No. 835,269. PATENTED NOV. 6, 1906.

W. R. WHITEHORNE.

SELECTIVE SYSTEM.

APPLICATION FILED MAR. 15, 1906.

3 SHEETS—SHEET 1.

Fig. 1.

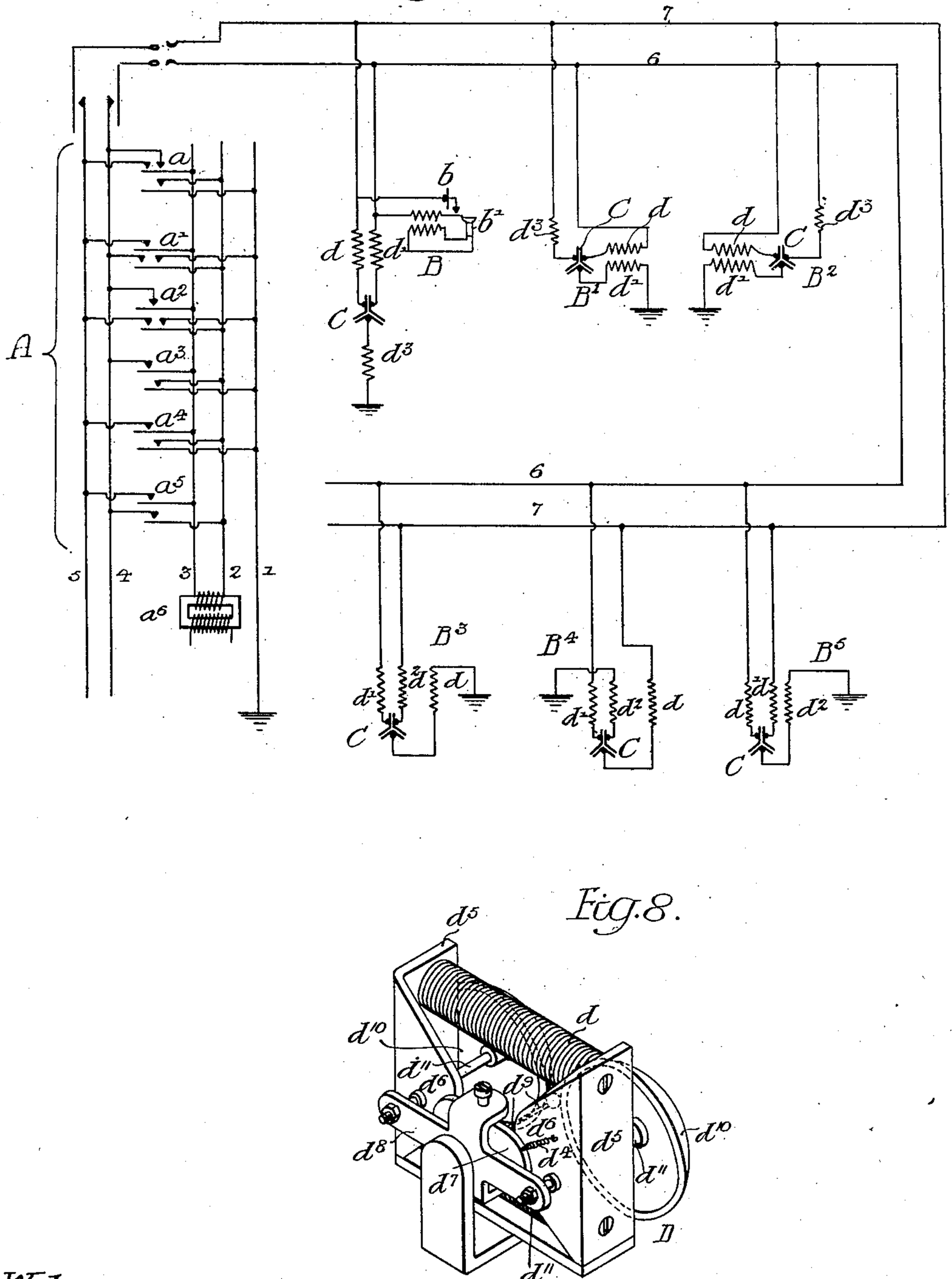

Fig. 8.

Witnesses:

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Titus H. Jones.

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3 SHEETS—SHEET 2.

Fig. 2.

