J. H. HAMMOND, Jr.

WIRELESS SELECTIVE SYSTEM AND APPARATUS.

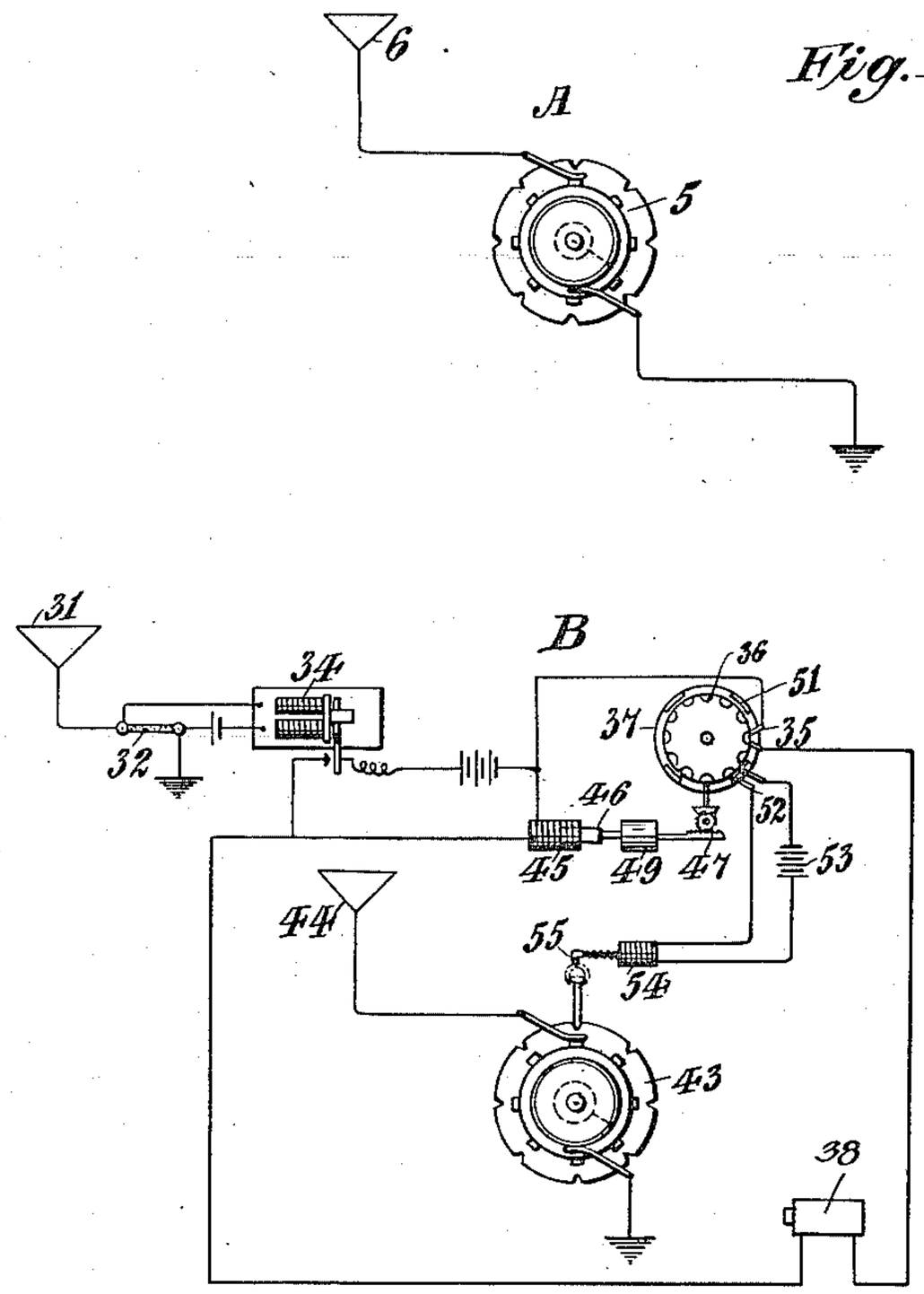
APPLICATION FILED FEB. 23, 1910.

1,154,628.

Patented Sept. 28, 1915.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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4 SHEETS—SHEET 2.

