
Iowa State Teachers College, Cedar Falls, Iowa.
Lake Placid High School, Lake Placid, N. Y.
Massachusetts Agricultural College, Amherst, Mass.
Michigan Agricultural College, E. Lansing, Mich.
Minden High School, Minden, Nebr.
Parson College, Fairfield, Iowa.
Princeton University, Princeton, N. J.
Rock Hill College, Ellicott City, Md.
School District No. 2, Brattleboro, Vt.
St. Edward's College, Austin, Tex.
St. Joseph School, San Jose, Cal.
St. Mary College, Dayton, Ohio.
St. Mary's Mission, O'Kanogan Co., Wash.
South Georgia College, Helena, Ga.
South Western Presbyterian University, Clarksville, Tenn.
State Manual Training Normal School, Pittsburg, Kan.
State University of Iowa, Iowa City, Iowa.
Stevens High School, Clairmont, N. H.
St. Mary's Mission, Mission, Wash.
University of Fla., Gainesville, Fla.
University of Manitoba, Winnipeg, Can.
University of Nebraska, Lincoln, Nebr.
University of California, Berkeley, Cal.
University of New Mexico, Albuquerque, N. Mex.
University of Washington, Seattle, Wash.
Vassar College, Poughkeepsie, N. Y.
Yale University, New Haven, Conn.

Government Departments that buy our goods:

U. S. Navy Supply Dept.
U. S. Signals Corps, Field Co.
U. S. Bureau of Standards, Washington, D. C.
U. S. Coast Artillery School, Fort Monroe, Va.

Sea Isle, N. J.

Gentlemen:—

I wish to thank you for your promptness in sending my goods. I received them within a week after I sent my order. I will recommend you to any experimenter and you may expect another order from me in the future.

MARTIN McDERNET.

TREATISE ON WIRELESS TELEGRAPHY

By H. GERNSBACK

President ELECTRO IMPORTING CO.
Editor "THE ELECTRICAL EXPERIMENTER"
Editor "RADIO AMATEUR NEWS"
Manager RADIO LEAGUE OF AMERICA

WIRELESS AND THE AMATEUR
A RETROSPECT
PART ONE

ON DECEMBER 13, 1912, the new wireless law went into effect. The average wireless "fiend" who has not followed the topic from the start will be interested in the following facts:

The very first talk about Wireless Legislation in the country started in 1908. The writer in his Editorial in the November, 1908, issue of **Modern Electrics** pointed out that a wireless law was sure to be passed in a very short while. In order to guard against unfair legislation as far as the wireless amateur was concerned the writer, in January, 1908, organized the "Wireless Association of America." This was done to bring all wireless amateurs together and to protest against unfair laws. Previous to this time there was no wireless club or association in the country. In January, 1913, there were over 230 clubs in existence, all of which owe their origin to the "Wireless Association of America."

The association had no sooner become a national body than the first wireless bill made its appearance. It was the famous Roberts Bill, put up by the since defunct wireless "trust." The writer single handedly, fought this bill, tooth and nail. He had representatives in Washington, and was the direct cause of having some 8,000 wireless amateurs send protesting letters and telegrams to their congressmen in Washington. The writer's Editorial which inspired the thousands of amateurs, appeared in the January, 1910, issue of **Modern Electrics. It was the only Editorial during this time that fought the Roberts Bill.** No other electrical periodical seemed to care a whoop whether the amateur should be muzzled or not. If the Roberts Bill had become a law there would be no wireless amateurs to-day.

That editorial quickly found its way into the press and hundreds of newspapers endorsed the writer's stand. During January, 1910, the **New York American**, the **New York Independent**, the **New York World**, the **New York Times**, the **Boston Transcript**, etc., all lauded and commended the writer's views. (See Editorial article February, 1910, **Modern Electrics.**) Public sentiment quickly turned against the Roberts Bill and it was dropped.

The first wireless bill not antagonistic to the amateur, The Burke Bill, appeared on March 8, 1910. It had some defects, however, and was dropped also. The Depew Wireless Bill appeared May 6, 1910, but did not meet with general approval; as the writer pointed out in his Editorial in the June, 1910, issue of **Modern Electrics.** It had several undesirable features, and the bill was never seriously considered, although it actually passed the Senate. (See Editorial, August, 1910, **Modern Electrics.**)

At last the Alexander Bill made its appearance on December 11, 1911. This bill as far as the amateur was concerned was not quite acceptable to the writer, who had the amateurs' rights at heart, and steps were immediately taken to bring about an amendment as the writer, perhaps more than anyone else, realized that this bill, in some form or other, would become a law sooner or later. This is clearly stated in his Editorial in the February, 1912, issue of **Modern Electrics. In that Editorial is to be found also the first and now historical recommendation that if a wireless law was to be framed it should restrict the amateur from using a higher power than 1 kw. and his wave length should be kept below 200 metres.** No one else had thought of it before, and it is to be noted that when Congress finally passed the present wireless law, **it accepted the writer's recommendation in full**, thus paying him the greatest compliment, while at the same time acknowledging the fact that he acted as the then **sole** spokesman for and in behalf of the wireless amateur.

In March, 1912, the writer in a letter to the **New York Times** (See page 24, April, 1912, issue **Modern Electrics**) pointed out the shortcomings of the Alexander Bill, and protested against unfair legislation.

The Times, as well as a host of other newspapers, took up the cry and published broadcast the shortcomings of the Alexander Bill. All this agitation had the desired effect and Mr. Alexander for the first time realized that the amateur could not be muzzled, especially when there was such a periodical as **Modern Electrics** to champion his cause. Promptly in April the Alexander Wireless Bill, **amended**, appeared and here for the first time in history the amateur and his rights are introduced in any wireless bill.

Mr. Alexander and his advisers accepted the writer's recommendation as set forth in his Editorial in the February, 1912, issue of **Modern Electrics.** (See Paragraph 15, 2nd Part of this Treatise.)

It will be noted that it copied the writer's recommendations word for word. The amateur had at last come into his own. This is all the more remarkable as

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Minneapolis, Minn.

Gentlemen:—

We are using some of your apparatus and THEY WORK GOOD. We have received some of the radio stations on the coast and other large stations such as Arlington, Sayville and others.

Yours truly, C. BOOTH.

Treatise on Wireless Telegraphy—(Continued)

this is the only country that recognizes the wireless amateur. On May 7, 1912, the Alexander Bill, amended, now known as S-6412, passed the United States Senate and on May 8th was sent to the House of Representatives and referred to the Committee on the Merchant Marine and Fisheries. The bill was signed on August 13th by President Taft, thus making it a law.

This terminated the fight which the writer had waged single-handedly for almost five years in behalf of the American amateur. Now that it is all over, and that Uncle Sam has set his seal of approval upon the amateur's wireless, the writer cannot but extend his heartiest congratulations to the 400,000 American amateurs, and he furthermore wishes to extend his thanks to all the amateurs who have supported him in his fight to bring about a new wireless era in America.

Long live the Wireless! Long live the Amateurs!

WIRELESS AND THE LAYMAN

PART TWO

THE QUESTION we hear from most beginners is:—"What outfit do you advise me to use? I know nothing about wireless."

We advise the use of ANY of our receiving outfits. They are ALL good—the result of years of manufacturing. Which one to choose depends upon yourself, your taste and your pocketbook. This is where YOU must decide. Of course, ALL our outfits work, they are all guaranteed to do so—OR MONEY BACK. The lower priced outfits have naturally a short range—they won't catch messages hundreds of miles away, and those without tuning coils cannot be used to "cut out" one of the messages when two of them are in the "air" at the same time. It is self-evident, though, that you can start with the very cheapest outfit,—say anyone of our detectors and a pony telephone receiver. With such an outfit messages can be picked up astonishingly well indeed. Many of our enthusiastic young friends started with such an outfit and kept on adding instruments till they finally had up-to-date stations.

Receiving Wireless Messages

The next question hurled at us is:—"How can I receive messages if I don't know the codes?"

A wireless telegram, no matter if it is in Chinese or English, "comes in" in dots and dashes. When you have the telephone receivers to your ear and a message is coming in, you hear a series of long and short, clear, distinct buzzes. A long buzz is a dash, a short buzz is a dot. We sell a 10c. code chart by means of which the dots and dashes are translated into letters. Thus (in the Morse code) dash, dash, dot, stands for the letter G; dash, dash means M, dash dot, dash, dot means J and so forth. Any person with a few weeks' practice "listening to the wireless" can master the code, and read the messages with ease.

Remember that there are over two thousand high powered wireless stations in this country alone, each being able to transmit messages of over a thousand miles distance.

There are almost at any minute, during night and day, messages in the air, no matter where you are,—sending YOU messages, only waiting to be picked up by you. It is truly wonderful; it is the cheapest as well as the most elevating diversion known to modern man, the most inspiring example of the triumph of mind over matter.

"How about the Wireless Law?" you want to know next.

The law does not apply for stations used for **receiving** only. **There is no law which forbids you to receive all the messages you wish.** You can receive as many and as long as you please,—Uncle Sam doesn't mind. But you MUST preserve the secrecy of the message. You must not make use of any information you receive by wireless, if this information is of such a nature that makes it private property. Your own conscience will tell you which message to keep secret and which one you can make use of. Here is the text of the Law:

SECRECY OF MESSAGES

"Nineteenth. No person or persons engaged in or having knowledge of the operation of any station or stations, shall divulge or publish the contents of any messages transmitted or received by such station, except to the person or persons to whom the same may be directed, or their authorized agents or to another station employed to forward such message to its destination, unless legally required to do so by the court of competent jurisdiction or other competent authority. Any person guilty of divulging or publishing any message, except as herein provided, shall, on conviction thereof, be punishable by a fine of not more than two hundred and fifty dollars or imprisonment for a period of not exceeding three months, or both fine and imprisonment in the discretion of the court."

Of late a great many stations are beginning to use the wireless telephone. This art is rapidly being perfected and is the coming thing in "Wireless." There is hardly a week that you do not read about some new wireless telephone and some new distance record established.

Wireless Telephony

It is of course understood that any receiving apparatus that can receive wireless telegraph messages, 90 times out of 100, can receive wireless telephone messages. Of course, in that case no code is required as the voice comes through the receiver

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Dear Sirs:— **Hamilton, Ont., Can.**

I bought one of your D.S. tuning coils and two of your detectors and must say they work fine. **F. HOLIDAY, JR.**

Treatise on Wireless Telegraphy—(Continued)

the same as through the regular telephone. (For further details on Wireless Telephony, see Lesson No. 18 of The Wireless Course.)

Distance

The question asked mostly by the layman is: "How far can I receive with such and such an outfit, my aerial being so high and so long?"

Nobody can correctly answer such a question. You can reason it out as well as we can. For example: Would you ask us: "How far away can I hear the steam whistle of the X & Y Cotton Mill?" No you wouldn't, for it all depends. First, how hard the whistle blows, second, how good your hearing is, third, how the wind blows, and fourth, how many and how great are the intervening objects between the whistle and your ear. Some days you may hear the whistle two miles off with the wind blowing your way. Or, if you are way down in a cellar you may only hear it faintly, although you are but two blocks away from it. It all depends. The one thing you are sure of is that the whistle blows about the same strength each day. The same reasoning holds true for wireless to a very great extent.

As a rule, the higher up and the bigger your aerial, the better the wireless reception will be. Naturally if you are a thousand miles off from a station that can but send 500 miles, you won't hear it, no matter how good your instruments are. It's like trying to hear the sound of a whistle 10 miles away from you, that can at the very best be heard only within a radius of 5 miles. Just use a little horse sense and you can do your own deducting; no wireless expert is required. It is also evident that the messages cannot come in with the maximum loudness unless the instruments are well in tune, and unless well designed instruments are used. Thus a loose coupler will give louder signals than a small tuning coil. It also depends a lot on the detector and its adjustment.

This is the way the detectors range according to their sensitiveness:

1st, THE AUDION; 2nd, THE RADIOSON (the most sensitive Electrolytic detector to date); 3rd, THE RADIOCITE Detector; 4th, The Perikon; 5th, Zincite and Bornite; 6th, Silicon and Galena; 7th, Iron Pyrites (Ferron); 8th, Carborundum; 9th, Molybdenite. (See Lesson No. 10, of The Wireless Course, on Detectors.)

If you are entirely surrounded by high mountains or steel buildings, you naturally will not expect to receive messages as well as if you were on the top of a mountain. Also remember that wireless waves travel **twice as far over water as over land,** and that you can reach **twice as far after sundown than during the daytime.**

Wave Lengths and Tuning

This seems to be the greatest stumbling block for most beginners. Again let us make a comparison. Take two pianos and place them in the same room. Or two violins will do as well. Tune two strings, one on each instrument, so both will give exactly the same note. Pick one of the strings in order to sound it, and the other "tuned" string, although 10 feet away will sound in unison, although you did not touch it. **Both are now in tune.** Both give out the same (sound) wave length. No mystery here. The secret lies in the fact that both strings ARE OF THE SAME LENGTH, and have the same tension, roughly speaking. Make one string longer than the other and both are "out of tune."

The same in wireless. Nearly all commercial stations operate on a wave length of from 300 to 600 meters. (A meter measures 39.37 inches.) Now in order that you can hear such a station, you must be able to tune up to 600 meters; roughly speaking your aerial should be 600 meters long electrically. That, however, would be a pretty expensive and cumbersome aerial. Besides it isn't required. We simply wind, roughly speaking, 600 meters of wire on a coil or drum and our aerial can now be quite small, within certain limits of course, and we can for this reason "catch" the station having a 600 meter wave length, providing our other instruments are sensitive enough. By referring to our catalogue it will be seen that our cheaper tuning coils, as well as our loose couplers, have sufficient wave length capacity to catch 700 meter waves. As they are both provided with adjusting sliders, more or less wire can be put into the circuit, and therefore these instruments can be used to catch wave lengths from 100 up to 700 meters, but not over this amount.

Therefore, if we should want to hear a station having 1400 meters wave length, we would connect two No. 8486 tuning coils in series, which would give us 700 + 700 = 1400 meters wave length. Or we would connect one No. 8486 tuner in series with the primary of the No. 12002 loose coupler and we would get the same effective wave length. As a rule only stations doing long distance work use excessive wave lengths, thus the Marconi Transatlantic station at Glace Bay has a wave length of about 7100 meters, while the new Government station at Washington, which sends messages over 3,000 miles, has a wave length of about 2,500 meters. By consulting **"The Radio Call Book,"** the wave length of all important stations can be found, as each station normally uses a certain prescribed wave length. (See Lessons No. 4, 5, 6, 7, 8, 9 of The Wireless Course.)

Gentlemen:— **Knox, Pa.**

The Radioson Detector I received is a "Peach." I am using it alongside of a very sensitive Galena and it is not only louder, but clearer and always in adjustment. **V. E. SMITH.**

Treatise on Wireless Telegraphy—(Continued)

Aerial and Ground

The best all around aerial is about 75 feet long, composed of four strands "Antenium" wire. One of the best forms is shown herewith. We recommend our No. 10007 insulators, although others as listed in our catalogue can be used. For a 75 foot aerial, the strands should be about two to three feet apart. For a 150 foot aerial from three to four feet apart and so on. The strands should never be less than 1½ feet apart even for a very small aerial. All connections should be soldered if possible. Use as many insulators as feasible, remember you have but little energy when receiving; few and poor insulators waste 50 per cent. of the little incoming energy. If you have a good spacious roof it is not necessary to use poles to hold up the aerial. It may be stretched between two chimneys, etc. The spreaders to hold the wire strands apart may be of bamboo, wood, metal pipe, etc. If metal is used, the wire strands should be insulated from the former. (See Lesson No. 11, of The Wireless Course, on Aerials.)

The ground is quite important. The best wire to use is a No. 4 copper wire run from the instruments to the water or gas pipe using one of our No. 10003 ground clamps to make an efficient connection. If no water or gas pipe is to be had, bury a metal plate, copper preferred, not less than three feet square, in a good moist ground; a number of these plates connected to the ground wire would be preferable. The heavy ground wire is soldered to the plate, of course. It should be buried at least six feet deep. Another good ground is a six to ten feet long iron pipe rammed into moist earth, the ground wire being connected to it, either soldered, screwed, etc. The ground wire running from ground to instruments should never be less than No. 16 B. & S. copper, and can, of course, be bare. Insulation on a ground wire is just that much waste.

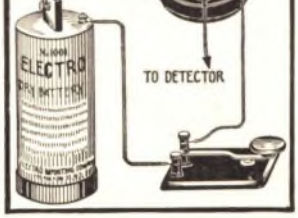
Connections and Hook-Ups

The diagrams given in our catalogue show how to connect most of our instruments. Our Wireless Course (Lessons 12 and 13), give hundreds more of them, and our Engineering Department, or receipt of 25c. to cover postage, will be only too glad to furnish any hook-up to be used in connection with our instruments. Connections should be made with nothing finer than No. 18 B. & S. copper wire (Annunciator wire). All connections must be as short and straight as possible. Avoid all wire crossing as far as practicable; if you can't avoid crosses, the wires should cross each other at right angles; and NEVER wind the connecting wire in coils ("curls") which may **look** pretty, but kills all wireless messages. Make all connections as tight as possible, a loose connection is worse than no connection at all.

Reception of Messages

We presume you have a complete receiving set. You proceed thus:

First, you must know if your detector is adjusted to its greatest sensitiveness. If a message is just coming in, you will have little difficulty to adjust the detector to its best sensitiveness. If no message comes in you don't know if your detector is in its best receptive condition. (This does not hold true of the **RADIOSON** detector, which needs no adjusting.) For this reason, the up-to-date wireless man uses the "Buzzer test." Aside from giving imitation wireless buzzes, the buzzer set may be used to **practice telegraphy.** It consists of three things: 1st—Our famous No. 1800 **RADIOTONE** (see illustrations at right); 2nd—Our No. 1118 key; 3rd—A dry cell. Connections **Must** be made as shown. Now every time you press the key you will get a perfect imitation of a wireless signal and it becomes child's play to adjust the detector to its greatest efficiency. The buzzer test can of course be used with ANY detector. It saves lots of time and bother and is quite necessary. Sometimes a detector may have a "dead spot" and you might be "listening" in for hours, without being able to catch as much as one dot. The buzzer test makes such an occurrence impossible.



Only One Wire Goes to Detector

Of course to get the best results while testing your detector you should use our Radiotone. It is a test buzzer with its special connections all developed for just one purpose to test crystals. It is absolutely silent and can therefore be right on your instrument table.

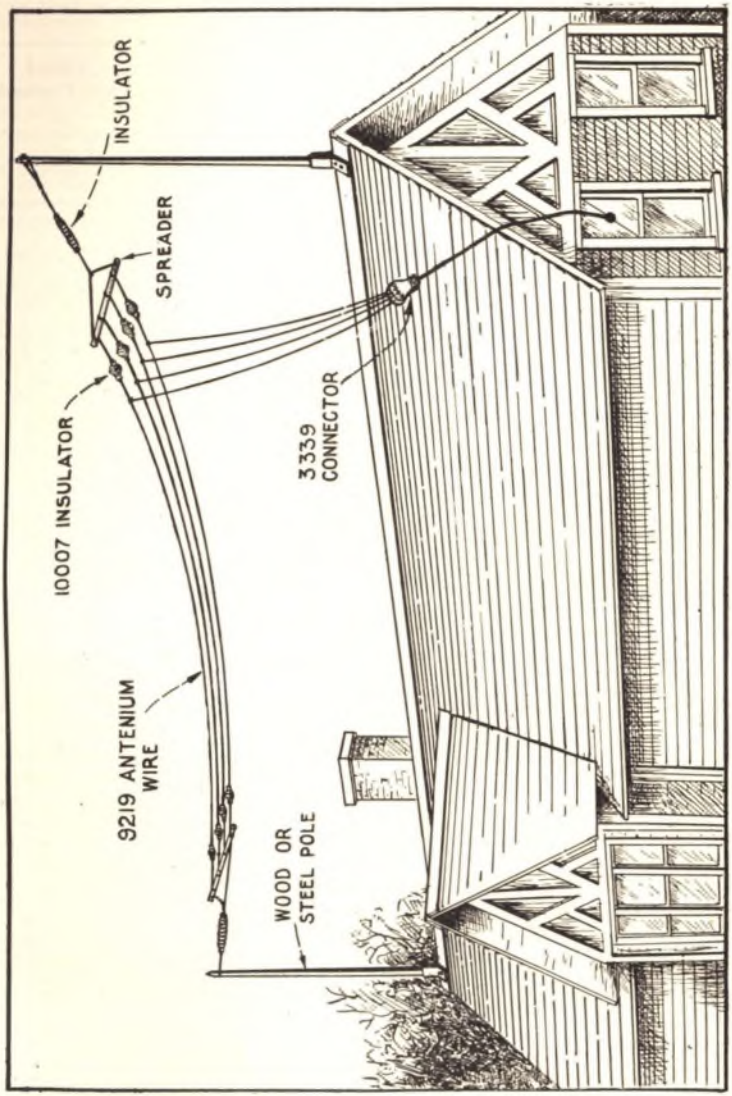
When the detector is adjusted the tuning coil is regulated by moving the slider or sliders back and forth till the signals are heard the loudest. If the loose coupler is used the secondary is moved back and forth in addition, till the best position is reached. Now the variable condenser (or condensers) are adjusted if required.

Dear Sirs:— **Newark, Ohio.**

I have one of your Loose Couplers, Fixed Condensers, Detector and 2,000-ohm phones and am able to pick up Duluth, Minn. (DM), along with other stations. I can bring them in very plain with your loose coupler.

CARL HOWARD.

Treatise on Wireless Telegraphy—(Continued)



SIMPLE AERIAL CONSTRUCTION.

Gentlemen:— West Hoboken, N. J.

Some time ago I purchased one of your "Interstate" receiving outfits, and I wish to say that this outfit HAS FAR EXCEEDED MY EXPECTATIONS.

A friend of mine purchased a tuning coil (a $2.00 coil) from another firm in New York City. His coil is four inches thick and a little longer than the one on my outfit and yet I can tune the Navy Yard, the Herald, and several other Stations, BETTER ON MINE THAN ON HIS.

The "Interstate" is the BEST OUTFIT FOR THE MONEY that could be purchased. Yours truly, EDW. J. COTTERELL.

Treatise on Wireless Telegraphy—(Continued)

The variable condenser is of the greatest use during excessive "static," which sometimes interferes seriously, during summer weather, especially when "taking" a long distance message. It is also of invaluable help to "cut out" unwanted messages when two or more are "coming in" simultaneously. Thus by adjusting the tuner (or loose coupler) in conjunction with the variable condenser it is often possible to cut out all interference from unwanted stations.

It is an excellent idea to have several detectors in a station, arranged in such a manner that by means of a multi-point switch any one of them can be thrown into the circuit. It will thus be found, that some stations, especially during interference, can be heard better on a certain detector than on another. Some will be found to work best for long distance work, others work best for medium distances, etc., etc., (see also "Wireless Course," Lessons No. 8 and 9).

Let us quote the law, as far as the amateur is concerned, before going any further.

THE WIRELESS ACT

Transmitting Stations

"Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled: That a person, company, or corporation within the jurisdiction of the United States shall not use or operate any apparatus for radio communication* as a means of commercial intercourse among the several States, or with foreign nations, or upon any vessel of the United States engaged in interstate or foreign commerce, or for the transmission of radiograms or signals the effect of which extends beyond the jurisdiction of the State or Territory in which the same are made, or where interference would be caused thereby, with the receipt of messages or signals from beyond the jurisdiction of the said State or Territory, except under and in accordance with a license, revocable for cause, in that behalf granted by the Secretary of Commerce and Labor upon application therefor; but nothing in this Act shall be construed to apply to the transmission and exchange of radiograms; or signals between points situated in the same State: Provided, That the effect thereof shall not extend beyond the jurisdiction of the said State or interfere with the reception of radiograms or signals from beyond said jurisdiction."

GENERAL RESTRICTIONS ON PRIVATE STATIONS

"Fifteenth. No private or commercial station not engaged in the transaction of bona fide commercial business by radio communication or in experimentation in connection with the development and manufacture of radio apparatus for commercial purposes shall use a transmitting wave length exceeding two hundred meters or a transformer input exceeding one kilowatt except by special authority of the Secretary of Commerce and Labor contained in the license of the station: Provided, That the owner or operator of a station of the character mentioned in this regulation shall not be liable for a violation of the requirements of the third or fourth regulations to the penalties of one hundred dollars or twenty-five dollars, respectively, provided in this section unless the person maintaining or operating such station shall have been notified that the said transmitter has been found upon tests conducted by the Government, to be so adjusted as to violate the said third and fourth regulations, and opportunity has been given to said owner or operator to adjust said transmitter in conformity with said regulations.

SPECIAL RESTRICTIONS IN THE VICINITIES OF GOVERNMENT STATIONS

"Sixteenth. No station of the character mentioned in regulation fifteen situated within five nautical miles of a naval or military station shall use a transmitting wave length exceeding two hundred meters or a transformer input exceeding one-half kilowatt."

Let us explain in plain English just what this means: As you notice from the first paragraph, the part which we underlined, it is pointed out to you that the law does not concern you unless you send messages from one state into another. You therefore do not require a license as long as your messages do not reach over the border of your state and if you do not interfere with a station's business (in your state) which receives messages from another state. Of course, you want to know how you can tell what your transmitting range is. We will explain.

It has been proved by experience with spark coils, that in almost all cases a one-inch spark cannot possibly reach over eight miles. From this information the following table has resulted:

*Wireless Telegraph or Telephone sending stations included.

Michigan City, Ind.

Dear Sirs:—

I am glad to say I received the goods which were in VERY FINE CONDITION. The order which consisted of key, Leyden jar condenser and the "Radioson" detector, are all of the very best quality. I tried the detector out which BROUGHT IN MESSAGES I NEVER HEARD BEFORE, and all coming in very loud. Anyone wishing to buy a detector among my friends I will surely tell them of this one.

Yours truly,

ROY WRENN.

Treatise on Wireless Telegraphy—(Continued)

TRANSMITTING DISTANCES OF SPARK COILS

¼-in. coil, Maximum trans. dist., 2 Miles.
½-in. coil, Maximum trans. dist., 4 Miles.
1-in. coil, Maximum trans. dist., 8 Miles.
1½-in. coil, Maximum trans. dist., 12 Miles.
2-in. coil, Maximum trans. dist., 16 Miles.
3-in. coil, Maximum trans. dist., 24 Miles.
4-in. coil, Maximum trans. dist., 32 Miles.
And so forth.

With open core transformers the spark length cannot be taken as a basis to figure distances, but the input in watts is used. It has been found that for each five watts input into the primary, not more than one (1) mile can possibly be covered.

Thus our No. 8050 transformer coil in conjunction with our electrolytic interrupter uses 5 amperes at 110 volts. That is 550 Watts. Five goes into 550 just 110 times. The maximum distance that can be covered with the No. 8050 coil (unless you use more current) is 110 miles. If you use but one secondary the distance that can be covered is cut in half, or 55 miles. For closed core transformers we figure ten watts for each mile. Therefore, our No. 9281, ½ K.W. transformer will at best not send over 50 miles, and our No. 9282, 1 K.W. type will not send over 100 miles.

Knowing what the distance is, as the crow flies, from your locality to the nearest border of the next state, you can easily figure out what the maximum power is that you can use if you do not wish to take out a license. An example:

Suppose you live in the city of Columbus, Ohio. The nearest state line is Kentucky about 86 miles in a direct line from Columbus. If you do not wish to be licensed you can use any spark coil up to 10-inch spark, or a ½ K.W. close core transformer.

Suppose your home is in Austin, Texas. The nearest state line is Louisiana, a distance of 230 miles. Thus you could with perfect safety use a 200 mile sending outfit, which does not reach more than 200 miles.

It is also pointed out that if you live within five miles of a Government wireless station you cannot use more than ½ K.W. power, though the next state border might be 100 miles or more distant. Of course if you live close to another state, as for instance, in New York City, you are required to take out a license for any size transmitter.

What the License Is

The license has not been created to muzzle you; it is the other way around. Uncle Sam gives you a written order telling you that you can send messages to your heart's content, **and no one can tell you to stop sending,** as long as you do not create mischief.

The license is free. It costs not a penny. All that is required of you is that you are familiar with the law and that you can transmit messages at a fair degree of speed.

The law does not require that you take an examination in person if you are located too far from the **nearest** radio inspector. All you have to do is to take an oath before a notary public that you are conversant with the law and that you can transmit a wireless message. If you wish to be licensed—and we urge all amateurs to do so, as it is a great honor to own a license—write your nearest Radio Inspector (see below), and he will forward the necessary papers to you to be signed.

Radio inspectors are located at the following points: (Address him at the Customs House):

Boston, Mass., New York, N. Y.; Baltimore, Md.; Savannah, Ga.; New Orleans, La.; San Francisco, Cal.; Seattle, Wash.; Cleveland, Ohio, and Chicago, Ill. Also the Commissioner of Navigation, Department of Commerce and Labor, Washington, D. C.

In an interview with the **New York Times,** W. D. Terrell, United States Radio Inspector for the port of New York, said in discussing the new law:

"The new law regulating wireless messages will work no hardship to the amateur operator. It is the intention first, to classify the various operators and place each operator in his proper class. They will then be permitted to work or play as much as they please, but under an intelligent, general supervision. Only those stations are affected which are near enough to the coastal stations to offer interference, or which work across the state lines which brings them under the supervision of the inter-State laws. I would like to make it very clear that the license costs the amateur nothing, and that the Government is willing to facilitate the wireless operators in every way possible to secure their license."

Buffalo, N. Y.

Gentlemen:—

I am VERY MUCH PLEASED with your ½ K.W. Coil No. 8050. I have SENT 48 MILES UP THE LAKE TO THE CITY OF ERIE a boat equipped with the Clark Wireless system. The operator said I CAME IN AS LOUD AS C.H., THE PORT HURON STATION. (10 K.W.) Yours truly, H. SCHOEFFLIN.

Treatise on Wireless Telegraphy—(Continued)

So much for the law. Everybody will now understand that the law is just and fair and that it gives the amateur a distinct standing in America, a standing which he does not enjoy in any other country. He knows what he can do and what he can't do, and no one can come to him and boss or abuse him, as Government or Commercial wireless operators were wont to do before the enactment of the law.

With sending outfits the reasoning is about the same as with the receiving outfits.

In order to select an outfit you must of course know where and how far you wish to send. Upon this, all depends.

Sending Outfits

As a rule—9 out of 10 of our customers have done it—two or more friends get the "Wireless bug" and order two or more complete transmitting sets. Of course, the outfits selected must necessarily be powerful enough to cover the intervening distance between the houses of the friends and this only you know.

