No. 858,569. PATENTED JULY 2, 1907.

S. CABOT.

SPACE TELEGRAPHY.

APPLICATION FILED NOV. 5, 1906.

6 SHEETS—SHEET 1.

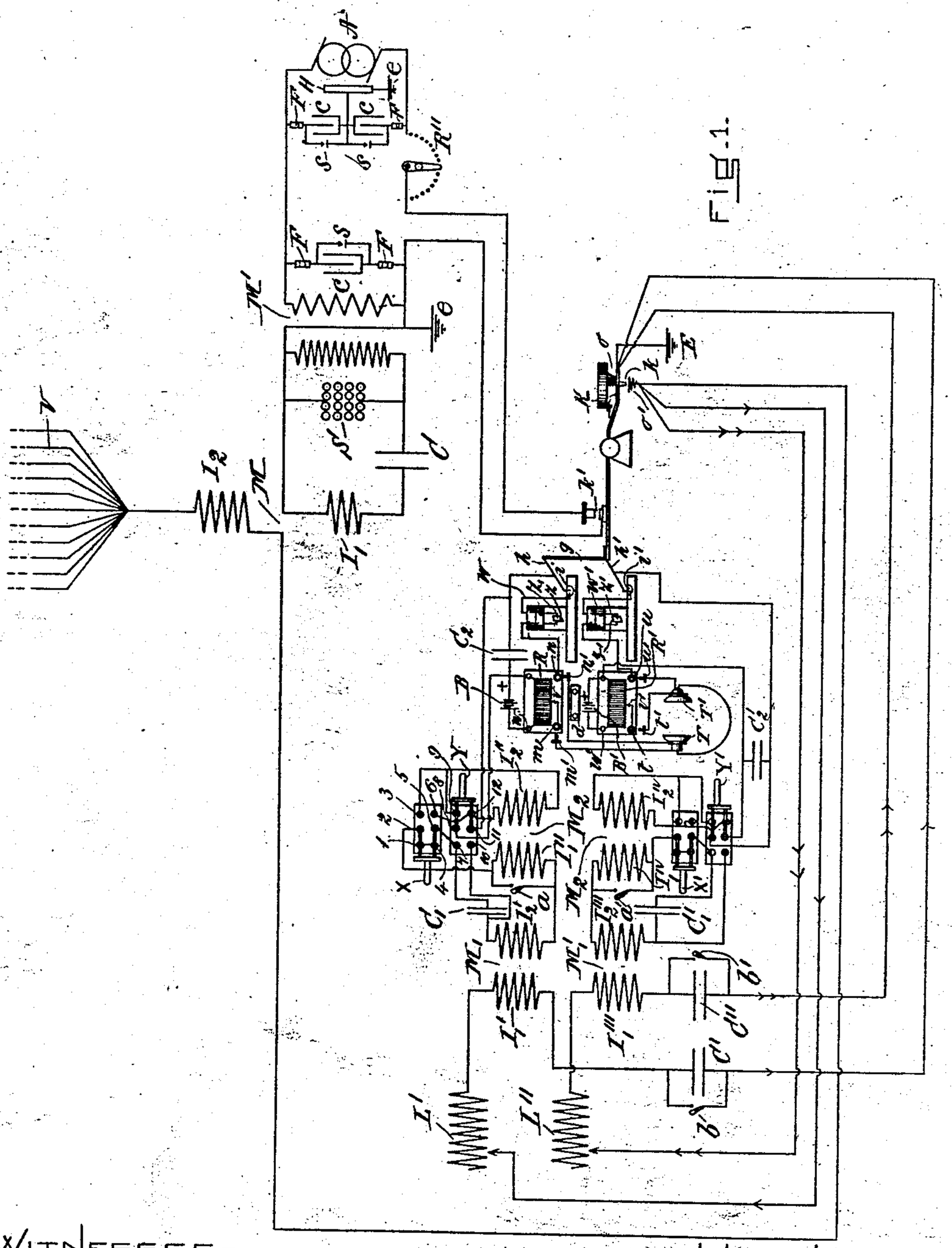

FIG. 1.

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[redacted]

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5 SHEETS—SHEET 2.

