E. GRAY.

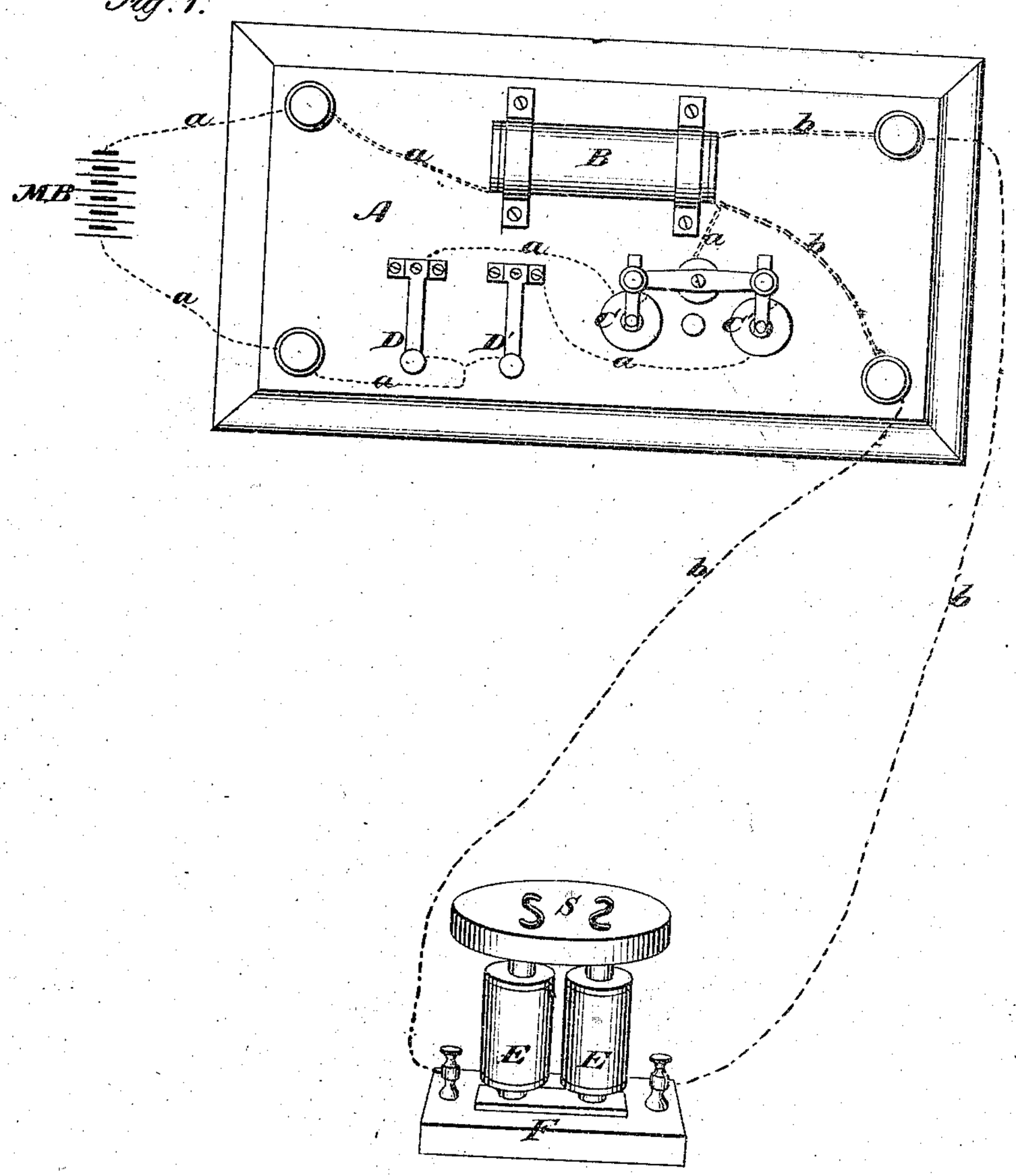
2 Sheets--Sheet 1.

Electric Telegraph for Transmitting Musical Tones.

No. 166,095.

Patented July 27, 1875.

Fig. 1.



Witnesses.
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Ewell & Wick

Inventor.
Elisha Gray
by his attorneys
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2 Sheets--Sheet 2.

Electric Telegraph for Transmitting Musical Tones.