Therefore if you and your friend decide to converse by wireless and if the distance between your two houses is 10 miles you will probably buy a 15 mile sending outfit. Of course, a more powerful set may be used, although there is no particular advantage in doing so, except perhaps that the incoming signals of necessity will be louder with the more powerful sets. It goes without saying that almost ANY receiving outfit which we list can be used with ANY of the sending outfits. Bear in mind that the selections which we give with our sending outfits do not have to be used if not wanted. Thus, our "Interstate" outfit or even our "Nauen" receiving outfit can be used with a 3 mile sending outfit. For if you and your friend live two and a half miles apart and both of you have 3 mile Sending Outfits, you probably want to have a receiving outfit with which both of you can pick up messages 2,000 miles distant. In that case you would order two 3 mile Sending Outfits only, and two 1,500 mile receiving outfits, or else two "Nauen" receiving outfits. If either you or your friend feel that you cannot afford such a set why then get the set that you can afford best and that suits you best. As you see there is no hard and fast rule about the relation of sending and receiving outfits. On the other hand we don't have to tell you that if you order two 200 mile sending outfits you require of necessity a good receiving outfit, else you couldn't hear the station 200 miles off. A little common sense will help everyone decide just what combination to order.

Like receiving sets, the transmitting sets are divided into two groups. The un-tuned (open circuit) and the tuned (closed circuit) ones.

Sending Apparatus

The untuned ones have 1st—a spark coil, 2nd—source of power, usually dry cells or a storage battery, 3rd—the spark gap, 4th—the key.

Such outfits can be used only for very short distances and should never be used above three miles. When connections are made the pressing of the key gives a strong spark in the spark gap. The spark gap (the open space between the zinc plugs from the smallest to the largest sets, must never be more than one-eighth to three-sixteenths of an inch. A bigger gap does not work. Pressing the key long gives a dash, pressing it but for a fraction of a second gives a dot. Combination of these represent the telegraphic characters; the code can be learned in a few weeks, practicing twice a day from one-half to one hour. (See Lesson No. 15, of The Wireless Course.)

In the tuned outfits, we have in addition to the above enumerated apparatus: 5th—The Leyden jars, or condenser; 6th—The Helix, or oscillation transformer. The Leyden jars change the red spark obtained from a spark coil, into an intense blue-white crashing spark. The Leyden jars also create a train of fast oscillations and go to make the outfit far more powerful although no more battery power is required. The Leyden jars also give better "carrying power," as the signals can be heard more distinctly and not "mushy" as if no Leyden jars were used. For each outfit the best jars or condensers have been selected and no changes should be made here.

The helix as well as the oscillation transformer, are, to the sending outfit, what the tuner and the loose coupler respectively, are to the receiving outfit. The helix or the oscillation transformer is the tuning coil pure and simple for the transmitting station. Like the tuning coil the helix and the oscillation transformers have sliders or else clips by means of which more or less wire convolutions can be put in the circuit of the aerial. Therefore more or less wire, and consequently more or less wave length is added to your aerial. Again there is not much of a mystery here. Anyone understands it. (See Wireless Course Lesson No. 14.)

Dears Sirs: **Alameda, Cal.**

I tested the one-inch coil with a 6 volt, 6 ampere dynamo, and could with point dischargers, OBTAIN A STEADY SPARK OVER ONE INCH LONG. COULD SEND OVER SIX MILES which took me by surprise, the aerial was 32 feet long, made up of four copper wires, on spreaders two feet wide, suspended from a mast 80 feet high. The detector WORKED FINE; COULD PICK UP SIGNALS without any trouble.

Yours truly, **F. ARNBERGER, JR.**

Treatise on Wireless Telegraphy—(Continued)

In the larger sets where the battery power is insufficient as well as uneconomical we have two methods open to fill the gap. One is the Gernsback electrolytic interrupter working on 110 volts Direct or Alternating current, which supplies the spark coil (transformer coil) with the power; the other method requires the use of a CLOSED core transformer operating without any kind of interrupter direct from the alternating current supply. This kind of transformer, however, does not work on the direct current, not even in connection with the electrolytic interrupter. The choice, for this reason, lies entirely with you.

The aerial switch is an absolute necessity where both a sending and receiving set is used in one station. If you are through receiving a message from your friend, you, of course, wish to answer him. You therefore, must switch the receiving set off from your aerial and switch the sending onto the aerial. The aerial switch does all this in one operation.

For sets using nothing higher than a 2½-inch spark coil an ordinary double pole, double throw switch may be used. For heavier sets using more power our Antenna switch No. 8100 must be used, as the smaller switch cannot carry the necessary power.

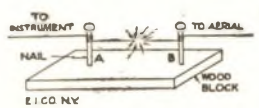
Sending a Message

In order to send messages it goes without saying that you must know how to "tap the key." The easiest way to learn, and the cheapest way at the same time, is to get a buzzer set as explained under "Reception of Messages." With this set, which represents a first class learner's outfit, you can send yourself dots and dashes to your heart's content until your wrist has limbered up sufficiently to do rapid sending. After a few weeks' practice it will be as easy to send a telegraphic message as to write on a typewriter.

If your friend has a wireless and starts learning the code with you, it becomes very simple for both of you to soon become proficient in the art. Each will send to the other, the Morse or Continental alphabet, which is sent back and forth till the right speed is obtained. After this certain words are exchanged between the stations; later on short sentences are sent and so forth, till it becomes possible to converse freely by wireless.

There is but little adjusting to do when sending. As a rule amateurs converse with only one, seldom two, and rarely three stations. For this reason much adjusting is unnecessary. When using a small set comprising Spark Coil, Leyden jars and helix it becomes first necessary to adjust the Leyden jars. Either more or less jars (which adds more or less capacity to the circuit) are used till the spark sounds loudest in the spark gap and appears most powerful. A little experimenting will quickly tell when the right capacity is used. **It is important to understand the capacity should be adjusted only when the spark gap is connected to aerial and ground.** (See Lesson No. 14, Wireless Course.)

The next important adjustment is in the helix (or oscillation transformer if this is used in place of a helix). To change the clips around on the helix (or on the oscillation transformer) it is necessary that a small gap is first made in the aerial circuit. This is done best by driving two nails in a piece of very dry wood, and connecting the aerial wires to each nail as shown in sketch. The two wires A and B are brought close together now and when the key is pressed down a small spark will jump from A to B showing that you are charging the aerial and that energy is radiated from same. Now change the adjustment on the helix (or oscillation transformer) till the longest and fattest sparks jump between A and B. To do this A and B are separated until a point is reached where the spark cannot jump any further. You know now that you are radiating the maximum of energy and the point on the helix (or adjustment on the oscillation transformer) should be carefully marked so you will know at any time just where the maximum is. It goes without saying that you should also note how many Leyden jars (or how many condensers) you are using when making the test and you should write this information down, for if you were to use more or less Leyden jars (or condensers) you would have to change the adjustment on the helix (or oscillation transformer) as explained above. Now after the maximum "radiation" has been ascertained, the test block with the nails is discarded and the break in the aerial wire connected again. You know now that your station is radiating the maximum energy and adjustments of the sending set will not be required for some time to come. Indeed they may be left undisturbed indefinitely.



Gentlemen:— **Bakersfield, Cal.**

Your articles are A1 and YOUR PRICES LEAVE NOTHING TO BE DESIRED by the amateur with a short pocket-book. I have set up a couple of the small meters purchased from you some time ago, on a small switchboard, and besides giving the BEST OF SERVICE, they add very materially to the APPEARANCE of the other apparatus. The ½-inch coil and tubes purchased of you OVER A YEAR AND A HALF AGO STILL GIVE FINE DEMONSTRATIONS.

Yours respectfully, **O. BICKERDIKE.**

Treatise on Wireless Telegraphy—(Continued)

We believe that we have made everything as plain as possible and that by reading this treatise the elementary points of "Wireless" must become plain to even the layman. If, however, you desire additional information, our engineering staff will be only too glad to answer your questions promptly and explicitly. Now it's up to you to get busy and "start something"!

Now suppose you have ordered your instruments from us and have erected your aerial. For the first few weeks you will be thrilled as you daily receive the far distant stations not only from all over the country but from far distant Germany, providing of course that you have the correct instruments for doing so. Sometimes also you will catch wireless telephone messages, as more and more Radio telephone sets come into use every day.

Wireless Clubs

Soon will come the time when you wish to chat with your friends by wireless. They will see your station and will be so impressed that they will want to have one of their own. Then why not start a local Radio Club in your town yourself, and become its president and founder? Indeed nothing is simpler. But first you must belong to a National Body and this you will find in the RADIO LEAGUE OF AMERICA, the biggest association in the country to which every amateur of note belongs.

The Radio League of America is a big scientific institution and ANYONE who has a wireless station can and should belong to it. It is a non-money-making institution; there are no fees and no dues to be paid. The League moreover furnishes every member with a free certificate printed in green and gold. Each member's station will, moreover be registered free of charge at Washington in the Government records, so that in case of war, every patriotic amateur can help his country in important scout work.

The League has the following distinguished members, of world renowned fame:

Admiral W. H. G. Bullard, U. S. N.
Dr. Lee de Forest.
Professor Reginald A. Fessenden.
Nikola Tesla.

The affairs of the League are managed by Mr. H. Gernsback. Write for 8-page booklet telling you all about the League. In case you want more for distribution among your friends, write to

RADIO LEAGUE OF AMERICA,
233 Fulton Street, New York City.
No charge is made for this service.

FINIS

Fac-simile of button

Application for Membership in the Radio League of America

I THE UNDERSIGNED, a Radio Amateur, am the owner of a Wireless Station described in full attached to the back of this application. My station has been in use since..... and I herewith desire to apply for membership in the RADIO LEAGUE OF AMERICA. I have read all the rules of the LEAGUE, and I hereby give my word of honor to abide by all the rules, and I particularly pledge my station to the United States Government in the event of war, if such occasion should arise.

I understand that this blank with my signature will be sent to the United States Government officials at Washington, who will make a record of my station.

Witnesses to signature:

.....

.....

Name.....
City.....
State.....
Date.....19

In the event of national peril, will you volunteer your services as a radio operator in the interest of the U. S. Government?.....

This last question need not be answered unless you desire it.

Cut out, fill out blank and mail to:
Manager Radio League of America, 233 Fulton St., New York.

Centralia, Fla.

Gentlemen:—

I purchased one of your Commercial Detector stands and it is a very neat and efficient instrument. With my four-wire aerial, this detector (using silicon) and a receiver of 75-ohms resistance I could hear several stations quite plainly. The nearest station to me is the station at Tampa, 55 miles. With the addition of your Jr. Fixed condenser and your No. 10000 fixed condenser, can hear just about any station in the state.

JOHN C. DOOLITTLE.

Receiving Time by Wireless

(Reprinted from "The Electrical Experimenter")

The wisdom of furnishing vessels at sea with the correct time by wireless has been demonstrated time and again since the government began sending the signals over a few years ago. Since that time, too, many jewelers, railway officials and others on land who need the correct time have been taking the messages. The sending instruments used are extremely powerful, and any owner of a wireless receiving outfit within their range may get the time absolutely correct twice a day by properly tuning his receiving apparatus.

The stations that send out the reports, and the wave lengths used by each, are as follows:

Radio Time Signals of the World

Washington, D. C. (NAA) 2,500 meters. Noon and 10 p. m. 75th Merid. S. T.*
Great Lakes, Ill. (NAJ) 1,515 meters. 11 a. m. 90th Meridian S. T.
Key West, Fla. (NAR) 1,500 meters. Noon and 10 p. m. 75th Merid. S. T.
San Francisco, Cal. (NPG) 2,400 meters. Noon and 10 p. m. 120th Merid. S. T.
New Orleans, La. (NAT) 1,000 meters. Noon 75th Meridian S. T.
San Diego, Cal. (NPL) 2,400 meters. Noon 120th Meridian S. T.
San Diego, Cal. (NPL) 9,800 UD meters. Noon 120th Meridian S. T.
Eureka, Cal.(NPW) 2,000 meters. Noon 120th Meridian S. T.
Point Arguello, Cal. (NPK) 1,515 meters. Noon 120th Meridian S. T.
North Head, Wash. (NPE) 2,800 meters. Noon 120th Meridian S. T.
Darien, Canal Zone, Panama (NBA) 4,000 meters. 1 p. m. 75th Meridian S. T.

The above listed Naval Stations transmit "Time Signals" each day for a period of five minutes, starting exactly five minutes in advance of the above specified schedules. Every tick of a standard Naval Observatory clock is transmitted as a dot, omitting the 29th second of each minute; the last five seconds of each of the first four minutes; and finally the last ten seconds of the LAST minute. The 12 noon, 1 p. m. and 10 p. m. signal is sent as a dash.

Note—NAJ, NPL, NPK, NPW:—During that part of the season in which the DAYLIGHT SAVING LAW is in effect, the time signals mentioned above will be transmitted exactly one hour earlier than the above schedules of NAJ, NPL, NPK and NPW.

Foreign Stations

Darsena Norte, Argentine Republic (LIA) 800 meters. From 1:56'00" to 2:00'00" (Greenwich Mean time). At 2:00'00" a dot lasting 0.25 second is transmitted.

Choshi, Japan (JCS) 600 meters. From 8:59'00" to 9:04'00" (Central Japanese Time) (135th East Meridian). At 9:04 a one second dash is sent.

Cape Town, South Africa (VNC) 600 meters. From 8:59'00" to 9:00'00" (Greenwich Mean Time). At 9:00'00" a second dash is sent.

The transmitting clock that mechanically sends out the signals is corrected very accurately shortly before noon, from the mean of three standard clocks, that are rated by star sights with a meridian transit instrument.

(We recommend for this Time receiving purpose, either our "Tuckerton" Receiving set or our type "Nauen" Receiving set.

The aerial for this purpose should be quite large and preferably have a height above the ground of not less than 75 to 100 feet. The aerial itself may be of the flat-top or slanting variety; and may be composed of 6 to 8 strands of our solid Antenium wire, each strand having a length of 80 to 100 feet, and for very long distances such as 1,000 miles or more, the aerial should be as high as possible, and probably 150 to 200 feet in length, or even more. The strands may be spaced 5 to 6 feet apart.)

*Meridian Standard Time.

Gentlemen:— **Moscow, Idaho.**

I received order all O. K. The tuner was better than I had expected. The wire and ground clamp are also very good. **GEORGE CURTIS.**

FREE Wireless Correspondence Course —IN 20 LESSONS— FREE

BY

S. GERNSBACK, A. LESCARBOURA and H. W. SECOR, E. & R. Eng.

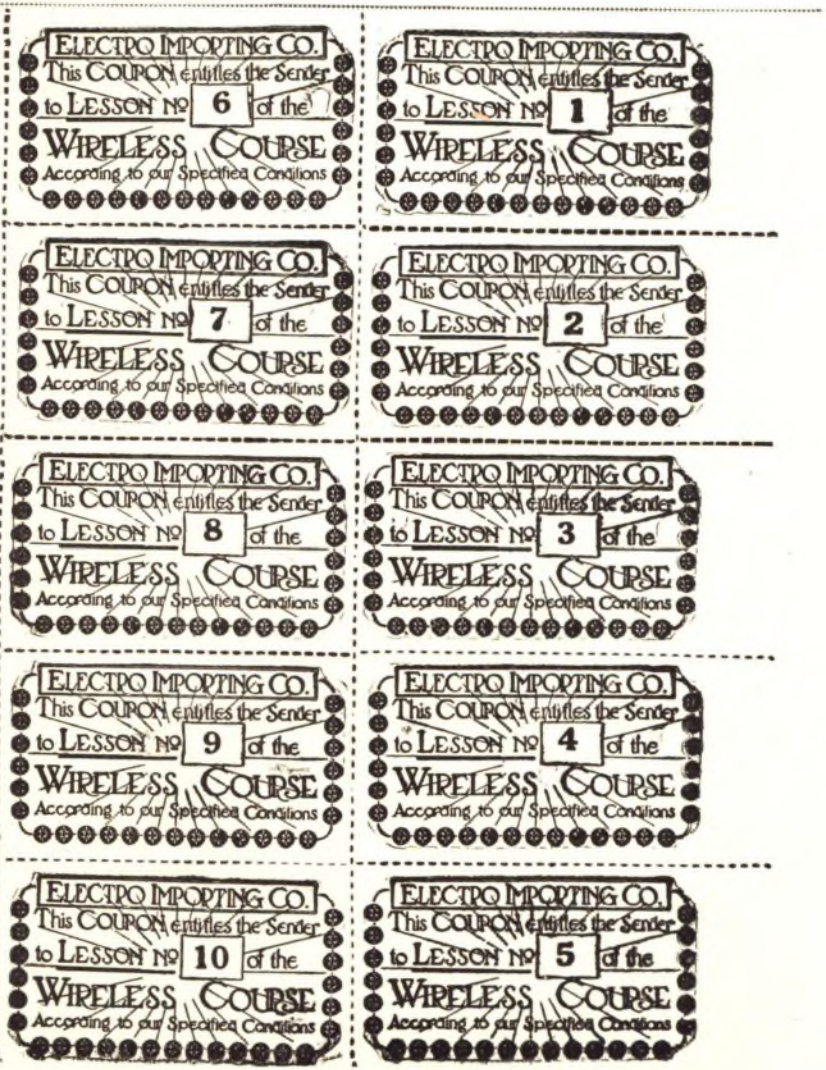
In Use on Every Battleship of the U. S. Navy

Let Us Help You to Become a Practical WIRELESS EXPERT

THIS IS THE ELECTRICAL AND WIRELESS AGE

Wonderful opportunities are offered to the man who has special training to-day. We will help you to become an expert in Wireless. Hundreds have done it, **why not you?** Just try it! You can do it as well as anybody else!

(over)



Free Wireless Course Offer—(Continued)

Our aim is not only to sell you electrical goods! We want to instruct you how to handle to the best advantage all the Wireless Apparatus; to tell you the **how and why** of the fascinating art of Wireless. This is the Reason for offering you our

FREE COURSE.

Of course, we want you for a customer. You are interested in buying electrical and wireless apparatus. Why not be one of our regular patrons? We promise to give you the maximum of quality, **plus service** and to show you **OUR** appreciation, we are going to give you a profit sharing PREMIUM on every dollar you spend with us.

Read the following proposition. It means an absolutely unique opportunity.

(over)

Contents of Lesson No. 1

THE PRINCIPLES OF ELECTRICITY.

Conductors, Insulators, Static Electricity, Current Electricity, Electro-Motive force, Batteries, Measuring Instruments.

Contents of Lesson No. 2

THE PRINCIPLES OF MAGNETISM.

Compass, magnetic flux, Electrodynamics, Electro-Magnetic Induction, Induction Coils and Transformers.

Contents of Lesson No. 3

DYNAMOS, MOTORS, GENERATORS AND WIRING.

Series Motors, shunt motors, compound motors, Power transmission and wiring. Transformer boxes Frequency, Edison 3-wire system.

Contents of Lesson No. 4

THE PRINCIPLES OF WIRELESS TELEGRAPHY.

Maxwell's theory, Hertzian waves, Branly's coherer. G. Marconi. Principles of wave length, tuning, oscillating circuit, autotransformers, etc.

Contents of Lesson No. 5

THE AMATEUR TRANSMITTING SETS AND APPARATA.

Spark, Gaps, Coils, Sending Helices, Condensers, Interrupters, Keys.

Contents of Lesson No. 6

TRANSMITTING SETS (Continued)

Aerial switch, commercial stations, Motor-Generator, Heavy keys, commercial spark-gaps, Rotary spark-gaps, Leyden Jar Condenser, Lightning switch, commercial wireless stations.

Contents of Lesson No. 7

NEW TRANSMITTING SYSTEMS.

Quenched Spark system, Telefunken system, Poulsen system, Duddel Arc, Complete Poulsen Station.

Contents of Lesson No. 8

RECEIVING APPARATA.

Detectors, Tuning of Receiving Apparata, Loose Couplers, Variometers, Detectorium, Portable Receiving Set.

Contents of Lesson No. 9

RECEIVING APPARATA.

Variable Condensers, Rotary Condensers, Fixed Condensers, Potentiometers, Wireless Receivers, commercial receiving sets.

Contents of Lesson No. 10

THE DETECTORS.

Coherers, Slaby-Arco-Vacuum coherer, Branly Detector, Automatic Detectors, Relays, Crystal Rectifiers, Silicon — Perikon — Galena — Molybdenite — etc., detectors, Electrolytic Detectors, Peroxide of Lead Detectors, Fleming Valve, Audion.

Free Wireless Course Offer—(Continued)

CONDITIONS:

On these pages you will find twenty Wireless Course Certificates.

When sending your order which **must** not be less than One Dollar ($1.00), attach one of these coupons and you will receive with your goods the first lesson of the **WIRELESS COURSE** and a superb cloth binder.

With every following order amounting to not less than $1.00, we send you another lesson. This means that for every dollar's worth of goods you order, you will receive as a premium, one lesson of our **"WIRELESS COURSE."**

It is understood that you can receive the whole course with one order if same amounts to $20.00, or ten lessons, if you order goods amounting to $10.00, etc.

You may, of course, select any number of the Wireless Course you want: but the cloth binder is only furnished with lesson Number One.

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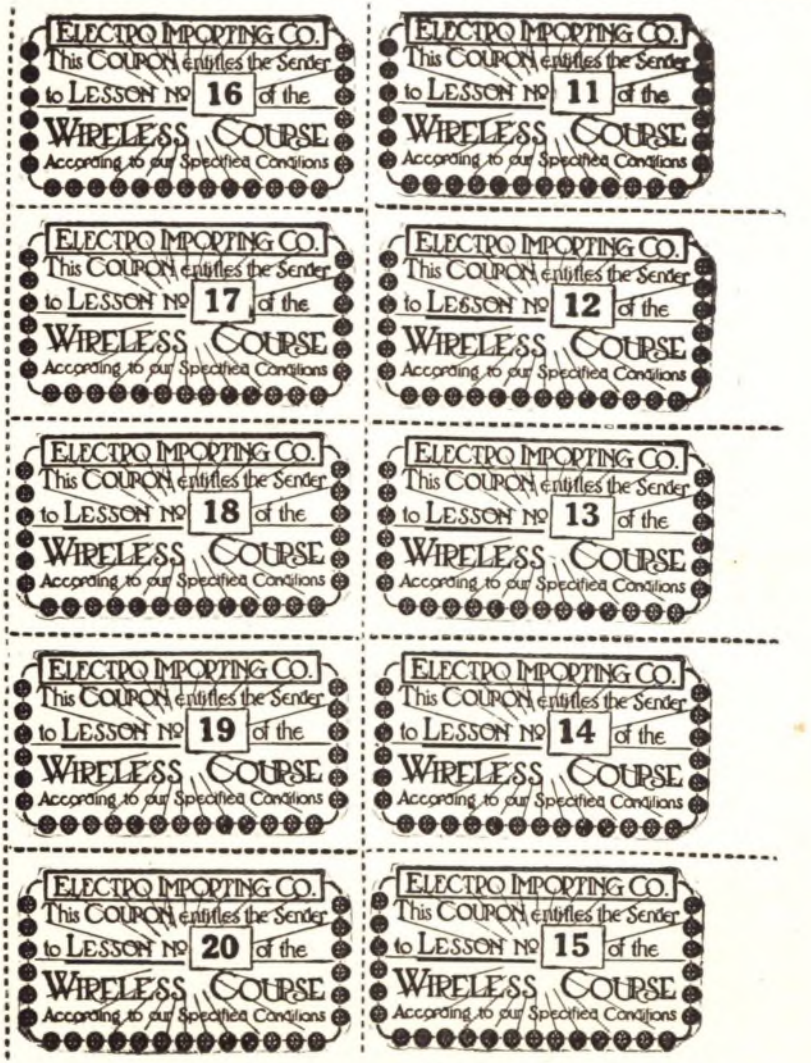


Free Wireless Course Offer—(Continued)

— ABSOLUTELY NO DISCOUNT ALLOWED FROM ANY ORDER APPLYING TO THIS FREE WIRELESS COURSE, AND NO LESSONS WILL BE SENT ON ANY ORDER UNLESS THE CORRESPONDING COUPON IS ATTACHED.

It is needless to say that our **Wireless Course** is up-to-date and absolutely thorough, commencing with the most complete explanations on Electricity in General and Wireless, ending with chapters on scientific mathematics and complete history of Wireless.

Do not miss this splendid opportunity.

Send in your order and your **Wireless Course Certificate TO-DAY.**
READ contents of Wireless Course on back of coupons.

Contents of Lesson No. 11

AERIALS.

Antenna, Wiring, Insulators, Looped Aerial, Umbrella aerial, Lead-in, Bellini-Tosi Radiogoniometer, construction of aerials, etc.

Contents of Lesson No. 12

THE HOOK-UPS AND CONNECTIONS

Study of the diagrams, Wireless telegraph symbols, close coupled systems, connecting interrupters, shipboard stations, Fessenden station, Receiving sets, Loose-coupled sets, Marconi selective receiving set, etc.

Contents of Lesson No. 13

THE HOOK-UPS & CONN. USEFUL INFORMATION.

Fessenden interference Preventer; Telefunken receiving set. Duplex Receiving set. The Collin system. The Lee De Forest system. Dielectric strengths of insulators, Notes on Ropes, Equivalents, connecting and soldering wires, Electrical units.

Contents of Lesson No. 14

OPERATION OF THE INSTRUMENTS.

Wave-length, Wave-Meters, Tuning. The use of the different instruments, Wireless Regulation.

Contents of Lesson No. 15

LEARNING TO OPERATE. THE CODES.

Operating the key, patent keys. The codes, Omnigraphs. The different codes, cipher messages, Abbreviations, Government messages, commercial messages. The Wireless Law.

Contents of Lesson No. 16

COMMERCIAL SHIP AND LAND WIRELESS STATIONS.

The Nauen station, United Wireless station. War ship stations. Commercial ship stations. Army stations.

Contents of Lesson No. 17

HIGH FREQUENCY CURRENTS.

Tesla experiments. Prof. Fessenden's experiments. Tesla Transformer, Oudin Transformer.

Contents of Lesson No. 18

THE WIRELESS TELEPHONE.

The principles. Collins system. Poulsen's system, etc.

Contents of Lesson No. 19

THE MATHEMATICS OF WIRELESS TELEGRAPHY.

Calculation of wave-lengths, Inductive calculation, Capacity calculation, Range of stations. Tables, Data, etc.

Contents of Lesson No. 20

THE HISTORY OF THE DEVELOPMENT OF WIRELESS TELEGRAPHY.

Steinheil, Edison, Maxwell, Tesla, Hertz, Crookes, Hughes, Popoff, Marconi, etc., etc.

The "Interstate" Wireless Receiving Outfit

No. 1500

This is the outfit you have been looking for. IT IS NOT A TOY by any means, and while we do not claim it to be a commercial set, we do claim that the amateur who owns one is enabled to do excellent work in all respects.

The very best instruments are used in the **"Interstate."**

This set comprises:

Our No. 9950 Standard Tuning Coil, bare wire wound, with two patent sliders, hard rubber composition coil head and posts; our new improved **GALENA DETECTOR** of wonderful sensitiveness, **ONE OF THE MOST SENSITIVE IN EXISTENCE;** our No. 1024 75 ohm Watch Case Receiver and 3-foot cord; a good condenser, mounted in base, balanced to the right capacity for this set, and a ½ inch thick **SOLID HARD RUBBER COMPOSITION BASE** on which all the instruments are mounted. A handy nickel hook is also provided, on which to hang the receiver when not in use.

ALL CONNECTIONS ARE MADE. When you get the outfit it is ready for use. Just attach the aerial to post 1, and ground to post 2, and the **"Interstate"** is ready for use. Full and very explicit directions go with the outfit.

In order to receive messages up to 300 miles or over, a 4-wire aerial about 50 feet above ground, 50-75 feet long is required. For this you need 200 or 300 feet of our No. 9219 Antenium wire and 8 of our No. 10007 insulators.

By using the No. 8071 Receiver the distance is increased from 20-25 per cent.

Size over all of this set is 9x6x6 inches.

No. 1500 "Interstate" Wireless Outfit, as described..... $7.00

Shipping weight 4 lbs.

NOTE.—By using our No. 8487 loading coil in series with the tuning coil the wave length of this outfit is increased greatly, and time signals from the powerful Government stations can be plainly heard.

"Inter-Ocean" Wireless Receiving Outfit

No. 1550

The increasing popularity of loose coupled wireless receiving apparatus has caused us, as leaders in the manufacture of amateur wireless equipment to design an outfit which, at its price, is positively unequalled at the present time.

It consists of our latest model loose coupler No. 12002 with single slide, bare wire wound primary; with a secondary of silk covered wire. A switch handle is provided on the secondary to permit of the closest possible tuning adjustment, so important in long distance work. Signals can be perfectly received from stations using long wave lengths, for our celebrated No. 8487 Loading Inductance is provided giving a receiving capacity **up to 6,000 meters wave length.**

The detector is our No. 9700 Galena Detector which for sensitivity, convenience and permanence of adjustment is positively unsurpassed at the price. Our No. 10010 Jr. fixed condenser is also part of the outfit.

Size 10x12x6½ in. high.

No. 1550 "Inter-Ocean" Wireless Receiving Outfit, complete as described but no phones $12.50

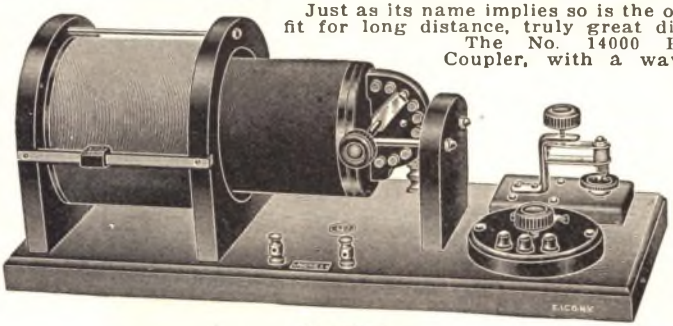
Shipping weight 10 lbs.

Permit us to let us send you FREE, with our compliments when ordering any of our Receiving apparatus, Lesson No. 1 **"The Principles of Electricity"** or Lesson No. 9 **"The Receiving Apparatus"** or Lesson No. 14 **"The Operation of the Instruments"** or Lesson No. 12 **"The Hook-Ups and Connections"** of our famous "WIRELESS COURSE."

The Principle and Construction of Receiving apparatus are described in these lessons.

Just attach your free coupon to your order. For further information consult free Wireless Course Offer in this catalogue.

The "Trans-Pacific" Wireless Receiving Outfit



No. 1555

Just as its name implies so is the outfit. It is the outfit for long distance, truly great distances.

The No. 14000 Professional Loose Coupler, with a wave length of 4,000 meters, permits of its use for receiving all the commercial stations. The coupler itself is the simplest and most beautiful instrument of its kind we have ever developed. The detector has been on the market many years and its rotary sliding cup (patent applied for) and double micrometer and spring adjustment are really the acme of detector simplicity and efficiency. The blocking condenser is not the ordinary fixed kind, but is our No. 10000 Fixed Variable type which gives 3 capacities to work with, enabling a choice of the one which will bring in the signals loudest. The entire outfit is superbly finished and mounted on a finely polished base. All wiring is done at the factory and the outfit comes ready for connections to an aerial and ground.

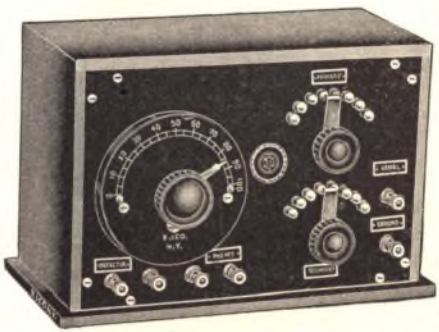
No. 1555 "Trans-Pacific" Wireless Receiving Outfit, complete as described, no Phones **$16.80**

Shipping weight 15 lbs.

