

THE "HOW-TO-DO-IT" BOOKS

ELECTRICITY FOR BOYS

**A working guide, in the successive
steps of electricity, described in
simple terms**

WITH MANY ORIGINAL ILLUSTRATIONS

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CARPENTRY FOR BOYS

PRACTICAL MECHANICS FOR BOYS

Extract:

Chapter IX. "The Telegraph"

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CHAPTER IX

THE TELEGRAPH

THE telegraph is a very simple instrument. The key is nothing more or less than a switch which turns the current on and off alternately.

The signals sent over the wires are simply the audible sounds made by the armature, as it moves to and from the magnets.

MECHANISM IN TELEGRAPH CIRCUITS.—A telegraph circuit requires three pieces of mechanism at each station, namely, a key used by the sender, a sounder for the receiver, and a battery.

THE SENDING KEY.—The base of the sending instrument is six inches long, four inches wide, and three-quarters of an inch thick, made of wood, or any suitable non-conducting material. The key (A) is a piece of brass three-eighths by one-half inch in thickness and six inches long. Midway between its ends is a cross hole, to receive the pivot pin (B), which also passes through a pair of metal brackets (C, D), the bracket C having a screw to hold one of the line wires, and the other bracket having a metal switch (E) hinged thereto. This switch bar, like the brackets, is made of

brass, one-half inch wide by one-sixteenth of an inch thick.

Below the forward end of the key (A) is a cross bar of brass (F), screwed to the base by a screw at one end, to receive the other line wire. Directly below the key (A) is a screw (G), so that the key will strike it when moved downwardly. The other end of the bar (F) contacts with the forward end of the switch bar (E) when the latter is moved inwardly.

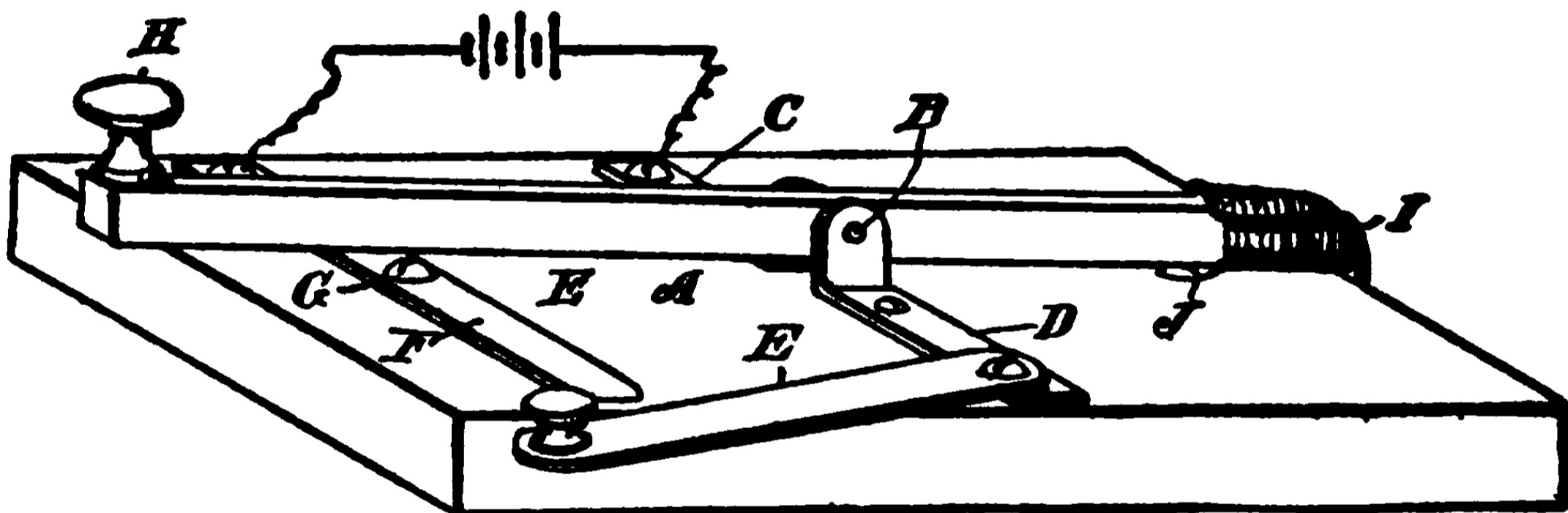


Fig. 67.