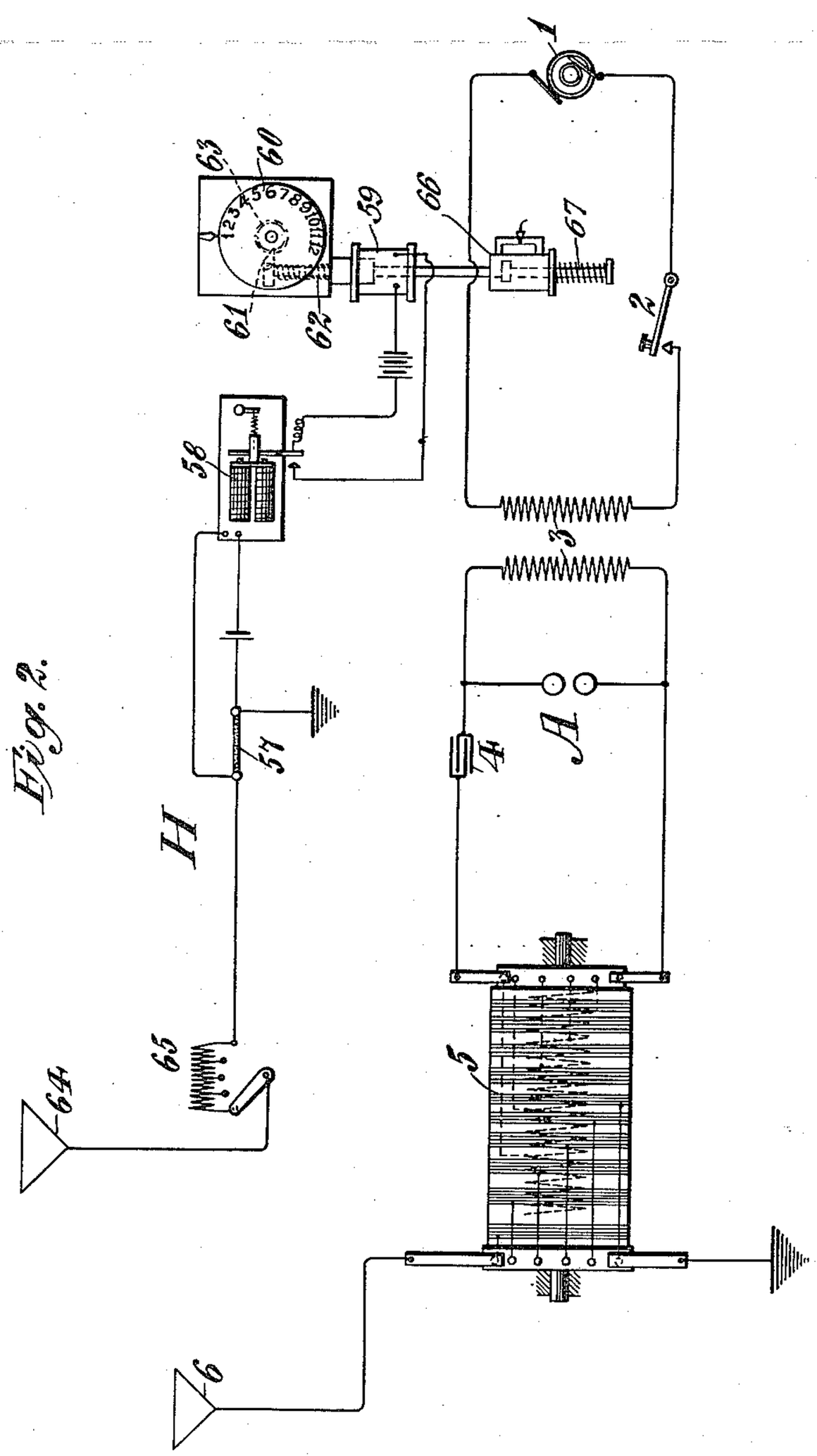

Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 3.