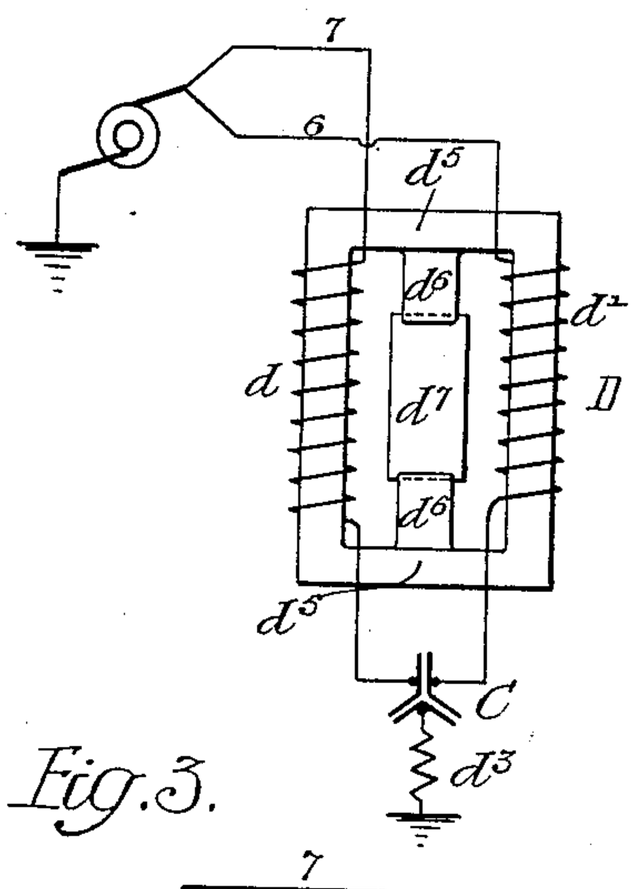


Fig. 3.

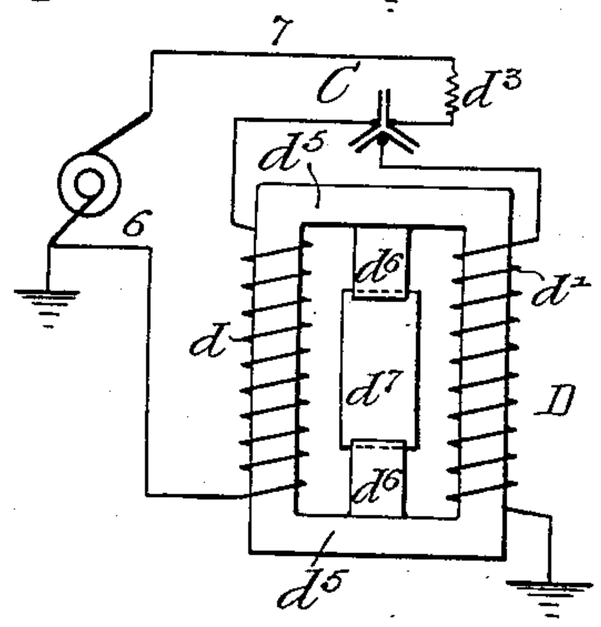


Fig. 4.

Fig. 5.