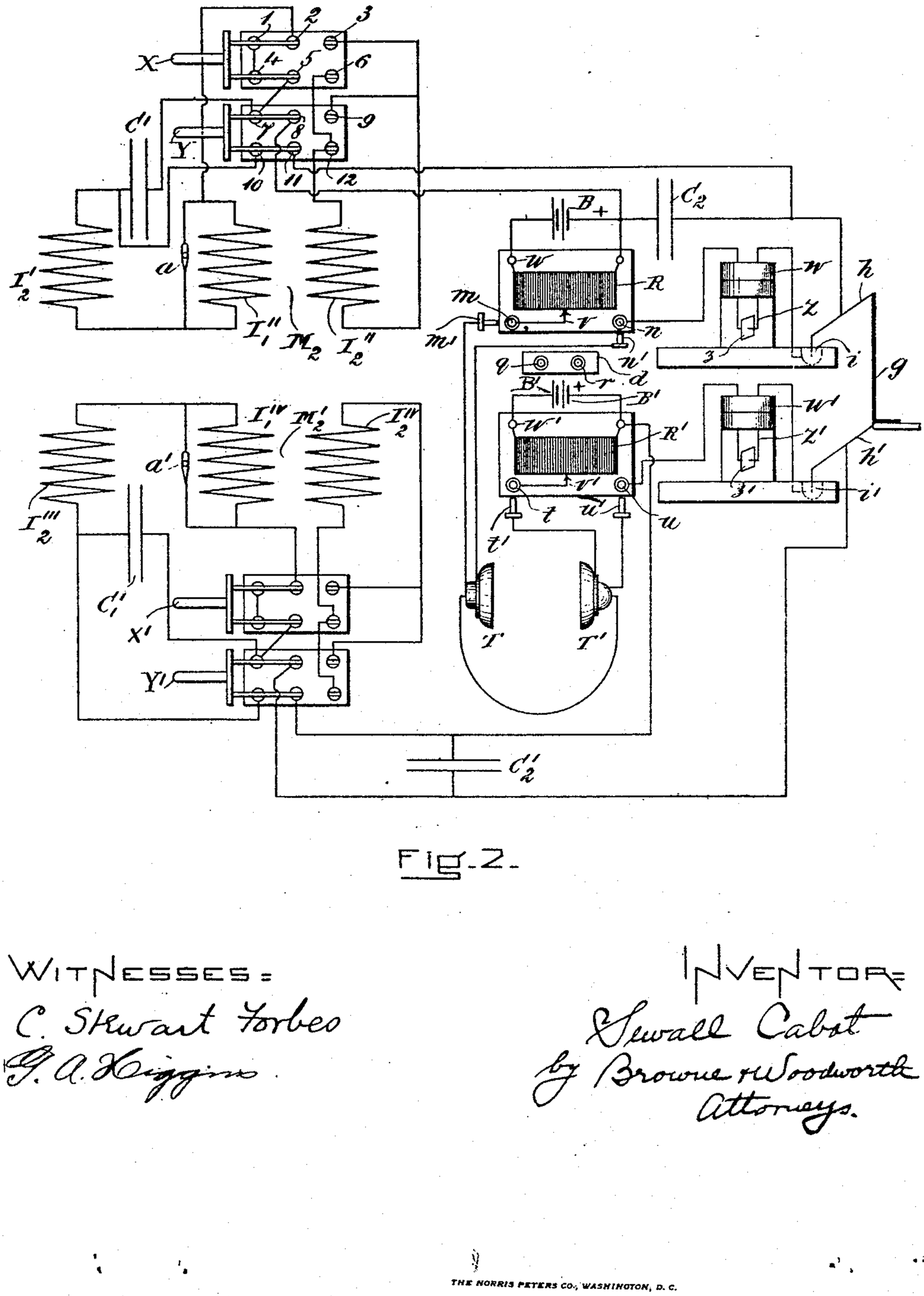

Fig. 2.

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5 SHEETS—SHEET 3.

