

TWENTY-EIGHTH EDITION.



TRADE MARK

ABRIDGED CATALOGUE
AND
MANUAL
OF
TELEGRAPHY

WITH

DESCRIPTION OF
INSTRUMENTS

ADAPTED FOR USE IN

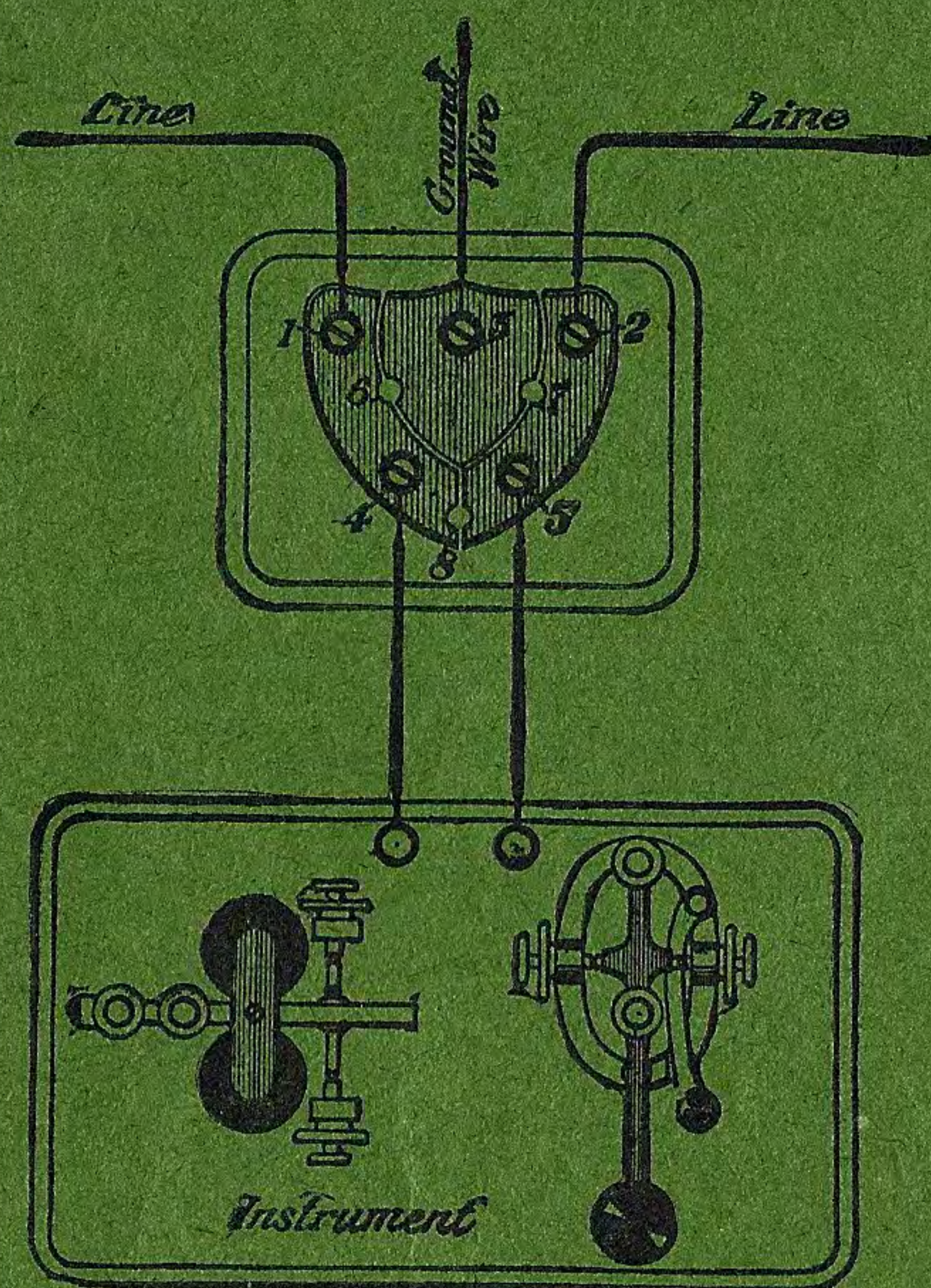
LEARNING THE ART OF OPERATING

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UNION LIGHTNING ARRESTER CONNECTIONS.



The cut shows arrangement of Switch and Instrument at an "Intermediate Station." Line to 1 and 2; Ground Wire to 3 and Instrument Wires to 4 and 5.

Placing peg in 6 or 7 cuts off or grounds the corresponding side of line; peg in 8 cuts out instrument.

TERMINAL STATION WITHOUT BATTERY.

Instrument Wires to 4 and 5. Line Wire to 1. Ground Wire to both 2 and 3.

TERMINAL STATION WITH BATTERY.

Line to 1. One pole of the battery to 2; other pole of battery to 3; ground wire also to 3. The pole of battery connected to 3 must be the reverse of pole connected to line at distant end.

Explanation of the Telegraph.

The telegraph consists in a combination of four things, namely:

A battery, which produces a current of electricity.

A line wire, which conducts that current from one point to another.

A transmitting key.

An electro-magnetic apparatus, which gives out in sounds or sounding strokes all the signals which are made by pulsations of that current from a distant point.

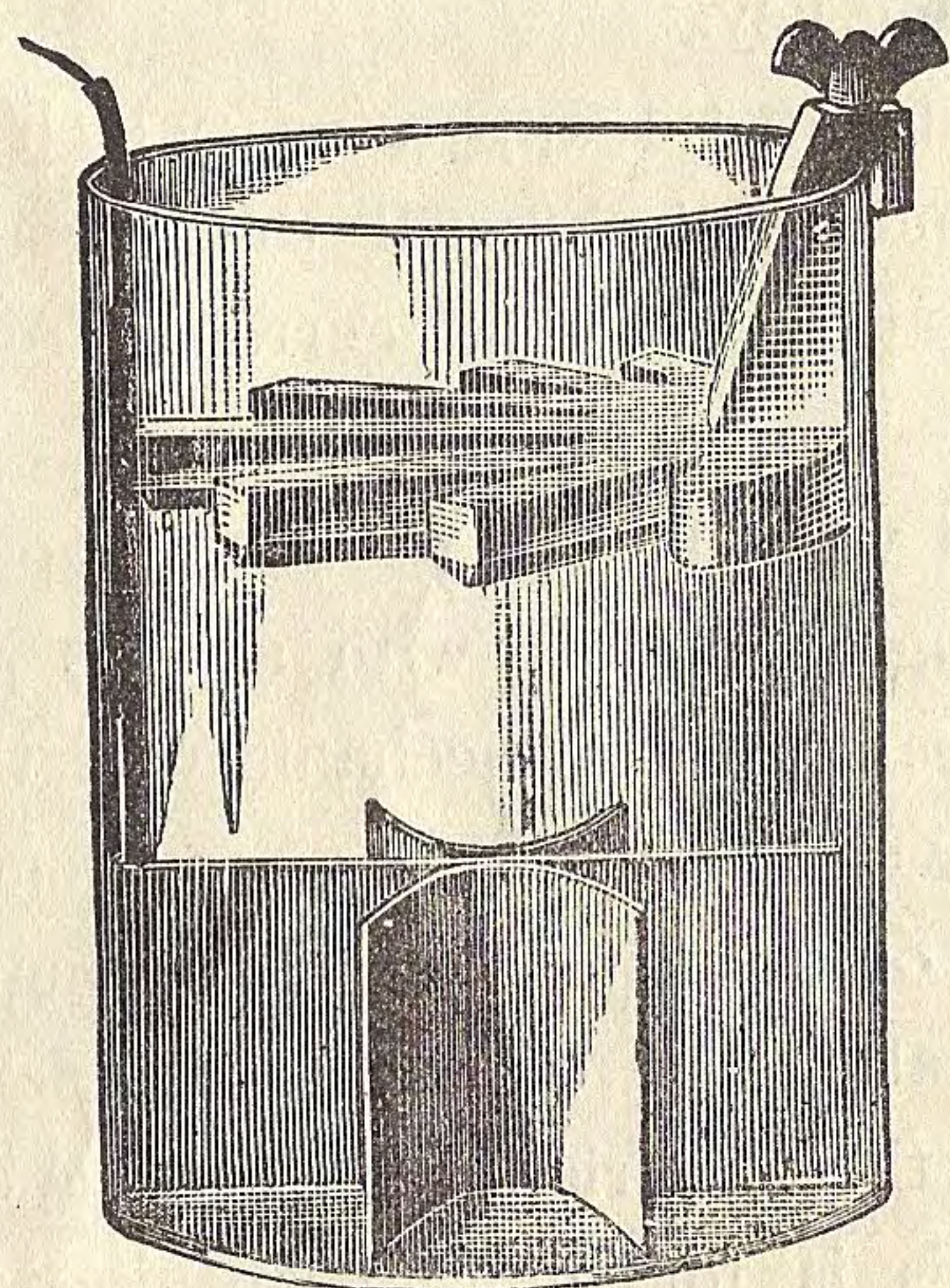
The student who intends to be an operator should become thoroughly familiar with all the practical features of the apparatus and mechanism of the telegraph.

It is not only a great aid to the prospects of advancement for the operator to have a thorough knowledge of the electrical theory of telegraphing and to understand all about the batteries, the wires, and the instruments, but this is for him an opening page to that great book of wonders, Electrical Science, which is now attracting the attention and the enterprise of the civilized world.

THE BATTERY.—As the Battery is the first essential part of a Telegraphic apparatus, the study will properly begin here.

It is by the chemical action in the battery that the electric current is first generated, and in practical Telegraphy this current is made to traverse long or short distances through the conducting medium of metallic wires, and by means of the proper instruments, which are herein described, made to give out tangible

signals which, being arranged in the form of an alphabet, enables us to read or to speak instantaneously through great distances, for the electric current requires but a small fraction of a second's time to travel many hundreds of miles through the wires.



Gravity Battery, Size 5x7, Price, 90c. per cell.

The above cut represents a single cell of Battery of the kind now most generally used for telegraphic purposes throughout the United States. It consists of three parts, namely: The Jar, the Zinc, and the Copper.

The jar is of glass, and is about five inches diameter and seven inches deep.

The "Zinc" is shaped as shown in the cut and is provided with a brass connecting screw at the top of the arm—the arm serves as a means of supporting the Zinc in proper position.

The connecting screw is used to bind or "connect" a copper wire to the Zinc—which is called the "*Negative*" or "Zinc pole" of the battery.

In the bottom of the jar three leaves or strips of sheet copper are joined together, as shown in the cut, and having fastened to them an insulated conducting wire, which, passing out at the upper part of the jar, constitutes what is called the copper or positive pole of the battery.

When the battery is charged for operation if the wire projecting upward from the copper be connected with the zinc by binding the bared end of the wire under the screw in the arm of the zinc, a current of electricity will constantly flow through the wire from copper to zinc, and will cease to flow the moment the wire be disconnected. If the wire from the copper be extended to a mile in length, and its end connected in the same manner with the zinc, the current will flow through its entire length and come back to the zinc, just as surely as though the distance were but a few inches, and will instantaneously cease to flow the moment the wire is disconnected or broken at any point in its entire length.

Where powerful currents are required, additional cells are added by connecting either the copper or zinc pole of the first cell to the opposite pole of the next, and so on; so that in a series of fifteen or twenty cells, if the unconnected pole of the cell at one end was copper that pole would constitute the copper pole of the entire battery, and the unconnected zinc at the other end would be the zinc pole of the entire battery. By

connecting the end of a wire of any length to the zinc or copper pole of such a battery, and its opposite end to the remaining pole, a much more powerful current would pass through the wire than if the Battery consisted of but one cell.

Telegraph companies on their long lines use Batteries of from twenty to a hundred cells each.

Conductors and Insulation.

Mention is made of the use of wire as the medium of conducting currents of electricity from one pole of a battery to any given point, and thence back to the opposite pole, making the "circuit," as it is called, complete. Certain substances are found to conduct electricity with more or less facility, and these substances are called conductors, while through other matter no currents whatever will pass. The latter class of substances are called non-conductors or insulating bodies.

In Telegraphy the principal materials used as conductors are copper, iron, brass and platina, For insulation, gutta-percha, hard and soft rubber, glass, silk and cotton fibre, dry wood, bone and ivory.

Iron in the shape of wire is usually employed as an outside conductor on account of its durability, cheapness and strength, although it is not as perfect a conductor as copper, which latter is generally used for all wires inside of buildings and offices.

In conducting currents of electricity from one point to another, as in Telegraphy, it is found necessary to use non-conductors wherever the wire is fastened for

support, in order to prevent escape of the current at these numerous points. For this purpose, glass is principally used for outside wires. The glass "insulator" is placed on a wooden pin or "bracket" which is fastened to the pole or building on which the wire is to be supported, after which the wire is strung, and tied to the glass with a short piece of iron "tie wire." Inside of offices, hard and soft rubber tubes are used where the wires pass through the windows, and the copper conducting wires are usually covered with a coating of gutta-percha, or wrapped with a continuous covering of cotton or silk. The latter is principally used as a covering for the wires inside the finer instruments. For the handles or knobs to the various instruments which require manipulation, hard rubber is generally used.

The Earth as a Conductor.

It is found that when one pole of a battery is connected with the earth, and the wire from the opposite pole carried to a point at any distance away, and also connected with the earth, the current will flow as readily as though the "circuit" had been made complete by the use of a return wire. It is therefore shown that the earth is practically one vast conductor. This is principally due to the fact that moisture is everywhere present beneath the surface of the earth, and water itself is known to be a very fair conductor.

Telegraph companies make great practical use of earth conduction by using it in all cases for their numerous lines, both long and short, thus saving the

construction of a separate or return wire on every circuit.

Magnets and Keys.

A careful reading of the foregoing will have enabled the student to understand how currents of electricity are generated and made to travel through space. The next feature of the study will be the mechanism employed to make these currents transmit signals.

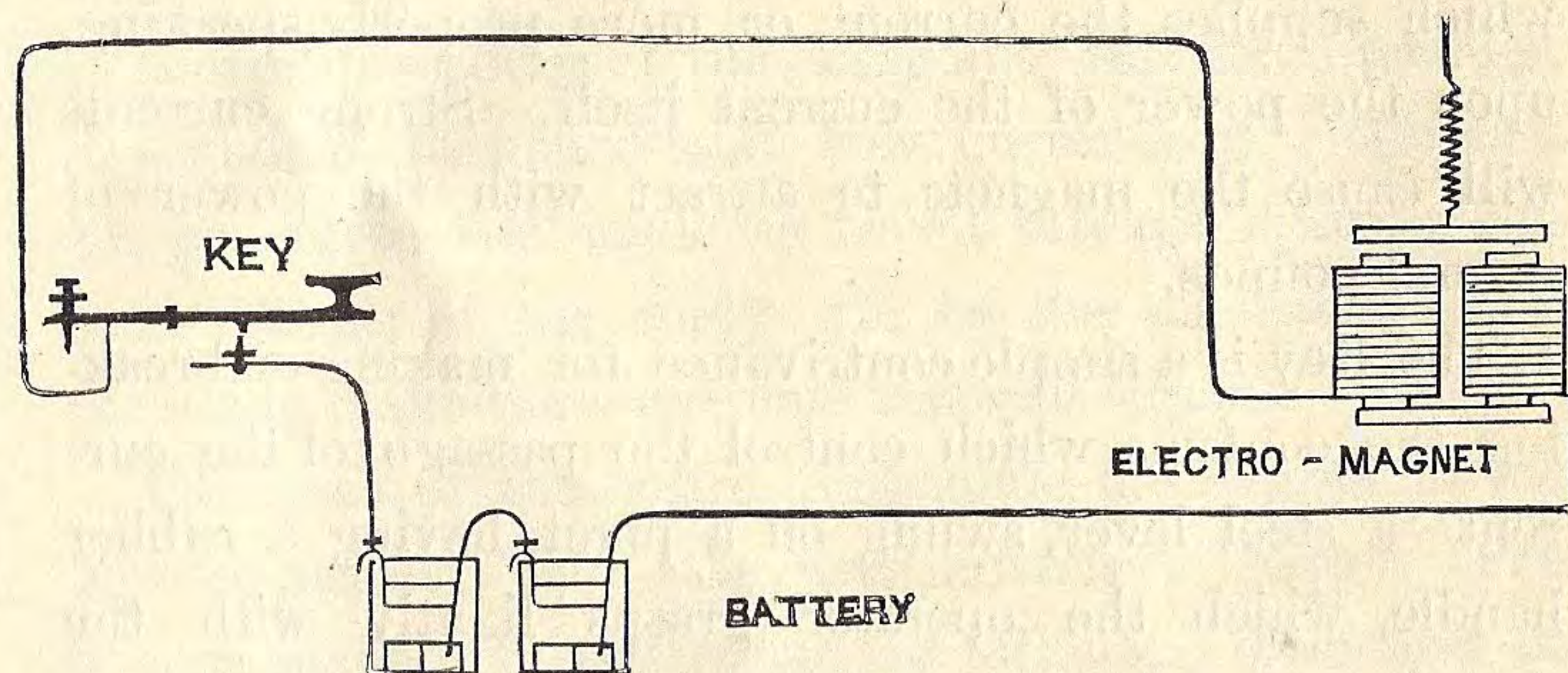
The basis of the entire telegraphic mechanism is the Electro-magnet and the transmitting "Key." The Electro-magnet is constructed as follows: Two bars of soft iron, having round heads of hard rubber, thus making spools of each, are joined together by means of a short flat bar of iron similarly soft. The round bars in the spool of the magnet are called cores, the flat connecting bar at the back is called the "back bar" or "heel piece." The movable flat piece of iron in front which is to be attracted by magnetism to the cores, or withdrawn by the spring when no magnetism excites the cores, is called the Armature.

A silk or cotton-covered wire is wound in continuous turns about the cores, until the diameter of about an inch and a half is attained, and each core or spool of the magnet contains a great number of turns of the wire around it. Now, if a current of electricity be sent through this wire, it will, by its passing through the numerous turns, cause the iron cores within to become magnetic and to possess the power of attracting with considerable force any piece of iron brought near to their ends. The cores being made of soft iron, will lose

their magnetism and cease to exert any attractive power the moment the current ceases to flow. The actual power of the attractive force thus exerted is directly dependent upon the power of the battery which supplies the current, or, more properly speaking, upon the power of the current itself. Strong currents will cause the magnets to attract with the power of several pounds.

The Key is a simple contrivance for making or breaking the contacts which control the passage of the current—a steel lever, swung on a pivot, having a rubber handle, which the operator grasps lightly with the thumb and forefingers. On pressing the lever downward, a platina point projecting under the lever is brought into contact with another platina point set into an insulation of rubber in the base of the key, so that there can be no electrical connection between them unless the key is pressed down, or "closed," as it is termed. A conducting wire being separated at any point, and one of its ends connected with the lever or base of the key, and the other end with the metal set into the rubber insulation, would convey the current while the key was closed, and cease to do so the moment it was opened. Platina is used at the points where the electrical contacts are made and broken, because it does not readily fuse or tarnish. An extra lever at the side of the key is called the "circuit-closer," and is used as a means of keeping the circuit closed when the hand of the operator is not on the key. When the circuit-closer is pushed into its closed position, it makes contact with a brass lip, which latter is fastened to the

rubber along with the lower platina point. This, then, has the same effect as though the key was pressed downward and contact made at the points.



The above cut represents a magnet with its armature suspended from a spring, and connected with it by a wire, a battery, and a key. From what has now been explained, it may be seen that when the key is closed a current from the battery will pass through the wire and magnet, and cause the latter to attract the armature, overcoming the resistance of the spring, and that the instant the key is opened the current will cease to flow, the magnet cease to attract, and the spring will instantly draw the armature back to its original position. In this way the armature is made to follow exactly the movements of the key, no matter at what distance they may be placed from each other, although in practice it is found that as the circuits are lengthened, more battery power and more delicate instruments are required than on short lines.

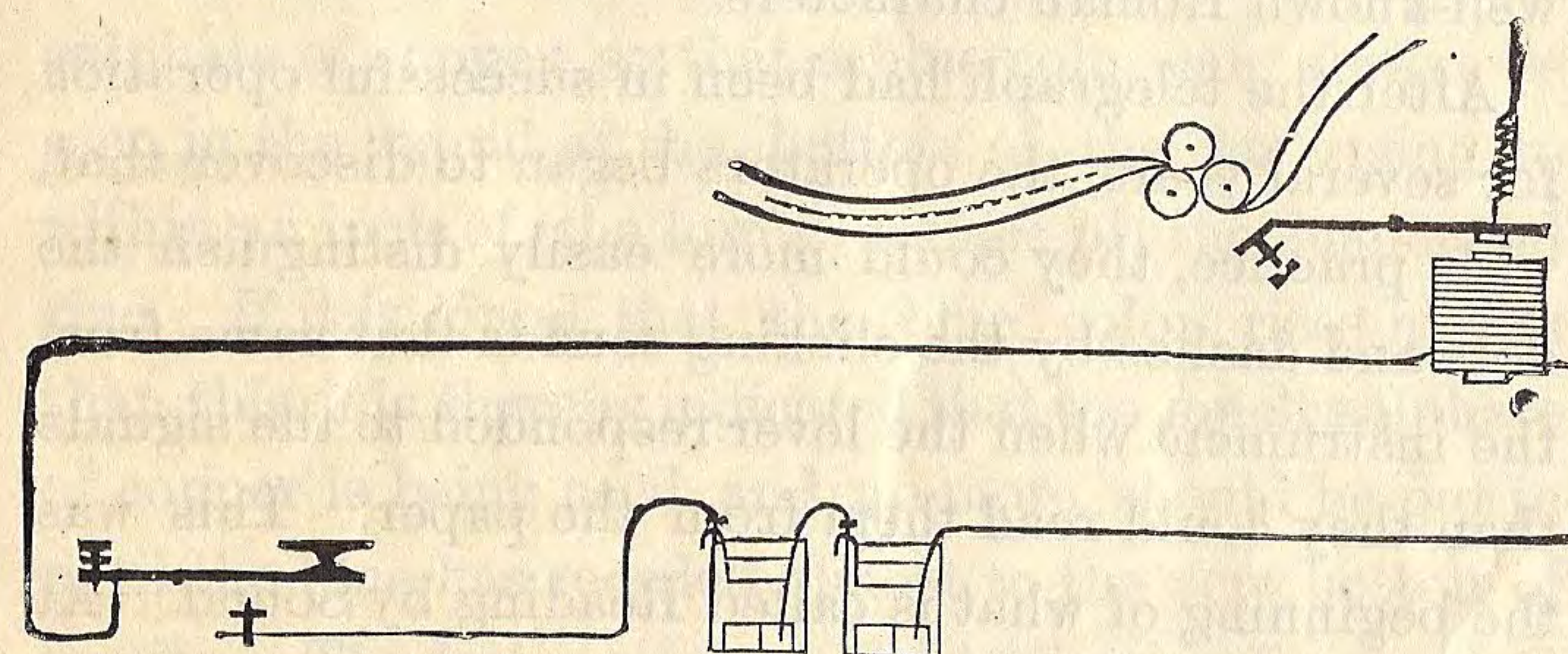
The whole basis of the telegraph system is this duplication at one point, by the magnet and its armature, of the

motions made on the key by the hand of the operator, at another separate and distant point.

During the first years of telegraphy, the Morse Register was the only means employed to put into tangible form the signals transmitted over the wires.

In order to give the clearest possible idea of the operation of a Register, by which it records these signals, reference is made to the next paragraph, containing an outline diagram of the main working parts of the instrument, and an accompanying explanation.

Morse Alphabet and Register.



The armature of the magnet is attached to a lever, and this lever, which swings on a pivot in the middle, is provided at the end with a pointed pin or screw, which is caused to press upwards against a strip of paper whenever the magnet attracts, and to return to its former position when the attraction ceases. Meanwhile the paper is kept moving steadily forward, so that if the lever-pin is pressed against the paper, for only an instant of time, a short mark or *dot* appears pressed or embossed into the paper. If for a longer time, the mark would be proportionately longer, or a *dash*. If

alternately, the marks would come consecutively, and have *spaces* between them. As the Morse Alphabet consists entirely of dots, dashes, spaces, and extra long dashes, the letters and numerals are easily made with these marks and their combinations. So that as the hand of the operator, on the key at a distant point, makes short or long strokes, dots or dashes, or spaces, these same marks appear on the paper as it comes from the Register, and being based on the formation given by the Morse Alphabet, are as easily understood by the receiving operator as though they appeared in the well-known Roman characters.

After the telegraph had been in successful operation for several years, the operators began to discover that, with practice, they could more easily distinguish the dots and dashes by the clicking sounds that came from the instrument when the lever responded to the signals than they could read them from the paper. This was the beginning of what is called Reading by Sound. At the present time none are considered good operators who cannot read by sound, and there are comparatively few Registers in use in the United States.

To Set Up the Instrument and Battery for Practice.

First—Put the battery in operation according to the following directions:

Fill the jar about two-thirds full of water, place the copper in the bottom of the jar in such a way that the leaves of the copper are spread out like an **X** with the copper wire extending upwards and out of the jar.

Next drop carefully into the bottom of the jar about 1 lb. of blue vitriol and 2 oz. sulphate of zinc.

Then hang the zinc in the jar as shown in the cut, and the battery is ready for operation, although it will not work at its best power until it has been in use for about three days.

To hasten its full action, connect the copper with the zinc by fastening the wire into the clamp screw of the zinc, and leave it so for about twelve or fifteen hours. This is called putting the battery on a "short circuit."

The battery should be kept supplied with enough sulphate of copper so that a blue color can always be seen in the liquid at the bottom of the jar, rising to within an inch of the lower surface of the suspended zinc. If it is found that the blue color rises higher than this, it is thereby indicated that too much sulphate of copper is being used, and no more should be put in until the blue has receded almost to the very bottom of the jar. The latter state of the battery indicates that more sulphate of copper is required. Water should be from time to time added to that in the jar, to replace the loss by evaporation.

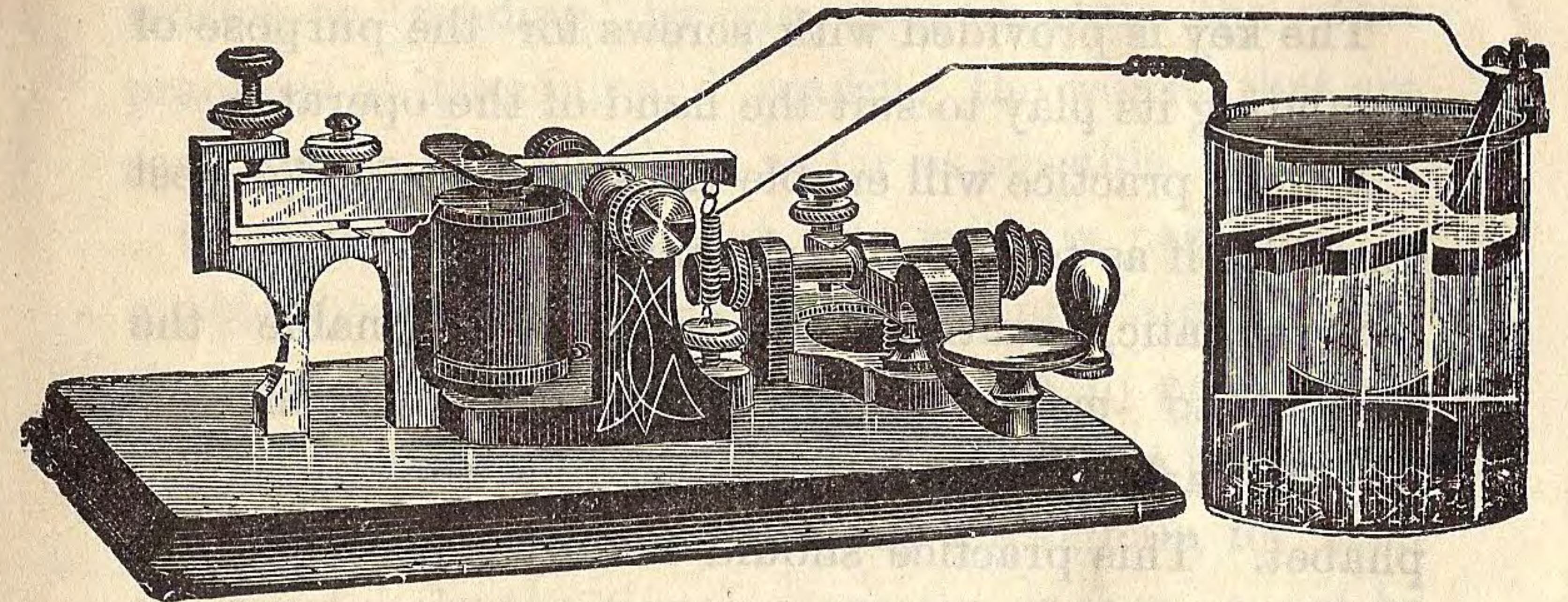
As long as the battery continues in action there is an increase of the quantity of sulphate of zinc in solution in the upper part of the jar. A hydrometer is convenient for the purpose of testing the strength of this solution. When the specific gravity is less than fifteen degrees, the sulphate of zinc solution should be strengthened; when it is thirty degrees, or more, a portion of the top of the liquid should be drawn

off with a syringe or cup, and replaced with fresh water.

Once in eight weeks or three months it will be necessary to thoroughly clean the battery. Take out the zinc carefully, and clean it by scraping with a knife and washing; pour the liquid into a separate jar, leaving behind the oxide and dirt which may have gathered on the bottom of the jar. Now take out the copper and clean it, throw the sediment away, and clean the jar. Pour the clean liquid back into the jar again, replace the copper and zinc, add water enough to cover the zinc, and put in a few crystals of sulphate of copper. The battery will again be ready for use.

In joining together any number of cells, whether of the same or of different kinds of battery, the positive pole of the first cell must be connected with the negative pole of the second cell; the positive of the second with the negative of the third, and so on throughout the whole series. It matters not which pole you commence with, if you are only careful never to connect like poles. This law must be as strictly observed in joining batteries hundreds of miles apart as if they stood side by side.

No battery should be permitted to freeze, for while frozen the current is very much impaired or altogether suspended. A battery while warm works more vigorously, as heat is a promoter of chemical action. The connections must be kept free from rust or dirt, in order to allow the current to pass through them freely.



Having set up the battery according to the preceding directions, connect one wire from the copper pole of the battery to one of the brass binding-posts at the back of the instrument, as shown above, and one wire from the zinc pole to the remaining binding-post; screw down the instrument firmly to the table with the screw in the base, as its best sound is thereby produced. See that none of the screws are loose in their places, and that the armature lever, which is the speaking tongue of the Telegraph, plays freely, with a movement of about one-sixteenth of an inch. The spring, which draws the armature lever upwards, and is called the *adjustment*, should only be set at sufficient tension to raise the lever when no current is passing through the magnets. If drawn too tightly, the spring will not allow the armature to respond to the attractions of the magnets. When the instrument is not in use, leave the circuit-closer of the key open about half the time. This will keep the battery well at work. See that the platina points of the key are kept clean from dirt or dust, thus preventing imperfect contacts from being made.

The key is provided with screws for the purpose of regulating its play to suit the hand of the operator.

A little practice will enable the student to judge best for himself as to how this should be set.

Systematic, continual practice will enable the student to make surprising progress in mastering the art of sending and reading the Morse Alphabet. This practice should mainly consist of three kinds.

I. Morse writing with the Key and without a companion.

II. Combined Morse writing and reading with a companion student.

III. Practice in both Morse writing and reading of messages, social conversation, printed matter, and the Exercises, where the two or more persons practicing are in separate rooms, or at a distance from each other in separate houses, and entirely dependent upon the wire and instruments for their communication with each other.

Regarding the first named, a great amount of single practice should at all times be kept up, as it brings that thorough and unhesitating familiarity with the Morse signals which is necessary before any one can become a telegraph operator. This familiarity with the Morse signals becomes, when fully acquired, as easy as the exercise of speech. An operator does not have to *think* before making a Morse letter on the key any more than he or she does before speaking a word in the English language.

The second step of practice consists in alternate key

writing or "sending" by one student while the other practices at listening and reading the words that are sent, and in copying them as far as possible.

Considerable training at this work is necessary to enable the students to become sufficiently familiar with the *sound* of the Morse letters, as made by each other, to read what is sent with the key. This practice serves to correct inaccuracies in sending the signals, for each one must make the signals correctly, or they cannot be read by the other.

As soon as two persons have pursued the above system of practice until they have become able to hold a conversation of short sentences in "Morse" with each other, they should begin the separated practice, which is the last and most interesting step in learning telegraphy, and in preparation for the duties of an operator. Set up the instruments in separate rooms, connect them with each other by wire, as explained elsewhere in this book, and practice at sending and receiving messages, printed matter, and conversation, copying everything as it is received.

Wherever it is possible, the student should secure an opportunity to finish his or her practice in a telegraph office. A few weeks of such practice will familiarize the student with the everyday work of a telegraph line, give excellent opportunity to practice at reading by sound in copying the constantly passing messages, and will thoroughly prepare the applicant for a situation as an operator.

THE MORSE TELEGRAPH ALPHABET.

<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>	<u>G</u>
<u>H</u>	<u>I</u>	<u>J</u>	<u>K</u>	<u>L</u>	<u>M</u>	<u>N</u>
<u>O</u>	<u>P</u>	<u>Q</u>	<u>R</u>	<u>S</u>	<u>T</u>	<u>U</u>
<u>V</u>	<u>W</u>	<u>X</u>	<u>Y</u>	<u>Z</u>	<u>&</u>	

NUMERALS.

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>0</u>

PUNCTUATION.

<u>Period.</u>	<u>Comma.</u>	<u>Semi-colon.</u>	<u>Quotation.</u>
<u>Parenthesis.</u>	<u>Interrogation.</u>	<u>Colon.</u>	<u>Paragraph.</u>

The Morse alphabet consists of what are called dots, dashes and spaces. Combinations of these make intelligible signals. Many of the characters will be found to be the reverse of others: such as A is the reverse of N; B of V; D of U; C of R; Q of X; Z of &; so if the formation of one of each of these letters be obtained, its reverse is easily mastered. C, E, H, I, O, P, R, S, Z, Y, are merely represented by dots and spaces, and, if due regard be given to time, they will be found very easy to commit to memory.

The first step is to memorize the alphabet, so that each character can be called to mind at will; thus, A, dot and dash; B, dash and three dots; C, two dots, space, dot, etc. The period is the only punctuation mark in frequent use, and the student need not learn the others at first.

A dot (E) is made by a single instantaneous, downward stroke of the key. A short dash (T) is made by holding the key down as long as it takes to make three dots. A long dash (L or cipher) is made by holding down as long as required to make five dots. A cipher is prolonged so as to occupy about the time required for seven dots.

The intervals between dots or dashes in the same letter are called breaks. A space in letters should occupy the time required for a dot and break. The space between letters should occupy the time required for two dots and breaks.

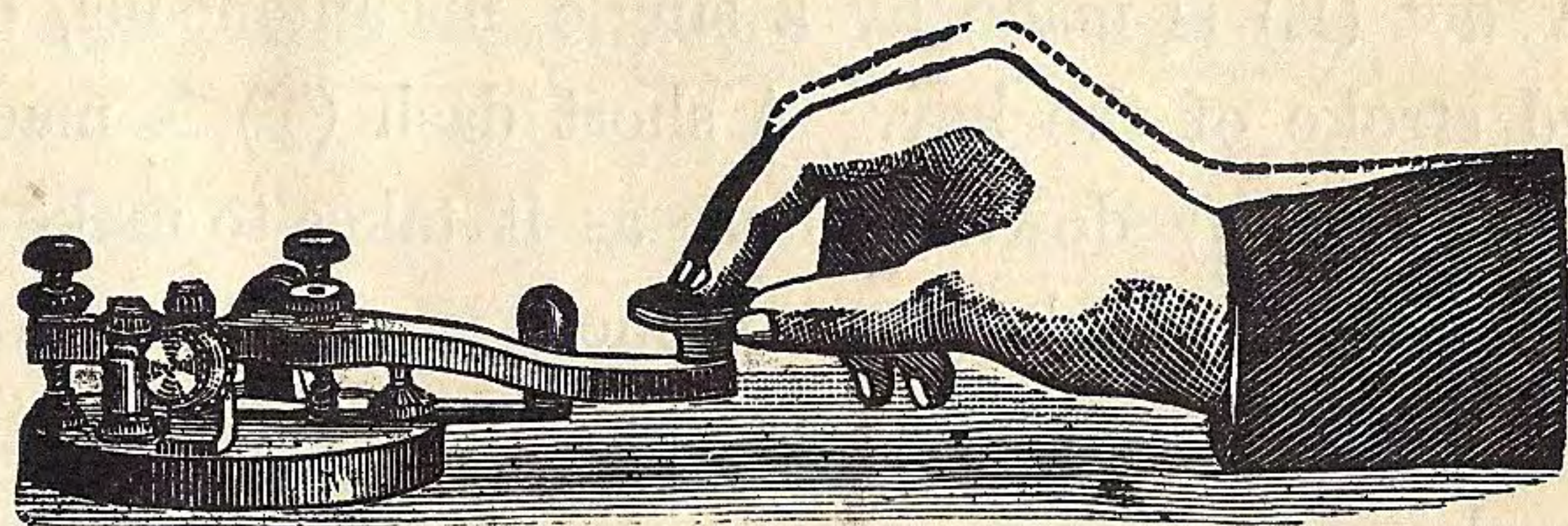
The space between words should occupy the time required for three dots and breaks.

In letters that do not contain spaces, the dots and dashes should follow each other as closely as possible.

The beginner should be careful to form and space his letters correctly, as this will lead to a perfect style in sending.

Position and Movement.

It should be remembered that there is no change in the tone of a sounder, the letter being determined solely by the "time or times" the lever is up or down. The back stroke, so called, is as necessary to reading by sound as the down stroke, and these must be distinguished each from the other; for, without it, the duration of the downward movement could not be determined.



Place the first finger on the top of key button, with the thumb under the edge; and the second finger on the opposite side. Curve the first and second fingers so as to form the quarter section of a circle. Partially close the third and fourth fingers. Allow the wrist to be perfectly limber. Rest the arm on the table at or near the elbow.

Let the grasp upon the key be firm, but not rigid. Never allow the fingers or thumb to leave the key, nor the elbow to leave the table. Avoid too much force, or too light touch, and strive for a medium firm closing of the key.

The motion to be imparted is directly up and down, avoiding all side pressure.

The movement is made principally at the wrist, although the finger and hand must be perfectly elastic.

The fingers, wrist and arm, should move uniformly in the same direction.

The downward movement produces the dots and dashes, and the upward, the breaks and spaces.

Commence the use of the key by making dots in succession at the rate of two every second, and increase the speed five-fold as skill is acquired. Continue to practice dots until 360 per minute can be made with perfect clearness and regularity.

When dots can be readily made as directed, begin with dashes at the rate of two in every three seconds, and gradually increase until 120 per minute can be made with perfect regularity.

Next attempt the long dash at the rate of one every second, and increase to ninety per minute.

When perfection is attained, take up the following exercises in order.

Repeat each exercise until every letter can be made at will correctly.

DOT LETTERS.

E I S H P 6
 - -- --- ---- -----

DOT AND SPACE LETTERS.

Take pains to make spaces uniform, and in the proper place.

O C B Y Z &
 . - - . . - - - - - - - - - - - -

DASH LETTERS.

Be careful to proportion short and long dashes accurately.

T L M 5 0
 - - - - - - - - - - -

DOTS, WITH DASH, IN SUCCESSION.

Avoid leaving any space between them.

A U V 4
 - - - - - - - - - - - - -

DASH, WITH DOTS, IN SUCCESSION.

D B 8
 - . . - . . . -

DASHES OR DOTS IN MIXED COMBINATION.

F	G	J	K	Q	W
X	1	2	3	7	
9	Period.				

There are almost as many styles of sending among operators as of penmanship. It is quite possible on a line where forty operators work to tell each one by his manner of manipulating the key. Cultivate a firm, even, smooth style of sending. The fast writers do not dispatch the most business. Graduate your writing to the capacity of the receiver, and never crowd him.

FRACTIONS.

Fractions are made by substituting a dot for a hyphen between the figures.

1-2	1-4
2-3	3-5
7-8	9-10

11-12

NUMBERS.

In large numbers, a short space is usually made between every three figures.

1,000.
1,500.
18,907.
21,369.

UNUSUAL SPACES.

In words largely composed of dots and spaced letters, the spaces should be larger than usual between the letters.

Seen.

Erie.

Receive.

Cicero.

WORDS.

After the student can write the words in this Exercise satisfactorily, he may arrange several series himself for practice.

And.	Barn.	Chair.
Desire.	Exchange.	Family.
German.	Humane.	Inmate.
Judgment.	Knowledge.	Limited.
Maintain, etc.		

SENTENCES.

The student may take such sentences as he chooses for practice, always being careful to write one correctly before commencing with another.

OFFICE CALLS.

Every telegraph office has a name or call, which usually consists of one or two letters; thus the call for New York is N. Y.; Baltimore, B.; Philadelphia, P. If New York desires to communicate with Philadelphia

he repeats the latter call on the line till answered. It is proper to sign one's own office every three or five calls, so that others may know who is using the wire. Thus:

.....

If Philadelphia hears the call, he opens his key and answers by repeating "I" several times, and signing his own call thus:

.....

When so answered, New York proceeds with his business.—The process is exactly the same between any other two offices.

Abbreviations.

THE SIGNALS MOSTLY USED ARE AS FOLLOWS:

- | | |
|------------------------------|--------------------------------|
| 1.—Wait a minute. | 18.—What is the matter? |
| 4.—Where shall I go ahead? | 77.—I have a message for you. |
| 5.—Have you anything for me? | 45.—Answer quick by telegraph. |
| 13.—Do you understand? | 73.—Accept my compliments. |
| 134.—Who are you at the key? | Ahr.—Another. |
| G. M.—Good Morning. | Ans.—Answer. |
| G. N.—Good night. | Bk.—Back. |
| Immy.—Immediately. | Bf.—Before. |
| Impt.—Important. | Bn.—Been. |
| Min.—Minute. | Bat.—Battery. |

- | | |
|-------------------------------|--------------------|
| Msgr.—Messenger. | Bbl.—Barrel. |
| Msk.—Mistake. | Col.—Collect. |
| No.—Number. | Ck.—Check. |
| Ntg.—Nothing. | Co.—Company. |
| N. M.—No. More. | D. H.—Free. |
| O. K.—All right. | Ex.—Express. |
| Ofs.—Office. | Fr.—Freight. |
| Opr.—Operator. | Fr.—From. |
| Sig.—Signature. | G. A.—Go ahead. |
| P. D.—Paid. | P. O.—Post Office. |
| Q. K.—Quick. | R. R.—Repeat. |
| G. B. A.—Give better address. | |

Many other abbreviations will be acquired in actual business.

MESSAGES.

Commercial messages may be divided into five parts, viz.: date, check, address, body and signature. The date is composed of the name of the place where the message originates, the month, day of month, and year. An operator accepting a commercial message for transmission, should be careful that this is written out in full, as follows:

New York, Dec. 10, 1895.

In actual transmission, the month and year are always omitted. Between offices on the same circuit, the office call is frequently used, and the date omitted. It can do no harm to write the name in full, and the date should always be given in commercial business. This is always done when the message goes beyond

the line where it originates. In sending a message, the date is always prefixed by "from" abbreviated to Fm. or Fr.

FORM OF MESSAGE.

From New York, Dec. 10, 1895.

Or sometimes on same line.

The address should comprise the full name and place of the person to whom the message is addressed. When not known the number and street should be given, as well as the place of destination and State. The word "to" always precedes the address, and a period divides it from the body of the message. When the office to which a message goes is on the same line, only the office call is written. When the message goes through, the destination is spelled out in full.

FORM OF MESSAGE.

From New York, Dec. 10, 1895.

To John Wilson,
22 State St., Chicago, Ill.

(Through Message.)

Local Message.

The body of the message is embraced between the period and signature. No abbreviations are permitted, or if inserted, each letter is charged for; compound words are usually considered one word. Numbers are written out in full, and if the figures also are inserted, are paid extra for. The body of some messages are written in cipher, being composed of disjointed words, having no sense unless interpreted by means of the key in possession of the sender and receiver.

FORM OF MESSAGE.

From New York, Dec. 10, 1895.

To John Wilson,
22 State St., Chicago, Ill.

Goods were shipped on the fifth by American Express.

Sig., Henry Harding.

.....
 - - - -

 - - - -

 - - - -

The check follows the date of a message, and gives the number of words in it subject to tariff. It aids in preventing omissions and errors. The check also tells whether a message is paid, collect, or free—if free, it usually explains why.

Upon full paid business, ten words can be sent as cheaply as one, but for all over ten an additional rate (per word) is charged. The date and address of a message are not counted. The body of a message is always counted. The extra signatures, titles and directions after signatures are counted. When there are several signatures the last one goes free. Upon night rate messages, the same rule applies, except that the tariff is computed at reduced rates.

The "From," "To" and "Sig." in a message are never copied by the receiver.

When an office is through receiving a message, he must always say O. K. and sign his office, thus:

..... or

If no O. K. is received, it will be known that the message has not been properly received, and must be repeated.

When the sender discovers that he has made a letter wrong, he stops, makes more than six dots, says "msk." (mistake), and commences again with the last word made correctly.

When the receiver finds he is not getting a message correctly, he breaks, and tells sender to "G. A." (go ahead) the last word received.

After receiving a message, the operator should be careful to see that he has the right number of words as called for by the check of the message. If they do not agree, he should compare with sender till error is found. This is usually done by commencing at period and writing the first letter in each word till the missing portion is discovered.

There are a few operators capable of sending and receiving forty words per minute; thirty-five words is very rapid work. The average speed does not reach thirty words. When the student finds himself capable of sending and receiving promiscuous messages at the rate of thirty words he may begin to look about for an office.

Private Lines.

In the construction of short lines, No. 12 galvanized wire is chiefly used. This wire weighs one hundred and seventy pounds, and measures thirty ohms resistance, to the mile.

Only one wire is necessary to the construction of a line, the earth being used for the return circuit.

Great care should be taken to have the earth connections perfect. When possible, connect the ground wire to gas or water pipes, but when this cannot be done solder it to a sheet of copper three feet long by two feet wide, and bury the latter about four deep in damp earth.

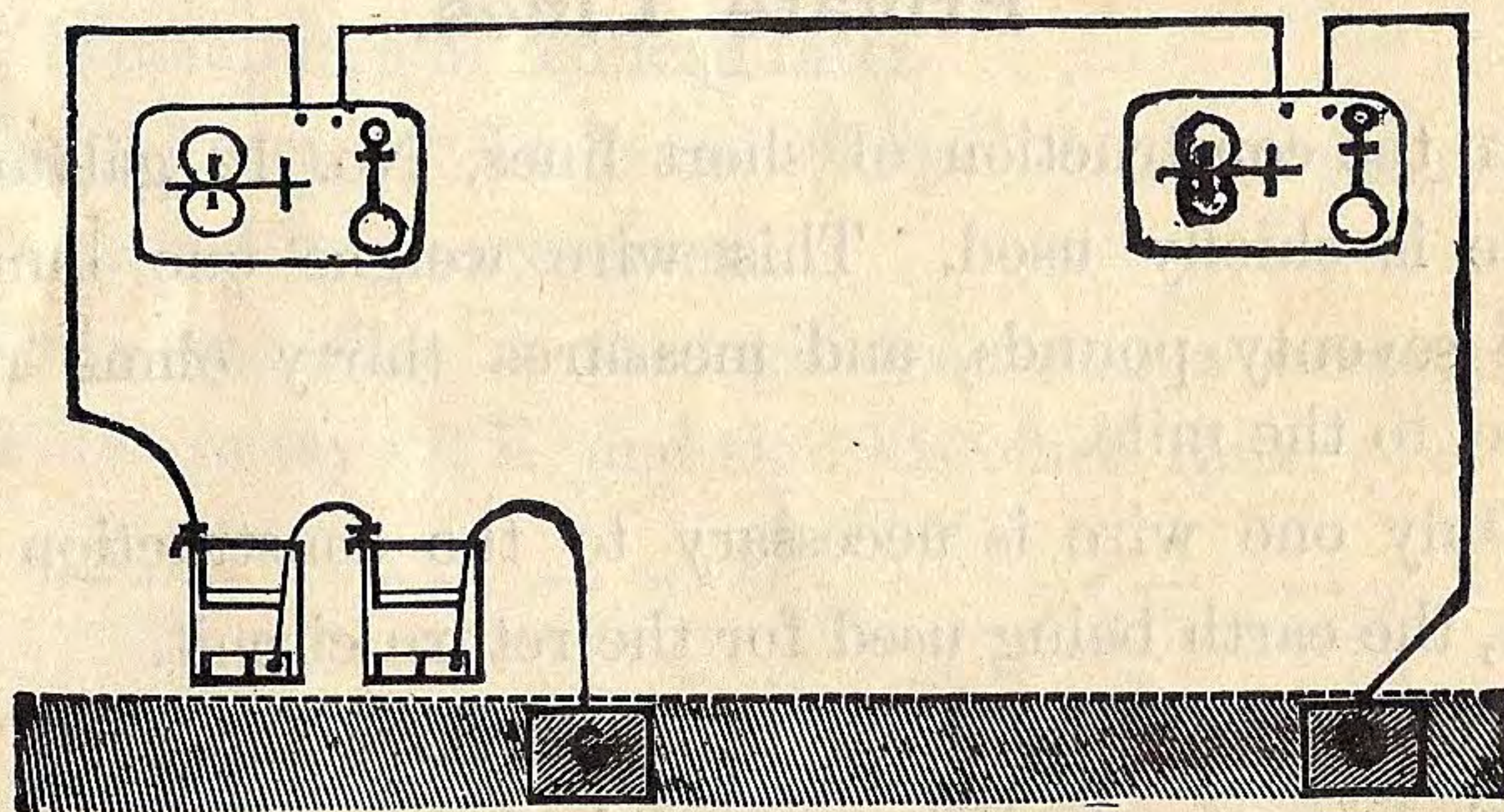
In locations where the earth is very dry, it is some

times impossible to make a good ground connection, and in such cases we recommend a metallic circuit, as being more economical than the large battery which would be required to overcome the excessive resistance.

The resistance in the instruments on the line should be proportioned to its length. The rule is to make the resistance in the instruments equal that of the line and battery. Instruments for use on a short circuit are made with five ohms resistance, but for long lines should be proportioned to its length.

In ordering instrument give the length of line and the number of instruments to be used on it.

To Connect Two Instruments with a Short Line.



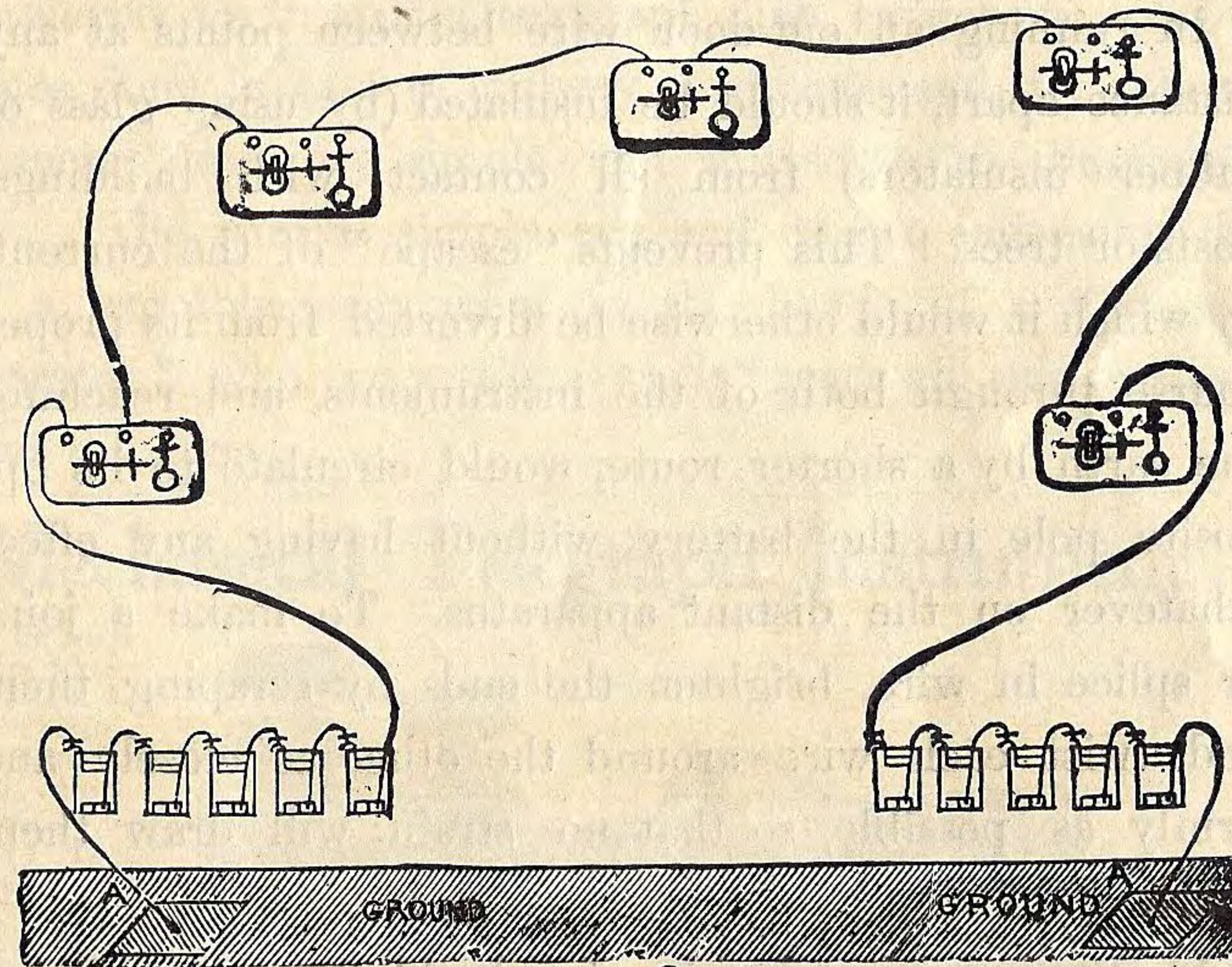
Run a wire from the zinc pole to a gas or water pipe, and carefully connect it, then run a wire from the copper pole to a binding post on the instrument; connect the line wire to the opposite binding post; at the other end of the line attach the wire to one binding post,

then run a wire to the gas or water pipe from the opposite post. If part of the battery is used at each end of the line, always be careful to have the zinc and copper poles of the battery towards each other.

The return circuit may be made either by a continuous wire, as indicated, or by connection with the earth at each end, *G. G.* For wires of but a short distance in length the return wire is best.

Private Line with Several Stations or "Offices" in Connection.

Connect wires, instruments and batteries on such a line as shown in the diagram below, placing the batteries at each end of the line.



Battery at *A* has its zinc pole connected to the earth and its copper to the line; necessarily, therefore, the other battery at *B* presents its zinc pole to the line and

its copper to the earth. If both batteries were connected with the same pole to the line, they would neutralize each other, and no current whatever would be produced.

The line is connected, as shown from the battery, to the first instrument and on to the next in such a way that the current is made to pass through each and every instrument on the route.

It is necessary where two or more offices are connected together on a line, that every key should be kept closed by having its circuit-closer shut, excepting only when sending communications. If any one key on the entire line is left open, all communication is stopped. The reason for this has already been fully explained.

In running an out-door wire between points at any distance apart, it should be insulated (by using glass or rubber insulators) from all contact with buildings, posts or trees. This prevents "escape" of the current, by which it would otherwise be diverted from its proper course through both of the instruments, and reaching the earth by a shorter route, would circulate to its opposite pole in the battery without having any effect whatever on the distant apparatus. To make a joint or splice in wire, brighten the ends by scraping them and twist each wire around the other as closely and firmly as possible, so that no strain will draw them apart.

In running wires inside of a building, use insulated copper wire covered either with cotton or gutta-percha; fasten it in place with small staples or tacks, but in doing so be careful not to allow the covering to be opened

or stripped from the wire, nor allow the latter to come in contact with gas or water pipes, or metal posts.

When several persons are jointly practicing on a line in which there are a number of separate instruments, placed either in different rooms or in different houses, all are thus in communication with each other, and while any one of them is writing all the rest can simultaneously practice at reading by sound.