The "Electro" "Arlington (NAA) Baby Timer"

De Luxe Receiving Cabinet

Wave Lengths: Min. 200 Meters; Max. 1,200 Meters



No. 4433

The "Arlington Baby Timer" is without question the most compact, the smallest, as well as the most wonderful little time receiving cabinet on the market to-day.

Very fine selectivity is had both with condenser and tuning inductances. The tuning is sharp and accurate and you will be amazed at the clearness of the received signals.

In this outfit a standard Auto Transformer type of tuning inductance is used. This type makes for great selectivity as practically no energy is lost in the transformation. This makes it in a sense more efficient than most loose couplers on the market to-day.

The outfit acts similar to an interference preventer, because the variable condenser is especially connected for efficient selective tuning.

The "Arlington Baby Timer" is recommended for use with an oscillating vacuum detector for undamped waves if external connections are made as per diagram furnished with the cabinet.

It can of course be used with any detector and any good set of phones.

Size over all 8¾x6x2 inches. Shipping weight 4 lbs.

No. 4433 "Electro" "Arlington (NAA) Baby Timer" as described..... **$11.90**

The "Electro" "Key-West (NAR)" Radio Outfit

De Luxe Receiving Cabinet

Wave Lengths: Min. 200 meters; Max. 2,000 meters

Here is a high grade long wave, long distance outfit. Will receive messages from large stations such as Key-West (NAR) Florida, over a radius of 1,250 miles on a medium aerial. Longer distances with a larger aerial. Arlington (NAA) times signals can be copied perfectly with either a good crystal or vacuum detector.

Our "Key-West NAR" outfit can be used with any kind of crystal or vacuum detector. We also furnish a diagram showing how undamped waves can be received with this cabinet, using an oscillating vacuum detector.

Explicit diagram showing hook-up as well as various clever connections is furnished with the outfit. By placing a loading coil in the aerial circuit, longer waves can of course be received with this outfit.

Size over all 8x8x4⅜ inches. Shipping weight 6 lbs.

No. 4444

No. 4444 "Electro" "Key-West NAR" Radio Outfit as described **$22.00**

The "Electro" "Sayville (WSL)" Radio Outfit

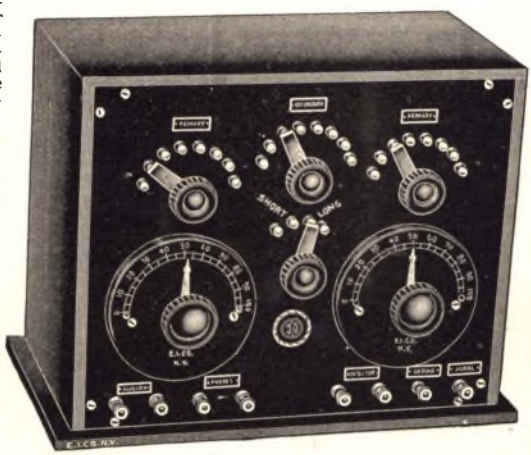
De Luxe Receiving Cabinet

Wave Lengths: Min. 450 meters; Max. 2,500 meters

Our "Sayville (WSL)" outfit was originally planned for jewelers' use. As can be readily understood a jewelers' outfit must be of commercial type, must be highly selective and practically free from interference.

Time signals from such stations as Arlington (NAA) are received with the greatest ease over a radius of 1,500 miles on an aerial having 310 meters. This is accomplished with any good crystal or vacuum detector. On larger aerials the receiving distance of course is increased.

In this outfit we use very efficient, closely coupled tuning inductances **AND A SPECIAL VARIOMETER COIL** placed at right angles to the tuning inductance. This construction is original with us and the entire arrangement of closely coupled inductances is more efficient than most loose couplers, as practically no energy is lost in transformation.



No. 4455

This outfit is highly selective especially on long wave lengths. It is an ideal jewelers' set and the better, up-to-date amateur will be proud of this fine set. Four binding posts for the phones are used in order that two sets may be attached to the outfit.

This highly efficient set stands unmatched in this country to-day. It is of generous proportions and represents a good deal more than what we ask you to pay for it. It looks business and will give your station a commercial looking appearance.

Size over all 12x10x5½ inches. Shipping weight 9 lbs.

No. 4455 "Electro" "Sayville (WSL)" Radio Outfit as described..... $28.00

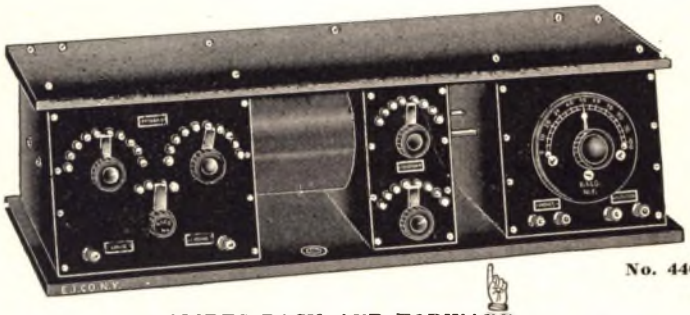
The "Electro" "Tuckerton (WGG)" Radio Outfit

De Luxe Receiving Cabinet

Wave Lengths: Min. 780 meters; Max. 3,200 meters

This outfit while eminently suited for the better amateur class, is highly recommended for jewelers' use, for the reason that the set is exceedingly compact and fool proof to a very high degree.

Time signals from Arlington (NAA) as well as other stations sending out the time twice daily, are received with astonishing ease with this outfit, signals are received over a radius of about 2,500 miles on a medium size aerial, in connection with a "Radiocite" or a vacuum detector, or any other sensitive detector and a good set of phones. With very large and highly elevated aerials the receiving distance is of course increased.



No. 4466

SLIDES BACK AND FORWARD

The outfit is so designed, and the circuit so arranged that it is possible to use it as a receptor for undamped waves. It is necessary to connect an additional loading coil in the aerial circuit to receive long waves, as stations which employ undamped wave generators use wave lengths exceeding 4,000 meters. Two of our No. 8486 Tuning Coils can be connected in series and will work satisfactorily, in conjunction with the "Tuckerton" receiver for receiving wave lengths up to 6,000 meters, with a moderate size aerial. A suitable antenna for this kind of work should consist of one or two wires 300 to 600 feet long and about 50 feet high. Under normal conditions, with the above aerial and a properly tuned oscillating Audion, there should be no trouble in receiving European stations such as Nauen and Eilwiese with this wonderful outfit.

Our "Tuckerton" (WGG) Outfit can be used with any kind of crystal or vacuum detector. We also furnish a diagram showing how undamped waves can be received with this cabinet, using an oscillating vacuum detector.

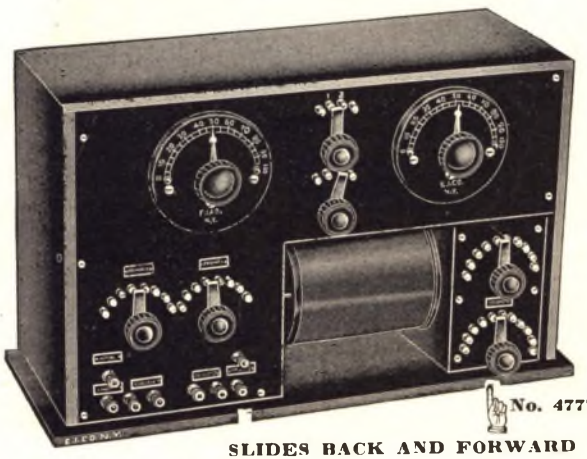
Size over all is: 21½x7x6¾ inches. Shipping weight 15 lbs.

No. 4466 "Electro" "Tuckerton (WGG)" Radio Outfit as described $35.00

The "Electro" "Nauen (POZ)" Radio Outfit

DeLuxe Receiving Cabinet

Wave Lengths: Min. 150 meters; Max. 3,500 meters



No. 4777

SLIDES BACK AND FORWARD

One of the finest designed radio outfits is our "Nauen (POZ)" Radio Outfit which constitutes the most modern receiver.

This outfit is so designed that the circuit is capable of receiving both undamped and damped wave stations. It has a minimum wave length of 150 meters and a maximum of 3,500 meters which covers practically the entire range of modern radio practice.

The outfit contains two sets of primary switches for controlling long wave reception for use in receiving continuous wave stations. In receiving long waves, switch blade No. 1 is turned towards the right, and the secondary is placed well within the primary. The secondary

The "Electro" "Nauen (POZ)" Radio Outfit (Continued)

switches are placed on the extreme right hand switch point, thus suing the complete winding of the secondary. The pointer of the left hand condenser should be set at 100 of the scale, thus giving maximum capacity to the outfit.

In receiving short wave lengths, such as 600 meters and, below, switch No. 1 is re-set to contact on the left in order to connect the right hand condenser in series with the ground, thus decreasing the natural wave length of the outfit. The switches of both the secondary and primary are manipulated until the incoming signals are heard at the maximum intensity.

For selective tuning the secondary should be loosely coupled with the primary by pulling it out from the primary and carefully tuning the secondary or left-hand condenser. It will be found that exceptionally fine tuning is obtained with this arrangement when once experience is obtained in the matter of handling the various parts of the outfit.

This outfit is of the latest approved loose-coupled type. The secondary and the primary come as close together as is possible without touching each other. The secondary slides back and forward on two nickel plated thick brass slider rods. It slides with wonderful ease and is pushed in or out of the primary by merely grasping one of the secondary switch knobs. These switch selectors are mounted on a BAKELITE panel which slides back and forward with the secondary.

The outfit is so designed, and the circuit so arranged that it is possible to use it as a receptor for undamped waves. This is accomplished by an additional coil placed within the cabinet and forming part of the outfit. By merely throwing in the coil in the circuit by connecting in switch No. 2 to the right, it is possible to receive continuous wave stations. It is necessary to connect an additional loading coil in the aerial circuit to receive long waves, as stations which employ undamped wave generators use wave lengths exceeding 4,000 meters. Two of our No. 8486 Tuning Coils can be connected in series and will work satisfactorily, in conjunction with the "Nauen" receiver for receiving wave lengths up to 6,000 meters, with a moderate size aerial. A suitable antenna for this kind of work should consist of a single wire 300 to 600 feet long and about 50 feet high. Under normal conditions, with the above aerial and a properly tuned oscillating Audion, there should be no trouble in receiving European stations such as Nauen and Eilwiese.

Two variable rotary condensers are built in. All workmanship is of the highest grade throughout. All metal parts are heavily nickel plated and hand buffed. Six generous nickel binding posts and four etched name plates, are furnished.

A diagram of connections is supplied with the outfit giving full details of connections and various hook-ups for use with the outfit.

Our "Nauen (POZ)" outfit can be used with any kind of crystal or vacuum detector. We also furnish a diagram showing how undamped waves can be received with this cabinet, using an oscillating vacuum detector.

Size over all 17½x11½x7 inches. Shipping weight 15 lbs.

No. 4477 "Electro" Nauen (POZ) Radio Outfit as described..... $45.00

The "Electro" Galena Detector

WITH A PIECE OF TESTED GALENA AND ROTARY DETECTOR CUP

The preference of many amateurs for a light contact crystal detector has caused the advent of our Galena Detector. To evolve a detector of this type demanded no particular skill, but to construct a detector with **EVERY** advantage heretofore enjoyed by this class of detectors required much and long study. And above all this detector is presented at a lower price than many more costly detectors and far inferior to ours.

No. 9700

The base is of solid hard rubber composition, ¼ in. thick, solid standard heavily nickeled and polished adjusting screw of hard rubber composition 1 in. in diameter, contact spring of phosphor bronze, nickel plated and polished; crystal contact of phosphor bronze wire properly coiled and pointed. The cup is surrounded by a knurled fibre ring, and can be rotated, so that every point of the Galena can be reached.

By reason of the fact that the contact spring moves through an arc and the crystal cup moves on an eccentric, every spot on the cup can be touched. The spring being held down by a screw cannot slip and lose its adjustment due to vibration. Size of Detector, 3½x3½ in.

No. 9700 Detector complete as described..... $1.75

Shipping weight 1 lb.

No. 9701 Detector as described but with a TESTED "RADIOCITE" crystal, the best there is..... $2.00

Shipping weight 1 lb.

A piece of TESTED GALENA, set in the Detector-cup with HUGONIUM soft metal is furnished with No. 9700 Detector and a piece of TESTED RADIOCITE set in the Detector-cup with HUGONIUM soft metal is furnished with No. 9701 Detector.

No. 7778

No. 7778 Hugonium, soft metal, to mount crystals or minerals, oz. bottle. Shipping weight 4 oz..... **$0.50**

THE "ELECTRO" RADIOCITE DETECTOR WITH GOLD CATWHISKER

POSITIVELY THE MOST SENSITIVE CRYSTAL DETECTOR MADE

No. 8888

FEATURES

Gold Catwhisker
Bakelite Base
Non jar-out
Quadruple Adjusting Range
Long distance tested
Ultra-Sensitive
⅜ in. Felt Sub-base
Adjustment Lock
Non Surface-leaking
Rotary Detector Cup

$4.50

CONSTRUCTION

BASE.—We use Bakelite **⅜ IN. THICK** the best insulator known to-day, as well as the most expensive.

NOT JARRED OUT.—This is a very important feature. The long fine catwhisker wire is so light that it needs a very heavy knock to displace it. To deaden any jar or knock we employ a ⅜ IN. THICK SOFT FELT SUB-BASE (not shown in illustration). This makes the detector practically jar proof.

RADIOCITE CRYSTAL THE MAIN FEATURE.—"A detector is no better than its crystal." We come out with this strong claim, supported by evidence from thousands of users:

Radiocite is the most sensitive crystal known to-day barring none. It is more sensitive than galena, zincite, or silicon.

ADJUSTMENT.—A heavy bronze casting, triple nickel plated WEIGHING ¼ lb. carries a very heavy shaft on both sides of which are attached two hard rubber knobs 1¼ in. in diameter. In the center of the shaft a small tubular rod is inserted, carrying the little thumbscrew "B," which in turn holds the catwhisker wire. By this simple method the catwhisker can be exchanged for another one in five seconds.

A simple slot makes it possible to LOCK THE CATWHISKER by means of the hard rubber adjusting knob **"A"** WITHOUT DISTURBING THE CATWHISKER ADJUSTMENT IN ANY WAY WHATSOEVER. The knob **"A"** simply locks the central rotating shaft, **without displacing the catwhisker as much as a millionth of an inch.**

BOTH HANDS REST ON THE TABLE while adjusting.

CATWHISKER.—We furnish two of these. One of 14 KARAT GOLD, impossible of oxidation, the other of phosphor bronze.

QUADRUPLE ADJUSTING RANGE.—This wonderful range is only to be found in the Radiocite Detector. It positively beats everything for quick and complete searching out of the most sensitive crystal spot.

1. Rotating the two large knobs, adjusts the catwhisker for best contacting pressure.
2. Pushing the knobs from one side to the other (⅜ in. movement allows for this) gives the catwhisker ample lateral motion.
3. The Rotating Detector Cup, rotated by means of the knurled insulating ring, serves to bring almost every point of the crystal under the catwhisker.
4. Sliding the Detector cup backwards or forwards completes any possible adjusting that can be imagined.

Finally the detector can be screwed on the table with the crystal towards you or away from you. The adjusting is accomplished equally well either way.

All workmanship and finish highest throughout. All metal parts are triple nickel-plated and hand-buffed. Two very large binding posts are used. The Bakelite base is highly finished. The bright nickel on the black Bakelite base gives the whole instrument a rich appearance, not possible to reproduce adequately in our illustration, which at best does the instrument scant justice.

Size 3x4½x2⅜ in. Shipping weight 3 lbs.

No. 8888 "Electro" Radiocite Detector, as described..... $4.50

The "Electro" Radioson Detector

"THE ULTRA SENSITIVE ELECTROLYTIC"

(Patents Pending.)

This detector to-day is without question one of the most sensitive, and from an operating standpoint, the most satisfactory one manufactured. The Radioson is far more sensitive than most detectors and will bring in messages which cannot be heard with other detectors.

The Radioson Detector is the only Detector so far developed which needs no adjusting and cannot get out of adjustment. It cannot be knocked out by nearby sending stations, never loses its sensitivity and messages come in clear and distinct **even while the detector is shaken violently.** You no longer lose part of an important message because your detector lost its adjustment if you use the Radioson Detector.

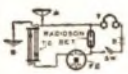
No. 9300

The acid as well as all other parts are sealed in the detector. It is absolutely clean and safe, and it is adjusted to its highest sensitivity at the factory. Every Radioson cartridge undergoes five different tests before it is finally sealed. You cannot change the adjustment without smashing the glass or by passing a high tension current through it.

It is necessary to use two dry cells (three volts) in connection with the detector. These cells may be of very small size, such as a flashlight battery. A curious part of the improved Radioson is that it does not sound at all like an electrolytic detector, but the sound coming in over the telephone receivers is exactly the same as that of a crystal detector.

The Radioson can only be used with a 2,000-ohm headset or one with higher ohmage. Lower resistance than 2,000 ohms tend to shorten the life of the detector.

The Radioson is only sold complete as shown. Radioson exchange cartridges are only furnished to users of the instrument providing the original cartridge is returned to us either whole or broken.



Specifications: The Radison consists of a heavy insulated base, on this is mounted a very large solid hard rubber standard, which supports the heavy nickel plated brass spring. The spring holds the Radioson cartridge in place by a positive spring action.

The cartridge is easily snapped in and out by simply lifting the spring upwards. There are two extra large nickel binding posts. Size over all 4x2½x3½. All metal parts are triple nickel plated and highly polished. **Base is felt covered.** This extremely neat instrument has already been introduced in a number of commercial radio stations.

No. 9300 "Electro" Radioson Detector (complete)..... **$5.50**
Shipping weight 2 lbs.

No. 9301 "Electro" Radioson Cartridge only (see note above)..... **$3.50**
Shipping weight 1 lb.

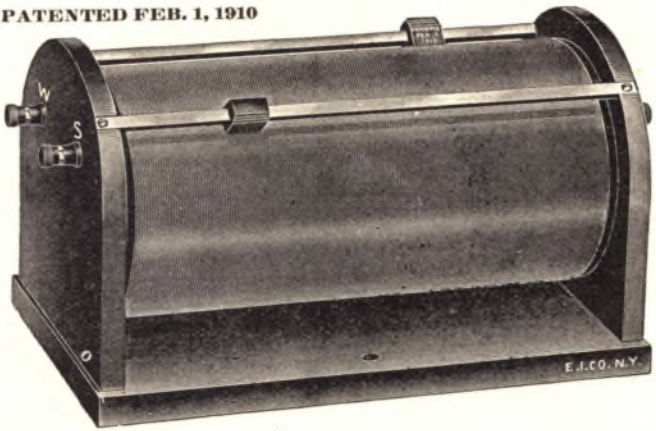
Let us send you **free** with our compliments lesson No. 10 **"The Detectors"** of our famous "WIRELESS COURSE" telling you all about "Detectors."

Just attach coupon No. 10 to your order. For information see free Wireless Course offer in this catalogue.

The "Electro" Tuner

3300 METERS

PATENTED FEB. 1, 1910



No. 8486

The "Electro Tuner" which we present is undoubtedly one of the best examples of a high grade commercial tuner. We were the very first firm building this style, and there is no doubt whatever that this tuner is the most popular one we manufacture. The type described herewith is the **tenth** style evolved, and we believe it is impossible to further improve on it. Our long years of experience vouch for superiority.

The wave length of the "Electro Tuner" with 100-foot flat top 4-wire aerial 100 feet high is 3300 meters. This tuner is perfectly adapted to receiving from undamped wave stations and if 3 or more of them are used in series on a fair sized aerial you can receive from the European stations perfectly. According to the latest researches it is BARE WIRE WOUND by our special process. The convolutions approach up to 1/100 inch and are wound with amazing precision, making the finest tuning possible.

There are over 300 convolutions of copper wire, and this tuner will tune as accurately as ½ meter.

All woodwork is of the best seasoned oak, hand rubbed finish of the highest order. The base has holes so the instrument can be screwed to the table or wall. The two metal slider rods are double nickeled and highly polished. Our well-known hard rubber sliders are used, one BLACK for ground, one RED for aerial. This feature is found only on our instruments.

Our patented sliders are equipped with a medium hard BRONZE BALL which does not wear down the wire of the tuner. Our slider in this respect is the only one that can claim this truthfully. Besides being made of hard rubber, **ground through your body by way of the slider is impossible.** Each post is marked. W stands for the wire convolutions; S for slider.

Size of tuner over all, 13x7x7 inches,
Shipping weight 6 lbs.

No. 8486 "Electro Tuner" double slide, as described..... $5.50

The "Electro" Tuner, Jr.

PATENTED FEB. 1, 1910

No. 9950

While the "Electro" Tuner previously described may be used to "tune in" for the largest stations, we have had a large demand for a Double Slide tuner of a smaller design and present our friends with our "Electro Tuner, Junior."

CONSTRUCTION

TUBE — Non-Seamless — carefully dipped and finished. They are wound with bare wire (the best way). The wire can't come loose.

SLIDER RODS—Solid Square rods highly nickel plated and polished. They are made to last and they do. On the rods are our wonderful patent sliders, one red and one black—an exclusive feature found only on our goods.

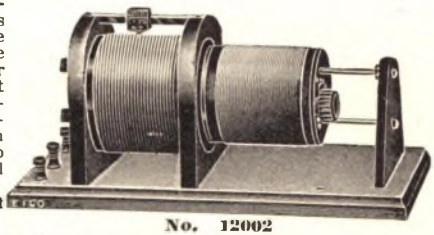
Sizes, 8 inches long, 3¾ inches high, 3¼ inches wide.

No. 9950 "Electro Tuner, Jr." (double slide) as described..... $3.50
Shipping weight 2 lbs.

The "Electro" Loose Coupler

RECEIVING TUNING TRANSFORMER

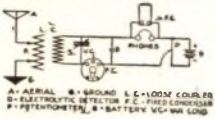
Patented Feb. 1, 1910



No. 12002

While an ordinary tuning coil is admirably suited for ordinary work it is not a success where exceedingly fine tuning is required. In fact, even the best tuner cannot tune within 10 per cent. accuracy. Furthermore, now that so very many stations are working simultaneously, we must have an instrument which is capable of tuning to an exceedingly fine degree and be able to ABSOLUTELY tune out ANY unwanted station.

This Loose Coupler is an excellent instrument for this purpose.



Wood parts are of polished hard wood; metal nickel plated. The wire on the primary is bare wire wound after the latest process, ensuring high efficiency.

The secondary is machine wound with green silk covered wire, as it would be quite impossible to wind the very fine wire otherwise.

The secondary, projecting from the right has a large hard rubber switch handle, which carries a nickel switch blade. This blade plays over 6 contact points, to vary the inductance. The secondary coil heads **ARE OF HARD RUBBER COMPOSITION**, the secondary slides **freely** on two beautifully nickel-plated brass rods. On the primary one of our patent sliders is provided as used on our other instruments. The secondary can be moved back and forth with the greatest possible ease and will not stick, or require two hands to move as is the case with even expensive makes. Our loose coupler is built to pick up wave lengths up to 800 meters and as the majority of commercial and government stations have only a wave length up to 600 meters, our instrument will be found to respond in practically all cases.

Adjustment: When connections are made and detector is adjusted, move secondary up to the centre of primary, then adjust slider till signals come in loud; then move secondary back and forth, while moving the switch knob back and forth, till position is found where signals are loudest. Now the variable condenser is adjusted. Dimensions: Length of base 12 inches, width 6 inches, height over all 6½ inches.

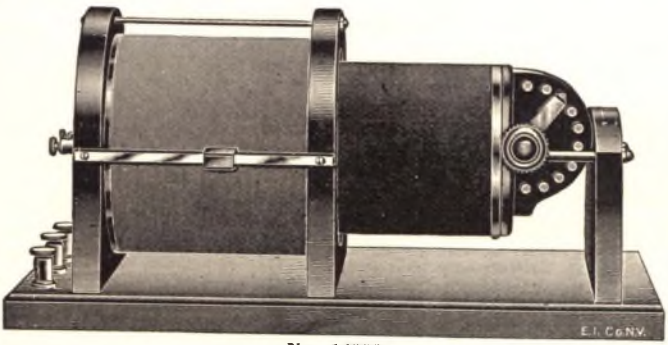
No. 12002 "Electro" Loose Coupler, as described..... $7.00

Shipping weight 5 lbs.

The "Electro" Professional Loose Coupler

(RECEIVING TRANSFORMER)

Our professional loose coupler has been carefully balanced and the secondary and primary have been wound according to the latest researches in this art. The diameter as well as the amount and the size of the wire is highly important and the type which we present herewith is unusually effective and we guarantee it to do anything and everything, even the most expensive loose coupler on the market to-day will do.



No. 14000

This coupler is made of **hand rubbed, piano finished mahogany throughout.** Primary winding is of bare copper wire wound by our special process and there is one of our well-known patented Hard Rubber Ball Sliders conveniently located on the side. This slider makes perfect contact on only one turn of wire at a time and never wears out the wire. The secondary wound with green silk

The "Electro" Professional Loose Coupler
(Continued)

covered copper wire is calculated for long wave lengths and the crowning feature of it is the secondary switching arrangement attached to the secondary. There are 8 switch points to the rotary switch which is directly attached to the secondary. By means of its knob the secondary can be moved backwards and forwards and this arrangement gives the maximum of efficiency in the minimum of time, particularly when quick tuning is necessary. Thus the switch knob is used for switching in more or less secondary turns and for moving the secondary backward and forward at the same time.

This feature as a rule is only found in "Navy" style couplers and this is the first loose coupler ever placed before the public, making use of this expensive as well as ultra-efficient feature.

Kindly note that the entire secondary rotary switching arrangement is built of solid MOULDED HARD RUBBER, not wood or composition. Also note particularly that the secondary coil heads are of MOULDED HARD RUBBER COMPOSITION, not wood.

With this instrument, in connection with other good receiving apparatus, nearly all large stations can be heard without much trouble.

Only first class material is used in connection with this fine instrument. All nickel-plated work is hand buffed.

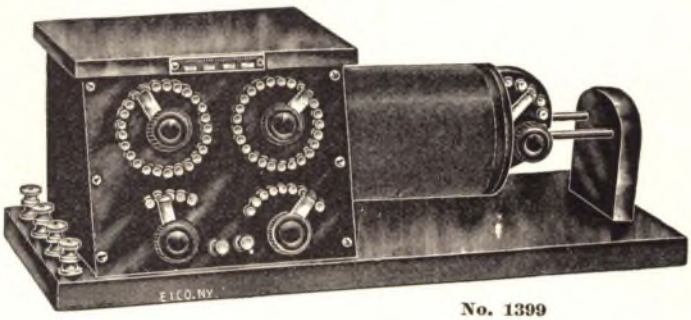
There are five large nickel binding posts, two for the primary winding, one for the primary slider and two for secondary winding. The loose coupler has a wave length of 3,000 meters without the use of a loading coil.

The "Electro" Professional Loose Coupler is guaranteed to do the work of any professional loose coupler. Size of this loose coupler, base 15½x7¼x7½ in. high. Length of Primary is 5¼ inches; length of Secondary is 4¾ inches.

No. 14000 Professional Loose Coupler **$13.00**
Shipping weight 10 lbs.

The "Electro" Navy Type "3 in 1" Coupler

PEER OF THEM ALL



No. 1399

With this we present an instrument to the advanced Radio enthusiast that has not a counterpart on the market to-day. There are many Navy Type Couplers on the market now, but we feel confident that you will find in this instrument features that you never thought possible in such a Coupler. We claim it to be the acme of perfection of an instrument of this kind, no expense or money having been spared to make it such.

We call this Coupler "3 in 1" for the reason that it not only has all the Navy Type Coupler features, but in addition, with the same instrument, we furnish a high grade loading coil, as well as a variable condenser, the three instruments being all built in the one case. On the Navy Type Coupler no sliders are used whatsoever, the tuning being accomplished entirely by means of rotary knobs or switches. At the upper left side you will find twenty-four switch points for the primary tuning, while at the upper right there are twenty-four switch points for cutting in single turns, on the primary, thereby giving one turn to the coil for every switch point.

This latter feature is highly important when working with an Audion or a valve type Detector where exceedingly fine tuning is necessary.

The third switch at the lower left side controls the variable condenser which is also necessary for extremely fine tuning, while at the lower right side is found the loading coil, by which long waves can be tuned in without taking recourse to a separate instrument.

The secondary, wound with silk wire, is calculated for extra long wave lengths. There are 8 switch points to the rotary switch, which is directly attached to the secondary. By means of its knob the secondary can be moved backwards and forwards and this arrangement gives the maximum of efficiency

The "Electro" Navy Type "3 in 1" Coupler—(Continued)

in the minimum of time, particularly when quick tuning is necessary. Thus the switch knob is used for switching in more or less secondary turns and for moving the secondary backward and forward all at the same time.

With this Coupler most all of the large stations can be heard with a fair sized aerial on account of its long wave length, and there will be but few stations indeed from which you cannot receive with this Coupler.

Only first-class material is used in connection with this instrument. All nickel plated work is hand buffed. There are four large binding posts at the left, two small binding posts for the telephone receivers in front. The secondary coil ends are of hard rubber composition. An absolutely distinct feature of this Coupler is found in the fact that the front part carrying the various switches is not of wood nor hard rubber, but is of **BAKELITE**, the latest electric product and more expensive than hard rubber; it also gives the highest electrical insulation to-day for this work.

This Bakelite plate is placed at a slight angle in respects to the apparatus; this makes the working very much easier than if it was placed at right angles to the base.

The woodwork used throughout is mahogany, handrubbed, piano finish.

Dimensions are as follows: 19 in. long, 7¾ in. wide, 6¾ in. high. Shipping weight 14 lbs.

No. 1399 The "Electro" Navy Type "3 in 1" Coupler, as described. Price **$23.00**

The "Electro" Vario Selective Coupler

CABINET TYPE

No. 11000

In presenting this outfit the only introduction necessary, is consideration of the fact, that an outfit of this type **convinced the D. L. & W. Railroad** that long distance communication with trains in motion carrying small low aerials was not only possible, but eminently practical.

It consists of a highly selective induction coupler of the cabinet type in which all tuning is done by switches acting on switch points, eliminating sliders entirely. There are three of these switches: one marked primary, having 25 contact points, another secondary with 7 contact points, and the third a loading circuit for long wave lengths, having 7 contact points. This outfit can tune to wave lengths from 100 meters to 3,000 meters and its selectivity is so perfect, that with 4 stations sending at one time, we have been able to select any one station, eliminating the others entirely.

The entire cabinet is made of highly polished mahogany, with switches controlled by hard rubber handles, and the binding posts and metal parts of brass, nickel plated. The size 9x9x2 in. and weight of this outfit, being only 2 lbs., especially recommends it for service under conditions where space is at a premium or where weight must be kept down.

The loudness of signals received is due to the variometer effect introduced in this outfit which eliminates all open or dead ends, in the windings.