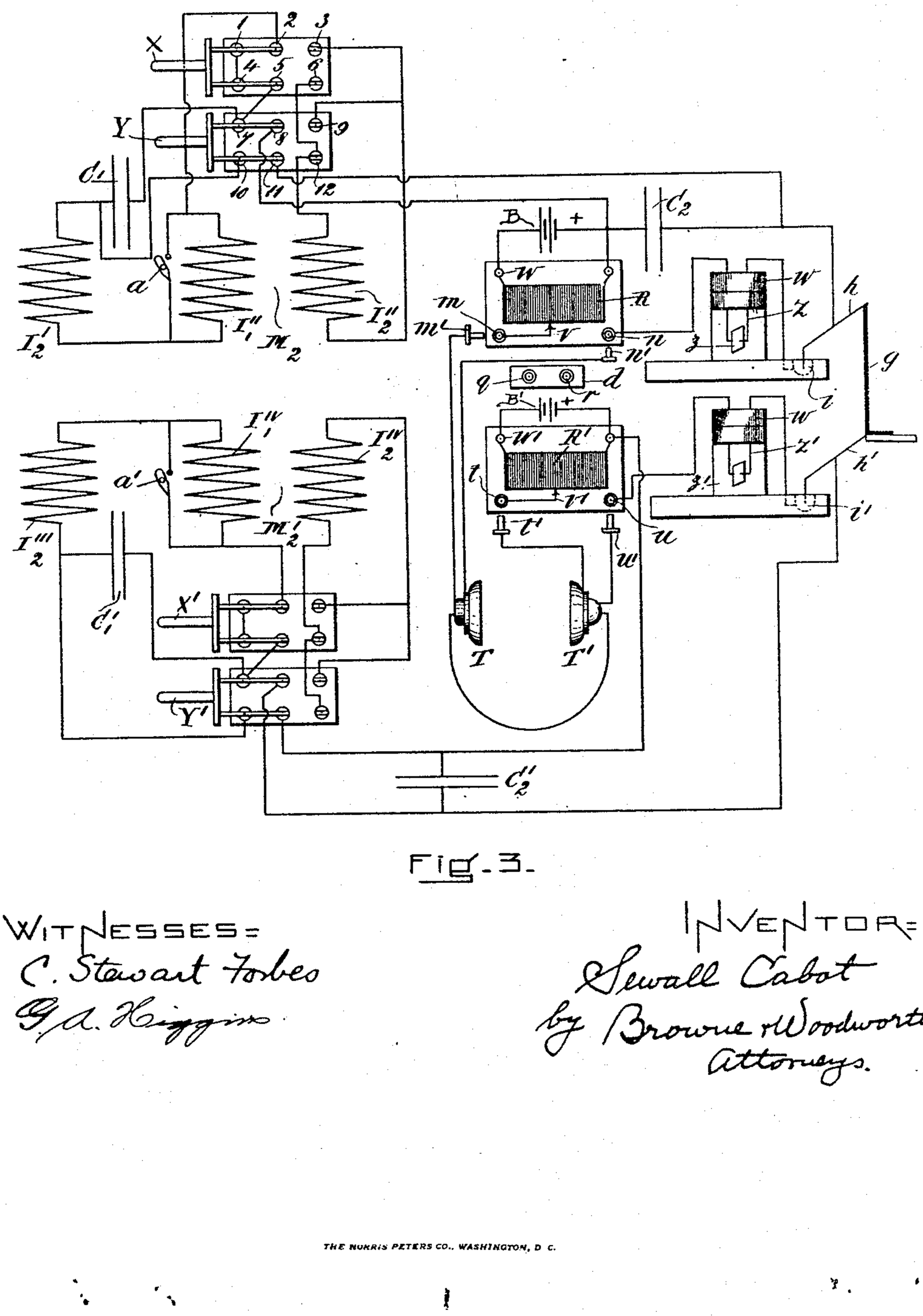

Fig. 3.

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5 SHEETS—SHEET 4.

