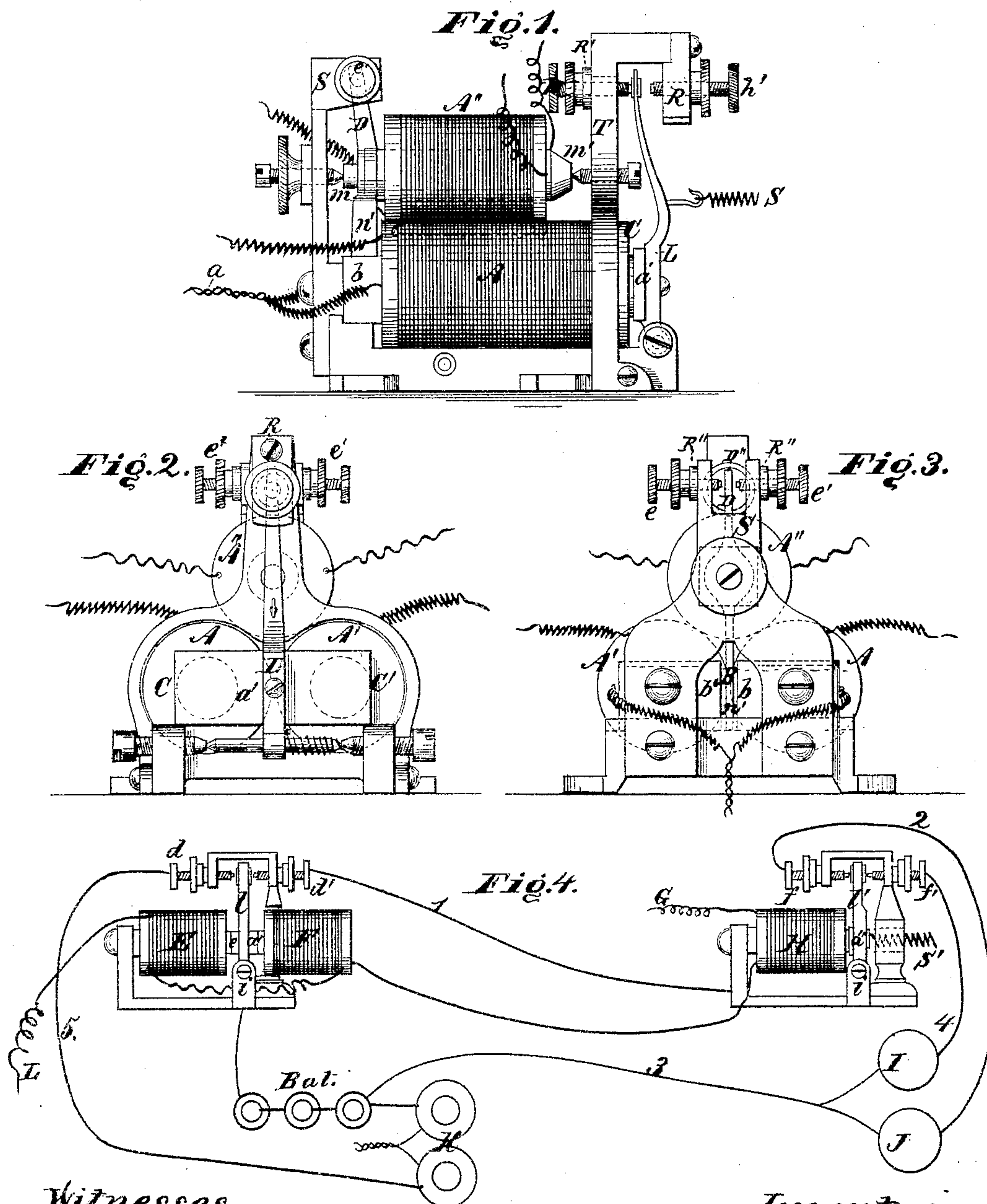


T. M. FOOTE & C. A. RANDALL.

Improvement in Telegraph Apparatus.

No. 129,219.

Patented July 16, 1872.



Witnesses.
 Alonzo Hughes
 A. Moore

Inventor:
 T. M. Foote & C. A. Randall
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 Atty.