This is one of the smallest and most compact long distance wireless receiving outfits manufactured and we particularly recommend it **FOR RECEIVING TIME SIGNALS** as sent out by the various U. S. Government Wireless Stations. The outfit may be used with any type of detector and any phones but we particularly recommend the use of the No. 9300 Radioson Detector and our No. 6666—3000 ohm Government Phones.

No. 11000 "Electro" Vario Selective Coupler (no phones or detector)... Shipping weight 5 lbs. **$8.50**

When ordering one of our Tuners, Loose Couplers, Loading Coils, Receiving Cabinets, etc.; permit us to present you **free** with our compliments the following lessons of our famous "WIRELESS COURSE": lesson No. 4 **"The Principles of Wireless Telegraphy"** or Lessons Nos. 8 and 9 **"Receiving Apparatus"** or lesson No. 12 **"The Hook-Ups and Connections"** or lesson No. 14 **"Operation of Instruments."** You will learn how to tune your station properly and how to get the most out of your instruments. Just attach your free coupons to your order. For further information consult free Wireless Course offer in this catalogue.

The "Electro" "Trans-Oceanic" Undamped Wave Loading Coil

15,000 METER COIL

32 IN. HIGH

No. 4500

15,000 Meters

There is a distinct need of an extra long wave loading inductance for use in receiving the long distance undamped signals from such stations as: Nauen—POZ; Eilvise—OUI; Arlington—NAA; Tuckerton—WGG; Darien—NBA; Clifden—5CN; Sayville—WSL and over twenty other high powered, long wave stations in all parts of the world. As an example, the Nauen, Germany, station (call POZ) transmits on either of three waves, viz.,—6,300, 9,400 while 12,600 meters and 10,000 to 14,000 meter wave lengths are quite common among the newer, long range stations.

Such circuits as the Armstrong, which utilize vacuum tube oscillating relays, in order to hear stations working on waves of 10,000 to 15,000 meters length, absolutely require a first-class inductance such as we present to our patrons herewith. These waves cannot be received otherwise.

We are confident that our "Trans-Oceanic" long wave tuning inductance will meet every demand that can be made of it. It is adjustable by means of a seven-point switch mounted on the base in a convenient position, as shown in the illustration. The inductance of the winding has been carefully balanced and properly divided up in six equal sections, in the latest approved manner to that when used with a four wire, 300 flat-top, "L" shaped aerial, placed 100 feet above the ground, in conjunction with our Navy type or other large size loose coupler, wave lengths up to 15,000 meters and more can be easily tuned in. This considers that the loading inductance is connected in series with the aerial and the loose coupler primary.

The long wave lengths mentioned are also within your range when the coil is used in the **secondary** coupler circuits, as for instance in the Armstrong hook-up, which requires two of these coils for the secondary or vacuum valve circuits, and one for the aerial or primary circuit unless you intend using a special large size loose coupler capable of tuning in 10,000 to 15,000 meter waves directly, when only two are required. If this inductance is employed with a 500-foot flat-top, "L" design aerial, placed 100 feet above the ground, IT WILL TUNE UP TO 20,000 METERS WAVE LENGTH when used with any standard large size coupler, such as our Navy type.

Ordinarily and when a small loose coupler of 3,000 to 4,000 meters wave length capacity, such as our "Navy type," is used with a vacuum valve detector ("beat" producer), the following auxiliary apparatus is necessary besides three of the "Trans-Oceanic" Inductances:

Three .001 M.F. No. 9241 and two .0004 M.F. No. 9240 variable condensers; one No. 10,000 .003 M.F. fixed variable condenser. It is presumed of course that you have or intend to procure the loose coupler, vacuum valve and phones, which latter should be of 2,000 to 4,000 ohms resistance—the higher the better.

If a "tikker" is used for interpreting the undamped wave signals then the apparatus required includes two "Trans-oceanic" loading, inductances, one for primary and one for secondary circuits; a "Tikker" across the stopping (fixed) condenser, No. 10,000 type; our "Navy type" coupler; two No. 9241 .001 M.F. variable condensers and 'phones. No detector or vacuum valve is necessary. The Tikker should make about 200 interruptions per second. Dr. de Forest found that a crystal detector reduced the signal strength on long distance reception but one may be used for ordinary work with the Tikker. The sound or pitch of the received signal can be altered as desired by varying the capacity of the variable condensers in the Armstrong circuits; in "Tikker" circuits the pitch is variable by changing the speed of the Tikker interruptions.

The "Trans-Oceanic" long wave inductance measures 32 INCHES HIGH by 8 inches square at the base. The extra heavy tube is machine wound with a single layer of single silk covered, pure, copper magnet wire of ample size to keep the ohmic resistance down to a minimum. SMALL COILS WOUND WITH FINE WIRE PRESENT A HIGH OHMIC RESISTANCE AND CONSEQUENTLY A HIGH DAMPING EFFECT. THIS INDUCTANCE HAS THE LOWEST DAMPING FOR ITS SPECIFIC INDUCTANCE VALUE, OF ANY SIMILAR INSTRUMENT ON THE MARKET—BAR NONE. The taps from each section are brought down inside the instrument and through the hollow base to the multi-point switch shown in the illustration. No more reaching up in the air and tiring your arms while adjusting the inductance. All wood-work is hand-polished mahogany, piano finish. Metal parts heavily nickel plated. All parts substantial and well designed. Nothing to wear out or collapse at a critical moment. The "Trans-Oceanic" is really a commercial instrument in all respects: in design, workmanship, efficiency and appearance.

No. 4500 "Trans-Oceanic" Undamped wave loading coil. Price..... $13.00

Size 8x8x32 in. over all. Shipping weight 15 lbs.

The "Electro" Loading Coil

No. 8487

In order to receive messages from stations using very long wave lengths it becomes necessary to use a loading coil in order to increase the natural wave length of the ordinary tuning coil or loose coupler. Our loading coil has a wave length of approximately 5,000 meters. If placed in series with either our tuning coils, or our couplers (in series with the primary) or our "Interstate" outfit it becomes possible to catch time signals from the Arlington Government station using 2,500 meters wave length. These stations cannot be heard with the ordinary tuner or coupler, as these instruments usually do not go beyond 600 or 800 meters wave length. The use of our loading coil enables one to receive messages from almost any station, no matter what its wave length, up to 5,000 meters, the capacity of your outfit is increased enormously as you can practically receive most any message from any radius.

There are six steps, each switch point representing approximately 800 meters wave length, and by simply revolving the knob most any wave length can be obtained. Of course, it must be understood that either a loose coupler or a tuner must be used in conjunction with this instrument **as it cannot be used by itself alone.**

These progressive times, when your amateur is only satisfied with receiving from only the most distant stations, our "Electro" Loading Coil is of especial value for European stations which use long wave lengths exclusively which cannot be received without a loading coil such as we offer here for so low and reasonable a price.

It is made entirely of hard rubber composition with large hard rubber handle. All metal parts are nickel plated and highly polished; its size is 4 in. in diameter and 1½ in. in height. The diameter of the hard rubber thumb handle is 1 in.

No. 8487 Electro Loading Coil, as described. Price..... **$3.50**

Shipping weight 1 lb.

The "Electro" Junior Fixed Condenser

THE CONDENSER THAT IS COPIED BUT NEVER EQUALLED

No. 10010

The "Electro Junior" Condenser is the outcome of long experimenting and is the SMALLEST AND NEATEST wireless condenser ever placed before the public. It is entirely made of hard rubber composition and has hard rubber binding posts. Size over all 2⅝x1½ in., weight 3 ounces. This condenser is used mostly to shunt across the telephone receivers and is invaluable for any of the mineral detectors. We guarantee that the signals will come in fully 25 per cent. stronger with the addition of this condenser. A novel idea in connection with this instrument is that the diagram of connections is pressed right in the condenser top as seen in illustration. (Explanation of diagram (see ill.); T.T. telephone receiver (or receivers); C. "Junior" fixed condenser, arrows go to detector and battery, as the case may be.) Of course, the condenser can be used in other parts of the circuit and two or three of these in any wireless station will prove a great addition, not alone on account of the neat appearance of the instrument but also on account of the increased receiving range of the station. The condenser itself is sealed in the case and there are no parts to get loose and form bad connections.

One use for which this condenser is particularly adapted is in the grid circuit of a vacuum type relay such as the Audion, etc. It is here that its small capacity and special construction make it particularly valuable. Here also does its superior dielectric prove valuable for the ordinary surge that occurs will never break down its insulation.

A comparatively recent development of the regenerative circuit such as the Armstrong makes use of small fixed capacities. For this purpose the No. 10010 Junior Fixed Condenser is hard to beat. Its capacity is right and fixed and above all every condenser is exactly like every other one of its kind making them perfectly balanced and interchangeable.

Of course a very common use for the No. 10010 Junior Fixed Condenser is as a blocking condenser where a very small capacity conveniently shaped and convenient for connections is required. It is then simply connected in series with the crystal detector.

Another use for this condenser that its low price and size make particularly useful is in conjunction with the test buzzer where it can be used to produce a better wave form.

This condenser will positively last a lifetime and cannot be punctured unless you connect it across the spark coil. CAPACITY is .0165 M.F.

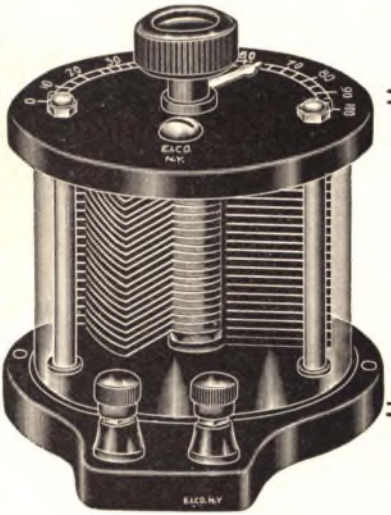
No. 10010 "Electro" Junior Fixed Condenser, as described..... **$0.90**

Shipping weight 4 oz.

The "Electro" Rotary Variable Condensers

43 PLATE SIZE

$6.00



17 PLATE SIZE

$4.00

No. 9241

The best rotary variable condenser made.

The rotary variable condensers we present here, have exclusive features which make them more valuable than others, yet our price is lower. Consider these three features alone and you will be convinced: **FIRST—THESE CONDENSERS ARE THE ONLY ONES MADE WITH A TRANSPARENT CASE IN WHICH OIL CAN BE USED WITHOUT IT LEAKING.** In this way the condenser capacity can be increased **FIVE TIMES** and at the same time the condenser can be used on higher potential currents than air insulated condensers. Next, this condenser is the only one now on the market provided with screw holes so it can be screwed down to a table or instrument board. **THIRD—THIS CONDENSER IS THE ONLY ONE NOW ON THE MARKET WITH CONNECTIONS AT THE BOTTOM** as shown in the illustration. This form of construction makes a better instrument and cleaner wiring for you. No longer is it necessary to run unsightly wires up to the top of your condenser, for our connections are only ½ in. above the table level. Cover is made of highly polished hard rubber composition with **a large scale that is easily read.** The handle is knurled and a very convenient size. The pointer is very rigid and clear and the handle has an exclusive feature permitting of it swinging all around in a complete arc or stopping at the maximum and minimum capacity. Plates are of a special metal alloy, properly spaced with separators milled to .0005 of an inch, and so supported that they can never slip or short circuit. The base is of one piece of hard rubber composition, with a beautiful finish that will stay on. The case is a special hard, clear flint glass cylinder, and by an exceedingly simple arrangement between same and the base, oil may be kept in it without the slightest possibility of leaking.

No. 9240 has 17 plates and a capacity of .0004 microfarads.

No. 9241 has 43 plates and a capacity of .001 microfarads.

No. 9240 **"Electro" Rotary Variable Condenser, 17 Plates, size 4⅛x2⅞ in.** **$4.00**
Shipping weight 2 lbs.

No. 9241 **"Electro" Rotary Variable Condenser, 43 Plates, size 4⅛x2⅞ in.** **$6.00**
Shipping weight 3 lbs.

Let us send you **free** with our compliments lesson No. 9 **"The Receiving Apparata"** of our famous "WIRELESS COURSE" telling you all about "Potentiometers."

Just attach coupon No. 9 to your order. For information see free Wireless Course offer in this catalogue.

The "Electro" Fixed Variable Condenser

This is one of the greatest innovations ever originated by us. The case contains two fixed condensers of different capacities. If the switch lever is on point 1 the two condensers are in series; this is the lowest capacity available. If lever is moved to point 2, the smallest condenser is in circuit. On point 3 the large condenser is placed in circuit. Thus it will be seen that three distinct capacities are provided for in this condenser. It is a proven fact that different stations are heard with varying degrees of intensity, all depending on the capacity of the ground (blocking) condenser. Very few persons realize that they cannot hear certain stations for the sole reason that their ground condenser is either too high or too low in capacity. For that reason this new style condenser was evolved by us and it has found the instant approval of thousands of wireless enthusiasts.

No. 10000

It is of especial value when used on regenerative wave circuits where a variable condenser is desirable, yet fixed capacities are especially needed. It also fits in perfectly on small receiving outfits as either a primary or secondary loose coupler condenser. Its convenient shape and rotary system of operation is what will make its first appeal to you.

This instrument is built on strictly scientific principles after the latest researches in condenser building. A special grade of dielectric is used and the capacities of the condensers are correct and balanced to meet all regular wireless requirements. The switching arrangement is unique and we absolutely guarantee that neither the switch lever nor the switch blade will come loose even through excessive use of the instrument. Contacts are of the self cleaning low resistance type.

The case is of solid hard rubber composition, as is also the thumb screw, which latter is polished; there are two stops to check the lever.

Sizes are 4 in.x1½ in. Shipping weight 1 lb.

No. 10000 "Electro" Fixed Variable Condenser **$1.75**

The "Electro" Sliders

The accompanying cut (actual size) shows our hard rubber ball bearing slider (patented Feb. 1, 1910). It is the acme of perfection and surpasses in efficiency, quality, accuracy, any slider ever placed on the market.

As it is non-metallic, it slides over the rod with astonishing ease. **NO MICROPHONIC CONTACTS** are possible with this slider, no jars in the telephone. The brass ball is pressed evenly on the tuning coil wire, while the phosphor bronze spring which makes contact with the rod, presses firmly on the ball, ensuring perfect contact at all times.

No. 2222

It can never stick, but responds at once, quickly and with astonishing ease. ALL OUR INSTRUMENTS ARE EQUIPPED WITH **OUR PATENT SLIDER, WITHOUT EXTRA CHARGE.**

NOVEL FEATURE. We have devised the same slider in **BRIGHT RED COMPOSITION,** for the Aerial slide, and therefore equip all our double slide tuners, couplers, etc., with one **black and one red slider.** This original feature is a distinctive departure. Sizes over all ⅝ x ⅞ x ½ inch. Our new slider fits any ¼-inch square rod.

No. 2222 Hard Rubber Slider (black) complete with ball and spring.. **$0.40**
No. 2222a Hard Rubber Slider (red) complete with ball and spring.... **$0.40**
Shipping weight 3 oz. each.

High Capacity Condensers

Few articles are so hard to make and get good results from, yet are so important an article to the electrical experimenter, as high capacity condensers. Those listed by us here are made of the very best grade of rice paper and tinfoil impregnated with paraffine. Capacities, while high, are ideal for telephones or ringing circuits, for experiments with duplex telegraphy, artificial cable capacities, wireless telegraphy, and as spark coil condensers, etc., or any service where high capacity, low tension condenser can be used. The terminals are brought out in a neat and substantial manner.

No. 1582 High Capacity Condensers (½ microfarad). Size 4½ x 1¾ x ½ in..... **$0.60**

No. 1583 High Capacity Condensers (1 microfarad). Size 4x2⅝ x ½ in..... **$0.90**

No. 1584 High Capacity Condensers (2 microfarads). Size 4⅜ x 2¼ x ¾ in..... **$1.25**

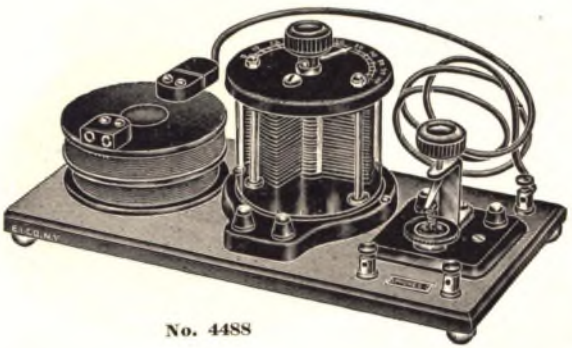
Shipping weight 2 lbs., any capacity.

These Condensers cannot be used for high tension work


No. 1583

The "Electro" Professional Wave Meter

FOR WAVE LENGTHS FROM 180 TO 1,800 METERS



No. 4488

The up-to-date wireless amateur to-day wants more than a sending or receiving outfit or both. He wants to know what he is sending and what he is receiving. Realizing therefore the need of the radio enthusiast for an accurate measuring instrument we devoted a great deal of time and money to perfecting one that would produce the maximum of results with the simplest of instruments and with a maximum of accuracy even when in the hands of a mere novice.

Our Professional Wave Meter enables you to easily find out what wave length you are emitting and therefore to tune your station to comply with the law which requires an amateur station to use a wave length of 200 meters or less. The law goes further and says you must emit a wave with a decrement of 1/10 or less. Our wave meter enables you to so tune your station so it will emit a wave form acceptable to the government.

In other words, our Professional Wave Meter enables you to read wave lengths of either receiving or sending stations, also to obtain capacities, inductances and decrements, and then when you are through using your wave meter as such, JUST ADD A LOOSE COUPLER, TAKE OFF YOUR INDUCTANCE COIL AND YOU HAVE A FIRST CLASS RECEIVING OUTFIT.

WHAT IT CONSISTS OF

Our Professional Wave Meter consists of two standard and accurately wound inductance coils on a seasoned and polished mahogany form having two neat separable connectors conviently mounted for connections to either of the coils. This form is also called the exploring coil. When not in use it sets on a handy peg on the polished mahogany base. For connections we supply a 5 ft. silk cord. The detector is our standard No. 9701 RADIOCITE DETECTOR whose sensitivity is so well known that it requires no further mention. The condenser is our accurate and never varying No. 9241 that is as near perfect as a condenser can be made. All are mounted on a beautiful hand rubbed piano finish mahogany base that will be an ornament to any station. The entire instrument rests on soft rubber feet for extra insulation. The directions that we supply are as complete as it is possible to make them and yet are so simple that they require no expert or trained user to get perfect results with the instrument. For readings we supply an accurate plotted curve that is of course absolutely essential. Altogether every part is of very high grade and assembled by expert mechanics so it will last and always be accurate and reliable.

OPERATION:

Do you want to find out what your emitted wave is? Simply bring the standard inductance near your sending helix or oscillation transformer. Move your condenser needle to the position where signals come in loudest in the receiver. Note the reading on your condenser and look for that reading on your curve **which immediately tells you the wave length in meters,** without lengthy mathematics. To read the wave length of an incoming wave bring the exploring coil close to your tuning coil or loose coupler and follow the same procedure.

Accurracy is guaranteed within 3 per cent.; sufficient for all commercial needs and surely for all amateur purposes.

Remember we were **not** the first to produce a wave meter, but we are the last. We have profited by the mistakes and experience of others and can therefore assure you of the best at the lowest price.

For receivers we advise the use of any of our better grade wireless receivers, but any good wireless receiver will do excellent work. Receivers are not supplied with this wave meter.

Is your station up-to-date? If not, bring it up-to-date by getting our Professional Wave Meter at once.

No. 4488 "Electro" Professional Wave Meter, complete..... **$16.00**
Size 7x14x6 in. Shipping weight 10 lbs.

Gentlemen:— **Jersey City, N. J.**

Am just after receiving my Detector and Buzzer and am very much pleased with both, especially the Detector.

ANDREW SCHMIDLAPP.

The "Electro" Radiotone

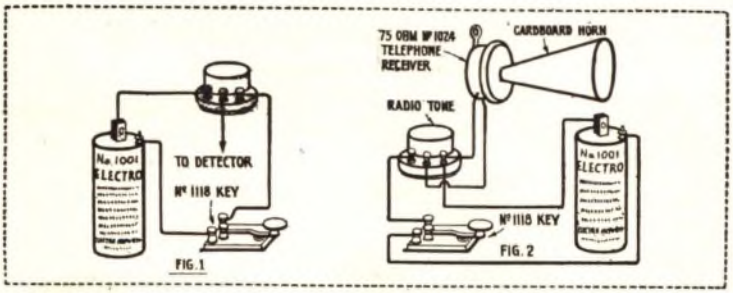
HIGH FREQUENCY SILENT TEST BUZZER

This instrument gives a wonderful high pitched MUSICAL NOTE in the receivers, impossible to obtain with the ordinary test buzzer. The RADIOTONE is built along entirely new lines; it is NOT an ordinary buzzer, reconstructed in some manner. The RADIOTONE has a single fine steel reed vibrating at a remarkably high speed, adjusted to its most efficient frequency at the factory. Hard silver contacts are used to make the instrument last practically forever. There is nothing to get out of order—for there are no set screws, no adjusting screws, which in themselves proclaim an instrument as unperfected.

Yes, the RADIOTONE is **SILENT.** In fact, it is so silent that you must place your ear almost on top of it to hear its beautiful musical note. If you have to adjust your detector you appreciate just what this means. Nearly all test buzzers on the market to-day, scream so loud that you hear them 15 feet and more away.

No. 1800

How can you adjust a detector, when you hear TWO SOUNDS, one outside of the phones, the other inside of the phones? Nothing like this with the RADIOTONE. You hear the sound where it belongs—in the phones.



How do we do it? First the steel reed is so constructed that it cannot possibly create a loud sound in the air surrounding it. Then by accoustically insulating the entire electrical unit, and by providing a heavy felt base for the instrument, all outside sound is done away with.

The casing is made of hard rubber composition and there are three binding posts.

Then, too, a big feature—COMPACTNESS. The RADIOTONE is small and takes up but very little room. Just the same, we wager you will give it a prominent location on your instrument table, because it really is an exceptionally beautiful instrument, one you will be proud to show to your most critical friends.

As already mentioned the RADIOTONE is equipped with an exceptionally heavy green felt sub-base.

The RADIOTONE works best on a single dry cell. Two cells may be used, but we do not recommend this. The RADIOTONE can be operated continuously if desired, it will POSITIVELY NOT STICK.

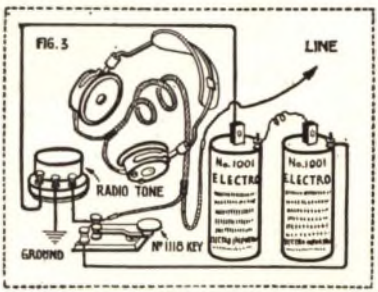


Fig. 3

RADIOTONE LEARNER'S OUTFIT

No instrument lends itself more readily towards learning the telegraph codes than the RADIOTONE. An ordinary telegraph sounder outfit is worse than useless to learn the wireless codes because every time you depress the key and hold it down no sound is heard but the first click. It does not resemble in the least the sounds heard in a set of phones when receiving a Radio message.

The "Electro" Radiotone—(Continued)

The RADIOTONE, however, lends itself admirably to this purpose. It gives an **exact reproduction** of a Radio message and you can readily learn the codes in less than thirty days with only a little persistent practicing.

Fig. 2 shows what a real learner's Radio Code Outfit consists of: You require first the RADIOTONE; second a dry cell; third, our No. 1024 Receiver (75 ohms); fourth, our No. 1118 Telegraph Key; fifth, our No. 10010 Condenser. A few extra receivers may be connected as shown by dotted lines, in case several of your friends are learning the code with you. Don't forget: in all cases the condenser MUST be used.

If you wish comfort, order one of our headbands and an extra receiver, to keep the receivers to your ears.

INTERCOMMUNICATING RADIOTONE OUTFIT

Fig. 3 shows another suggestion for a modern telegraph line, to practice telegraphy between two chums' houses.

As will be noted but one metallic line wire is required. The return circuit may be the ground as indicated. Each station consists of one RADIOTONE, one or more dry cells (according to distance); one of our No. 1118 telegraph keys; one No. 10010 Junior Fixed Condenser; two No. 1024—75 ohm receivers (of course a single receiver may be used); one No. 8075 5-foot receiver cord, and one headband.

It will be noted that no current flows when the keys are at rest, and no switches are required. A call bell is not required as the phones will sing so loud that the tone may be heard ten feet away.

As a rule young experimenters get little pleasure from the old-fashioned sounder telegraph sets, because they are too noisy and parents usually object to the incessant **rat-tat-tat.**

No such objection to the RADIOTONE outfit. It is silent for all, except for yourself and your chum.

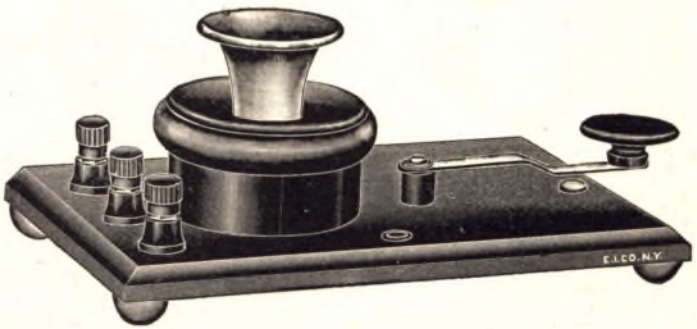
Size of instrument over all 2¾ x1⅝ in.

No. 1800 The "Electro" RADIOTONE, as described..... **$1.50**
Shipping weight 1 lb.

THE "ELECTRO" CODOPHONE

(Patents Pending)

This instrument imitates LOUDLY and audibly Radio Signals. It is used in learning the Morse or Continental Codes. It replaces the buzzer practice outfit, as well as the regular telegraph sounder outfit.



No. 1999

What this remarkable instrument is and does.

The "Electro" **Codophone** is positively the only instrument made that will imitate a 500 cycle note exactly as heard in a Wireless receiver, so closely and so wonderfully clear, that Radio operators gasp in astonishment when they first hear it. And you need no receivers over the ears to hear the imitation singing spark, which sounds for all the world like a high-pitched distant powerful Radio Station. No, the loud-talking receiver equipped with a horn, talks so loud that **you can hear the sound all over the room,** even if there is a lot of other noise.

THAT'S NOT ALL. By lessening or tightening the receiver cap, a tone from the lowest, softest quality, up to the loudest and highest screaming sound can be had in a few seconds.

FURTHERMORE, this jack-of-all-trades marvel, can be changed instantly into our famous silent Radiotone test buzzer, simply by replacing the metal diaphragm with a felt disc, **which we furnish with every instrument.**

FOR INTERCOMMUNICATION. Using two dry cells for each instrument, two **Codophones** when connected with one wire and return ground, can be used

The "Electro" Codophone—(Continued)

for intercommunication between two houses one-half mile apart. Any one station can call the other, no switches, no other appliances required. No call bell either, the loud-talking phone takes care of this.

AS AN ARMY TYPE BUZZER. Last, but not least, **two Codophones** with two 75 ohm receivers can be used to converse **over miles** of fine (No. 36 B. & S. Wire) so fine that no one can see the wire. Or you can use a long metallic fence and the ground, or you can communicate over **your 110 volt line up to several miles, using no wires, only the ground.**

Full directions how to do all this furnished with each instrument.

One outfit alone replaces the old-fashioned learner's telegraph set, consisting of key and sounder, which is all right to learn the telegraph code but not the wireless codes.

The "Electro" **Codophone** is a handsome, well made instrument, fool proof, and built for hard work. Contacts are of hard silver ⅛ inch in diameter, that will outlast the instrument. Horn and housing is of metal throughout, horn and key lever nickel plated and buffed.

There is also a neat code chart and full directions **enabling any intelligent young man or girl to learn the codes within 30 days,** practising one-half hour a day.

No. 1999 The "Electro" Codophone, as described, complete. Size: 6¾x3x2⅝" **$2.75**

Shipping weight 3 lbs.

"Electro" Loud-Talker

No. 205

We present herewith two little instruments for which we have had a long and persistent demand.

These outfits have been gotten up solely for the Experimenter and for this reason we are selling them "Knocked Down." In other words, the instruments **come all ready for you to assemble,** all the parts, screws, nuts, washers, etc., being furnished. Complete directions how to assemble accompany each set. With a pair of pliers and a screwdriver, the outfit can be readily put together in less than twenty minutes.

The most important point is that the telephone receiver spool comes already wound complete, and the Experimenter will, therefore, not need to wind his own spool.

The outfit when assembled comprises a highly sensitive **CARBON BALL MICROPHONE** with carbon diaphragm of exactly the same type as is used with our **Detectaphone.**

The "Back Plate" which holds the carbon balls has five cup shaped polished depressions, each accommodating about twelve to fifteen of the special carbon balls furnished in a bottle.

The receiver is our No. 1024 style with the difference that no magnet is used in the same for the reason that the function of this instrument is electro magnetic, the same as all loud-talking phones. The spool is wound with special enameled wire for five ohms, standard with our **Detectaphone.**

This instrument works best on two dry cells, and particular attention is called to the fact that in order to work, the loud-talker requires a fairly heavy current and for that reason thick wires must be used for connecting the transmitter with the loud talker. If this is not done, the voice will be weakened considerably. If no heavy wire is at hand, more batteries must be used to compensate.

With this instrument **no switch is required;** if one is through talking all that is necessary is to lay the transmitter **face up,** which automatically cuts out the current.

USES: This instrument can be used to transmit phonograph music from one room to another; used as a Detectaphone; as a Radio Amplifier; as a telephone extension (by placing the regular telephone receiver against the sensitive transmitter); as a "Howler" (Whistling Micro-telephone); dictating to stenographer at a distance; for salesmen to talk "through" window (Loud-Talker outside in street, microphone transmitter for salesman, talking into same); for restaurants for talking to the chef, and a hundred other uses. Many young experimenters are developing a lucrative business selling this appliance to various merchants at a good profit.

Outside of the two instrument parts, one three-foot cord is furnished with the sensitive microphone as shown. Blueprint, instructions, etc., are furnished.

No. 204 "Electro" Loud-Talker Outfit Parts "Knocked Down," complete **$2.10**

No. 205 "Electro" Loud-Talker Outfit, same as above except that it is already assembled and tested at factory. Set complete..... **$4.50**

Shipping weight 1 lb.

The Electro "Government" Phones

Highest Precision Phones Made in the United States

(Adopted by several Governments)

No. 6666 (Patent Pending)

CONSTRUCTION:

The magnets are wound with No. 43 B. & S. ENAMEL COPPER WIRE. The magnets are a great deal more powerful, being made of the best imported Swedish tungsten steel, which we guarantee. The Magnetic power of this receiver is the highest of any and this accounts for the remarkable sensitivity and long distance receiving power of these wonderful phones.

We lay particular stress on the magnets of this receiver and we guarantee that the magnets will not lose their strength for two years. We realize a **wireless telephone receiver is not better than the strength of its magnets,** hence we have extended all our energies towards producing something that can be relied upon, practically indefinitely.

While this headgear is the lightest on the market to-day we have not sacrificed its efficiency, as may be easily ascertained when testing out the sets. **Each receiver is wound to 1,500 ohms, giving 3,000 ohms per set.**

These phones as well as all our others are now equipped with our famous **"Gernsback Patent" Common-Sense Headbands.**

Our Mr. H. Gernsback had been experimenting for years before this extraordinary simple as well as efficient headband was finally developed.