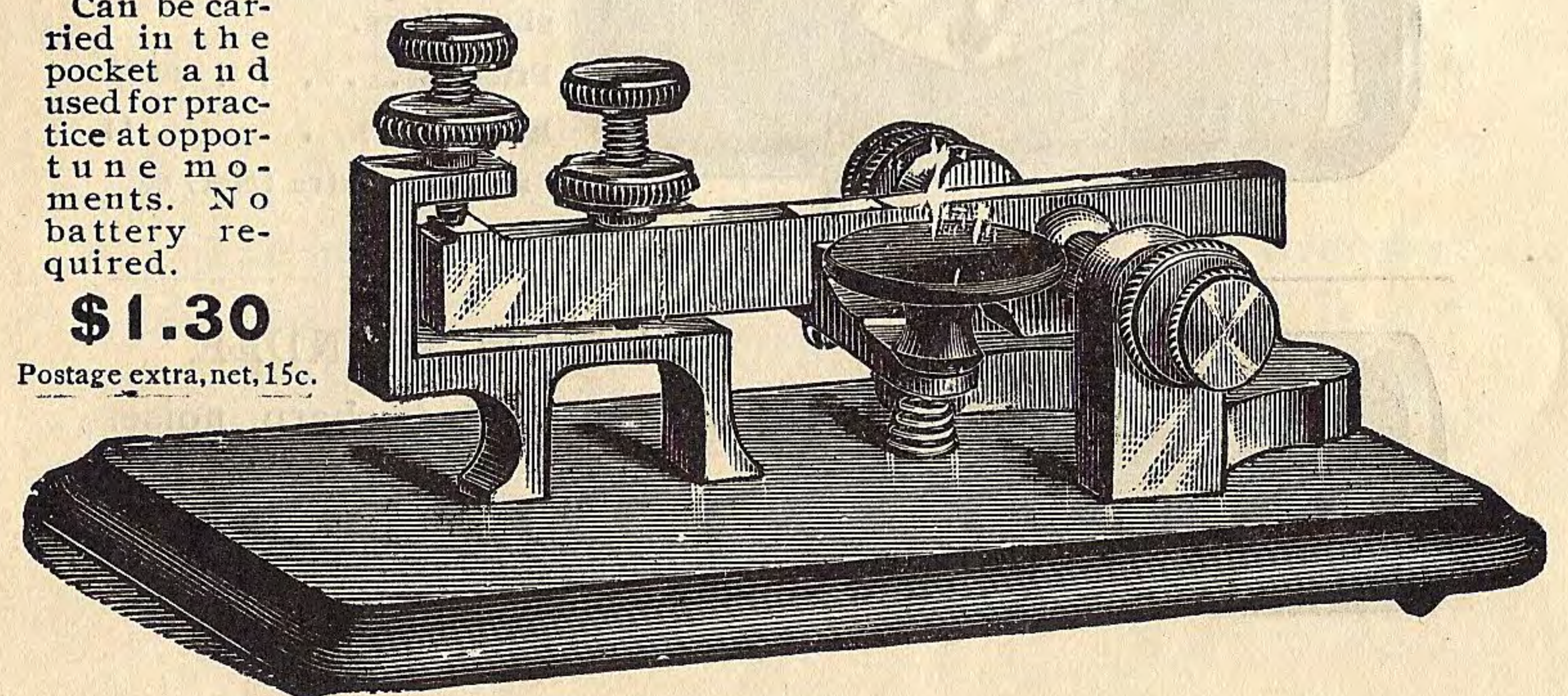
Main lines of telegraph are arranged in precisely the same way. With wires of many lines in length, main batteries, containing a large number of cells, are placed at the end stations. The return circuit is made through the earth the entire distance, and each office connected to the line in the manner here described. The means employed to "tap" a telegraph line (which is sometimes done in case of railway accidents and for other purposes) are very simple, and will serve to illustrate this. The wire is simply cut, and its two ends connect to a portable instrument in the hands of a "sound operator," who may then easily read all that passes over the wire.

Mechanical Telegraph Instrument

Can be carried in the pocket and used for practice at opportune moments. No battery required.

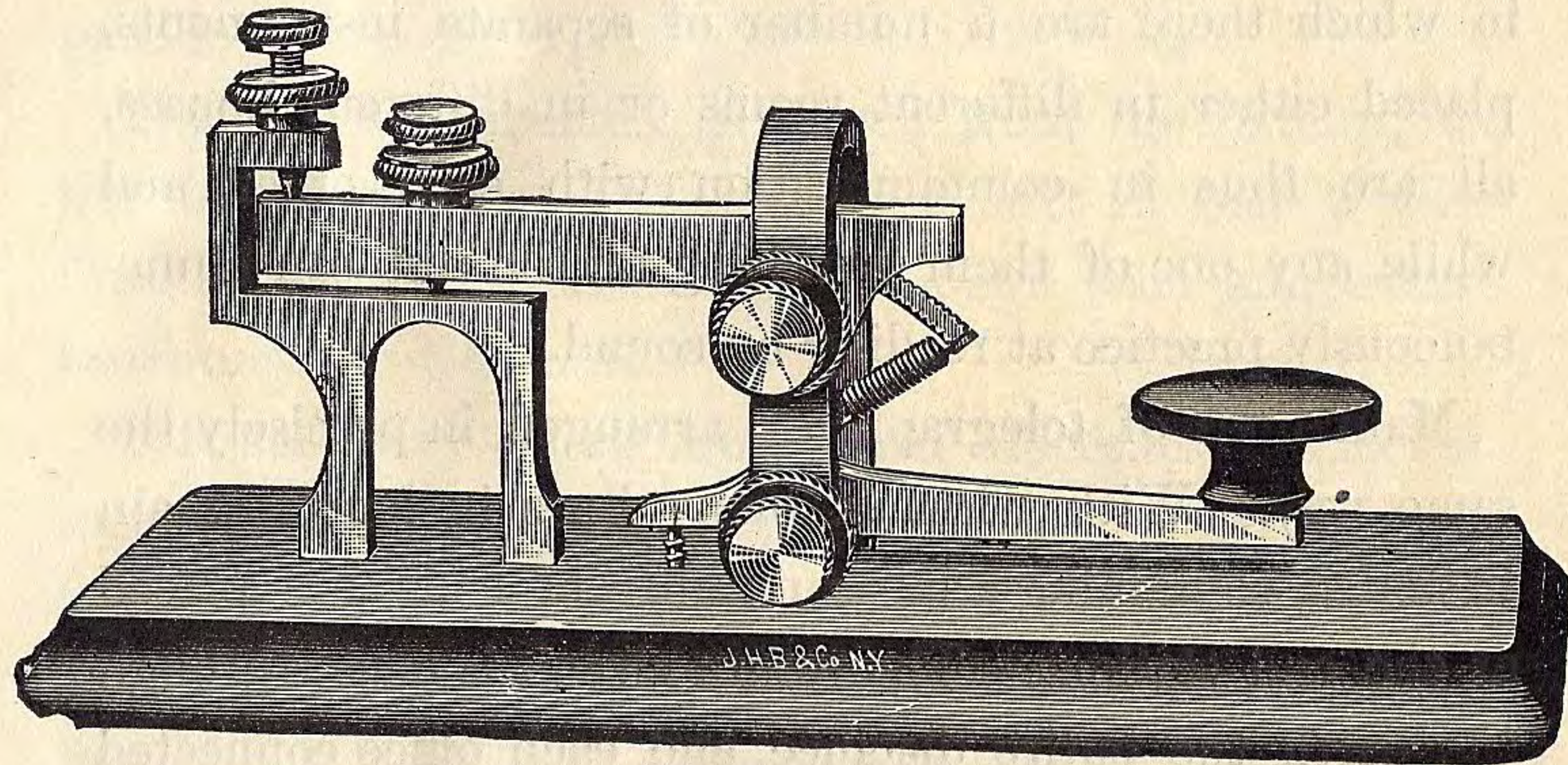
\$1.30

Postage extra, net, 15c.

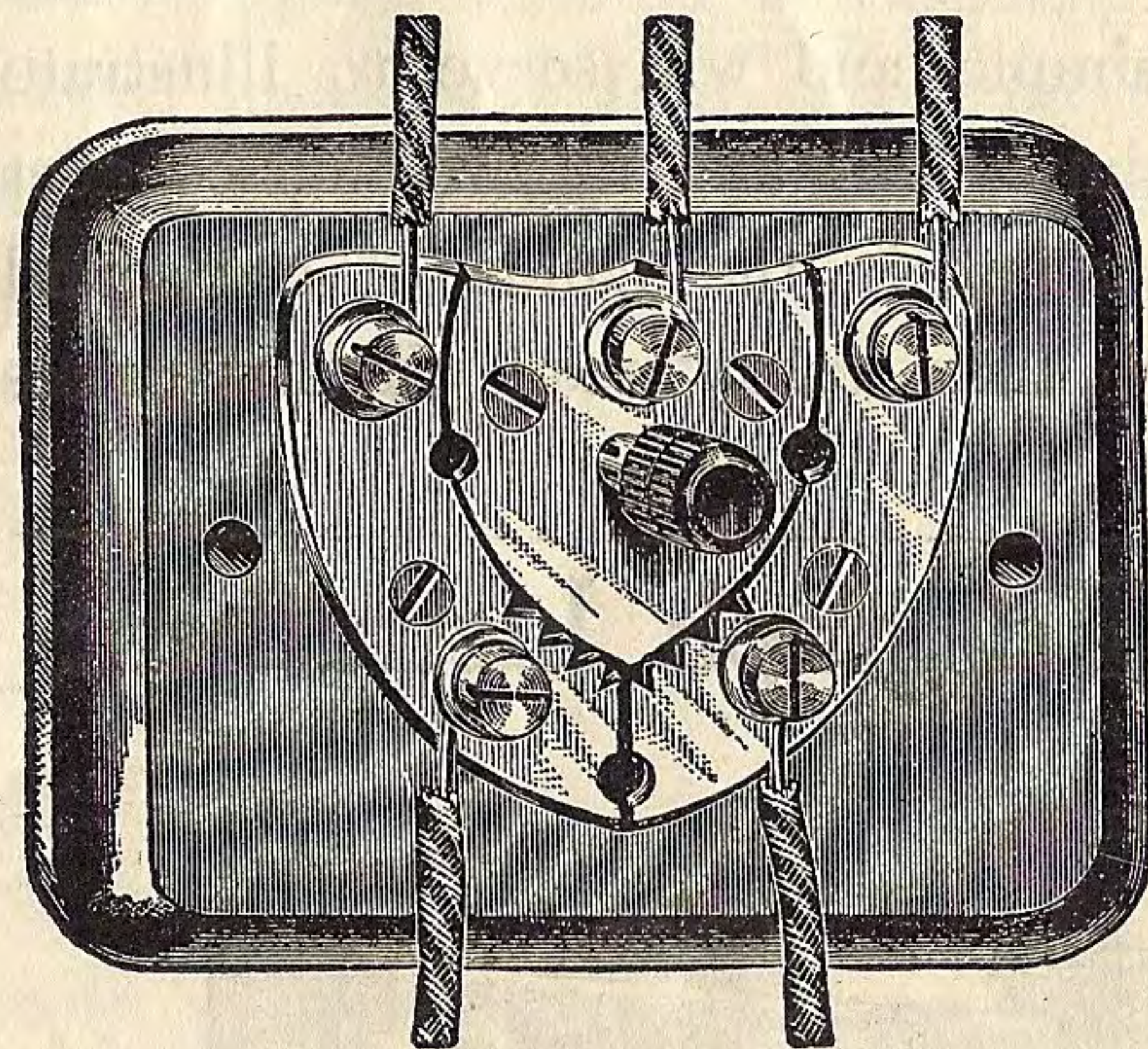


No. 2 Mechanical Telegraph Instrument

Price, with Telegraph Instruction Pamphlet, Packet of Morse Alphabet Cards, etc., \$1.60
Postage, extra (Net) 16 cents.



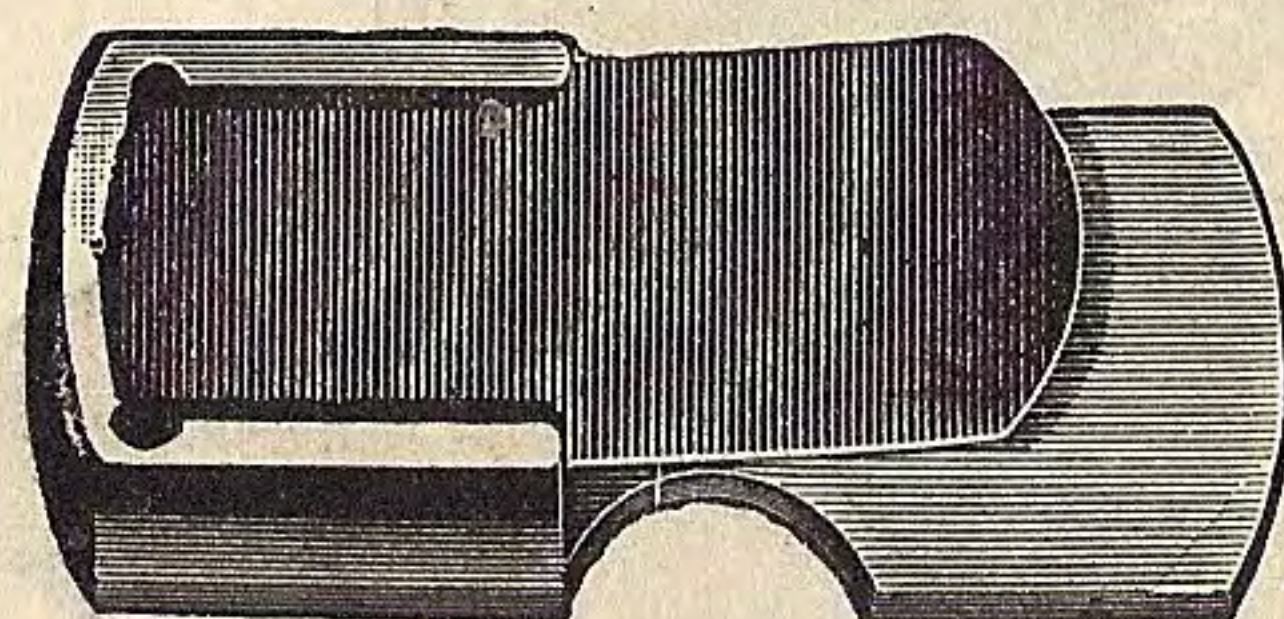
For Morse Alphabet practice in sending and reading by sound and for learning, or teaching Telegraphy, works exactly like the very best Sounder and Key Combination Telegraph Set, giving loud, clear sound with slightest force or movement of Key. All made in first-class Instrument Composition Brass, same pattern as best Giant Sounders.



THE UNION LIGHTNING ARRESTER AND GROUND SWITCH

Serves as Peg Cut-Out, Lightning Arrester and Ground Wire Switch. It is an excellent and cheap form for amateur and all short lines.

Price \$0 76
Extra Pegs 14
Postage, extra (Net) 6c.

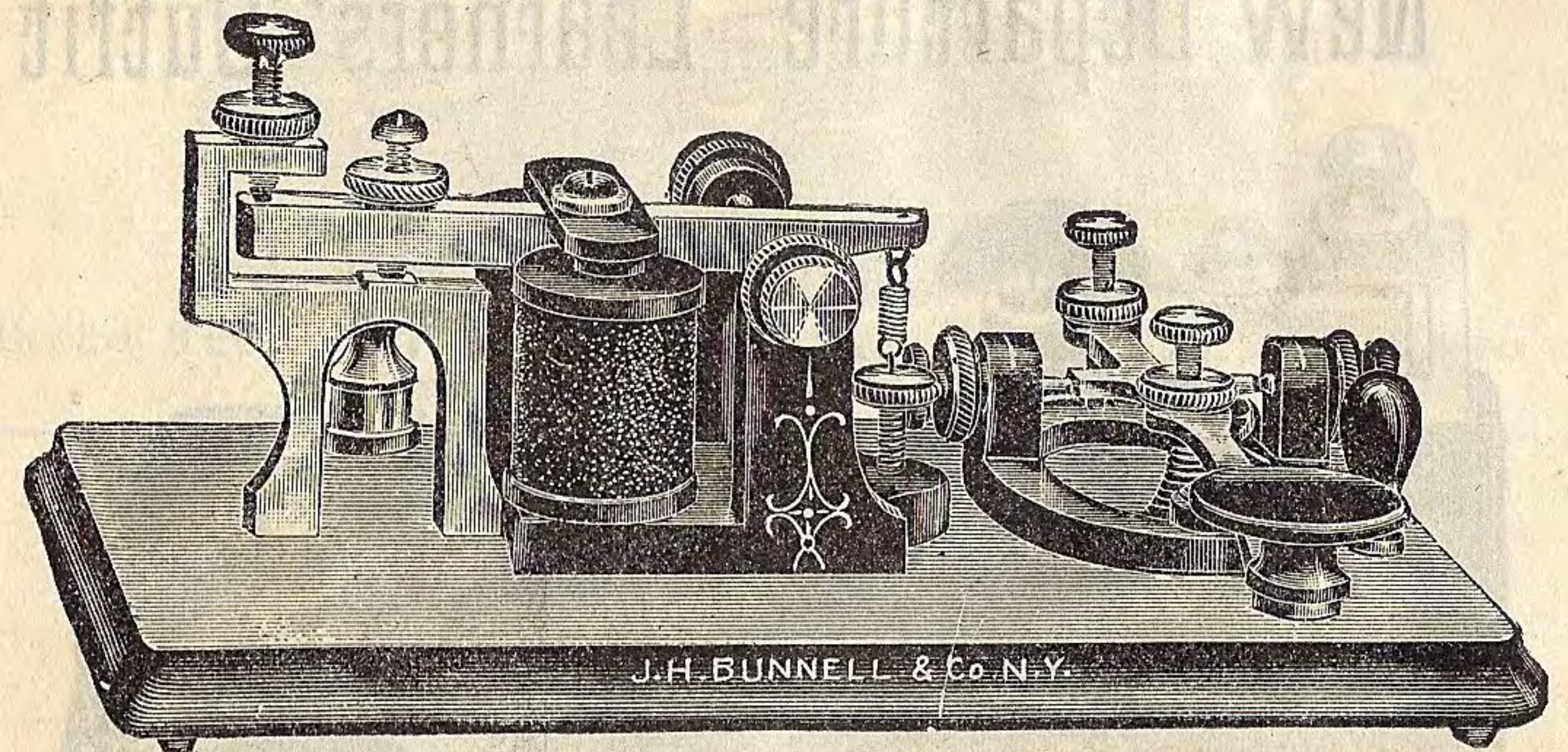


SNAPPER SOUNDER

Makes a loud sharp noise. The "Click" being similar to a telegraph sounder.

Price \$0 16
Postage, extra (Net) 2 cents.

THE "MORSE" LEARNERS' OUTFIT



Price, MORSE OUTFIT COMPLETE, with 5x7 size Crowfoot Gravity Battery, Book of Instructions, Wire, Chemicals and all necessary materials for operating \$3 50
"Morse" Instrument, with Cell of Dry Battery 2 70
"Morse" Instrument alone, without Battery 2 30
"Morse" Instrument, wound with fine wire, 20 ohms resistance, for use on outdoor lines of from 200 feet to 10 or 15 miles in length, price, without Battery, etc. 2 50
Cell of 5x7 Crowfoot Battery, complete (no chemicals) 90
Cell of Mascot Dry Batteries 30
Postage on above instruments only, extra (net) 40

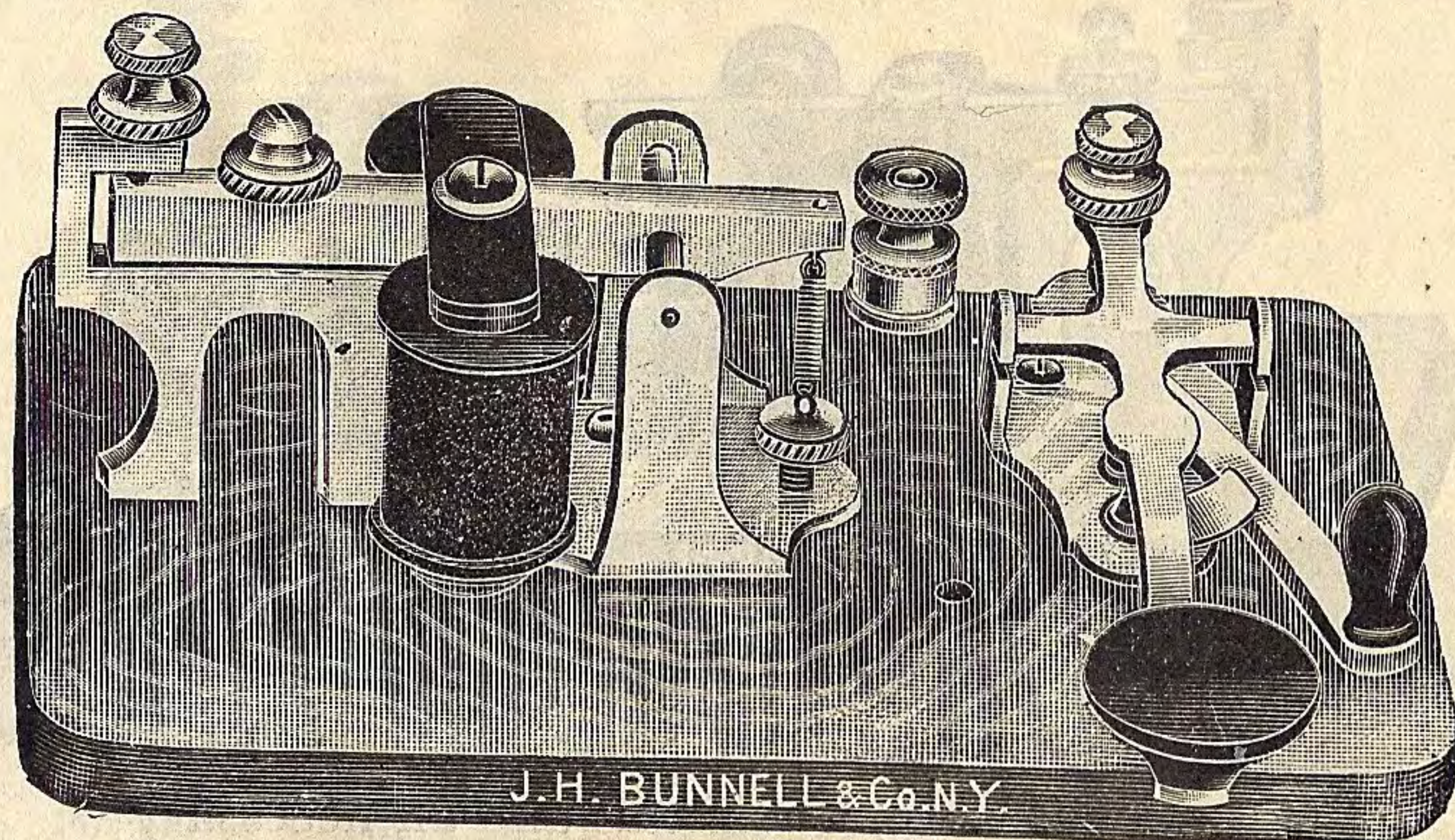
Battery Cannot Be Sent by Mail.

The above will be sent C. O. D. to points not over 500 miles distant, if one-third of the amount of the bill is sent with the order.

No goods sent more than 500 miles C. O. D.

Remit by Draft, Money Order, Registered Letter or Express Money Order.

.....THE.....
“New Departure” Learners’ Outfit



With Mascot Dry Battery and Steel Lever Key

PRICE, COMPLETE, \$2.50

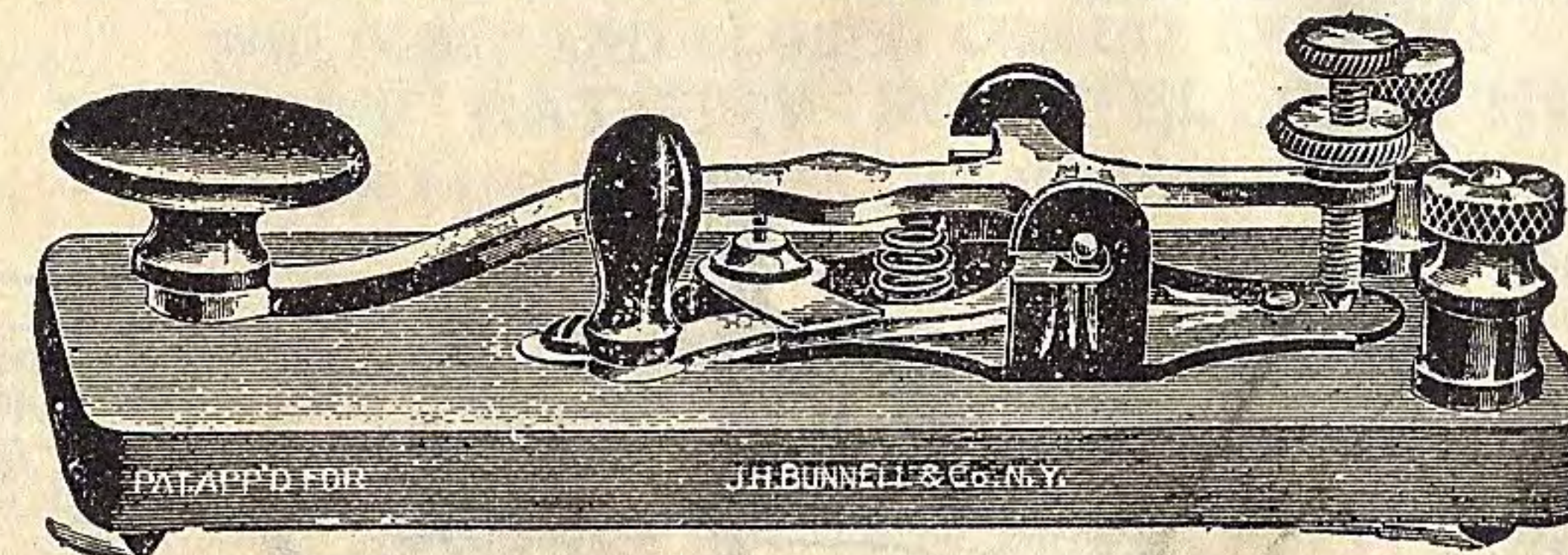
The IDEAL SET for HOME PRACTICE. Always Ready.
 NEAT, CLEAN, ATTRACTIVE.

The INSTRUMENT is a well-made “MORSE LEARNERS’ APPARATUS” with a Steel Lever Key, arranged for use with our “MASCOT DRY BATTERY.”

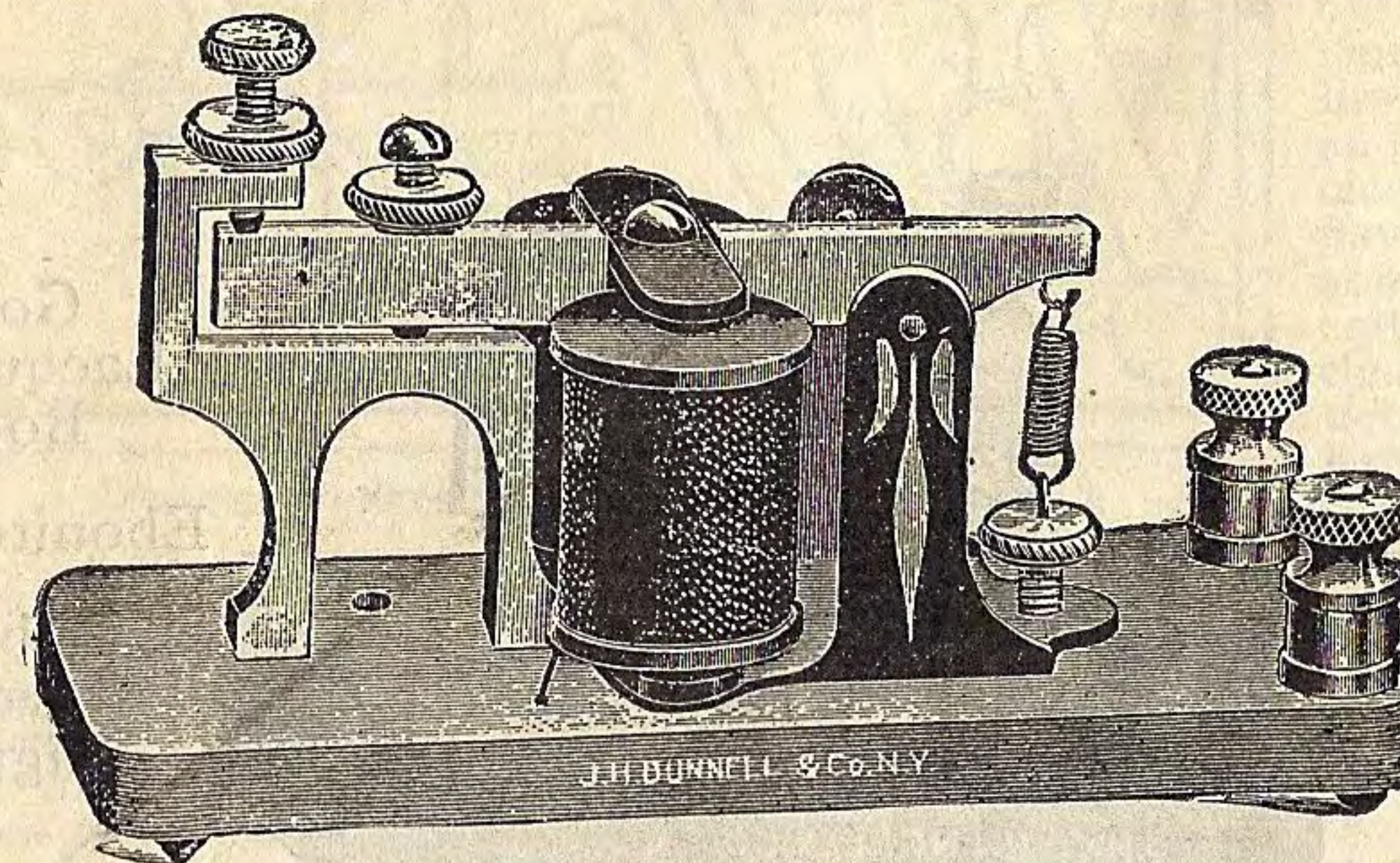
The “circuit-closer” is detached from the key, as it will prolong the life of the battery to leave the circuit open when not using the instrument. With “circuit-closer” detached the Mascot Battery should last for several months’ practice. The “circuit-closer” is sent with each apparatus, so that it can be replaced when it is desired to operate two or more instruments on the same circuit with bluestone battery.

- 4 ohm New Departure Instrument only.....\$2 10
- 20 “ “ “ “ “ “ 2 30
- Extra Mascot Renewal Cells, each..... 30
- Postage on above Instrument only, extra (net)..... 35
- Instruction Book goes free with each outfit.
- Complete outfit packed in wooden box, weighs about 7 lbs.

BEEKO LEARNER’S KEY AND SOUNDER.



Beeko Key.....\$1 00
 Postage extra (net) 8 cents.



4 ohm Beeko Sounder.....\$1 50
 20 “ “ “ “ “ “ 1 70
 Postage extra (net) 20 cents.

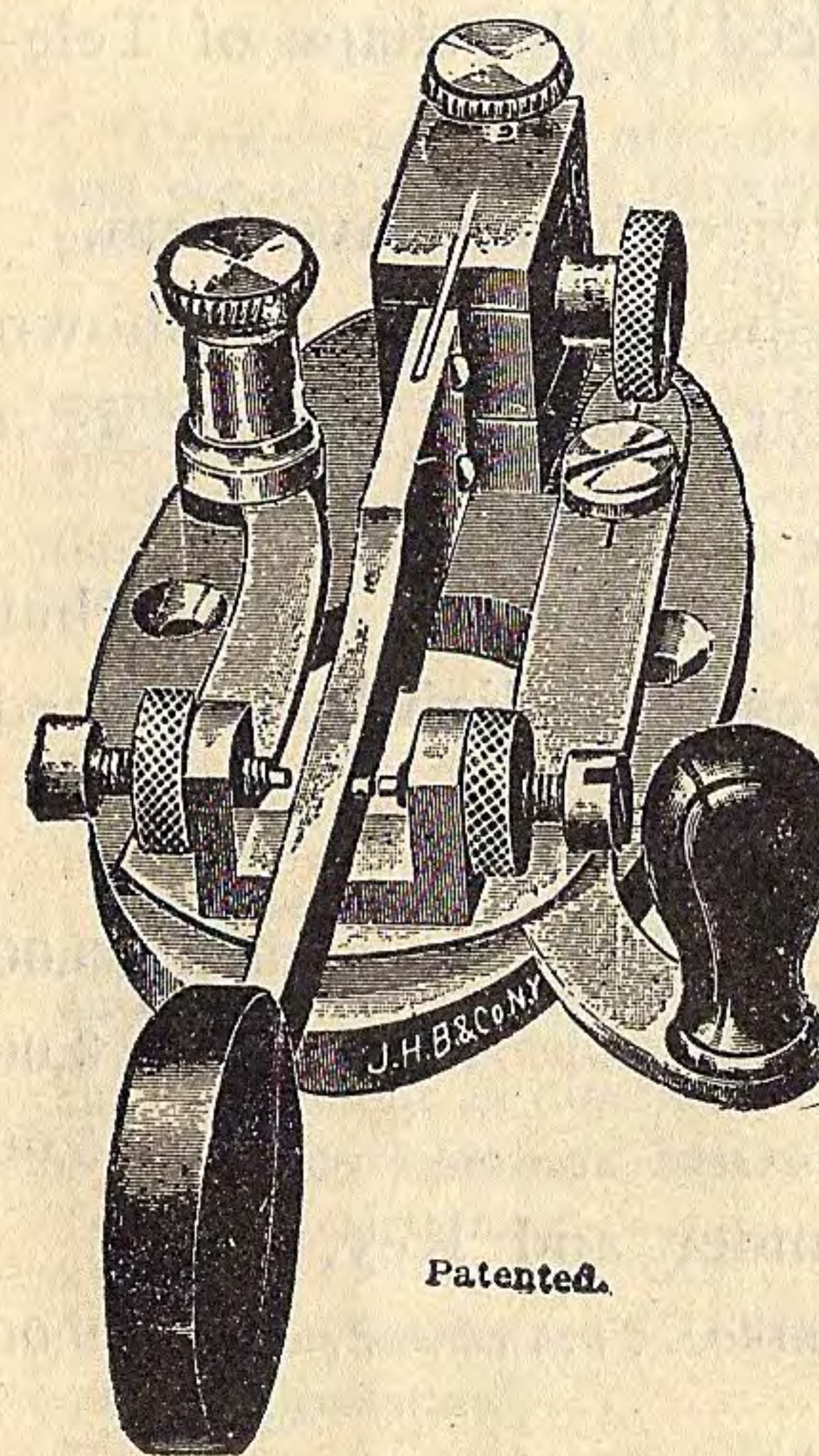
The Double Speed Key.

Easy to manipulate at the rate of 60 words per minute. The lever is moved horizontally, instead of vertically, and stands normally open between two contact points. It is operated by a natural rocking hand motion, easily acquired, and as only one-half the number of movements of the ordinary key is required, unusual speed can be attained. For instance, the letter P ordinarily requires ten movements of the hand—five down and five up—but with the double speed key only five motions are necessary.

Style W..\$4 00 Style G..\$3 50

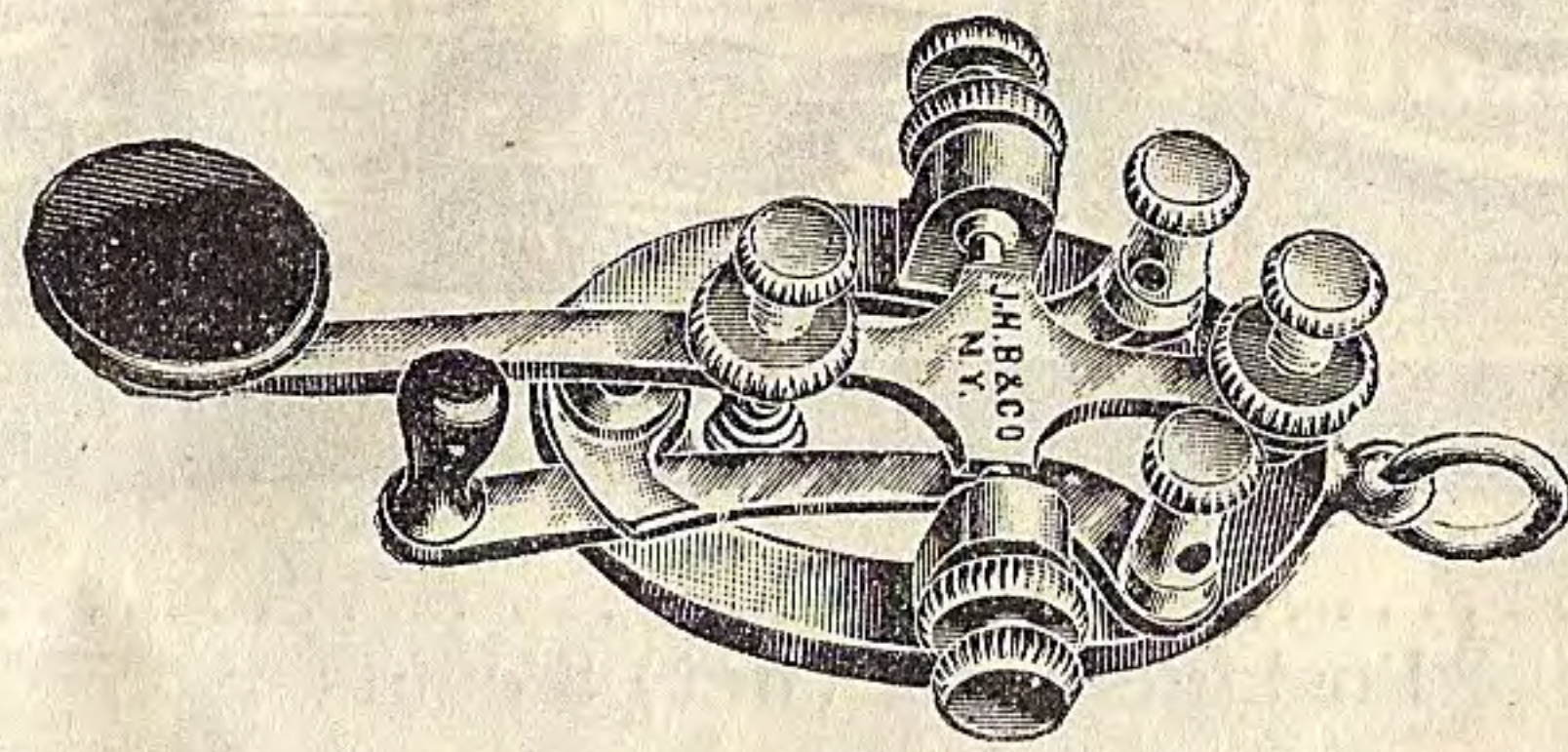
Portable Legless Pattern, with Heavy base and Cord and Wedge for connecting under lip of regular key..... 6 50

Send for Circular.



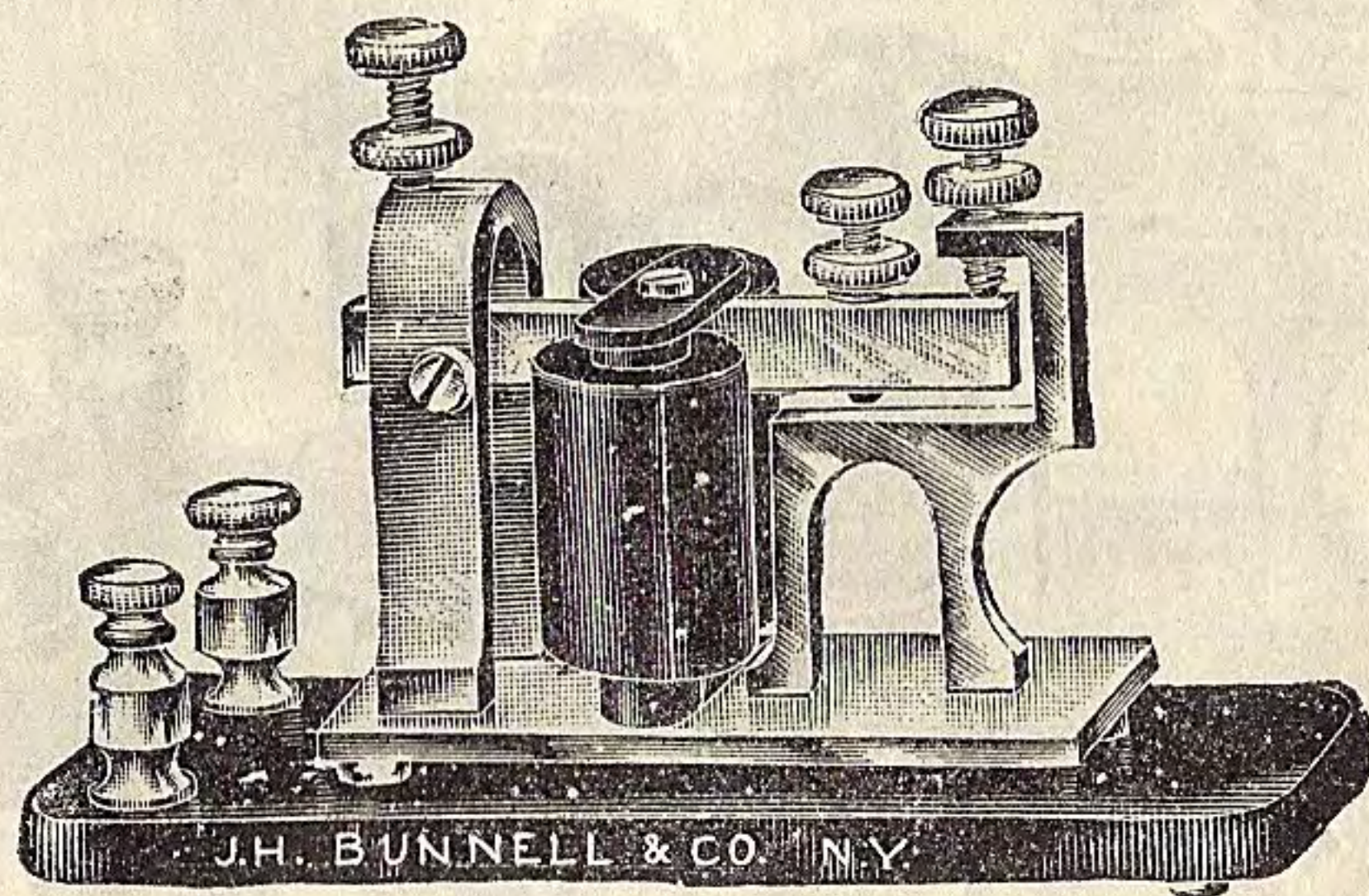
MINIATURE BUNNELL INSTRUMENTS

Gold
Lacquered
Body
Nicked
Lever
Polished
Rubber
Knob



Cut Full
Size.

Cut Full
Size.



Gold
Lacquered
Body
Ebonite Base
Rubber
Covered
Magnets

Perfect working Bunnell Models. Complete in every detail.
The prettiest things ever produced in the shape of Telegraph Instruments.

Every operator in and out of service should have them.

The Miniature Key can be furnished with ring (as shown in cut) for use as a watch charm, or with pin for use as a badge.

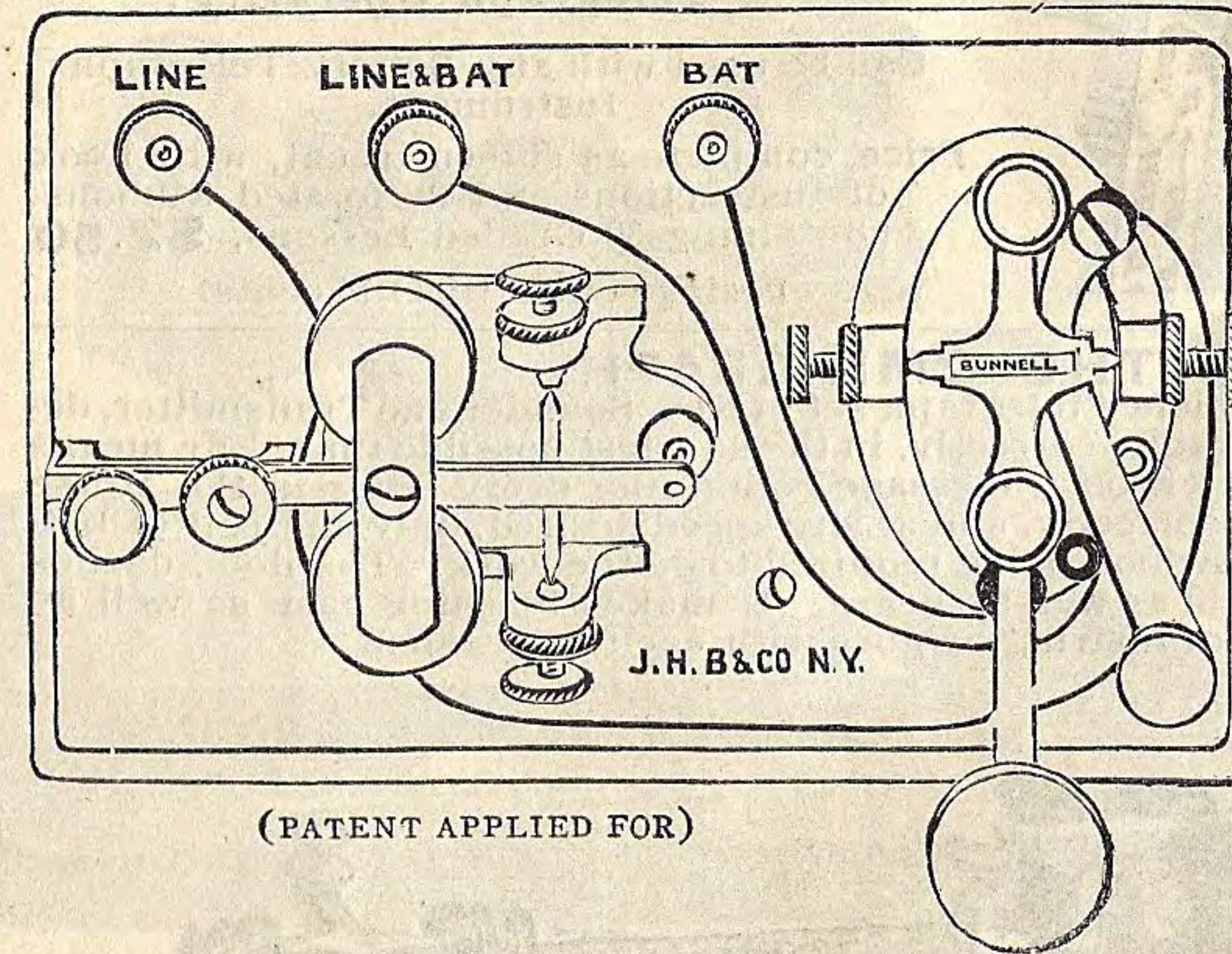
The Miniature Sounder is wound regularly to 5 ohms, but can be furnished in higher resistances at a slightly advanced cost.

Miniature Key, with Ring.....	each	\$3.00
“ “ “ Pin	“	3.00
“ 5 ohm Sounder.....	“	5.00
“ Combination Set of Sounder and Key, mounted on Ebonite base.....	“	9.00

Sent by sealed Registered Mail on receipt of price.

INTERCHANGEABLE COMBINATION INSTRUMENTS

FOR OPEN AND CLOSED CIRCUIT SYSTEMS
USE DRY BATTERY FOR TELEGRAPHING
SAVES OVER 75 PER CENT. OF BATTERY EXPENSE



(PATENT APPLIED FOR)

Our new Interchangeable Instruments can be used singly for learning or on lines having several offices for practice or for regular telegraph work. With the ordinary instruments when the line is not in use and the keys are closed (as they have to be to enable signals or calls to be made) there is a continuous waste of battery and when dry cells are used this waste soon exhausts them, thus making

their use as costly if not more so than that of the blue vitriol type of wet battery. By using our Interchangeable Combination Instruments the battery is only in use whenever signals are being actually sent, consequently the Dry Cells will last for a long time, estimated at from one to three years.

The new instrument, although differing in construction, has the appearance of the regular standard closed circuit types with circuit-closing switch on key and is manipulated in the same manner; that is, the circuit-closer must be thrown open or away from the lever when sending, and must be closed or thrown towards the lever when through sending or when a distant office breaks.

DIRECTIONS FOR USE

FOR OPEN CIRCUIT SINGLE INSTRUMENT.

Connect one post of a dry cell to right hand binding post of instrument and connect the other battery post to both the centre and left hand binding posts of instrument.

FOR OPEN CIRCUIT LINES.

For Terminal Offices connect the line to left hand binding post of instrument, one pole of battery to right hand binding post of instrument, the other pole of battery and also the ground wire to the centre post of instrument.

For intermediate offices on open circuit lines, instead of the ground wire, the other line wire with one pole of battery is connected to the centre post of instrument.

FOR CLOSED CIRCUIT WORK.

Connect the centre and right hand binding posts of instrument together and consider them as one post, the left hand post being the other.

For line work the number of dry cells required at each office will depend upon the resistance of the line and instruments.

A line one mile long of No. 12 iron wire, with three offices having 20 ohm instruments would require about six cells at each station. These cells should be connected in series; that is, the carbon of one cell to zinc of the next, the spare terminal at each end of the series of cells to be connected to the instrument as directed.

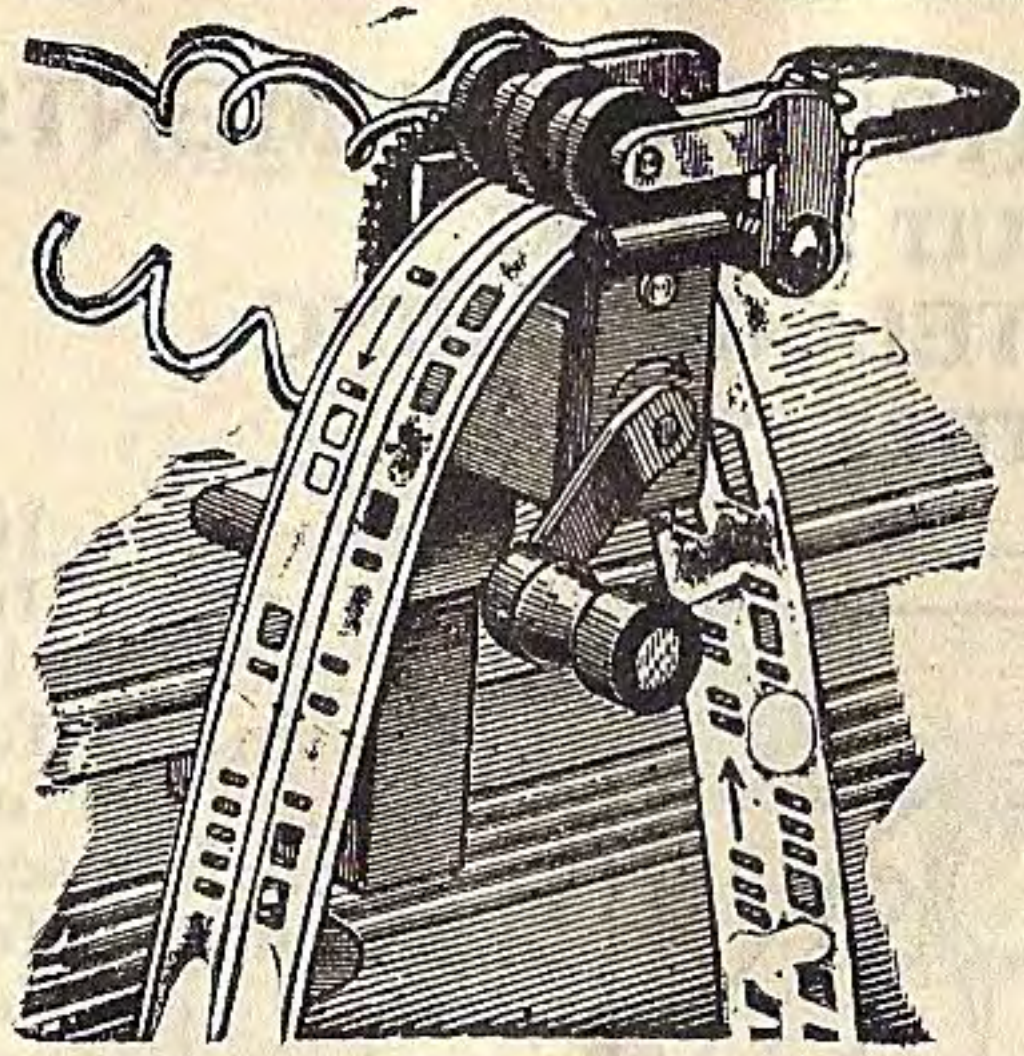
Dandy Learners Instrument, with Interchangeable Attachment

4 ohm resistance.....	each	\$3.50
20 “ “	“	3.70

Giant Sounder and S. L. Key Combination Set with Interchangeable Attachment

4 ohm resistance.....	each	\$6.00
20 “ “	“	6.30

(20 ohm instruments are recommended for use with dry battery.)



THE AUDIBLE ALPHABET
OR
AUTOMATIC TRANSMITTER

**For Self Instruction in learning
Telegraph Operating.**

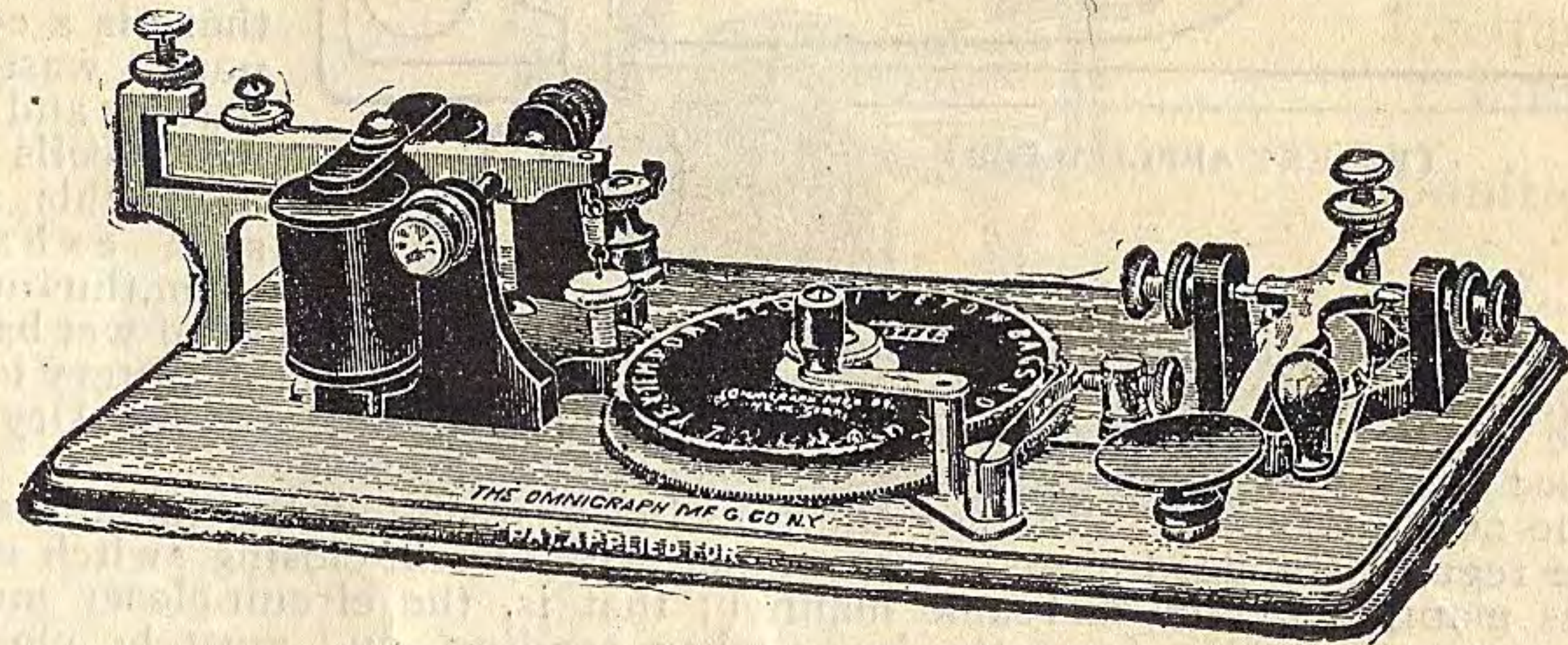
Can be used with any Battery Telegraph
Instrument.

Price, complete as shown in cut, with Book
of Instructions and Perforated Ribbons,
containing 30 Graded Lessons, **\$2.50**

Postage extra (net) 14 cents.