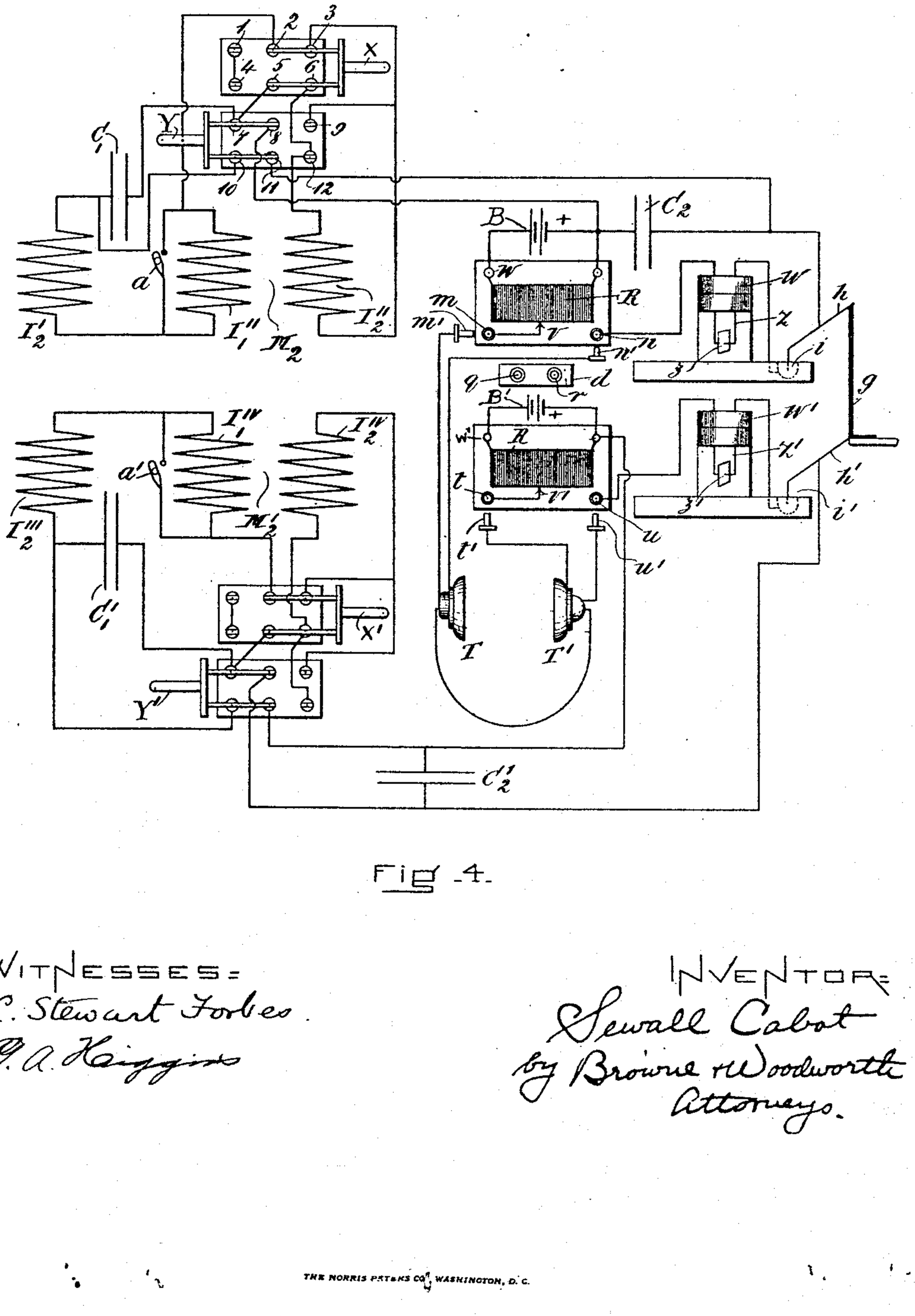

Fig. 4.

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APPLICATION FILED NOV. 5, 1906.