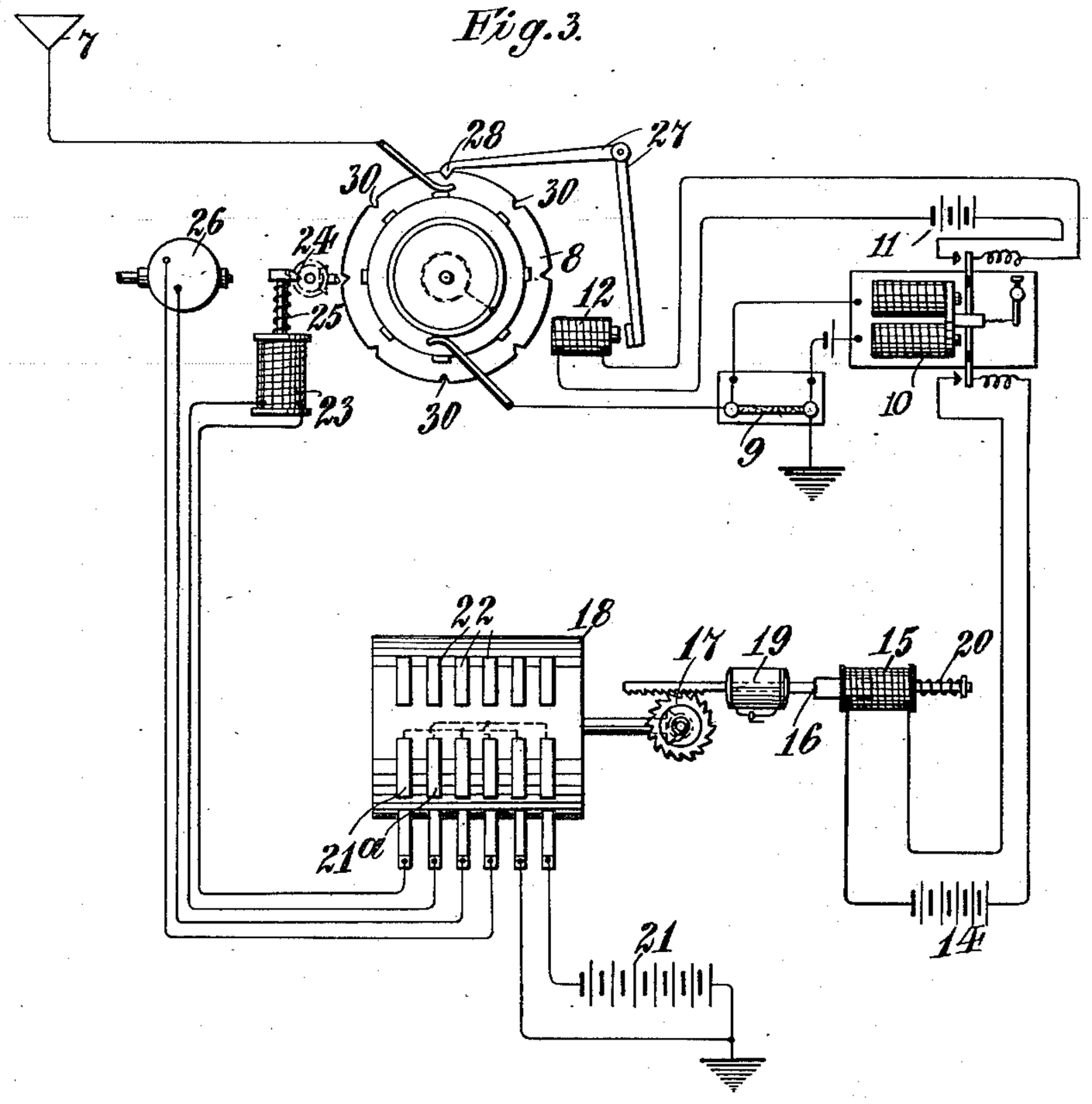
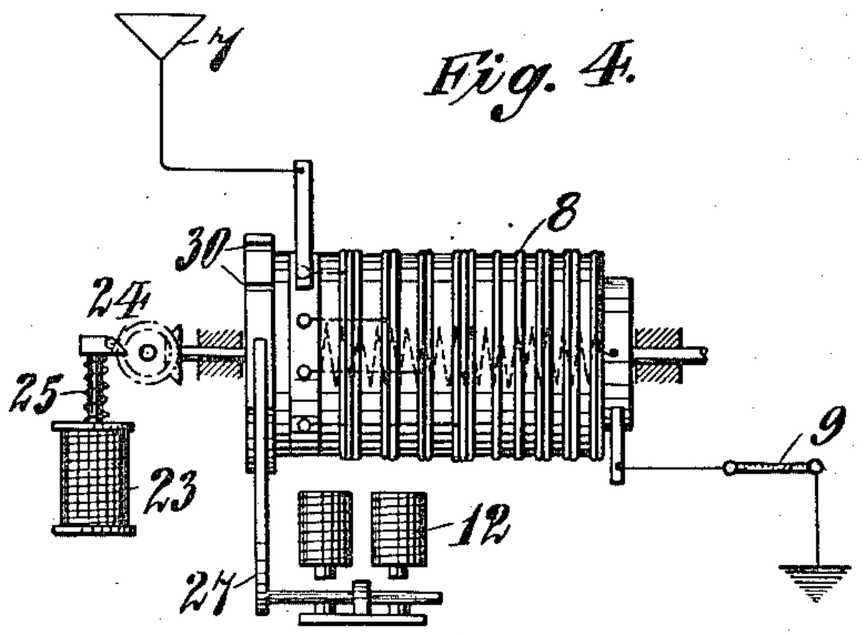