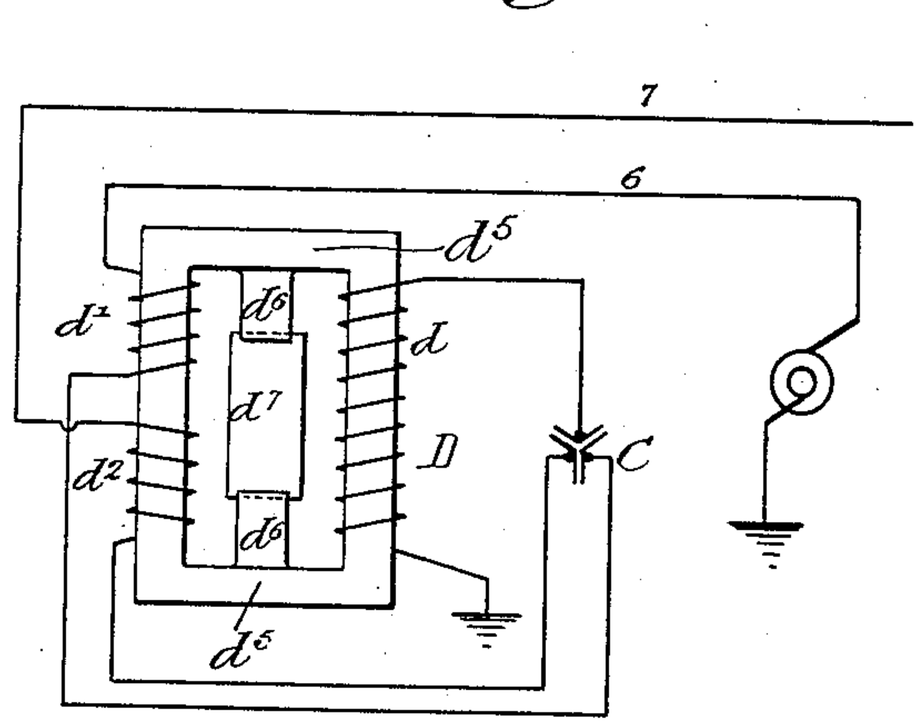


Fig. 6.

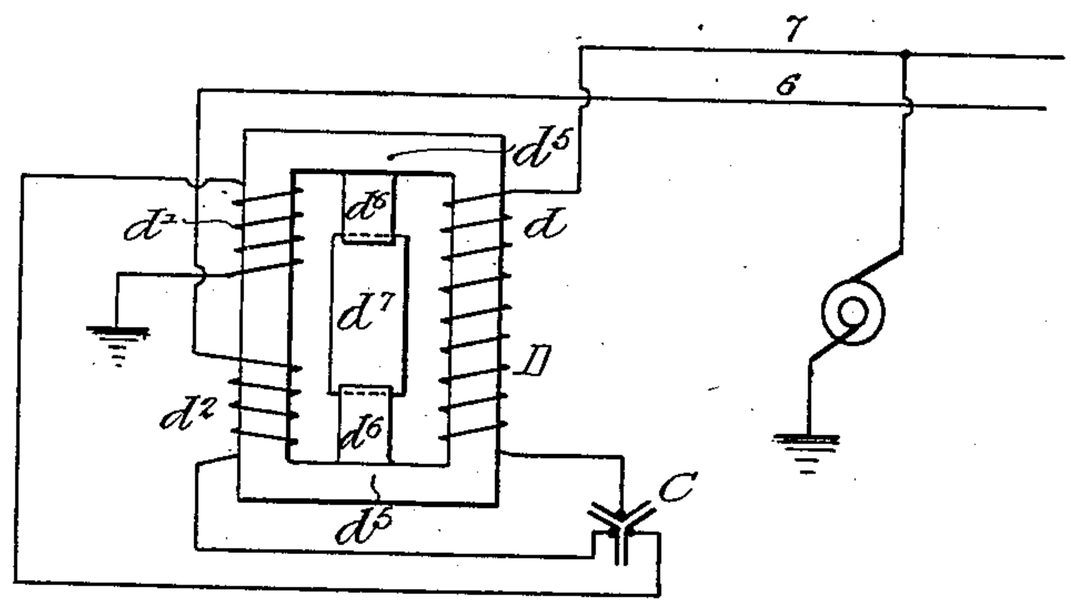