Greatly annoyed by headbands that would not fit the head permanently, that would not hold the receivers tight to the ears, that caught your hair, that were heavy and hurt your head, he developed the present band that has none of these faults.

It does all this and then some:

1° Will not catch and tear your hair; as ALL doubleband headbands do.

2° Utmost comfort assured—molded soft rubber pad does it.

3° Fits any head instantly. Can be shortened or lengthened simply by unloosening chucks.

4° Lightest band on the market—weight 5 oz.

5° Fits the receivers to your ears perfectly and keeps them there excluding all outside noises.

6° Band on head, is almost invisible, consequently not unsightly as are ALL others.

7° No metal touches your head—no shocks, no leakage.

8° Has less parts than ANY other band, consequently gives less trouble.

9° The powerful Hard Brass spring wire keeps the phones pressed to your ears, with an even pressure ALWAYS. You can't possibly shake the phones from your head.

10° Beautiful hand-buffed nickel finish. Sanitary soft rubber pad.

Until you have worn a **"Gernsback Patent" Common-Sense Headband** you don't know what phone comfort is.

Other points of superiority: Light rubber cap, highest insulation. The 'phones will fit the ear snugly to exclude all external noise. We use a five-foot cord with two tips.

No. 6666 Electro "Government" Phones, as described **$9.00**

Shipping weight 2 lbs.

No. 6667 Single Receiver (no band or cord), 1,500 Ohms **$4.00**

Shipping weight 1 lb.

The "Electro" Amateur Wireless Phones

We herewith present our amateur type wireless phones which are superior to anything as yet. These phones are wound to 1,000 ohms each receiver and are wound with **No. 40 enamel copper wire,** have **double pole magnets,** which are extremely powerful and made especially for wireless.

These phones as well as all our others are now equipped with our famous **"Gernsback Patent" Common-Sense Headbands.**

The receivers fit the head perfectly. The weight is 12 ounces. With this set we furnish a finely finished five-foot bifurcated green cord with nickel-plated tips.

No. 8070 Two Thousand Ohm Phones, as described **$6.00**
Shipping weight 2 lbs.

No. 8071 Receiver only (1,000 Ohms), as furnished with No. 8070 (double pole) **$2.45**
Shipping weight 1 lb.

No. 8077 "Gernsback Patent" Double Headband (fits our No. 1024, 1024a, 8071) **$1.40**
Shipping weight 1 lb.

No. 8075 Five-foot bifurcated green cord, each **$0.75**
Shipping weight 4 oz.

Read about construction and advantages of our COMMON-SENSE HEADBANDS on preceding page.

2,000 Ohms

No. 8070 (Patent Pending)

THE "ELECTRO" "JUNIOR" Wireless Phones

These phones are exactly the same as our No. 8070 described above with the exception that instead of using No. 8071 double pole receivers, we furnish 2-1,000 ohm No. 1024a single pole receivers. While these are single pole receivers, it should be borne in mind that in connection with silicon or galena detectors, such phones will almost prove as sensitive as the No. 8070 kind. These phones are marvelously sensitive and will give a click when the two moistened tips are contacted with another piece of metal,—a test which very few high priced receivers will stand.

These phones as well as all our others are now equipped with our famous **"Gernsback Patent" Common-Sense Headbands.**

Until you have worn a **"Gernsback Patent" Common-Sense Headband** you don't know what phone comfort it.

The "Electro" Junior wireless phones consist of two receivers. "Gernsback Patent" swivel soft rubber pad headband and five-foot bifurcated cords are furnished with this set.

No. 8090 2,000 ohm Junior Wireless Phones, as described per set.. **$5.00**

Shipping weight 2 lbs.

2,000 Ohms

No. 8090 (Patent Pending)

The "Electro" 1000 Ohm Single Pole Receiver

It isn't often that we can offer you so valuable a piece of apparatus at so little money. Here is a case in point.

Our No. 1024A is a carefully designed wireless receiver of the single pole type and one which with certain types of detectors such as the silicon, galena, carborundum, etc., will give excellent results. This is not a cheap telephone receiver wound to a high resistance and then called a wireless receiver, but it was actually designed for the purpose we advertise.

No. 1024A

To make you fully appreciate what this phone is, let us tell how it is made and you judge for yourself.

The shell is of polished hard rubber composition, light strong, and durable. The earpiece is of the same material and designed to be comfortable yet exclude external noises. Shell fits our regular headband. The magnet is a very fine special tungsten alloy magnet steel, very ingeniously shaped. It will retain its magnetism under all conditions, short of abuse.

The winding is a full tested 1000 OHMS IN No. 40 B. & S. BLACK ENAMELED WIRE. It is wound on a specially soft Swedish iron core. Every receiver is tested for resistance and insulation. Diaphragms are of selected stock and hand sorted.

After reading this description do you doubt that we are proud of our No. 1024A Receiver? You will never regret buying one or a pair. Their sensitivity far excels many double pole receivers. Size 2½x1½ inches.

No. 1024A Receiver 1000 ohms as described. Price..... $1.75

Shipping weight 1 lb.

The "Electro" Double Pole Receiver

No. 1030

The double pole receiver No. 1030, which we illustrate here is of course more powerful than the No. 1024 type. The No. 1030 receiver is wound to 75 ohms and has two powerful magnets and double poles. This telephone receiver is suitable for all kinds of telephone work where a powerful double pole receiver is wanted and is also found of great use in wireless telegraphy where a low resistance receiver is desired.

Of course, it can be used in the same way as our No. 1024, but in all cases it will give better results just as you have a right to expect for it is double pole and stronger.

One of the uses many of our customers have been putting it to is in the making of microphonic telephone and wireless amplifiers using it as a second step up from the transmitter used. In that case a high grade low resistance receiver is required and high grade receivers are the only kind we make.

It can also be used as a second receiver for regular telephones in that way providing one receiver for each ear. Try it once and you will always have it on your phone. Keeps out outside noises and lets you hear on both ears as nature intended. Simply connect it in parallel to your present receiver using one of our single receiver cords.

Sizes 2½x1¼ inches.

No. 1030 75 Ohm Receiver, as described. Price..... $1.40

Shipping weight 1 lb.

When ordering any of our Phones, don't forget that we will gladly send you FREE with our compliments Lesson No. 2 **"The Principles of Magnetism"** or Lesson No. 9 **"Receiving Apparatus"** or Lesson No. 18 **"The Wireless Telephone"** of our famous "WIRELESS COURSE."

Everything worth knowing about Receivers is explained in these lessons.

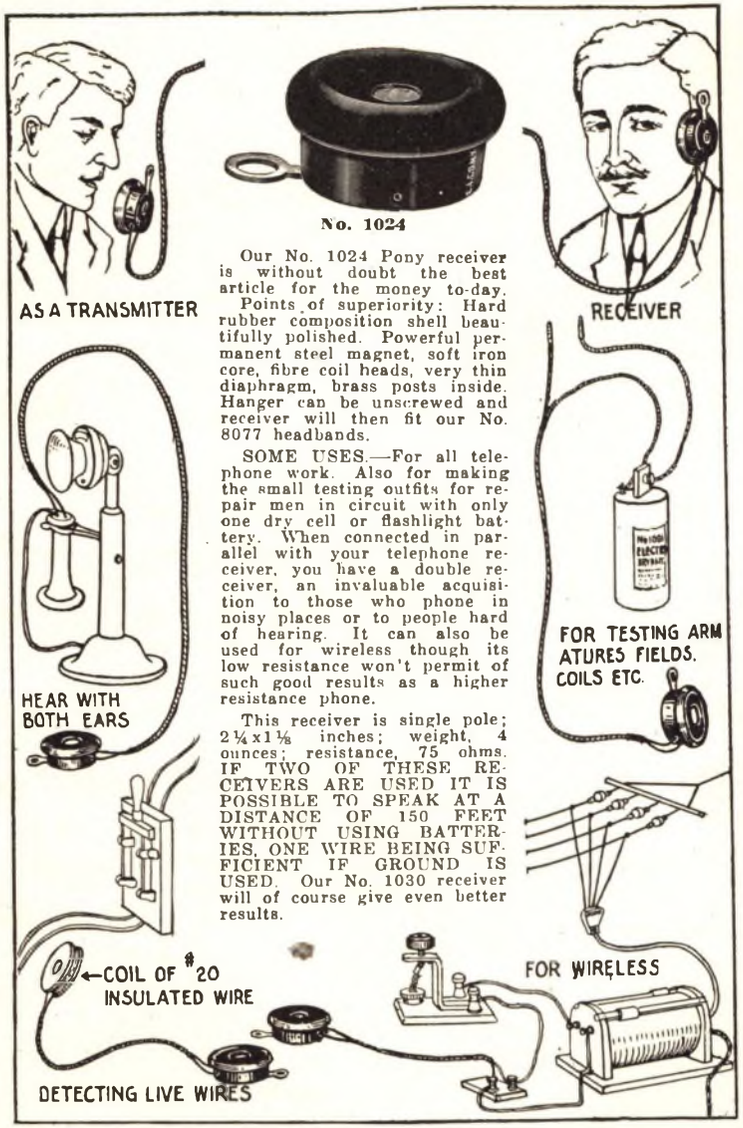
Just attach your free coupons to your order. For further information consult free Wireless Course offer in this catalogue.

Gentlemen:— **Saratoga Springs, N. Y.**

I have just received your reply concerning the wire I wound on that Magneto generator and was exceedingly pleased to note your kindness in such a thing as this. I bought considerable goods from you and they were always satisfactory in both quality and price.

CHAS. M. COGAN.

SEVENTY-FIVE OHM PONY RECEIVER



Our No. 1024 Pony receiver is without doubt the best article for the money to-day.

Points of superiority: Hard rubber composition shell beautifully polished. Powerful permanent steel magnet, soft iron core, fibre coil heads, very thin diaphragm, brass posts inside. Hanger can be unscrewed and receiver will then fit our No. 8077 headbands.

SOME USES.—For all telephone work. Also for making the small testing outfits for repair men in circuit with only one dry cell or flashlight battery. When connected in parallel with your telephone receiver, you have a double receiver, an invaluable acquisition to those who phone in noisy places or to people hard of hearing. It can also be used for wireless though its low resistance won't permit of such good results as a higher resistance phone.

This receiver is single pole; 2¼x1⅛ inches; weight, 4 ounces; resistance, 75 ohms. IF TWO OF THESE RECEIVERS ARE USED IT IS POSSIBLE TO SPEAK AT A DISTANCE OF 150 FEET WITHOUT USING BATTERIES, ONE WIRE BEING SUFFICIENT IF GROUND IS USED. Our No. 1030 receiver will of course give even better results.

No. 1024 Pony Receiver, 75 ohms, as described..... $0.80

Shipping weight 1 lb.

Minerals and Crystals

When you buy a mineral or wireless crystal you are interested in only a very few things. First you want to know value. EVERY CRYSTAL SOLD BY US IS TESTED FOR SENSITIVITY. Don't pay more for so-called **"special"** and **"extra"** grades. Now for quantity. Note that we sell by weight wherever possible. When we say you get an ounce, you get an ounce, **not a piece.** This means a big saving to you. Now on delivery. We carry more wireless minerals in stock than any other concern in the world. **We guarantee prompt delivery.** Being the largest buyers and sellers of this class of material we are naturally offered the pick of the world. In that way by buying your Crystals and Minerals from the E. I. Co., you buy the best tested goods that are found at the lowest possible prices. Your first order will convince you of our claims.

BORNITE

Used a great deal abroad. Can be used with a phosphor bronze contact wire, or with zincite. Marvelously sensitive.

No. 2416 Bornite, per oz..... **$0.45**
Shipping weight 2 oz.

GALENA

No. 2504

This mineral is thought by many to be one of the most sensitive discovered so far. Used to best advantage by having a fine phosphor bronze or brass wire spring, size about No. 26 B. & S., press **very lightly** on the Galena. We carry only a specially selected cubic crystal grade.

No. 2504 Galena, per oz..... **$0.25**
Shipping Weight 2 oz.

COPPER PYRITES

Very sensitive and very stable. Even sensitiveness along whole surface. Not easily jarred out. Use phosphor bronze contact wire. **GUARANTEED 100 PER CENT. PURE.**

No. 2419 Copper Pyrites, per oz..... **$0.45**
Shipping weight 2 oz.

MOLYBDENITE

This new substance is the only one discovered so far which does not get out of adjustment, when used in a sensitive Detector, and when placed near a sending gap. Most substitutes suffer a great deal from strong sending currents, but it is impossible to damage the adjustment of the Molybdenite Detector, and a heavy discharge does not affect it. Molybdenite proves quite sensitive when distant stations are to be picked up.

No. 9210 Molybdenite, per oz. **$0.70**
Shipping weight 2 oz.

CARBORUNDUM

Specially selected for experimenting with the Carborundum Detector. Quite sensitive. Used by commercial companies for many years.

No. 9308 Carborundum, per oz..... **$0.40**
Shipping weight 2 oz.

ZINCITE

The aristocrat of all wireless minerals. Too well known and too far famed to praise it here. **Undoubtedly the most sensitive of all crystals. GUARANTEED 100 PER CENT. PURE.**

No. 2417 Zincite, per oz..... **$1.75**
Shipping weight 2 oz.

No. 2418 Zincite, ¼ oz..... **$0.45**
Shipping weight 1 oz.

SILICON

There are two kinds of this material: Silicon crystals and fused Silicon. The former, manufactured in this country, is absolutely unfit to use; the latter, imported by us, is the only kind that should be used. It comes in chunks and somewhat resembles graphite. It is very hard and extremely brittle.

No. 9209 Silicon, per oz..... **$0.45**
Shipping weight 2 oz.

No. 9209a Silicon, ¼ oz..... **$0.20**
Shipping weight 1 oz.

IRON PYRITES

Our iron pyrites is all imported Spanish stock that may be used for years without deterioration. Very sensitive.

No. 2505 Iron Pyrites (Ferron), extremely sensitive, per oz. **$0.40**
Shipping weight 2 oz.

PEROXIDE OF LEAD

No. 2506 Peroxide of Lead, Compressed tablets, ea. **$0.40**
Shipping weight 2 oz.

MINERAL SETS

No. 2502 Zincite and Copper Pyrites (Perikon) per set **$0.95**
Shipping weight per set 4 oz.

MINERAL ASSORTMENT

Consisting of generous pieces of each of the nine minerals and crystals shown on these pages. An excellent assortment for the wireless experimenter. Each mineral in a separate box. No Radiocite supplied.

No. 2346 Mineral Assortment (9 minerals)..... **$2.00**
Shipping weight 1 lb.

RADIOCITE

TESTED FOR SENSITIVITY

The most wonderful of all Wireless Crystals

Use Radiocite in your detector and then forget it

The Wireless Crystal that DON'T Jar Out

RADIOCITE is the most wonderful of all radio crystals. It is more sensitive than Galena and far more sensitive than ANY other crystal or mineral. RADIOCITE is a specially selected grade of a rare crystal chemically treated.

The mineral that looks like liquid gold. It has a highly, wonderfully polished surface giving it a perfectly burnished appearance. This crystal is now in use by several governments, and is conceded to be the most satisfactory of all. It is used with a medium stiff phosphor bronze spring, or with a stiff silver wire, about No. 30 B. & S. Gauge. One of the important features of RADIOCITE is that it does not jar out easily. Each crystal is **tested out individually for sensitivity** and guaranteed. RADIOCITE comes packed separately in a box, wrapped, and full directions for use accompany it. RADIOCITE can be mounted like any other crystal; it may be clamped between springs, but it is best to set it in **Hugonium** soft metal.

No. 3939 Generous piece of tested RADIOCITE. Prepaid $0.60

Shipping weight 2 oz.

The one up-to-date mineral which every amateur must have.

Cleveland, Ohio.

Electro Importing Co.,
233 Fulton St.,
New York.

Gentlemen:—

Your piece of radiocite received in excellent condition and am glad to inform you that it is without doubt the best mineral ever put on the market. It has any silicon or galena beat forty different ways and back again. I have tried it out on an indoor set consisting of a piece of bare copper wire 20 feet long, a gas pipe ground, a forty cent detector and a pair of 2000 Ohm phones. This set was used merely for the purpose of testing Radiocite and the results obtained "knocked me off my feet." I have not yet tried it on my big set but if it works as good as it did on the small set—why, I'll have **"some"** set.

Yours truly,
L. PLACEK,
316 W. 84th St.,
Cleveland, O.

Wireless Code Chart

15c

This code chart has been brought out by us pursuant to a large demand by our enthusiastic wireless friends, who like to have the three codes, the Morse, Continental and Navy, before their eyes when sending or receiving messages. This is truly a beautiful chart, being arranged in such a manner that a letter or figure can be "spotted" instantly, without the eye searching for precious seconds. The dots and dashes are very heavy and large and can easily be read 10 feet off. There are, in addition, a list of abbreviated numerals as used by Continental operators; also the usual wireless abbreviations used by most of the fraternity.

The chart measures 9x11 inches and is printed on stiff cardboard. It will make a fine addition to any wireless station and it will make the latter look businesslike.

Comes in black on white background only.

The latest feature of this article is that on the back we now have the International Morse Code and conventional signals, also the list of abbreviations to be used in radio communication and as adopted by the International Radiotelegraphic Convention. Room is also left for a private code if desired.

No. 2501 Wireless Code Chart..... $0.15

By mail, extra **$0.03.**

No. 2501

The "Electro" Rotary Potentiometer

(NON-INDUCTIVE). PATENTED FEB. 28th, 1911

No. 9255

There are several unique features incorporated in our instrument which above all takes up a minimum of space, being only 4 in. diameter, the thickness of the main body being only ⅝ in.

We use in this instrument a high resistance carbon-graphite rod and the resistance of this instrument is approximately 300 ohms, as experience has taught us that for wireless use only about one hundred to two hundred ohms are generally used, we do not furnish extra rods for this new instrument and 300 ohms will cover all the wants of the operator and experimenter. The most important part is that the movement is rotary and not straight on a long rod, as used in our old style instrument. It will be realized that this is a great advantage, as the rotary movement for wireless instruments comes into force more and more every year. The adjusting knob carries a pointer which moves over an empirical scale which is a great advantage to the operator as he will always know just how much current to give his detector and will easily remember the proper regulation.

All the insulating parts of the instrument are made of molded hard rubber which makes it the most attractive apparatus of this sort ever placed on the market. There is nothing to shrink or warp on this instrument and the construction is beyond criticism. The connection is positive. The instrument is always ready and there is nothing to wear out or to be replaced. The carbon-graphite rod is embedded in the hard rubber and it will not break even if the instrument should be dropped. The pointer is nickeled and polished. The scale is molded into the hard rubber. The diameter of the rubber thumb handle is 1 inch. An ideal instrument for use with the Radioson detector.

Size over all 4x1½ in.; weight four ounces. Connections are the same as for any potentiometer. Instrument is shipped ready for instant use.

No. 9255 "Electro" Rotary Potentiometer (patented) **$2.75**
Shipping weight 1 lb.

Telephone Cords

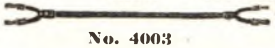
No. 8075

5 FOOT GREEN COTTON BIFURCATED CORD. This cord is used on our No. 8070 telephones; with 2 nickel tips and 4 loop connections. (See illustration.)

No. 8075 Each **$0.75**
Shipping weight 2 oz.

No. 6669 5 FOOT SILK BIFURCATED CORD, as used on our No. 6666 receivers with 2 tips and 4 loop connections (Shipping weight 2 oz.). **Each** **$0.85**

No. 4005 3 FOOT TELEPHONE CORD with 2 metal tips and 2 loop connections to fit No. 1024a, No. 8071 Receivers. (Shipping weight 2 oz.). . **Each** **$0.45**



No. 4003

No. 4003 3 FOOT TELEPHONE CORD with 4 metal tips, well finished throughout. (Shipping weight 2 oz.) **Each** **$0.45**

No. 6083 RECEIVER DIAPHRAGM (Ferrotype). Each **$0.10**
Shipping weight 1 oz.

The "Electro" Ground Clamp

No. 10003

The most ingenious clamp ever invented. Invaluable to every wireless experimenter.

"A wireless outfit is not better than its weakest part"—which is usually a poor ground. Fifty per cent. of all wireless troubles are due to a poor ground. Our new Ground Clamp is, of course, not used only for wireless work, but for telephone, bells, telegraph and lighting work; in fact, everywhere where a good ground on which YOU CAN DEPEND is desired.

It fits any gas or water pipe. A tinned lug is provided to attach wires. The contact-band of our clamp (9/16 in. wide) is of pure copper with the lug tin plated.

No. 10003 "Electro" Ground Clamp, as described. Each **$0.20**
Shipping weight 4 oz.

"ANTENIUM" AERIAL WIRES

For a number of years we sold Aluminum wire for aerials, but finally decided to discontinue its sale for several good reasons. To begin with, it is impossible to obtain pure aluminum wire. The commercial aluminum composition wire is notoriously weak and ruptures at 75 lbs., for the No. 14 size. A sharp bend causes it to break almost immediately; it cannot be soldered; it **always** makes poor contact, on account of its natural oxide film. We had so many complaints on aluminum wire that we decided to develop an aerial wire that did not have any of the above objections. We finally found it in our present ANTENIUM wire, which not only has none of the objections cited, but has a great many excellent points making it highly desirable for aerials.

ANTENIUM wire is a 30 per cent. copper wire of enormous strength, even surpassing phosphor bronze in strength. Our size wire stands a rupture test of 330 lbs., against 75 lbs. of Aluminum wire. It can be soldered like ordinary copper wire. It can be bent back and forward and is so tough that it cannot be broken, except with difficulty. It makes excellent contact and does not oxidize readily. **It is cheaper than aluminum wire and three times cheaper than copper wire.**

In appearance it is exactly like copper wire, as a matter of fact it cannot be told apart from copper wire.

It has about 50 per cent. less skin resistance than Aluminum wire.

100 feet of our ANTENIUM wire costs $0.65. One pound No. 14 B. & S. Aluminum wire has 200 feet and costs $1.50. Thus ANTENIUM wire is cheaper than the former and is incomparably better. A 600-foot stretch with ANTENIUM wire is an every-day occurrence **and the heaviest sleet will not damage the aerial.** We carry only this one size, which as experience shows is the only kind to use. Heavier wire for aerial is not required as ours is strong enough for the greatest stretch practical.

No. 9219 ANTENIUM aerial wire, per hundred (100) feet..... $0.65

Comes in 100 foot coils. Not less than 100 feet sold.
Shipping weight, per 100 feet, 2 lbs.

ANTENNA INSULATORS

The "Electro" Junior Strain Insulator

No. 9461

For small aerials, used principally for receiving, a small but highly efficient insulator is desirable. In view of the fact that our Ball Antenna Insulators appear to some to be too large for this purpose the present insulator has been developed.

It consists of a small but heavily and deeply ribbed brown glazed porcelain, whose surface area, due to the thread, is twice as great as it would be if it were perfectly smooth. In other words it is as efficient as a cylindrical insulator of twice its length and more than twice its weight. It has a protected and smoothly turned hole in each end for wires.

Another advantage of this type of insulator over the plain ridges or corrugated insulator is that if used at an angle it conducts any rain or water down to a drip point, at the lowest end rather than holding it in a puddle between the ridges, which reduces the insulating qualities.

Size over all 2¾ in., diameter 1¼ in., net weight each 3½ oz.

No. 9461 "Electro" Junior Strain Insulator..... $0.16

Shipping weight 3 lbs. per eight.

The "Electro" Ball Antenna Insulator

No. 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 is of the highest order and greater than similar insulators. It will hold 35,000 volts.

All the grooves are undershot and this feature is responsible for the fact that the new insulator **"sheds the water like a duck."**

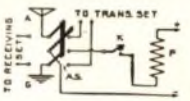
We recommend one insulator on each end of an aerial strand for receiving. For sending there should always be two of the insulators in tandem; this will afford sufficient insulation up to 1 K. W. transformer.

No. 10007 "Electro" Ball Insulator, as described. Each..... $0.25

Shipping weight 1 lb.

The "Electro" Antenna Switch

As illustration shows this is a three-pole double throw switch. As will be seen the throw to change the switch over is only about 1 inch, making it almost instantly. The two end blades are at an angle of 140 degrees and the construction of this switch is unlike others. By referring to the diagram it will be seen that when the switch is thrown for receiving the primary of the coil is disconnected. If accidentally the sending key should be touched it will be impossible to damage the receiving instrument, as the coil can under no circumstances operate. The diagram shown is standard, but of course many other connections can be devised by the experimenter. All metal parts are pure copper.



No. 8100

This switch will stand the discharge of a 4-inch coil without jumping across. It can be used in connection with a transformer up to 5 K.W. All copper parts are very heavy.

The switch can be screwed down on any table or wall. Size of base 7x7 inches, height over all 4 inches, when lever is down; when lever is up, height is 5 inches.

No. 8100 "Electro" Antenna Switch, as described. Shipping weight 3 lbs. **Price**..... **$4.00**

The "Electro" Wireless Lightning Switches

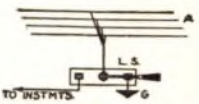
100 AMPERE

No. 1616

The Underwriters' Rules in all cities now call for lightning switches, wherever aerials are erected on top of buildings.

The rules prescribe either 250 or 600 volt, single pole, double throw switches, which must be fastened outside of the building. A No. 4 B. & S. wire is specified in all cases, to run from the aerial to the switch and thence to the ground, on the outside of the building.

The aerial should always be grounded when not in use, to protect the house from lightning. Connecting diagram is given herewith. Our switches are of the standard type. All metal parts are of pure copper, base is slate. Strong, durable handle is furnished.



No. 1616 measures 14x2½x3 inches over all. Its carrying capacity is 100 amperes.

No. 1617 measures 17x3x3 inches over all. Its carrying capacity is 100 amperes.

DON'T USE 60 AMPERE SWITCHES.

No. 1616 250 Volt Lightning Switch. Shipping weight 6 lbs..... **$4.00**

No. 1617 600 Volt Lightning Switch. Shipping weight 7 lbs..... **$6.00**

Ground Wire for Lightning Switches

(Approved by the Underwriters.)

This wire has a soft iron core while the outside is pure SOLID copper. The copper forms about one-third of the entire wire. Only one size carried, No. 4, which has 9 feet per lb.

No. 4004 Size 4 B. & S. soft copper clad wire, per foot..... **$0.08**
Shipping weight 2 lbs. for each 10 feet.

Galvanized Stranded Guy Wire

This wire is used as guy wire to secure the aerial mast. It is made of 6 No. 18 B. & S. wires twisted and is well galvanized to prevent rust. We do not recommend thinner wire, as it is not strong enough to withstand storms, etc. This wire is furnished in coils measuring 100 feet.

NOT LESS THAN 100 FEET SOLD.

No. 1526 Galvanized iron wire, per 100 feet..... **$0.55**
Shipping weight, 3 lbs.

NOTE—Don't use a single solid wire for guying your mast.

Bamboo Spreaders

No. 6527

These bamboo rods are 8 ft. long and taper slightly from 1¼ and 1½ in. at the butt. They are very strong and light. **Must be sent by express** unless cut in 2 ft. pieces.

No. 6527 Bamboo Pole, 8 ft. long. Price each.. **$0.70**
Shipping weight 2 lbs.

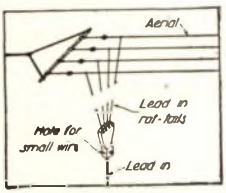
The "Electro" Antenna Connector

NO MORE SOLDERED AERIALS. NO MORE LOOSE CONNECTIONS

We present herewith the latest useful device to those erecting wireless aerials of any size; it is in the form of a terminal connector block for the lead-in or rat-tail juncture. The wiring diagram given indicates how the connector is employed to properly join the downcoming leads from the aerial to the lead-in wire, which may be No. 14 or larger. The larger the better. The rat-tail leads are made of No. 14 wire or cable as used in the aerial flat-top.

The weak point in most experimental radio plants lies in poor joints of the aerial, especially where it joins the lead-in wire. This weakness is avoided by using The "Electro" Antenna Connector which assures perfect joints always.

No. 3339



This connector solves the poor joint problem easily, both in an electrical and mechanical sense. The connector is provided with four No. 8/32 screws at the top for the rat-tails; proper size holes for the wires being provided. Also the rat-tails may be clamped under the 8/32 screw head if preferred. It is always best to solder or sweat in the leads, but the screws here provided make it possible to effect a perfect joint between the lead-wires without soldering.

The connector is drilled with a large and small hole at the base to accommodate any wire from No. 14 to No. 4 solid B. & S. conductor. A heavy No. 14-20 screw clamps this heavy wire. The connector, if desired, may be covered with friction tape after installing it, although this is not absolutely necessary. The size of the "Electro" Antenna Connector is 2 in. high by 1¾ in. wide by ⅝ in. thick.

No. 3339 "Electro" Antenna Connector **$0.45**
Shipping weight 6 oz.

High Tension Cable

It is used in most all wireless stations, and can stand an enormous high secondary discharge. The wires used in the construction of this cable are made from soft drawn copper, covered with three and four separate rubber insulations. It is very flexible, and can be handled easily, especially for laboratory and portable purposes. It is an absolute necessity to lead the antennae (aerial) from the station out in the open air.

No. 1298

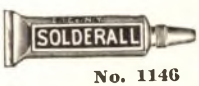
The 5 millimetre (diameter) size will stand the discharge of our 1 in. coil. The 10 millimetre size will stand the discharge up to a 4 in. coil.

No. 1297 High Tension Cable 5m/m Diam., per foot **$0.15**
Shipping weight 1 oz. per foot.

No. 1298 High Tension Cable 10m/m Diam., per foot **$0.20**
Shipping weight 2 oz. per foot. Not less than 5 feet sold.

Solderall

SOLDERALL is a wonderful solder and non-corrosive flux combined, in paste form, and contained in a collapsible tube, always ready for instant use. No acids, rosin or flux necessary.



No. 1146

All you have to do is to unscrew the cap from the nozzle of the tube, squeeze a little SOLDERALL on the parts to be soldered, and heat with a match, hot iron or torch, and the work is done.

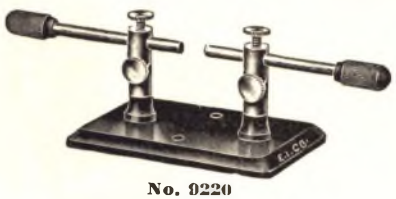
Large holes can be soldered (something impossible to do with other solders) by building a pyramid of SOLDERALL over the hole and then applying a match or torch at short intervals, so as to melt slowly.

Indispensable in the Home, Shop, Garage, Laboratories, for repairing Kitchen Utensils, Toys, Leaky Pipes, Tin Roofs, Automobile Parts, Instruments, Models, Etc., Etc.

Will be found of the greatest use by Electricians, Telegraph and Telephone Linemen, Plumbers, Gas Fitters, Automobilists, Motor Cyclists, Dentists, Physicians, Jewelers, Engineers, Campers and Sportsmen. Size of tube ¾ x 3¼ in.