Fig. 4.



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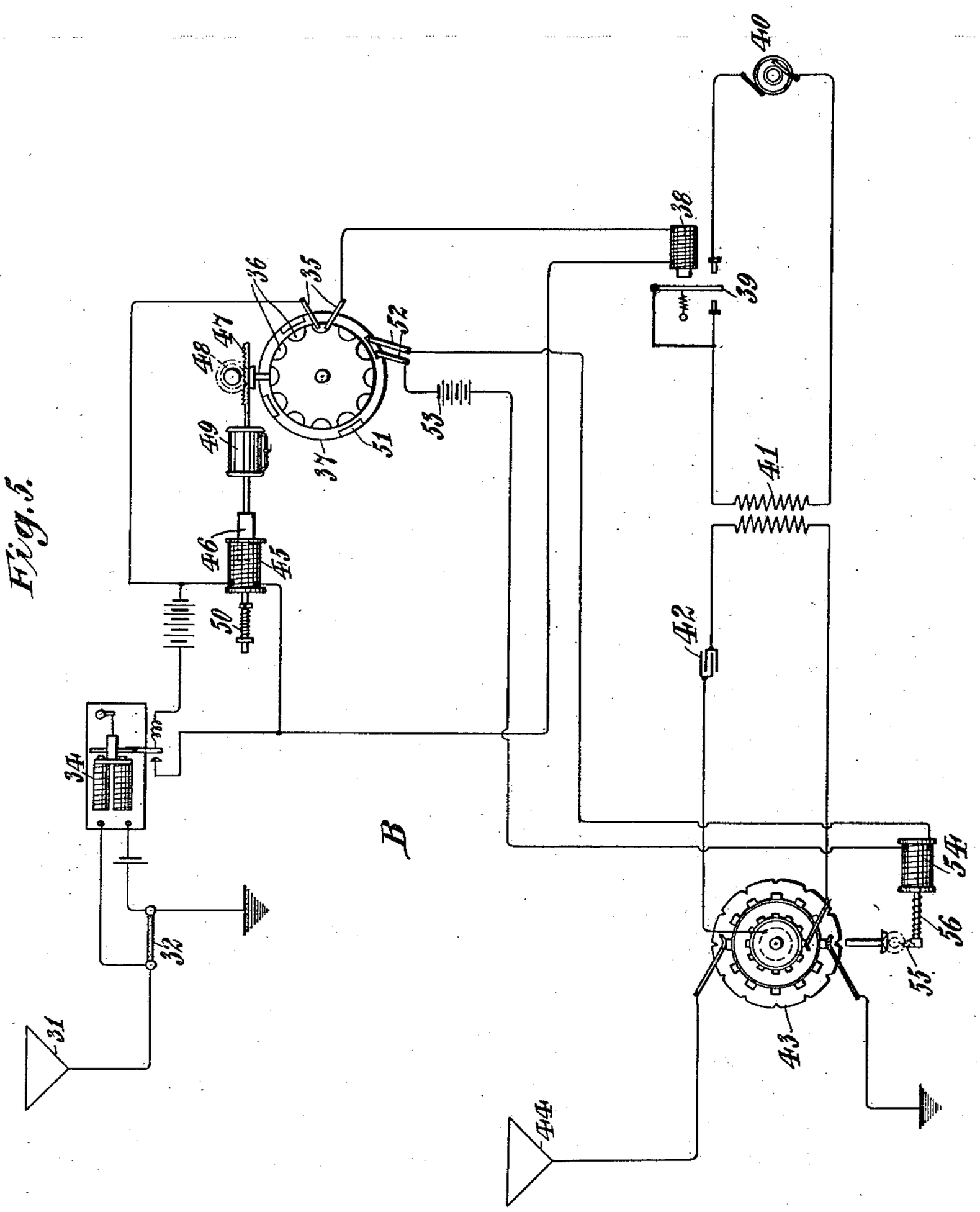
4 SHEETS—SHEET 4.