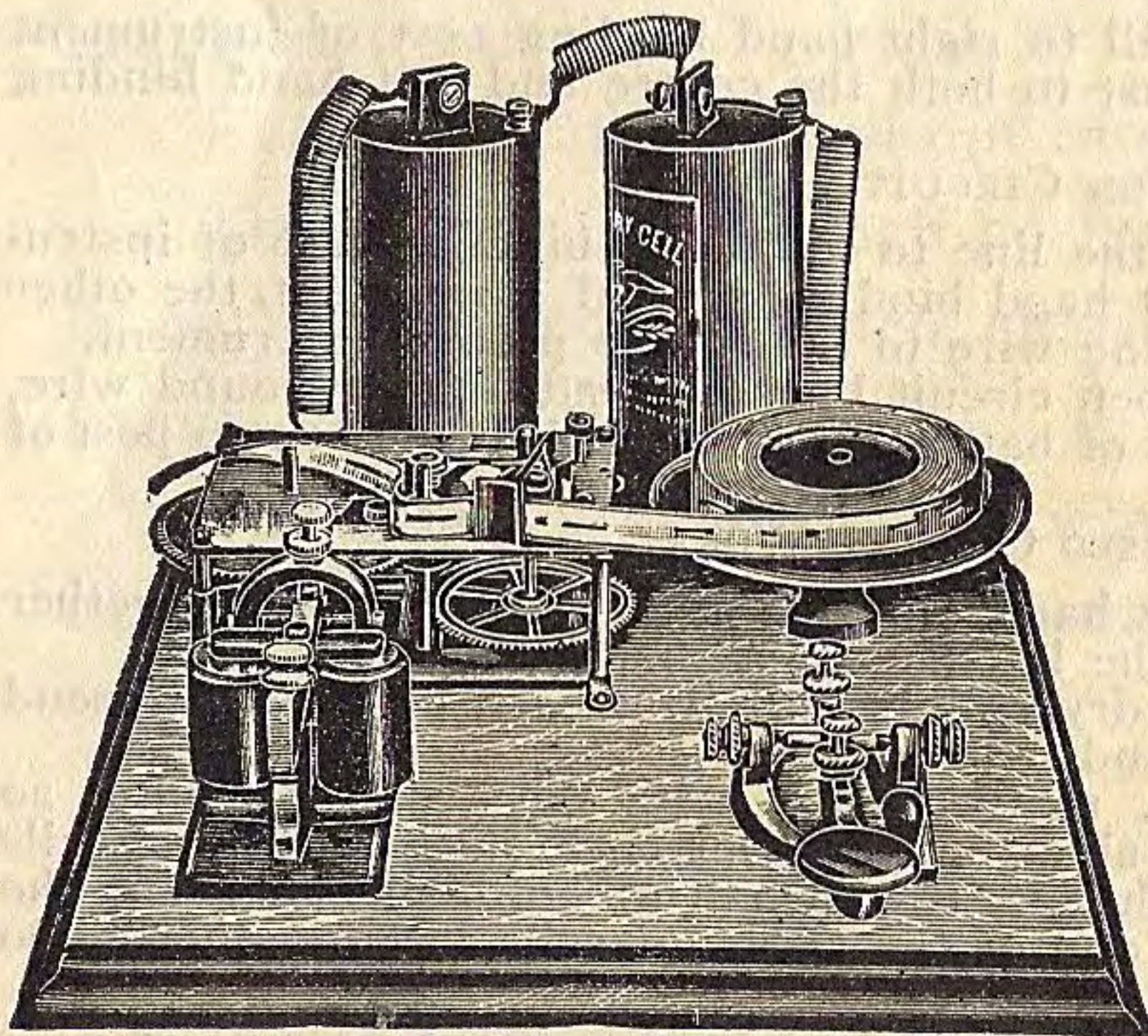
THE OMNIGRAPH.

This is a finely finished telegraph set of Key, Sounder and Transmitter, de-
signed to teach telegraphy correctly, in the shortest possible time. By means
of it, a learner can tick off a message containing every letter in the Morse
Alphabet, absolutely correctly, and at any speed desired, only one cell of bat-
tery, either dry or crowfoot, being required to do the work. The dots, dashes
and spaces can be seen as well as heard. It makes learning easy as well as
interesting. A book of instruction goes with each instrument.



Price, Instrument only \$6.00

The National Automatic Telegraph Self-Teacher.



Will make you an expert opera-
tor. You can learn to receive at a
speed faster than that of the ordi-
nary telegraph wires. It also
sends slowly and at any speed
desired between 5 and 40 words
per minute. You learn to send
accurately by listening to the
records which have been made
by an expert telegraph operator,
and which reproduce the char-
acters exactly as they were sent
by him upon the telegraph key.
Each record contains from 300
to 500 words; there are 27 differ-
ent records, making a total of
over 10,000 words.

*This device is the only one by
which one can secure the ability
necessary to become an operator.
One device connected on a line with
a number of instruments will send*

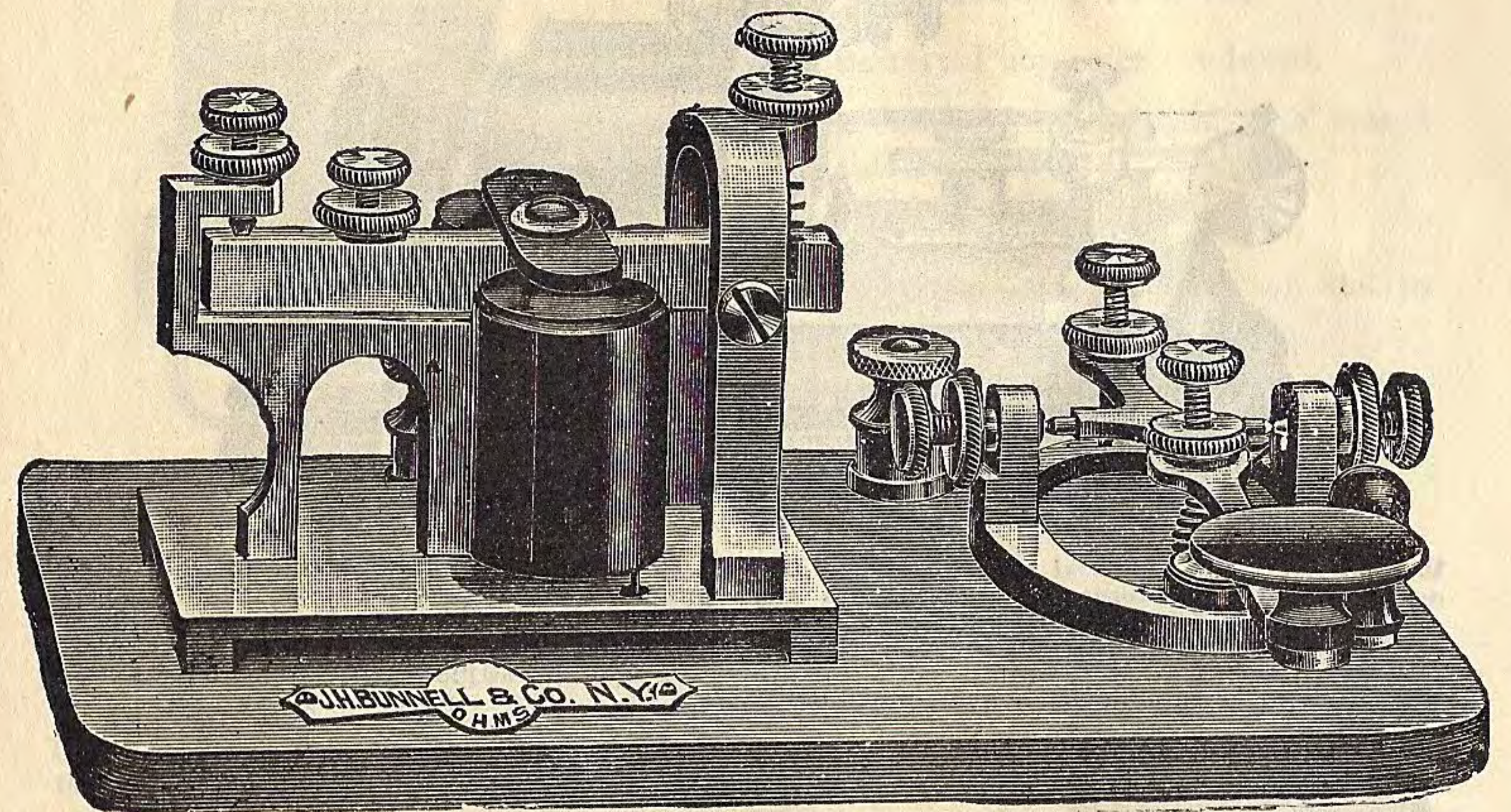
*to all at the same time. Every student of telegraphy, or club of students, should
have an Automatic Self-Teacher.*

The entire outfit, including transmitter, key and sounder (best make), two
cells best dry batteries, entire set of records and *The Telegraph Instructor*
(silk bound) containing 256 pages of information—invaluable to a student.

Outfit complete, price **\$36.00**
The same outfit, exclusive of key, sounder and batteries **29.70**

WRITE FOR DESCRIPTIVE CIRCULAR AND TESTIMONIALS.

**Giant Sounder and Steel Lever Key
Combination Set.**



Our standard first-class Giant Sounder, finely finished, with rubber covered coils, mounted
on polished base, with a Steel Lever Key, making the prettiest and most perfect set of Short
Line Instruments ever produced.

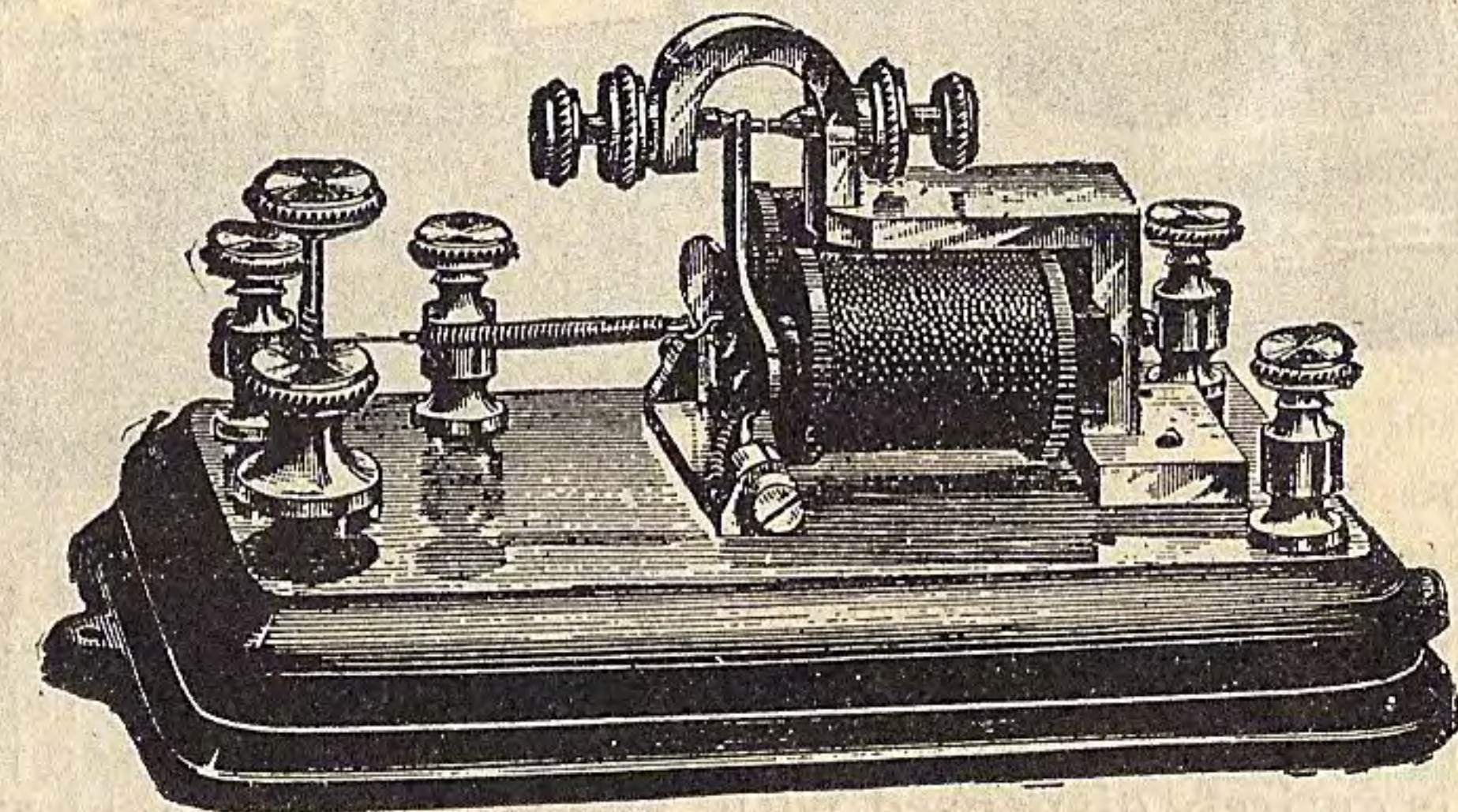
Wound to 4 ohms, for lines up to 200 feet \$4 70

The above set, with large cell of crowfoot battery, book of instructions,
chemicals, wire, etc., making an Extra Fine Finished Learners' Set 6 50

20 ohm Instrument only, for lines up to 10 or 15 miles in length 5 00

Postage on above Instruments only, extra (net) 40

NOVEL FORM PONY RELAY.



Mounted on polished base with finely finished surbase.

5 to 20 ohms resistance.....\$3.00

50 ohms " 3.30

75 " " 3.50

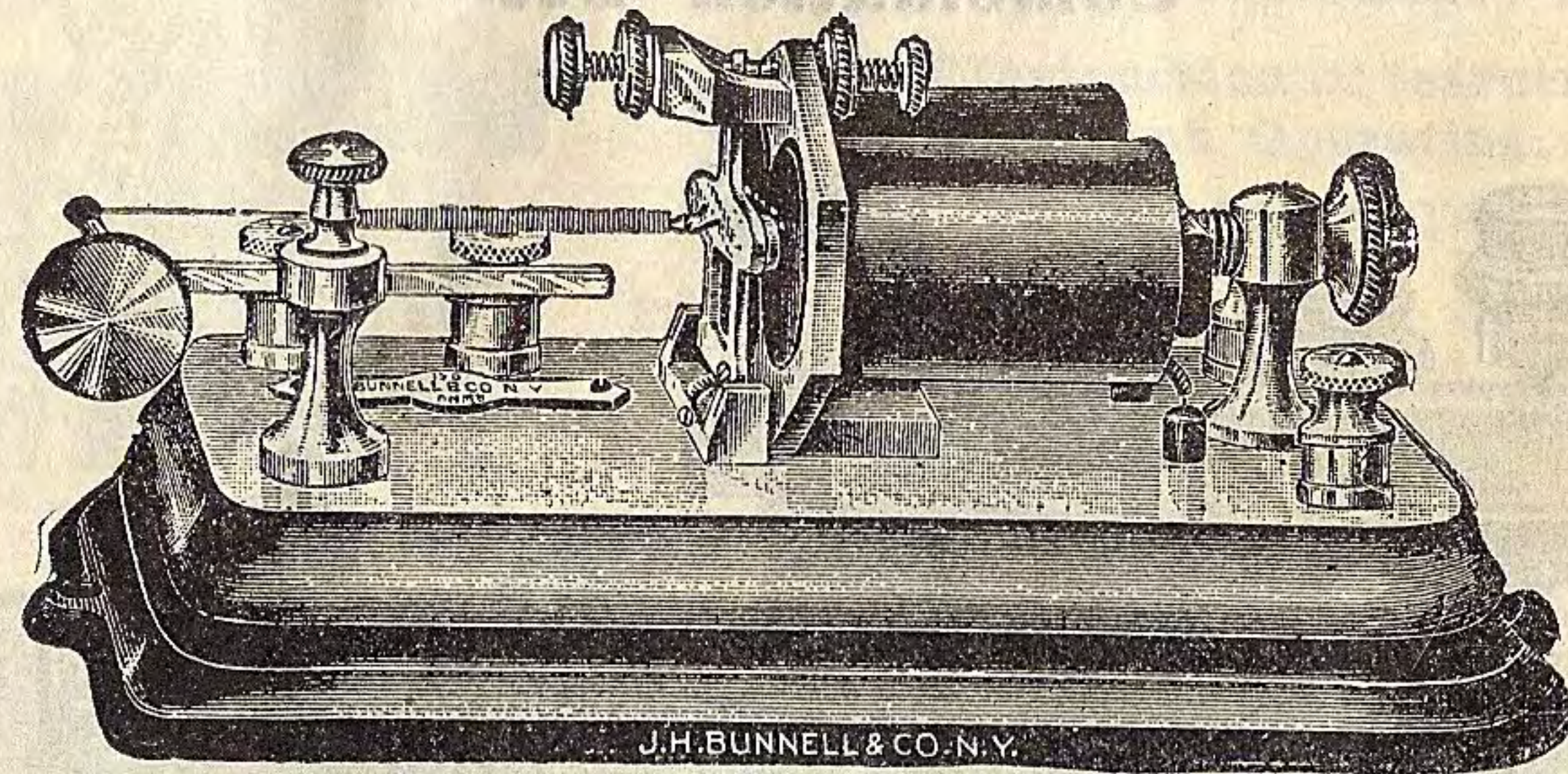
100 " " 3.70

With Polished Rubber Covered Magnets, extra..... .50

Postage extra (net), 35 Cents.

RELAYS.

First Class Main Line Relays. Solid Trunnion, Single Piece Armature.
STANDARD No. 1 RELAY



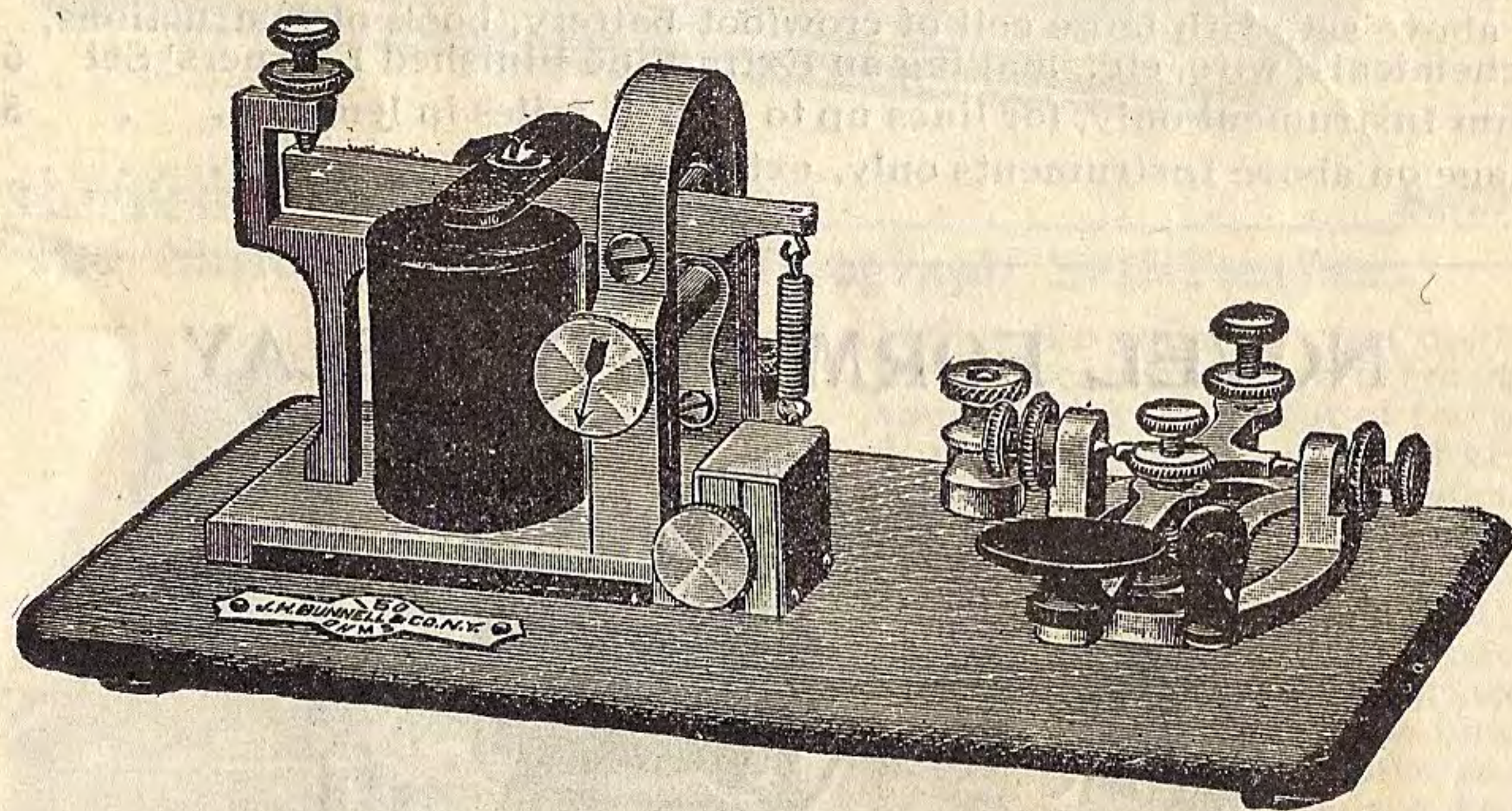
J.H. BUNNELL & CO. N.Y.

Wound with Silk Covered Wire, Polished Rubber Covered Coils, Mahogany Base, Mounted on Ornamental Surbase, with Extension Adjustment. In addition to the excellent merits of these relays, in all the usual details of construction and finish, their special advantages consist in the armature and lever, which is all struck from a single piece of finest iron, the improved form of trunnion seat, the improved magnet adjustment, etc., etc., making them the finest type of relay ever constructed.

150 ohms resistance	.....	\$8.00
200	.....	8.50

NEW MAIN LINE SOUNDING RELAY.

"MCM" MODEL.

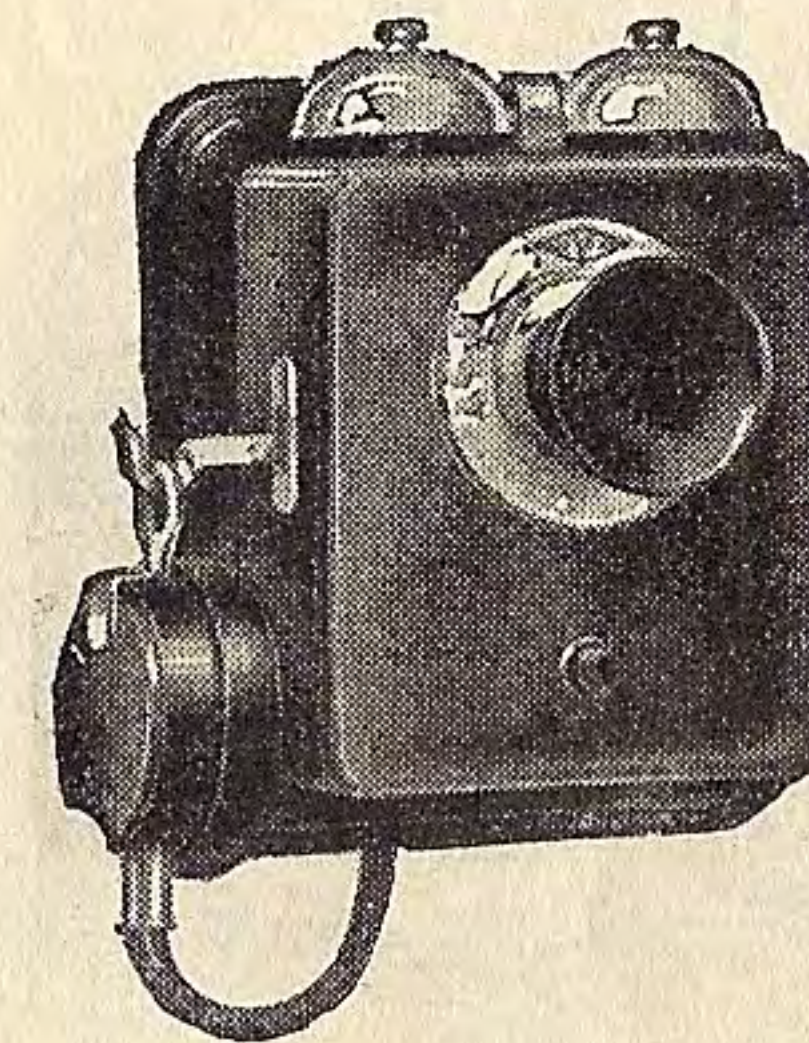


New and important improvements, instantaneous adjustment of both armature spring and distance from magnet cores, both adjustment nuts conveniently located in front. The arrow on the upper adjusting nut indicates the relative distance between armature and magnet cores, the string arrangement used in the old style tension springs is entirely dispensed with, and a wide and rapid range of spring adjustment obtained by a cam lever operated by the lower adjusting nut. The "MCM" model retains all the good points of our original type of instrument and is intended for use on main lines in place of the ordinary relay, and dispensing entirely with the local sounder, thus saving the continual expense of maintaining local batteries.

20 ohms, with key on base	.....	\$ 9 50
20 " without key	.....	7 50
150 " with key on base	.....	10 00
150 " without key	.....	8 00

TELEPHONES

NEW BEEKO PHONE

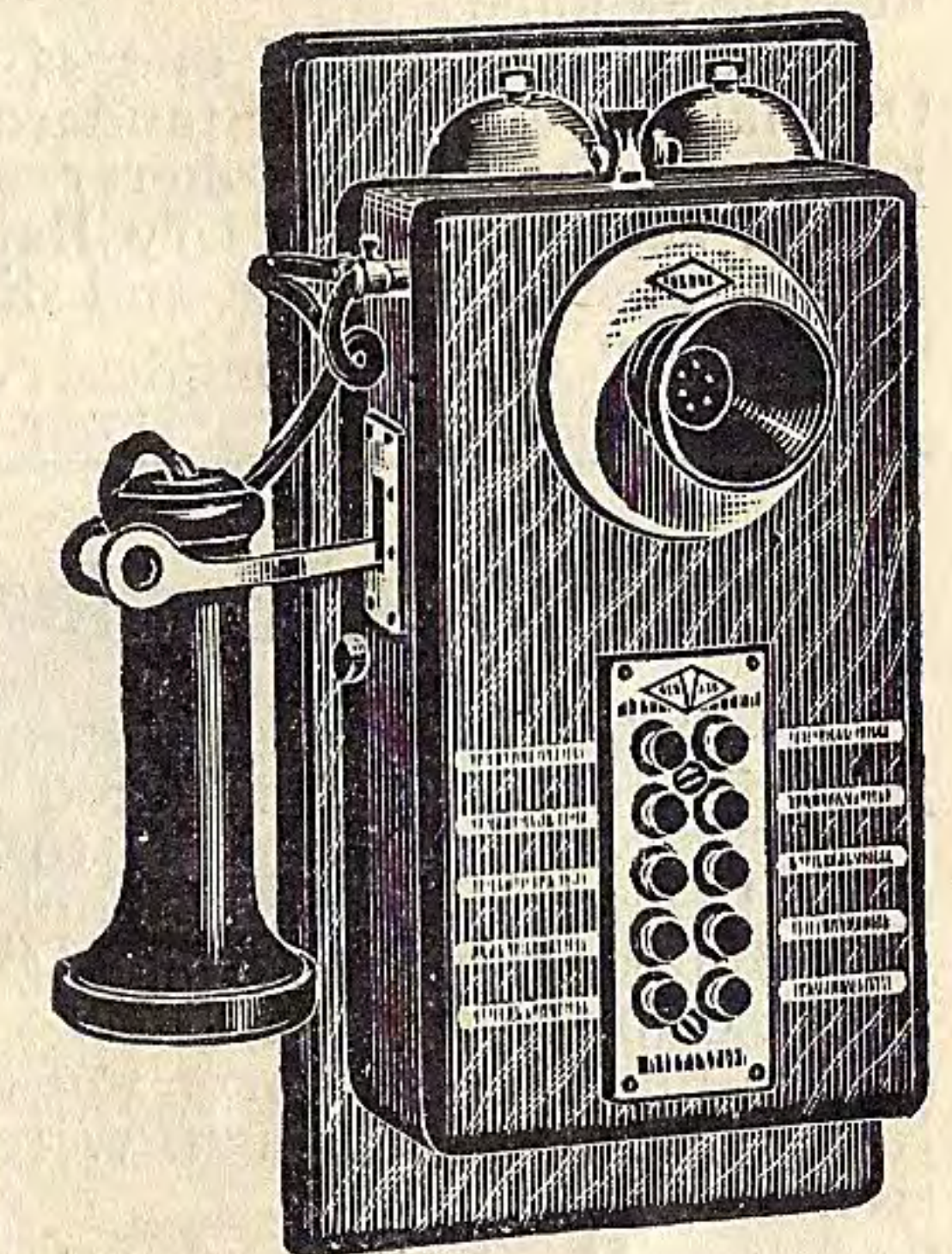


The best Small Battery Phone yet produced.
All metal. Black rubber, Japan finish, with nickel trimmings. All inside connections.
Knockout holes on each end for cable.
Double Pole Watch Case Receiver.
Will work satisfactorily for a distance of 800 to 1,000 feet.
Wiring diagram furnished with each set.
Per pair.....\$10.00

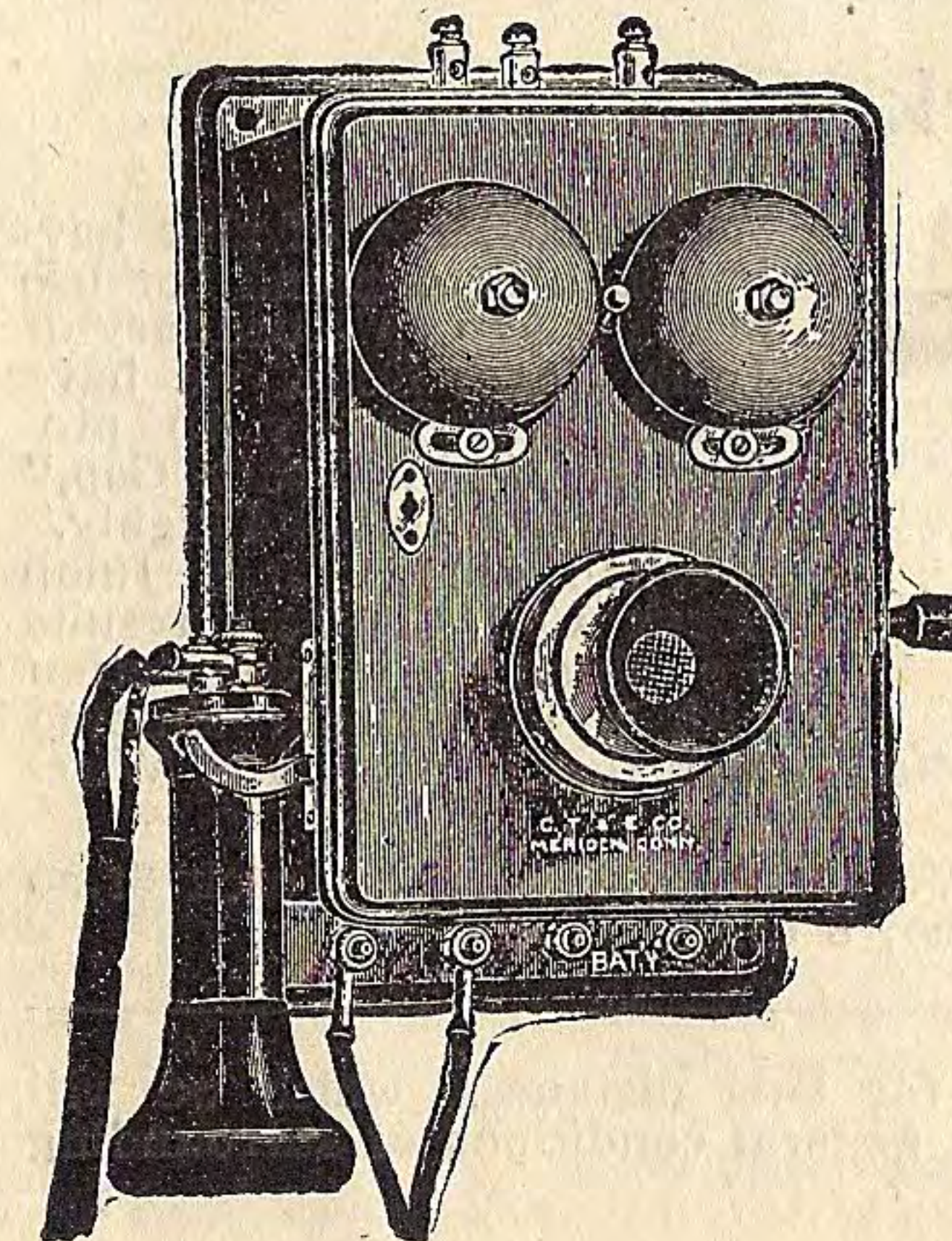
INTERCOMMUNICATING WALL TELEPHONE

AUTOMATIC, SWITCHLESS BALL BEARING

All Metal, Black Rubber, Japan Finish, mounted with Nickel Trimmings.
Automatically restored by placing receiver on hook.
Common return. Metallic Circuit or Apartment House Wiring.
All Inside Terminals. Knockout holes on each end for cable.
All moving parts easily changed without removing wires from telephone.
Capacity, all Metal, 2 to 20 Stations.
Capacity in Wood, 2 to 50 Stations.
From 2 to 10 Stations.....\$17.00
For each additional 2 Stations..... 1.40



COMPETITION MAGNETO TELEPHONE

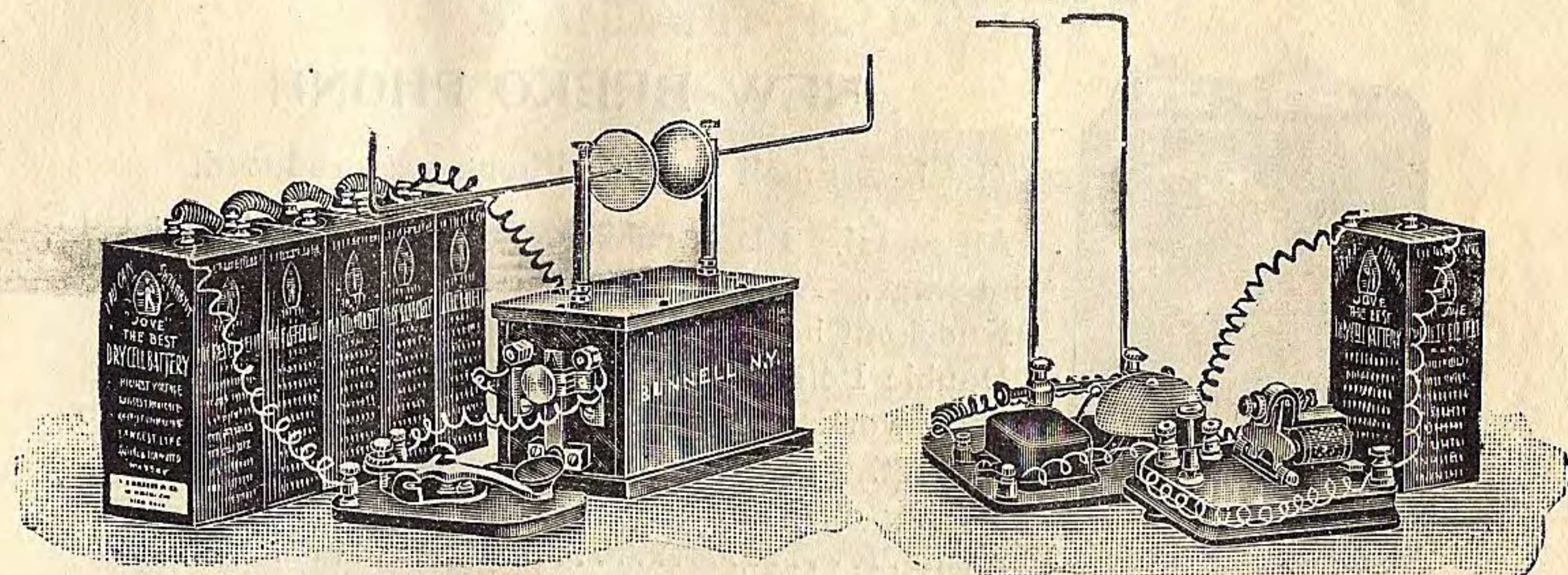


A low priced, reliable telephone, with magneto call for lines up to 15 miles. Will work on grounded circuits with several instruments on the line. Compact in form, no battery box or backboard required. Batteries can be placed in any convenient place and wired direct to battery binding post at base of instruments.

Priceeach \$13.00

Batteries are not included in any of the above prices.

"Amateur" Wireless Telegraph Outfit



Will operate a distance of 1/4-mile to several miles, according to height of aerial and surrounding conditions.

The advantage of an outfit with Coherer and Relay is that it produces audible signals.

Outfit consists of one 3/4-inch Box Pattern Spark Coil, two Jump Spark Oscillator Balls, two Standards, two Sending Wires, one Beeko Steel Lever Key, one Standard Coherer and Decoherer, one 75 ohm Novel Form Pony Relay, six Cells Jove Dry Battery, 25 feet No. 14 Bare Aluminum Wire, 25 feet of Insulated Wire and diagrams of instructions.

"Amateur" Outfit, Complete.....\$20.00

"Amateur Junior" Wireless Telegraph Outfit

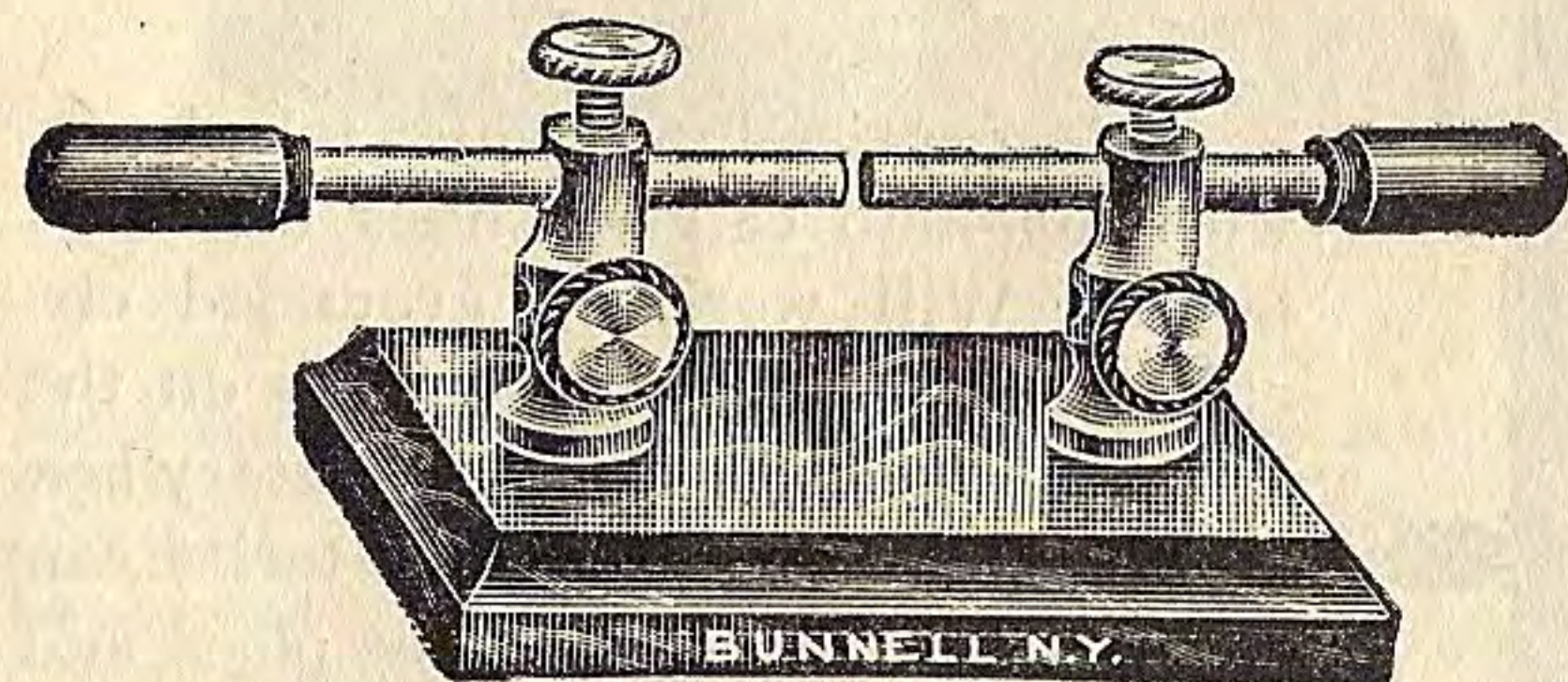
Suitable for demonstrations or experimental purposes. Will work satisfactorily for several hundred feet.

This outfit is similar to the "Amateur" outfit listed above, but is intended for short distances only.

Outfit consists of one 3/8-inch Box Pattern Jump Spark Coil, one Zinc Spark Gap, one Beeko Steel Lever Key, one Mascot Coherer and Decoherer, one 20 ohm Novel Form Pony Relay, five Cells Mascot Dry Battery, 10 feet No. 14 Bare Aluminum Wire, 20 feet Insulated Wire and diagram of instructions.

"Amateur Junior" Outfit, Complete.....\$16.00

Zinc Spark Gap



The efficiency of zinc having been determined for use in spark gap on secondary of Jump Spark Coils, we have found it necessary to produce the "Zinc Spark Gap," which we recommend highly.

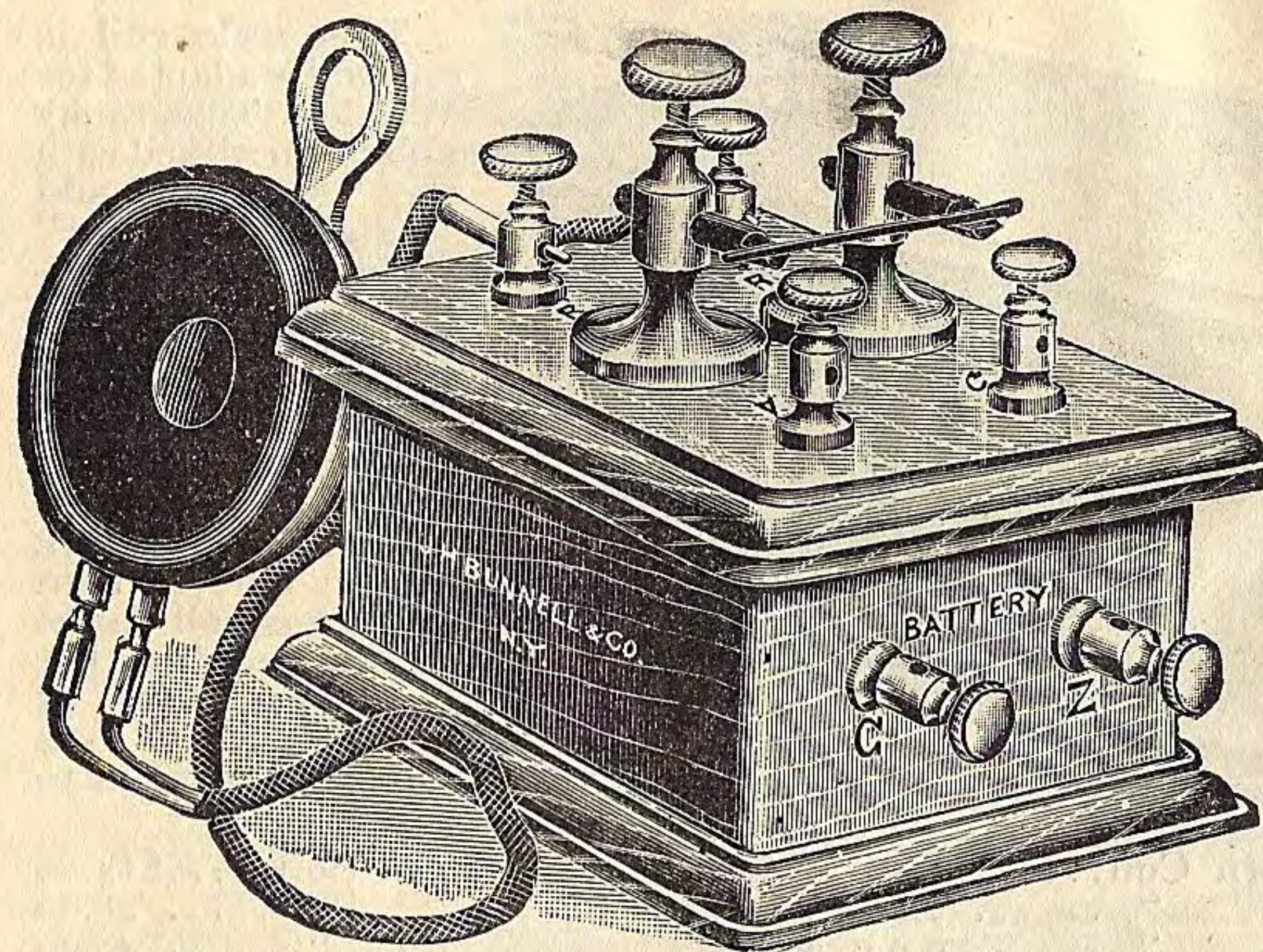
When used with a Jump Spark Coil the best results are obtained in connection with a Leyden jar shunted

across gap, which will produce the good "fat" spark that is needed in Wireless Telegraphy.

Zinc Spark Gap.....each \$1.20
Postage extra (net), 8 cents.

We also furnish high grade outfits for long distances, which we will quote on application, stating distance and general conditions of surrounding country.

BEEKO WIRELESS RECEIVER SET



To meet the large demand for a low priced Receiver Set we have placed this one on the market and can recommend it as being very satisfactory.

It is extremely sensitive, with no complicated parts to get out of order.

Set is complete, as shown in illustration, and does not include the sending apparatus.

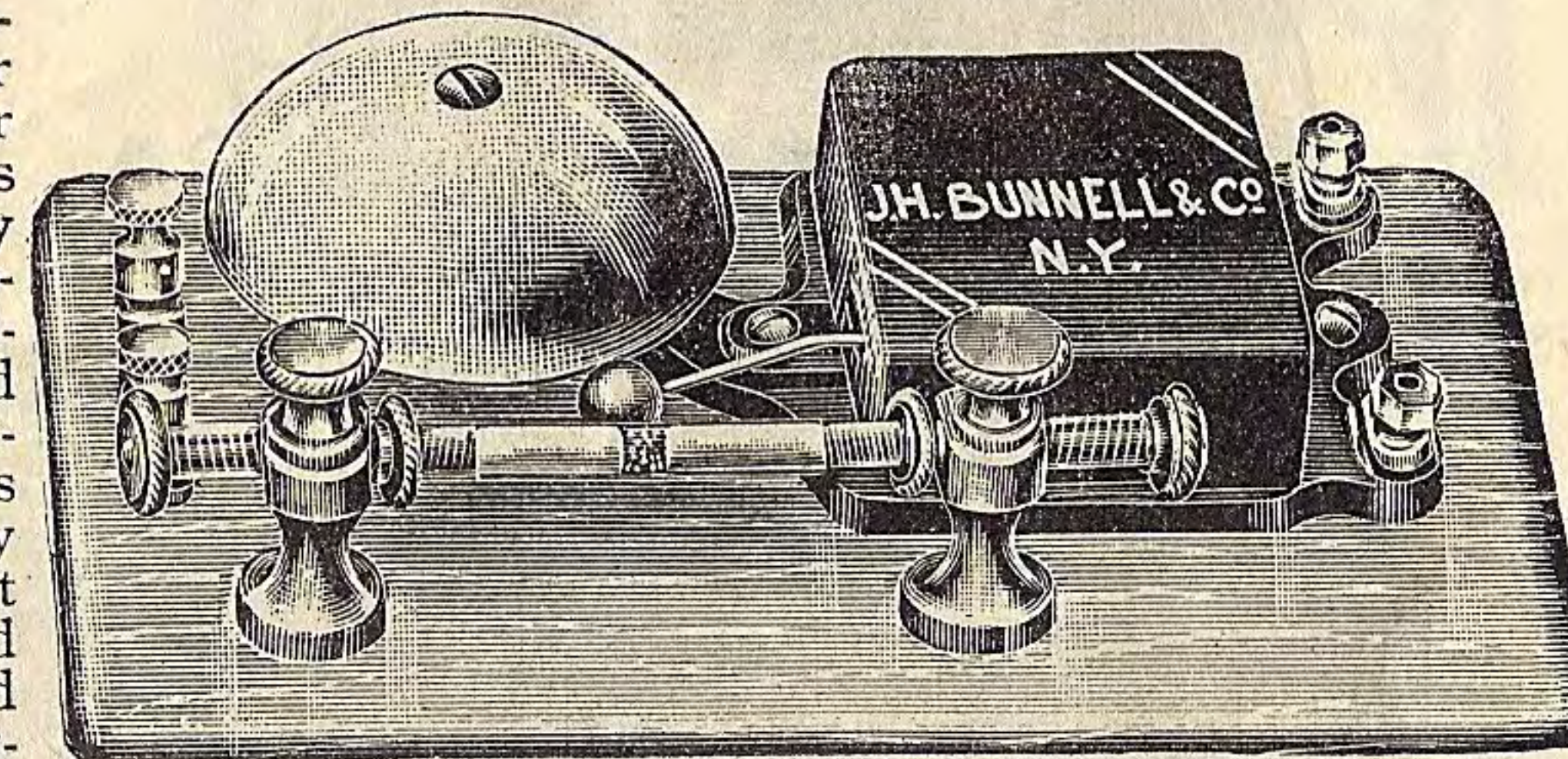
We have received some very complimentary

reports on this little set, among which was that of having caught signals from a distance of several hundred miles.

Beeko Receiver, Set Complete.....\$6.00

STANDARD COHERER AND DECOHERER

The Standard Coherer and Decoherer is furnished with our "Amateur" Wireless Set, and is extremely sensitive. The Coherer Plugs have silver-plated points and are fitted with micrometer screws which allows very fine regulation. It is finely finished throughout and mounted on mahogany base.



Under favorable conditions when used with a sensitive relay they will work from a distance of several miles. The filings are specially prepared and are properly proportioned to get best results. Care must be taken, however, in placing the filings in glass tube that they do not come in contact with the hands, as the natural oil will destroy the usefulness of the filings.

The Decoherer in striking against Coherer acts as a sounder, so that telegraphic characters may be deciphered therefrom.

When so desired we can furnish Coherer separately.

Standard Coherer and Decoherer combined.....\$2.80

Postage extra (net) 26 cents

Standard Coherer only..... 2.00

Postage extra (net) 15 cents

Glass Tube only... .20 Filings per package20

MASCOT COHERER AND DECOHERER

For those wishing a lower priced set for experimental purposes, we have placed the Mascot pattern on the market. This set is similar to the Standard pattern, but is slightly smaller and does not have the same high finish given our Standard pattern.

Mascot Coherer and Decoherer combined.....\$2.00

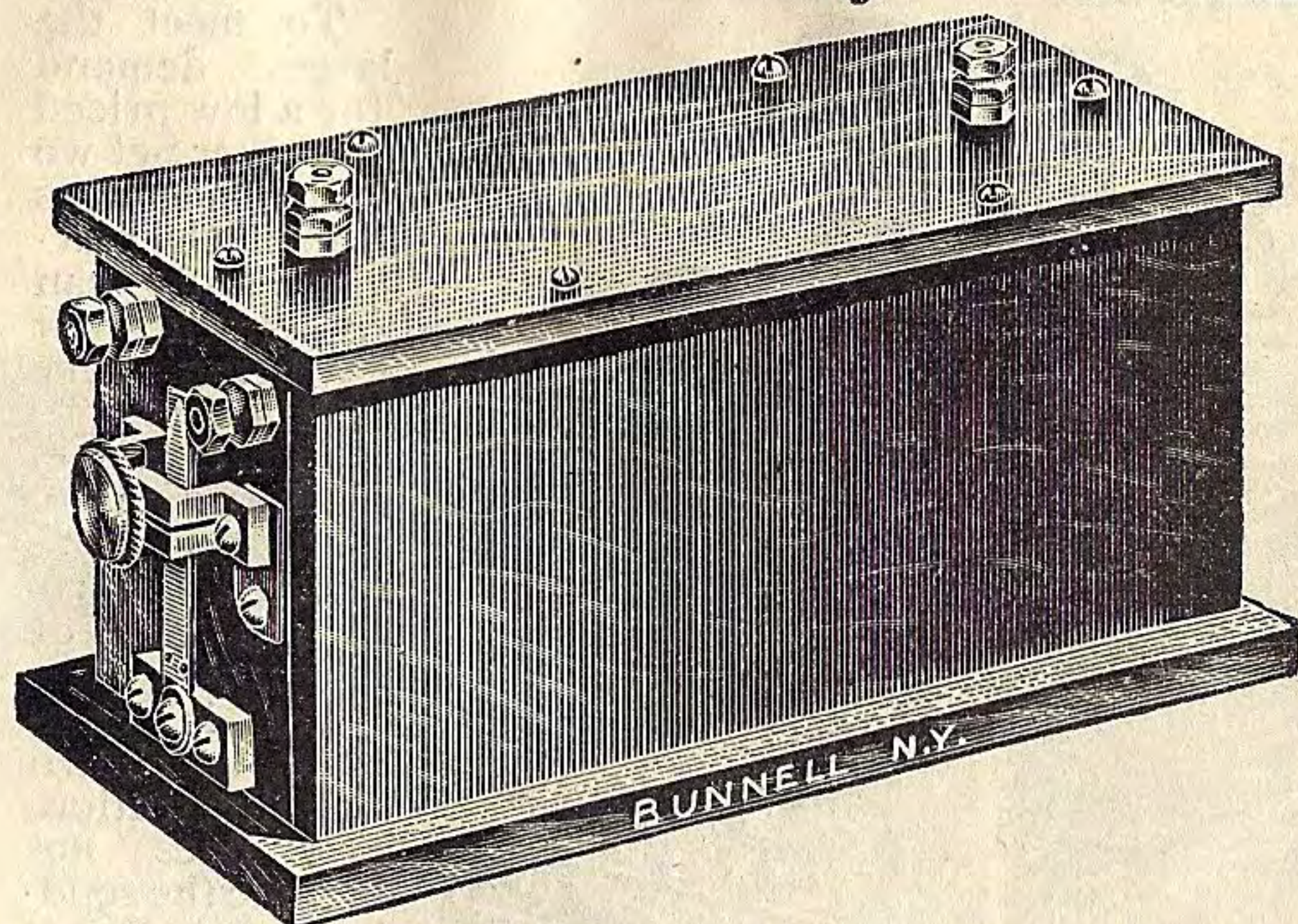
Postage extra (net) 22 cents

Mascot Coherer only..... 1.20

Postage extra (net) 10 cents

Glass Tube only..... .20 Filings per package..... .20

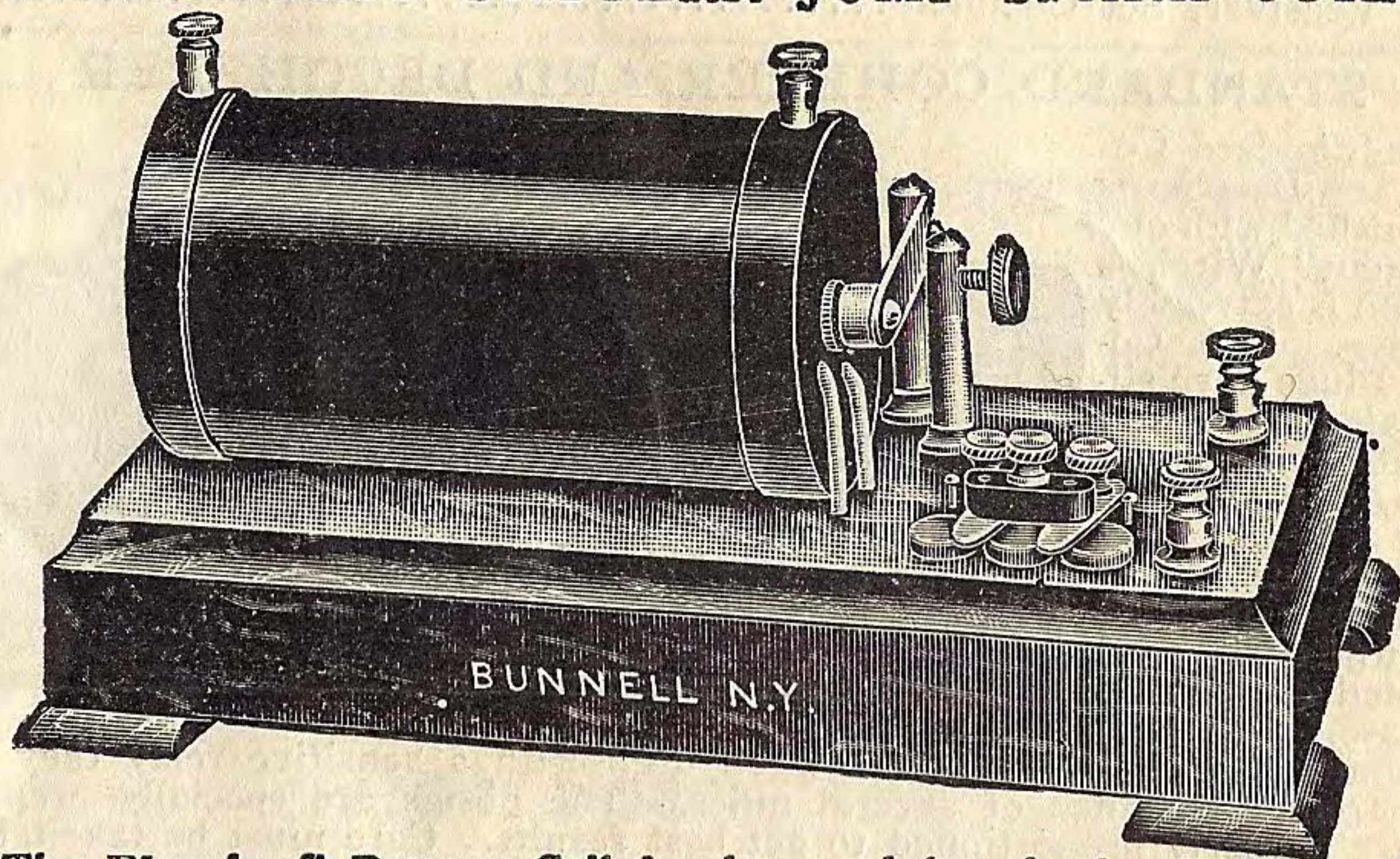
BOX PATTERN JUMP SPARK COIL



This style coil is especially adapted for Wireless Telegraphy and is furnished with the "Amateur" and "Amateur Junior" Outfits. The coil is enclosed in a neat polished Oak Case with Brass trimmings and has condenser in base to decrease sparking at contact points. It will work on less current than any other coil on the market, requiring but 6 to 8 volts and $\frac{3}{4}$ of an ampere to 4 amperes, according to size of coil.