5 SHEETS—SHEET 5.

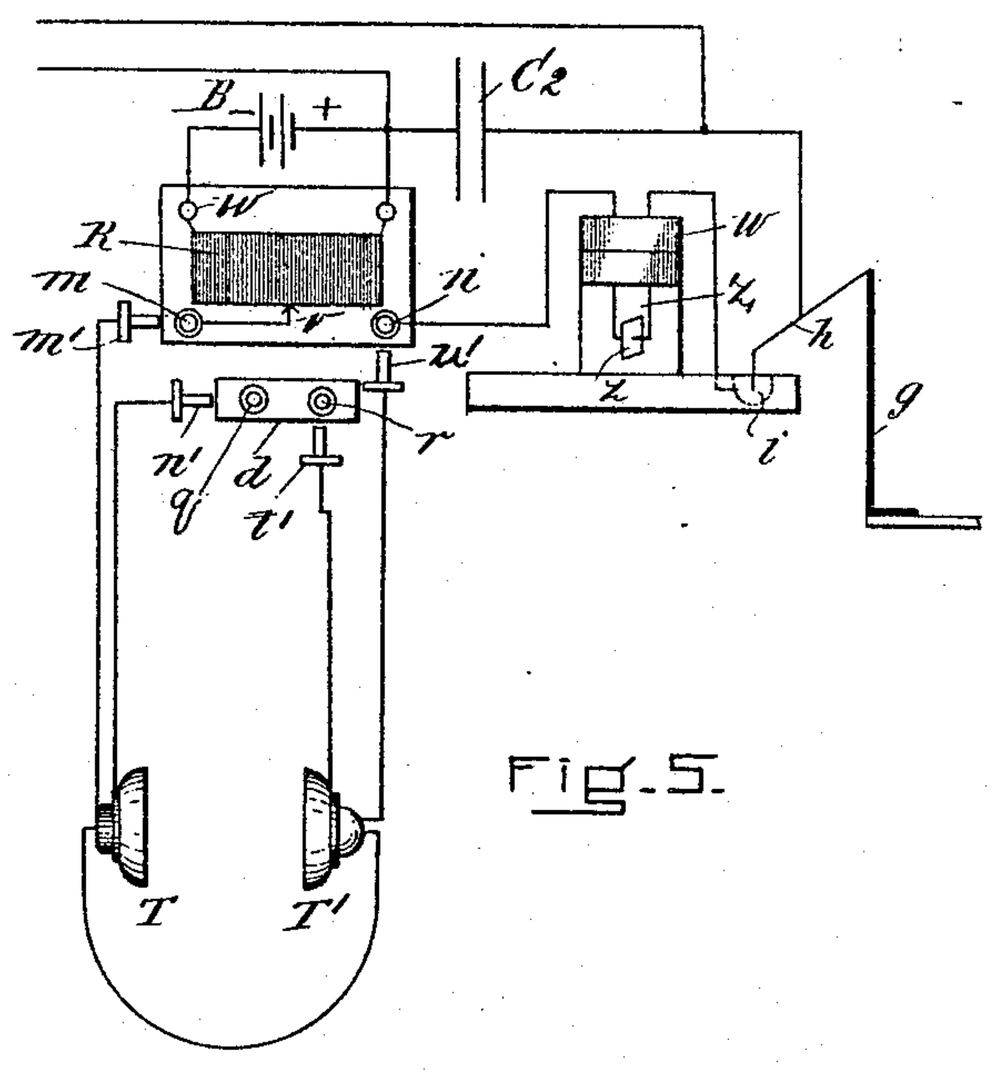

Fig. 5.