Fig. 5.



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UNITED STATES PATENT OFFICE.

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WIRELESS SELECTIVE SYSTEM AND APPARATUS.

1,154,628. Specification of Letters Patent. Patented Sept. 28, 1915.

Application filed February 23, 1910. Serial No. 545,415.

To all whom it may concern:

Be it known that I, JOHN HAYS HAMMOND, Jr., a citizen of the United States, residing at Gloucester, in the State of Massachusetts, have invented certain new and useful Improvements in Wireless Selective Systems and Apparatus, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

The invention relates particularly to apparatus for sending and receiving impulses or Hertzian waves transmitted a considerable distance from the sending station without the use of wires and one of the principal objects of the invention is to prevent interference with the sending or the receiving of impulses by providing mechanism for controlling from the sending station the wave length of the impulses receivable at the receiving station.

A further object of the invention is to provide means whereby the sending apparatus at a relay station may be regulated and controlled so as to synchronize same with any one of a plurality of receiving stations located outside of the range of the primary sending station.

The further objects of the invention will be more fully set forth hereafter in the following description of the invention, which consists in a new and novel arrangement, construction and combination of parts hereinafter set forth and claimed.

In the accompanying drawings, Figure 1 is a diagrammatic view of a plurality of stations embodying my improved system and apparatus. Fig. 2 is a diagrammatic view of the sending station and an automatic indicating station. Fig. 3 is a diagrammatic view of a receiving station. Fig. 4 is a view of the oscillatory transformer comprised in the relay station. Fig. 5 is a diagrammatic view on an enlarged scale of the relay station indicated in Fig. 1.

In Fig. 1, A represents a sending station; B, a relay station; and C, D, E, F and G, receiving stations.

The primary sending station A comprises the high-frequency alternating current generator 1, Fig. 2 key 2, transformer 3, condenser 4, oscillatory transformer 5, and aerial 6, which may all be of any well-known construction, and need not be particularly described. The oscillatory transformer 5 can be rotated so as to vary mutual inductance between its coils, and hence vary the wave length of the sending station. It is similar to the transformer shown in my copending application, Serial No. 539,248, filed January 21, 1910, and so need not be more particularly described here. It is wholly immaterial how the high frequency currents are set up in the oscillatory transformer 5. In practice, any well known spark gap arrangement such as shown in the U. S. Patent to Stone, No. 714,833, December 2, 1902, and in the U. S. Patent to De Forest, No. 822,926, June 12, 1906, may be used to produce these high frequency oscillations, and I have diagrammatically indicated the same in Fig. 2.

The receiving station comprises the aerial 7 Fig. 3 and a tuning coil 8, which is in circuit with the coherer 9 and the relay 10. Said relay is in circuit through a battery 11 with a magnet 12, and through battery 14 with a solenoid 15. The core-rod 16 of the solenoid is provided with a ratchet 17 operatively connected with a controller or distributer 18, and is normally retarded in its movement by a brake or retarder 19. The core-rod is normally returned to its forward or inoperative position by a spring 20 when released. The core-rod 16 may be partly of iron and partly of other material, or it may be wholly of iron and have an increased diameter, as shown in the part which is acted upon by solenoid 15.

The controller or distributer 18 is in circuit with the battery 21 and is provided with any suitable number of contacts 22, two of which, as 21^a are in circuit with a solenoid 23 operatively connected with the tuning coil 8. The core-rod of said solenoid is provided with a pivoted pawl 24 operatively engaging with the tuning coil so as to cause said tuning coil to rotate one notch each time the solenoid is energized. A spring 25 normally returns the core-rod to its original or initial position when released. The remaining contacts on the controller or distributer 18 may be operatively connected with operating mechanism such as motor 26 and other apparatus if desired.