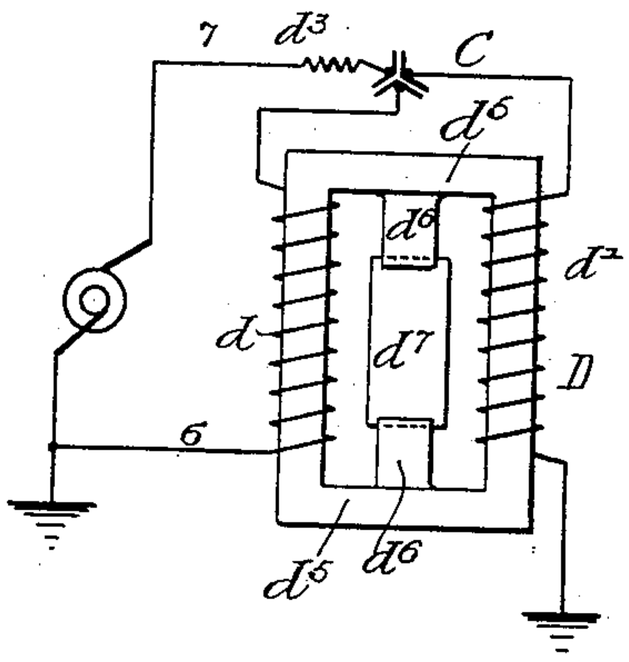
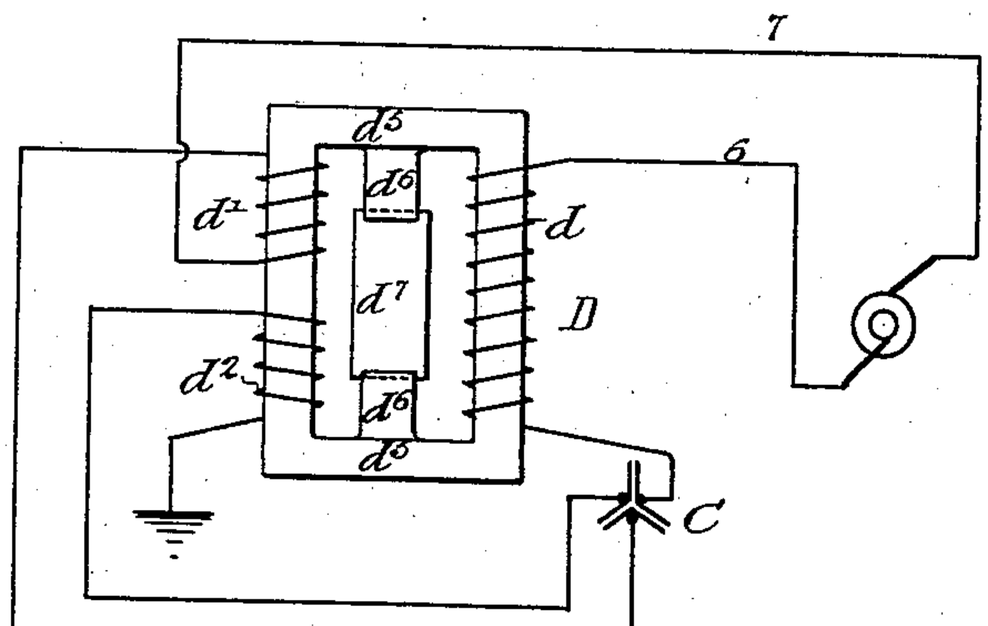