TELEGRAPH SENDING KEY

The forward end of the key (A) has a knob (H) for the fingers, and the rear end has an elastic (I) attached thereto which is secured to the end of the base, so that, normally, the rear end is held against the base and away from the screw head (G). The head (J) of a screw projects from the base at its rear end. Key A contacts with it.

When the key A contacts with the screw heads

G, J, a click is produced, one when the key is pressed down and the other when the key is released.

You will notice that the two plates C, F are connected up in circuit with the battery, so that, as the switch E is thrown, so as to be out of contact, the circuit is open, and may be closed either

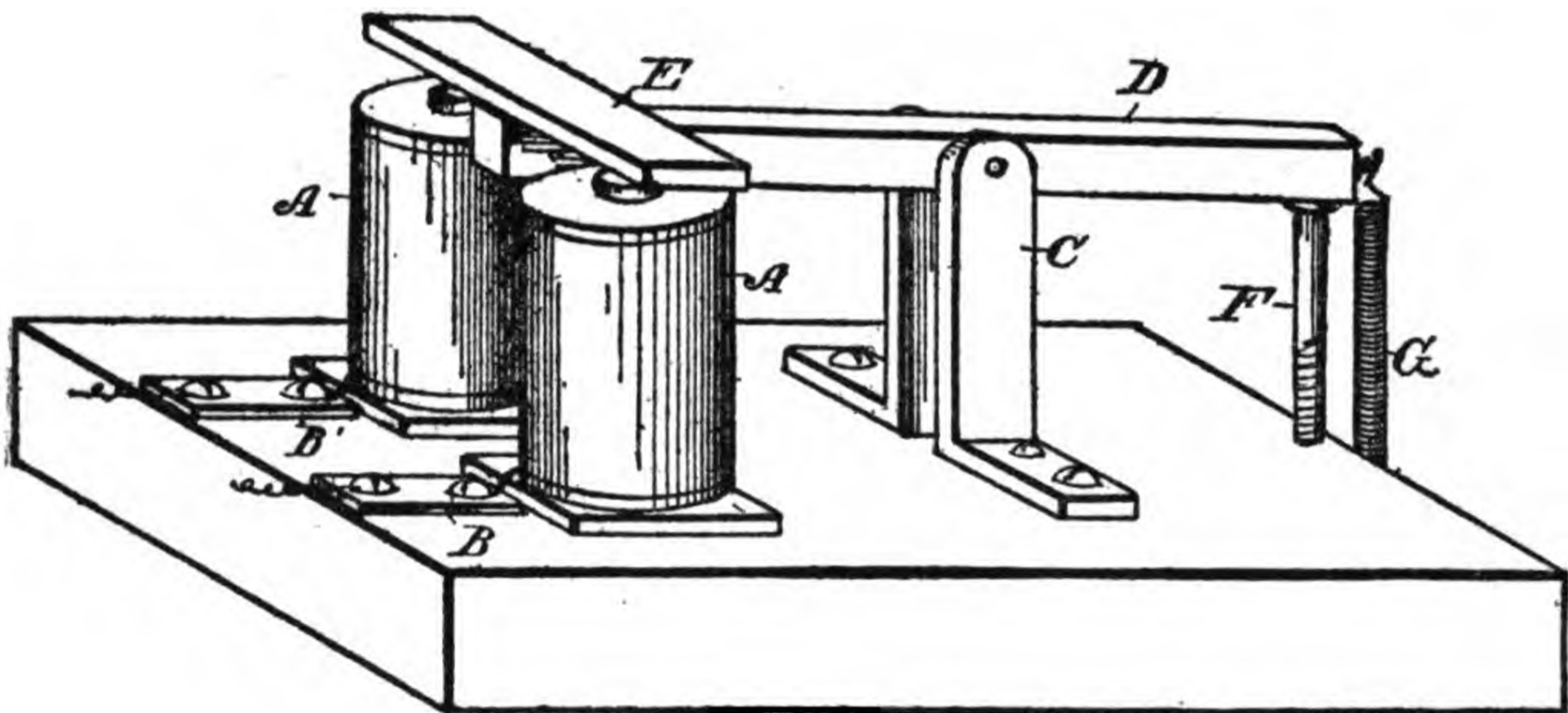


Fig. 68.