$\frac{1}{4}$ inch Box Pattern Coil.....	\$5.00	$1\frac{1}{2}$ inch Box Pattern Coil.....	\$14.00
$\frac{3}{8}$ " " " "	7.00	2 " " " "	20.00
$\frac{3}{4}$ " " " "	9.00	3 " " " "	40.00
1 " " " "	10.00	4 " " " "	64.00

RHUMKORFF PATTERN JUMP SPARK COIL



The Rhumkorff Pattern Coil is also used largely for Wireless Telegraphy, as being more delicate than the Box Pattern Coil, it will permit of finer adjustment. It is also more generally used for experimental purposes, Geissler Tubes, X Ray work, etc.

$\frac{1}{8}$ inch Rhumkorff Coil.....	\$3.60	1 inch Rhumkorff Coil.....	\$27.00
$\frac{1}{4}$ " " " "	4.60	$1\frac{1}{2}$ " " " "	40.00
$\frac{1}{2}$ " " " "	11.00	2 " " " "	54.00
$\frac{3}{4}$ " " " "	17.50	3 in. or over " "	per inch. 26.00

GEISSLER TUBES

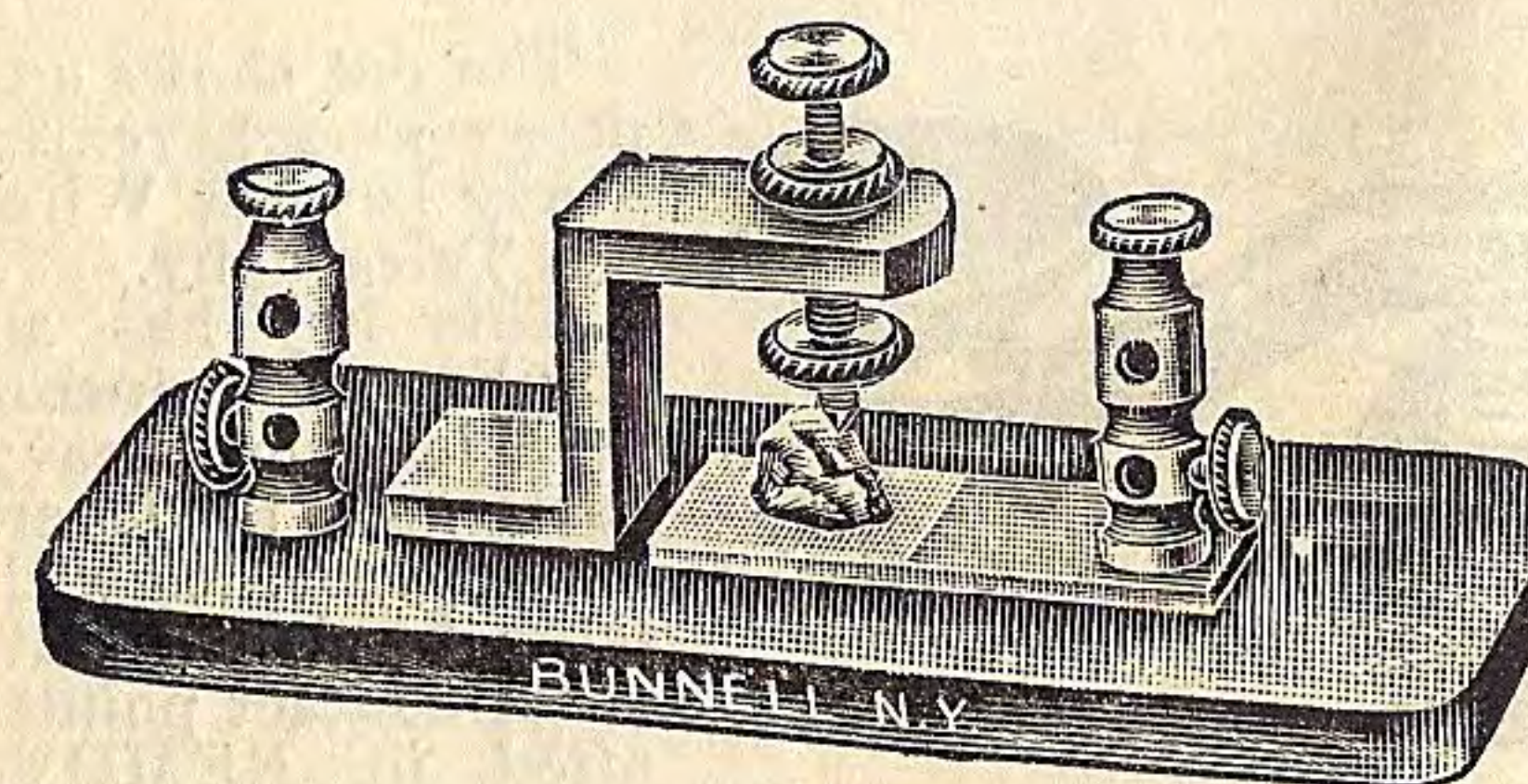
We handle the highest grade of imported Geissler Tubes. They can be used in connection with any of the above Spark Coils and produce wonderful effects.

The six inch tube is the size most generally used, and is carried by us in three different styles, viz.—Plain Tube only, Plain Enclosed Tube and Enclosed Tube filled with fluorescent liquid.

We can also furnish larger sizes up to 12 inches, prices for which will be quoted on application.

6 inch Plain Geissler Tube.....	each \$0.70
6 " " Enclosed "	" .90
6 " Fluid " "	" 1.10

BEEKO DETECTOR HOLDER



Can be used for any solid substance used in Wireless Telegraphy. It has adjusting screw, so that any desired tension may be secured, has double binding posts for receiver cords and the ground and aerial connections. Is finely finished in lacquered brass and mounted on polished hardwood base.

Price	\$2.00
Postage extra (net), 12 Cents.	
Carborundum, in one-ounce boxes, per ounce.....	.50
Fused Silicon " " " " .....	.50

TUNING COILS

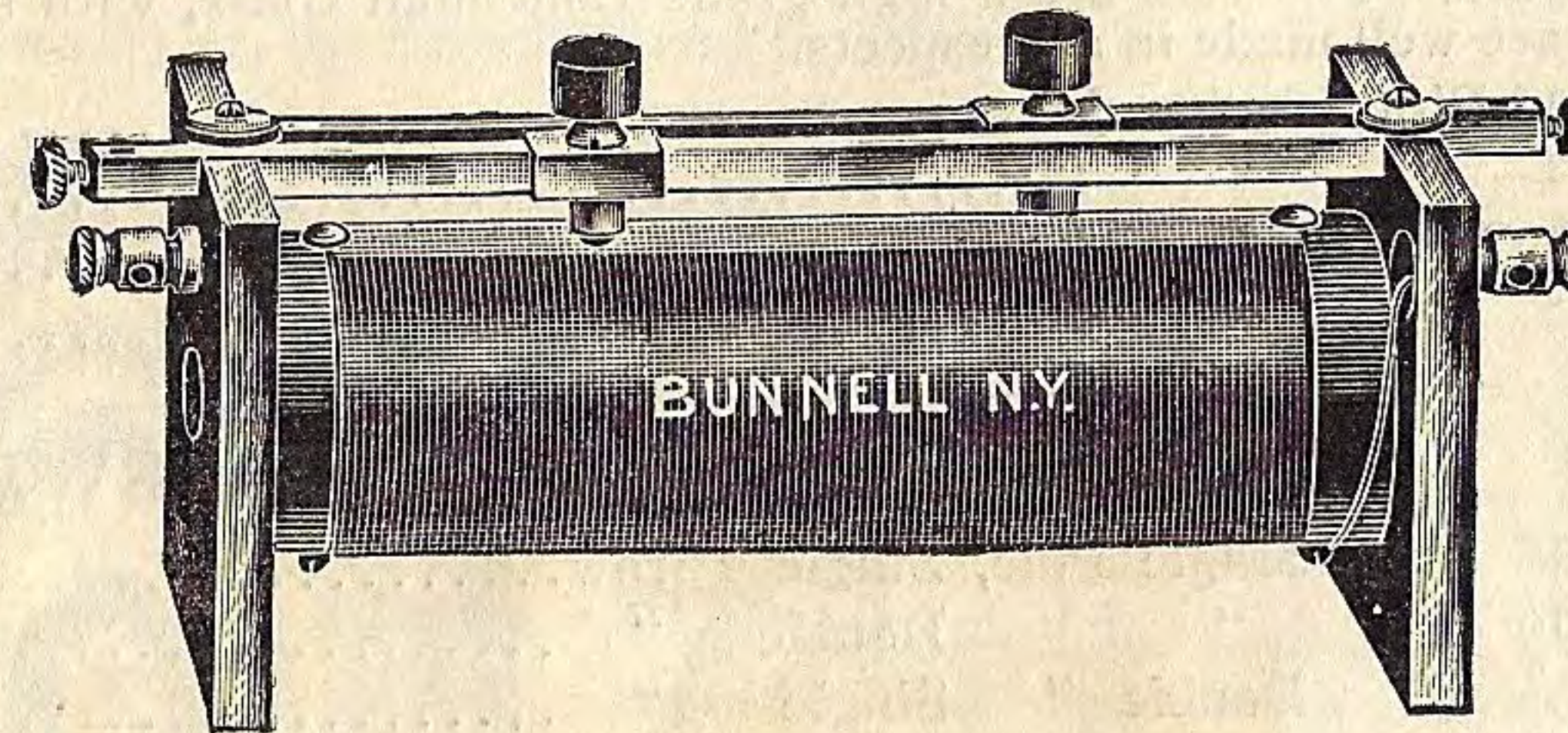
A tuning coil is very essential to satisfactory signals. With it many interfering signals may be eliminated and the desired signals brought out clearer or louder.

Our tuning coils are made in the most approved manner for obtaining best results.

We illustrate a very efficient type with double contact slides by means of which a variety of conditions may be obtained in aerial and ground adjustments, with and without condensers, etc.

It is known as the Junior Tuning Coil. Our Standard Tuning Coil is larger than the Junior type, with correspondingly greater range. It is also provided with double sliding contacts and is very efficient in action.

Junior Tuning Coil.....	\$4.50
Standard Tuning Coil.....	8.00



POTENTIOMETER

The Potentiometer is used to regulate the battery current in connection with the Electrolytic or other forms of Detector that requires battery. Two Resistance Rods are furnished with each Potentiometer, one of 300 ohms, the other of 500 ohms.

Potentiometer	each \$3.00
Extra Resistance Rods.....	" 1.00
Postage extra (net), 20 Cents.	

VARIABLE CONDENSER

Is used where a greater range of efficiency and balancing of circuits is necessary.

Price	\$6.00
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SENDING HELIX

To tune the sending end, by means of which one can change the wave lengths as desired.

Price	\$4.00
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ELECTRICAL BOOKS

Allsop—Induction Coils and Coil Making.....	\$2.50
Bottone—Amateur Electrician's Workshop.....	1.50
Brooks—Automobile Handbook.....	3.00
Carlisle & Finch—Miniature Electric Railway Construction.....	1.00
Clark—A B C of Electrical Experiments.....	2.00
Dickenson—Easy Experiments in Electricity.....	2.00
Dodge—The Telegraph Instructor.....	1.72
Haskins—Electricity Made Simple.....	2.00
Homan—A B C of the Telephone.....	2.00
Homan—Automobile Educator.....	4.00
Horstman & Tousley—Wiring Diagrams and Descriptions.....	3.00
Jones—Pocket Edition of Diagrams for Telegraph Engineers.....	3.00
Lockwood—Electrical Measurements, The Galvanometer and its Uses... .	.75
Marshall—Small Accumulators, Cloth, \$1.00. Paper.....	.50
Massie & Underhill—Wireless Telegraphy and Telephony.....	2.00
Maver—American Telegraphy.....	10.00
Maver—Wireless Telegraphy.....	4.00
Meadowcroft—A B C of Electricity.....	1.00
Meyer—The 20th Century Manual of Railway and Commercial Telegraphy. .	2.00
Meyer—The 20th Century Manual of Railway Station Service.....	2.50
Norrie—Electric Gas Lighting.....	1.00
Norrie—Induction Coils.....	2.00
Phillips Telegraph Code.....	2.00
Schmidt—The Gas Engine.....	1.50
Schneider—Electric Circuits and Diagrams.....	.50
Schneider—Modern Primary Batteries.....	.50
Schneider—Study of Electricity for Beginners.....	.50
Sloane—Electricity Simplified.....	2.00
Sloane—How to Become a Successful Electrician.....	2.00
St. John—Elementary Magnetism and Electricity by Experiment.....	2.50
St. John—How Two Boys Made Their Own Electric Apparatus.....	2.00
St. John—Real Electric Toy Making.....	2.00
St. John—Things a Boy Should Know About Electricity.....	2.00
St. John—Wireless Telegraphy.....	2.00
Trevert—A B C of Wireless Telegraphy.....	2.00
Trevert—Electro-Plating.....	1.00
Trevert—Experimental Electricity.....	2.00
Watson—One Kilowatt Dynamo.....	2.00
Watson—Storage Batteries.....	3.00
Watson & Bubier—Electrician's Handy Book.....	3.00
Weber—Electrical Dictionary.....	.50
Weber—First Steps in Electricity.....	2.00
Weston—Electro-Plating.....	2.00

(Above prices on books include postage.)

CONTINENTAL TELEGRAPH CODE

Generally Used on Wireless and Cable Systems

A	B	C	D	E	F
G	H	I	J	K	L
M	N	O	P	Q	R
S	T	U	V	W	X
Y	Z	WAIT	UNDERSTAND	DONT UNDERSTAND	
PERIOD	INTERROGATION	EXCLAMATION			
1	2	3	4	5	
6	7	8	9		
0	CALL	FINISH.			

9234 A

DRY BATTERIES

"JOVE," "STANDARD," "MASCOT"

We are the pioneers in the manufacture of Dry Batteries, having produced the first dry cell made.

The Mascot

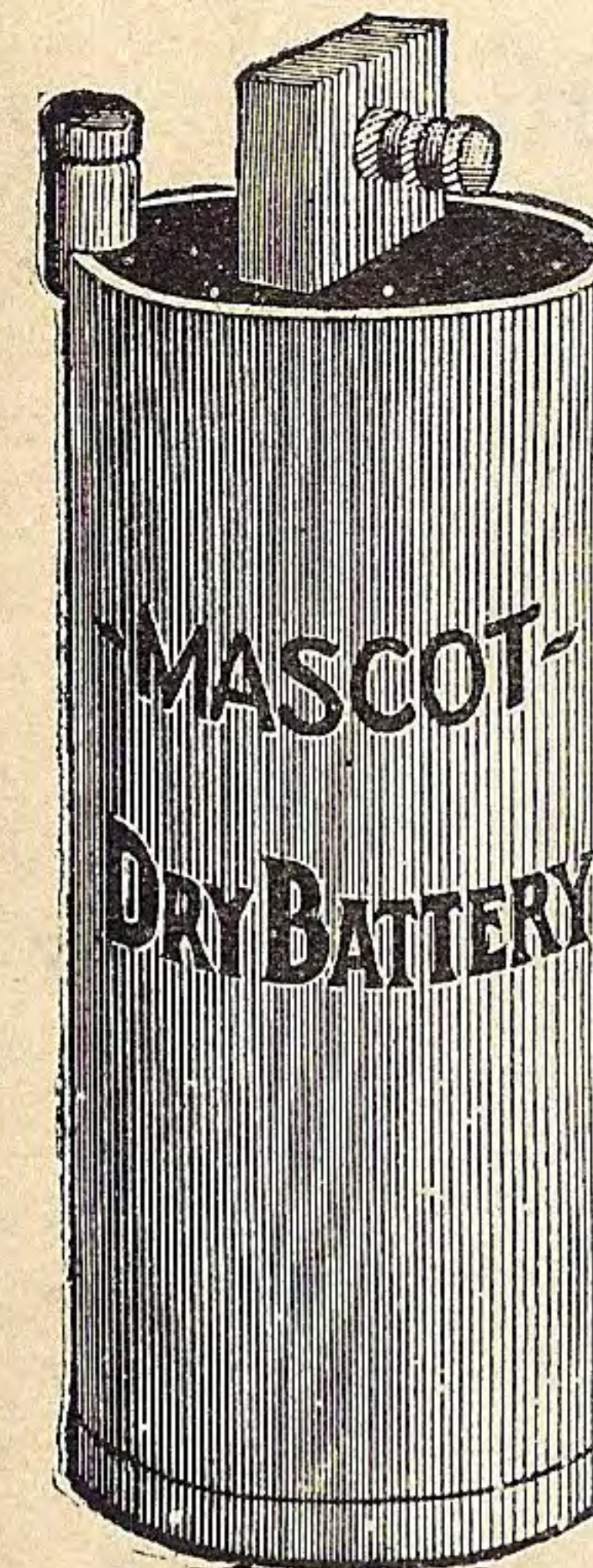
Dry Cell is our competition battery. It is carefully made by an improved process from selected materials. For an "all around" open circuit battery it will be found fully equal if not superior to many of the type advertised as "first class" batteries. We can highly recommend the "MASCOT" for all ordinary open circuit systems, such as Bell, Burglar Alarm, Annunciator, Telephone and Gas Lighting Work. E. M. F. 1½ Volts. Current on short circuit, 10 to 12 Amperes. Size 2½x6½ inches.

Price, per cell.....\$0.30

The Baby Dry Cell

is the same type as the larger forms, and is intended for use in places where space is limited. E. M. F. 1½ Volts. Current on short circuit 8 to 10 Amperes. Size 1¾x3½ inches.

Price, per cell.....\$0.30



THE "JOVE" INDIAN TUBE

WEATHERPROOF MOTORCYCLE BATTERY



Consists of three Dry Cells solidly packed in paraffine inside of tin case. Cannot be affected by vibration. No wires to break off or shake loose. Will give 20% more mileage than any other make of Battery.

Size of Tube 17x2¾ inches, weight 4½ lbs.

Price, each.....\$3.00

THE "JOVE" DRY BATTERY IGNITION SETS

FOR LAUNCHES AND MOTORCYCLES

Designed Especially for Marine Use

Batteries connected in series (soldered connections); and sealed in nicely finished tin case filled with waterproof compound, with terminal wires extending through cover.

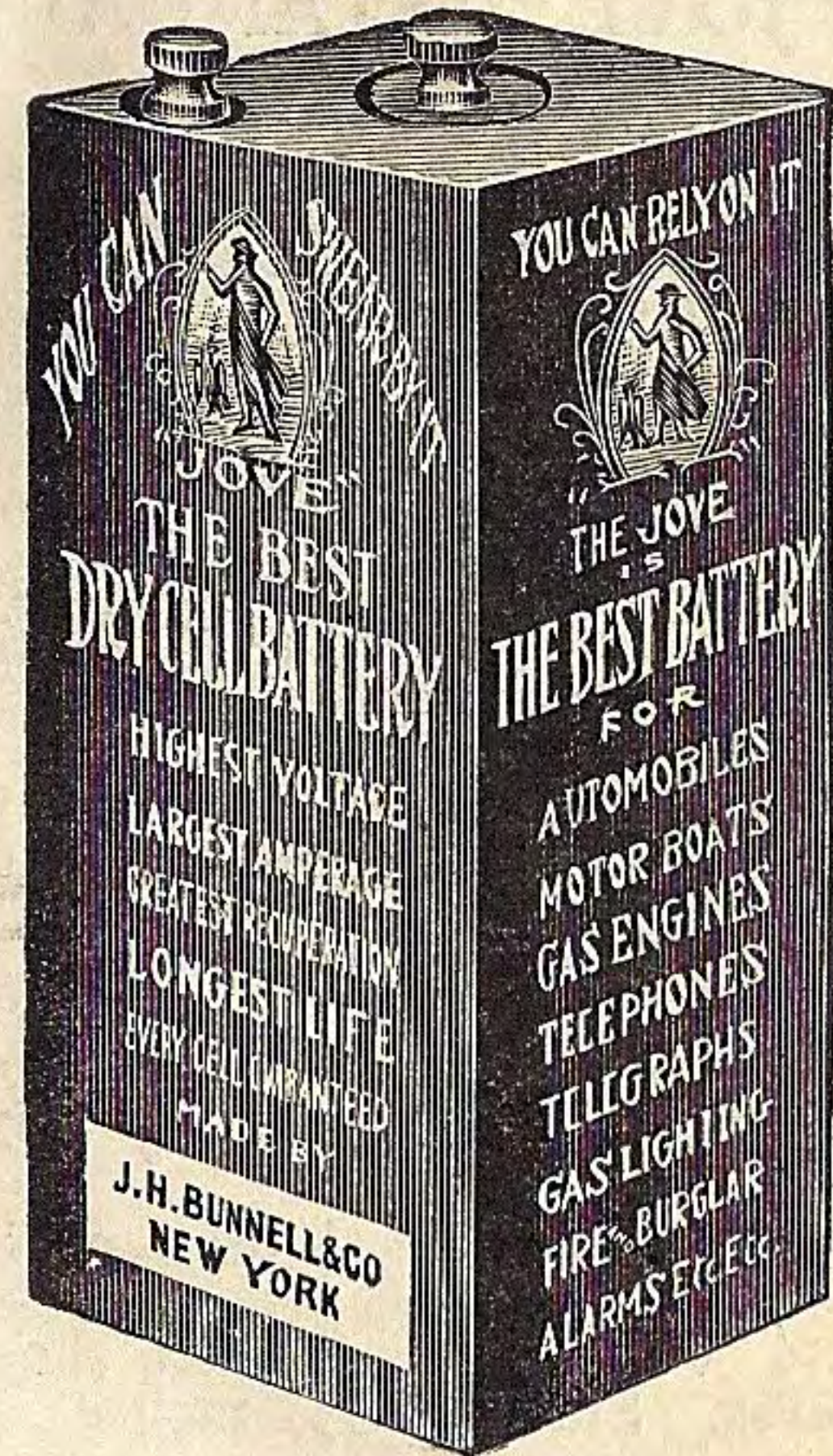
Guaranteed air-tight and moisture proof.

4 Cell, 6 Volt Set, size 10¾x7x3 in.....	each	\$2.80
5 " 7½ " " " 13½x7x3 in.....	"	3.50
6 " 9 " " " 16¼x7x3 in.....	"	4.20

THE "JOVE" OR "BEST" DRY BATTERY

No. 6.
6 x 2½ inches,
25 to 30
Amperes.

No. 7.
7 x 3 inches,
30 to 35
Amperes.



Made in two
sizes.

A
Round Battery
in a
Square Box.

It has the **Greatest Voltage, Amperage and recuperating qualities.**

It is unequalled for heavy work, such as **Gas and Gasoline Engine ignition**, whether stationary or in **Autos, Motor Boats, etc.**

Can also be used for **Telephone, Telegraph, Gas Lighting, Fire and Burglar Alarms** or wherever an open circuit battery is suitable.

A **trial order** will convince the most skeptical. We **guarantee** every cell and will refund your money if not satisfied.

For the greater convenience of users and dealers we are now putting the cells in square cartons, as shown in the cut. They pack better in this form and make a much nicer shelf or window display.

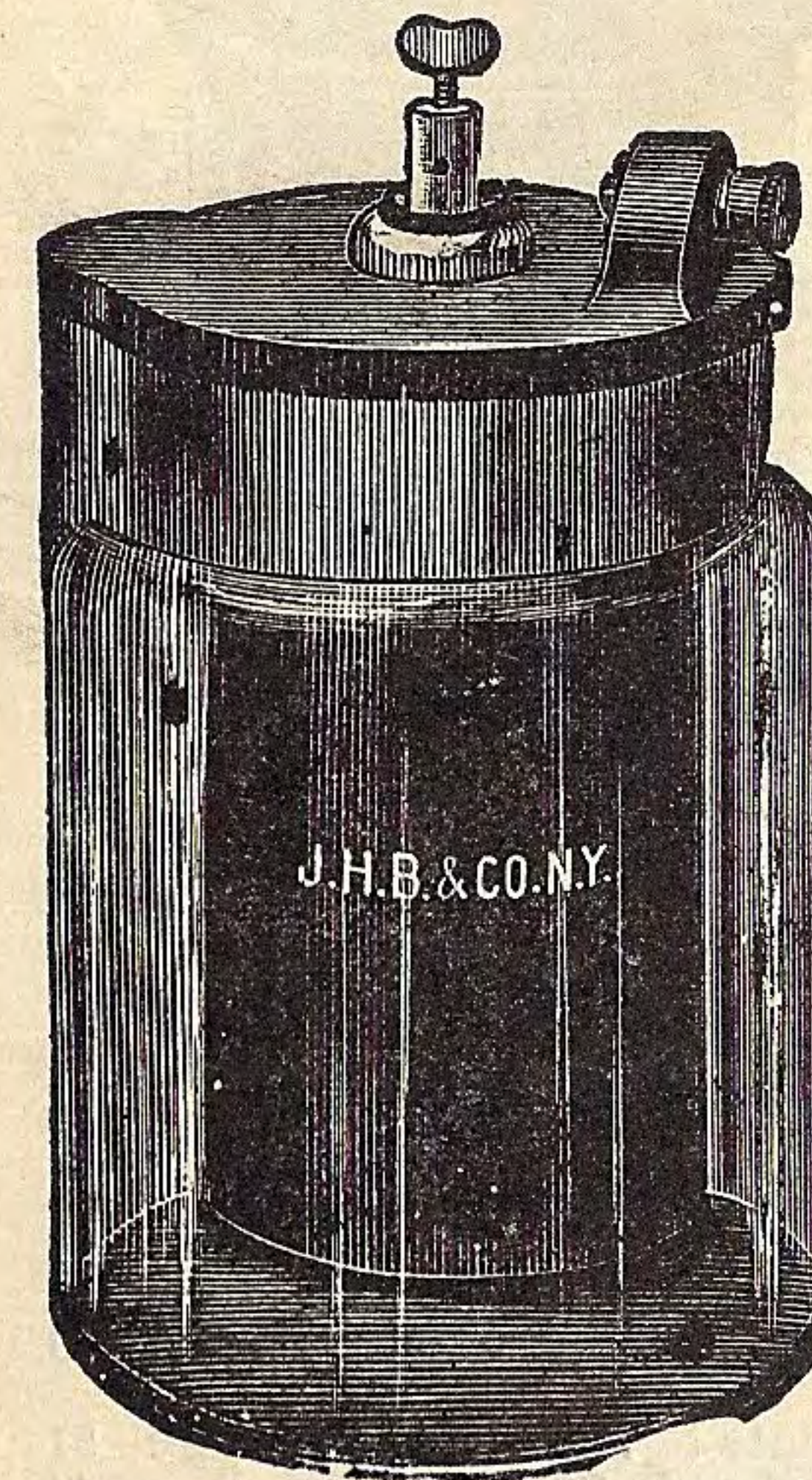
We are **Pioneers** in the making of **Dry Cell Batteries** and confidently assert that our **New Jove Battery** is the **BEST DRY CELL** ever produced.

No. 6 size, 6x2½ inches.....each \$0.50
No. 7 size, 7x3 inches..... " .90
Special No. 5 Jove Junior, in round Carton, size 5x2 in.,
20 to 24 amperes..... " .50

Special Prices on All Dry Batteries for Quantities.

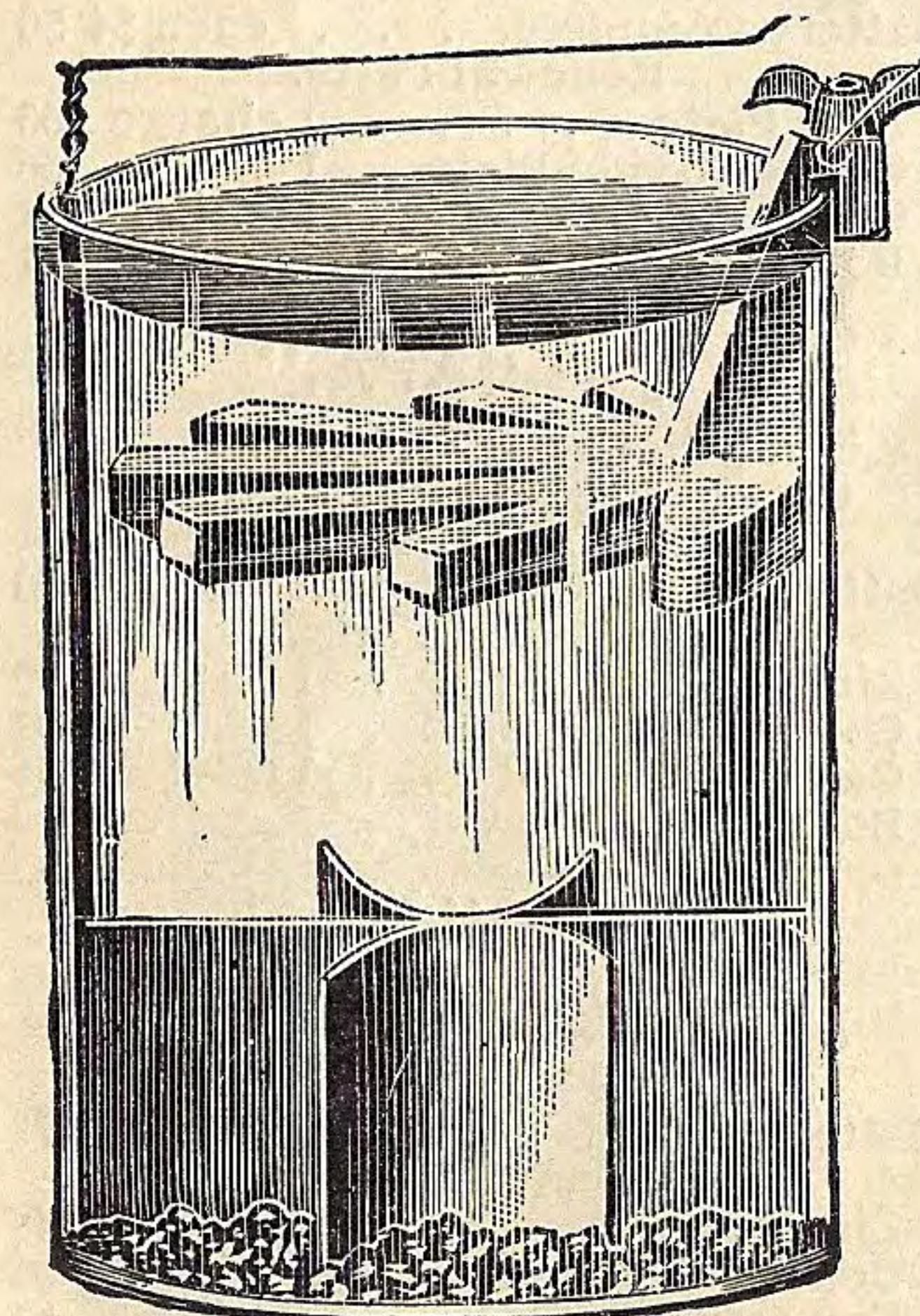
Carbon Cylinder Battery.

For open circuit work.



Battery Complete, per cell	\$0 50
Carbon Cylinder only.....	26
Zinc only.....	06
Jar only.....	16
SalAmmoniac, per package	10

Crow Foot Battery.



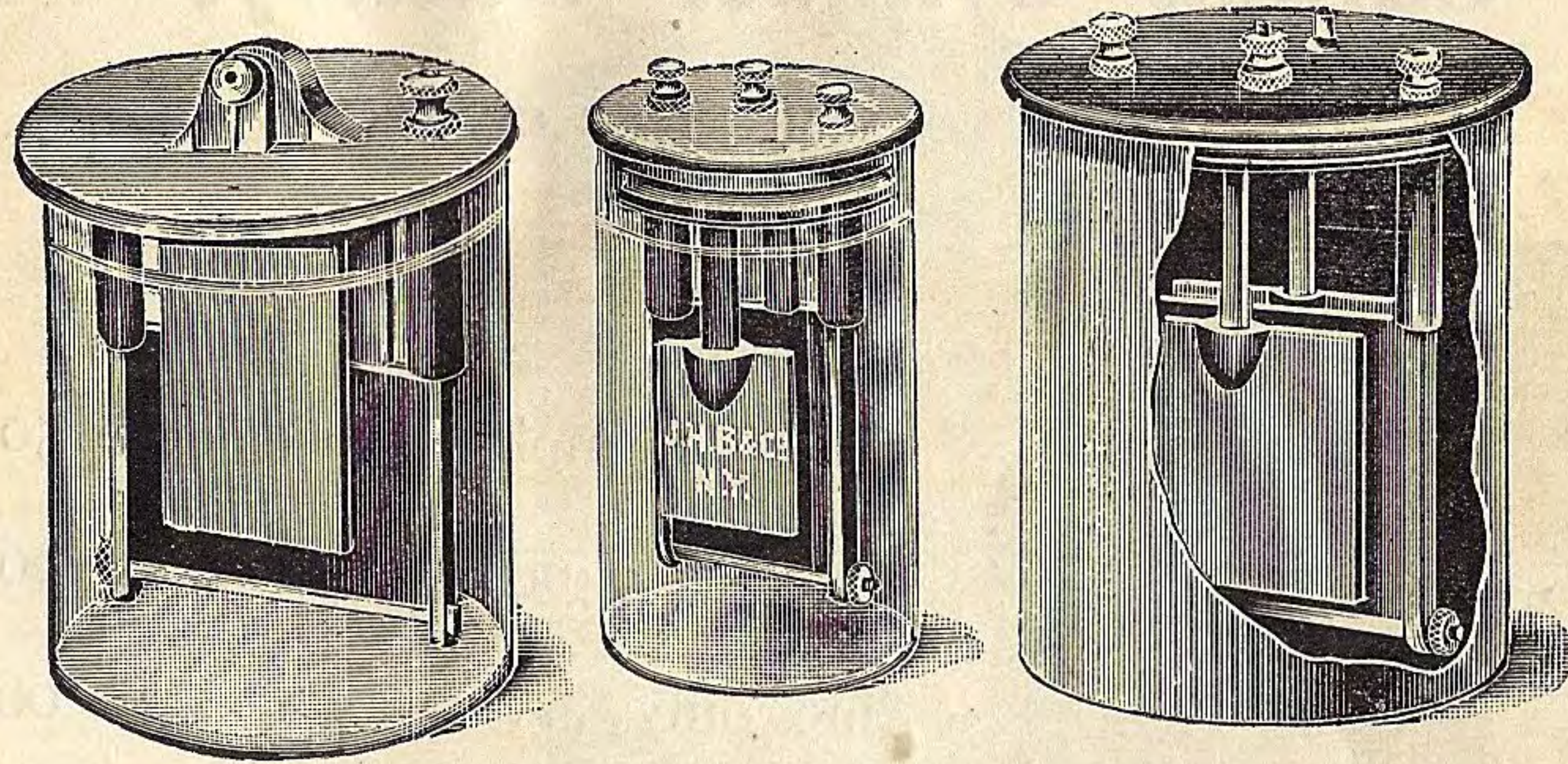
Large, Regular Size 6x8.

Battery Complete, no chemicals	\$1 10
Zincs, 3 lbs.....each	50
Copper 6x8..... "	12
Glass Jars 6x8.... "	40

Small Size 5x7.

Battery Complete, no chemicals	\$0 90
Zincs, 1¾ lbs.....each	36
Copper 5x7..... "	12
Glass Jars 5x7.... "	34
Blue Vitriol, per lb....	18

EDISON PRIMARY BATTERY.



Type Q.

Type B. B.

Type A. A.

Type "B. B."

Porcelain Jar.
Capacity 100 Ampere-Hours.
Size over all, 4½x7¾ inches.
Battery complete, . . . each \$2 70
Renewal Parts.
1 Zinc Plate . . . 1 charge 51
1 Copper Oxide Plate . 1 " 44
1 Can Caustic Soda . . 1 " 27
1 Bottle Paraffine Oil . 1 " 09

Type "Q."

Porcelain Jar.
Capacity 150 Ampere-Hours.
Size over all, 5¾x8¾ inches.
Battery complete, . . . each \$3 96
Renewal Parts.
2 Zinc Plates . . . 1 charge 51
1 Copper Oxide Plate . 1 " 56
1 Can Caustic Soda . . 1 " 31
1 Bottle Paraffine Oil . 1 " 11

Type "R. R."

Porcelain Jar.
Capacity 300 Ampere-Hours.
Size over all 7¼x10½ inches.
Battery complete, . . . each \$5 22
Renewal Parts.
2 Zinc Plates . . . 1 charge 90
1 Copper Oxide Plate . 1 " 99
1 Can Caustic Soda . . 1 " 51
1 Bottle Paraffine Oil . 1 " 13

Type "S."

Porcelain Jar.
Capacity 300 Ampere-Hours.
Size over all 5¾x13 inches.
Battery Complete, . . . each \$5 40
Renewal Parts.
2 Zinc Plates . . . 1 charge 90
2 Copper Oxide Plates . 1 " 1 12
1 Can Caustic Soda . . 1 " 51
1 Bottle Paraffine Oil . 1 " 11

Type "Z."

Liquid-Tight Enameled Steel Jar.
Capacity 100 Ampere-Hours.
Size over all, 4½x6¾ inches.
Battery Complete, . . . each \$3 60
Renewal Parts.
1 Zinc Plate . . . 1 charge 51
1 Copper Oxide Plate . 1 " 44
1 Can Caustic Potash . 1 " 27
1 Bottle Paraffine Oil . 1 " 09

Type "V."

Liquid-Tight Enameled Steel Jar.
Capacity 150 Ampere-Hours.
Size over all, 5¾x8 inches.
Battery Complete, . . . each \$4 50
Renewal Parts.
1 Zinc Plate . . . 1 charge 63
1 Copper Oxide Plate . 1 " 56
1 Can Caustic Soda . . 1 " 31
1 Bottle Paraffine Oil . 1 " 11

Type "A. A."

Liquid-Tight Enameled Steel Jar.
Capacity 300 Ampere-Hours.
Size over all, 7¼x10 inches.
Battery Complete, . . . each \$6 30
Renewal Parts.
1 Zinc Plate . . . 1 charge 99
1 Copper Oxide Plate . 1 " 99
1 Can Caustic Soda . . 1 " 51
1 Bottle Paraffine Oil . 1 " 13

Type "W."

Porcelain Jar.
Capacity 600 Ampere-Hours.
Size over all, 7½x15 inches.
Battery Complete, . . . each \$8 73
Renewal Parts.
2 Zinc Plates . . . 1 charge \$1 48
2 Copper Oxide Plates . 1 " 1 98
1 Can Caustic Soda . . 1 " 94
1 Bottle Paraffine Oil . 1 " 14

STORAGE BATTERIES.



The invincible is the most compact lightest, efficient and durable storage battery on the market.

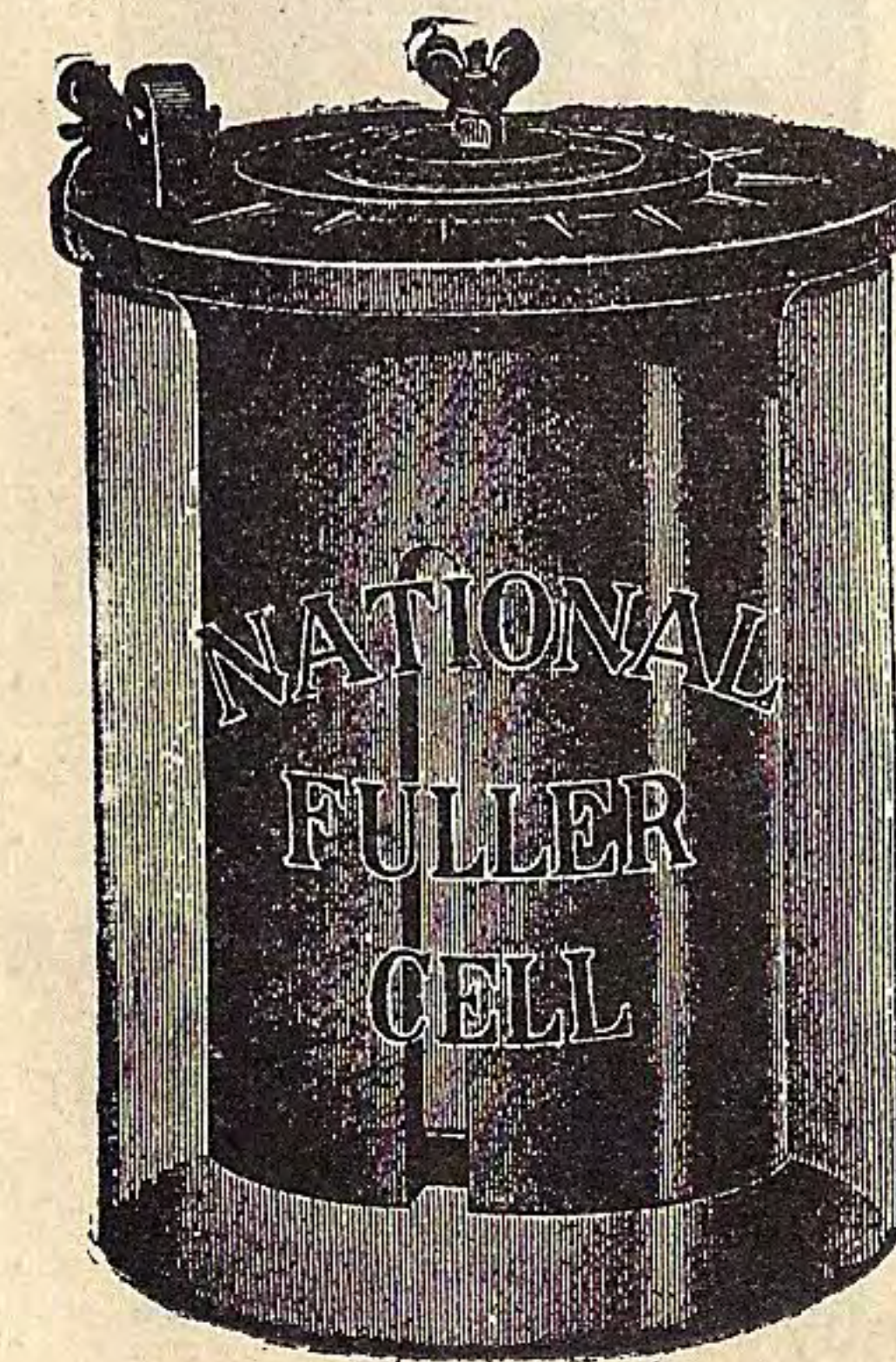
5 Ampere Hour Cells.....	each	\$2 00
12 " " "	"	4 00
30 " " "	"	8 00
45 " " "	"	12 00
70 " " "	"	17 00

Witherbee Storage Battery Ignition Sets.

For Automobile and Launch Ignition, Stationary Gas and Gasoline Engines.

4 Volt, 40 Amp. Hour Sets, each	\$18 00	4 Volt, 60 Amp. Hour Sets, each	\$27 00
6 " 40 " " " " " " " " " "	27 00	6 " 60 " " " " " " " " " "	37 50
8 " 40 " " " " " " " " " "	36 00	6 " 80 " " " " " " " " " "	45 00

IMPROVED FORM OF FULLER BATTERY.



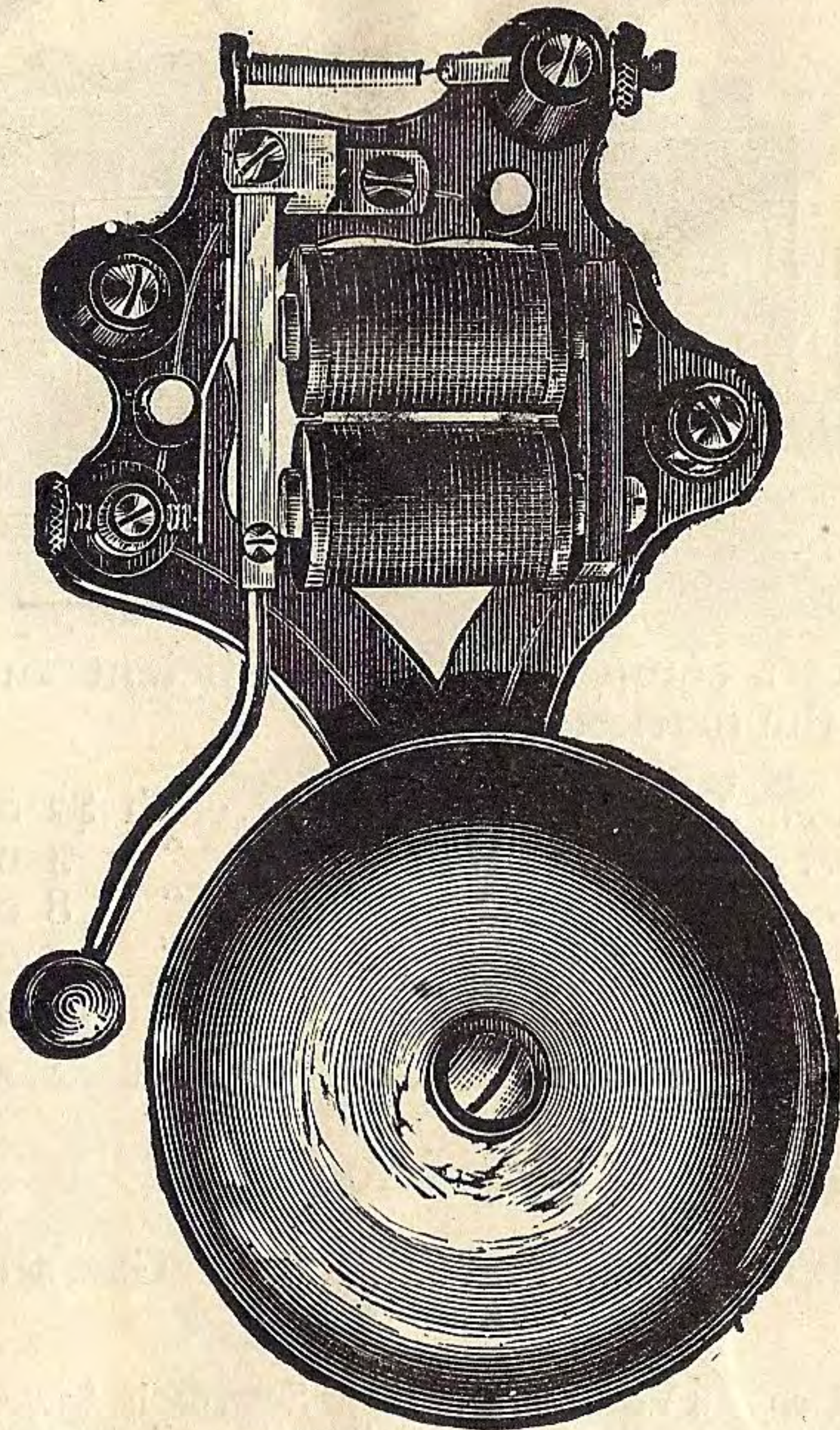
The carbon cup of this battery is made to fit a 6x8 in. jar. It has a great current capacity, and high E. M. F. A clay porous cup and Daniel zinc goes inside of the carbon cup.

The solution for this cell is the same as for the Standard Fuller, and either bi-chromate of potash can be used or bi-chromate of soda.

The difference between this cell and the Standard Fuller is that a much greater current can be had from the Improved Fuller, than from the Standard Fuller, but the advantage of this cell over any other type of Fuller lies in the fact that the cell requires absolutely no attention on open circuit work in from two to four months.

Cell complete, no chemicals.....	each	\$2 20
Carbon only.....	"	90
Cover only.....	"	20
Zinc only.....	"	60
Glass Jar 6x8.....	"	40
Porous Cup.....	"	30

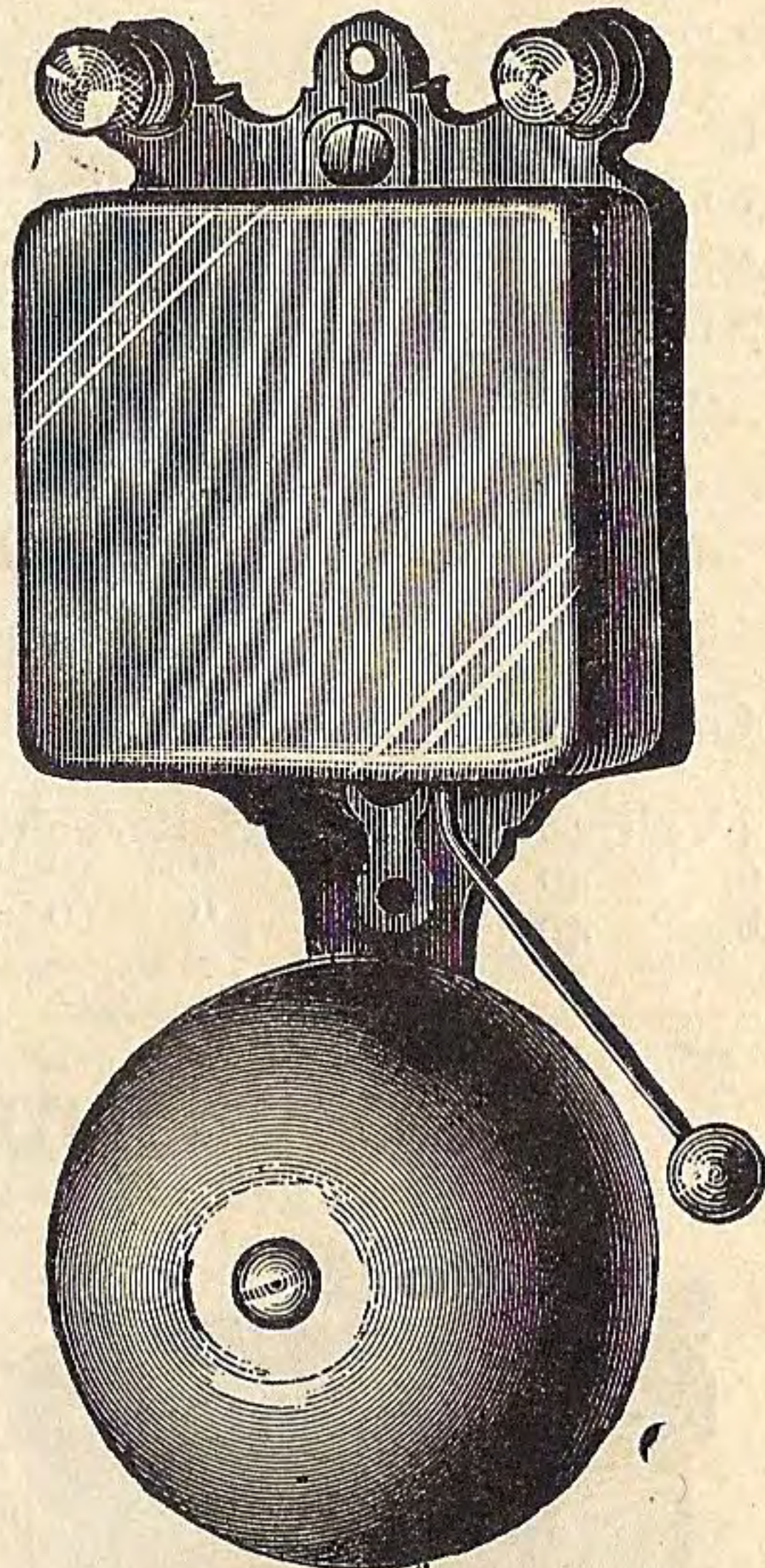
IRON FRAME ELECTRIC BELL.
SINGLE STROKE OR VIBRATING



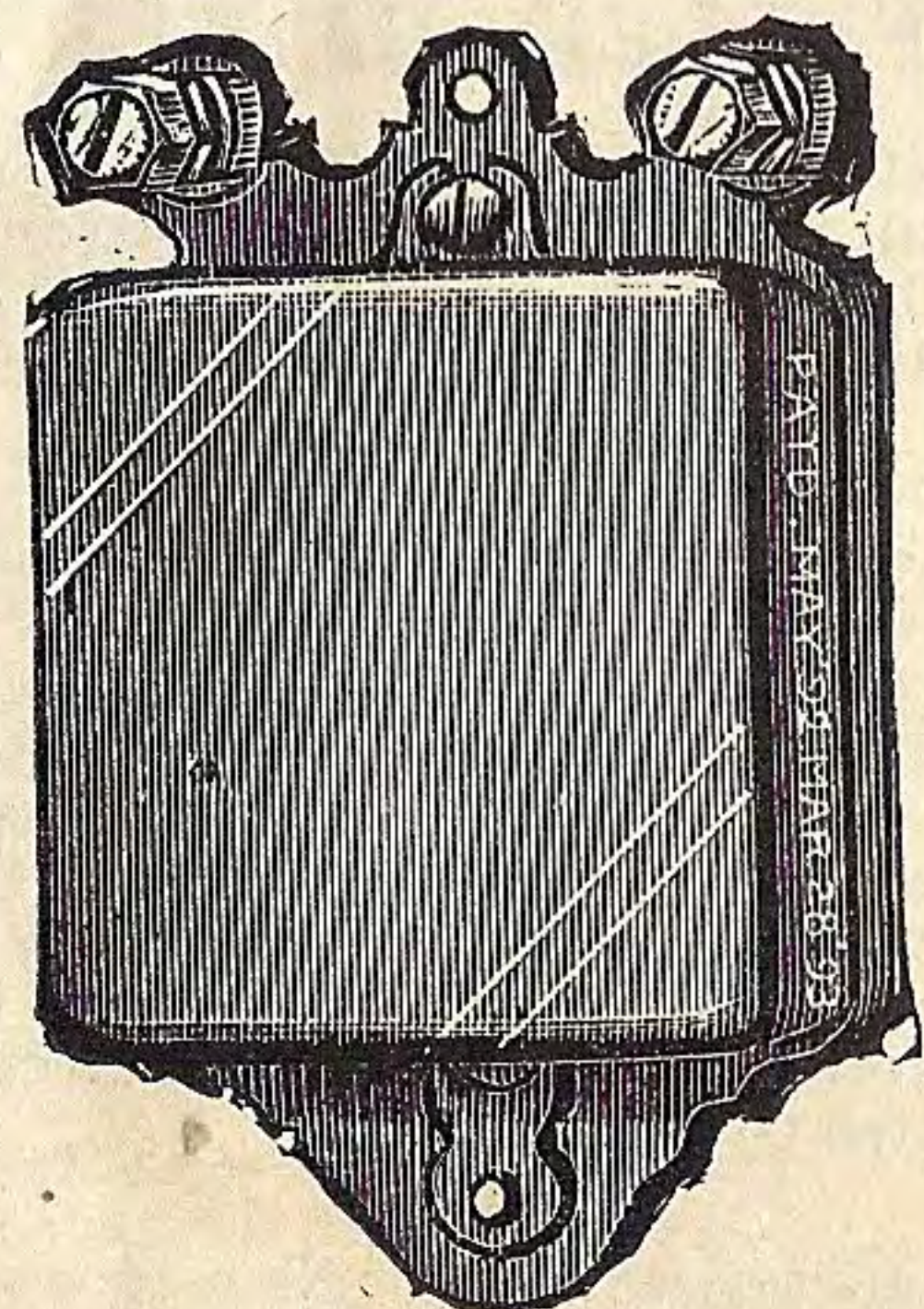
With Platinum Contact Points, Cast Bell Metal Gong and Nickel Plated parts, highly finished and first-class in every respect.