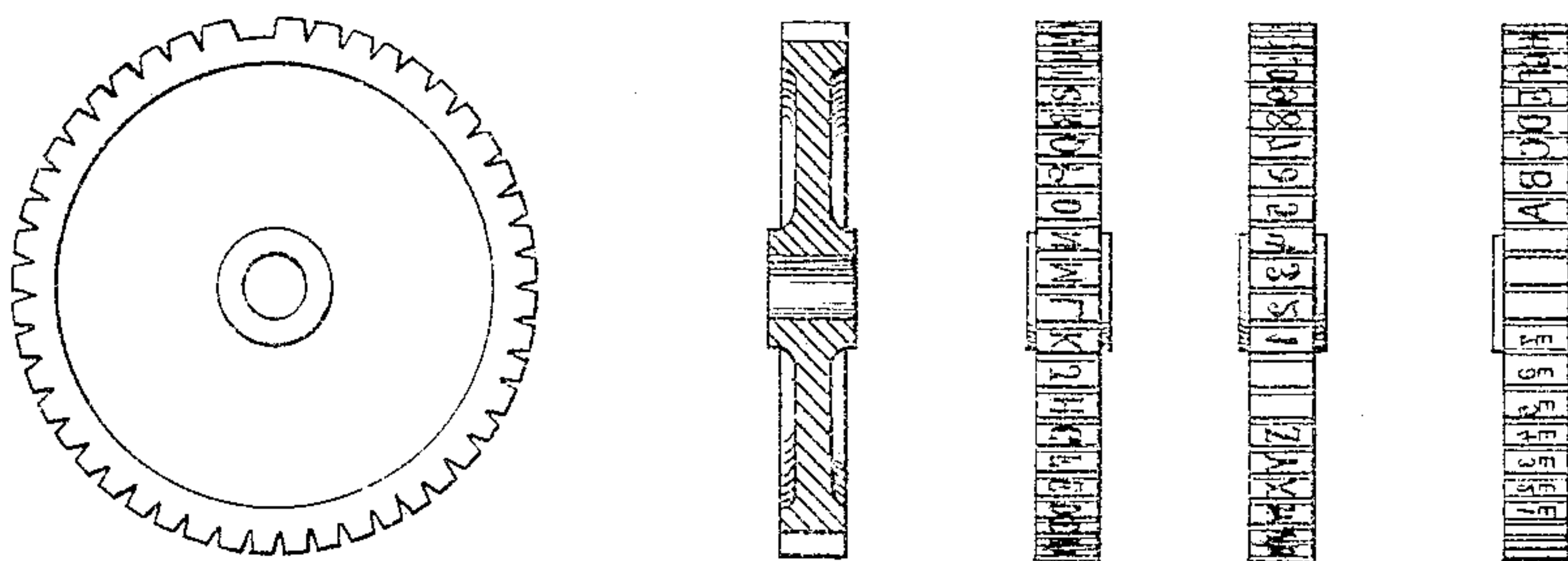
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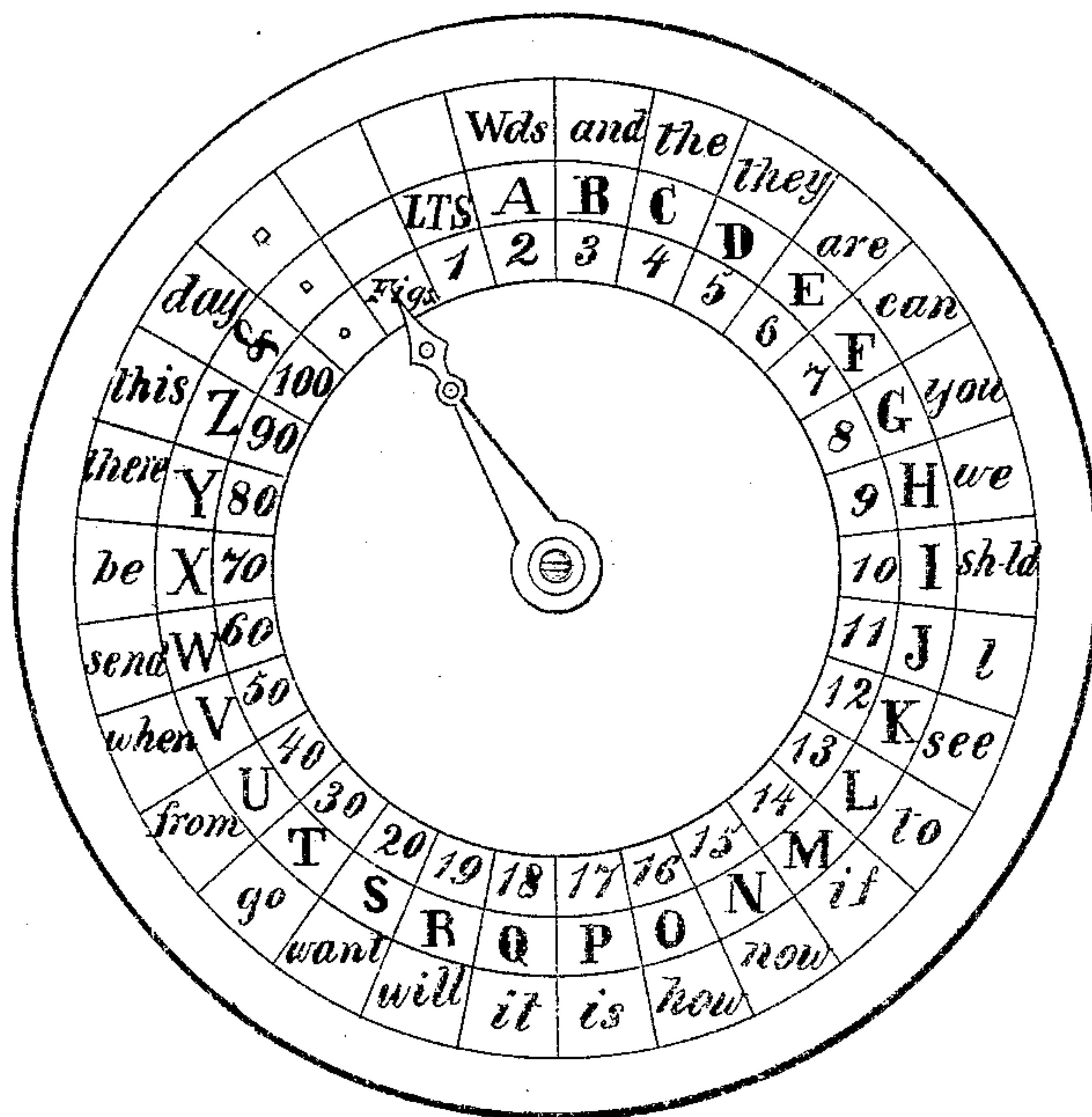
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Fig. 5.



ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890 1234567 888888 AB

Fig. 6.



Witnesses.

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UNITED STATES PATENT OFFICE.

THEODORE M. FOOTE AND CHARLES A. RANDALL, OF NEW YORK, N. Y.,
ASSIGNORS TO THE COMMERCIAL PRINTING-TELEGRAPH COMPANY.

IMPROVEMENT IN TELEGRAPH APPARATUS.

Specification forming part of Letters Patent No. 129,219, dated July 16, 1872.

To all whom it may concern:

Be it known that we, THEODORE M. FOOTE and CHARLES A. RANDALL, of the city, county, and State of New York, have invented new and useful Improvements in Telegraph Apparatus and Electric Circuits; and we do hereby declare the following to be a full, clear, and exact description thereof, which will enable those skilled in the art to which this appertains to make and use the same, reference being had to the accompanying drawing forming a part of this specification.

These improvements relate to telegraph apparatus and an arrangement of circuits.

Figure 1 shows a side view of our combined electro-magnetic switch and relay. Fig. 2 shows end view of the same, showing ends of helices A A' A'', and relay-lever and its supports and armature. Fig. 3 shows an opposite end view and parts of the electro-magnetic switch. Fig. 4 shows an arrangement of electro-magnets and circuits. Fig. 5 shows an improved type-wheel. Fig. 6 shows a dial-telegraph face.

In our combined switch and relay, Figs. 1, 2, 3, the helices A A' are joined together by the inside wire of each coil, as shown at a, Fig. 1, and are without the continuous yoke or back piece generally used, it being broken or cut in two at B, Fig. 3. The soft-iron core of the helix A'' is pivoted at m m', and is made to move free inside the coil A'', and the extended end D, an end view of which is shown at B, Fig. 3, extends to the lower edge of the iron pieces b b', and vibrates between them and the screws e e'. The screws h h' and screws e e' are insulated from the standards S and T by the rubber pieces R R' R'' R'''. The armature a' is attached to the lever L, and plays before the ends of the cores of the helices A A' in the usual manner, the spring s, Fig. 1, serving to remove the armature from the face of the magnet when the current is broken, closing the lever L with the screw h'.