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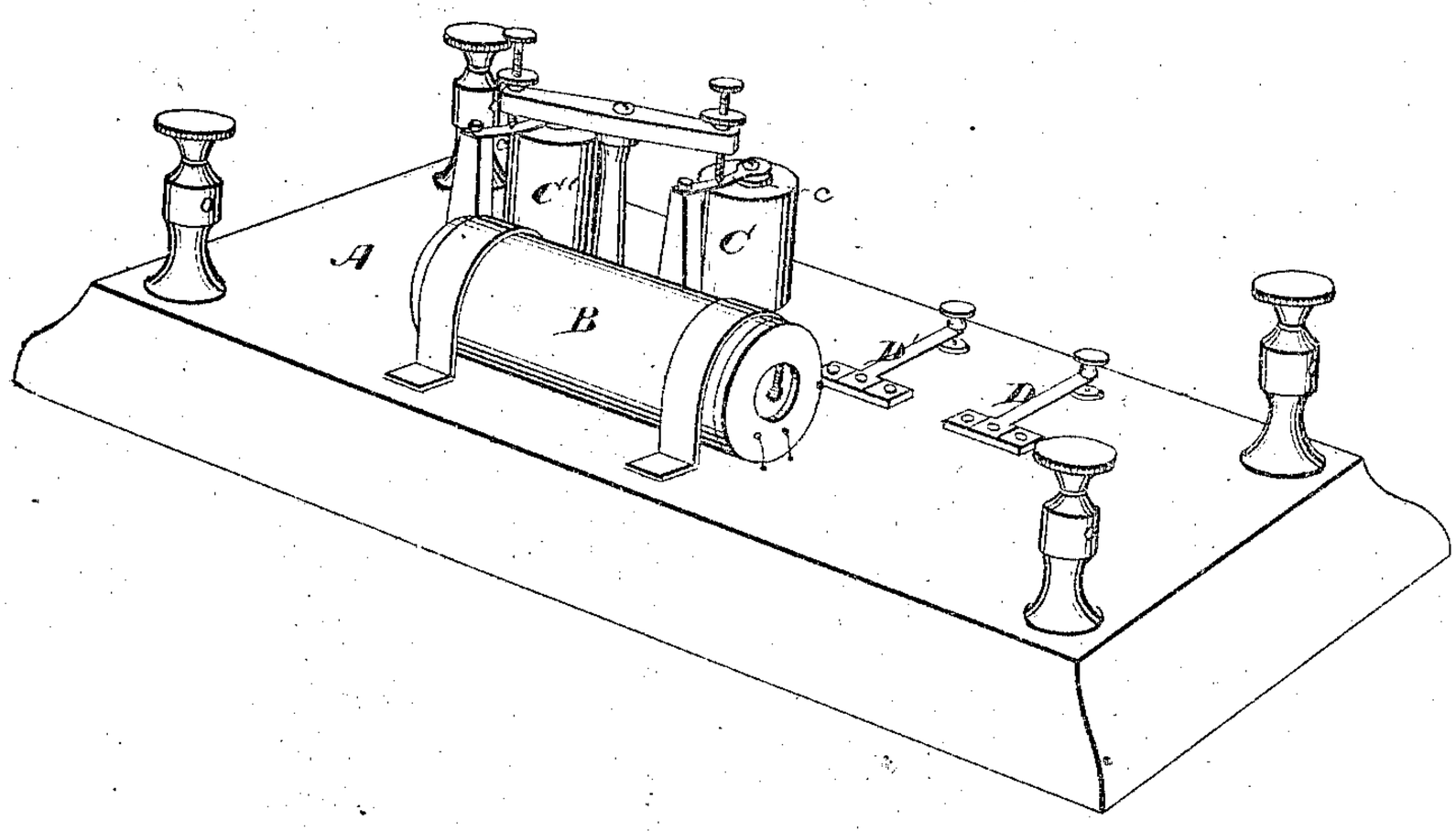
Fig. 2.



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Inventor.

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by his attorneys

A. L. Hayes

UNITED STATES PATENT OFFICE.

ELISHA GRAY, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN ELECTRIC TELEGRAPHS FOR TRANSMITTING MUSICAL TONES.

Specification forming part of Letters Patent No. 166,095, dated July 27, 1875; application filed January 19, 1875.

To all whom it may concern:

Be it known that I, ELISHA GRAY, of Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Apparatus for Transmitting Musical Impressions or Sounds Telegraphically, of which I hereby declare the following to be a full, clear, and exact description.

My invention relates to what I term an "electro-harmonic telegraph," and is based upon the fact well known to electricians that an electro-magnet elongates under the action of the electric current, and contracts again when the current ceases. Consequently a succession of impulses or interruptions will cause the magnet to vibrate, and if these vibrations be of sufficient frequency a musical tone will be produced, the pitch of which will depend upon the rapidity of the vibrations.