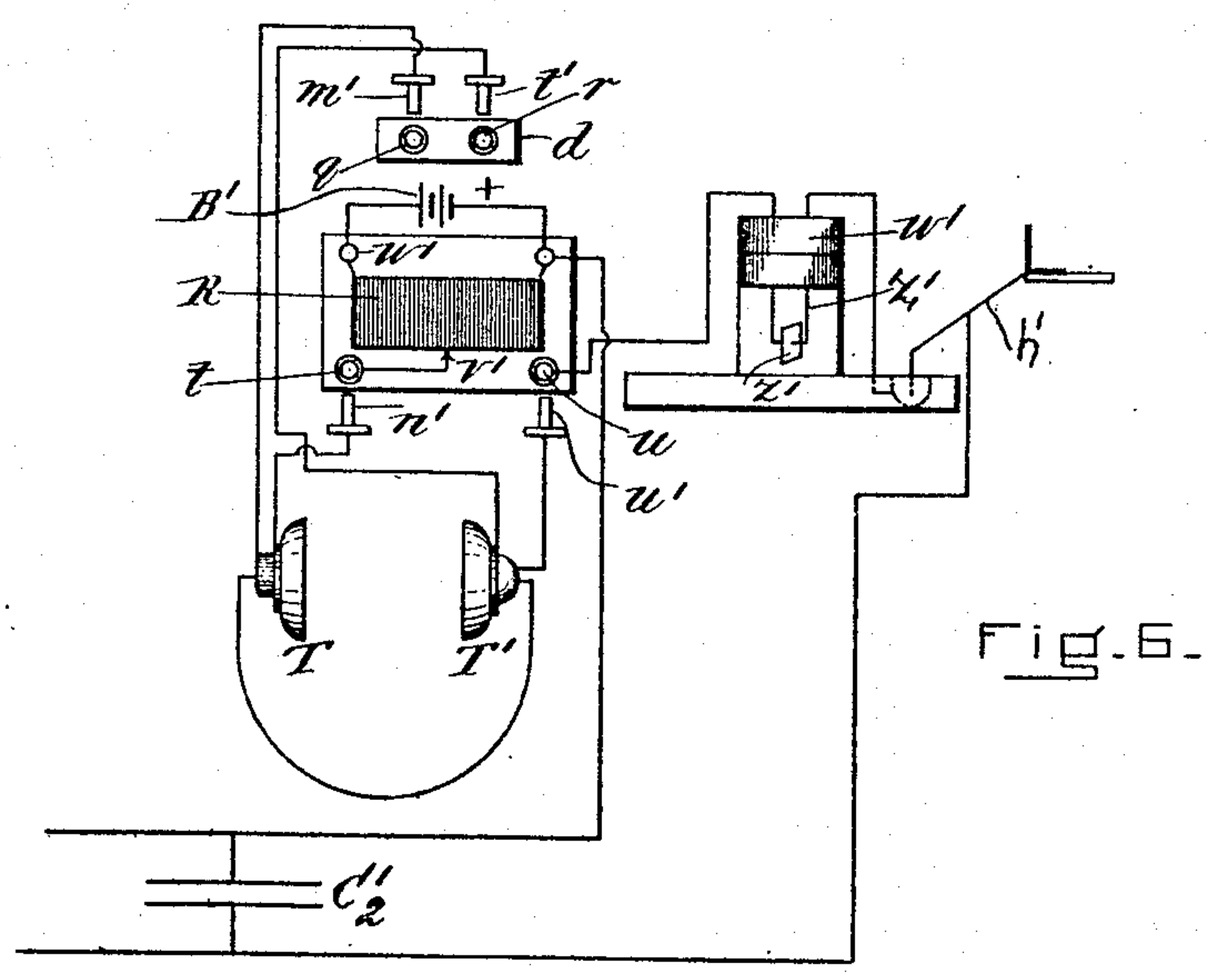

Fig. 6.

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UNITED STATES PATENT OFFICE.

SEWALL CABOT, OF BROOKLINE, MASSACHUSETTS, ASSIGNOR TO STONE TELEGRAPH AND TELEPHONE COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MAINE.

SPACE TELEGRAPHY.

No. 858,569. Specification of Letters Patent. Patented July 2, 1907.

Application filed November 5, 1906. Serial No. 341,996.

To all whom it may concern:

Be it known that I, SEWALL CABOT, a citizen of the United States, and a resident of Brookline, in the county of Norfolk and State of Massachusetts, have invented a new and useful Improvement in Space Telegraphy, of which the following is a specification.

My invention relates to space telegraph systems and especially to receiving systems.

One object of my invention is to provide a receiving system in which a plurality of oscillation detectors are associated with an elevated receiving conductor, and in which, by means of suitable apparatus and connections controlled thereby, each one of a plurality of signal-indicating devices may be associated with a different one of said oscillation detectors, or whereby all of said signal-indicating devices may be associated with any one of said oscillation detectors; and a further object is to provide a receiving system in which, by means of switches and connections controlled thereby, a resonant weeding-out circuit may be merged into or combined with a resonant receiving circuit or interposed between the elevated conductor and said resonant receiving circuit, while at the same time an oscillation detector may be associated with either the resonant receiving circuit or with the circuit formed by connecting the weeding-out circuit in series with the resonant receiving circuit.

Other objects of my invention will hereinafter appear and will be particularly pointed out in the appended claims.

In the drawings which accompany and form a part of this specification, I have shown in diagram one form of apparatus and circuit arrangements whereby the foregoing objects may be carried into effect, although it is to be understood that I do not limit myself to the particular arrangement of apparatus and circuits shown in said drawings, inasmuch as many modifications may be made therein by those skilled in the art without departing from the spirit of my invention.

In the drawings, Figure 1 represents diagrammatically a combined space telegraph transmitting and receiving system. Figs. 2, 3 and 4 are fragmentary diagrammatic views showing various circuital changes that may be effected by changing the positions of the several switches. Figs. 5 and 6 are fragmentary diagrammatic views showing how the signal-indicating devices may both be associated with either of the oscillation detectors.

In the figures, V represents an elevated conductor grounded at E.

M is employed to designate a transformer, and I_1 and I_2 are employed to designate transformer primary and transformer secondary, respectively. The several transformers, as well as their primaries and secondaries, are distinguished as to location and function by the employment of primes and subscripts.

S is a spark gap.

F F are fuses.

A is an alternating current generator or other suitable source of vibratory current.

K is a key.

R R′ R″ are adjustable resistances.

C is employed to designate a condenser, and the several condensers are distinguished from each other as to position and function by the employment of primes and subscripts.

W W′ are oscillation detectors which may be of any suitable type and which herein are shown as consisting of an anode Z and a cathode *z* immersed in an electrolyte, the anode having an area of about one circular mil exposed to said electrolyte, and the cathode consisting of a plate in very close proximity to said anode.

Connected to the elevated conductor through the coil I_2 which during the reception of signals operates as a loading inductance are two earth connectors each including an inductance L′ or L″, the primary I'_1 or I_1''' of the transformer M_1 or M'_1 and the condensers C′ or C″ which may be short-circuited if desired by the switches *b b′*. Associated in any suitable manner with said earth connectors are the resonant receiving circuits I''_2 C_2 or I^{iv}_2 C'_2, and interposed between the earth connectors and said resonant receiving circuits are the resonant weeding-out circuits I'_2 I''_1 C′ or I'''_2 I^{iv}_1 C'_1.

m, *n*, *t*, *u* are sockets adapted to receive any of the plugs *m′*, *n′*, *t′* and *u′*.