The armature of the magnet 12 may, if desired, be operatively connected with a bell crank lever 27 having one end thereof pro-

vided with a catch 28 adapted to engage in a plurality of notches 30 provided in the barrel of the tuning coil.

The present receiving antenna circuit is merely diagrammatically indicated. Any other well known antenna detector circuit arrangement capable of sufficiently sharp tuning may be used in place of that shown.

Instead of transmitting messages or impulses direct to the receiving station, however, they may be relayed through a suitable relay station B Fig. 1, also shown in Fig. 5. Said relay station comprises an aerial 31, coherer 32 and relay 34 in the usual manner. The aerial 31 is untuned, so as to receive waves of different lengths from the sending station. Said relay is connected through brushes 35 engaging contacts 36 on the controller 37 with a magnet 38, the armature of which constitutes a key 39 in the sending circuit of the relay, said sending circuit comprising the high-frequency alternator 40, transformer 41 condenser 42 and oscillatory transformer 43 with its aerial 44 of the usual constuction.

The controller 37 is under the immediate control of the operator from the primary sending station A, however, by means of a solenoid 45 in shunt circuit with the relay. Said solenoid is operatively connected with the controller by means of a core-rod 46 provided with a ratchet 47 engaging with the wheel 48 which rotates the controller. The core-rod 46 may be partly of iron and partly of other material, or it may be wholly of iron and have an enlarged diameter as shown in the part which is acted upon by solenoid 45. Its operation is the familiar one between solenoids and their cores. A brake or retarder 49 of any preferred construction is connected with the core-rod to prevent same from operating the controller except when a continued impulse is given. A spring 50 returns said core-rod to its initial position when released. The controller is also provided with a plurality of contacts 51 adapted to be put in circuit through the brushes 52 and battery 53 with a solenoid 54. Said solenoid is operatively connected with the oscillatory transformer by a pawl and ratchet connection 55 actuated by the core-rod of the solenoid which is normally returned to its initial position by a suitable spring 56 when released.

Preferably an indicating station is provided at the main or primary sending station, which will register accurately the position either of the tuning coil in the receiving station or the position of the oscillatory transformer at the relay station. Said indicating station comprises the coherer 57 Fig. 2 and a relay 58 in circuit with the coherer and also in circuit with the solenoid 59. Said solenoid is operatively connected with a dial 60 by a pawl 61 pivoted to the core-rod 62 of the solenoid and adapted to engage ratchet teeth 63 upon the indicator. A brake or retarder 66, of any preferred construction, can be connected with the core-rod of the solenoid, as shown in Fig. 2, and a spring 67 can be used to return said core-rod to its original position when released. In this way the indicator will show the position of apparatus and mechanisms whose operation is likewise retarded, and the amount of retardation can be regulated to suit each particular apparatus. There can be a separate indicator for each piece of apparatus whose position it is desired to know. Said indicating station may be provided with a separate aerial 64, or, if desired, may be connected with the aerial of the sending station through the variable resistance 65, whereby the indicating station may be caused to respond to any impulse which operates either the tuning coil of the receiving station or the oscillatory transformer of the relay station and to indicate the position thereof upon the dial provided for this purpose. The indicator can be readily adapted to show the position of any mechanism which may be operated through motors controlled by the system and apparatus herein set forth.

By this construction it is evident that the tuning coil can be rotated by impulses sent from the sending station to vary the wave lengths receivable at the receiving station. A short impulse such as employed in transmitting messages will have no appreciable effect upon the operating solenoid 15, but an impulse of considerable duration, the length of which can be determined by adjustment of the brake or retarder 19, will rotate the controller. Consequently the tuning coil can be rotated through the solenoid 23 to change the wave lengths receivable thereby. The lever 27 provides further means for stopping the tuning coil positively so that it will synchronize with some particular wave lengths known to the operator. It is obvious also that the controller can be utilized to control independent mechanism such as motors or any other apparatus. In the relay station also the brake or retarder 49 prevents the contoller from being actuated except when impulses of considerable duration are received. The controller 37 not only is in the circuit for the impulses received from the primary sending station but also provides means for changing the high-frequency oscillatory transformer 43 so as to vary the wave lengths of the impulses propagated thereby.