3 inch Gong...	each	\$1 74
4 " " " "	"	1 06
5 " " " "	"	2 84
6 " " " "	"	3 20
8 " " " "	"	5 00
10 " " " "	"	8 00

IRON BOX BELLS



IRON BOX BUZZER



With Adjustable Contacts.
Each\$0 38

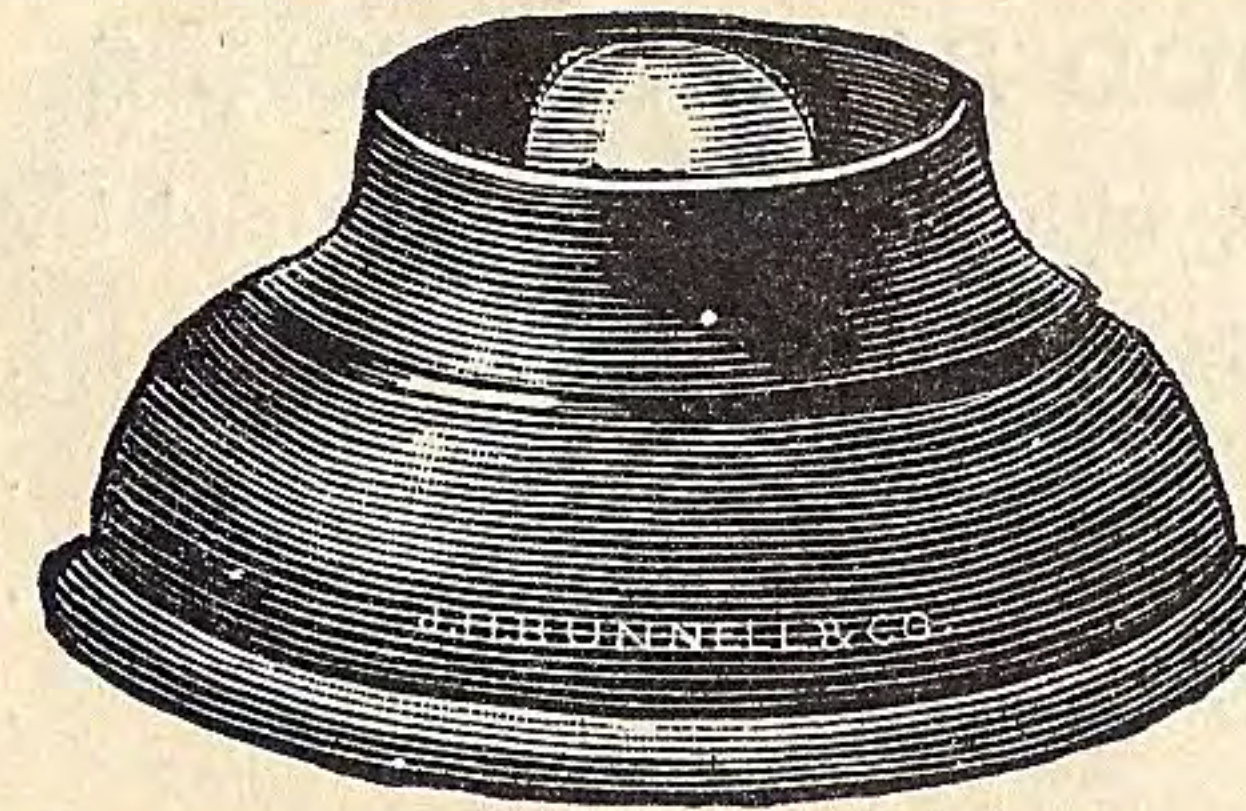
With Adjustable Contacts.

2½ inch Gong...	each	\$0 40
3 " " " "	"	.42
4 " " " "	"	.56
Fancy " " " "	"	.70

WOOD BOX BELLS

2½ inch Gong...	each	\$0 54
3 " " " "	"	.56
4 " " " "	"	.70
Fancy " " " "	"	.84

Wood Push Button.



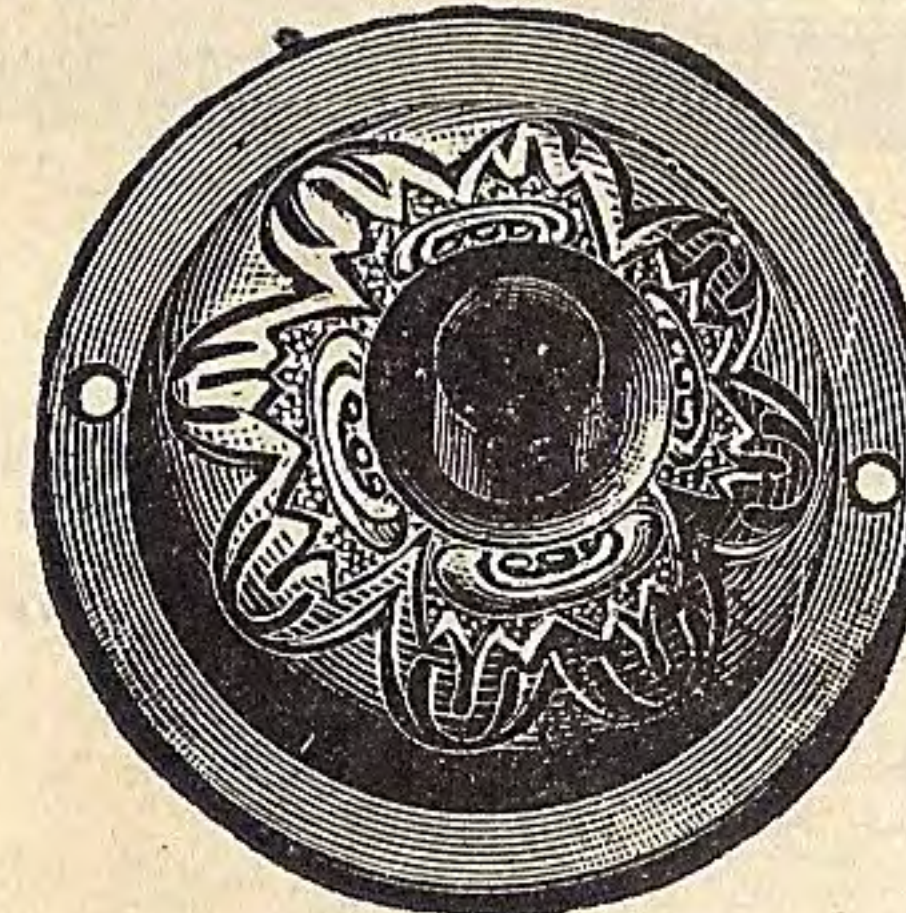
In assorted woods 2½ inches diam.
Price \$0 10

Cast Bronze Push Button,



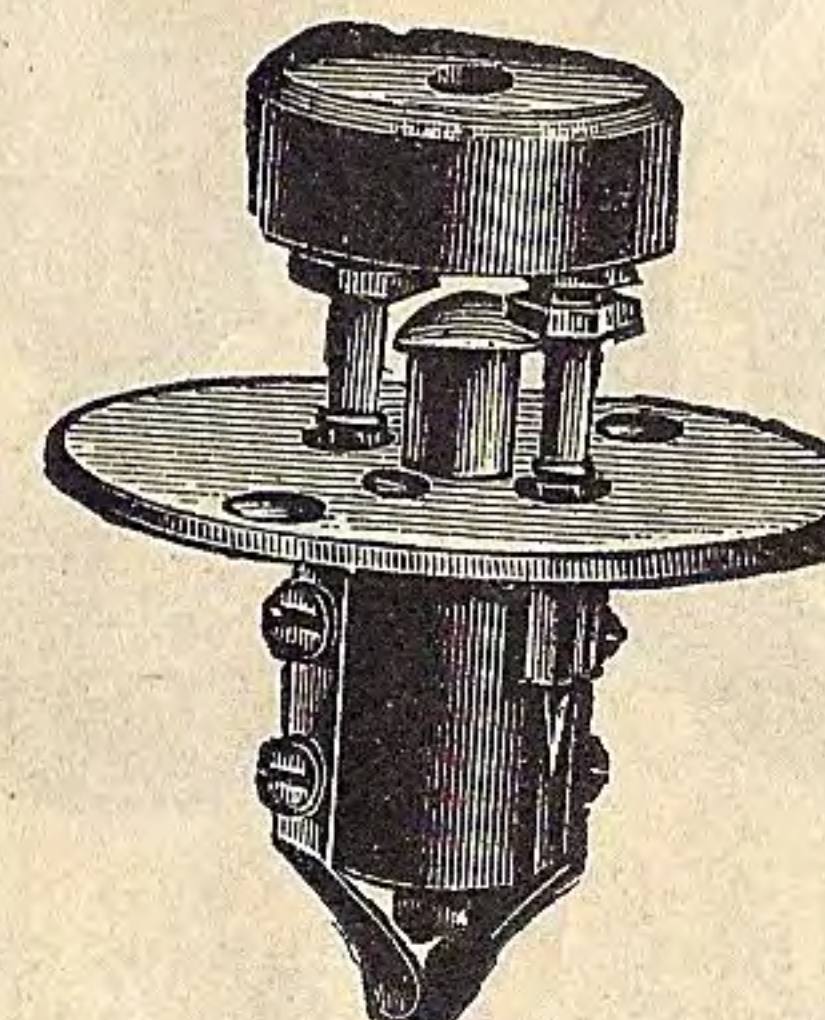
No. 1157. Loose Back, 2¾ in. diam.
Price \$0 30

Stamped Brass Push Button.



No. 1183. Loose Back, 2¼ in. diam.
Price \$0 20

Combination Floor Push.



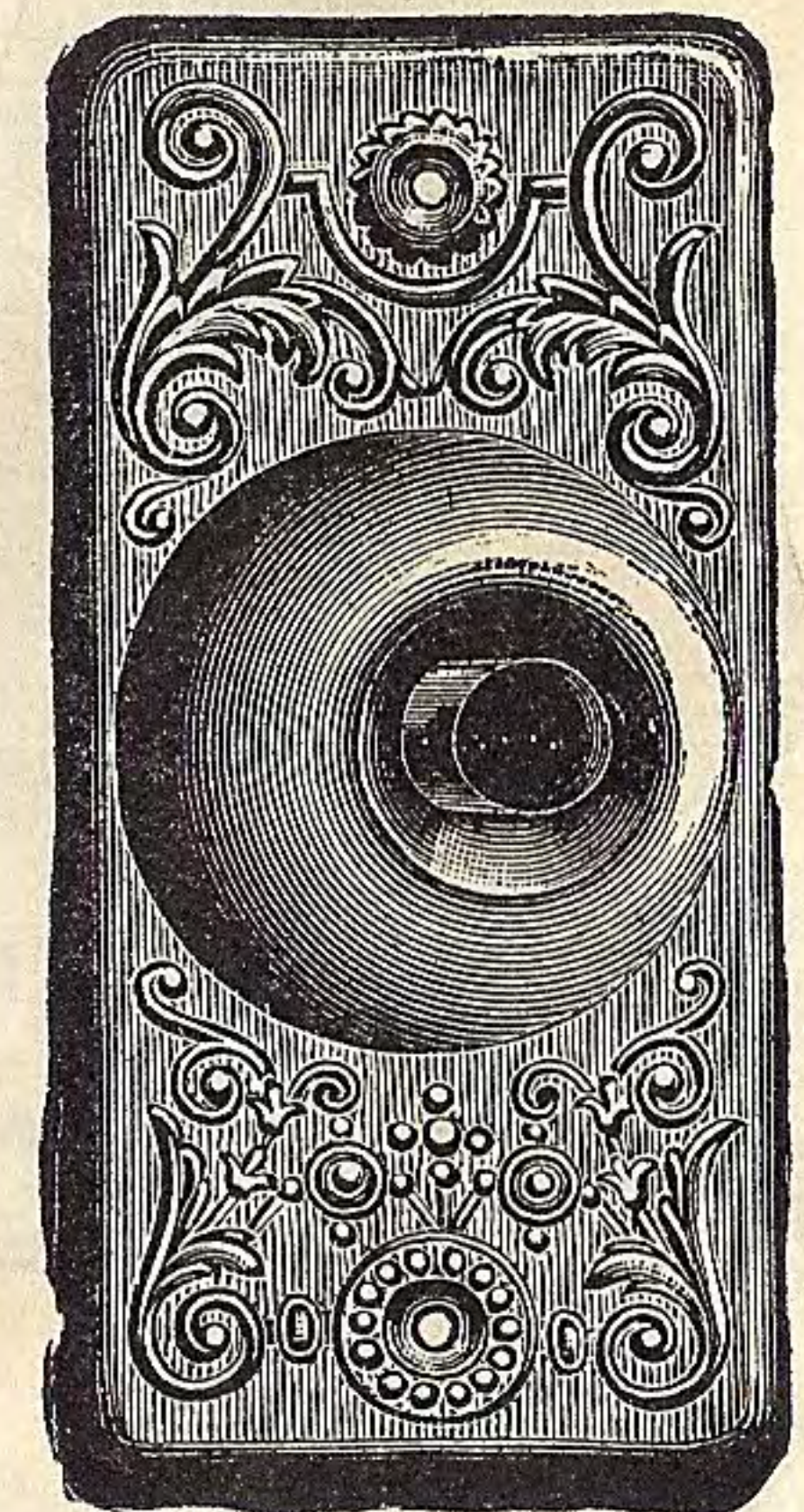
Price \$0 50

Midget Jr., Push Button.



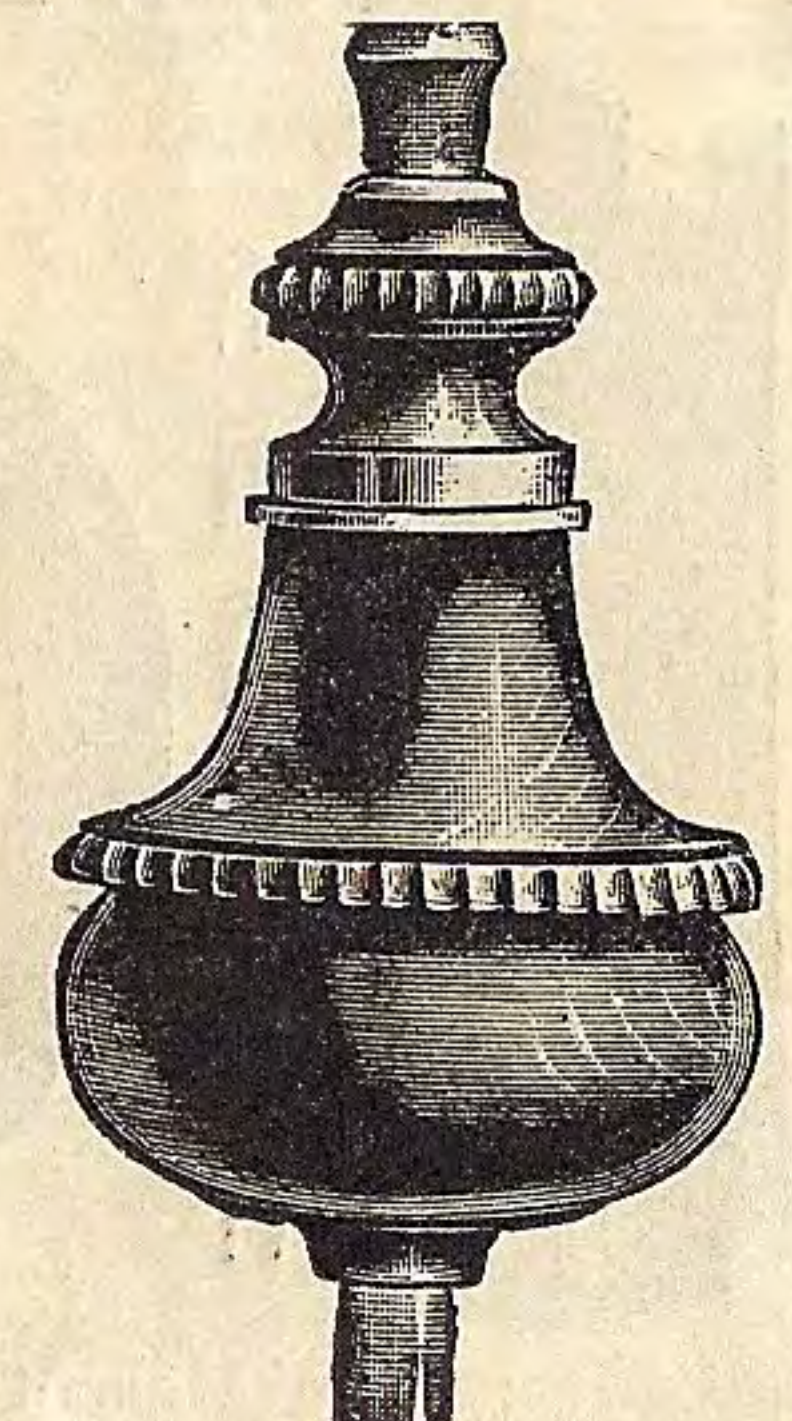
With Pearl Center for 5/8 in. hole.
Price \$0 20

Stamped Brass Push Button

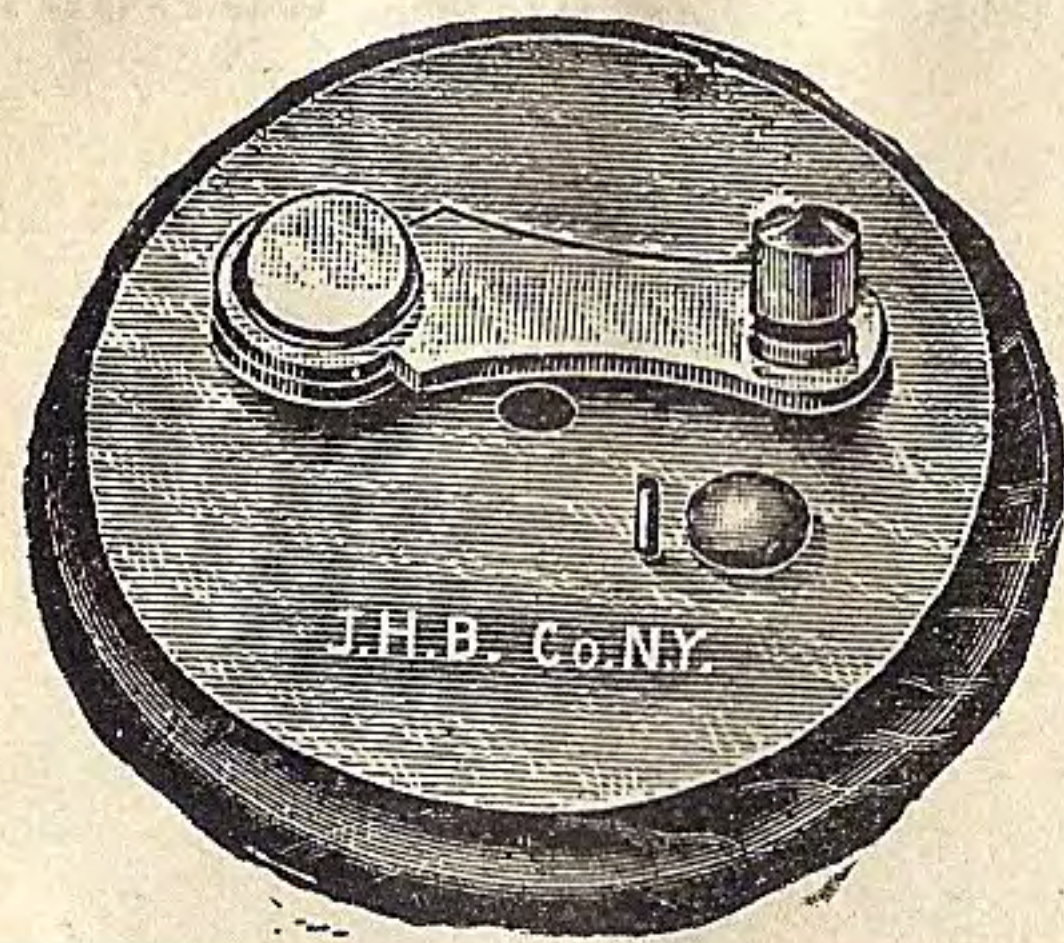


No. 1147. Loose Back, 4 x 2 inches.
Price \$0 40

Fancy Pear Push.

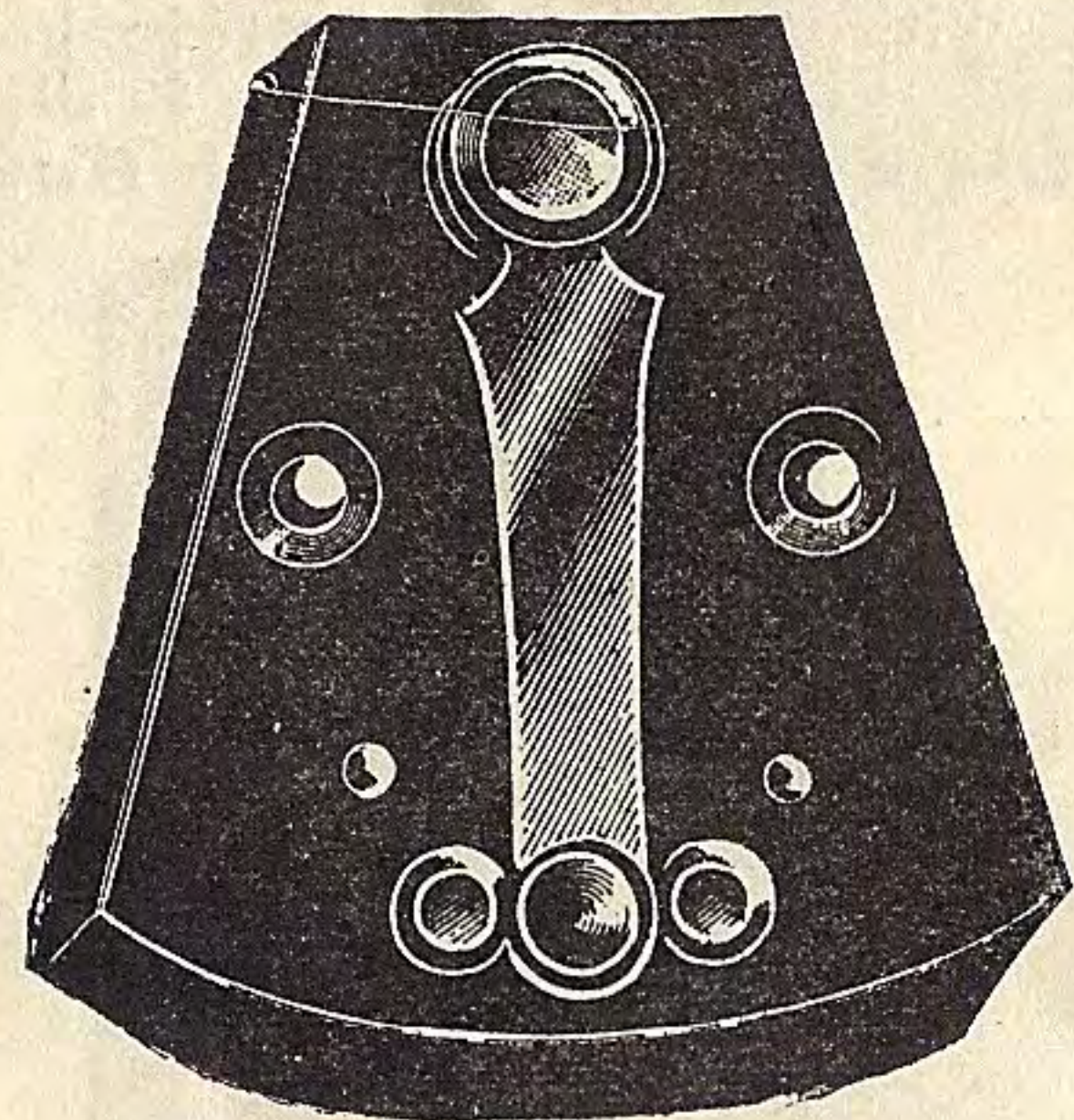


Price \$0 28



WOOD BASE SWITCHES

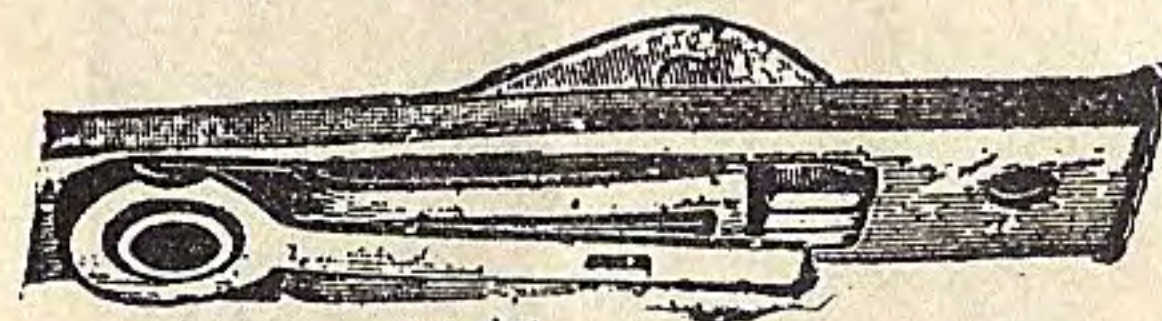
Oak base, with nickel-plated lever and knob.
 1-Point Switch.....each \$0.15
 2-Point Switch..... " .17
 3-Point Switch..... " .19
 4-Point Switch..... " .22



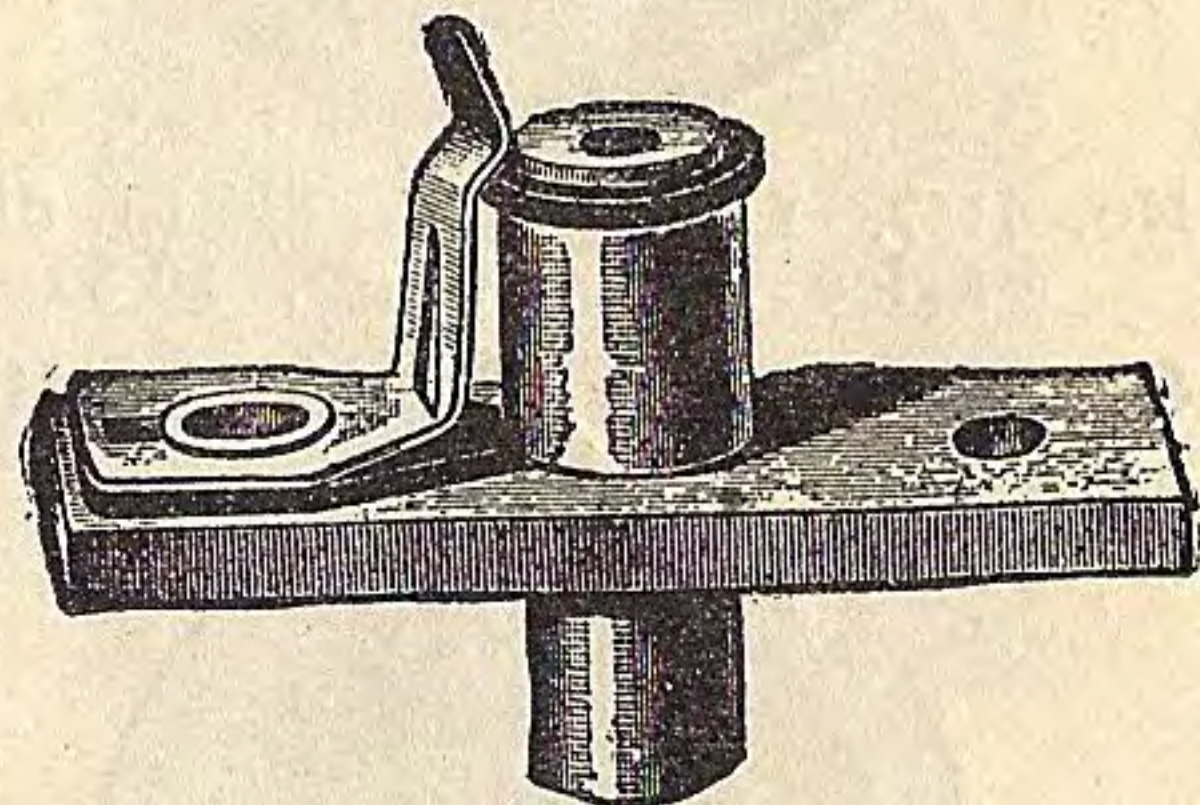
**Keystone
Rubber Base Switches
with Back Connections**

1-Pointeach \$0.32
 2-Point " .36
 3-Point " .46
 4-Point " .70

WINDOW SPRING



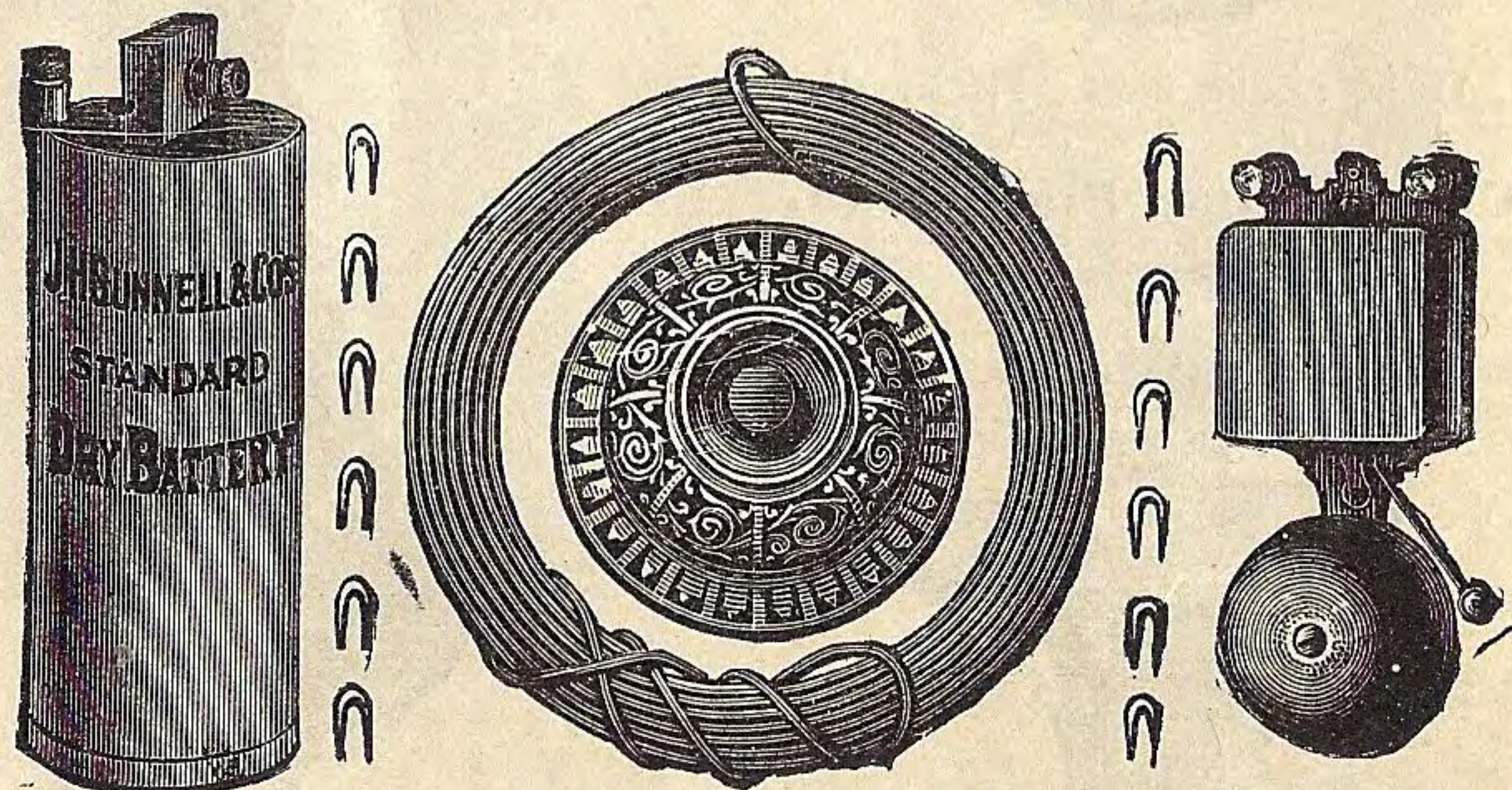
Good rubbing contact.
 Phosphor bronze springs.
 Being small, it is easily applied.
 Each\$0.17



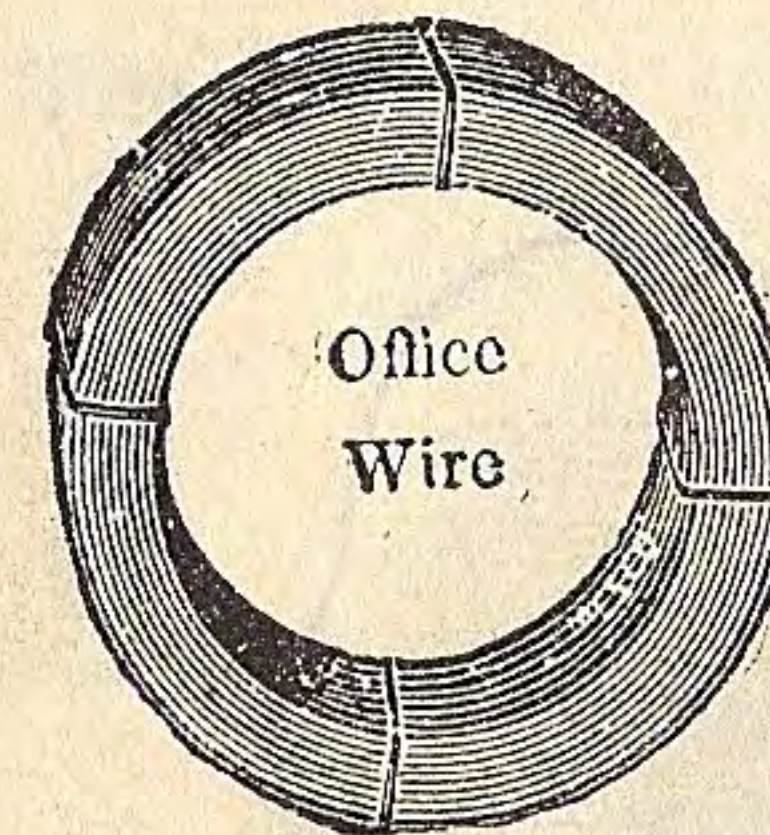
DOOR SPRING

Open Circuit.....each \$0.17
 Make and Break..... " .25
 Closed Circuit..... " .25

COMPLETE BELL OUTFIT

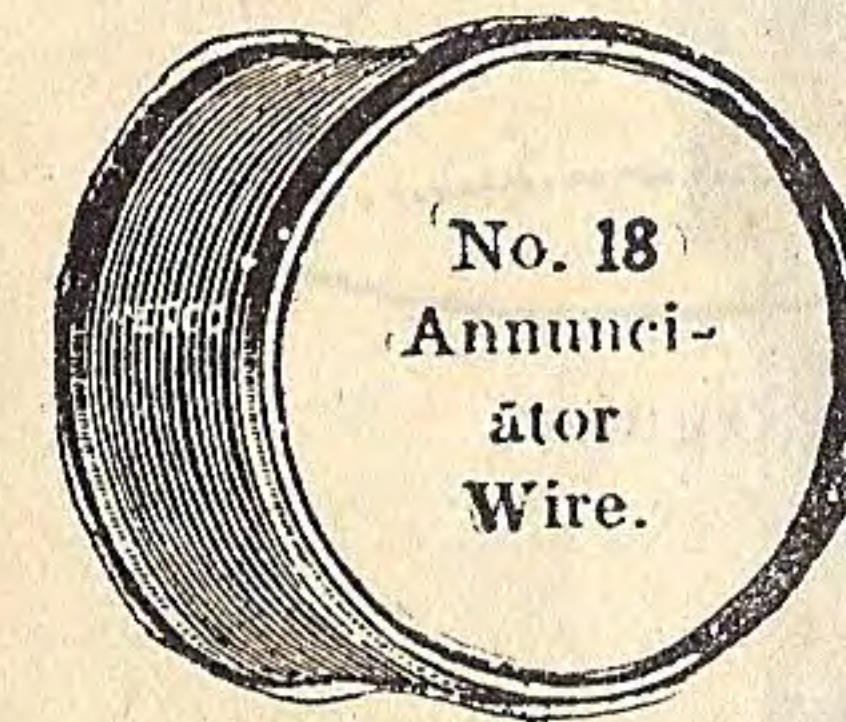


Contents: One Mascot Dry Battery, one Brass Push Button, one 3-inch Iron Box Bell, 75 feet of Insulated Wire, package of Staples and Screws, one copy of Directions for Installing.
 Packed in neat box.....Price \$1.50



OFFICE WIRE.

Insulation consisting of two cotton winds in reverse directions saturated with a moisture proof compound, and an outer braid of any standard color finished in beeswax compound.
 No. 14—per pound (about 52 ft.).....\$0 50
 No. 16— " (" 71 ft.)..... 52
 No. 18— " (" 98 ft.)..... 54



Annunciator or Bell Wire.

Double cotton wrapped, waxed and paraffined. In any standard color.
 No. 18 is most generally used for bell work, etc.
 No. 16—per pound (about 105 ft.)....\$0 52
 No. 18— " (" 155 ft.).... 54
 No. 20— " (" 230 ft.).... 56

WEATHERPROOF WIRE.

Combines the highest degree of insulation with durability and resistance to abrasion from mechanical injury.
 It is either double or triple braided, thoroughly saturated with compound and has a black and highly polished finish.
 No. 10—Triple Braid (53 lbs. per 1000 ft.) per pound.....\$0 46
 No. 12— " " (35 " ") " 48
 No. 14— " " (25 " ") " 50
 No. 16— " " (20 " ") " 52
 No. 18— " " (16 " ") " 54

For double Braid add 2 cents per pound to above prices.

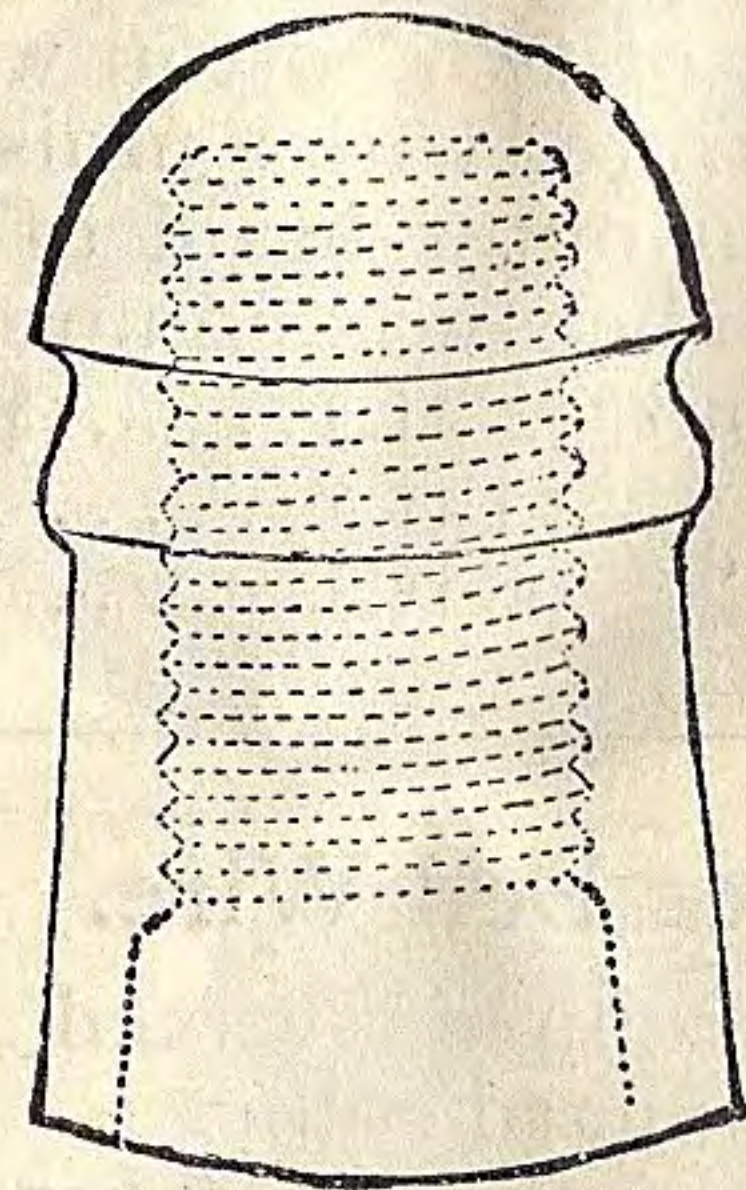
Galvanized Telephone and Telegraph Wire.

In one-half mile coils. Quotations are made for full coils only.
 No. 10—About 260 pounds per mile, per pound.....\$0 09½
 No. 12— " 165 " " 09¾
 No. 14— " 96 " " 10¼
 We will furnish No. 14 in less than full coils at 40c. per 100 ft.

COPPER MAGNET WIRES.—Price Per Pound.

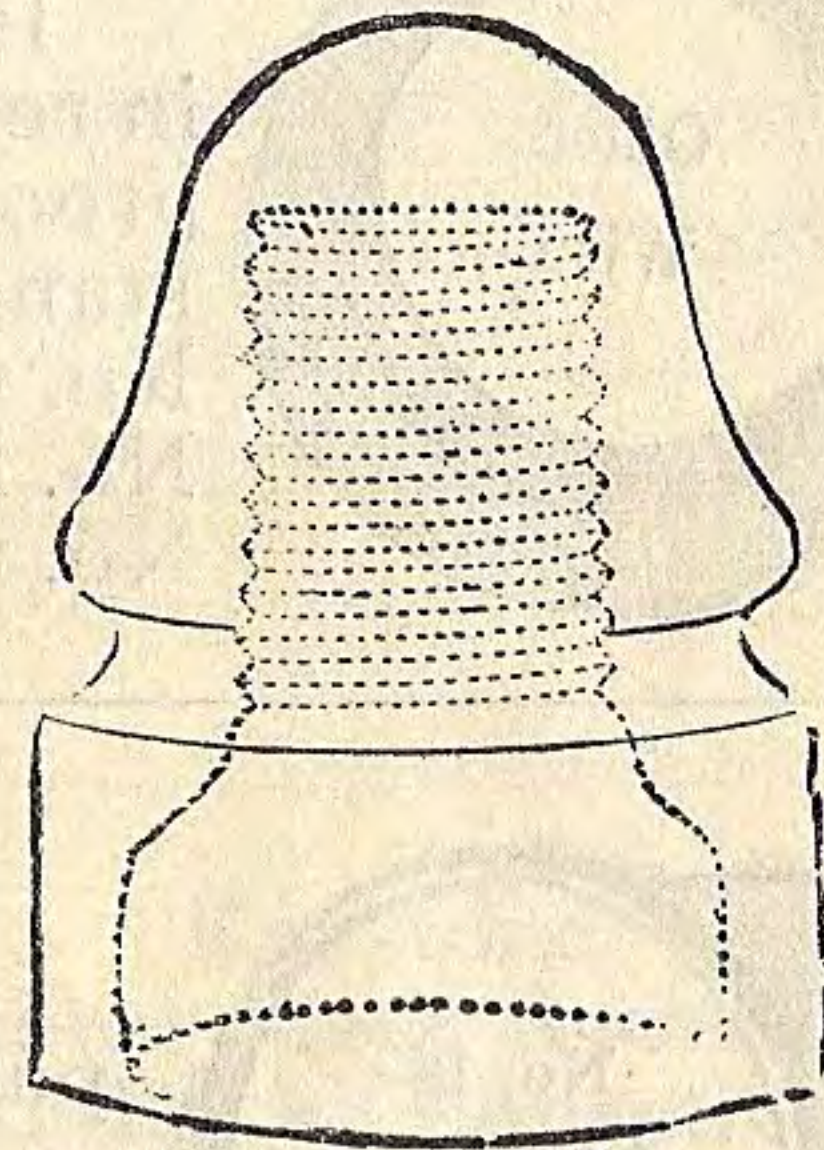
SIZE B & S Gauge	COTTON		SILK		SIZE B & S Gauge	COTTON		SILK	
	Single Cov'd	Double Cov'd	Single Cov'd	Double Cov'd		Single Cov'd	Double Cov'd	Single Cov'd	Double Cov'd
12	\$0 80	\$0 82	—	—	26	\$1 60	\$2 00	\$2 40	\$ 3 00
14	0 82	0 84	—	—	28	1 84	2 40	2 76	3 68
16	0 86	0 88	\$1 60	\$1 84	30	2 04	2 84	3 20	5 12
18	0 90	0 92	1 68	1 92	32	2 48	3 28	3 96	6 80
20	1 16	1 28	1 76	2 00	34	3 28	4 40	5 08	9 20
22	1 24	1 48	1 84	2 12	36	4 24	6 00	6 80	11 20
24	1 36	1 68	2 04	2 44	38	7 20	11 40	9 80	14 80

GLASS INSULATORS.



Pony.

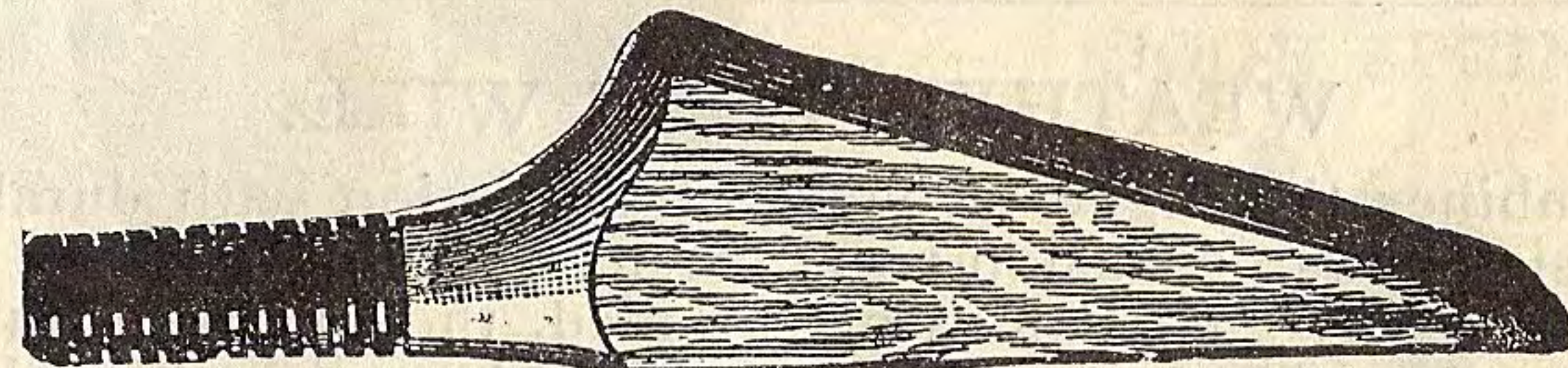
Each \$0 04



Regular.

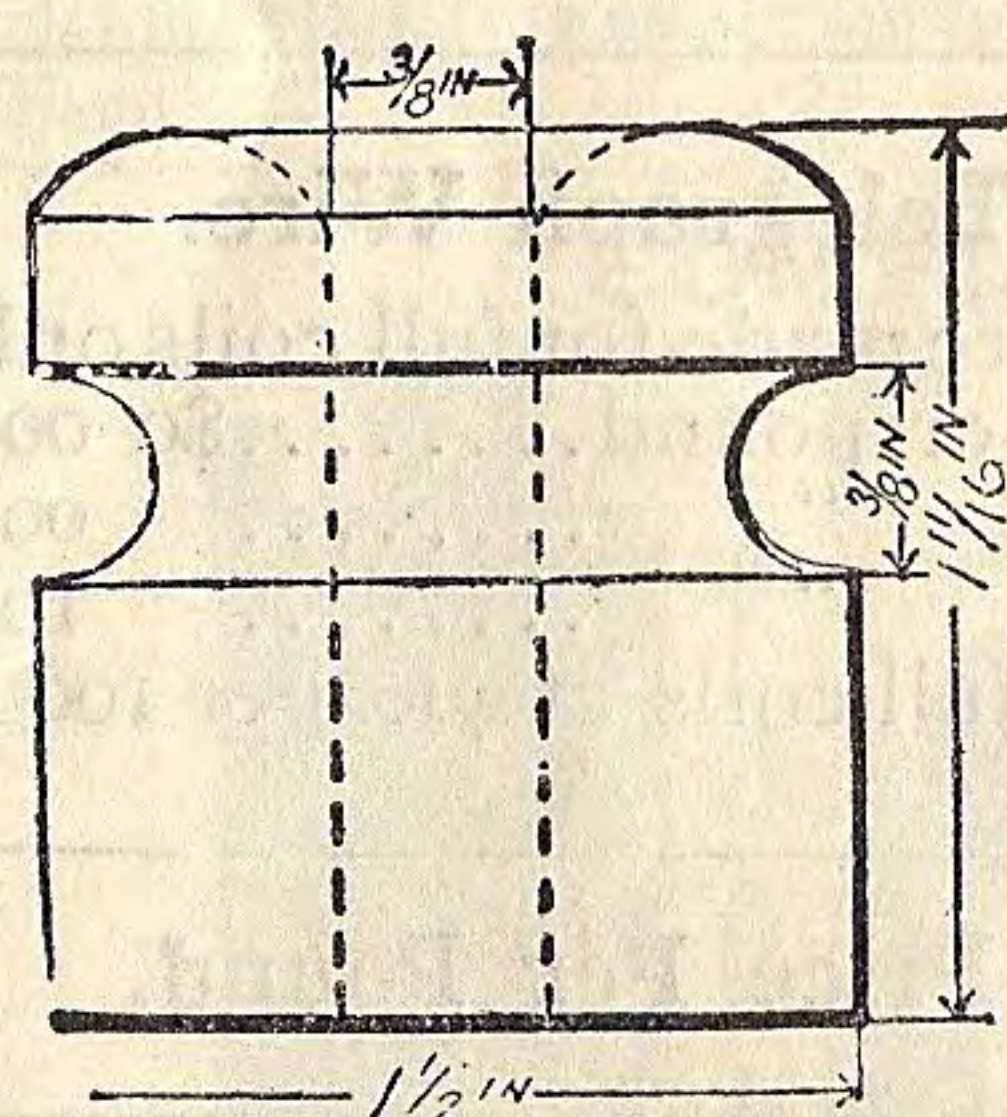
Each \$0 06

INSULATOR BRACKET.



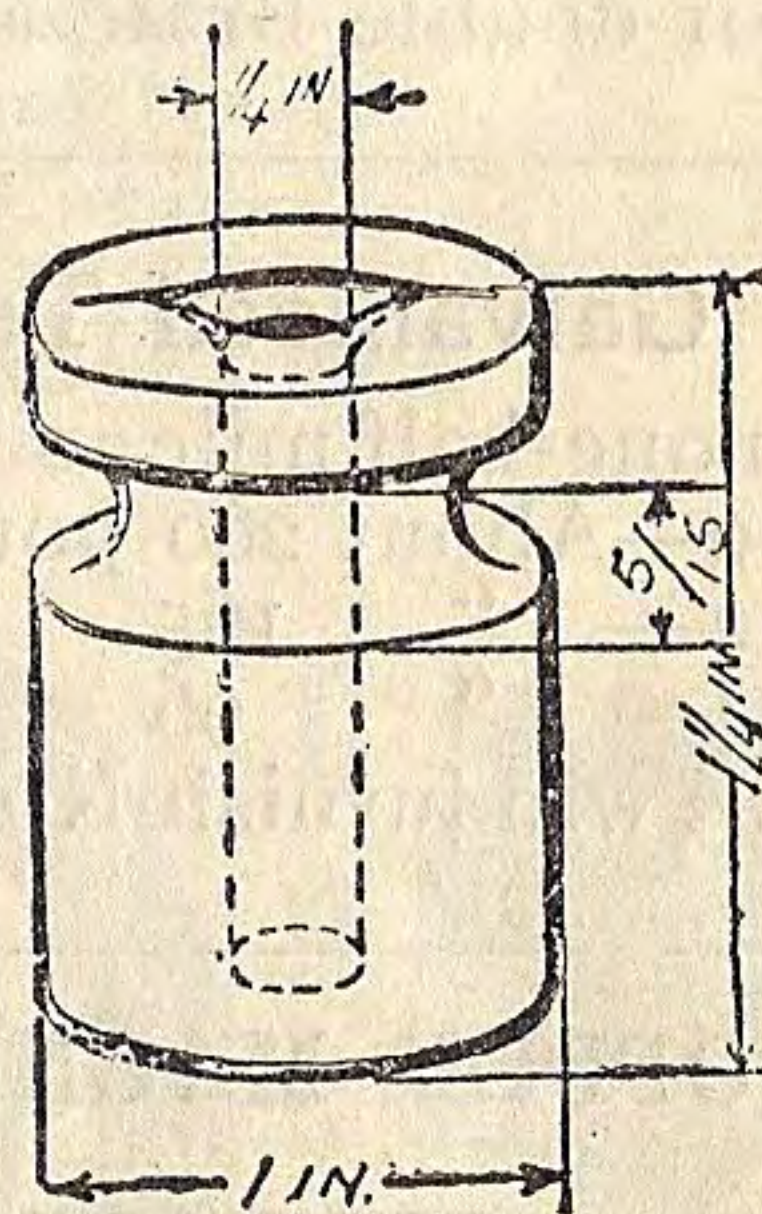
Regular Oak Bracket, Painted.....each \$0 03
 Special Heavy Oak Bracket, Painted..... " 06

PORCELAIN INSULATORS.



No. 4.

Without Screws, . . . Each \$0 02
 With " . . . " 03



No. 5.

Without Screws, . . Each \$0 01 1/2
 With " . . . " 02

ADHESIVE INSULATING TAPE.

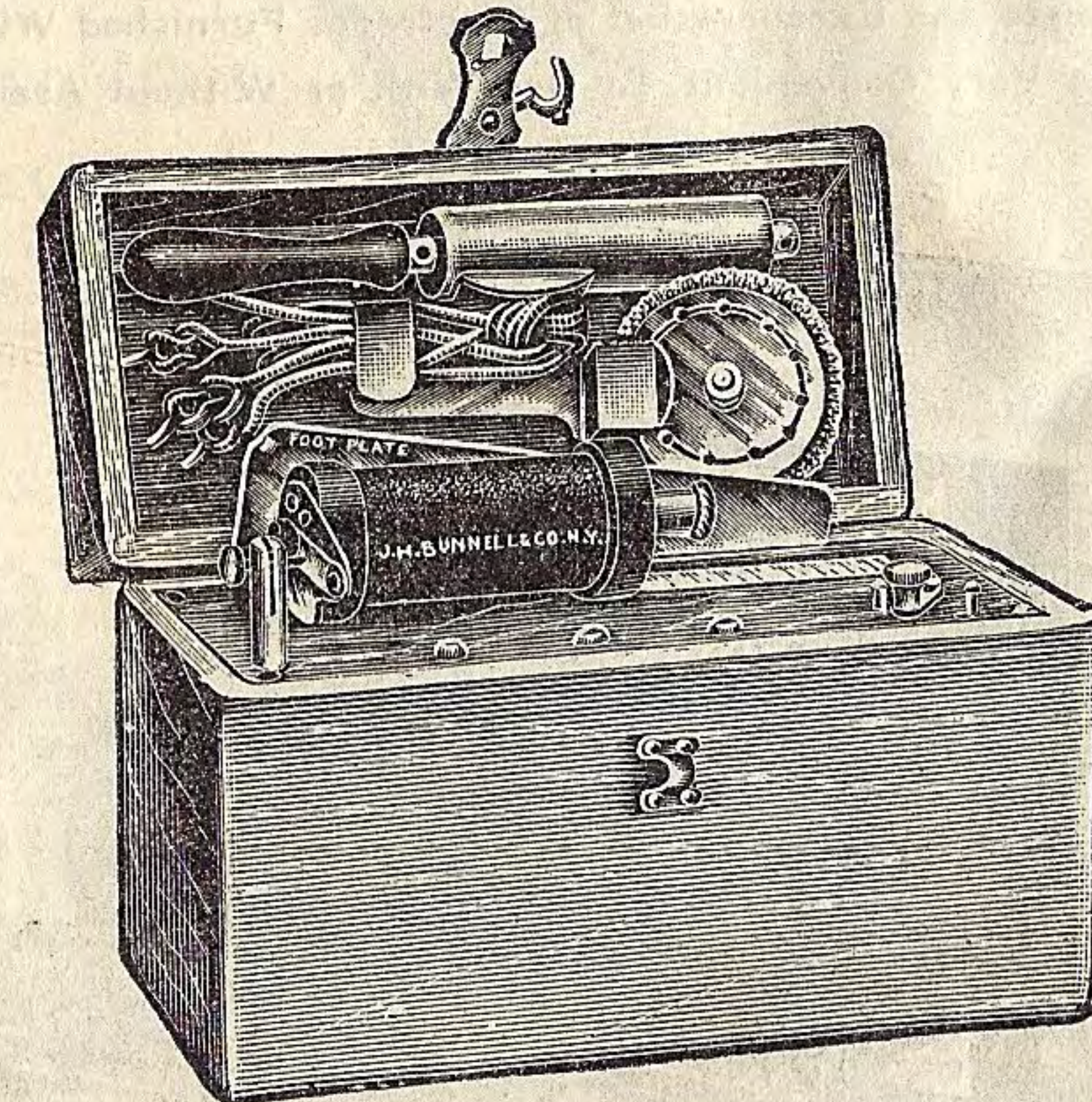
In 1/2 lb. rolls.