Assuming that the switches X Y and *a* are in the positions shown in Fig. 1 and that the several plugs above referred to have been inserted in the sockets adjacent to which they are shown in said figure, the operation of the receiving system is as follows:—The electromagnetic waves impinging upon the elevated conductor V create oscillations therein which pass through the inductance I_2 and thence to the point *o′* where said oscillations divide through the two earth connector circuits, those which pass through the earth connector including the inductances L′ I'_1 and the condenser C′ developing oscillations of corresponding frequency in the resonant weeding-out circuit I'_2 I'_2 2, 1, 4, 5, 7, C_1 and the oscillations in said resonant weeding-out circuit develop other oscillations of corresponding frequency in the resonant receiving circuit I''_2, 9, 8, C_2, 11, 12. These oscillations develop a difference of potential across the terminals of condenser C_2 which varies the resistance of the oscillation detector W and enables the current of battery B to take the following path: From the positive terminal of battery B marked + to 8, 9, I''_2, 12, 11, Z,

z, n, n', T, m', m, v, binding post w, thence back to the battery. In like manner the oscillations which pass through the earth connector which contains the inductance L'' primary I'''_1 and condenser C'' develop at the terminals of the condenser C'_2 a difference of potential which varies the resistance of the oscillation detector W' and enables the current of the battery B' to pass through the telephone T'.

It will be noted that in both cases the oscillation detector, a portion of the potentiometer resistance and the telephone are included in series with the secondary of the oscillation transformer in the resonant receiving circuit, this arrangement being permissible because of the large distributed capacity of the potentiometer resistance, telephone windings and the cord circuit connecting the telephone windings with the plugs m' n' or t' u'.

The two resonant receiving circuits are attuned to different frequencies and their interposed resonant weeding-out circuits are each attuned to the same frequency as its corresponding resonant receiving circuit. The receiving operator will place both head telephones T T' which are joined by the usual spring support in position and may thereby receive at the same time two signals sent from two distant stations by electromagnetic waves of different frequencies. Having ascertained which signal he desires to receive or which is the more important to be received, he is enabled by means of the several plugs and sockets to connect both telephones in series with either one of the oscillation detectors. This may be accomplished as follows, reference being had to Figs. 5 and 6: To connect said telephones in series with the oscillation detector W, the plugs t' u' are removed from their sockets, u' may be inserted in socket n and plugs n' t' may be inserted in sockets q and r, respectively, with which the conducting plate d is provided. The circuits may then be traced as follows:—From the positive terminal of the battery B through the secondary I''_2 in the manner more fully set forth above, to the anode Z, cathode z, socket n, plug u', telephone T', t', r, q, n', T, m', m, v, part of the potentiometer resistance R, binding post w and thence back to the battery B. To connect the telephones T T' in series with the oscillation detector W' the connections shown in Fig. 6 may be made.

Where the greatest selectivity is not necessary and it is desirable to cause the telephones to give forth louder signals, the resonant weeding-out circuit may be eliminated by throwing the switch Y to the left and retaining the switch X in its original position, as shown in Fig. 2. In this case there is but one resonant circuit associated with the elevated conductor system, namely, that which performed the functions of the weeding-out circuit when the switches were in the position shown in Fig. 1. The functions of the switches a, a' are to short-circuit the primary windings of the transformer M_2 M'_2 and when said switches are closed the resonant circuit in the upper portion of Fig. 2 may be traced as follows:—Secondary I'_2, switch a, 2, 1, 4, 5, 7, C_1, 8, C_2, 11, 10 and back to C_1, the two condensers C_1 and C_2 being connected in parallel and the oscillation detector W being connected across said condensers which are in parallel. The local circuit in this case may be traced as follows:—From the positive pole of the battery B to 8, 7, 5, 4, 1, 2, a, I'_2, 10, 11, i, Z, z, n, n', T, m', m, v, a portion of the potentiometer resistance R, w, and thence back to the battery B.

Where it is desired to receive waves of lower frequency or of longer wave length, the switches a a' are opened, in which case the resonant circuit may be traced as follows, reference being had to the upper portion of Fig. 3:—I'_2, I''_1, 2, 1, 4, 5, 7, C_1, 8, C_2, 11, 10, thence back to C_1, the two condensers C_1 and C_2 being as before connected in parallel. In this case the local circuit is the same as that described in connection with Fig. 2, except that the battery current passes through the winding I''_1 as well as the winding I'_2.