No. 1146 SOLDERALL (Shipping weight 4 oz.) **Per tube** **$0.40**

The "Electro" Spark Gap



No. 9220

While our old style jump spark balls were well suited for short distances, for which purpose they were unmatched, the "Electro" Spark Gap is intended to do real hard work—even commercially for short distances.

The peculiar properties of a small spark gap make it particularly efficient for sending, especially when a sending condenser is used.

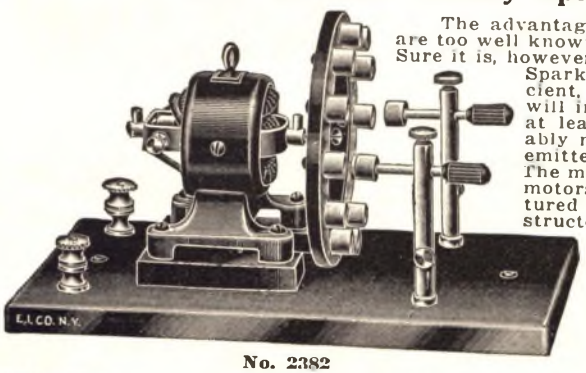
Any size spark coil up to 6 inches can be used successfully.

If a single small Leyden jar is shunted across the gap and if, for instance, a 1-inch coil is used, an intense blue mass of fire will crash across the gap with a roar—exactly as you hear it in the large commercial and government stations. If you never saw our Gap in operation, you will hardly realize its power. Besides, it may also be used as an ANCHOR GAP in the antennae, which serves as an automatic switch. The "Electro" Spark Gap has two rods 3-16 inch diameter, and 2½ inches long, having a hard rubber handle at each end, making it possible to adjust the gap while sending. Stands which are finely plated are mounted on heavy hard rubber composition base. Size of base, 2½x3½ in. Size over all, 6 in. long, 2 in. high.

No. 9220 "Electro" Spark Gap, as described **$1.00**

Shipping weight 1 lb.

The "Electro" Rotary Spark Gap



No. 2382

The advantages of the rotary spark gap are too well known to require much comment. Sure it is, however, that the "Electro" Rotary Spark Gap will give you an efficient, high pitched spark that will increase your sending range at least 30 per cent. (and probably more), besides making your emitted signals more easily read. The motors are all standard stock motors that have been manufactured for years, are well constructed, operate at high speed and are perfectly dependable under all conditions. The disc is of solid Bakelite, 4¾ in. in diameter and with 12 large zinc gap contacts that have been carefully turned and ground to size. The disc runs perfectly true. The capacity of the gap is 1 K.W. and this capacity can be carried continuously. Base is of **ELECTRITE** that can't leak or crack, as does slate and marble. Binding posts are nickel plated and very conveniently placed. The stationary electrodes are of zinc and fully adjustable to take up wear and burning of contacts. **All contacts are renewable by use of pliers and screw driver only.** Owing to its high speed the "Electro" Rotary Spark Gap is especially valuable for use in connection with Tesla Transformers and high frequency outfits.

Size, base 7x9 in.

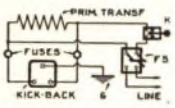
No. 2382 "Electro" Rotary Spark Gap, with 110 volt Universal Motor working on D. C. & A. C. **$18.00**

Shipping weight 20 lbs.

When ordering one of our Spark Gaps, Telegraph, or Wireless Keys, permit us to send you FREE, with our compliments, Lesson No. 5 **"The Amateur Transmitting Sets and Apparata"** or Lesson No. 6 **"Transmitting Sets"** or Lesson No. 7 **"New Transmitting Systems"** or Lesson No. 15 **"Learning to Operate"** of our famous "WIRELESS COURSE." More practical knowledge is contained in these lessons than in big books.

Just attach one or all coupons Nos. 5, 6, 7 or 15 to your order. For further information see Free Wireless Course offer in this catalogue.

The "Electro" Kick-Back Preventer



All transmitting sets in Wireless stations, employing commercial light or power circuits for the source of energy, are required to properly protect the circuit against Kick-backs from the spark coil or transformer. To this end, the Fire Underwriters require that two, one-half microfarad, fixed condensers, be connected in series across the primary circuit, supplying the transformer or spark coil. The centre connection between the two condensers is to be grounded to a good damp ground connection, as in diagram, or to a water pipe, on the street side of all meters, etc. The ground wire should be run on insulators, and be of the same size as the primary leads of the transmitting set. The proper capacity condenser has been developed by us, and is very compact and efficient. It is made of heavy tin foil and a good dielectric; the enclosing case being of glass. The condensers are then sealed in a high grade sealing compound giving a superb insulation, that cannot be surpassed. Get one of these condensers to-day, and have your station protected according to the Underwriter's rules, before you get into trouble.

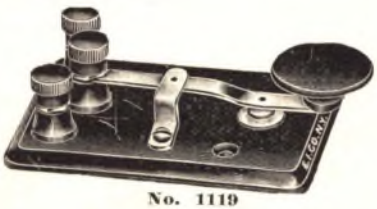
No. 1718

Size, 3¾x4x6 inches. Shipping weight 8 lbs.

No. 1718 Kick-Back Preventer, as described. Price..... $3.00

The "Electro" Telegraph Keys

There has long been a demand for a good, efficient, but cheap telegraph key and the one which we are now manufacturing complies with all demands that anyone could possibly make of a low price key. The parts are mounted on a solid hard rubber composition base, size 2½x3½ inches, ¼ inch thick. All metal parts are nickel plated and polished and the contact arrangement is simple but absolutely sure. A standard telegraph knob one inch in diameter in hard rubber composition is furnished. The No. 1118 Key has two of our standard binding posts, while the No. 1119 has three of them. This key works easily and there is nothing to get out of order. It will make a handsome addition to any instrument table.



No. 1119

No. 1118 Single Circuit "Electro" Telegraph Key composition base, as described. Shipping weight 1 lb..... **$0.55**

No. 1119 Double Circuit (Morse) "Electro" Telegraph Key composition base, as described. Shipping weight 1 lb..... **$0.65**

The "Electro" Telegraph Key

These steel lever, standard telegraph keys are a radical departure from the old style metal keys and the amateur as well as the professional will find these keys far superior to anything that has been offered heretofore. Our new departure is centered in the fact that instead of using a metal frame, which is so liable to short circuit the different parts, **we use a ½ in. insulated base.** This not alone gives the instrument a classy appearance, but it enhances at the same time the insulation a great deal, and our keys to-day are without doubt the most beautiful and the best built on the market. We do not use a spiral spring to operate the key, but use a special kind of a tongue spring which works a great deal easier and smoother than the old style spring. The lever is solid steel, nickel plated and highly polished as are all the metal parts on the key. There is absolutely no lateral motion and the trunnions cannot possibly get loose. The contacts are pure silver. A generous hard rubber handle and two large binding posts are furnished. If you have once used this key you will never use another.

No. 1117

We only furnish one style of this key, namely, the one with top connection. No leg connections are furnished.

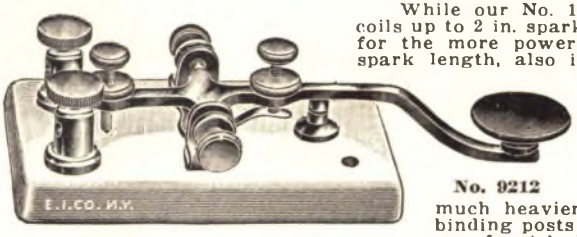
Size over all 6½x2¾x1¾ in. Size of base ½x2½x4¼ in.

No. 1117 Steel Lever Key with Insulated Base as described, Each..... $2.25

Shipping weight 1 lb.

The "Electro" Wireless Key

30 AMPERES CAPACITY



No. 9212

While our No. 1117 Key is well suited for coils up to 2 in. spark a larger key must be used for the more powerful coils, from 3 to 12 in. spark length, also in connection with our No. 8050 transformer or coil **using up** to 30 amperes. Our key will positively not heat up even if 30 amperes are used for hours at a time. This key is similar to our No. 1117 except that it is very much heavier and two extremely large binding posts that can take a No. 6 wire, are furnished. The contact points are solid silver and measure ⅜ in. in diameter, ⅛ in. thick; they are built in such a manner that they can be exchanged in less than two minutes. **No tools being necessary.**

As a **HEAT PROOF** Insulated Base is used, it will be understood that the insulation is the best that can possibly be had and there need not be any fear of short circuit as with metal base keys. For the price at which this key is sold it is positively the greatest bargain offered in wireless keys to-day. All metal parts are highly nickel plated, hand polished and buffed. Size of base ½x2½x4¼ in. Size over all 6½x2¾x2 in.

No. 9212 Wireless Key with Insulated Base, as described **$3.50**
Shipping weight 2 lbs.

No. 9213 Upper Contact for above key **$0.30**
Shipping weight 2 oz.

No. 9214 Lower Contact for above key **$0.30**
Shipping weight 2 oz.

The "Electro" Adjustable High-Tension Condensers

No. 530

For many years we sold these fine condensers with no adjusting arrangement, but of late a heavy demand for a high tension adjustable condenser has sprung up and we are therefore more than pleased to present our condensers now with the adjustable feature.

The connections are made in such an ingenious manner that either one, two, three or all nine or nineteen plates can be put in circuit, simply by sliding the contact rod into more or less contact bushings. The adjustment is **quick, sure** and **easy,** no switches or levers need be touched. The adjustable feature is of incalculable importance for wireless work, as no spark coil, transformer coil, or transformer can work to the highest efficiency without the right capacity, which can only be obtained by means of a condenser with a variable capacity. No. 530 has 5 contact bushings, No. 531 has 10 contact bushings.

The construction is simple and durable, and sparking is absolutely prevented. The cases are solid quartered oak, highly finished. For dielectric we use imported French glass sheets **of a special grade, 1/16 in. thick, free from salts and air bubbles.** Instead of tinfoil we use metal plates. The No. 530 has 1440 sq. in. of active condenser surface. **It can be used up to ½ K.W.** Size over all is 11¾x14¾x2¾ in. Its maximum capacity is .009 microfarads.

The No. 531 has 19 metal plates, 3040 sq. in. of active condenser surface. **It can be used up to 1 K.W.** Sizes, over all, 11¾x14¾x3¾ in. Its maximum capacity is .0203 microfarads. Both condensers are sealed in with a large amount of Pure Sealing Compound, which not only prevents bursting of the plates, but also safeguards the condenser from breakage, and, to a large extent, from puncturing. Two heavily nickeled binding posts are furnished. Each condenser is fully guaranteed as to capacity.

No. 530 High Tension Adjustable Condenser, as described **$5.60**
Shipping weight 40 lbs.

No. 531 High Tension Adjustable Condenser, as described **$7.70**
Shipping weight 45 lbs.

The Gernsback Electrolytic Interrupter

Patented April 4th, 1911

is a radical departure in electrolytic interrupter manufacture. It was constructed with the view to stand great abuse, gives marvelous results and to be ridiculously low in price. Heretofore such interrupters could not be had under $15 to $20 and most experimenters who did not care to pay this sum had to go on using batteries, which only cause trouble and dissatisfaction.

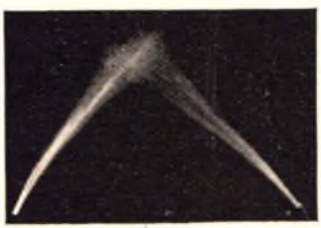
The Gernsback interrupter is connected in series, with any ordinary spark coil and the 110 V. direct or alternating lighting current supply. No resistance or condenser is used, except a key or switch to break the current in the usual manner. The vibrator of the coil must be screwed up tight as it should not vibrate. The glass vessel is filled with the solution (formula furnished only with interrupter), and as soon as the key is depressed you will get the surprise of your life. Instead of a thin, meagre spark, as with batteries, you get a HEAVY FLAME ¼ INCH THICK. That this is the ideal thing for Wireless is unnecessary to mention. The spark obtained of a 1-inch coil, connected to a big sending condenser and a zinc spark gap with zincs ½ INCH THICK will crash in the gap with such a tremendous noise that it will take your breath away AND THE SPARK FILLS THE GAP. These are PLAIN FACTS backed by our usual guarantee. By way of proving our statement look at the two photos taken by Mr. Gernsback. The first one shows the full spark of a 2-inch coil run by a 6 V. 60 A. H. storage battery. Exposure 1½ seconds. The second shows the FLAME of the same coil with a 110 V. current and the new interrupter. Exposure 1½ seconds. The flame shoots upward, as the great amount of heat raises the discharge. You are able to get a better and heavier spark from 15% to 25% LONGER, all depending on the construction of the coil.

No. 8000

And that is not all. The output of the coil is increased at least 60%. That means that you can send at least 60% further with the Gernsback interrupter. This will be better understood by mentioning that two No. 14 copper wires, connected to a 1 inch coil and separated ¼ inch will fuse within 5 to 10 seconds. The Gernsback interrupter starts at 50 volts. A metal rod of especial alloy goes through the cover down in the porcelain tube. This tube at its lower end has a peculiar aperture in which the pointed rod fits. The tube at the upper end has a threaded top which screws in the cover. This tube is made of special material and will not crack even if the interrupter is worked steadily. In operation the metal rod wears itself away to a point. The rod is fed down by gravity and is entirely controlled by the weight attached to the top of the rod (see ill.). In fact, the entire success of this interrupter lies in the right size of the metal weight. Too much weight gives no spark at all; too little gives an uneven and unsteady spark. New rods are supplied at a trifling cost. The rod can be left constantly in the solution.

No. 1
ORDINARY SPARK

The porcelain cover has all metal parts IMBEDDED in it (patented). No metal is exposed whatsoever. Therefore NO CORROSION. The interrupter heats up very little even with steady work. The path between the two electrodes is only ¼ inch and the amount of solution heated at a time therefore is necessarily very small.



No. 2

SPARK OBTAINED WITH INTERRUPTER.

This interrupter has found thousands of friends and is especially recommended for wireless and X-ray work. When used for wireless it may be stated that it produces an extremely high sound in the distant receiver, which is much easier to read than the low sound produced with the old spring vibrator giving only from 150 to 200 interruptions per second, against 5,000 to 7,000 per second with the electrolytic interrupter. The interrupter is to be used in connection with ordinary spark coils from ¼ inch up to 12 inch spark length, or our No. 8050 Transformer.

Two coils (or more) may be connected in series and if the secondaries are connected in series too, the length of the resulting spark is as long as the spark of the two coils put together.

The Gernsback Electrolytic Interrupter—(Continued)

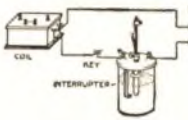
Therefore, two 2-inch coils will give a 4-inch spark and so on. Ordinary vibrator coils can not of course be connected in series, as each vibrator opposes the other, the spark length is cut down.

With the electrolytic interrupter a plurality of coils work as one, as the pulsations from the interrupter flowing through all the primaries (connected in series) magnetize and demagnetize the primaries all at the same time. The result, therefore, is that each coil acting in unison with the other (or others) will add its output to the other (or others). The longer spark is the result.

OPERATION

First fill the glass jar with the solution (to be obtained from any druggist) so that it stands 2½ inches from the top of jar. Put the cover on jar and pass the rod through the cover down in the tube. Be sure that its point fits in the aperture at the bottom of tube. The weight is then attached to the rod as shown in ill. The thumb screw of the metal bridge on top of cover is left loose. Now connect the interrupter as shown in diagram. If the current is direct the positive pole of the current must be connected with the post marked +. If the current is alternating it does not make any difference how the wires leading to interrupter are connected, since there is no positive nor negative pole.

The Interrupter works on direct and alternating current.



A switch block with fuses should always be used with the interrupter. It is much better to blow out a fuse than to damage the coil or interrupter if the current should get too strong, or if the tube in the interrupter should accidentally become fractured, which would short circuit the line.

Every instrument is fully guaranteed to be all we claim for it.

Note.—This interrupter does NOT work our closed core transformer, but only open core transformers, such as our No. 8050.

No. 8000 **THE GERNSBACK INTERRUPTER, as described. Size 10½x5 in.** Shipping weight 6 lbs. **Each**..... **$4.25**

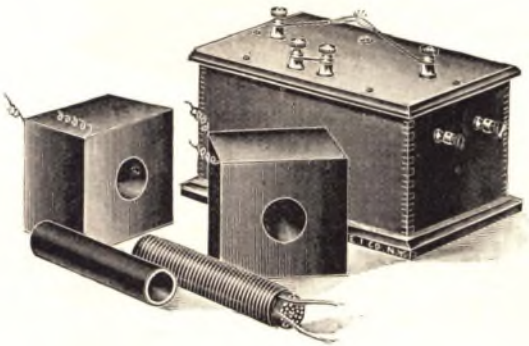
No. 8000a Metal rods for Gernsback Interrupter. Each..... Shipping weight 4 oz. **$0.25**

No. 8000b Interrupter Tube. Shipping weight 4 oz..... **$0.65**

No. 8000c Interrupter Jar, 4½x6½ in. Shipping weight 3 lbs. **Each**.... **$0.55**

The "Electro" ½ K. W. Transformer-Coil

(100 MILE WIRELESS COIL)



No. 8050

The average experimenter when buying a coil nowadays buys a cat in a bag. The coil is sealed entirely and if it should break down it must go back to the factory. Neither does the owner know what is inside of the coil—he must take the maker's word for it. Our new coil is **NOT SEALED IN,** yet is better insulated than a sealed in coil. The new departure is our **BLOCK SECONDARIES** (see illustration). These secondaries are wound with **ENAMELED WIRE.** This means, on account of getting 3 times as many ampere turns into a given space, that our secondaries are 3 times as efficient as other ones, and that they take up one-third as much room. Size of secondary, 3½x2¾x3½ inches. You marvel that such a small coil could give such an enormous output. The enameled wire explains the mystery. After the secondary coils have been wound they are placed in a square mould which is filled with molten insulating compound. When cold, a square block-coil is obtained, which exposes no wire except the 2 connections. We form our secondaries square so they cannot roll. Each secondary weighs 2¾ lbs. and gives a 1-inch spark. The primary is wound with Double Insulated Copper Wire No. 14, B. & S. and separated by a hard rubber insulating tube from the two block secondaries. The whole is placed in the coil box, which has been treated with an insulating compound. All coils fit snugly in the box and

The "Electro" ½ K. W. Transformer Coil—(Continued)

are arranged in such a way that they cannot move and are always ¼ inch apart. After connections are made the cover is screwed down, and this marvel of simplicity is always ready to be inspected and to be taken apart, when occasion arises, for new experiments, etc., etc.

Four top metal binding posts are provided, so that one secondary may be used at a time, **both in series, both in parallel and for other important experiments.**

BY CONNECTING IN MULTIPLE, RANGE IS GREATLY INCREASED.

As there is no vibrator or condenser to this coil, it must, of course, be used with our electrolytic interrupter by running it from 110 Volts Alternating current, or 110 Volts Direct current.

The spark obtained is 1 to 1½ inches long, but ¼ inch THICK. For wireless work it is the fat spark that counts, not the long, thin spark. You must radiate (amperage) from your antenna, not tension (voltage).

Our coil radiates energy—high amperage—and lots of it. Compared with the ordinary coil, ours, as far as wireless transmission is concerned, will send further than the 8-inch coil and wound with No. 36 B. & S. wire. Size of box, 9x5½x4½ inches.

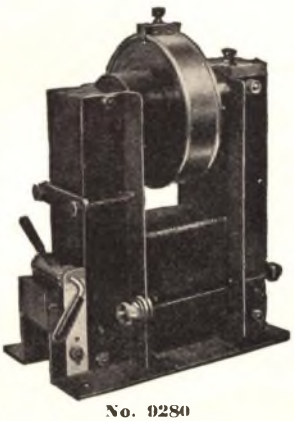
No. 8050 Electro ½ K.W. Transformer-Coil, as described..... $10.00
Shipping weight 12 lbs.

Closed Core Transformers

Commercial and experimental wireless stations today are using invariably a closed core alternating current transformer for sending messages. They are thoroughly reliable and of the highest electrical efficiency. Superior to spark coils, they are, besides, very cheap to operate; the cost of running the ¼ kilowatt (K.W.) size, being 2 cents per hour. They will not heat up even if run continuously.

These improved type transformers operate on the same principle (induction) as spark coils, but the transformer is simply connected to 110-125 volt A.C. 60 cycle circuits, with a telegraph key such as our No. 1117 or No. 9212 in series, to make and break the primary circuit.

Specifications:—Transformer of best design throughout. Electrical efficiency 94 per cent. Core of annealed silicon steel accurately cut and assembled. **Primary coil well insulated and provided with device permitting of regulating the secondary voltage from 10,000 to 12,000 volts.** Primary current on ¼ K.W. unit on lowest secondary voltage about 2¼ amperes. Secondary wound in best manner with finest insulation; cannot break down. Range about 50 miles per ¼ K.W. with sensitive detector at receiving station.



No. 9280

This transformer is extremely efficient, reliable, and flexible in control. For 120 cycles frequency costs is the same as for 60 cycles, below. For lower than 50 cycles frequency, add 20 per cent. to cost here given.

No. 9280 "Electro" ¼ Kilowatt Transformer, as described. Size 6¾ in. high by 8 in. long by 8¼ in. wide..... $15.00
Shipping weight 32 lbs.

No. 9281 "Electro" ½ Kilowatt Transformer..... $25.00
Shipping weight 45 lbs.

No. 9282 "Electro" 1 Kilowatt Transformer..... $47.00
Shipping weight 65 lbs.

Gentlemen:— **Louisville, Ohio.**

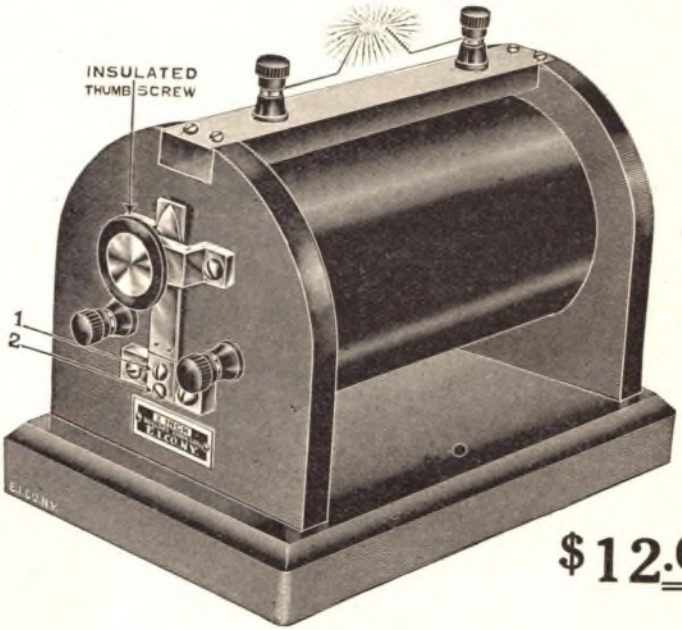
The goods which I purchased from you ARRIVED ALL O. K. The Spark Coil DESERVES PRAISE. I intend sending you an order in the near future. Will you please send me a catalogue, giving prices on all wireless goods.

Respectfully, **SANFORD ESSIG.**

The "Electro" "Bull-Dog" Spark Coils

This new "Bull Dog" type is the outcome of our 12 years' experience in this work, and for workmanship and appearance it stands unmatched.

We departed from the old, cold looking box style and now enclose the



SPARK
2-inch

$12.00

No. 1089

primary, secondaries and condenser all in a fibre tube, enhancing the appearance a great deal and also making the coil far more compact and lighter at the same time.

A new French double spring vibrator with **double adjustment** is used now, giving extremely fast vibrations. The insulation is superb, internal sparking is impossible, as the greatest care is exercised to insulate all parts with the most expensive sealing compound. Our coils are especially constructed for use in wireless telegraphy, and we have devoted considerable labor and time in experimenting to produce something that we can recommend confidently to our customers. Our aim has been to furnish a coil not easily injured, even by rough handling, and these coils may be subjected to considerable rough usage without injury. The usual form of Ruhmkorff coil we found was too delicate and easily put out of order, and we therefore do not manufacture same. All the good features of the Ruhmkorff are embodied in our coils, and we guarantee them to give a very powerful and "fat" spark impossible to obtain with any other coil. All the experiments cited on the following pages can be performed with our coils.

We employ a condenser of large capacity in parallel with the vibrator, which decreases the sparking thereof as much as possible. All our coils have condensers, even the ¼ in. one. The vibrator contact points are of tungsten and will last almost indefinitely, providing the coil is not abused by the use of too strong a current.

If we say a coil gives 1 in. spark, this means that a 1 in. spark will be thrown across a gap one inch long, between **two sharp points,** not between balls, plates, etc. We always guarantee our coils to give the full spark length. To get best results use storage cells, which are by far the most efficient current. **We do not guarantee** the spark length with **dry cells,** as their current is not steady enough. However, it is understood that they will give excellent results if treated intelligently.

The "Electro" "Bull-Dog" Spark Coils—(Continued)

The secondaries of all our coils are wound with enameled wire.

No. 4360 ¼ in. use 2 type R. E. cells, or 3 dry cells.
No. 1087 ½ in. use 2 type R. E. cells, or 4 dry cells.
No. 1088 1 in. use 3 type R. E. cells, or 5-6 dry cells.
No. 4366 1½ in. use 3-4 type R. E. cells, or 6-7 dry cells.
No. 1089 2 in. use 4 type R. E. cells, or 12 dry cells.

PRICE LIST

No. 4360 ¼ **inch coil, price** **$4.00**
Size 7½x4 5/16x6¼. Shipping weight 4 lbs.

No. 1087 ½ **inch coil, price** **$5.00**
Size 7½x4 5/16x6¼. Shipping weight 5 lbs.

No. 1088 1 **inch coil, price** **$7.00**
Size 7¾x5¾x6¼. Shipping weight 6 lbs.

No. 4366 1½ **inch coil, price** **$9.00**
Size 8½x5¾x6¼. Shipping weight 7 lbs.

No. 1089 2 **inch coil, price** **$12.00**
Size 8½x5¾x6¼. Shipping weight 8 lbs.

No. 1090 3 **inch coil, price** } Cabinet style. **$23.00**
No. 1091 4 **inch coil, price** } **$36.00**

Prices of larger coils on application.

Experiments With Spark Coils

Connect two short pieces of wire to the two top binding posts. Make a "spark gap" by leaving a small space between the wire points. If the coil is started a steady stream of sparks will flow between the points. It can be intensified by tightening the thumb screw on the vibrator of the coil. If the "spark gap" is about ⅛ inch, a "fire ball" will be observed between the points. If the experiment is continued the positive wire will get white hot and finally fuse at the end. If the wires were copper the fire ball will be green; if of iron, reddish yellow; if of zinc, bluish. To lengthen the spark, attach a metal ball, or metal disc, to the negative pole. The positive pole should have a sharp point. The lengthened spark will not be single; it will tend to branch out.

Another method to greatly lengthen the spark is as follows: Moisten the wood frame between the two wire points with your finger. The spark will at first be thin, but it will enlarge gradually as the moisture dries. This method lengthens a spark two or three times. A 1-inch spark coil will very often give 2 or 3 inches. The experiment is very interesting. If a thin glass plate is placed in the spark gap, the spark will not be straight, but it will hit around the plate's edge in ziz-zag form. A very striking experiment is done as follows: Bend two thin iron wires vertically in such a manner that they run parallel. With a little experimenting the right distance to space the wires will be found. The spark will then start at the bottom and run up swiftly in ladder fashion. As soon as it reaches the top it stops, only to recommence at the bottom. It will work automatically for hours, and never fails to attract considerable attention. The sparks also emit a strange noise.

Lengthen the spark gap 4-5 times and strew carbon powder or metal filings between it. The spark will select a route of its own in a peculiar manner. The experiment is greatly beautified in the dark. A small cup of benzine, gunpowder, etc., can be exploded if placed in a spark gap; but of course great precaution is necessary for such experiments. If the flame of a candle is brought near the spark gap, the spark will be drawn into the flame (hot air being a better conductor for the current than cold air). If the candle is blown out and if the wick is touched at once by the spark, it will light up again. If a piece of cardboard is put between the spark gap it will be pierced. The bigger the coil the thicker the cardboard can be. Note the very peculiar hole the spark has made, and compare it with a hole the needle has made. Explanation: The current comes from both sides.

If your friend smokes cigarettes you can play an amusing trick on him. Offer him some of your cigarette paper prepared as follows: Place 10 or 15 leaves on a metal plate to which one wire of the coil leads. Take the other wire (which must be well insulated or you get a shock) and move it all over the surface of the cigarette paper; the more sparks you make in different places the better the trick will turn out. The idea is this: The paper will be pierced with numerous holes—too fine to be observed—and when your friend tries to light the cigarette after he carefully rolled it, he will waste a box of matches without being able to get as much as one puff. After trying three or four leaves you can hardly blame him

Experiments With Spark Coils—(Continued)

if he commences to say a few things—or he may quit smoking cigarettes altogether. If an old incandescent bulb is connected with one wire, and if the other is grounded, the bulb will emit a greenish light in the dark. as soon as the coil starts working. If one wire has a very fine point and is not too far away from the other wire, a very peculiar and weird discharge will be observed in the dark. If a drop of oil is placed in the spark gap it will be scattered around violently through the spark. If your neighbors dog has the habit of extracting things from your ash can, lead a well insulated wire to the can, which must stand on a piece of very dry wood. Ground the other wire. When you see the dog standing on his hind legs and leaning against the can, bring your coil in operation. You will never see a more surprised dog in your life, and you can vouch that he will never come near that particular ash can again, even if it should be full of soup bones.

We leave it to the ingenuity of the experimenter to devise new experiments, tricks, etc., and shall be pleased to hear of such, for the benefit of other experimenters.

The most beautiful and startling effects, however, are created by lighting Geissler tubes. Our smallest coil will light the very biggest tube for hours, and our 1-inch coil will light 8-10 medium tubes **simultaneously** if connected in series. As all tubes are different in color, the most beautiful effects and designs can be created. In a store window they will stop every passer-by without fail. For parties a weird effect is obtained by suddenly turning out all the lights and operating a single large tube near the ceiling. It will startle the most phlegmatic man, and the ladies will swear they saw a ghost.

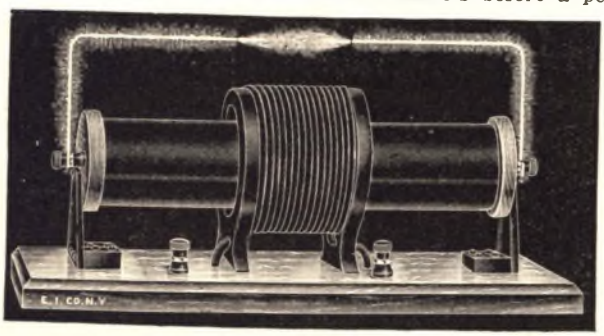
IMPORTANT NOTE: If for some reason a coil does not give the right spark length, bend the vibrator spring a little back (towards the thumb screw). The stiffer a vibrator works the better the spark will be.

The "Electro" Tesla Transformer

(Patent Applied for)

We hardly need mention that the Tesla Transformer is one of the most marvelous pieces of apparatus ever invented and there are thousands of experiments and demonstrations that can be performed with this apparatus.