I have discovered that by interrupting an electric current at the transmitting end of a line with sufficient frequency to produce a musical tone by an instrument vibrated by said interruptions, and transmitting the impulses thus induced to an electro-magnet at the receiving end of the line, the latter will vibrate synchronously with the transmitting-instrument, and thus produce a musical tone or note of a corresponding pitch. The object of my invention is to utilize this discovery for the transmission of intelligible signals to a distance by electricity; to which end my improvement consists in the combination of a telegraphic circuit, a series of circuit-breakers capable of producing musical tones of different pitch, a series of keys for simultaneously or successively throwing said circuit-breakers into or out of operation, and an electro-magnet receiver, which is thrown into operation by the transmitter, whereby tones of different pitch may be reproduced at the receiving end of the line by the use of a single circuit.

In the accompanying drawings, Figure 1 shows a plan view of the transmitting part of my improved apparatus, the receiver appearing in perspective. Fig. 2 is a view, in perspective, of the transmitter.

The transmitting apparatus is mounted upon a base-board, A, as usual. The induction-coil B has the usual primary and secondary circuits. An ordinary automatic electrotome, C, has a circuit-closing spring, *c*, so adjusted as, when in action, to produce a musical tone according to its length, thickness, and adjustment. A common telegraph-key, D, is placed in the primary circuit to make or break the battery-connection. In the drawings I have shown two electrotomes of identical construction, but of different pitch, and two keys, both the keys and electrotomes being placed in the primary circuit, which is so divided that part of the circuit passes through each key and its corresponding electrotome. The number of electrotomes may be increased, so that tones extending through two or more octaves may be produced. An ordinary electro-magnet is provided at the receiving end of the line.

The operation of the apparatus is as follows: In the arrangement shown in the drawings when a key is closed the primary circuit will pass from the battery H through that key and its corresponding electrotome, and will be automatically interrupted in the usual manner. The spring of the electrotome will thus be caused to vibrate rapidly and to produce a tone, the pitch of which is determined by the rate of vibration. It is obvious that several keys may be depressed simultaneously. These vibrations or interruptions of the current will simultaneously produce in the secondary circuit of the induction-coil a series of induced currents or impulses corresponding in number with the vibrations of the electrotome, and as the receiving electro-magnet is connected with this circuit it will be caused to vibrate, thus producing a tone of corresponding pitch, the sound of which may be intensified by the use of a hollow cylinder, S, of metal, placed on the poles of the magnet.

When a single electrotome is thrown into action, its corresponding tone will be reproduced on the sounder by the magnet. When electrotomes of different pitch are successively operated, their tones will be correspondingly reproduced by the receiver, and when two or more electrotomes are simultaneously sounded the tone of each will still be reproduced without confusion on the sounder, by which means I am enabled to reproduce melodies or tunes.

Mechanical circuit-breakers might be substituted for the automatic vibrating electrotome, hereinbefore described, and I have, in

fact, used such mechanical circuit-breakers of various construction; but I found the electrotome more satisfactory in practice.

In this instance the receiver is shown and described as operated by the induced current of the secondary coil; but the secondary or extra current of a primary coil may be used instead thereof with good effect.

My apparatus is specially adapted to telegraphing on long land and submarine lines. By it letters and signals can be represented by tones differing in pitch; or the ordinary Morse signals can be made by short and long interruptions in a prolonged tone of the same pitch, thus securing great rapidity of transmission.

An application for Letters Patent of the United States, filed by me April 18, 1874, shows an apparatus somewhat similar to the one herein described, for transmitting musical tones through animal tissue to a resonant electrical receiver. I do not, therefore, claim herein anything therein shown. Neither do I claim herein the combination, with a main line, of an intermittent circuit-breaker, or a series thereof, each adapted to throw upon the line a definite number of electrical impulses per unit of time, and a key or keys, one for and controlling each such circuit-breaker, as it constitutes the subject-matter of another application filed by me February 23, 1875. The combination of a telegraphic circuit, an automatic circuit-breaker capable of producing a musical tone, and an electro-magnet receiver which reproduces the tone by being thrown into vibration by impulses generated by the circuit-breaker, is not, broadly, claimed herein, as this combination constitutes a part of the subject-matter of said application, also.

I claim as my own invention—

The combination of a telegraphic circuit, a series of circuit-breakers capable of producing musical tones of different pitch, a series of keys for simultaneously or successively throwing said circuit-breakers into or out of operation, and an electro-magnet receiver, which is thrown into operation by the transmitters, whereby tones of different pitch may be reproduced at the receiving end of the line by the employment of a single circuit.

ELISHA GRAY.

Witnesses:
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WM. J. PEYTON.