When it is desired to receive oscillations of still lower frequency or still greater wave length, the switch X may be thrown to the right and the switch Y retained in the position illustrated in Fig. 3, in the manner shown in Fig. 4, in which case the circuit which in Fig. 1 served as a resonant weeding-out circuit is connected in series with the circuit which in Fig. 1 performed the function of a resonant receiving circuit. In this case there is one heavily loaded resonant receiving circuit associated with the elevated conductor. This circuit may be traced as follows:—I'_2, I''_1, 2, 3, I''_2, 12, 6, 5, 7, C_1, 8, C_2, 11, 10, thence back to C_1, the condensers C_1 and C_2 being connected in parallel. It will be understood in this case that the coils I''_2 and I''_1 are sufficiently separated to prevent any inductive effect from the one to the other. The oscillation detector W in this case is connected across the terminals of the condensers C_1 C_2, connected in parallel, and are in series with the three coils I'_2, I''_1 and I''_2, the path of the battery current being the same as that above traced in connection with Fig. 3, except that it flows through the three coils above mentioned.

It will be understood in view of the foregoing that the switch X controls the employment of the weeding-out circuit and that the switch Y governs the connection of the oscillation detector with the rest of the receiving system.

The receiving operator may cut in upon and interrupt the transmitting operator by depressing the key K when he fails to understand a portion of a message and signaling "BK". By depressing the key K the conducting strips h h' which may be supported by a non-conducting member g secured to said key, are raised out of the mercury cups i i', thereby opening the circuits of the oscillation detectors W W'. A further depression of said key closes the contact k thereby short-circuiting the receiving systems between the points o o' and connecting the elevated conductor system directly to earth.

The circuits of the oscillation detectors having been opened and the transmitting system having been connected directly to earth, a further depression of the key closes the contact k' thereby energizing the oscillation circuit S C I_1.

H represents the frame of the dynamo A and c c, s s, together with the fuses F F and the earth connections e e, are protective devices the operation of which will be readily understood.

I claim,—

1. In a space telegraph receiving system, a receiving conductor, a plurality of oscillation detectors associated therewith, a corresponding number of signal-indicating devices, means whereby each of said signal-indicating devices may be associated with a different one of said oscilla-

tion detectors, and means whereby all of said signal-indicating devices may be associated with any of said oscillation detectors.

2. In a space telegraph receiving system, an elevated receiving conductor, two oscillation detectors associated therewith, two signal-indicating devices, means whereby each of said signal-indicating devices may be associated with a different one of said oscillation detectors and means whereby both of said signal-indicating devices may be associated with either of said oscillation detectors.

3. In a space telegraph receiving system, an elevated receiving conductor, a resonant receiving circuit, a resonant weeding-out circuit, a switch, and connections controlled by said switch whereby said weeding-out circuit may be merged into or combined with said resonant receiving circuit, when the switch is in one position, and whereby it may be interposed between said elevated conductor and said resonant receiving circuit when said switch is in another position.

4. In a space telegraph receiving system, an elevated conductor, a resonant receiving circuit, a resonant weeding-out circuit interposed between said elevated conductor and said resonant receiving circuit, an oscillation detector, a switch and connections controlled by said switch whereby said oscillation detector may be associated with said resonant receiving circuit or with said resonant weeding-out circuit.

5. In a space telegraph receiving system, an elevated receiving conductor, a resonant receiving circuit including an inductance, a resonant weeding-out circuit, a switch, and connections controlled by said switch whereby said resonant weeding-out circuit may be interposed between said elevated conductor and said resonant receiving circuit, when said switch is in one position, and whereby said inductance may be included in series with said resonant weeding-out circuit when said switch is in another position.

6. In a space telegraph receiving system, an elevated receiving conductor, a resonant receiving circuit, an oscillation detector associated therewith, a resonant weeding-out circuit, a switch and connections controlled by said switch whereby said resonant weeding-out circuit may be interposed between said elevated conductor and said resonant receiving circuit, when said switch is in one position, and whereby said oscillation detector may be associated with said weeding-out circuit, and said resonant receiving circuit opened, when said switch is in another position.

In testimony whereof, I have hereunto subscribed my name this 29th day of Oct. 29, 1906.

SEWALL CABOT.

Witnesses:

C. STEWART FORBES,

GEO. K. WOODWORTH.