Mascot.....per roll \$0 30
 Grimshaw....." " 70

The New
 No. 7

AUTO-KURE

Medical
 Battery



A neat, compact and reliable battery, with power adjustable from the mildest perceptible current to the highest strength that is safe to use in home applications.

The attachments accompanying each Auto-Kure Battery are two Conducting Cords, two Tube Hand Electrodes, one Foot Plate, one Sponge Electrode, one Insulated Handle to be used with the Sponge or Hand Electrodes.

A copy of Wells' Electropathic Guide furnished free with each complete apparatus.

Dimensions: 7 1/2 x 5 1/4 x 3 1/2 inches; weight complete, 4 1/4 lbs. Auto-Kure Battery, complete with electrodes and Guide..\$4.00

PARTS SEPARATE

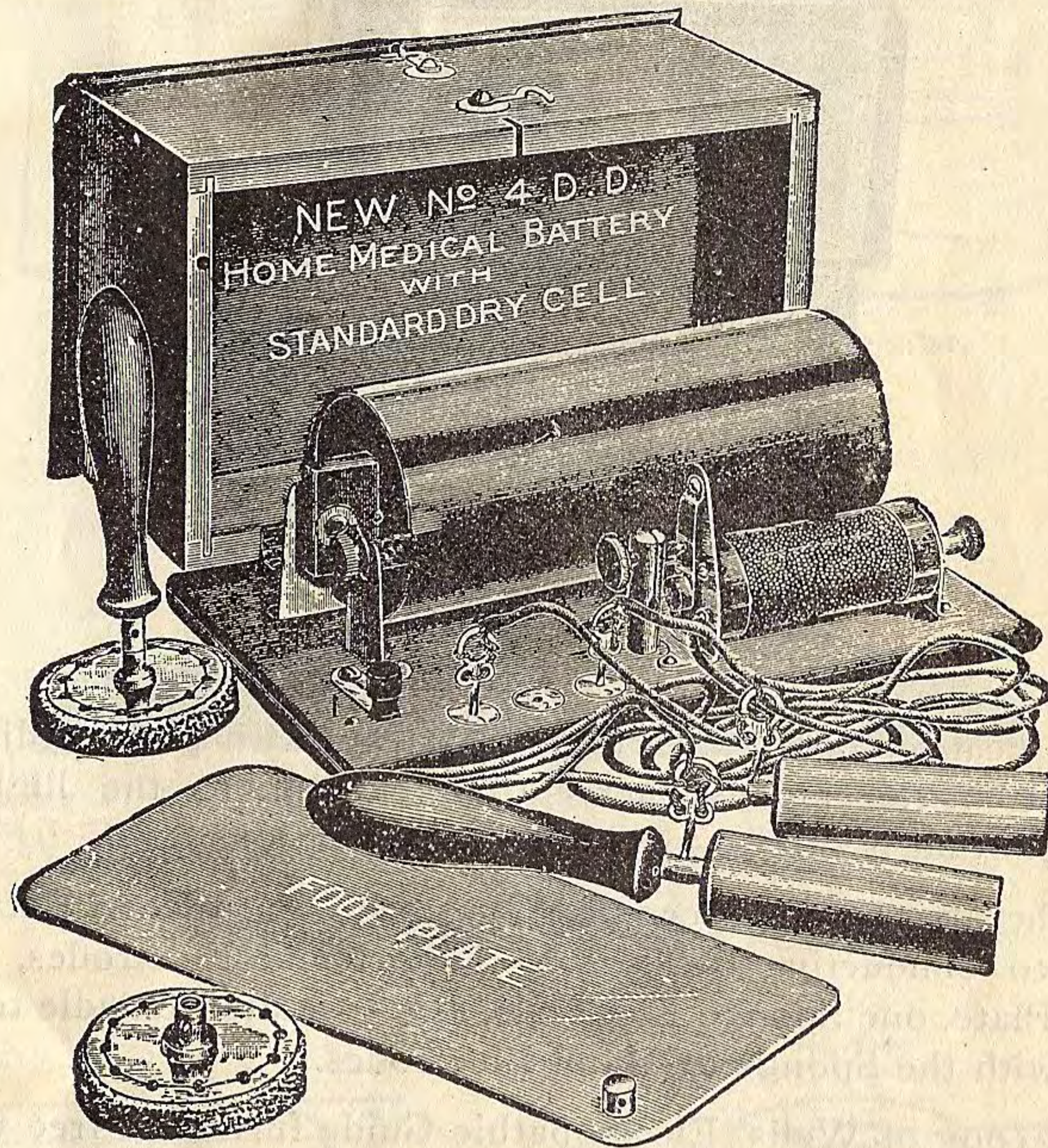
Mascot Dry Battery.....each \$0.30
 Sponge Electrode only (no handle)..... " .24
 Interchangeable Insulating Handle only..... " .14
 Tube Hand Electrodes, with Insulated Handle...per pair .40
 3-ft. Connecting Cords, with tips..... " .40
 Foot Plate.....each .30
 Wells' Electropathic Guide.....per copy .50

We carry a large assortment of Special Electrodes for use with above Battery. Write for special Electrode Circular.

MEDICAL BATTERIES.

THE NEW NO. 4, D. D., HOME MEDICAL APPARATUS.

The Unusually Complete and Excellent Set of Electrodes Furnished With This Instrument
Makes It Very Convenient To Use With or Without Assistance.



Our Standard Dry Battery, which is used with this apparatus, being a staple commercial article made only in one size and shape, is easily obtainable at any Electrical Supply Store or wherever this No. 4 apparatus is on sale.

No. 4, D. D., Apparatus, with battery and Electrodes Complete.	Each	\$7 00
Extra Battery, per Cell	"	50
Sponge Electrodes, with 2 handles, per pair	"	1 00
Tube Hand Electrodes, with 1 handle, per pair	"	50
Connecting Cords, 5 feet with tips, per pair	"	50
Foot plates	"	50
Hair Brush Electrodes, (Extra)	"	1 00
Special Flexible Sponge Electrode, with binding strings attached (Extra)	"	1 50

A copy of Wells' Electropathic Guide, giving full directions for treating over 100 diseases, is sent free of charge with each of these medical batteries.

Extra Copies, Each 50

MEDICAL INDUCTION COILS

Fig. 3448. Well made and finely finished. Adapted for demonstration as well as home use.

Price \$2.00

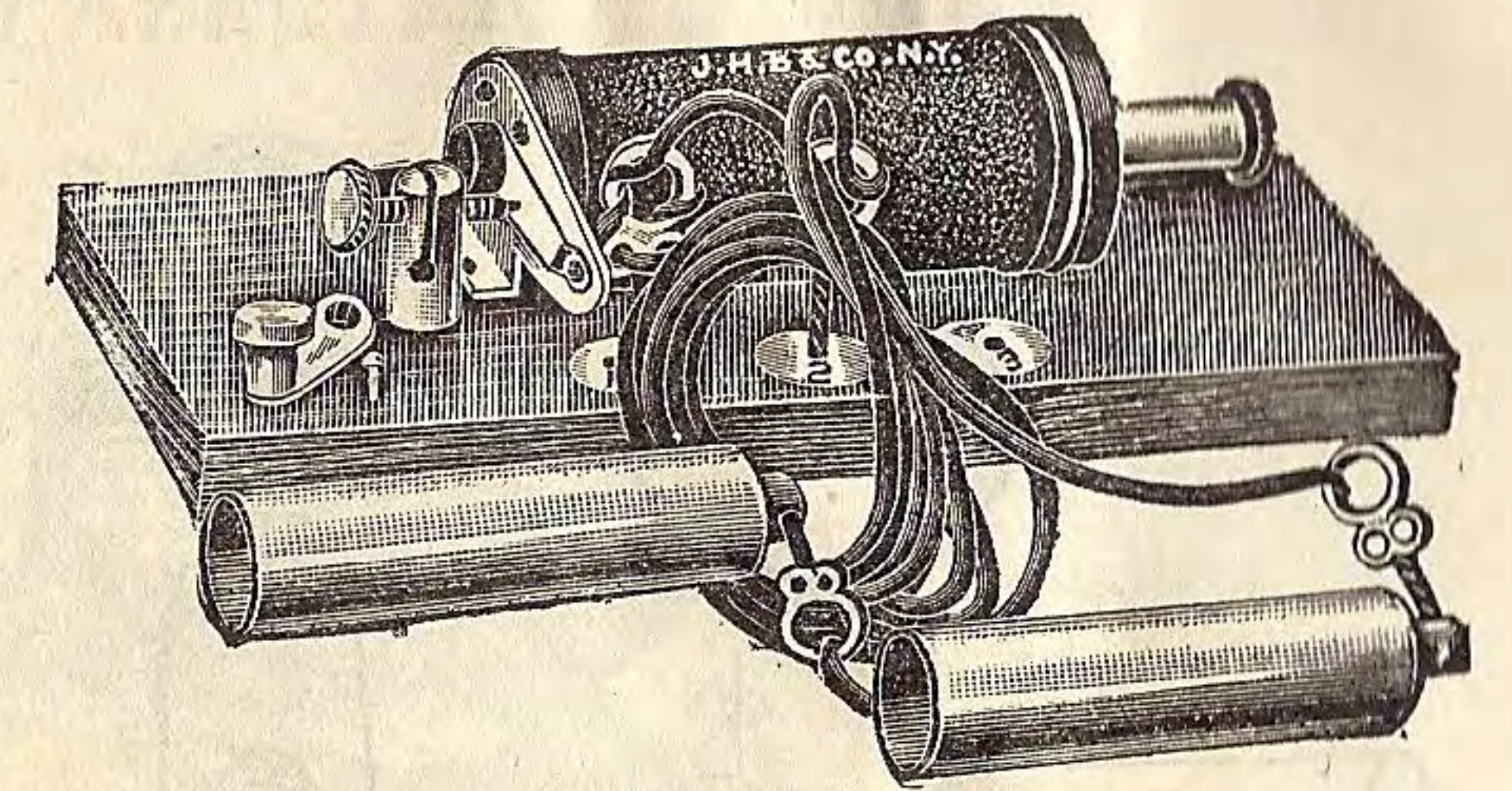


Fig. 3447. The same coil as furnished with our No. 4 Home Medical Battery.

Price \$2.50

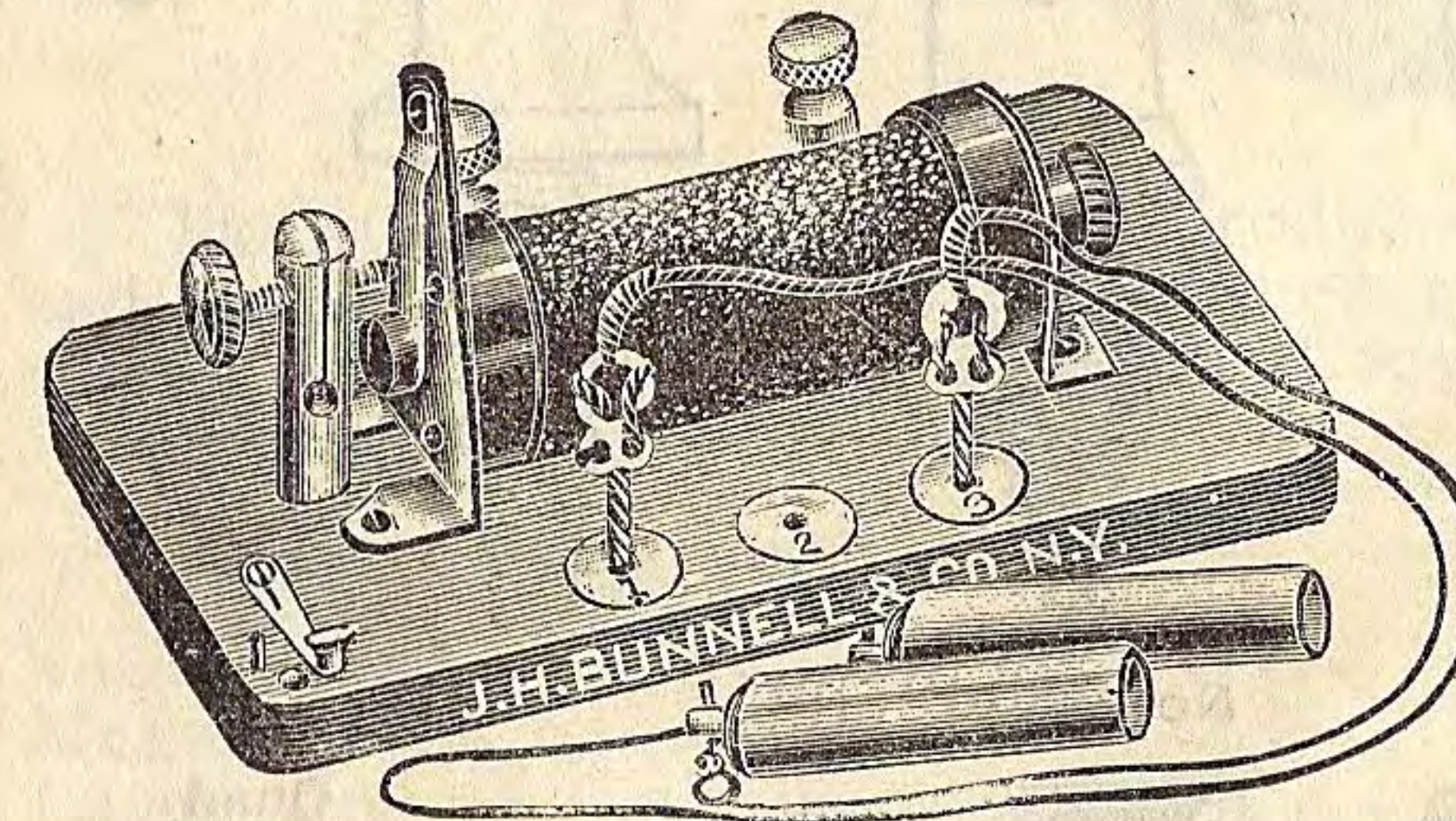
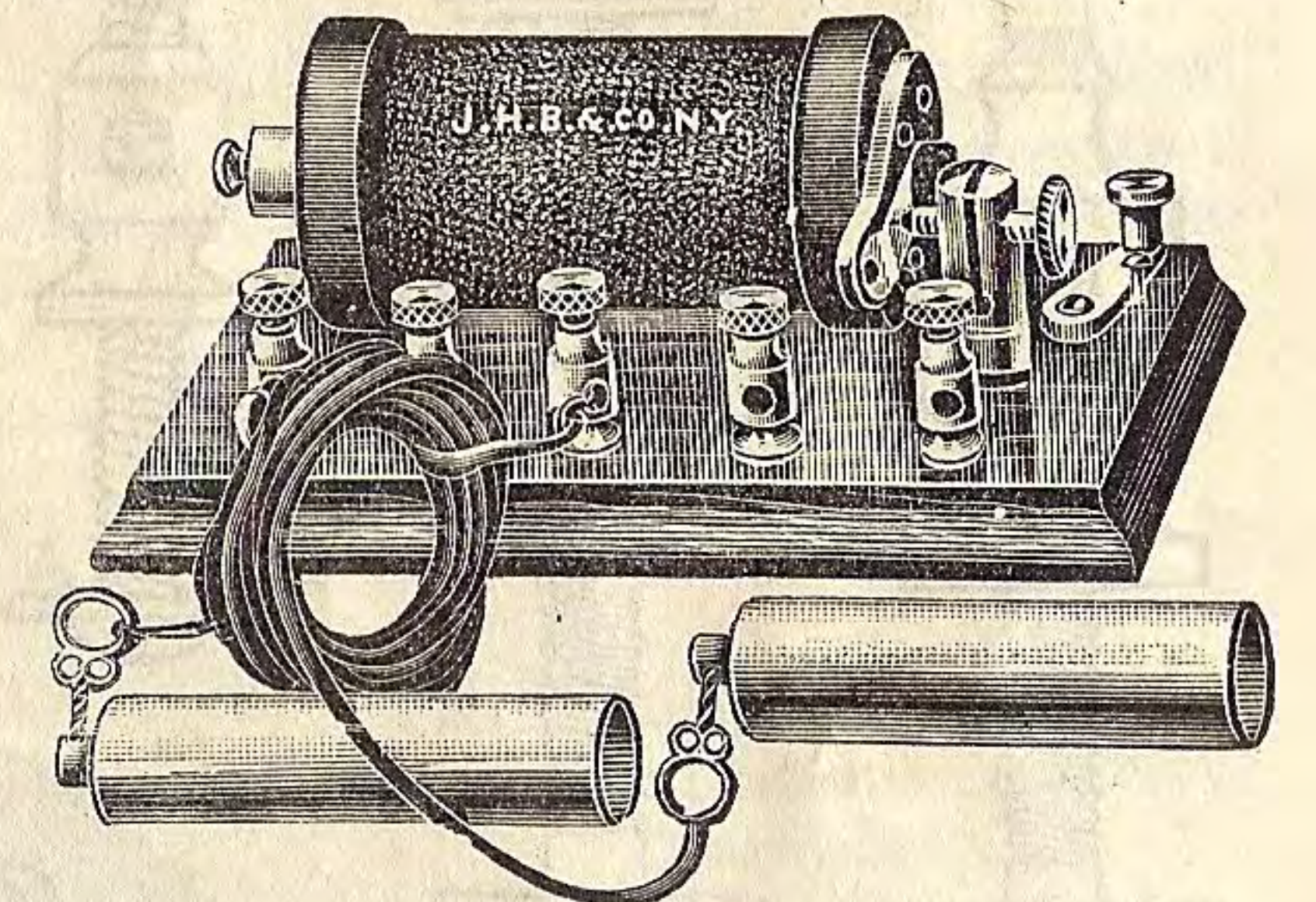
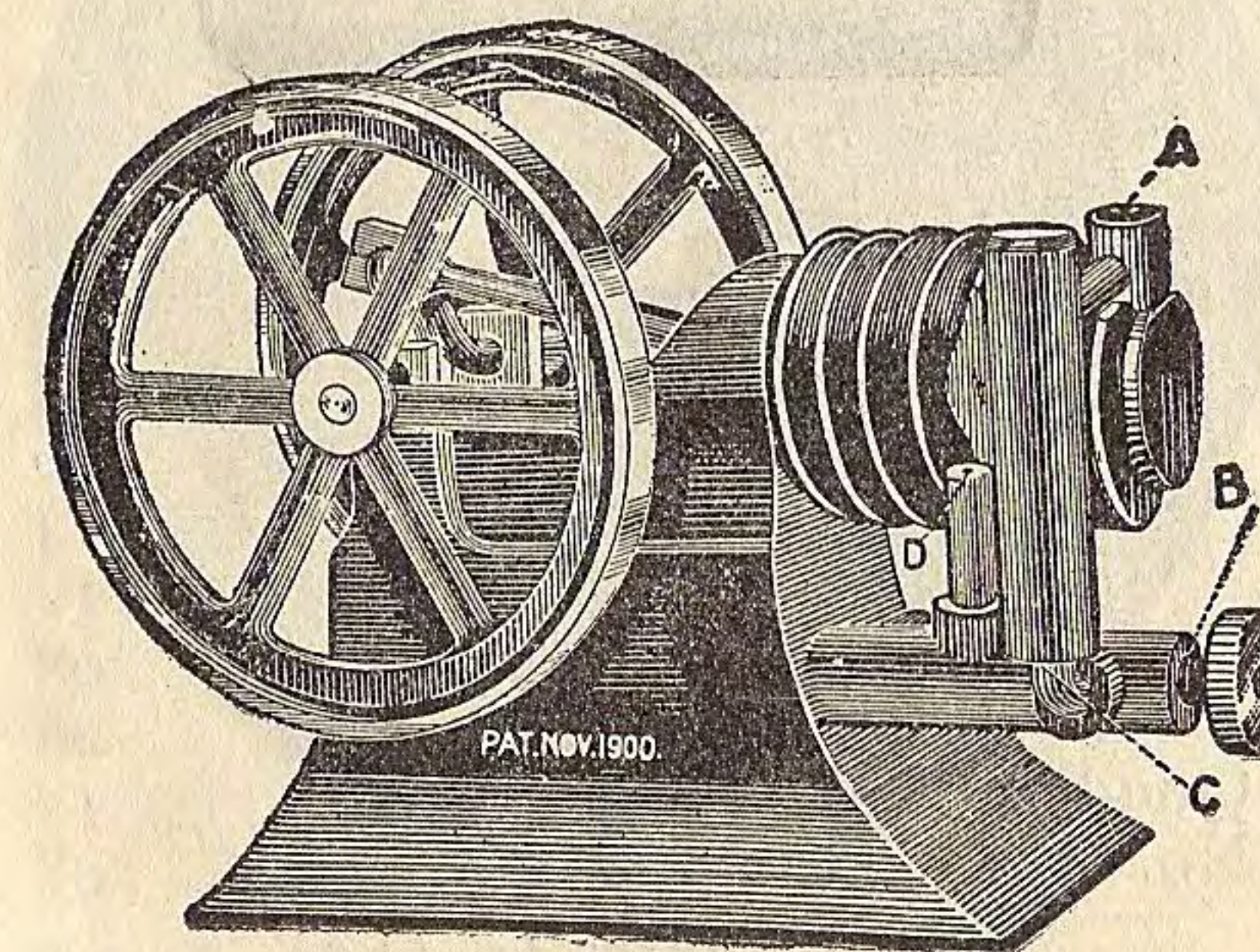


Fig. 3445. Same size coil as furnished with our No. 6 Double Power Medical Battery. Finely finished and very powerful.

Price \$4.00



PARADOX GAS ENGINE



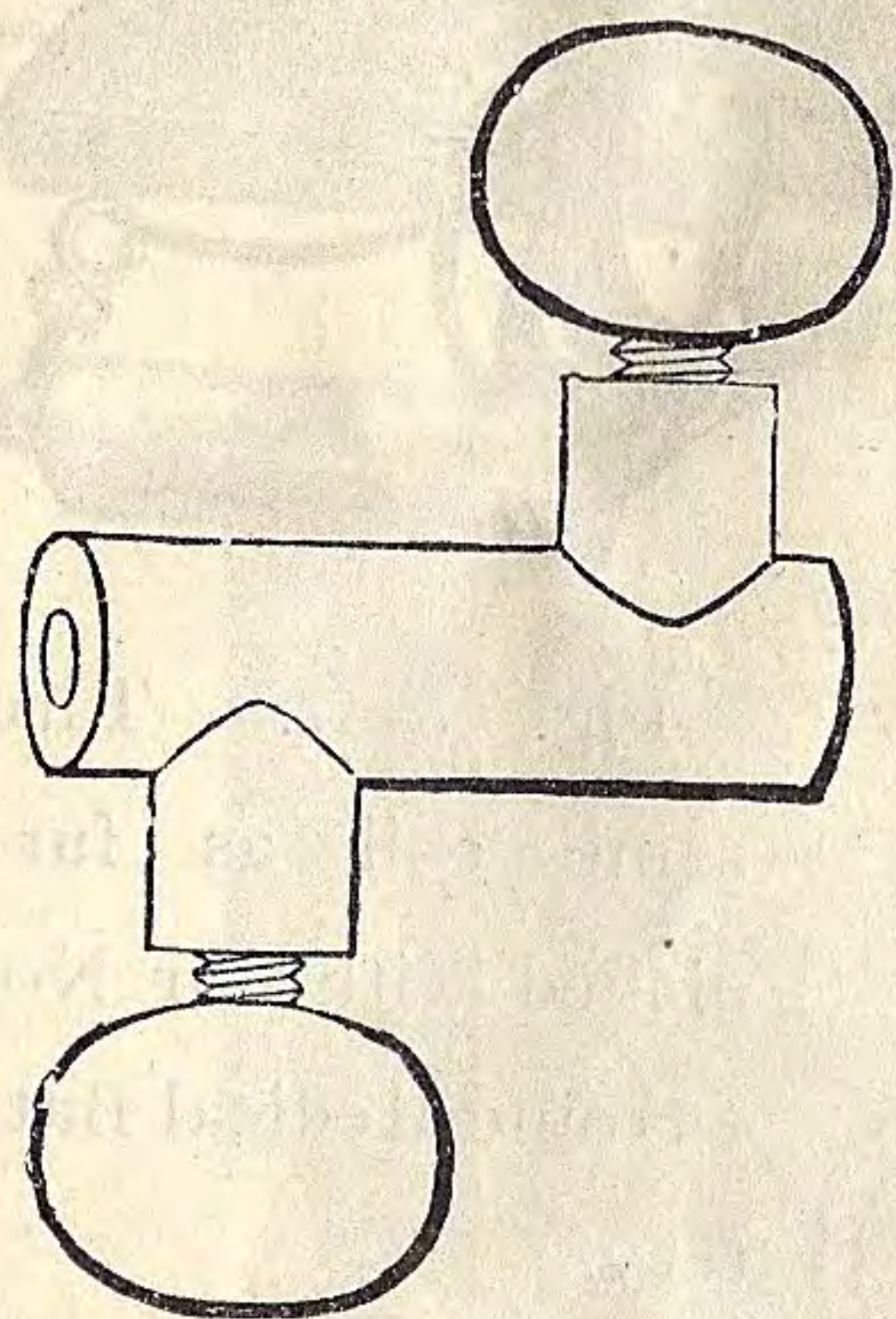
Air cooled. Will run from manufactured Illuminating Gas. Is intended as a toy only, but will run small toy machinery. It runs with an explosion at each revolution, and is an interesting study. Rubber tube packed in box.

Price \$5.00

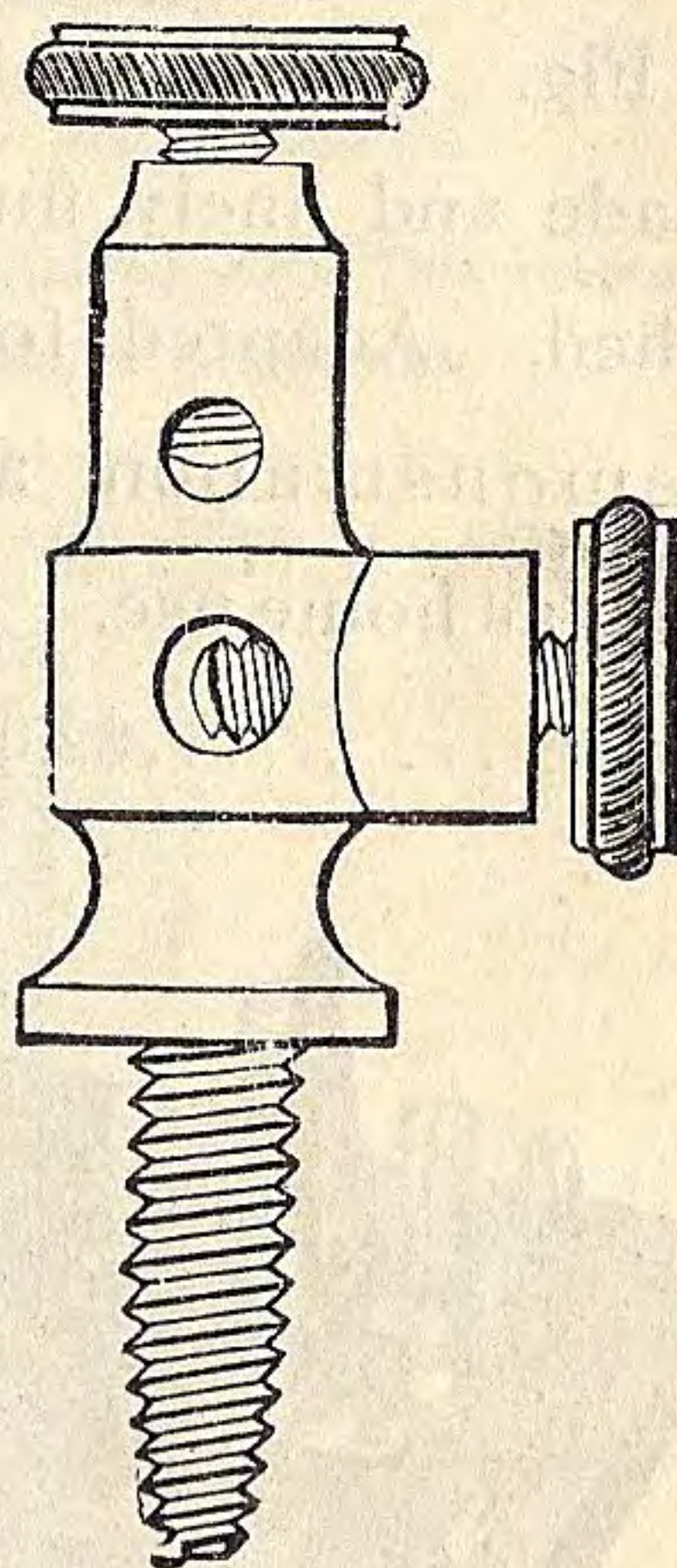
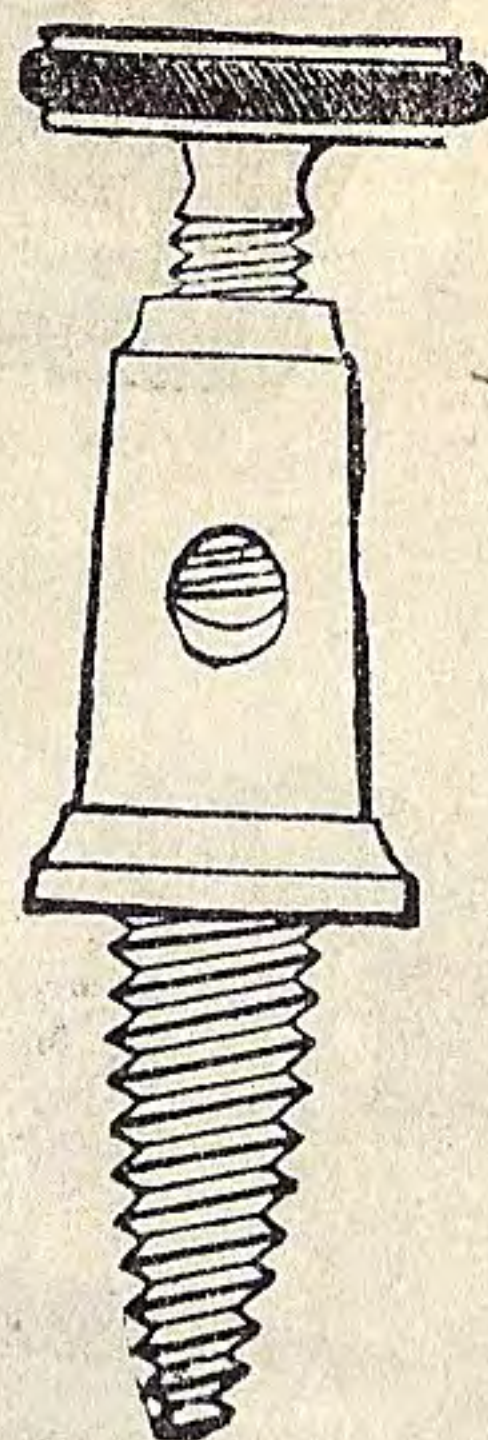
BINDING POSTS AND CONNECTORS.

No. 4.

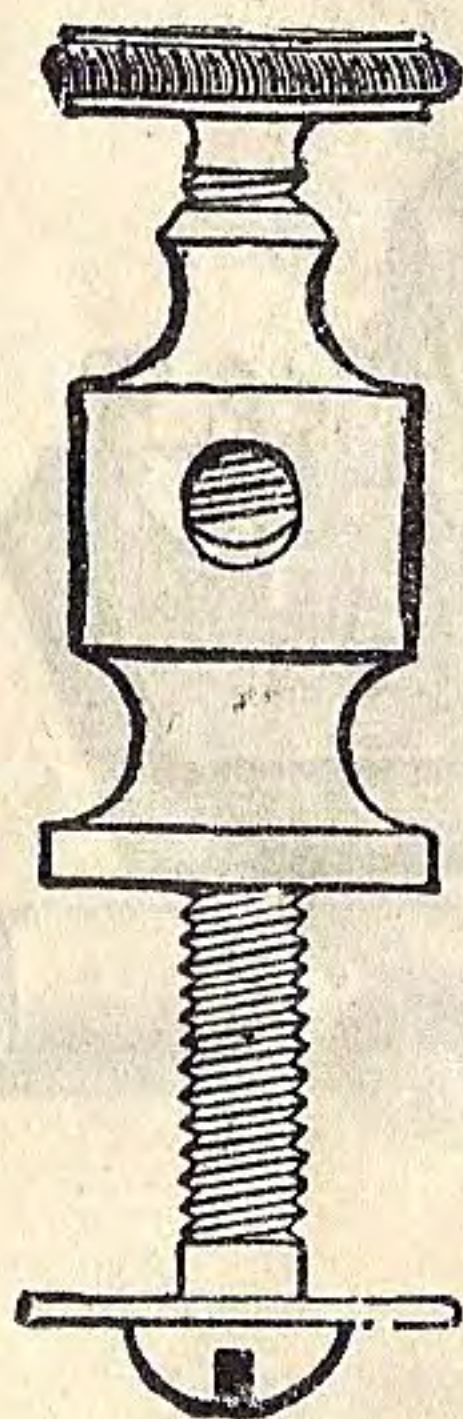
No. 3.



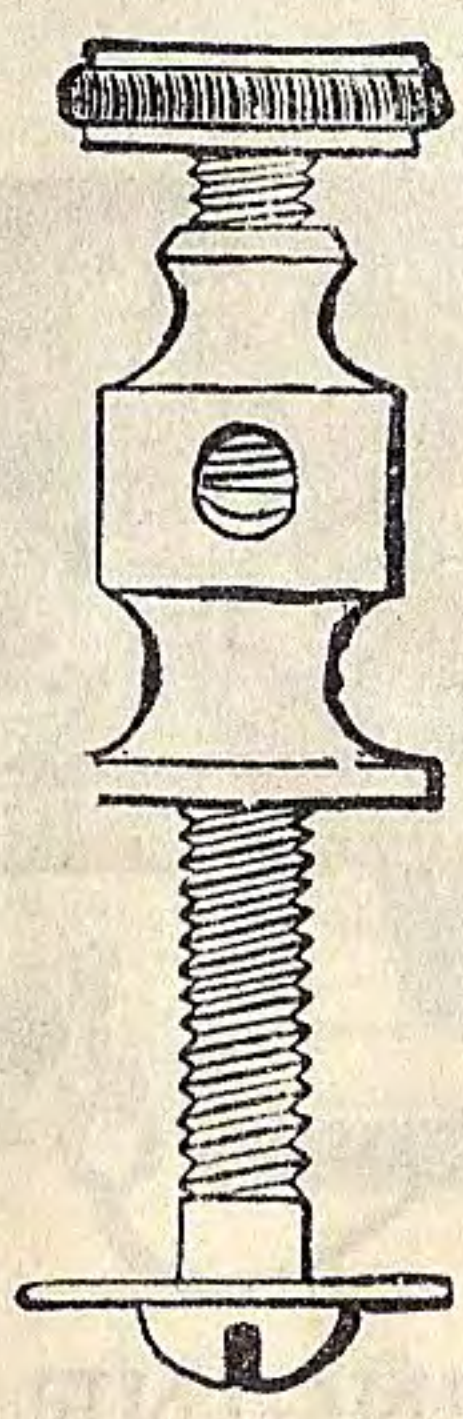
No. 5.



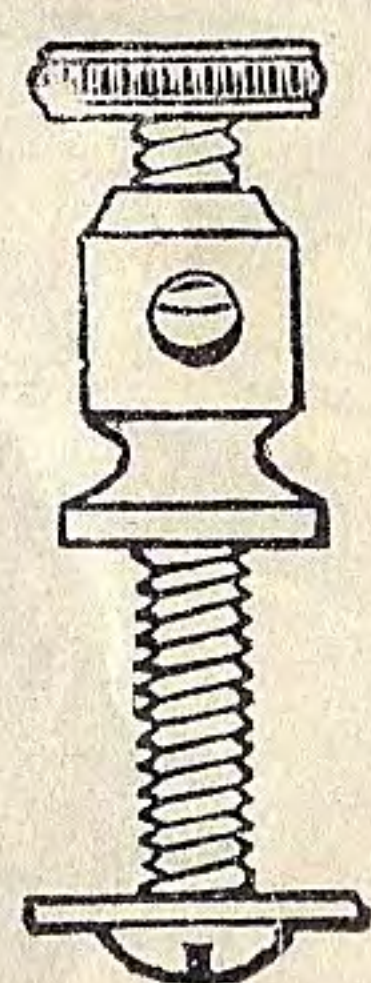
No. 6.



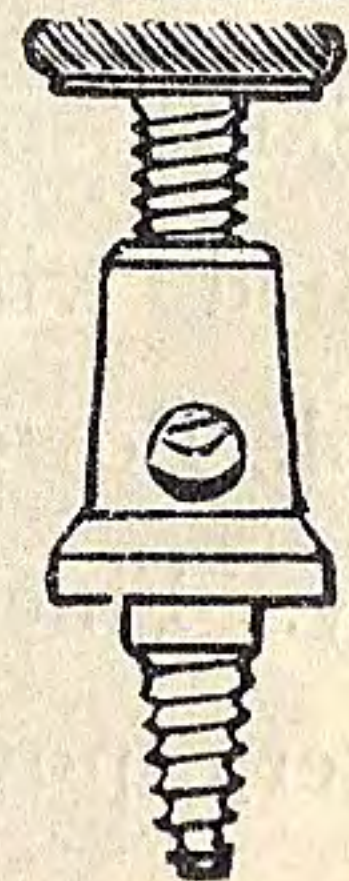
No. 7.



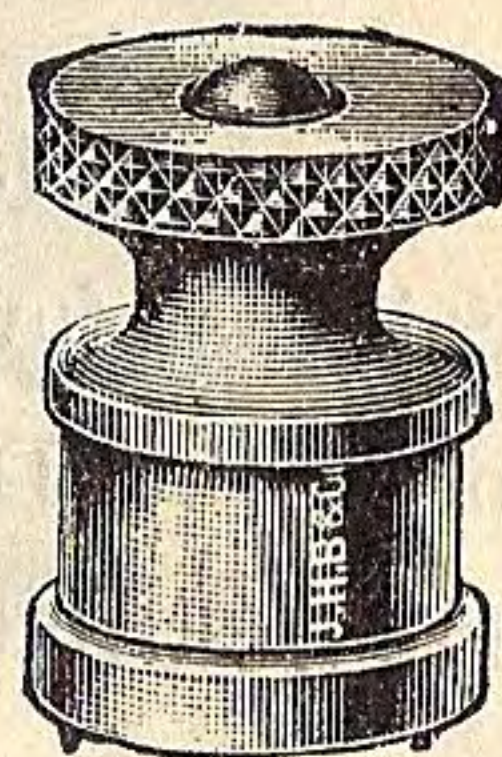
No. 7 B.



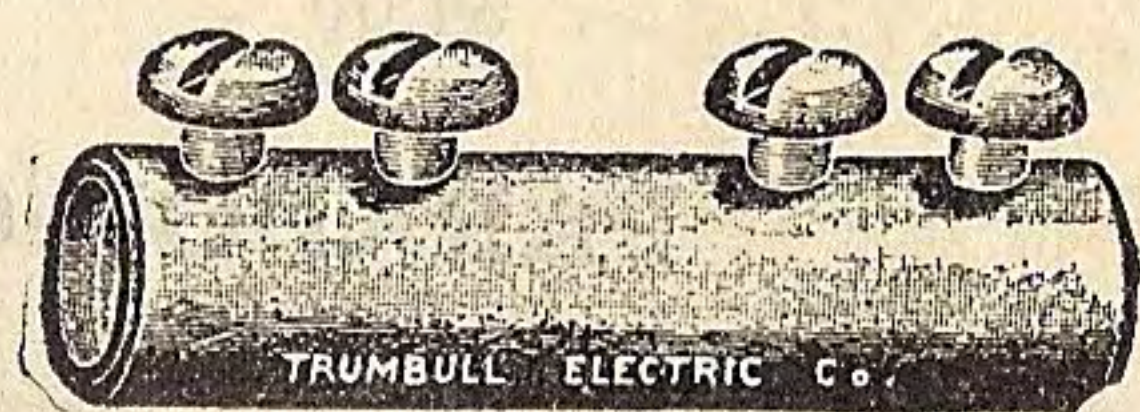
No. 5 B.



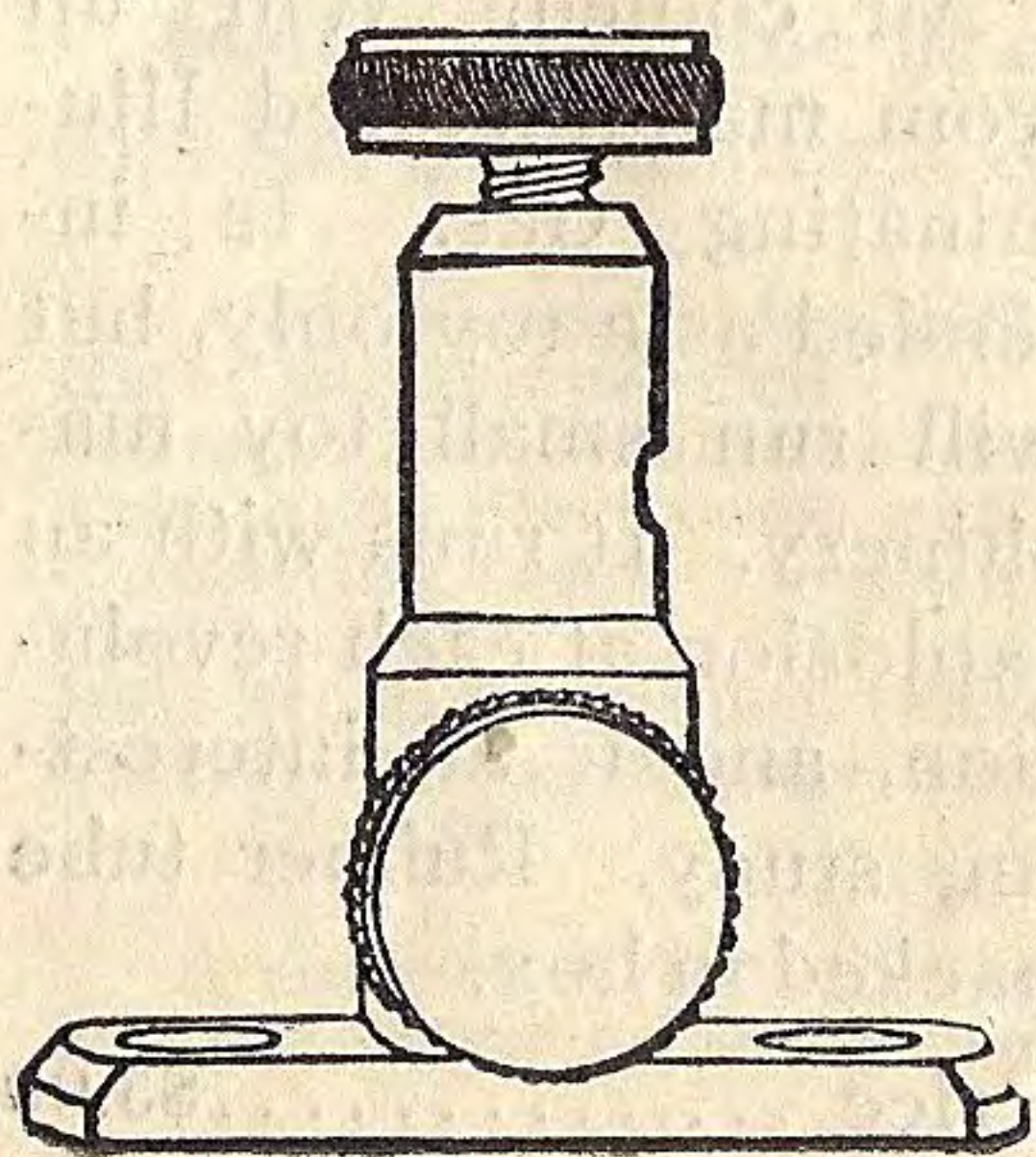
Quad



No. 21.



No. 11.

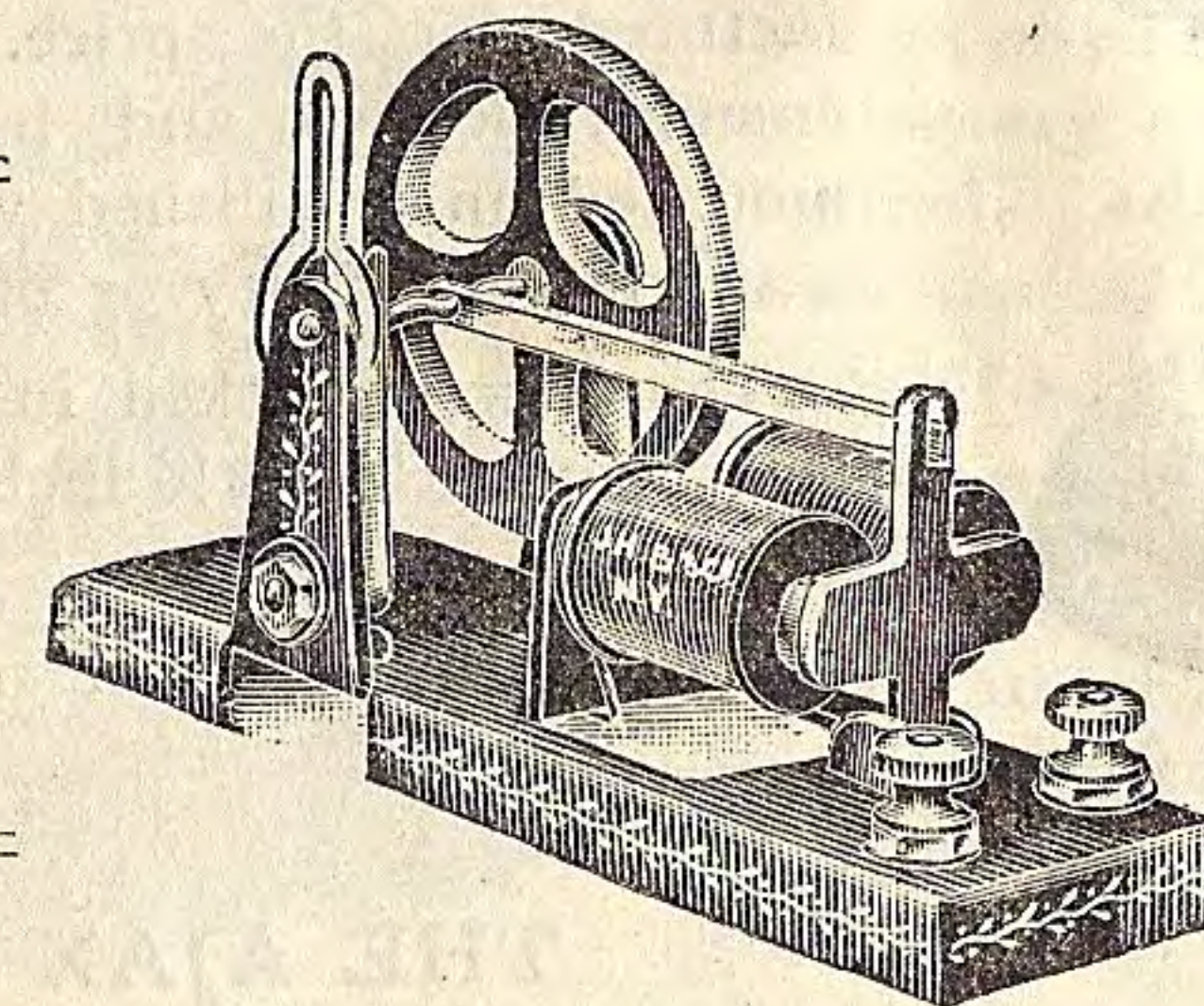


No. 3	Connector.....	each	\$0	12
"	4 Binding Post.....	"	"	18
"	5 " ".....	"	"	14
"	5 B " ".....	"	"	10
"	6 " ".....	"	"	14
"	7 " ".....	"	"	12
"	7 B " ".....	"	"	08
"	11 " ".....	"	"	26
Quad	" ".....	"	"	15
No. 21	Connector.....	"	"	08

Postage extra (net) 2c.

BEEKO ELECTRIC ENGINE

Cut
one-third
of smallest size
Engine.



Cut
one-third
of smallest size
Engine.

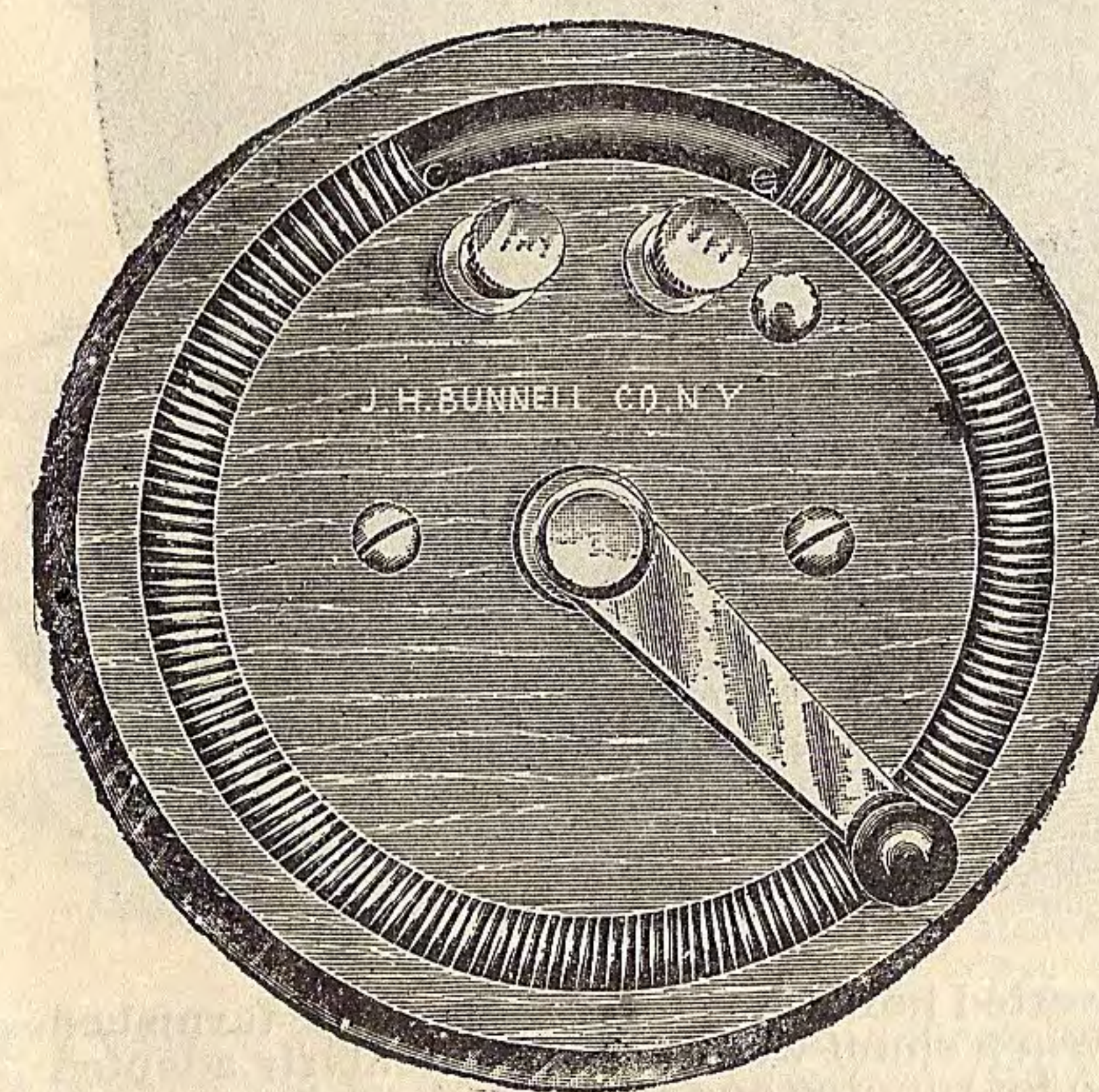
The most attractive toy ever produced. Has variable speed and reverse lever. Is finely finished and handsomely decorated. Will run a number of small toys at one time. Runs for weeks on one cell of battery.

Made in three sizes:

Small size.....	each	\$1.20
Medium size.....	"	2.00
Large size.....	"	2.50

We have a large line of small toys, consisting of Wind Mills, Water Wheels, Saw Tables, Counter Shafting, Machine Shop, Transmission Wheels, etc., for use with the Beeko Engine that we can furnish at 50 cents each and up.

BEEKO MINIATURE RHEOSTAT



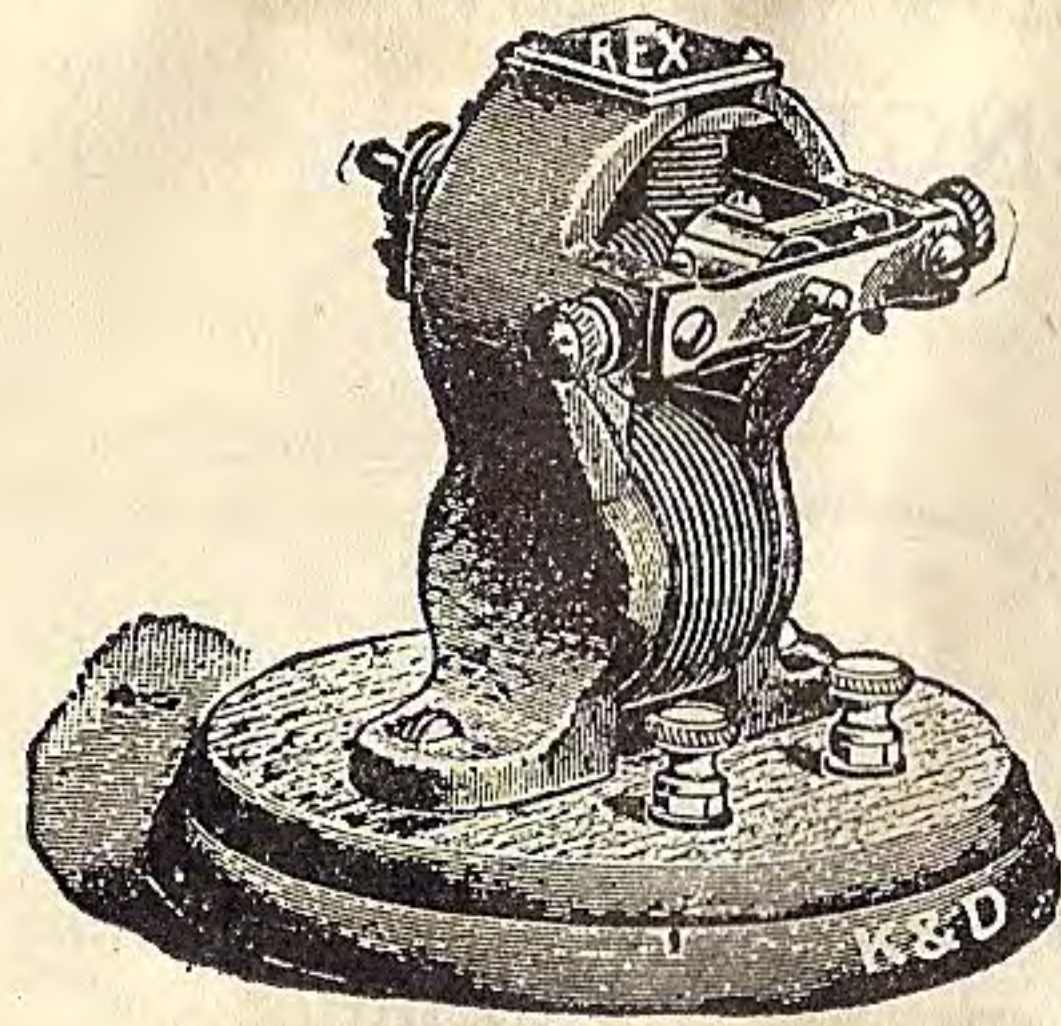
Resistance 11 ohms.
Continuous capacity
2 amperes.

Suitable for regulating Miniature Lamps, the speed of small motors or wherever a variable resistance is desired.