We had this transformer under consideration for years before we built it and we had to build dozens of different models before a perfect apparatus was produced. We do not hesitate to say that for the price this apparatus is the greatest bargain ever offered. The construction of this transformer has been simplified to such an extent that it is not only absolutely "fool proof" but we guarantee that it will do anything and everything any standard Tesla Transformer ever did, or will do. The primary is wound with the best high tension cable and the secondary with the best DOUBLE INSULATED enamel wire. The secondary is insulated by solid hard rubber brackets as shown in cut. It is also provided with two well finished coil ends. The insulation is absolutely perfect, the base is heavy quartered oak.



No. 7000

The Tesla Transformer is an apparatus which steps up the frequency of the secondary of a spark coil, to many hundred times its original value. It is this incredibly high frequency that produces the wonderful phenomena you have seen performed on the stage by some clever electrician, all of which can be duplicated with our transformer.

The "Electro" Tesla Transformer can be operated in conjunction with the following apparatus; it is of no value without them:

First, a spark coil or transformer coil; second, a set of condensers; third, a spark gap. One of our 1 in. spark coils is sufficient to operate the transformer, but we would always recommend getting a 2 in. coil with which the best results are to be had. Our ½ K. W. transformer coil in connection with our Electrolytic Interrupter will give still more wonderful effects. Two 1½ pint Leyden jars or any other sending condenser of the RIGHT CAPACITY can be used in connection with this transformer. A single spark gap completes the entire outfit. IT MUST BE UNDERSTOOD THAT THE TESLA TRANSFORMER CANNOT BE USED WITHOUT THE ABOVE MENTIONED ACCESSORIES.

The "Electro" Tesla Transformer (Continued)

OPERATION

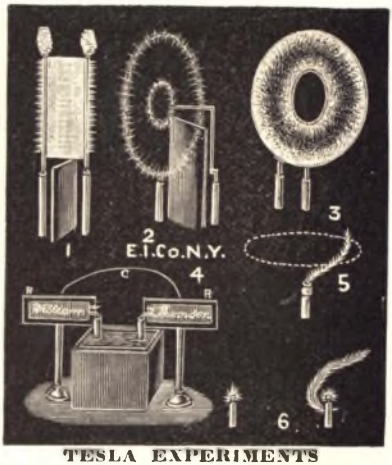
WIRING DIAGRAM

The connections are made as shown in diagram. It is of highest importance that the connecting wires from the secondary of the spark coil to the Tesla Transformer and to the condensers, are heavy (not less than No. 14 B. & S.). There should be as little wiring as possible, no loops or coils, and if possible all wires should be of equal length. When connections are made as shown, start operating. First test for spark length of the Tesla, by attaching two stiff copper or brass wires to the secondary coil leads (see illustration No. 7000). Leave a gap of about 2 inches between the two wires. Then start the coil. If the Tesla spark is not long enough, the spark gap must be adjusted, until best results are obtained. It is important that the zinc spark plugs have POINTED ENDS. Plugs with flat ends cannot be used. A few minutes' experimenting will give the right Tesla spark. It gives a crackling noise, which becomes louder as the spark of the zinc spark gap is lengthened.

All Tesla experiments should be performed in absolute darkness, as then the best results are obtained. When everything is adjusted and working right, the wires leading from the secondary give a blue brush. This works best when there is no spark discharge between the wires.

Next take off all wires from the Tesla Secondary, which we will call T. S. hereafter. Operate apparatus and both coil ends of the T. S. will show the "Fire Wheel." The brush composing the wheels actually turns in unison with the interruptions of the spark coil. Next take a piece of metal (anything will do), and, holding it in your hand, approach one of the T. S. You will observe a large brush as you approach, or a spark from 2 to 3 inches long will jump into the metal piece without you experiencing the slightest sensation.

Although the voltage of such discharges runs into the hundred thousands, it is harmless. A spark can also be drawn with the bare hand without harm, although it stings a little. Touch one of the T. S. with a piece of metal which you hold in your hand. With the other hand approach slowly and carefully the other T. S. About 4 or 5 inches away from it, a large beautiful brush will be drawn from the hand, very weird in character. Geissler and Tesla tubes light up when brought near the Tesla Transformer, without actually touching any part of it. They are usually operated by holding one end of the tube in the hand and drawing a spark into the other end of the tube by approaching one of the T. S. Ground one of the T. S. and attach a piece of wire to the other T. S. An enormous brush will be observed on the free wire. Another interesting experiment is performed by running two fairly stiff copper wires parallel to each other and about 2-4 inches apart (Fig. 1). When the frequency is high enough the space between the wires will be filled with light, while the ends will show a flame-like discharge. Small flames also play continuously on both sides of the wires.



TESLA EXPERIMENTS

Two rings formed of copper wire, the small ring placed into the larger one, and both connected to the poles of the transformer, will show a very pretty discharge (Fig. 2). A similar experiment is performed by forming two stiff wire loops, of heavy copper wire. The two loops are placed one into the other, and both are in the same plane. The space between the two loops will be filled with light when the coil is in operation (Fig. 3).

In Fig. 4, R. R. represents two thin hard rubber sheets. A thin silk covered wire, No. 36, B. & S., is glued in form of a name on the face of each sheet. The back of the sheets is covered with a piece of tinfoil. Both are connected by a thin wire, C. The terminals of the transformer lead to the name or characters as indicated in the illustration. After a little experimenting the point will be found where the name or characters will stand out brilliantly.

Fig. 5 shows another experiment to be produced in the dark. A very thin, bare copper wire attached to one end of the transformer, rotates in a circle. The length of the bare wire must be ascertained by experiment.

A short piece of thin, cotton covered copper wire when attached to one end of the transformer is enveloped in a beautiful light discharge. (Fig. 6).

These coils can be used to advantage for all kinds of work where high tension currents are required, such as wireless telegraphy, lighting Geissler and X-ray tubes, and for other interesting experiments.

Size of base 16 in. by 7 in. Height over all 6½ in. Shipping weight 11 lbs.

No. 7000 "Electro" Tesla Transformer, as described..... $6.00

The "Electro" Storage Batteries

Used on board of several U. S. battleships. Same style used in the Oldsmobile, Pullman and a number of other high-class automobiles for ignition and lighting.

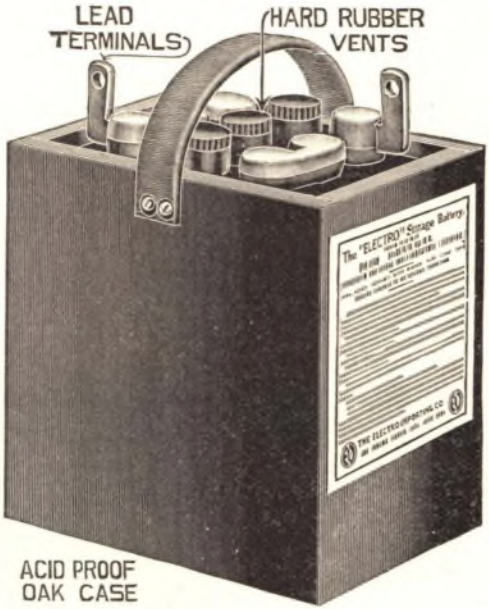
The 40 A.H. size has 3 plates in each cell; the 60 A.H. size has 5 plates in each cell; the 80 A.H. size has 7 plates in each cell; the 100 A.H. size has 9 plates in each cell. **The cells are of hard rubber, NOT glass.**

This battery is absolutely "fool proof." There is nothing to get out of order, and with ordinary care this battery will last for five years.

Every experimenter knows that there is practically no equal to a good storage battery. It is a pleasure to run your coil or other apparatus when you know there is lots of "juice" behind it. Our No. 555 battery will melt a No. 10 B. & S. copper wire and gives about 200 amperes in short circuit (although we do not recommend this test, as if performed often will weaken the plates). All batteries come in treated oak cases. There is absolutely nothing to corrode. Batteries shipped fully charged, ready to use. Shipped in strong wooden, non-overturning box. Full directions on every battery.

$15.00

Including War-Tax



No. 555

Full Directions on Label

Any garage or power plant will recharge any battery for about 35 cents. If you have direct current, you can charge it yourself at a cost of 8-10 cents by using a bank of lamps to cut down the current. If you have 110 volts A. C. this battery can be charged through a bank of lamps and our No. 12500 rectifier shown elsewhere.

If you wish to know more about this wonderful BATTERY, send 2c. stamp and we will send you our "Treatise on Storage Batteries."

No. 556 **"Electro" Storage Battery, 6 volts, 40 ampere hours, size 5¼x8x8 in.** **$13.00**
Shipping weight 35 lbs.

No. 555 **"Electro" Storage Battery, 6 volts, 60 ampere hours, size 6¾x8x8 in.** **$15.00**
Shipping weight 41 lbs.

No. 2328 **"Electro" Storage Battery, 6 volts, 80 ampere hours, size 9¼x7x8 in.** **$18.00**
Shipping weight 60 lbs.

No. 2329 **"Electro" Storage Battery, 6 volts, 100 ampere hours, size 12x7½x8 in.** **$24.00**
Shipping weight 68 lbs.

THESE BATTERIES ARE SENT FULLY CHARGED

Type R. E. Storage Battery

TYPE R. E.

We know that everyone having dry cells is dissatisfied because such batteries do not last for continuous work where a steady strong current is required. Nearly everybody wants storage batteries, but the price makes it prohibitive for the buyer.

With these facts in mind we have constructed a battery that, despite of its unusually low price, is the best that money can buy.

For seven years we sold these batteries, but they were not sealed up and the acid would evaporate and spill. The demand for a sealed battery has been growing every year and we abandoned the open type in favor of the sealed type.

The plates, with our twelve years' experience in making them, are the same reliable ones as used in our No. 555 6 V. 60 A. H. battery. The same is true of the other material used. We furnish these batteries without acid. It can be obtained from any druggist. To mix the acid proceed as follows: In a clean porcelain vessel pour five parts (by bulk) of distilled or rain water. Into this pour under constant stirring one part of chemically pure sulphuric acid (oil of vitriol) 66 degrees Beaume. If the solution has cooled, test it with a hydrometer such as our No. 1543 It should now read 1260 degrees specific gravity. The electrolyte is then carefully poured into each cell through the opening by removing the porcelain vent stopper until it stands ¼ inch over the top of plates. Battery should then be charged as per directions. Commercial acid or hydrant water should under no circumstances be used; it will spoil the battery in a few weeks. It is a good plan for owners to recharge their batteries once every two weeks, no matter if run down or not. This treatment will keep batteries in perfect shape and they will last much longer. When battery stands idle for over a month, first discharge same and recharge again.

Type R. E. should be charged with a steady current of two amperes for ten hours. It will then give twenty ampere hours, that is, a current of one ampere strong for twenty hours long, or two amperes for ten hours. It will run, for instance, a small motor, which takes one ampere, ten hours at a stretch. Battery must then be charged again, after which it will give the same output hundreds of times over. To charge cells: Only direct current can be used. Any electrician in your town who has charge of a private plant will be glad to charge your cells. The usual rate is ten to fifteen cents per cell. If you have direct current on your premises you can charge the battery yourself. If you have alternating current it will be impossible to charge storage cells unless our "Electro" Lytic rectifier No. 12500 is used, which changes the alternating current to direct. If you have no current available, do not try to charge with dry cells. The dry cells would be spoiled inside of one hour. The charging voltage must always be higher than the combined voltage of the batteries. A fully charged storage cell, with charging current turned on, has 2.5 volts. When the charging current is taken off the voltage of cell will drop at once to 2.2. This is correct. Coils from 2 to 4 inch need 5 cells of type R. E.

TESTING

The only reliable way to test a storage battery is by means of a low reading voltmeter. If the experimenter wants to know how far the battery is run down, the voltmeter readings should only be taken when the battery is actually working. Other tests are of no value whatever, as a storage battery, even if run down altogether previously, will nearly always register two volts per cell, on open circuit, as it is well known that accumulators always recuperate when standing unused. If they are put to work, however, the voltage immediately drops. Therefore, "Open" readings are of no value. The owner of a storage battery should always test it before starting in to use it; it will save him much annoyance. Each cell should be tested individually, as this is the only reliable way.

A storage battery—no matter what make—will stop working very abruptly and without any warning at all. This generally puzzles the layman a good deal, and, of course, he blames it all on the battery, as he cannot account for the drop. If he would have taken a voltmeter reading before starting in to use the battery he would have found that the cells registered about 1.85 volts each.

Never test an accumulator with an ammeter—that is, never connect the instrument directly across the battery. It is a "dead short circuit," and is not alone very harmful to the cell, but it will burn out the instrument.

No. 1251 **Complete cell, type R. E., SEALED UP (see illustration), 20 ampere hours, 2 volts, containing 1 positive and 1 negative plate, separators, rubber bands, porcelain vent, directions; weight when filled with acid, 4 lbs., size of glass jar 6x6x1 in. each** **$3.50**
Shipping weight 7 lbs.

No. 1251a **Glass jar for R. E. cell, 6x6x1 in** **$0.50**
Shipping weight 3 lbs.

TYPE R. E. BATTERIES ARE SOLD WITHOUT CHARGING LIQUID.

"Electro" Batterymeter

No. 1543

The greatest problem to the user of storage batteries is "How fully charged or discharged is my battery?" The question of overcharge if not too great is not a serious one, but letting a battery discharge **TOO MUCH** is.

The batterymeter is based on the principle that the density of the electrolyte in a storage battery varies directly as the battery is charged or discharged. For instance, the density of the electrolyte is found when the battery is fully charged to be 1,250 sp. gr. Then when the reading is taken after the battery has been used, and it now shows a sp. gr. of 1,175, it means that only 40 per cent. of the full charge remains. This is readily ascertained by a glance at the table accompanying each instrument. Always bear in mind that voltmeter readings never tell the true condition of a battery. The operation of the Batterymeter is simply as it is accurate. The vent of the battery is removed, the nozzle of the meter placed in the liquid and enough liquid is drawn up by suction in the glass tube to float the hydrometer. The reading is then taken and the liquid replaced in the battery by applying pressure to the bulb and vent is replaced. The value of the Batterymeter is self-evident, and if you don't want to get caught with a completely discharged battery or seriously sulphated one, get a Batterymeter at once and see just how much juice is left in your storage battery. An invaluable instrument for the automobilist, experimenter, electrician, owner of isolated plant, etc., etc.

No. 1543 Batterymeter, medium grade, length 10 in., hydrometer scale 15 to 35, Beaume and equivalent specific gravity. Complete with directions in a neat cardboard box, size 12½x2x2¼ inch. Price each **$0.75**

Shipping weight 2 lbs.

The "Electro" Pocket Volt and Ammeters

N. 4300

These little instruments are without doubt the most compact and durable meters ever produced in this country. They are not alone extremely accurate, but they are also "dead beat," all metal construction. The finish is the finest ever seen on a domestic instrument. Permanent magnet type indicates polarity as well as current. It is the smallest meter made, diameter 2¼ inches, net weight 4½ oz. Flexible, detachable lead, with contact pointer furnished free. Range of voltmeters, 8 volts; ammeters, 30 amperes; combination, 8 volts, 30 amperes.

No. 4300 "Electro" ammeter, as described, each .. **$1.25**

No. 4301 "Electro" voltmeter, as described, each. **$1.50**

No. 4302 "Electro" Volt-ammeter **$1.75**

Shipping weight, any style, 1 lb.

The "Electro" Storage Battery Meters

No. 1620

This meter is so called because when properly connected to a storage battery circuit it will not only show the quantity of current passing through the circuit but also show whether the battery is charging or discharging. The normal position of the needle on this ammeter is in the centre and the needle going to the left indicates that the battery is discharging, while a deflection to the right indicates the battery is being charged.

The meter is for direct current only, 2¼ in. in diameter and ⅞ in. thick. It is made for switchboard mounting for which purpose 2 studs are provided, each having 2 nuts and washers for connections and fastening. All metal parts are brass highly nickel plated and polished. Only supplied in one scale, 15-0-15. The mechanism is of the permanent magnet type, serviceable, accurate and above all durable. This meter is particularly useful on small lighting plants such as are used on automobiles, launches, small houses, etc., etc.

No. 1620 Electro Storage Battery Meter, Scale 15-0-15 amperes..... **$2.25**

Shipping weight 2 lbs.

The "Electro"-Lytic Rectifier

No. 12500

For the past years we have been flooded with mail to supply a rectifier to change alternating current to direct. As is well known, alternating current **can not be used to charge storage batteries** and for a great many other purposes also direct current only can be used.

Our rectifier works on any cycle alternating current up to 110 volts. It must be used in connection with a lamp or water resistance and cannot be connected to the current supply without the resistance in series with it. The efficiency of the 4 jar rectifier is 85%, AND THERE IS NO LEAKAGE such as is usually found in other rectifiers. The 4 jar rectifier furthermore USES BOTH SIDES OF THE CYCLE, which accounts for the high efficiency. Of course, a one or two jar outfit may be used successfully, and EVEN ONE JAR ALONE rectifies alternating current to direct but the efficiency is necessarily low, as only one half of each cycle is used.

However, for experiments using little current, the one jar type is very satisfactory. The 4 jar type passes as much as 5 amperes and can be used continuously (as for instance charging storage cells) with 2½ amperes. The one and two jar types pass 1/3 of the above amperage. Our rectifiers come ready for use. All you have to do is to dissolve the salts in HOT water and fill in jars, and the rectifier is ready. The 4 jar type comes with a wooden tray (see illustration) which holds the jars. No tray is furnished if jars are bought separately. The covers are of heavy porcelain with polarity marks in plain sight. The lead and aluminum plates are very substantial and the latter will last for months. If used up they can be renewed at small cost and replaced with new ones in a few minutes.

New aluminum plates will **not** be sold separately except to users of the rectifier. When ordering renewal plates it is ABSOLUTELY REQUIRED that you give us your order number or date of purchase.

OTHER PARTS ARE NOT SOLD. Directions and diagrams **only** furnished with rectifier. Every rectifier is guaranteed.

No. 12500 **Four jar rectifier, as described, with tray** **$6.50**
Size 8½x10½x10½. Shipping weight 30 lbs.

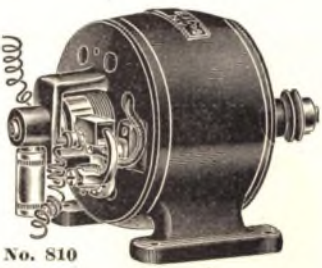
No. 12501 **One jar rectifier, as described** **$1.75**
Size 8x5½. Shipping weight 5 lbs.

No. 12502 **Renewal aluminum or lead plates, each** **$0.30**
Shipping weight 1 lb.

No. 12503 **Renewal salts (charge for one jar)** **$0.35**
Shipping weight 1 lb.

No. 12504 **Glass jar for rectifier, size 4½x6½ in.** **$0.55**
Shipping weight 4 lbs.

The "Electro 8-10" Dynamo


No. 810

Wherever there is surplus power, be it gasoline engine, large electric motor, water-wheel, windmotor, water-motor, etc., etc., the "8-10" can be used to light a bunch of Tungstens, **to charge the biggest storage battery,** to electroplate, to run spark coils, etc. As a motor when run on 8 volts, the No. "8-10" will prove an exceedingly strong machine. We furnish this dynamo giving 8 volts and 10 amperes, that is, 90 watts. With the No. "8-10" machine we were able to do the following: At 2,000 revolutions we lighted fifteen 8-volt 4 C. P. Tungsten lamps. At the same speed we also lighted six 6-volt C. P. Tungsten lamps. The full 80 watts capacity is obtained at about 2,500 revolutions.

POINTS OF SUPERIORITY

Armature constructed of thin annealed electrical steel. Slotted for conductors. Coils are connected up in the usual drum manner. Laminations are **keyed** to shaft. Commutator pinned. Shaft unusually large for this size machine. 5/16 in. diam. at all points. Material—**steel ground** to size. Commutator same construction as on large dynamo. Hard drawn copper segments, heavily insulated with mica. Bearings "Non Grain" bronze, best obtainable. Extra large wick feeding oil cups. Retaining grooves prevent oil flying, and returns are provided so that excess oil returns to oil cup.

Field Magnets—Two pole, carefully bored to size. 12 part armature and commutator. Brushes—Two, made of special carbon metal, of square sections to prevent turning. Double brushes and double pole construction allow large brush contact

The "Electro 8-10" Dynamo—(Continued)

surface with small commutator for the comparatively heavy currents encountered on low voltage work. Case—Cast iron, cast from die moulded patterns, therefore no damaged castings are ever used. Winding—Shunt.

In designing this machine the very first consideration was for results. No endeavor was made to save copper, iron or workmanship. Instead of fancy finish the money was spent in result producing labor and materials. No weak end brackets, no skimpy brushes and brush holders, but good honest to goodness solid stuff that shows the value. It's a real bargain and one you will never regret investing in. The finish is black enamel with gold stripe.

Machine is semi-enclosed, practically dustproof, a radical departure in small dynamo building. Pulley, 1 inch diameter, V-grooved for round belt.

Size over all is 7½x5½x5¼ inches. Shipping weight 20 lbs.

No. 810 "Electro" 8 Volt 10 Amperes Dynamo, as described..... $17.00

The "Electro" Rheostat-Regulator

PORCELAIN BASE

(PATENTED FEB. 1, 1910.)

No. 5000

This little current regulator makes a valuable addition to any wireless set where it is used to regulate the battery current.

With battery lamps it is very valuable, where it is used to prevent the lamps from burning out on account of too strong a current, etc.

In connection with small motors it will regulate the speed more accurately and more gradually than could be done by any other means. This feature makes it very desirable for Dentists, Doctors, and all those who need an effective regulator. In connection with cautery work it is indispensable, as any degree of heat can be obtained,—due to the very fine regulation.

One of its real values is in providing a small field regulator for small motors and dynamos, giving in that way a voltage and speed regulation not obtainable with the usual type of expensive step type rheostats. It also makes an excellent automobile lamp dimmer where it can be used to cut down the glare yet not dim the lamp enough to cut down the light too much. This is a fault of many of the present auto dimmers now in use.

Advantages over other small rheostats: Gradual and accurate regulation of current; great current capacity; little heating, resistance coil air-cooled; no concealed parts; impossible to get out of order. **PORCELAIN BASE. CANNOT BURN NOR CHAR.**

For electro-plating work it will be found indispensable. A gradual increase of current is especially necessary for fine work.

The wire used in this regulator is the finest high resistance wire. It will positively not rust, break nor bend, even under a constant load of 3 amperes. This we guarantee in every instance. The groove which holds the spiral is ( ) shaped (PATENTED), which makes it impossible for the coil to fall out or become dislocated once wound in place. Large hard rubber handle (1 in. diameter) is provided, allowing rapid and smooth turning of switch blade. **Don't use a rheostat with the resistance wound on fibre that will smoke and smell as soon as current is turned on.**

Resistance is 10 ohms. Maximum capacity, 3 amperes continually; size, 4 inches diameter, thickness of base 13/16 inch.

No. 5000 Rheostat-Regulator (patented). Price..... $0.75
Shipping weight 2 lbs.

Lincoln, Nebr.

Dear Sirs:—

Last year I ordered a number of things of you, among which was an "Electrolytic" Interrupter for my wireless station. I have used it very hard all the while except during the summer. I found that it worked just as well after three months of non-use as it did when I got it. The "Telegraph Key" I received of you is a dandy, as is the Ball Bearing slider.

ASHLEY WILLIAMS.

Student's Chromic Plunge Battery

Here is the first low priced, as well as fool-proof chromic acid battery on the market. It is a little wonder, and for the small price we ask for it, it stands unmatched.

It is an ideal battery for electrical experimental work where a very powerful current is not required. This battery will light a 2 volt lamp for several hours on one charge; it will run a small toy motor surprisingly well; it will do small electroplating work; it is ideal for testing work; it gives a fairly steady current, **and as the zinc electrode can be pulled clear of the electrolyte, no materials are used when battery stands idle.**

Best Amalgam Zinc only is used, as well as a highly porous carbon, to ensure a steadier current. We furnish enough chromic salts for 4 charges. Full directions for operation and care of battery are included. Each battery tests 2 volts and 10 amperes when set up fresh. Not over 2 amperes should be drawn from battery continuously. By using six or eight of these batteries, a great many experiments can be performed. No solution can run out of this battery if upset by accident. This makes it an **ideal portable battery,** such as for operating a bicycle lamp, or any other portable lamp, where a powerful light is not required, for boy scouts' field telegraph work, operating telegraph outfits, etc., etc. Size over all is 5x2 inches.

70c.

No. 999 Student's Chromic Plunge Battery **$0.70**
Shipping weight 1 lb.

No. 999

No. 998 Carbon Rod with Binding Post, for above battery, each **$0.20**
Shipping weight 4 oz.

No. 997 Amalgamated Zinc Rod with Binding Post, for above, each ... **$0.20**
Shipping weight 4 oz.

The "Electro" X-Ray Tubes

These tubes if worked by coil No. 4366 or No. 1089 will take quite sharp photographs of the human hand, contents of a purse, etc. The time required for exposure is comparatively short. With the use of Barium-Platinum-Cyanide screens the skeleton of a hand will be readily seen by placing the screen between the eye and the object to be examined. The X-Ray tube should be immediately behind the object. It is a great pity that electrical experimenters do not give more attention to the study of X-Rays and radiography. There are few subjects more fascinating and none more fruitful of results. That the last words in Roentgen rays is not spoken is evident by the strides made in radiography in the past few years. Once you have tried a few experiments you will be fascinated. You probably have never seen a diamond or ruby's real brilliance till it has been exposed to X-Rays. This is only a suggestion. There are innumerable others available.

No. 1129

Our No. 1129 is the only tube in the U. S. able to work satisfactorily on a 1½ in. coil. **Our No. 9010 tube works very well on a 1 in. coil.**

No. 9010 X-Ray tube, small size. Price **$4.20**
Shipping weight 3 lbs.

No. 1129 X-Ray tube, medium size. Price **$6.65**
Shipping weight 3 lbs.

No. 1130 X-Ray Tube, large size. Price **$9.50**
Shipping weight 4 lbs.

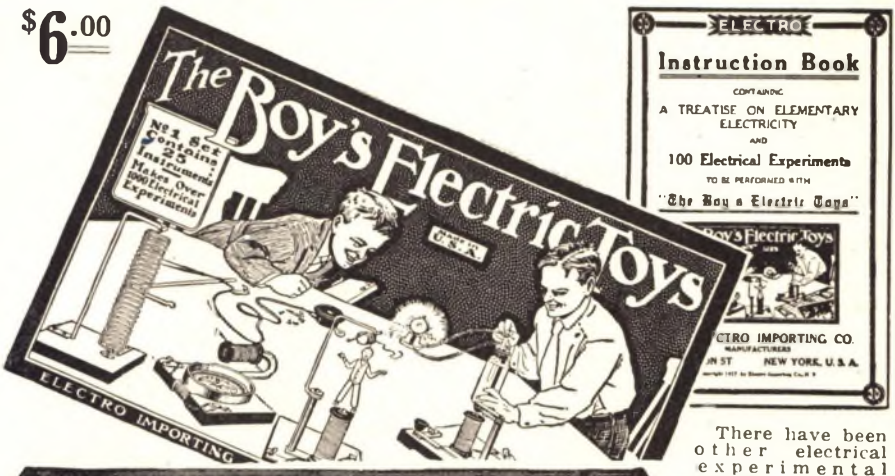
Barium-Platinum-Cyanide Screen

These are intended to make the X-Rays visible to the naked eye. If an object is shown before the screen and in front of the X-Ray tube, the outlines will readily be seen projected on the screen. The bones of a hand, for instance, can be observed easily with the use of the fluoroscopes. They represent the screen alone, which is mounted on a polished mahogany frame. To be used in the dark only. Size 3x4¼ ins.

No. 1284 Barium-Platinum-Cyanide Screen on frame. Price each **$3.00**
Shipping weight 4 oz.

"The Boy's Electric Toys"

$6.00



No. 2002

There have been other electrical experimental outfits on the market thus far, but we do not believe that there has ever been produced anything that comes anywhere near approaching the new experimental outfit which we illustrate herewith.

"The Boys' Electric Toys" is unique in the history of electrical experimental apparatus, as in the small box which we offer enough material is contained TO MAKE AND COMPLETE OVER TWENTY-FIVE DIFFERENT ELECTRICAL APPARATUS without any other tools, except a screw driver furnished with the outfit.

The box contains the following complete instruments and apparatus which are already assembled:

Student's chromic plunge battery, compass - galvanometer, solenoid, telephone receiver, electric lamp.

Enough various parts, wire, etc., are furnished to make the following apparatus:

Electromagnet, electric cannon, magnetic pictures, dancing spiral, electric hammer, galvanometer, voltmeter, hook for telephone receiver, condenser, sensitive microphone, short distance wireless telephone, test storage battery, shocking

"The Boy's Electric Toys"—(Continued)

coil, complete telegraph set, electric riveting machine, electric buzzer, dancing fishes, singing telephone, mysterious dancing man, electric jumping jack, magnetic geometric figures, rheostat, erratic pendulum, electric butterfly, thermo electric motor, visual telegraph, etc., etc.

This does not by any means exhaust the list, but a great many more apparatus can be built actually and effectually.

With the instruction book which we furnish, one hundred experiments that can be made with this outfit are listed, nearly all of these being illustrated with superb illustrations. We lay particular stress on the fact that no other materials, goods or supplies are necessary to perform any of the one hundred experiments or to make any of the 25 apparatus. Everything can be constructed and accomplished by means of this outfit, two hands, and a screw driver. Moreover, this is the only outfit on the market to-day in which there is included a complete chromic acid plunge battery, with which each and everyone of the experiments can be performed. No other source of current is necessary.

Moreover, the outfit has complete wooden bases with drilled holes in their proper places so that all you have to do, is to mount the various pieces by means of the machine screws furnished with the set.

The outfit contains 114 separate pieces of material and 24 pieces of finished articles ready to use at once.

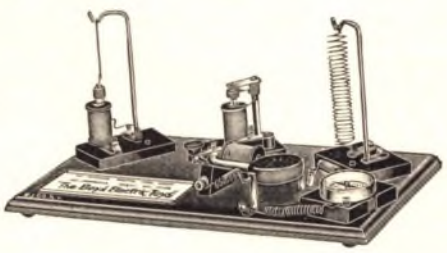
Among the finished materials the following parts are included: Chromic salts for battery, lamp socket, bottle of mercury, core wire (two different lengths), a bottle of iron filings, three spools of wire, carbons, a quantity of machine screws, flexible cord, two wood bases, glass plate, paraffine paper, binding posts, screw driver, etc., etc. The instruction book is so clear that anyone can make the apparatus without trouble, and besides a section of the instruction book is taken up with the fundamentals of electricity to acquaint the layman with all important facts in electricity in a simple manner.

All instruments and all materials are well finished and tested before leaving the factory. We guarantee satisfaction.

We wish to emphasize the fact that anyone who goes through the various experiments will become proficient in electricity and will certainly acquire an electrical education which cannot be duplicated except by frequenting an electrical school for some months.

The size over all of the outfit is 14x9x2¾.