The oscillatory transformers at the sending station and the relay station, and the tuning coil at the receiving station are kept in tune with each other. When an impulse of considerable duration is sent from the transmitting station, the oscillatory trans-

former there is turned to a new position, and, at the same time, the oscillatory transformer at the relay station and the tuning coil at the receiving station are turned to corresponding positions. The tuning coil at the receiving station may be operated through the relay station or directly from the sending station. Signals and messages are sent and received in the usual way by means of impulses of shorter length.

No claim is made herein for certain parts or combinations of parts of the apparatus as described since the same is more fully described and claimed in pending applications for Letters Patent heretofore filed by me, such as application, Serial No. 539,248, filed January 21st, 1910.

Ir general, I do not confine myself to the particular apparatus and mechanism here shown, but various changes and modifications, within the knowledge of those skilled in the art, may be made in the particular apparatus shown and described herein, without departing from the spirit of my invention, provided the means set forth in the following claims be employed.

I claim as my invention:

1. In a wireless selective system and apparatus the combination with a sending station provided with means for propagating impulses, of a receiving station comprising a tuning coil, a prime mover operatively connected with said tuning coil, a controller in circuit with said prime mover and a source of power, and means operatively connected with said controller and controlled by the tuning coil circuit, whereby impulses transmitted through the tuning coil may be utilized to actuate said controller.

2. In a wireless selective system and apparatus the combination with a sending station provided with means for propagating impulses, of a receiving station comprising a tuning coil, a solenoid operatively connected with said tuning coil, a controller in circuit with said solenoid and a source of power, a solenoid operatively connected with said controller and controlled by the circuit containing the tuning coil, and means for regulating the movement of said solenoid.

3. In a wireless selective system and apparatus the combination with a sending station comprising means for propagating impulses and a receiving station, of a relay station intermediate said sending and receiving stations said relay station comprising an oscillatory transformer and means controlled by impulses received from the sending station for actuating said transformer to vary the wave lengths in pre-determined order.

4. In a wireless selective system and apparatus a relay station comprising a receiving circuit, having a controller therein, and a sending circuit having an oscillatory transformer for varying the wave lengths or characteristics, and means controlled by said controller for operating the oscillatory transformer.

5. In a wireless selective system and apparatus a relay station comprising a receiving circuit, having a controller therein and a sending circuit having an oscillatory transformer therein, means operatively connected to the transformer in circuit with the controller for varying the wave lengths propagated by said transformer and means in shunt circuit with the receiving circuit for actuating the controller.

6. In a wireless selective system and apparatus a relay station comprising a receiving circuit having a controller therein, and a sending circuit having an oscillatory transformer therein, a solenoid operatively connected to the transformer and in circuit with the controller, and a solenoid operatively connected with the controller to control the same.

7. In a wireless selective system and apparatus the combination of a sending station for propagating impulses, of a receiving station comprising a tuning coil and means operatively connected with said tuning coil and under the control of the sending station to determine the length of the waves receivable by said tuning coil, of an indicating station provided with a register to indicate the position of the tuning coil in the receiving station, said indicating station having a receiving, aerial connection through a variable resistance.

8. In a wireless selective system and apparatus, a receiving station comprising a tuning coil, means for normally locking the same against rotation, a relay actuated through the wireless circuit, electric means controlled through said relay for releasing said locking means, a controller, electrically operated means for rotating said controller controlled by said relay, and an electric circuit comprising said controller and having means therein for partially rotating said tuning coil when the same is released from said locking means.

9. In a wireless receiving electric system of the kind described, the combination with a receiving circuit, of regulating devices in said receiving circuit, circuits controlled by the receiving circuit, a distributer controlled by said circuits controlled by the receiving circuit, operating circuits adapted to be closed and opened by said distributer, and a mechanism under the control of said operating circuits for varying said regulating devices, so that the responsive capacity of said receiving circuit can be varied at will.

10. In a system of radiodynamic control, a control station and a receiving station, said receiving station comprising switching devices constructed and arranged to change

the responsive capacity of said receiving station, and means for controlling said switching devices from said control station.

11. In a wireless selective system and apparatus, a relay station having a receiving circuit provided with a controller, and also having a sending circuit provided with wave-synchronizing means, and means controlled by said controller for operating said wave-synchronizing means.

This specification signed and witnessed this 9th day of February, A. D., 1910.

JOHN HAYS HAMMOND, Jr.

Signed in the presence of—

AMBROSE L. O'SHEA,

N. A. SMITH.