The resistance coil has about 150 convolutions, and as the change in resistance on movement of the lever is by single convolutions, it will admit of very fine adjustment.

Diameter of base, 4 inches; weight, 3 ounces.

Price\$1.00

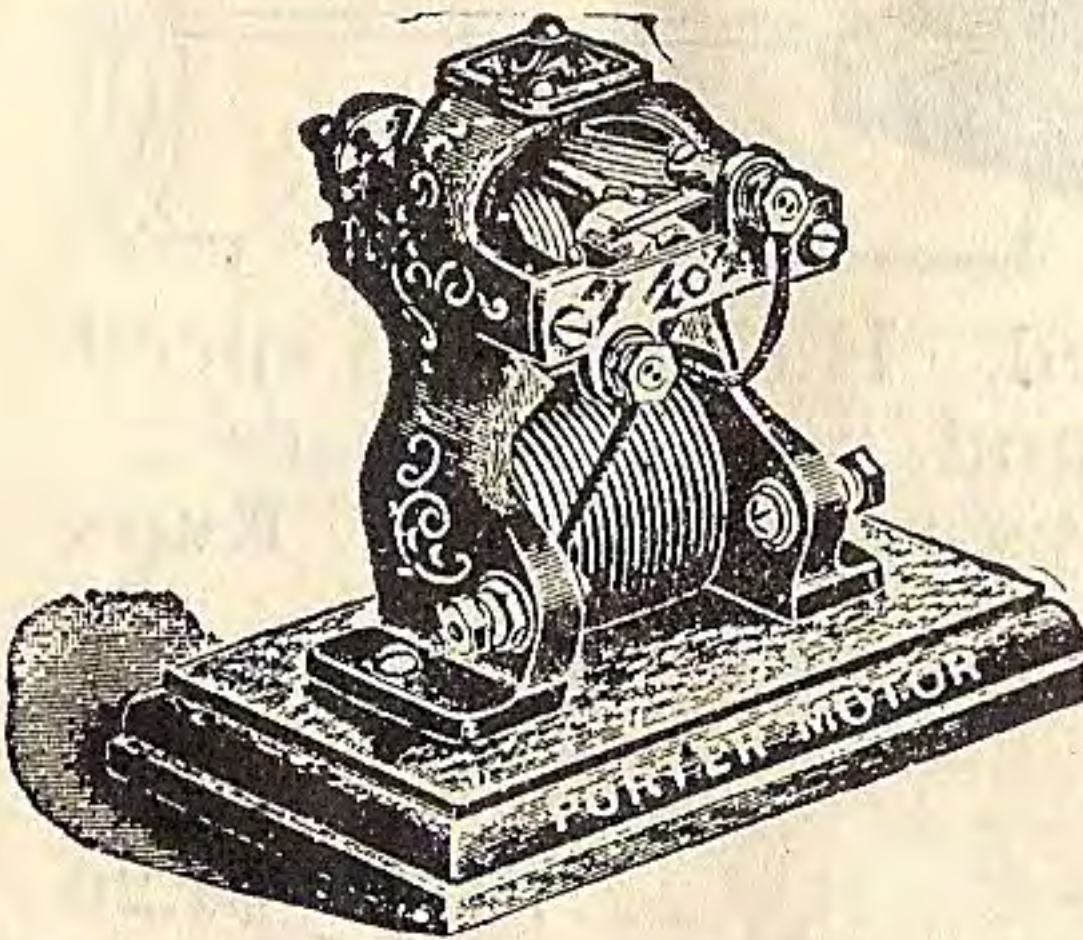


THE REX MOTOR.

Superior in every way to any motor manufactured for the price. Finished in black enamel; screws and bearings nickel-plated; mounted on a polished wood stand. Runs on a single cell of dry or other battery.

The Rex is packed in a neatly labeled box measuring 3x3½x3½ inches.

Motor only Each \$1.50
 3½ inch Fan " .30



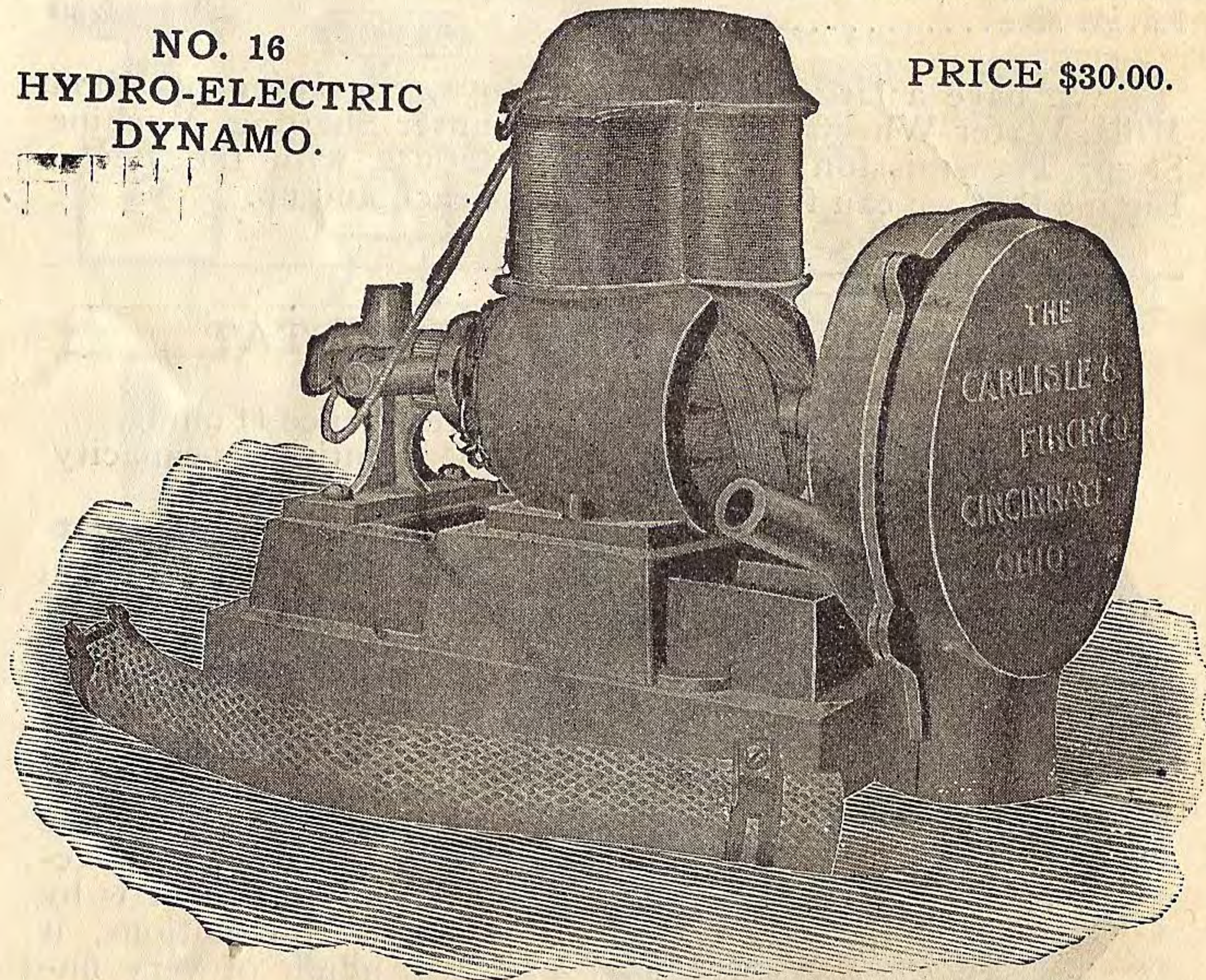
THE AJAX MOTOR.

The Most Accurate, Best Finished, Small Motor Made.

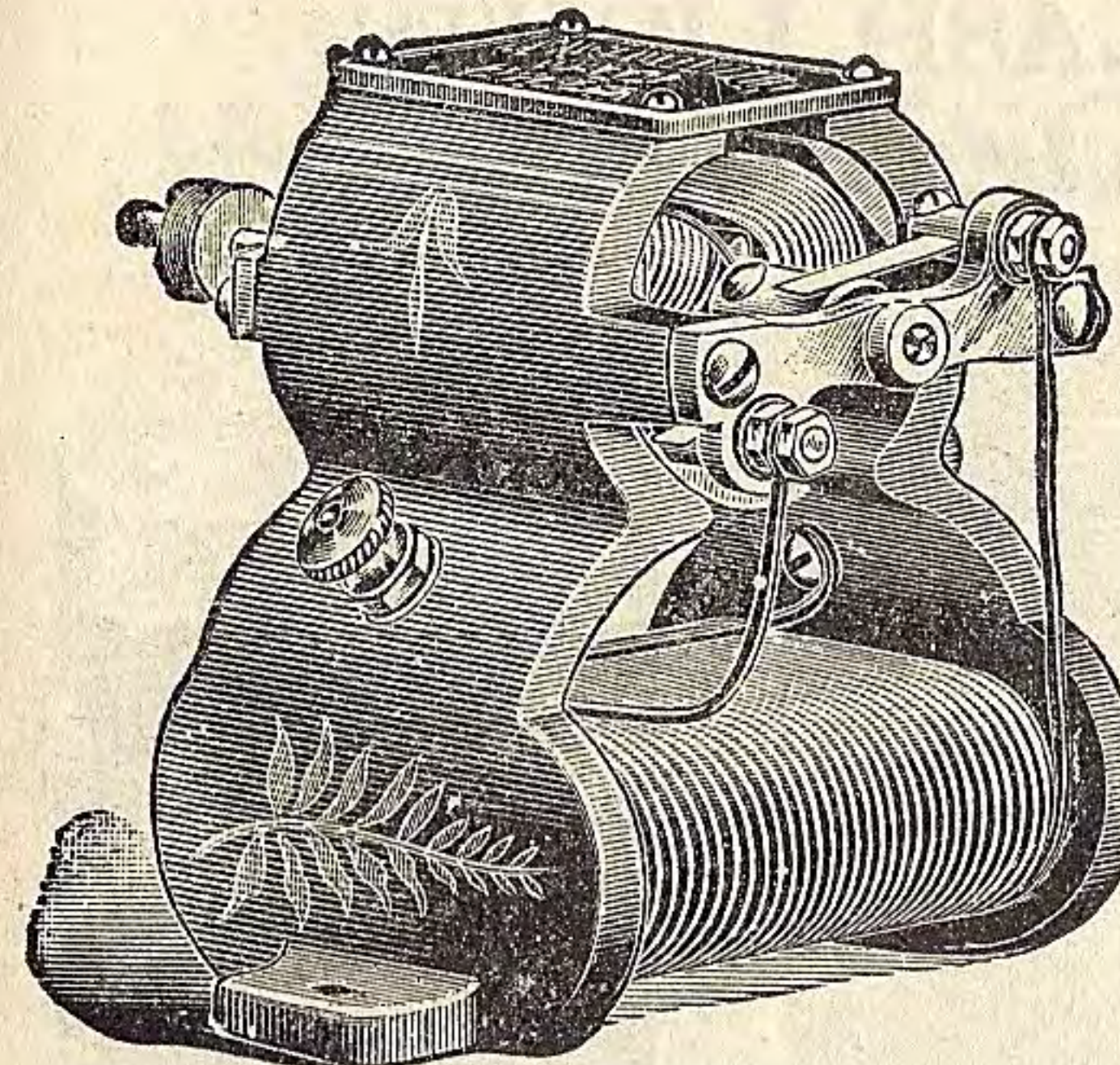
Motor only Each \$2.25
 4¾ inch Fan " .40
 Ajax parts, ready to wind and assemble " 1.90

NO. 16 HYDRO-ELECTRIC DYNAMO.

PRICE \$30.00.



The above Dynamo is of the inverted horseshoe type, and can be furnished in either shunt or series wound. When shunt wound it is particularly adapted for charging storage batteries, also for running our electric railways and small motors. On a water pressure of 40 to 90 lbs. it has an output of from 15 to 25 Volts and 2 to 3½ Amperes.



Porter Motor No. 1.

Can be run on one or two Cells of battery, according to power required. Adapted for propelling mechanical toys, etc.

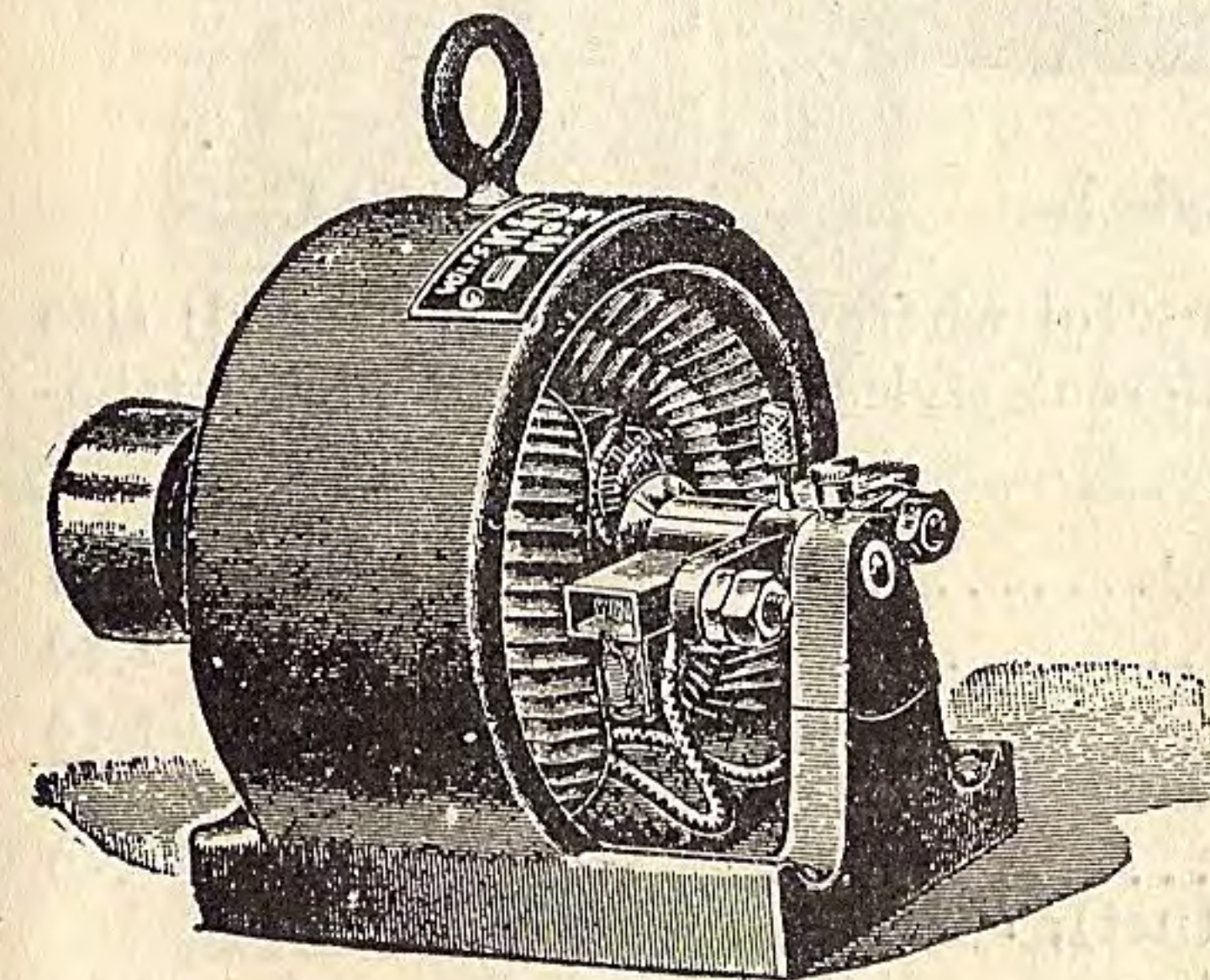
Price \$4 50

Porter Motor No. 2.

Constructed on same lines as No. 1 Motor, but larger and more efficient. Runs on two Cells of battery.

Price \$7 50

K. AND D. MOTOR NO. 5.

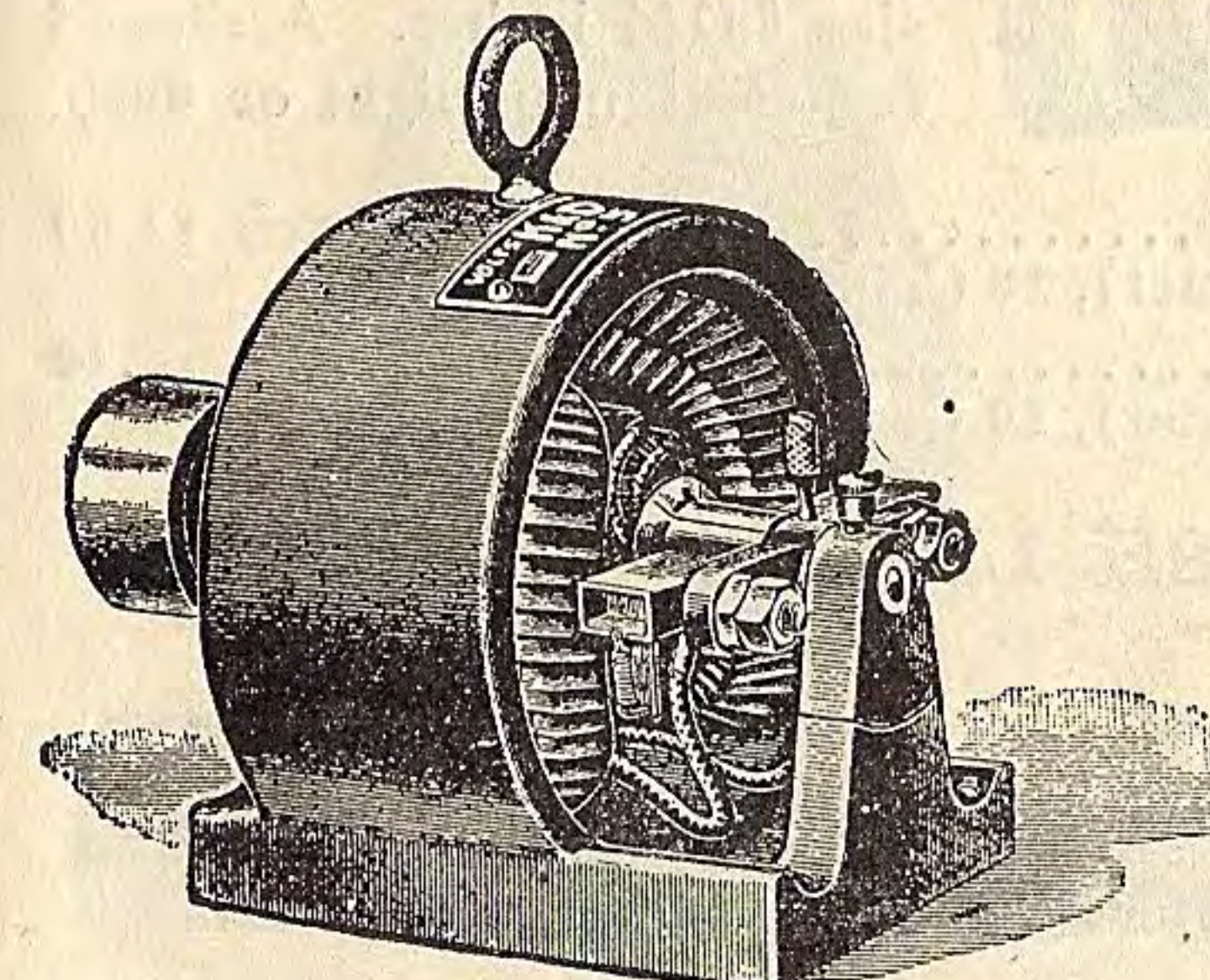


This motor is designed for power purposes. Its design and construction embody the best practice common to the larger machines in use. Attention has been devoted to the detail of each part. The field is of the ring type cast solid with the frame; coils are form wound; 6 section laminated drum armature; copper commutator; improved brush holders and adjustable yoke. These features combined, result in a very satisfactory motor. Finished in black enamel. 6 Volts. 2 Amperes. Speed, 1,800 R. P. M. with average load. Weight, 9 pounds. Length of shaft, 6 inches. Occupies a space 6 x 4¼ x 6 inches. Diameter of pulley 1½ inches; width, ¾ inch.

Price \$12 80

For Battery Motor work we recommend Storage, Edison-Lalande, or any good form of Acid Battery. Bluestone or Sal-Ammoniac cells are not adapted for Motor work.

K. AND D. GENERATOR No. 9.



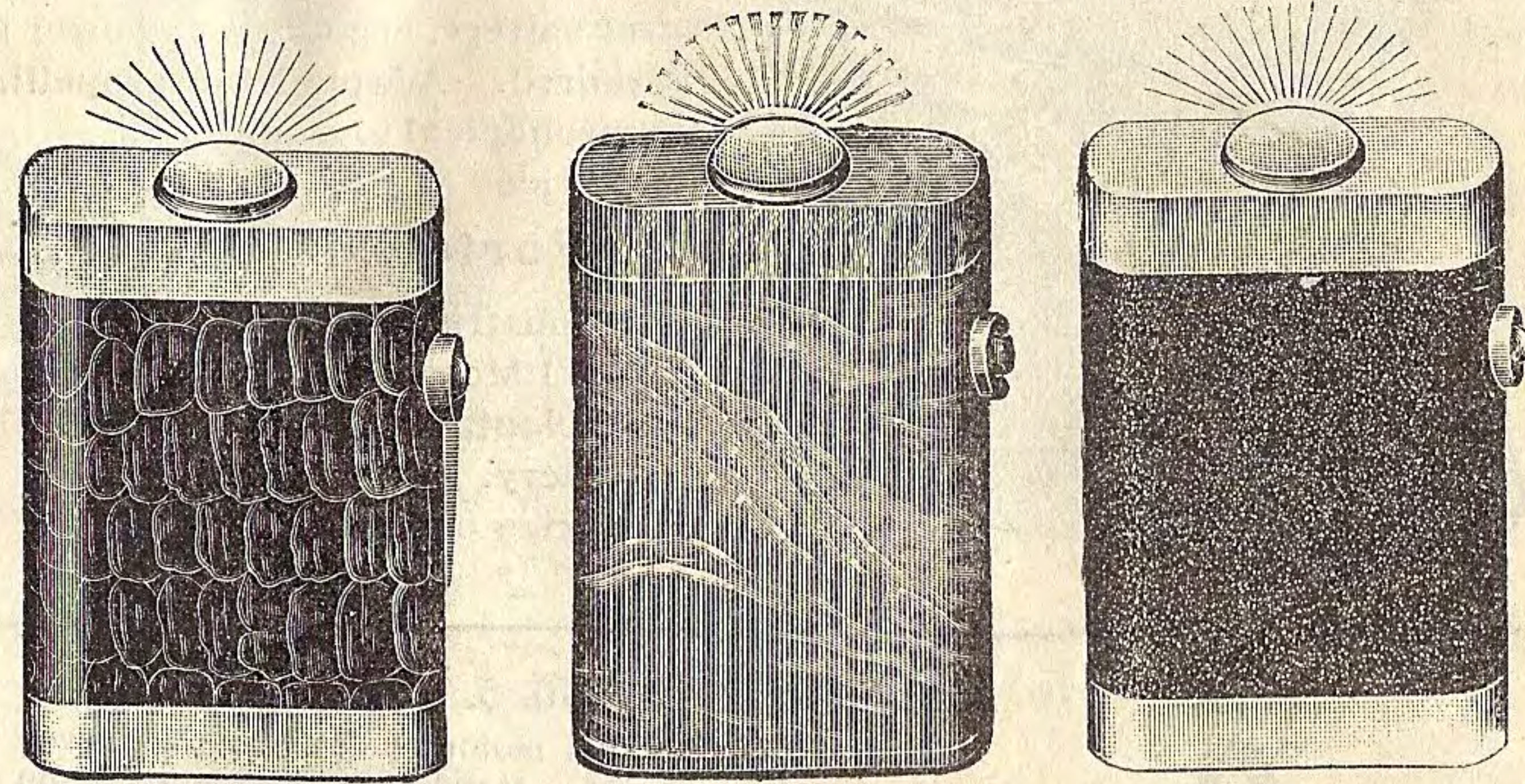
The K & D No. 9 is identical in design with motor No. 5, but is shunt wound to obtain the best results as a generator. It is particularly adapted for experimental purposes requiring a small amount of current. It will light to candle power 12 6-volt 3-candle power lamps. As an electro plating machine it will operate a 5 gallon solution successfully. There are also many other uses to which this machine may be applied.

The brush holders are of an improved type, and brushes require very little attention; the armature is slot wound and laminated. In fact, the most desirable and efficient features common to the larger generators are retained in this little machine. It has an output of 36 Watts. Finish, black enamel. Speed, 1800 R. P.

No. 2936. 6 Volts. 6 Amperes. Weight, 9 pounds. Length of shaft, 6 inches. Diameter of pulley, 1½ inches, width ¾ inch. Occupies a space 6 x 4¼ x 6 inches.

Price \$12 80

ELECTRIC FLASH LIGHTS VEST POCKET FLASH LIGHTS



Style A.

Style B.

Style C.

Convenient to carry around, and useful wherever a light is needed; size $3\frac{1}{2} \times 2\frac{3}{4} \times 1$ inch. Finished in three different styles, all polished nickel trimmings.

Style A.—Metal Case, Alligator covered.....	each	\$1.50
Style B.—Metal Case, Cloth covered.....	"	1.30
Style C.—Marbled Metal Case.....	"	1.10
Postage extra (net), 10 Cents.		
Extra Batteries.....	"	.40
Postage extra (net), 7 Cents.		
Coat Pocket Lamp, size $5 \times 3\frac{1}{2} \times 1\frac{1}{4}$ inches.....	"	2.00
Postage extra (net), 20 Cents.		
Extra Batteries.....	"	.60
Postage extra (net), 15 Cents..		

"COMET" FLASH LIGHTS

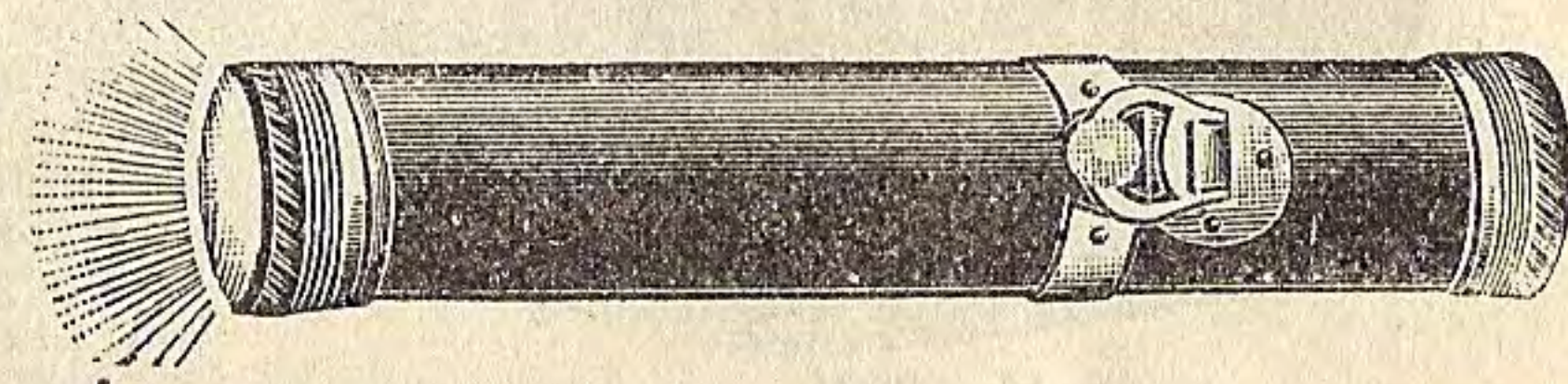


Metal case, cloth covered, size $8 \times 1\frac{1}{2}$ inches. Arranged for continuous light or flash.

Comet Flash Light.....	each	\$1.50
Postage extra (net), 18 Cents.		
Extra Batteries.....	"	.40
Postage extra (net), 10 Cents.		

NO. 1½ FLASH LIGHTS

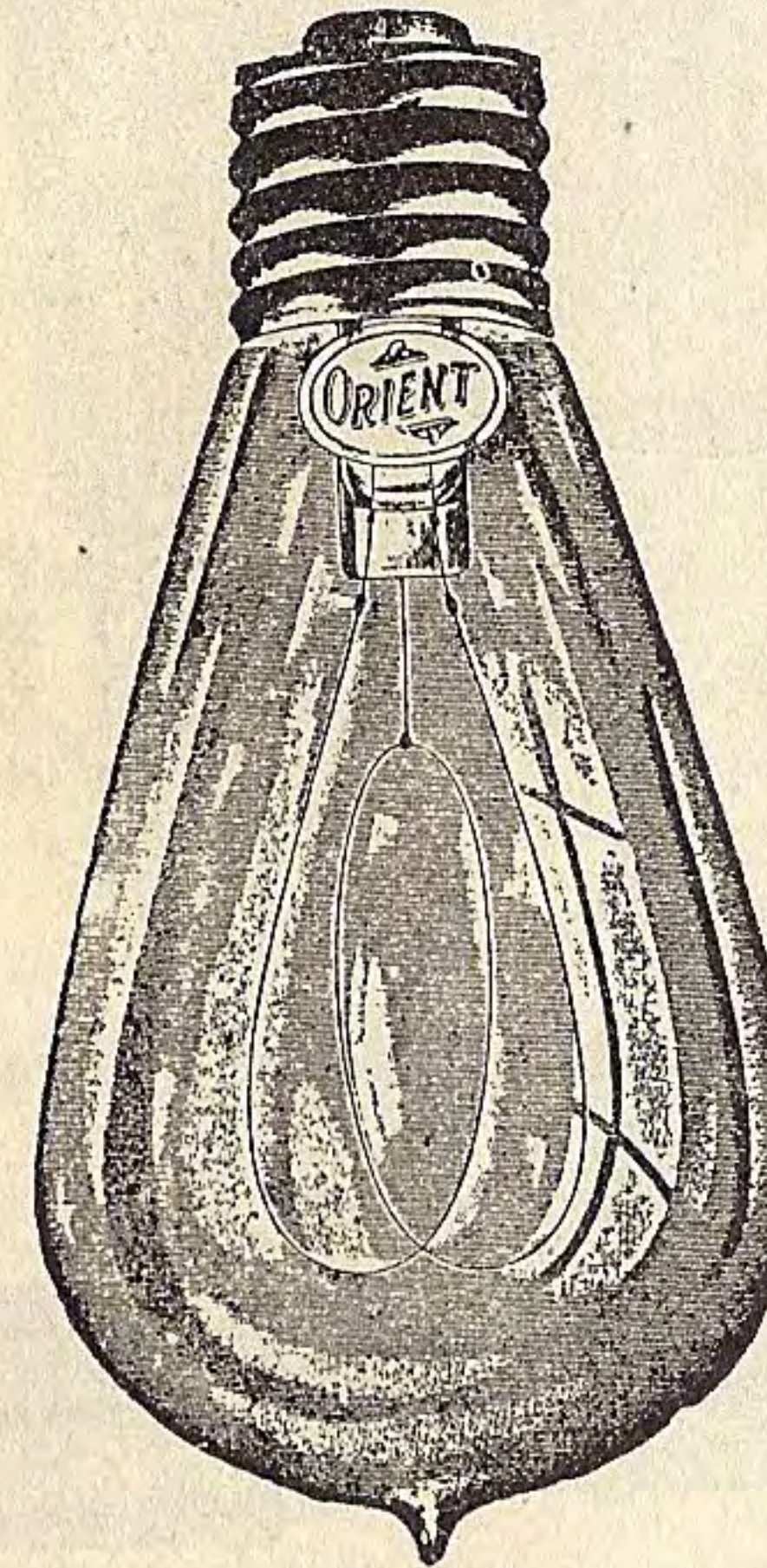
Metal case, cloth, covered, size $8\frac{1}{2} \times 1\frac{1}{2}$ inches. Arranged with glove-fastener contact, giving permanent light if desired.



No. 1½ Flash Light.....	each	\$2.00
Postage extra (net), 18 Cents.		
Extra Batteries.....	"	.40
Postage extra (net), 10 Cents.		

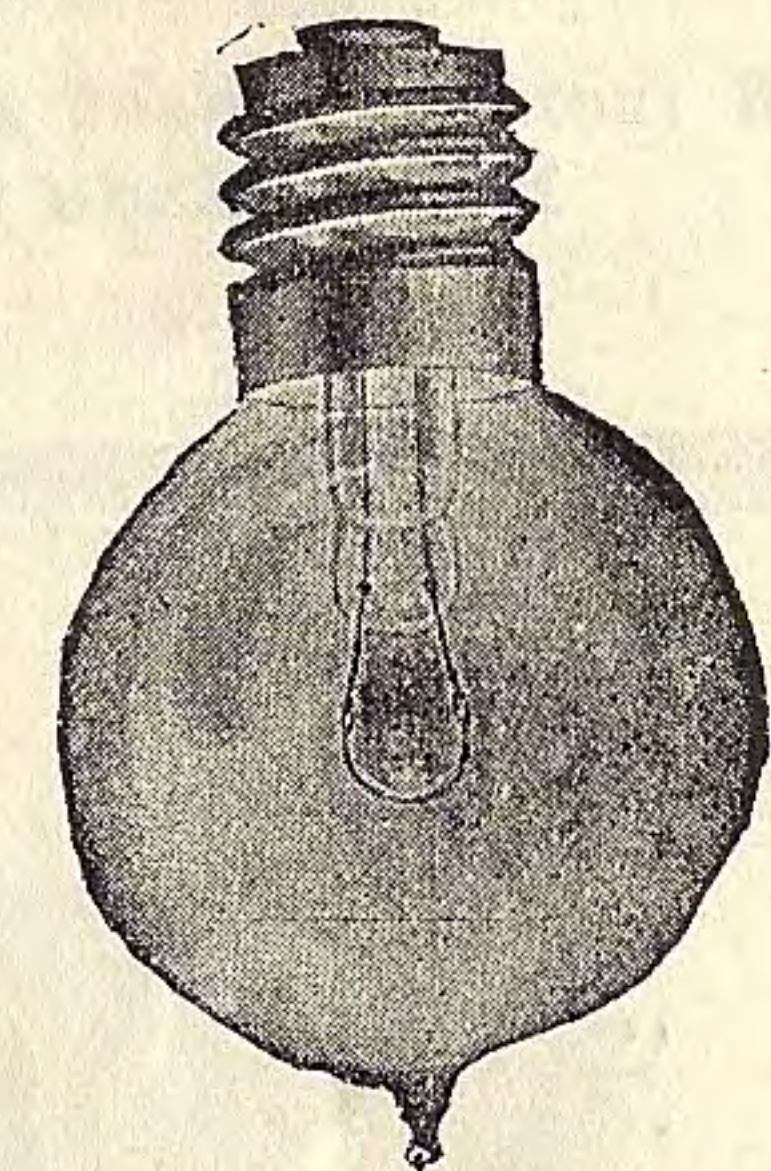
INCANDESCENT LAMPS.

REGULAR STANDARD LAMPS.

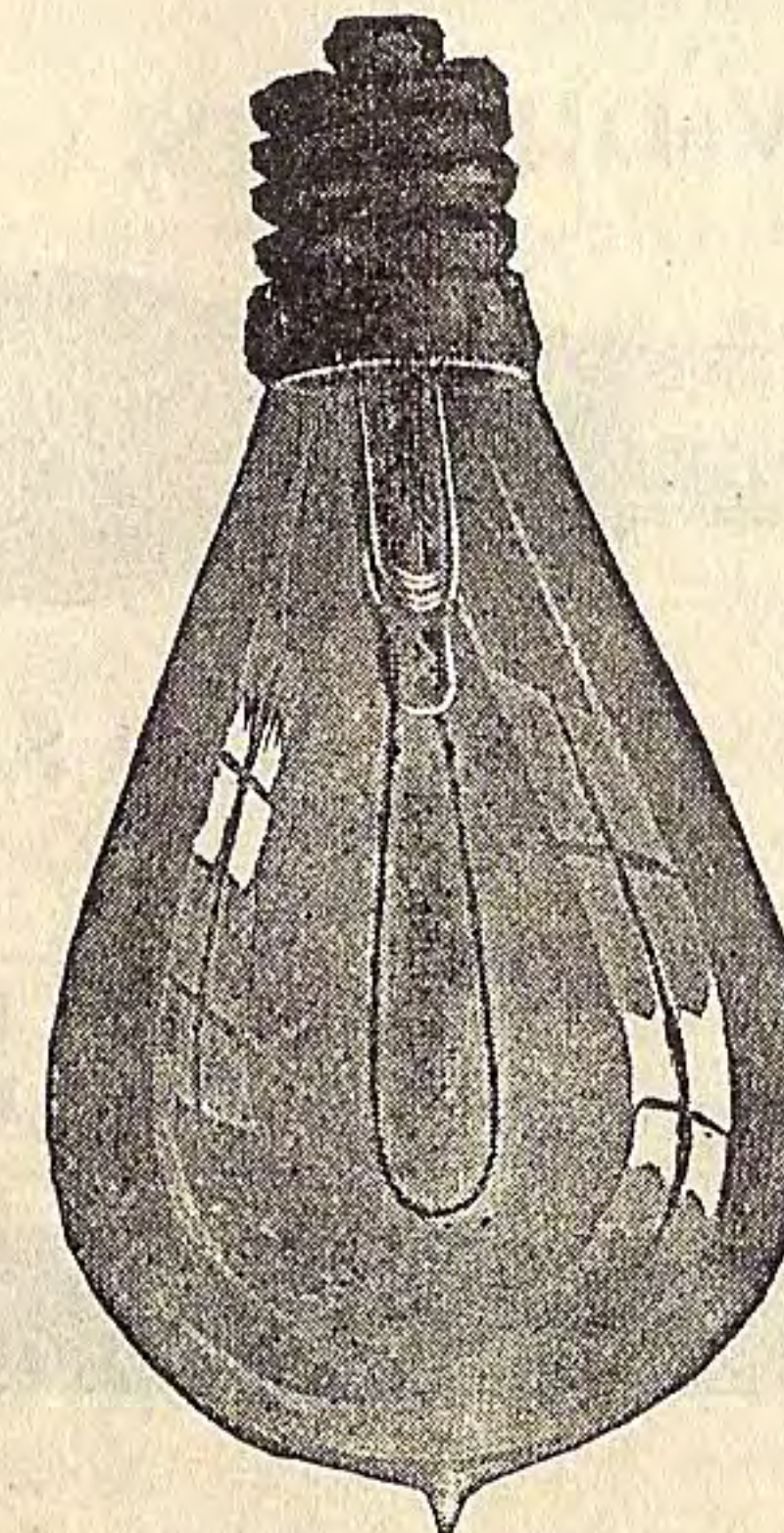


45 to 130 Volts, Edison Base.
 4 to 16 Candle Power.....Each, \$0 40
 32 " " " " " 60
 50 " " " " " 1 00
 Frosted Lamps 6 cents additional

MINIATURE BATTERY LAMPS.



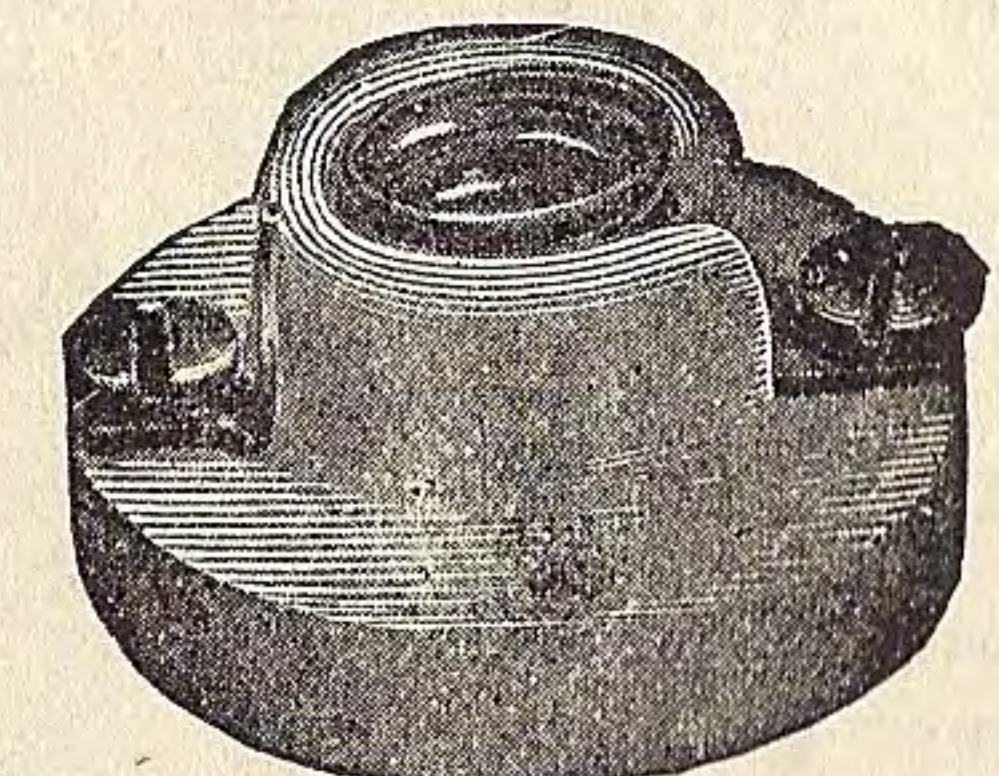
SERIES MINIATURE LAMPS.



1 C. P. $3\frac{1}{2}$ Volts.	Each,	\$0 40
2 " 4 " " "	"	40
3 " 6 " " "	"	50
4 " 6 " " "	"	50
6 " 6 " " "	"	50

Postage extra (net) 3 cents.

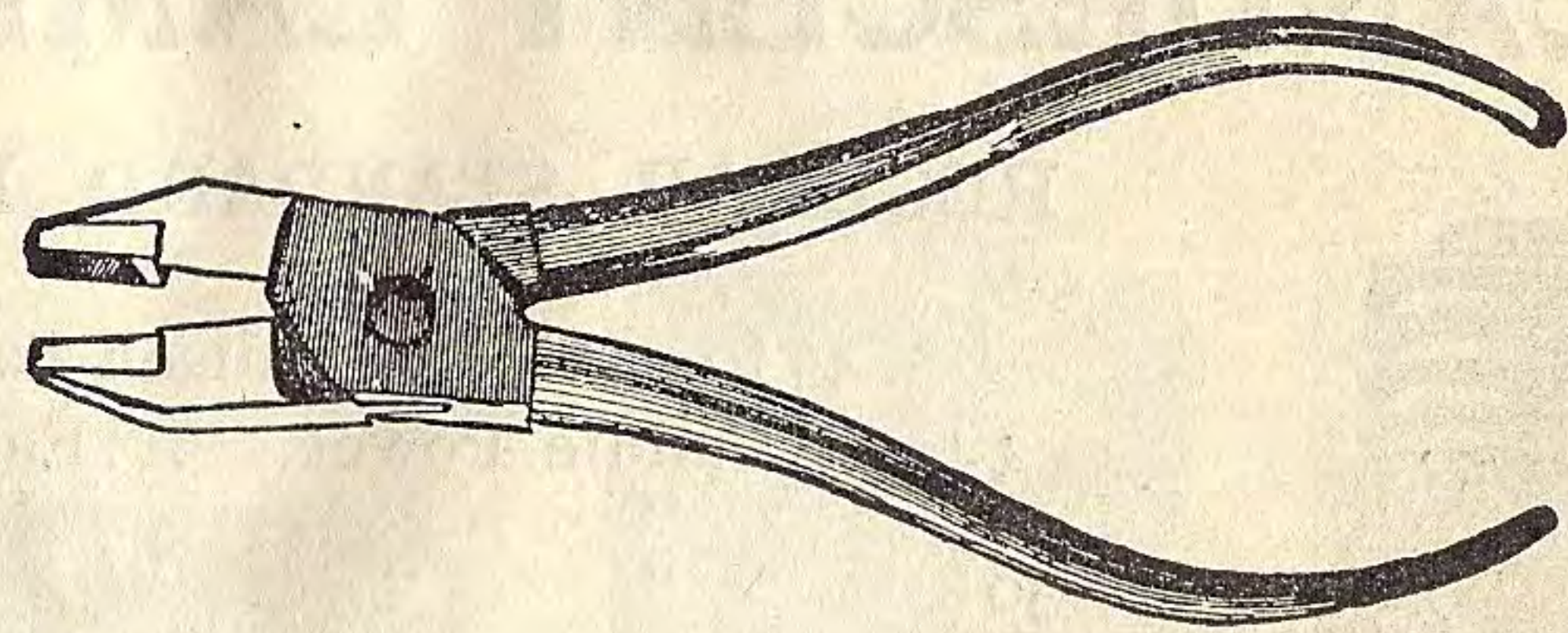
MINIATURE RECEPTACLE.



1 C. P. 14 Volts
 (8 in series on 110 Volts.)
 Each.....\$0 50
 Postage extra (net) 3 cents.

Each.....\$0 10
 Postage extra (net) 2 cents.

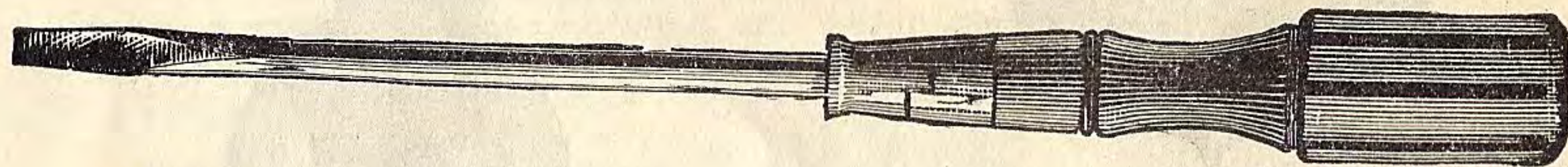
SIDE CUTTING PLIERS.



Size 5 inch.....	Each \$0 90
" 6 ".....	" 1 20
" 7 ".....	" 1 50
" 8 ".....	" 1 80

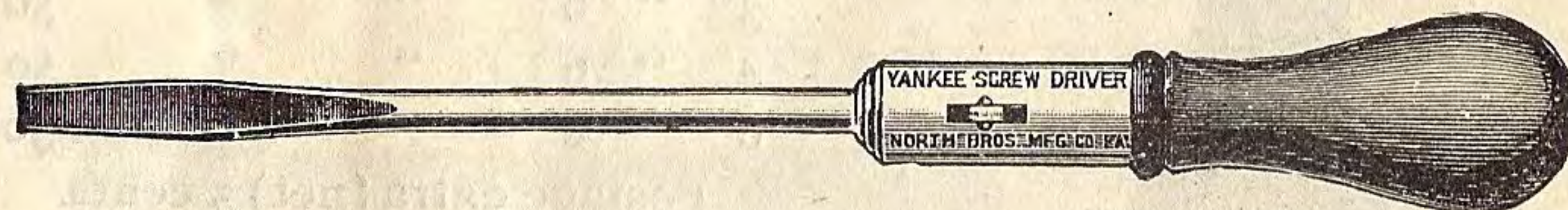
NEW CENTURY SCREW DRIVERS.

Forged from toughest steel. They are intended for hard usage. Every blade is tested to split a screw head.



Size 3 inch Blade.....	Each \$0 36
" 4 ".....	" 40
" 5 ".....	" 50
" 6 ".....	" 60
" 8 ".....	" 80

YANKEE RATCHET SCREW-DRIVERS.



Size 2 inch Blade.....	Each \$0 55
" 3 ".....	" 70
" 4 ".....	" 75
" 5 ".....	" 1 00
" 6 ".....	" 1 10

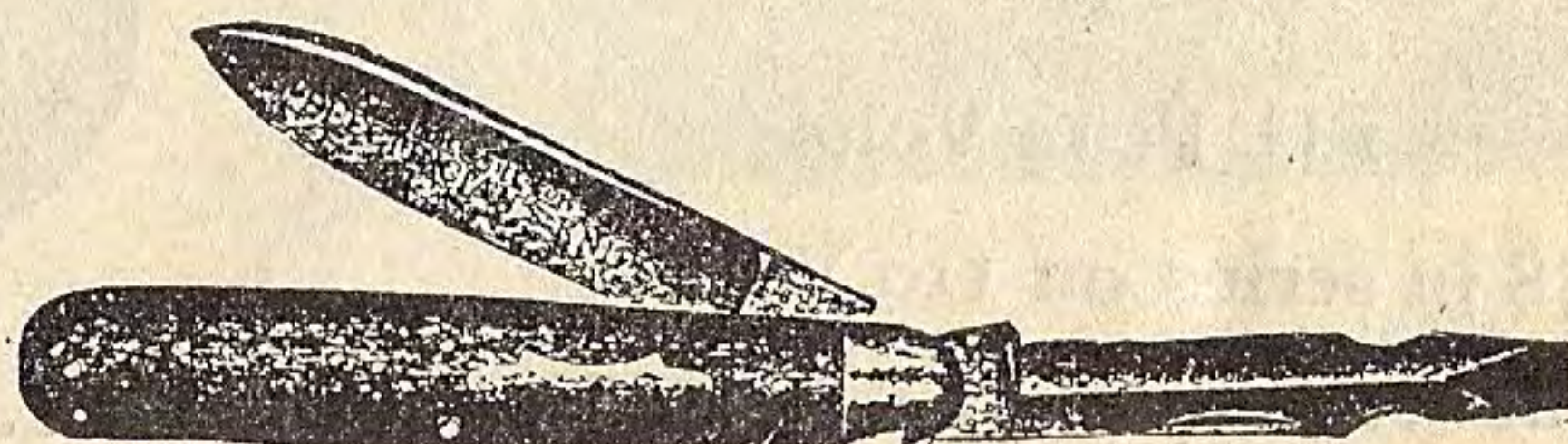
ELECTRICIAN'S COMBINATION KNIFE,

Screw Driver and Wire Scraper.

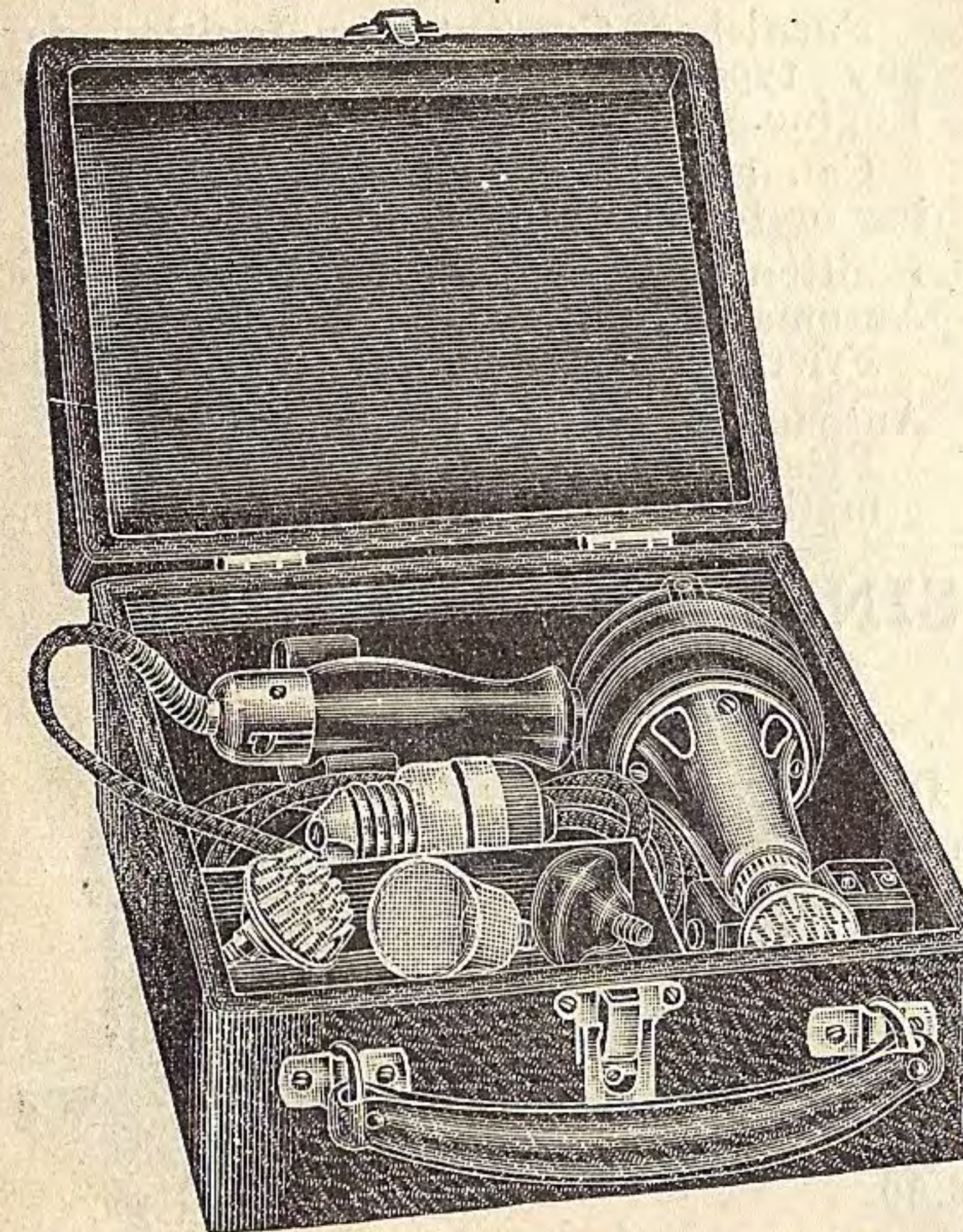
The screw driver blade is locked when open and cannot shut down on the hand when in use.

Single Blade Knife, each \$0 90

Double " " 1 30



MASCOT ELECTRIC MASSAGE VIBRATOR



This Vibrator will operate on direct currents of from 100 to 120 volts; and on alternating currents of 60 cycles, 100 to 120 volts. It is not adapted for use on alternating currents of frequencies higher than 60 cycles.

The Vibrator is handsomely finished in black enamel and polished nickel. A switch in the lower part of the handle under immediate control of the operator turns the current on or off at will. Practically noiseless and with a minimum of vibration in the handle.

Furnished with six feet of flexible conducting cord and Mesco Separable Attachment Plug, which will fit in any ordinary lamp socket. Weight stripped 38 ounces.

Enclosed in a leather covered, plush lined carrying case, with leather handle and nickel-plated

trimmings. Dimensions, 9 1/4 x 8 3/4 x 4 1/4 inches. Five Applicators are supplied with each outfit: Cup, Ball, Hard Toothed, Soft Toothed and Spinal. Mascot Vibrator, complete.....\$30.00

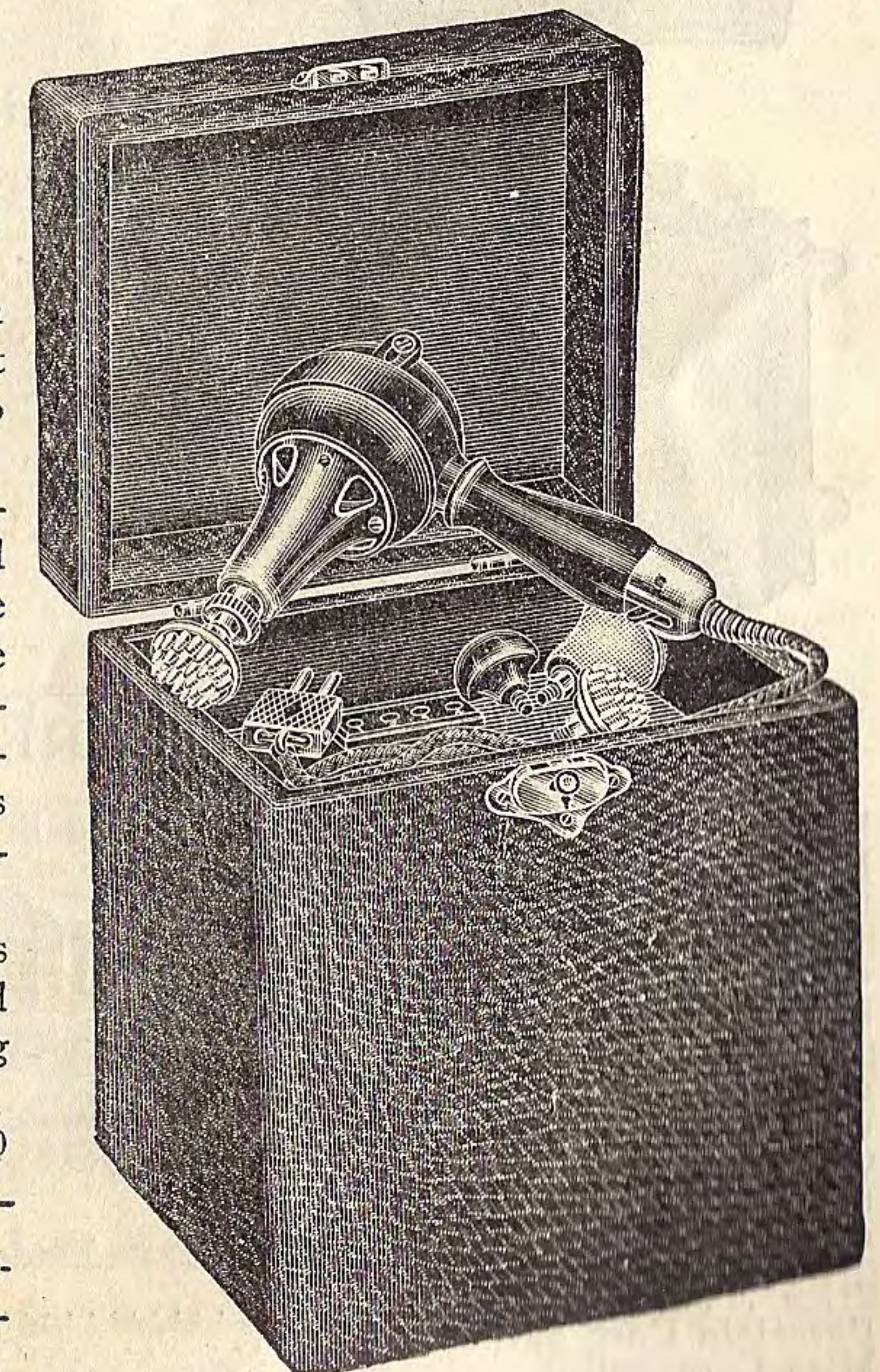
BATTERY MASSAGE VIBRATOR

This Vibrator is identical in every way to the regular current type except that it is made to operate by battery power only.