In practice the operation is as follows: The core of the helix A'' is, in this case, electro-magnetized by the passage of a current over the helix A'', developing a polarity at n' m', Figs. 1 and 3. By passing alternate negative and positive currents over the helices A A' reverse polarities are developed at b b',

Fig. 3, and also at the opposite ends G, Fig. 1, of the cores of the helices A A', the poles at C C' forming a magnet and attracting an armature, as in the usual manner, closing the lever L with the screw h. When the current is broken over the helices A A' the lever L is brought in contact with the screw h' by means of the spring s, so that a current may be made to pass from the lever L to screw h or h', the said parts A A', L, s, h, and h' acting as a relay. Simultaneously with the working of the relay the reverse polarities developed at b b' cause the extended core D, which has a polarity developed at n', to be attracted alternately to b b', and the bar D at D'', vibrating between and forming a contact with the screws e e', is made to pass a current from D to e or from D to e', or alternately from e to e', and thence through any circuit desired.

In place of the helix A'' and its movable core D, may be substituted a permanent steel bar, if found desirable.

In Fig. 4 we show two pairs of electro-magnets, E F and H, each attached to a support or base. The lever l has a polarized armature, a, attached to it, and, swinging at i, vibrates between the cores E F and screws d d', making contact with said screws. The lever l' has an armature, a'', attached to it, and swinging at i' by the attraction of the magnet H and the retractile force of the spring s, it is made to vibrate between the screws f f'. The screws d d' and f f' are insulated from their respective supports. K represents an electro-magnet, which we will term the printing or recording magnet. I and J represent single helices; but, if found desirable, two spool-magnets may be substituted. The magnets I and J are in different circuits, and in this case are operated by the same battery; thus, a positive current passing over line L, Fig. 4, and helices E F and magnet H to ground at G, causes the polarized armature a to be attracted to F, the lever l forming contact with d', and the armature a'' is also attracted to H, the lever l' forming contact with f. A current now passes from battery "Bat." to lever l, screw d', wire 1, lever l', screw f, wire 2, helix J, wire 3, to battery again. Now, the current over E, F, and H being broken, the spring s causes the lever l' to make contact with screw f'. A cur-

rent then passes from battery "Bat." to lever *l*, screw *d'*, wire 1, lever *l'*, screw *f'*, wire 4, helix I, wire 3, back to battery again. Now, to pass a part or the whole of the same battery or another battery over K, a reverse or current of opposite polarity to the one last used is sent over E, F, and H, instantly attracting the armature *a* to helix E, closing *l* in contact with *d*, breaking contact with *d'*. A current now passes from "Bat." to lever *l*, screw *d*, wire 5, to printing or recording magnet K, back to battery. By this arrangement the magnets I J K may be used at will.

It will be seen that this arrangement is but a modification of that shown in Figs. 1, 2, 3, as the same effects may be produced by those parts and combinations. There may also be other arrangements and modifications by the use of our combined switch and relay, and we claim any modification of our apparatus.

In Fig. 5 we have shown different views of a type-wheel, of which the principal feature is the combination of letters and figures for the production of fractions, we having substituted the letter E for the denominator of a fraction, it representing an eighth, and figures for the numerator, the number of eighths or amount of the fraction being denoted by the figure directly over the letter. Fractions have been printed from a type-wheel, as in the patent of S. S. Laws, dated January 25, 1870; but our invention differs therefrom in the fact of using a given letter or some arbitrary sign for expressing the denominator. It being known that all the fractions are expressed by eighths, it is only necessary to see the numerator to know the fraction being quoted, and there is less liability to mistakes by the fraction being blurred or blotted, and you cannot mistake three-fourths for three-eighths, or vice versa.

In Fig. 6, Plate II, we have shown the face of a dial-telegraph apparatus. In dial-telegraphs but two circles on the "face" are used—

one for letters and one for figures. For the purpose of gaining in rapidity of transmission we have adopted a third circle, in which we have placed words, and so arranged our dial that words, letters, or figures may be used to a great advantage and gain in transmission; for instance, the hand or pointer is made to travel in any of the well-known ways, and is stopped at one of the abbreviations "wds.," "ltrs.," "figs.," which indicates to the receiver the circle to be used, whether of words, letters, or figures. In general private line-telegraphing nearly all messages may be so arranged as to be transmitted by words in this manner.

We do not claim any particular arrangement of the words, nor the fact of having words.

Having fully described our several improvements, what we claim to be new, and desire to secure by Letters Patent, is—

1. A two-spool electro-magnet having its yoke or back-piece in two pieces, substantially as shown.
2. An electro-magnet of this construction, in combination with another electro-magnet, substantially the same as shown and described.
3. A combined switch and relay, constructed substantially as described.
4. The arrangement of circuits, as herein shown and described.
5. A type-wheel having a letter or letters to express the denominator of a fraction.
6. The combination of letters and figures to express fractions.
7. A dial-telegraph face having three or more circles, one or more of them being used for expressing or indicating words, as shown and described.

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