TELEGRAPH SOUNDER

by the key A or the switch E. The use of the switch will be illustrated in connection with the sounder.

When the key A is depressed, the circuit of course goes through plate C, key A and plate F to the station signalled.

THE SOUNDER.—The sounder is the instrument which carries the electro-magnet.

In Fig. 68 this is shown in perspective. The base is six inches long and four inches wide, be-

ing made, preferably, of wood. Near the forward end is mounted a pair of electro-magnets (A, A), with their terminal wires connected up with plates B, B', to which the line wires are attached.

Midway between the magnets and the rear end of the base is a pair of upwardly projecting brackets (C). Between these are pivoted a bar (D), the forward end of which rests between the magnets and carries, thereon, a cross bar (E) which is directly above the magnets, and serves as the armature.

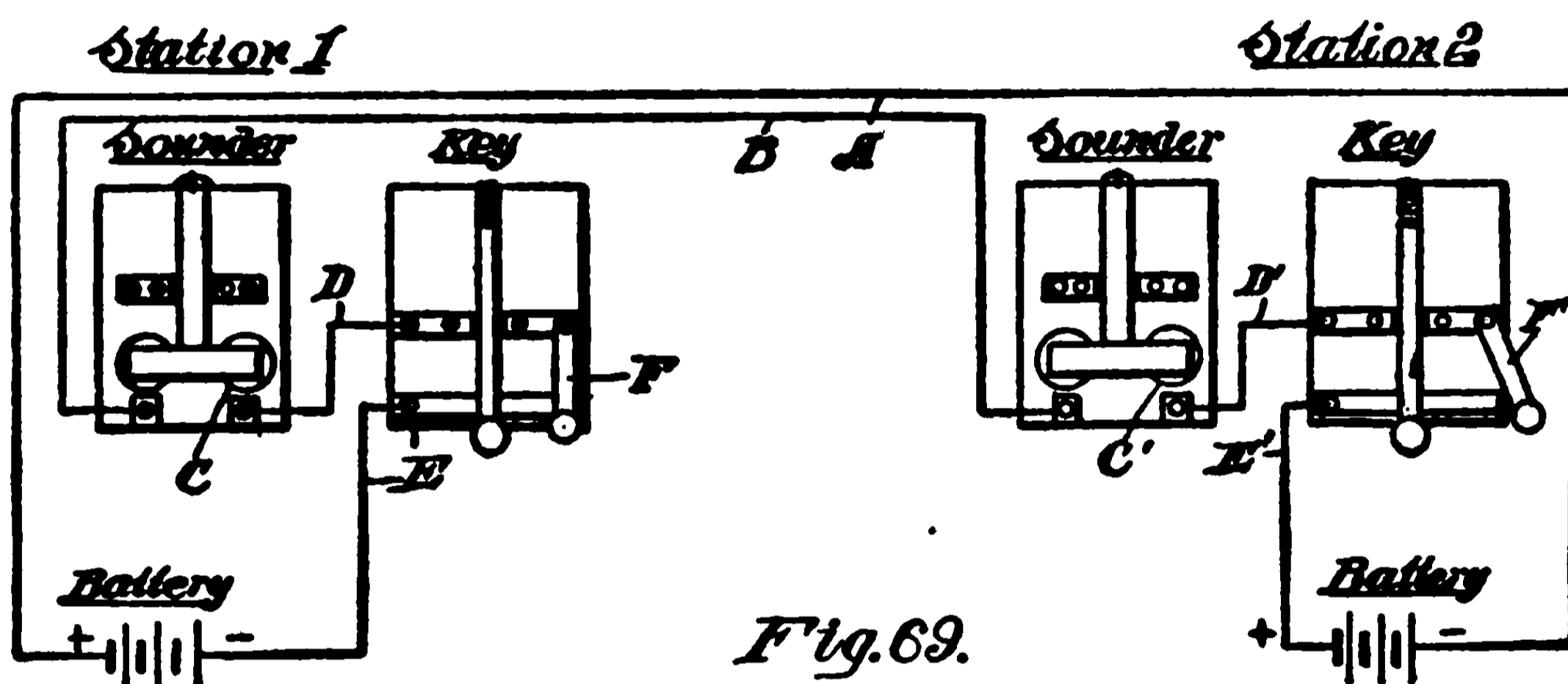
The rear end of the base has a screw (F) directly beneath the bar D of such height that when the rear end of the bar D is in contact therewith the armature E will be out of contact with the magnet cores (A, A). A spiral spring (G) secured to the rear ends of the arm and to the base, respectively, serves to keep the rear end of the key normally in contact with the screw F.