The leather covered case measures 9 1/4 x 8 x 12 inches high and contains six dry cells in the lower compartment, which are connected to a socket plate having four holes which are so arranged that four, five or six cells can be connected in circuit as desired.

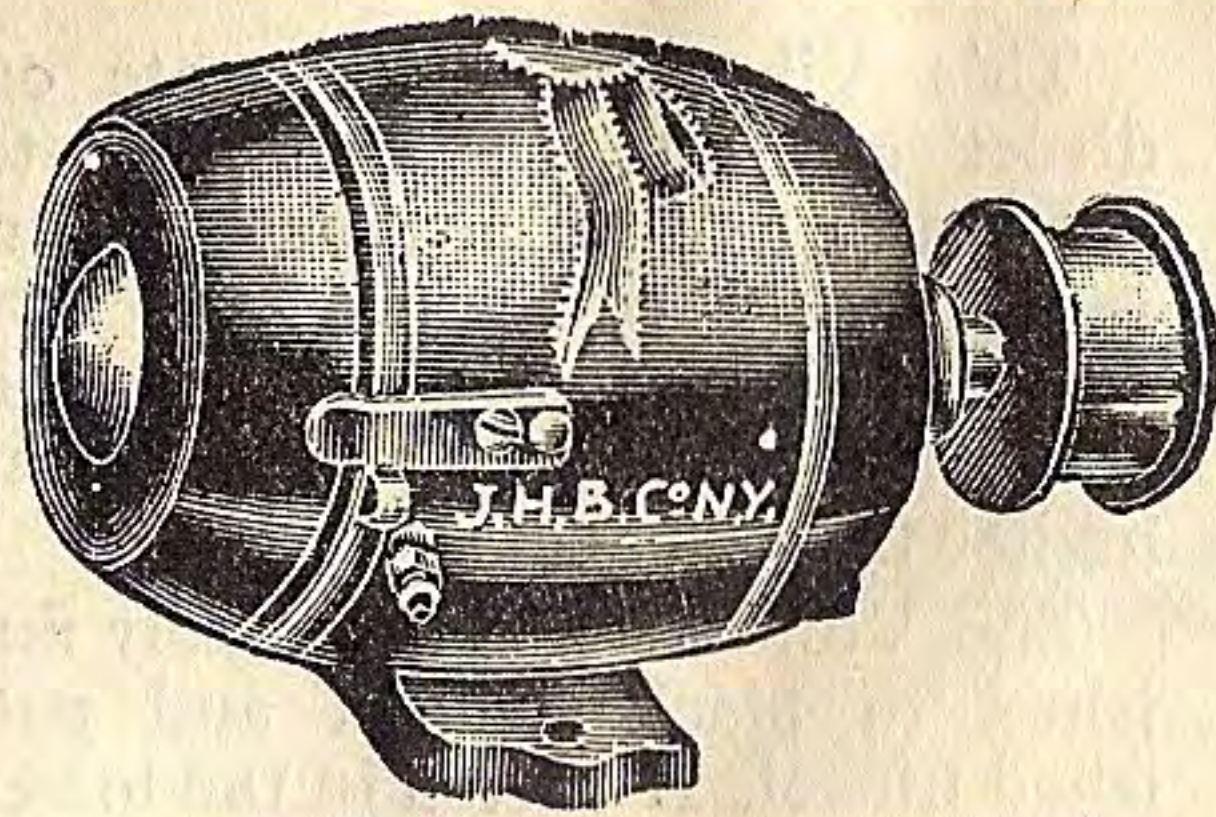
The upper compartment is plush lined and is made to hold Vibrator, flexible cord with plug and five Applicators.

Battery Vibrator, complete..\$30.00



We carry a large stock of Electric Light material of all descriptions. Write for special prices.

APPLE AUTOMATIC SPARKER



Furnishes Current for Ignition for any type of Automobile or Marine Engine.

Can also be used for Electric Lighting or for charging Storage Batteries.

Ignition Dynamo, with Belt Pulley. \$45.90
Automatic Ignition Dynamo, with Friction Governor..... 54.00

Automatic Ignition Dynamo, with Friction Governor and Automatic Cut-out..... 72.00

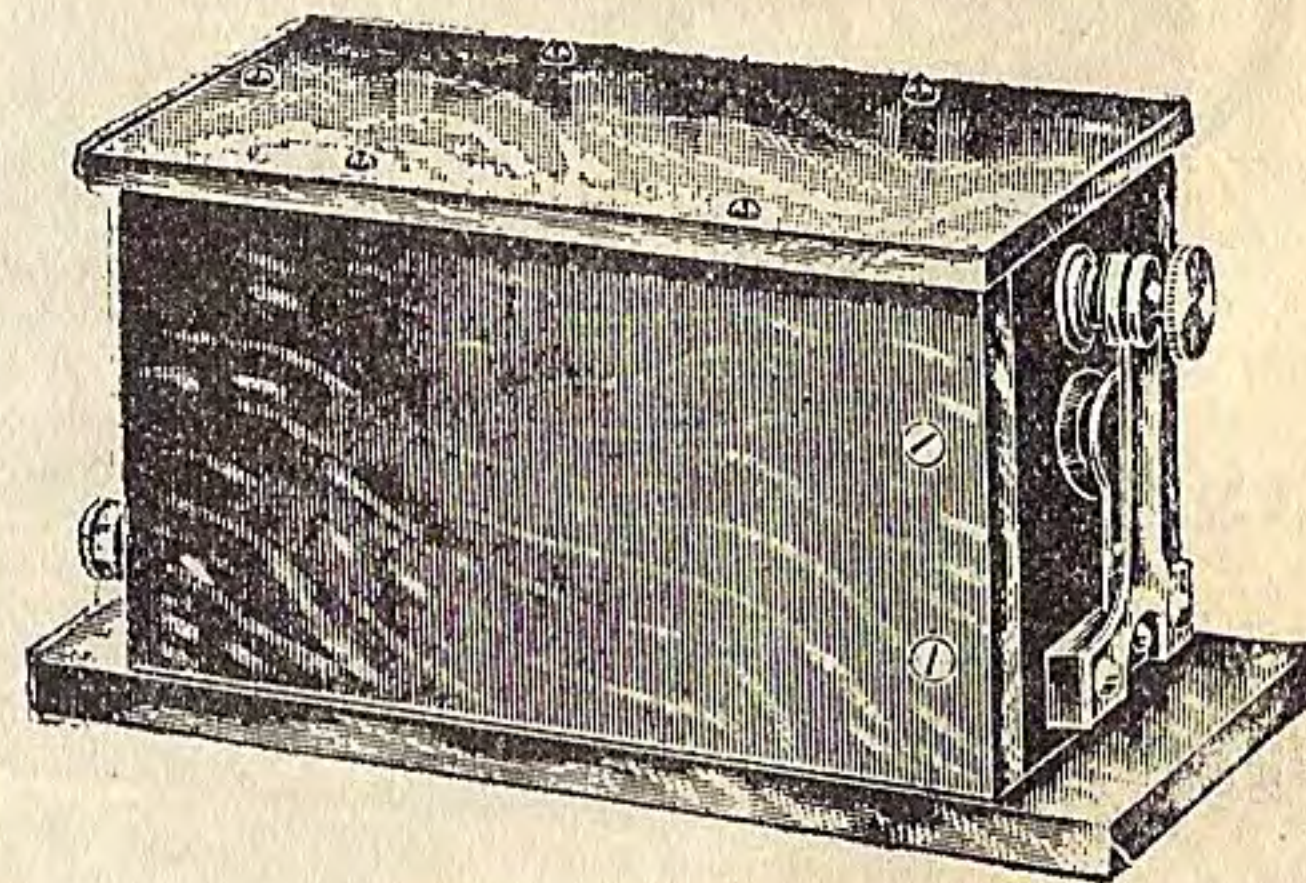
NO. 55 MIDGET SINGLE VIBRATOR

Size 7x3x3½ inches high.

The Standard Box Type Coil for stationary and marine engine use, equipped with latest style Hammer Break Vibrator.

Will run longer without adjusting than any coil on the market.

Consumes but 4-10 amperes of current.
Priceeach \$6.00

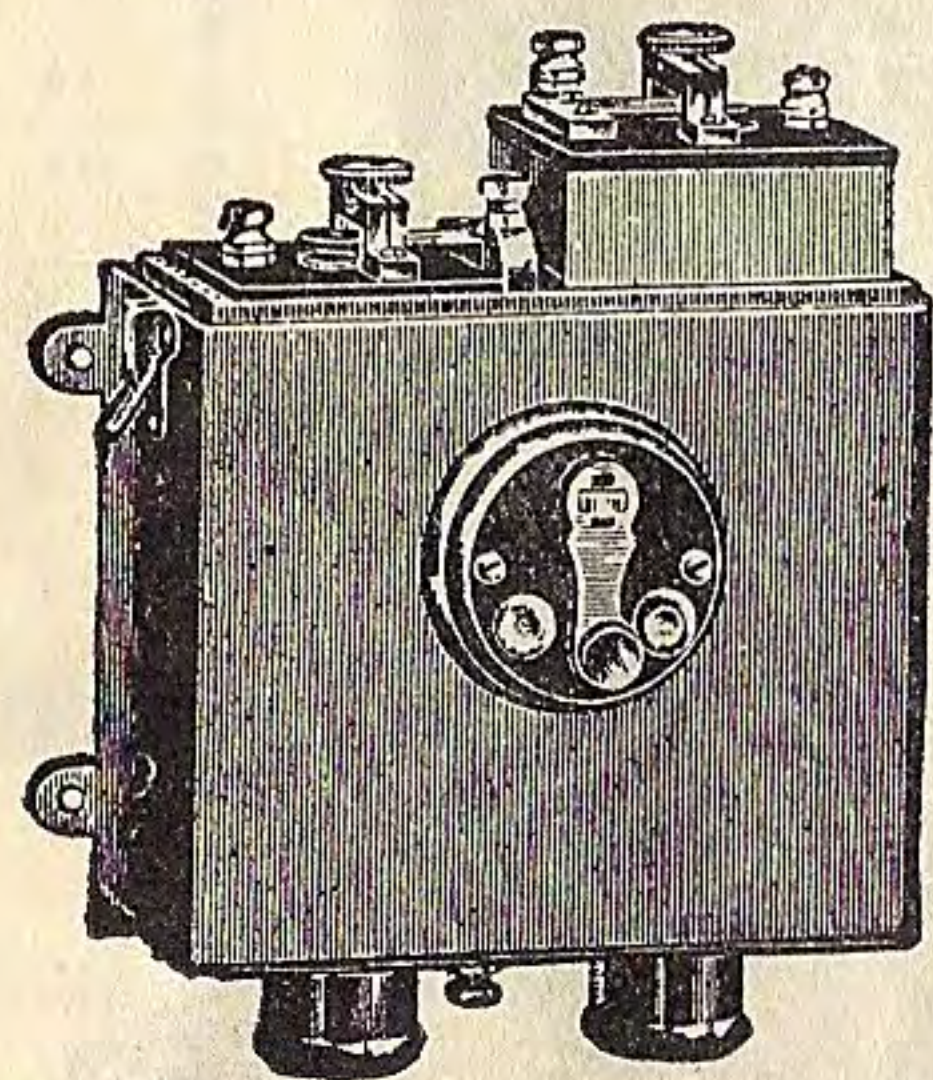


DASH COILS

Great Efficiency, Perfect Unit System

All Units are interchangeable and can be removed without disconnecting a wire.

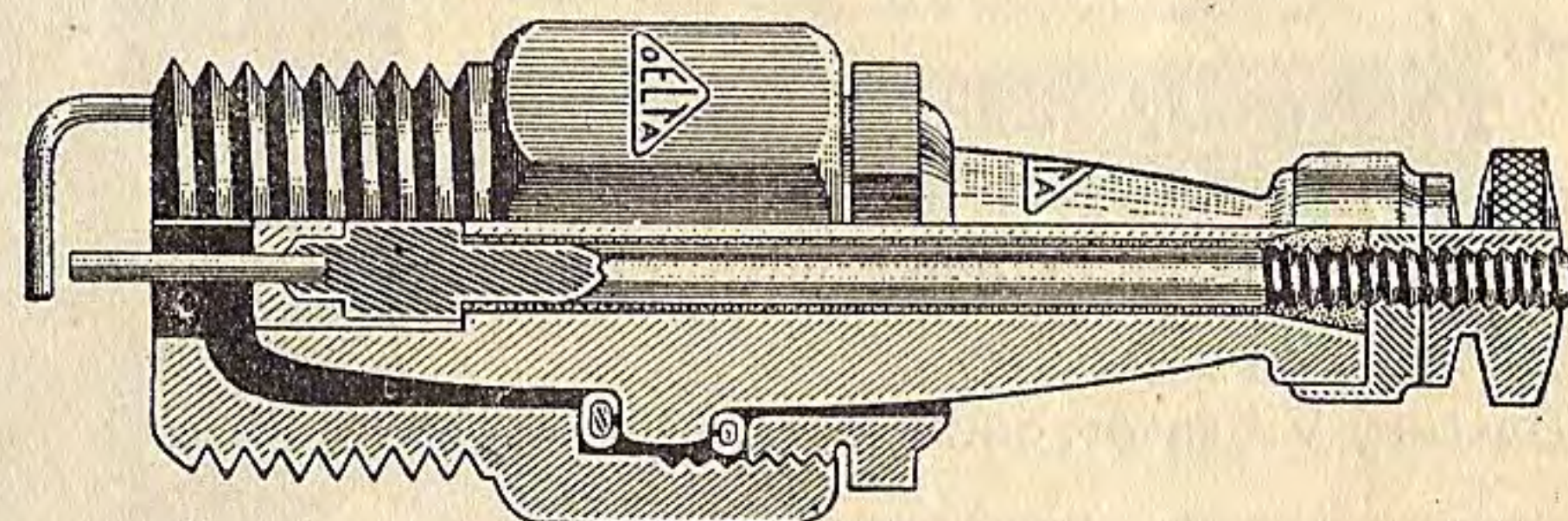
1 Cylinder, with Switch.....	each	\$17.00
2 " " "	"	26.00
3 " " "	"	37.00
4 " " "	"	48.00
6 " " "	"	70.00



DELTA SPARK PLUGS

It is practically impossible to short-circuit this Plug even under the most trying conditions, and it is especially recommended for use where other Plugs have failed to give satisfaction. Can be furnished with Porcelain or Mica Core at same price, but when not otherwise specified we ship Porcelain. All Cores are interchangeable.

(Quality that makes friends.)



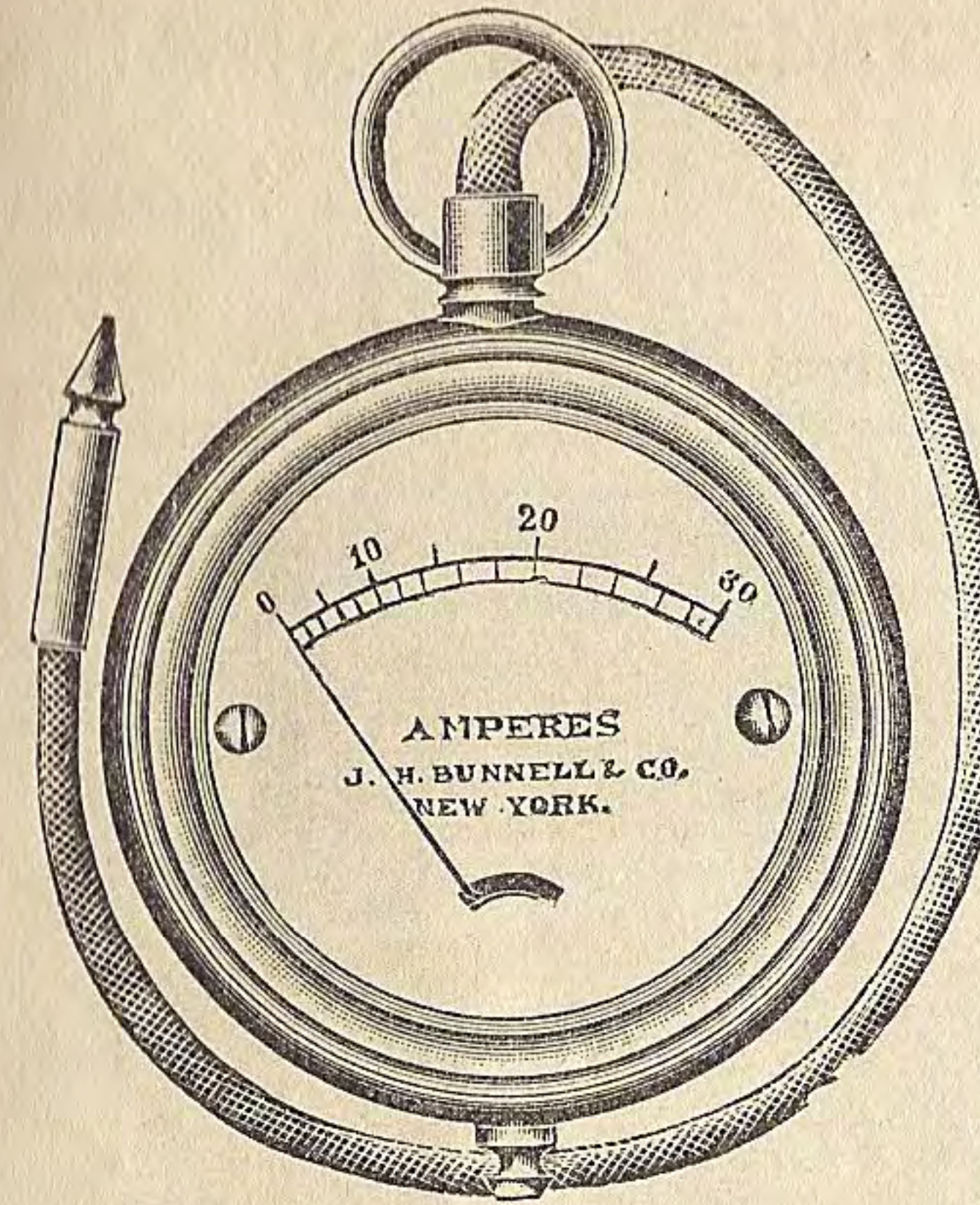
Made in all size threads.

Price	each	\$1.20
Porcelain Core only.....	"	.60
Mica Core only.....	"	.65

POCKET AMMETER.

Will show exact condition of your batteries. Has a range of from 0 to 30 Amperes, but are not recommended for storage batteries.

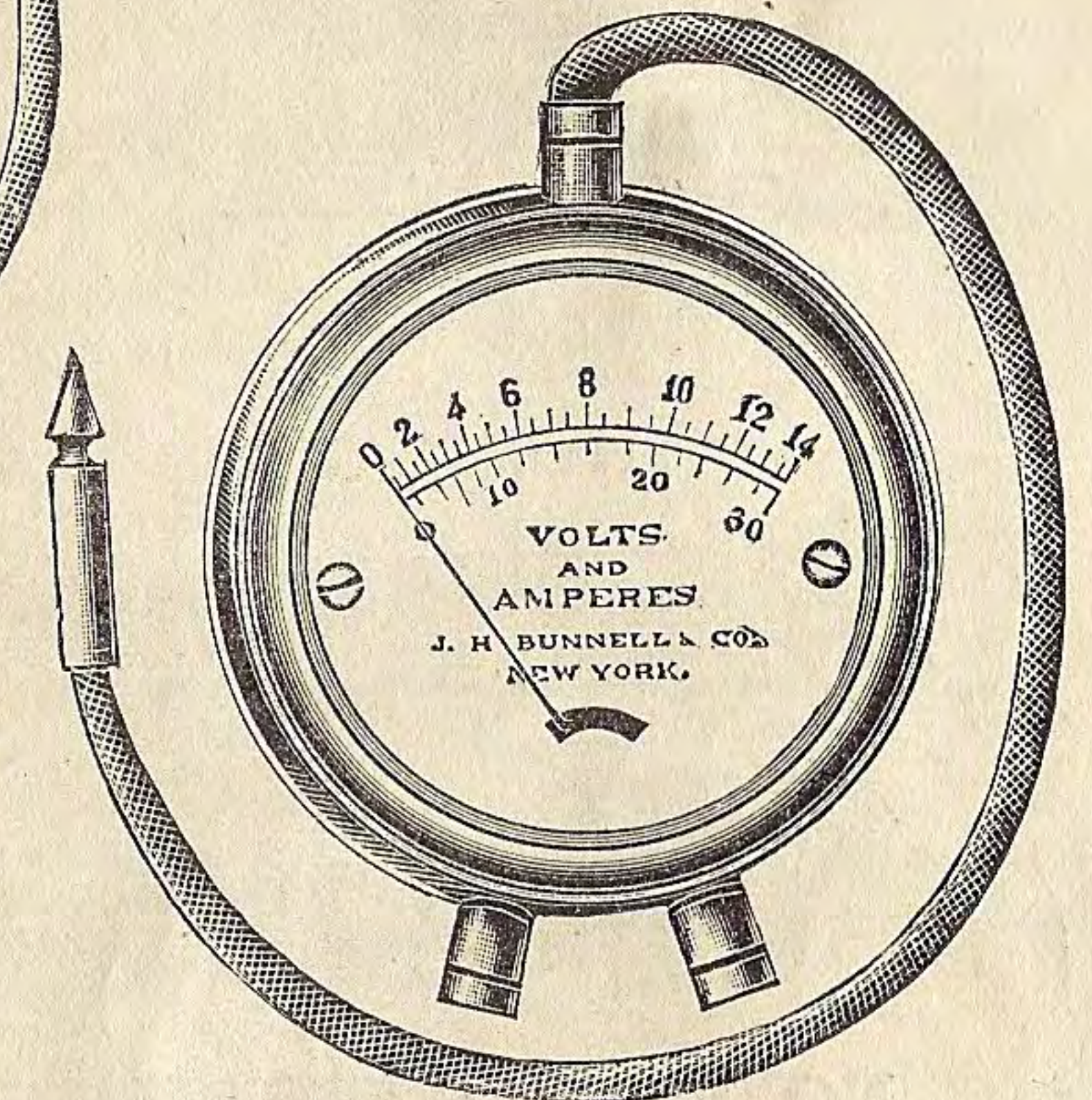
Price.....each \$3 00



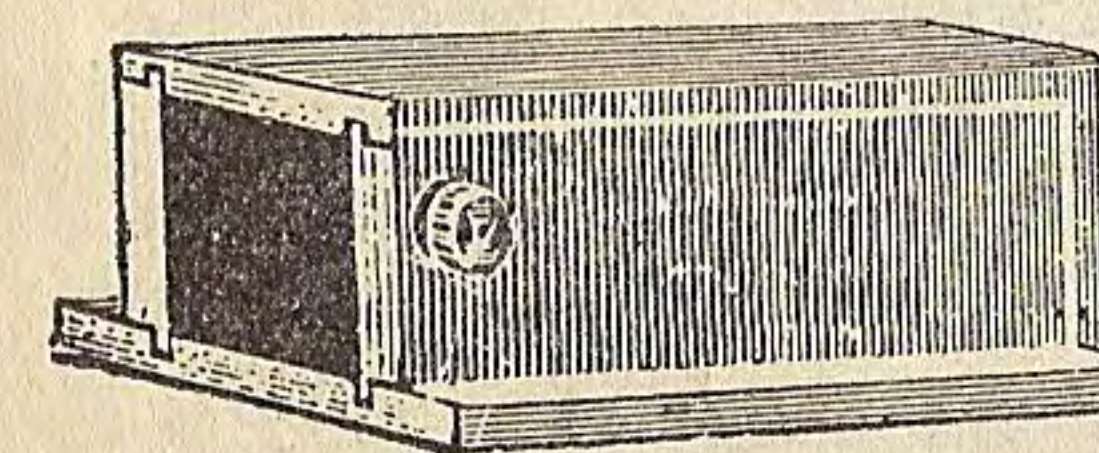
Combination Volt-Ammeter.

Range 0 to 14 Volts, 0 to 30 Amperes. The Voltage side is used for Storage Batteries. The Ampere side is used for Dry Batteries.

Guaranteed for one year.
Price.....each \$4 50



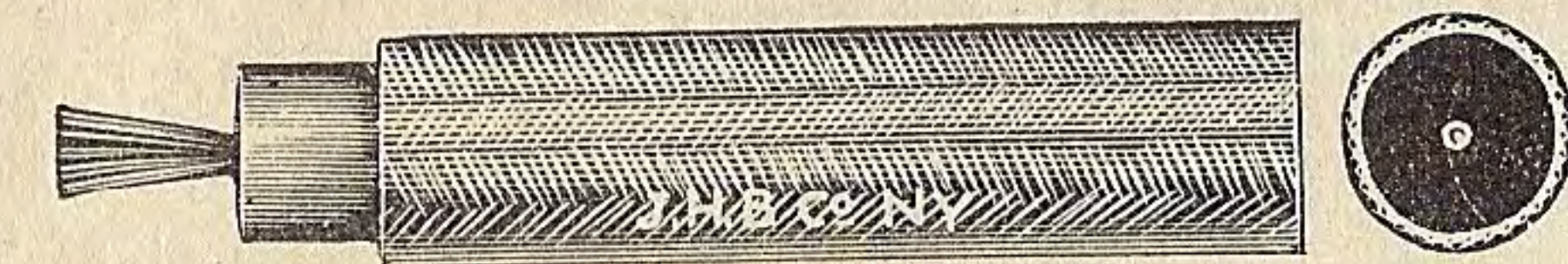
ECONOMY PRIMARY SPARK COILS.



Has the highest efficiency for "Make and Break" or "Wipe" Spark ignition, and is used most generally for stationary or marine engines. In oak box filled with waterproof compound. Size 6½x2¾x2¾ inches. Consumes less current than any other coil on the market, requiring but 1½ Ampere of current at six Volts pressure to produce a hot "fat" spark.

Priceeach \$2 50

SECONDARY AUTOMOBILE CABLE.



Is made of fine copper strands, with a heavy covering of semi-cured India Rubber, which is protected by three outer braids, each in turn being coated with a special enamel and baked. Price per foot . . . \$0 20

PRIMARY AUTOMOBILE CABLE.

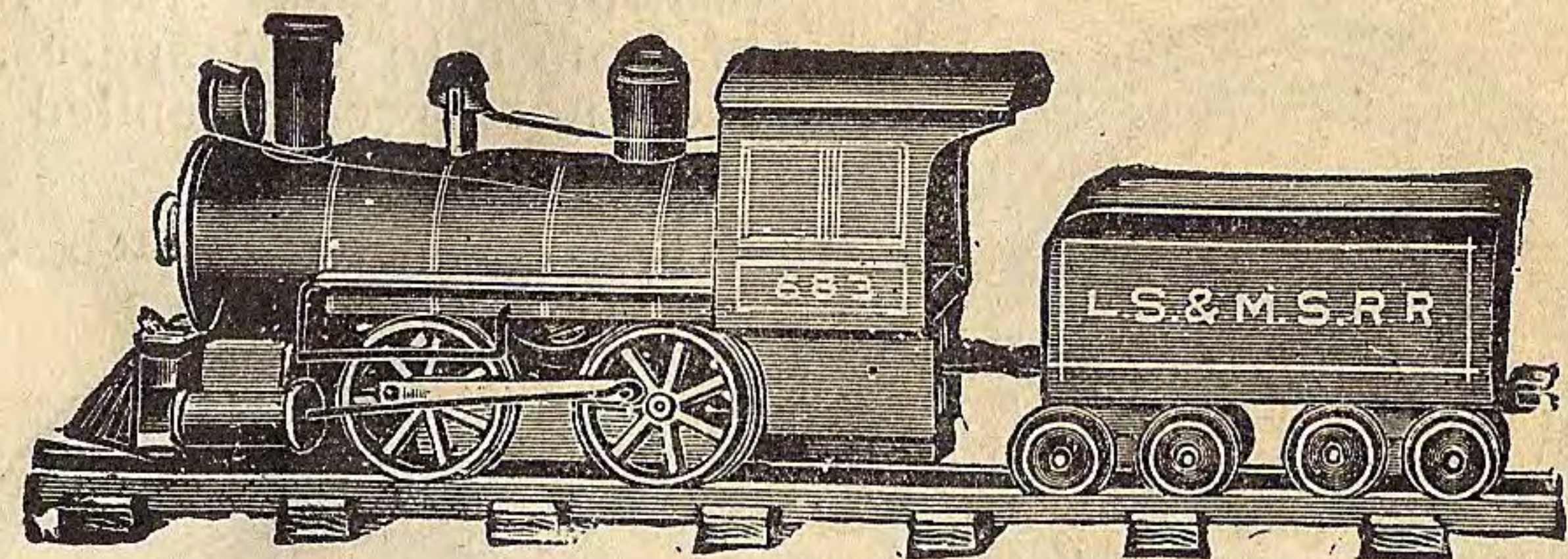
Is made of fine copper strands, with a heavy rubber covering, protected by two outer braids. Price, per foot . . . \$0 08

NO. 4 ELECTRIC LOCOMOTIVE ONLY

8 to 10 Volts

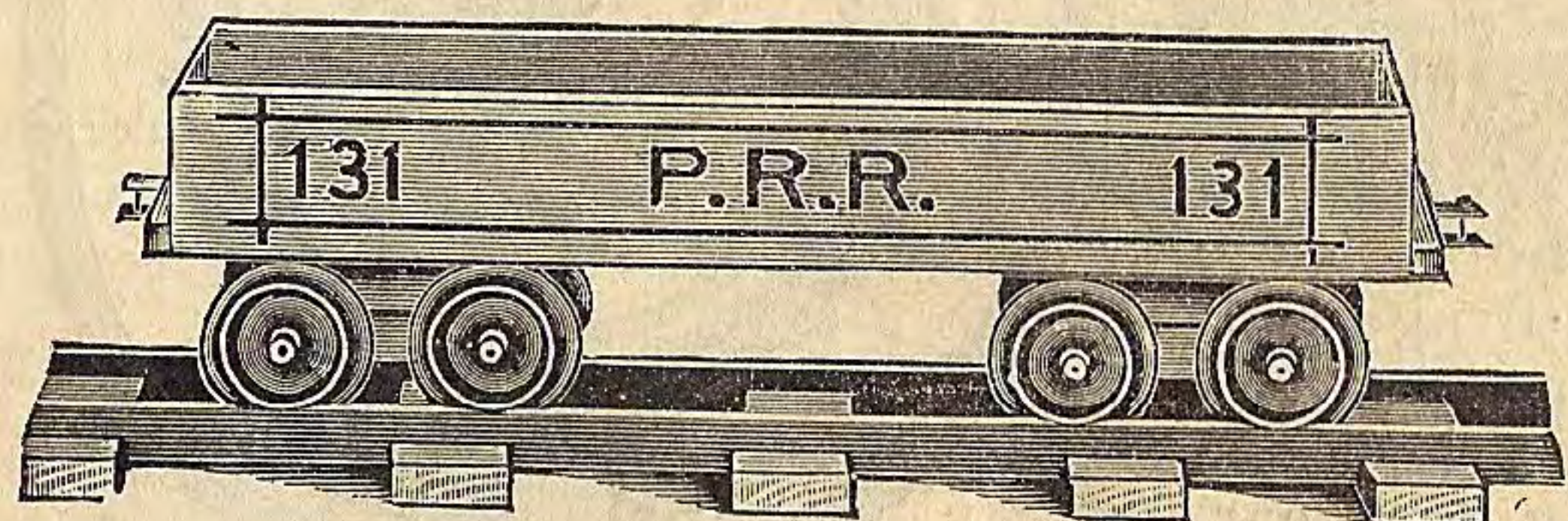
PRICE \$13.00

3/4 Amp.



No battery or track is included at above price.

NO. 11 GONDOLA FLAT CAR



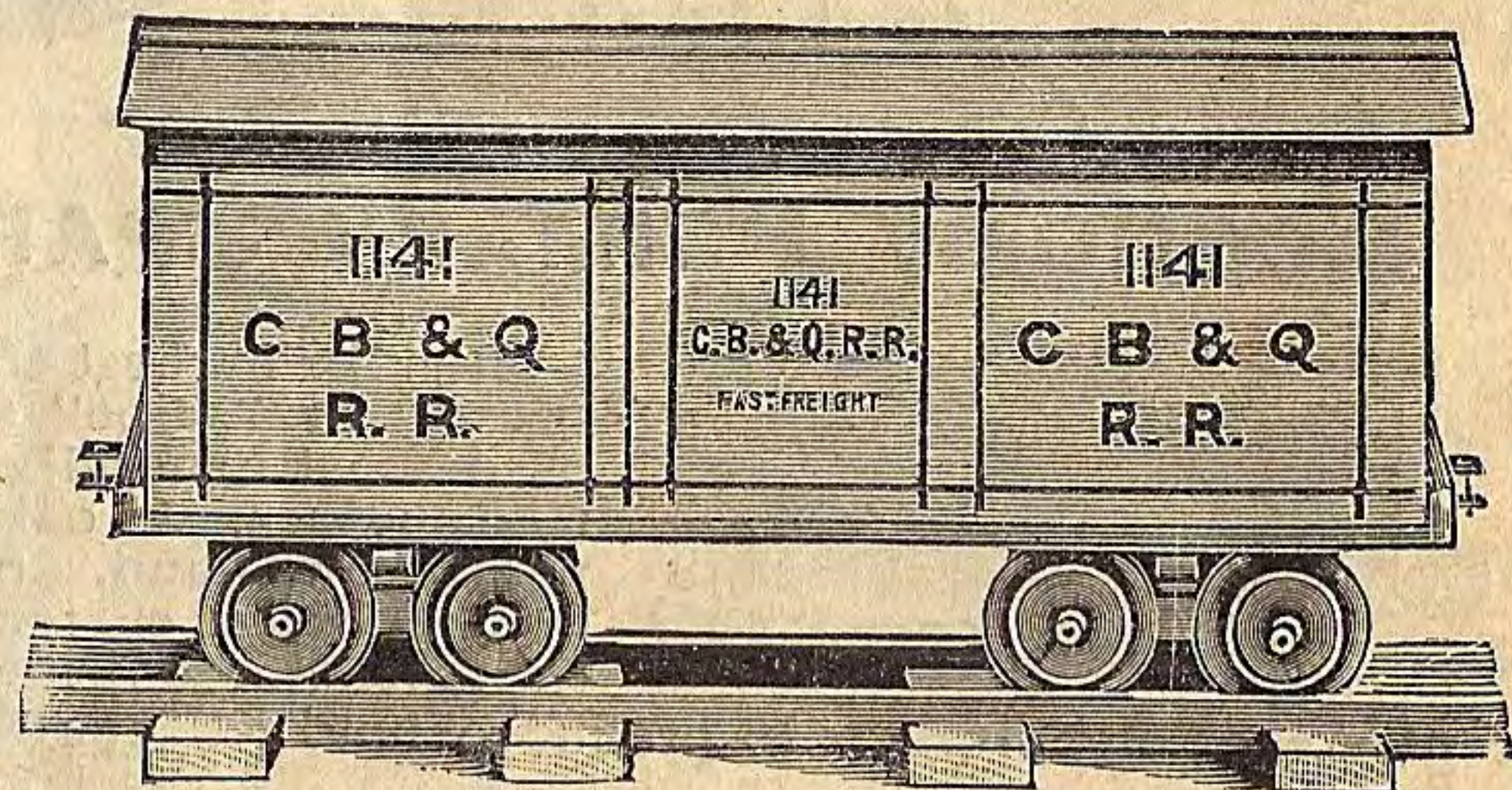
Made of heavy tin, with iron wheels, 1 inch in diameter; length, 10 inches; height, 2 5/8 inches; width, 3 inches.

Price\$1.20

NO. 12 BOX CAR.

Made of heavy tin, with 1-inch iron wheels, sliding doors, etc.; strong and durable; length, 10 inches; height, 4 3/4 inches; width, 3 inches.

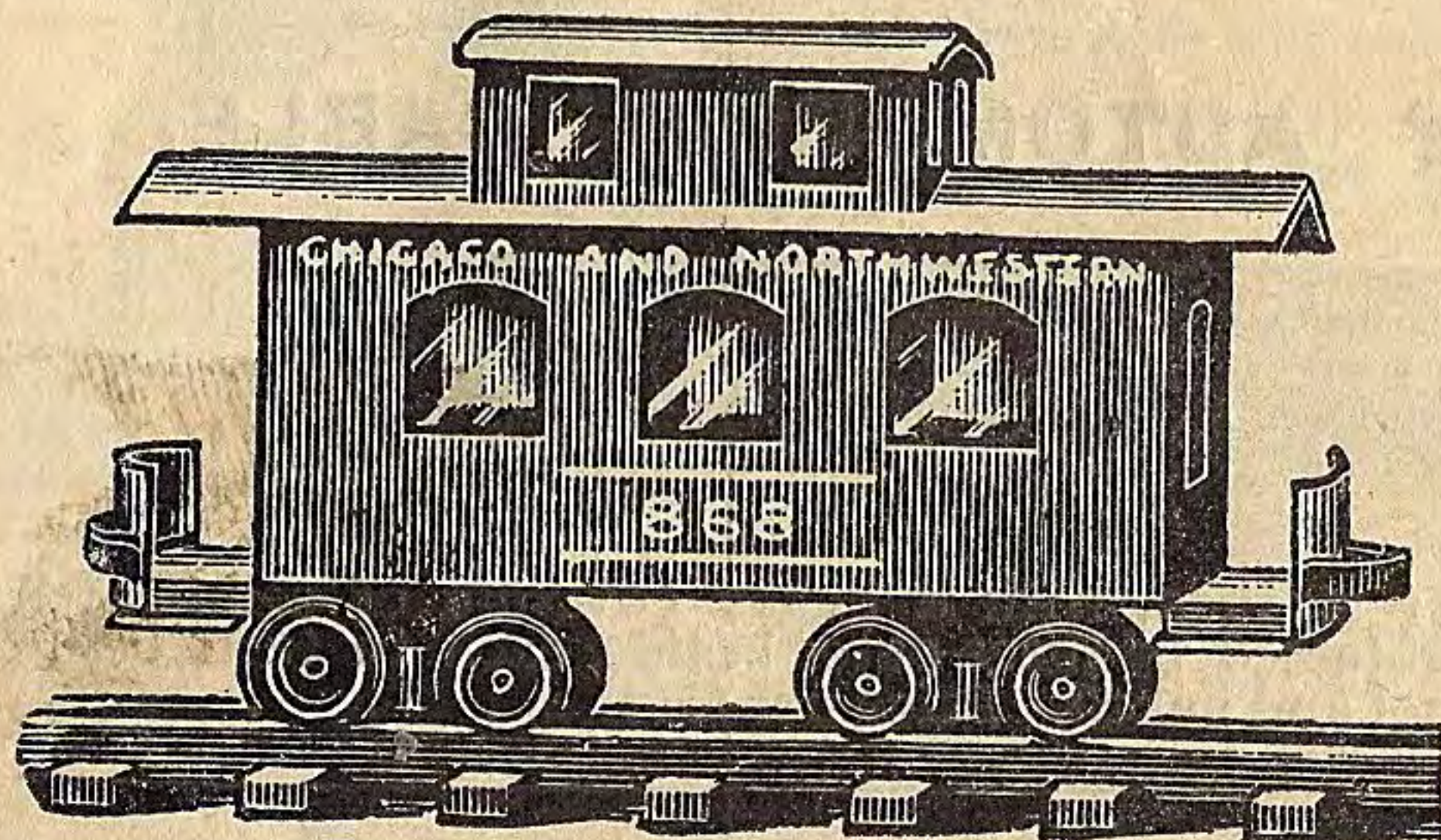
Price\$2.40



NO. 46 CABOOSE

Made of heavy tin, with 1-inch iron wheels; very strong and substantial; length, 10 inches; height, 5 1/2 inches; width, 3 inches.

Price\$2.40



Illustrated Descriptive Catalogue of Miniature Electric Railways Sent Free on Application.

No. 3 COAL MINING LOCOMOTIVE AND TRAIN:

5 to 6 Volts.

PRICE, \$11.50

3/4 Amp



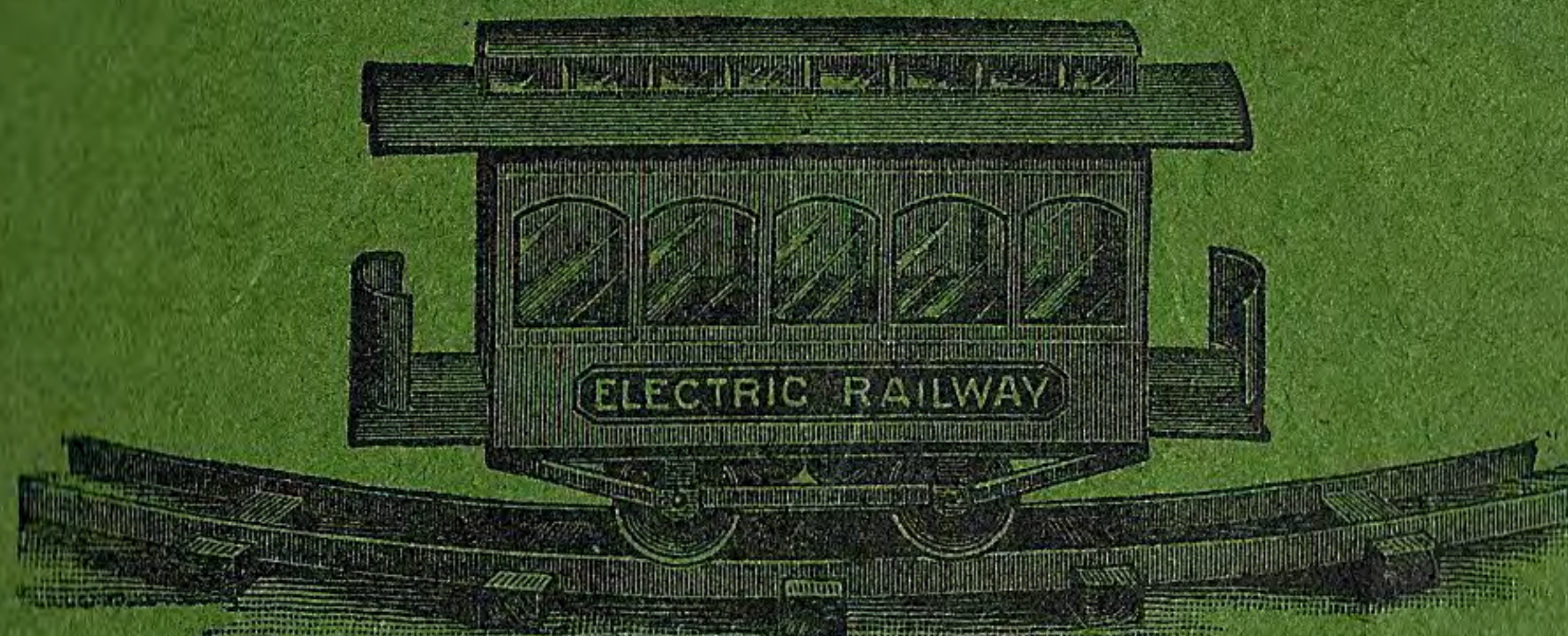
The equipment consists of locomotive, three coal cars, 18 feet of 2-inch gauge track, and four dry batteries. Coal cars are iron, with iron wheels. They will stand hard usage.

No. 42 ELECTRIC RAILWAY.

4 to 5 Volts.

PRICE, \$9.40

1/2 Amp.



A reversing switch enables the operator to run the car backwards or forwards, or start and stop it at will.

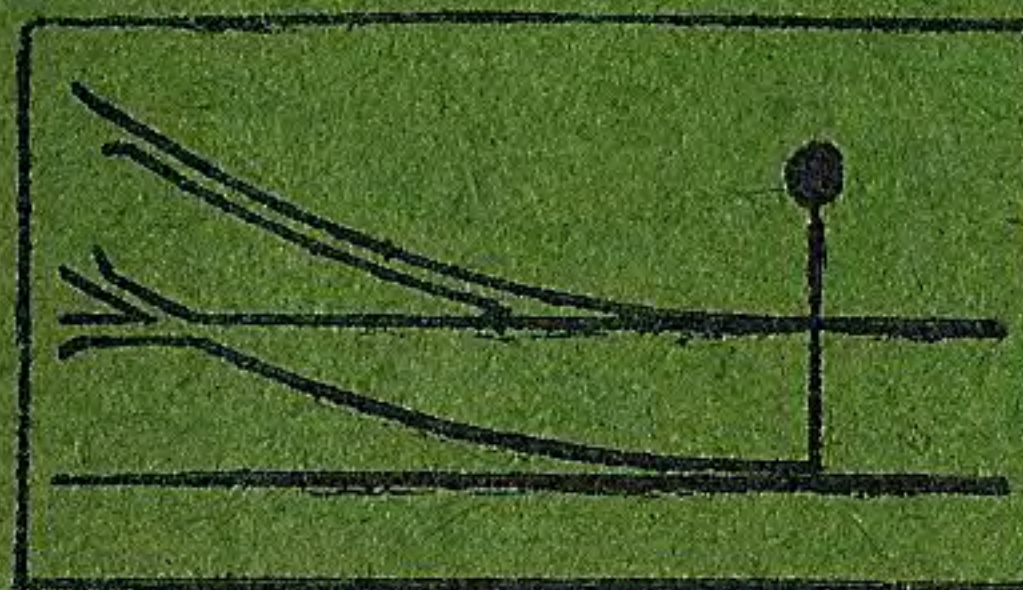
The complete equipment consists of car, 9 feet of track and 4 cells of dry battery.

MOTOR CAR ONLY, \$6.70

Trail car, same size as motor car, \$1.00

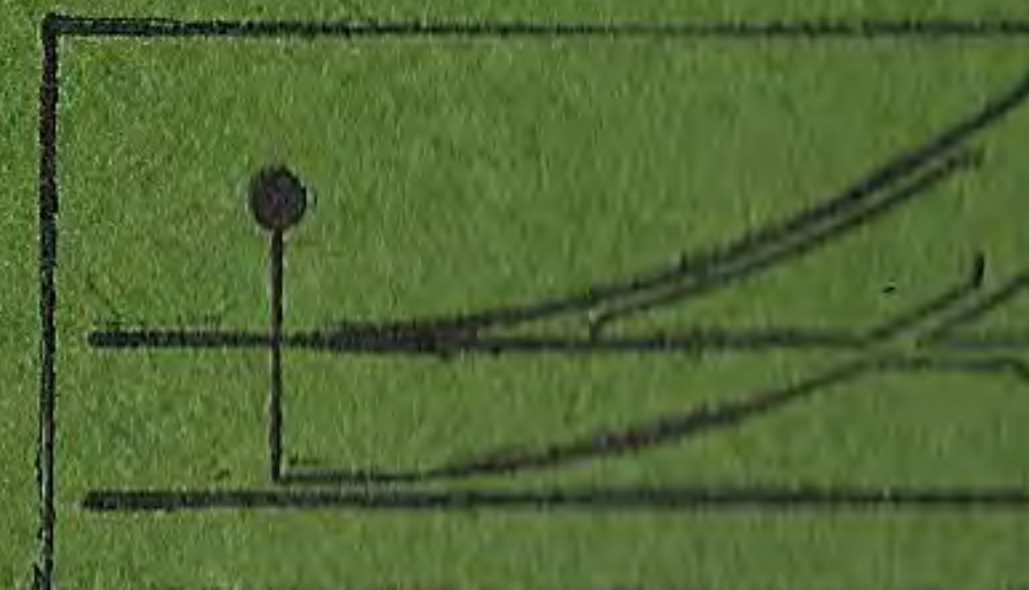
No. 10-R Switch.

Price \$1.50



No. 10-L Switch.

Price \$1.50



Track and Ties in 9 ft. lengths, Price 70 cents.

Discount 50%

NOTICE

A 50% discount will be allowed from the list prices in this, 28th edition of our Telegraph Manual.

The net prices do not cover transportation charges.

The net amounts of postage required on mailable articles are stated. There is no discount from postage rates.

All prices are subject to change without notice.

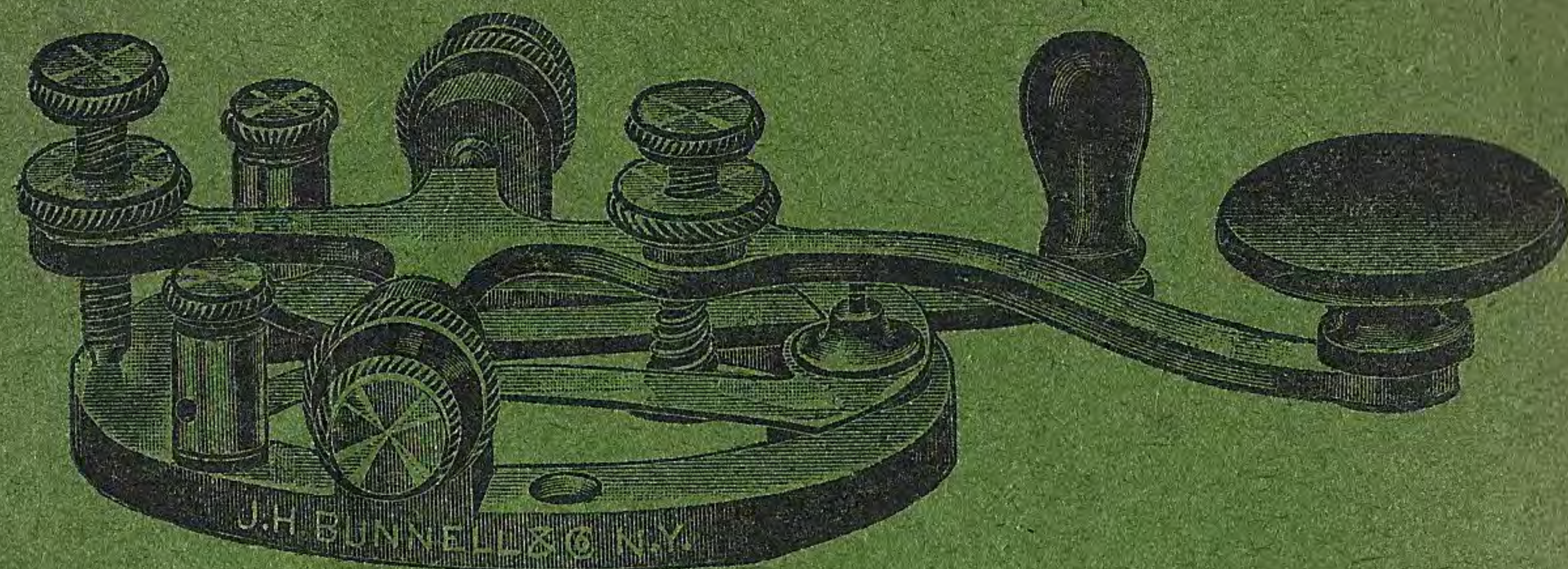
NO GOODS SENT C. O. D.

Remittances should be made by Money Order or Registered Letter. If remittances is made by uncertified check, shipment will be delayed.

J. H. BUNNELL & CO., Inc.

20 Park Place, New York.

STEEL LEVER SOLID TRUNNION KEYS.



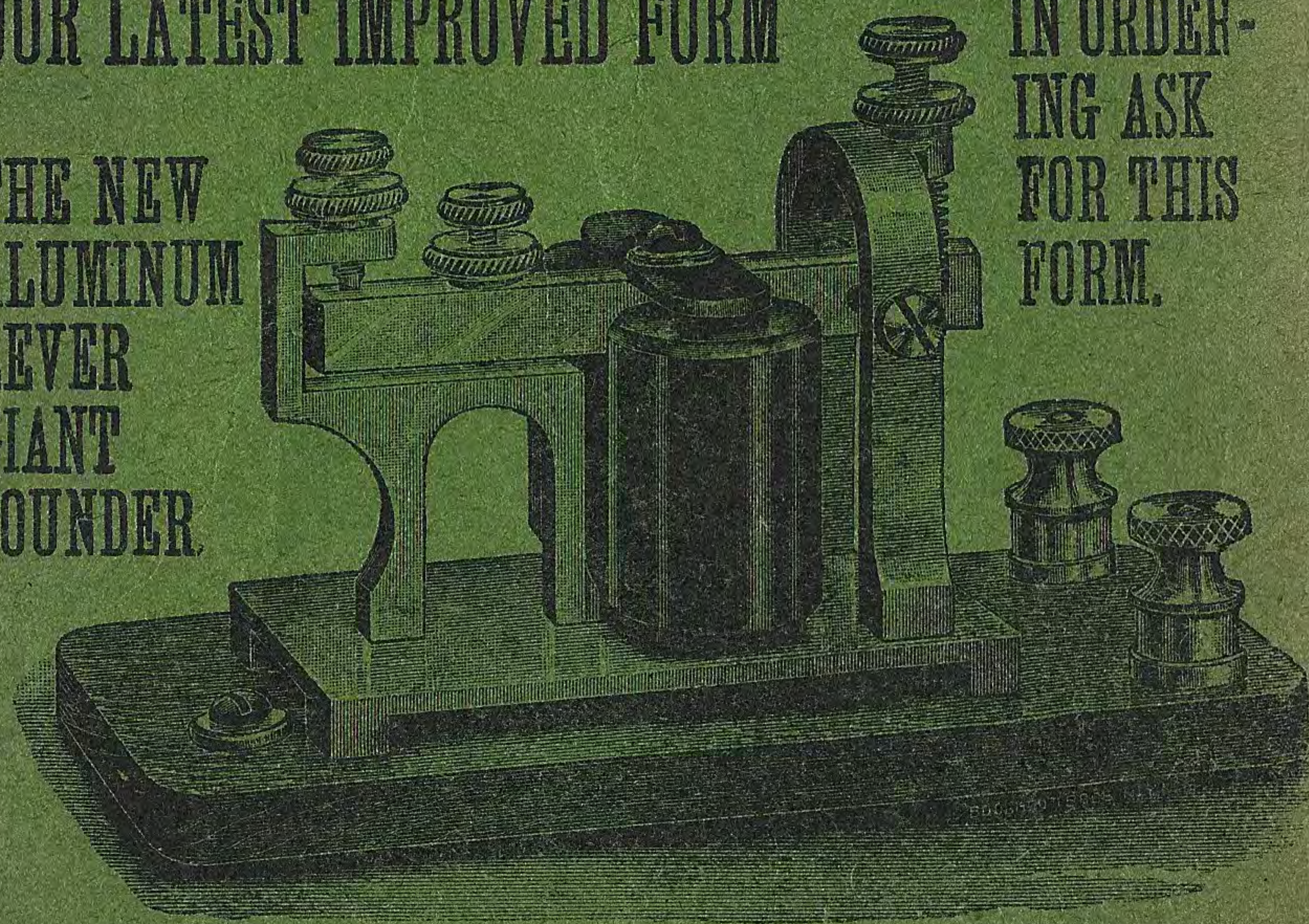
Leg Pattern.....Each, \$1.90
Postage extra (Net), 12 cents.

Legless Pattern.....Each, \$2.10
Postage extra (Net), 10 cents.

OUR LATEST IMPROVED FORM

THE NEW
ALUMINUM
LEVER
GIANT
SOUNDER.

IN ORDER-
ING ASK
FOR THIS
FORM.



Price, 4 Ohm.....\$2.80

“ 20 “ 3.00

Postage extra (Net) 26 cents.