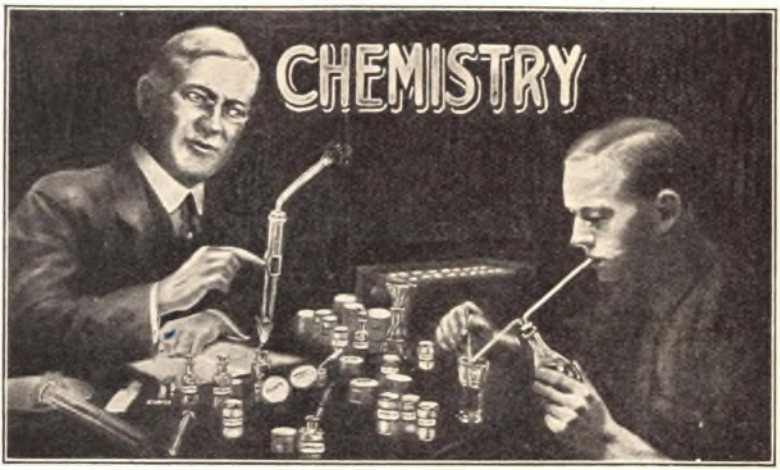
No. 2002 "The Boy's Electric Toys," outfit as described.. $6.00
Shipping weight 8 lbs.



Just a few things that can be made with "THE BOY'S ELECTRIC TOYS." We have not the space available to show all the other hundreds that can be made with this outfit and two hands.

THE DIFFERENT PARTS OF OUTFIT No. 2002

No. 1 Solenoid.
No. 2 Compass.
No. 3 Horseshoe.
No. 4 Telephone Receiver with cord.
No. 5 Chromic Battery with salts.
No. 5b Carbon for Battery.
No. 5c Zinc for Battery.
No. 6 Galvanometer Block.
No. 7 Iron Core with tapped holes.
No. 8 Iron Keeper.
No. 9 Slotted Carbon.
No. 10 Wooden Base.
No. 11 Glass Plate.
No. 12 Fine Wire
No. 13 Medium Wire
No. 14 Heavy Wire
No. 15 Tin Foil.
No. 16 Copper Spiral.
No. 17 Nickel Stand
No. 18 Bottle Iron Filings.
No. 19 Bundle large size Core Wire.
No. 20 Bundle small size Core Wire.
No. 21 Bottle of Mercury.
No. 22 Wooden Base.
No. 23 Package Paraffine Paper.
No. 24 Porcelain Lamp Receptacle.
No. 25 Thin Steel Spring.
No. 25a Heavy Steel Piece.
No. 26 Brass Piece.
No. 27 Brass Hexagon Nuts.
No. 28 Steel Washers.
No. 28a Fibre Washers.
No. 29 Chromic Battery Salts.
No. 30 Screw Driver.
No. 31 Key Knob.
No. 32 Nickel Key Lever.
No. 33 Spring Binding Posts.
No. 34 2 volt Mazda Lamp.
No. 35 Large Fibre Washers.
No. 36 Short Iron Machine Screws.
No. 37 Large Iron Machine Screws.
No. 38 Wooden Bushings.
No. 39 Pole Test Paper.



The E. I. Co. Chemical Laboratory

This outfit is not a toy, put up merely to amuse, but a practical laboratory set, with all the chemicals, apparatus and reagents necessary to perform real work and to teach the beginner all the secrets of inorganic chemistry. With this outfit we give free a book containing a **Treatise in Elementary Chemistry, useful data** and **recipes, and 100 instructive and amusing experiments.**

DESCRIPTION OF THE OUTFIT:

The outfit consists of forty-four (44) Chemicals all C. P. (chemical pure) put up in appropriate wooden boxes, glass bottles, and hermetically closed jars. The acids are put up in glass bottles, with ground-in glass stoppers and there is a sufficient quantity of chemicals supplied (mostly one to two ounces) enough to make dozens of experiments with each. See list of Chemicals herewith.

A list of the 17 pieces of apparatus furnished with this outfit is printed also herewith.

The Instruction book is a real **Chemistry Course for the Beginner.** Some of the Contents are: **Division of Matter:** This is a Treatise on Elementary Chemistry and deals with the theory of the Elements, Molecules and Atoms, etc. **Chemical Nomenclature.** This explains in simple language the derivation of the chemical names of the Elements and their compounds. There is a chapter on **Laboratory Operations; Glass Working; First Aid; Fire Extinguishers; Experimenters' Aphorisms,** etc.

A good part of the book is devoted to Weights and Measures. The Metric System, the English System and the U. S. System are fully explained.

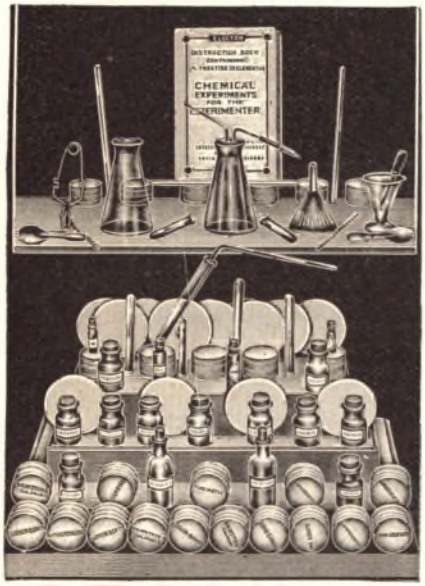
The following tables are furnished: Symbols and Atomic weights of the Elements; Measures of Weights, Volume, Capacity and Length; Per Cent. solutions; Conversion of Measure expressed in parts; Poisons and their antidotes; Technical and common name of chemical substances; Formulas for Cleaning various substances, etc., etc.

Among the **100 Experiments** are:

How to make chemical tricks; How to make invisible and magic inks; How to test flour; How to test soil; How to Make Chlorine Gas and smoke (German War Gas); How to bleach cloth and flowers. How to produce Oxygen and Hydrogen; How to make chemical colors; How to test Acids and Alkalies; Production of Ammonium Chloride; Making Sulphuric Acid; Testing Boric Acid; Formation of Zinc Oxide; Making Copper Chloride; Preparing Explosive Paper; Tin-plating by chemical action; Copper-plating; Electroplating; Fireproof Mixture; Producing Fireworks; Transparent Soap; Chemical Colors; How to Make Coal-Gas, and hundreds of interesting hints and formulas.

Chemical Laboratory

(Continued)



No. 4889 Chemical Laboratory

It contains the following 44 chemicals:

Alum $Al_2(SO_4)_3$, $(NH_4)_2SO_4$
Antimony (powdered) (Sb)
Ammonium Aqua (NH_3+H_2O)
Ammonium Carbonate $(NH_4)_2CO_3$
Ammonium Chloride (NH_4Cl)
Ammonium Sulphate $(NH_4)_2SO_4$
Barium Chloride ($BaCl_2$)
Boric Acid (H_3BO_3)
Brimstone (Sulphur) (S)
Calcium Chloride ($CaCl_2$)
Calcium Oxide (CaO)
Calcium Sulphate $(CaSO_4 2H_2O)$
Charcoal (Carbon) (C)
Chloride of Zinc ($ZnCl_2$)
Copper Sulphate ($CuSO_4$)
Ferrous Sulphate ($FeSO_4$)
Ferrous Sulphide (FeS)
Glycerol (Glycerine) $C_3H_7(OH)_3$
Hydrochloric Acid (HCl)
Iodine (I)
Iron Chloride ($FeCl_2$)
Iron Oxide (Fe_2O_3)
Lead Acetate Pb $(C_2H_3O_2)_2$
Litmus Paper
Magnesium Carbonate ($MgCO_3$)
Manganese Dioxide (MnO_2)
Mercury (Quicksilver) (Hg)
Nickel Chloride ($NiCl_2$)
Oxalic Acid ($H_2C_2O_4$)
Sodium Bicarbonate ($NaHCO_3$)
Sodium Borate ($NaBO_2$)
Sodium Carbonate (Na_2CO_3)
Sodium Chloride (NaCl)
Sodium Nitrate ($NaNO_3$)
Sodium Phosphate (Na_2HPO_4)
Sodium Sulphate (Na_2SO_4)
Sodium Sulphite (Na_2SO_3)
Stannous Chloride ($SnCl_2$)
Sulphate of Nickel ($NiSO_4$)
Sulphate of Zinc ($ZnSO_4$)
Sulphuric Acid (H_2SO_4)
Tin (Granulated) (Sn)
Zinc (Metal) (Zn)
Zinc Carbonate ($ZnCO_3$)

The following apparatus are furnished:

One Standard Washbottle
One Alcohol Lamp
One Conical Glass Measure
One Erlenmeyer Flask
One Glass Funnel
One Delivery Tube
Six Assorted Test-Tubes
One Test-Tube Holder
Ten Sheets of Filter Paper
One Glass Dropper
One Spoon Measure
Glass Tubing
One book containing Treatise on Elementary Chemistry and 100 Chemical Experiments to be performed with this outfit.

No. 4889 E. I. Co. Chemical Laboratory, as described **$6.00**

Shipping weight 10 lbs.

Can be Shipped by Express only.

Bunsen Burners

This useful appliance is mounted on iron base, with Stop to regulate the mixture of air. The Brass tip inside of tube can be adjusted to regulate the flow of gas. When used with ordinary illuminating gas gives intense heat. Size 5½x3 in.

No. 1352 Bunsen Burner as per illustration, each **$0.80**

Shipping weight 1 lb.

Glass Spirit Lamp

Invaluable to the experimenter. Used in a thousand different ways, to bend glass rods and tubing, to solder wires, etc. Uses wood alcohol. Size 3½x2 in.

No. 1339 Spirit Lamp, as per illustration, each **$0.35**

Shipping weight 1 lb.

No. 1339

Complete Wall Set Magneto Telephone

(Western Electric Type)

$7

This is a complete commercial telephone station. The cabinet is of polished oak, piano finish, within which is contained the powerful magneto, the 300 Ohm polarized ringer, and induction coil. The magneto is exceptionally efficient, being of the two bar type with brass gear transmission. The extra sensitive microphone, mouthpiece and two gongs are mounted on the front of the cabinet, giving the entire instrument that desirable appearance of compactness and efficiency. Guaranteed to work over 20 miles. The telephone receiver is a double poled one, and has a hard rubber case. Seven binding posts are provided for connections. The instrument is one which we can offer with pride to our patrons at a ridiculously low price. It is unobtainable anywhere else at less than $15.00 and is an instrument unequaled in value for the price we ask. Size over all 11x10x8 in. Shipping weight, 15 lbs.

No. 26 Long Distance Telephone Set—One station.... $7.00
Shipping weight 15 lbs.

Two stations $13.00
Shipping weight 25 lbs.

Above wall sets have been bought from telephone exchanges who put in Central battery types. Slightly used but guaranteed to be in A1 working order.

Telimphone—Interior Telephones

(These Telephones are new.)

No. 9204

In our efforts to present something to our friends that could only fail to work by using a sledge hammer, the **all-metal** "Telimphones" were produced, made of pressed steel, beautifully oxidized.

A short description of how these Telimphones are made may be of interest. The cases are of stamped steel finely finished in black baked enamel. The transmitter (the most important part of the phone), is of the carbon grain type with rigid back insulated by mica, rubber and fibre. It is as sensitive as that used on many a long distance phone. The receiver is of the metal shell type wound with a fine grade of magnet wire. It is remarkably sensitive. The bell is of the usual type but made as carefully as the rest of the phone. The ringing button is entirely concealed with the exception of the actual projecting stud.

Our illustration does the Phone little justice. You must see them to appreciate their value. Will work up to 4,000 feet, for 2 party lines only, 2 dry cells used at each end. Wiring diagram with each set. Size over all 6x4½x2. Prices given do not include batteries or wire.

No. 9204 Complete "Telimphone," One Station..... $2.95
Shipping weight 3 lbs.

No. 9204a Set of Two Stations, complete..... $5.80
Shipping weight 5 lbs.

N. B. Two stations are required for two persons to communicate with each other. Any amount of these phones can be connected in one circuit.

Carbon Grain Transmitter

This is a special design of transmitter for long distance work. It may be used with satisfaction on wireless telephone sets where a heavy current is to be passed through it. This is a first-class instrument in many respects.

No. 6080

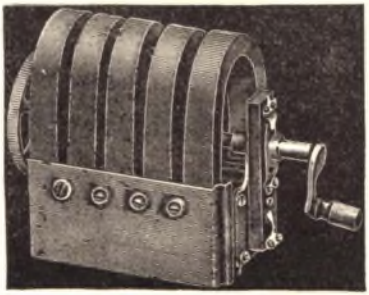
A telephone transmitter has only one function to perform and it either does that right or the most expensive telephone equipment is useless. Same applies especially when a transmitter is desired for experimental purposes. Our transmitter has a very low resistance and a high current capacity. Above all it don't transmit that tinny sound as cheap transmitters do. Altogether a finely nickel plated article at a very low price. Size over all 3¼x2½.

No. 6080 Carbon Grain Transmitter, each..... $1.25
Shipping weight 1 lb.

Telephone Equipment

5-bar Magneto, 110 Volt A. C. Generator

This is one of the most powerful magnetos ever built, when manufacturers could afford to put good stuff into them; equipped with transmission, make and break, etc. Transmission wheels are all brass, crank handle furnished. This magneto, as well as the other ones listed below, will light a 110-volt lamp merely by turning the crank handle slowly. While this magneto gives alternating current only, it can be rewound so it will light up a number of four, six and 10-volt lamps, all depending upon the thickness of the wire you wind on the armature. As we furnish these magnetos, they will give a powerful alternating current and you will not be able to stand the current when grasping hold of the terminals. This makes an ideal shocking machine. The magnets furnished with these generators are very powerful, each one being able to lift one pound easily.



No. 55

No. 55 **5-BAR MAGNETO GENERATOR as described. Price** **$5.00**
Shipping weight 25 lbs.

No. 22 **2-BAR GENERATOR same as the above described except that it is of a smaller type. Price** **$2.00**
Shipping weight 10 lbs.

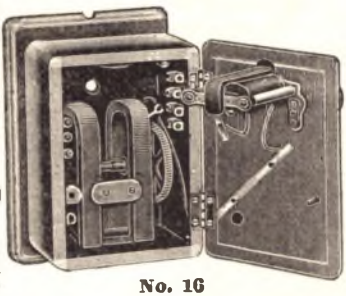
No. 33 **3-BAR GENERATOR, same as described, above except that it has only 3 bars, and is somewhat smaller. Price** **$2.30**
Shipping weight 10 lbs.

No. 44 **4-BAR GENERATOR, same as No. 55 except that it has 4 bars, and is somewhat smaller. Price** **$4.00**
Shipping weight 15 lbs.

Western Electric Ringer Box

Complete with 2500 ohm polarized ringer bells in front of cabinet. The magneto furnished is of the two-bar type, brass gear transmission to drive it, and crank on the outside of the cabinet. The cabinet is of polished oak, piano finish and if you mount our No. 10 microphone and bracket in front of the cabinet and use our No. 7 or 8 receiver, and then use a switch to break the current you have a first-class telephone outfit at a ridiculously low price. This ringer box is one of the greatest bargains that has ever been put out.

No. 16 Western Electric Ringer Box.
Price **$4.50**
Shipping weight 15 lbs.



No. 16

No. 17 Ringer Box. This is the same as No. 16, except no magneto is furnished. Also the box is somewhat smaller. It is a regular style independent box containing 2500 ohms, polarized ringer with bells on top outside of the box. Has also triple lightning arrester.

No. 17 Ringer Box, size over all 6x7x5. Price **$2.00**
Shipping weight 10 lbs.

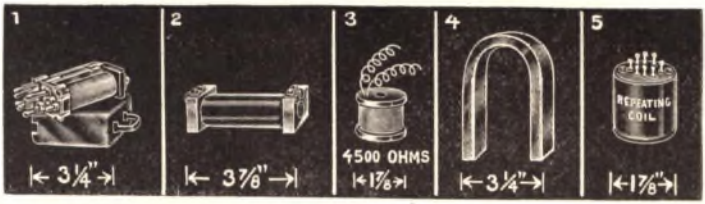
Telephone Equipment

The goods which we offer on these pages are all standard telephone apparatus. Every piece we are offering is equipment that for one reason or another was discontinued by the telephone companies.

We have bought a large block of these goods and have a large quantity of every item on hand. Immediate shipment can be made on all of the goods in practically any quantity within reason. We guarantee every piece to be as represented, and we will refund the money if the goods are not exactly as claimed by us.

(over)

Telephone Equipment—(Continued)



All the sizes are given on illustrations.

No. 1 TELEPHONE RELAY, 1500 ohms—has two silver-contact springs and is very sensitive. Can be used wherever a sensitive relay is needed. It is adjustable and can be used for a variety of purposes. Weight, 2 lbs. Price..... **$1.50**

No. 2 STANDARD TELEPHONE Induction Coil, primary 1 ohm, secondary 55 ohms. Used wherever you need a good induction coil. Has primary and secondary and iron wire core; fibre heads. Shipping weight, 2 lbs. Price **$0.65**

No. 3 STANDARD RESISTANCE wound with German silver wire—4,500 ohms, can be used as a choke or plain resistance. Shipping weight, 4 oz. Price..... **$0.40**

No. 4 HORSESHOE MAGNET, size 3¼ wide x 5 inches high. Will lift about 1 lb. Quality such as used on magnetos, which means the best. Shipping weight, 2 lbs. Price **$0.35**

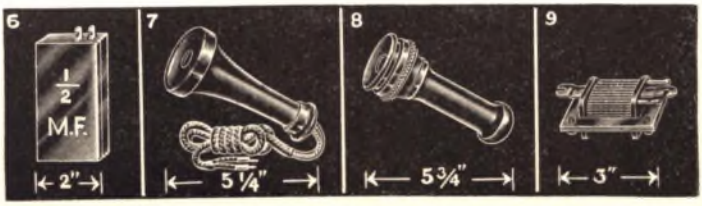
No. 5 REPEATING COIL (Transformer). This is a standard small repeating coil and is used by all telephone companies. It has 4 different windings and eight contacts. Entirely enclosed in iron. The resistance being respectively 72 and 120 ohms, and 90 and 100 ohms. Can be used for wireless, for boosting signals, etc. Shipping weight, 2 lbs. Price.... **$0.50**

No. 6 ½ M. F. CONDENSER. This is a standard telephone condenser and has ½ microfarads. Condenser comes in neat metal casing. This condenser is used in connection with spark coils to absorb the vibrator spark. Invaluable for test buzzers to absorb spark and make the sound of the buzzer more steady. Is also used by every experimenter in connection with wireless where a fixed capacity is needed. Shipping weight, 1 lb. Price **$0.65**

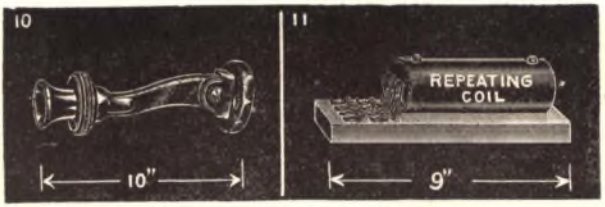
No. 7 DOUBLE POLE BELL TELEPHONE RECEIVER—hard rubber casing with 4 ft. cord and tips. Standard 75 ohms—very powerful magnets. This receiver can be used in connection with any ordinary telephone work, and you will even find it sensitive enough for short distance wireless work. Shipping weight, 3 lbs. Price **$0.80**

No. 8 STANDARD TELEPHONE RECEIVER with Metal Head. This receiver is made by Stromberg Carlson Co., with genuine hard rubber handle and ear cap. A very good fool-proof as well as sensitive receiver. Shipping weight, 3 lbs. Price **$0.75**

No. 9 IMPEDANCE COIL. This is a very fine little transformer and is used extensively in connection with telephone work. It is in reality an A. C. transformer for which you would pay $5.00 if you had it made to order. Winding a primary on top of secondary completes transformer. Secondary 2,000 ohms. Can be used successfully to boost wireless signals. Also in connection with audions, etc. Size 3x3 inches. Shipping weight, 2 lbs. Price **$0.80**



Telephone Equipment—(Continued)



No. 10 MICROPHONE AND BRACKET. An A-1 sensitive microphone of the carbon grain type. Has hard rubber mouthpiece and enamel steel bracket, the instrument being 10 inches long. This microphone, in connection with our No. 7 or 8 Receiver, will constitute a complete telephone outfit, good to speak 50 miles or more, at a remarkably low price. Shipping weight, 5 lbs. Price **$1.25**

No. 11 REPEATING COIL (Transformer). A standard repeating coil used for telephonic work. The coil windings are encased in an iron tube 2¼ inches in diameter. There are eight terminals for the four windings to connect to and the instrument is invaluable in connection with radio work to boost up signals, audion work, etc. Many interesting uses will be found for this coil. Resistances are: 100, 120, 145, 175 ohms. Shipping weight, 8 lbs. Price **$2.00**

No. 12 POLARIZED RINGER with Bells. The resistance of the two coils is 1250 ohms each. The armature is perfectly adjustable. Bell will work on any magneto. We also furnish blue print with ringer showing how a **first class polarized relay** can be made by anyone using only a few pieces of metal and screws. Shipping weight, 2 lbs. Price **$1.50**

No. 13 POLARIZED RINGER with Bells. This is the same kind of ringer as the No. 12, except that it is not adjustable and that the resistance is less. First class in all respects. Blue print furnished with this to **make polarized relay** same as with No. 12. Solenoids on this ringer are worth more than the price we ask for the entire, ringer, and do not forget a powerful magnet that goes with it. Shipping weight, 2 lbs. Price.... **$1.00**

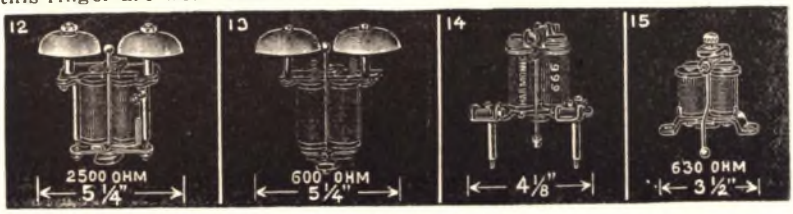
No. 14 HARMONIC RINGER. This ringer is also polarized and has a powerful magnet. It works on 66.6 cycles and any magneto will operate it if run at a certain speed. Resistance of each coil being 200 ohms. Can be converted into a polarized relay by substituting a very fine leaf spring instead of the heavy one furnished.

Shipping weight, 4 lbs. Price **$1.60**

No. 15 RINGER without Bells—630 ohms. This also is a polarized ringer and has an adjustable armature. The adjustment is done by means of the top screw. With this instrument, too, we furnish a blue print showing how a **polarized relay can be built.** They are worth their weight in gold; the powerful magnet alone being worth more than the price we ask for the entire instrument. Shipping weight, 2 lbs. Price..... **$0.80**

No. 18 POLARIZED RINGER with Bells, resistance 500 ohms. This is the same instrument in all respects as No. 15 except that the magnet is not adjustable. Blue print how to make polarized relay furnished. Shipping weight, 2 lbs. Price **$0.75**

No. 19 RINGER WITH BELLS, 80 ohms. This is the same instrument in all respects as No. 15 except that the magnet is not adjustable. Blue print how to make polarized relay furnished. Shipping weight, 2 lbs. Price **$0.75**



How to Make Wireless Sending Apparatus

No. 141

Contains information on how to make 30 different pieces of wireless sending apparatus from materials easily obtained. Illustrations and descriptions are big, simple, and easily understood.

Only modern apparatus is described by 20 wireless experts who give you the benefit of their experience.

Tells How to Make an Experimental Arc Set, Speaking Arc, Quenched Gap, ¼ K.W. Transformer, Oscillation Transformer, Photophone, etc., etc.

Book has 100 pages, (size 7 x 5 in.) 88 illustrations, paper cover printed in two colors.

No. 140. How to Make Wireless Sending Apparatus. Price prepaid **$0.25**

How to Make Wireless Receiving Apparatus

Written entirely for the Wireless "Bug" who makes his own apparatus. The 20 radio constructors who wrote the book know how articles should be made from simple materials.

Only modern apparatus is described such as Receiving Set without aerial or ground, magnetic detector, wireless relay, wireless lecture set, etc., etc. Book has 100 pages, each 5 x 7 in., 90 illustrations, many full pages, paper bound in two colors. A wonderful book and one you need.

No. 141 How to Make Wireless Receiving Apparatus. Price prepaid **$0.25**

No. 140

Design and Construction of Audion Amplifying Transformers

Radio and Audio Frequency Type

This latest and important book by Mr. Edward T. Jones, late Associate Editor of Radio News, will be of great interest to all radio amateurs throughout the land. The transformers shown in these books have never been described in print before, and have usually been considered a manufacturer's secret. Anyone who has several vacuum tubes cannot afford to do without this book because it will enable him to build the necessary amplifying transformers very readily.

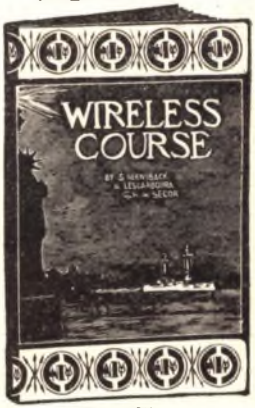
No. 142

Mr. Jones, the author, is a practical man, who is an experimenter himself and knows whereof he speaks. The book is printed on good paper and has an attractive cover in two colors. Paper bound. Size, 5 inches by 7 inches. Contains many illustrations, diagrams and working data necessary to build the transformers.

No. 142 Design and Construction of Audion Amplifying Transformers. Price prepaid.... **$0.25**

The Well-Known
"WIRELESS COURSE IN 20 LESSONS"
BY S. GERNSBACK, A. LESCARBOURA and H. W. SECOR, E. E.
(Eighth Edition)

More than 50,000 of this course sold as yet.



No. 187

In use on every battleship of the U. S. Navy.

Just as you will receive it—stiff covers, cloth bound, size 7 x 10 in., 160 pages, 20 lessons, 350 illus., 30 tables, with every bit of information on Wireless you can possibly want, besides valuable information on Electricity, Magnetism and Theory of them.

A course that tells you everything you can possibly want to know about "Wireless," starting off in Lesson No. 1 by explaining the Principles of Electricity.

The Second and Third Lessons are devoted to magnetism, motors, generators and wiring. And then, by simple, easy stages this wonderful Course takes you into "Wireless." The mysteries of "Wireless" are unfolded to you by the use of such simple language so skilfully used that of necessity you must understand every word. The subject is not treated superficially, however, for there is a whole lesson devoted to the Theory and Mathematics of this epoch marking subject. To lend charm to the Course, the last Lesson (No. 20) is devoted to a history of Wireless and the men who developed it.

No. 187 Wireless Course in 20 Lessons, as described, stiff covers, cloth bound. Sent prepaid..... **$1.25**

The Best Electrical Text Book on the Market
"Experimental Electricity Course"
By S. Gernsback and H. W. Secor, E.E.

TABLE OF CONTENTS OF THE TWENTY LESSONS:

Electric Bells, Buzzers and Annunciators.
Primary Batteries and Dry Cells.
Storage Batteries.
Rectifiers and Transformers.
Small Electric Lighting Plants.
Electrical Wires and their Calculations.
Telegraph and Telephones.
Dynamos and Motors.
Switches, Burglar Alarms and Miscellaneous Connections.
Experimental Electro-Physics.

No. 103

Electro-Therapeutics.
Induction Coils and Geissler Tubes.
The X-Ray.
High Frequency Currents (Tesla Transformer Experiments, etc.)
Electroplating, Part I.
Electroplating, Part II.
Static Electricity and Static Generators.
Electrical Measuring Instruments.
Practical Mathematics.
How to make things. (The Use of Raw Material).
Useful Information.

A masterpiece. Just the book you need to tell you all about electricity and electrical facts in plain everyday language that you can understand. Explains every electrical device from a push button and bell to the biggest generator made. Worth its weight in gold for the man who doesn't know enough about electricity, and to the experimenter it is still more valuable because of its many facts, tables, etc.

Book has a stiff cloth cover, is 5 x 9 inches in size, and contains 160 pages, 400 illustrations and is so shaped that it just slips in your pocket to read while you ride. A real bargain at the price.

No. 103 Experimental Electricity Course, sent prepaid..... **$1.25**

A THOUSAND AND ONE FORMULAS

By S. GERNSBACK

A Laboratory Hand Book for the Experimenter and for Everybody who wants to "do things."

A Book, brimful with very important and priceless information, collected and selected for years.

The recipes and formulas are classified in such a manner as to be available at once, without long research.

Invaluable for Students, Engineers, Physicians, Experimenters, etc.

Here are some of the chapter headings:

Cements and Glues; Compositions of All Kinds; Glass and Glassworking; Inks; Leather Polishes; Metal-craft; Perfumery, Soaps and Extracts; Photography; Blue Print and other Paper; Plating; Pyrotechny; Polishes and Stains; Varnishes and Paints; Various Cleaning Formulas; Wood-craft; Chemical Laboratory Hints and Experiments; Mechanical Laboratory Hints and Experiments; Electrical Laboratory Hints and Experiments.

Besides there are a score of tables and hundreds of Illustrations and Diagrams.

Book is cloth bound in Velum de Luxe.

Gold stamped and hand sewed.

It contains 160 pages. The paper has been especially selected to stand rough handling in laboratories.

Size 6 x 9 inches.

A thousand and one Formulas, as described. Postpaid..... **$1.75**

THE HOW AND WHY OF RADIO APPARATUS

By H. W. SECOR, E. E.

This newest book on radio matters fulfills a distinct gap in wireless literature in that, while the treatment is made as understandable and as free from mathematics as possible, it at the same time, incorporates a wealth of technique and instruction for the Radio Amateur—the Radio Operator—the Installation and Designing Expert—as well as teachers and students of the subject in general.

A very broad field has been covered by the author, at the same time giving a great deal of information not found in other text-books. If you are engaged in any branch of the Radio or allied arts at all, you will surely need this latest contribution to radio literature, which is destined to be found on every radio man's book shelf before long.

A glance at the following list of chapters gives but a very scant idea of the extensive and useful radio knowledge provided in its text:

The Induction Coil; The Alternating Current Transformer; Radio Transmitting Condensers; The Spark-Gaps; Radio-Transmitting Inductances; Radio Receiving Tuners; Radio Receiving Condensers; Detectors; Telephone Receivers; Radio Amplifiers; Construction of a direct Reading Wavemeter and Decremeter; Antenna Construction; The Calculation and Measurement of Inductances; Appendix containing very useful tables, covering all subjects treated in this very unusual book.

This newest of Radio Works, cloth bound in Velum de Luxe, Gold stamped and Hand Sewed has 160 pages. Size of Book 6 x 9 inches.

The How and Why of Radio Apparatus, Postpaid..... **$1.75**

CONSOLIDATED RADIO CALL BOOK

The only book in print officially listing all the radio calls as issued by the Bureau of Commerce.

All Amateur Calls Listed

In addition every vessel and land station in the world is represented and listed alphabetically, according to names of vessels or land stations, and according to call letters; Revision of American coastal stations under U. S. Naval control, and their new calls.

That new and great aid to navigation—the radio compass—is explained and is a unique feature of this publication which will be of special value to masters of merchant vessels. This book contains all calls listed in the new book to be published by the Department of Commerce.

Given Free with Each Copy

A Wireless Map of the World **in colors** is given absolutely free with each copy.

Price, Prepaid..... **$1.00**

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