CONNECTING UP THE KEY AND SOUNDER.—Having made these two instruments, we must next connect them up in the circuit, or circuits, formed for them, as there must be a battery, a key, and a sounder at each end of the line.

In Fig. 69 you will note two groups of those instruments. Now observe how the wires connect them together. There are two line wires, one (A) which connects up the two batteries, the wire

being attached so that one end connects with the positive terminal of the battery, and the other end with the negative terminal.

The other line wire (B), between the two stations, has its opposite ends connected with the terminals of the electro-magnet C of the sounders. The other terminals of each electro-magnet are connected up with one terminal of each key by a



A TELEGRAPH CIRCUIT

wire (D), and to complete the circuit at each station, the other terminal of the key has a wire (E) to its own battery.

TWO STATIONS IN CIRCUIT.—The illustration shows station 2 telegraphing to station 1. This is indicated by the fact that the switch F' of that instrument is open, and the switch F of station 1 closed. When, therefore, the key of station 2 is depressed, a complete circuit is formed

which transmits the current through wire E' and battery, through line A, then through the battery of station 1, through wire E to the key, and from the key, through wire D, to the sounder, and finally from the sounder over line wire B back to the sounder of station 2, completing the circuit at the key through wire D'.

When the operator at station 2 closes the switch F', and the operator at station 1 opens the switch F, the reverse operation takes place. In both cases, however, the sounder is in at both ends of the line, and only the circuit through the key is cut out by the switch F, or F'.

THE DOUBLE CLICK.—The importance of the double click of the sounder will be understood when it is realized that the receiving operator must have some means of determining if the sounder has transmitted a dot or a dash. Whether he depresses the key for a dot or a dash, there must be one click when the key is pressed down on the screw head G (Fig. 62), and also another click, of a different kind, when the key is raised up so that its rear end strikes the screw head J. This action of the key is instantly duplicated by the bar D (Fig. 68) of the sounder, so that the sounder as well as the receiver knows the time between the first and the second click, and by that means he learns that a dot or a dash is made.

ILLUSTRATING THE DOT AND THE DASH.—To illustrate: Let us suppose, for convenience, that the downward movement of the lever in the key, and the bar in the sounder, make a sharp click, and the return of the lever and bar make a dull click. In this case the ear, after a little practice, can learn readily how to distinguish the number of downward impulses that have been given to the key.

The Morse Telegraph Code

A . —	N — .	&
B —	O — — —	1 . — — .
C	P	2 . . — . .
D — . .	Q . . — .	3 . . . — .
E .	R	4 —
F . — .	S	5 — — —
G — — .	T —	6
H	U . . —	7 — — . .
I . .	V . . . —	8 —
J — . — .	W . — —	9 — . . —
K — . —	X . — . .	0 — — — —
L —	Y	
M — —	Z	

EXAMPLE IN USE.—Let us take an example in the word “electrical.”

E L E C T R I C A L
 . — — — —

The operator first makes a dot, which means a sharp and a dull click close together; there is then a brief interval, then a lapse, after which there is a sharp click, followed, after a comparatively longer interval, with the dull click. Now a dash by itself may be an L, a T, or the figure 0, dependent upon its length. The short dash is T, and the longest dash the figure 0. The operator will soon learn whether it is either of these or the letter L, which is intermediate in length.

In time the sender as well as receiver will give a uniform length to the dash impulse, so that it may be readily distinguished. In the same way, we find that R, which is indicated by a dot, is followed, after a short interval, by two dots. This might readily be mistaken for the single dot for E and the two dots for I, were it not that the time element in R is not as long between the first and second dots, as it ordinarily is between the single dot of E when followed by the two dots of I.