Fig. 7.





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3 SHEETS—SHEET 3.

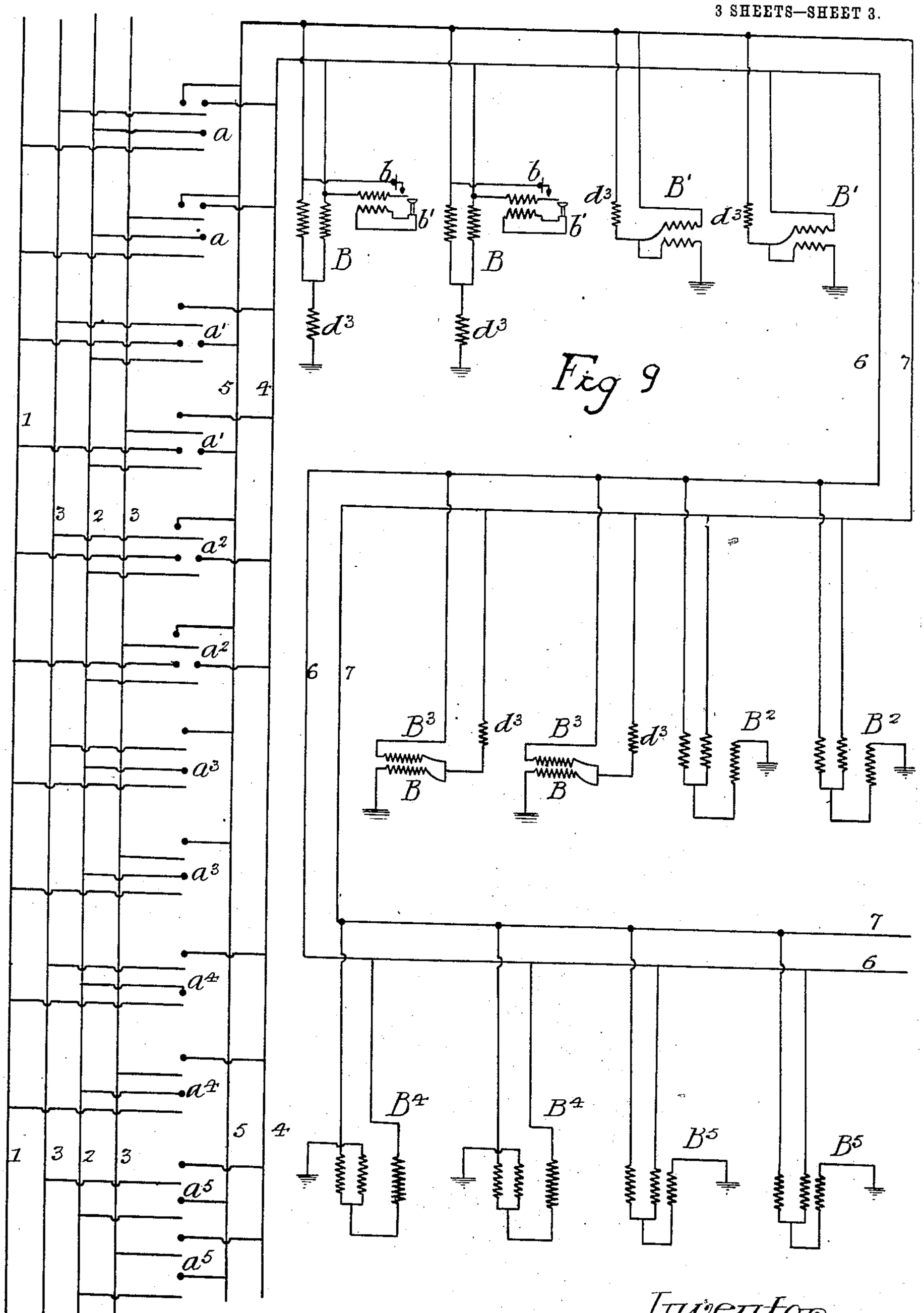

Fig 9

Witnesses: Titus H. Howe. Walter Chism

Inventor. William R. Whitehorne. by his Attorneys, Howson & Howson

UNITED STATES PATENT OFFICE.

WILLIAM R. WHITEHORNE, OF BETHLEHEM, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO BARRY MacNUTT, OF BETHLEHEM, PENNSYLVANIA.

SELECTIVE SYSTEM.

No. 835,269. Specification of Letters Patent. Patented Nov. 6, 1906.

Application filed March 15, 1906. Serial No. 306,2

To all whom it may concern:

Be it known that I, WILLIAM R. WHITEHORNE, a citizen of the United States, residing in Bethlehem, Pennsylvania, have invented certain Improvements in Selective Systems, of which the following is a specification.

One object of the invention is to provide a system having its apparatus so arranged that by the manipulation of a suitable switch at a central station the electromagnetic device (in the present case a bell of any one of a number of instruments) may be operated without operating the bells or other devices of the other instruments connected on the same circuit.

Another object of the invention is to provide a system of the above-noted class with a novel form of electrical signal-bell which shall be so made as to have a plurality of paths and windings for its magnetic circuit, its design and coustruction being such that it will ring only when the magnetic flux exists in a predetermined volume and direction in a definite one of the paths provided.

It is also desired to provide novel means for preventing the flow of any direct current through the apparatus for attaining the above-noted advantageous ends, which means shall also serve to prevent the flow of direct current from the line-wires to the ground.

It is a further object of the invention to secure a selective telephone system of the general character noted above without the use of automatic switches at the various subscribers' instruments.

These objects, together with other advantageous results, are attained as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view illustrating the apparatus and connections constituting the preferred form of the invention. Figs. 2 to 7, inclusive, are diagrammatic views illustrating the connections made by the operation of the central operator's switch for operating each of the six instruments on the particular telephone-circuit shown. Fig. 8 is a perspective view illustrating the preferred arrangement and construction of one of the bells employed; and Fig. 9 is a diagrammatic view similar to Fig. 1, illustrating the instruments and connections constituting a modified form of my invention.

In carrying out the invention any desired number of subscribers' instruments up to six are connected to a single pair of line conductors, there being a ground connection for each of the instruments, and at a central station a multipoint-switch with an alternating-current generator for ringing up any one of these subscribers without operating the ringing apparatus of any of the others. In order that the various instruments may answer the above requirements, we provide at each of them a bell whose operating-coils are mounted and connected between the ground and the line-wires in a special manner, as will hereinafter be set forth.

In the above drawings, A is a multipoint-switch, consisting in the present instance of six ringing-switches a to a^5, inclusive, one for each subscriber connected to the line, and having their connections arranged so that all or certain ones of five mains 1, 2, 3, 4, and 5 may be connected to each other in various combinations. The first of these mains is permanently grounded, while mains 2 and 3 are respectively connected to the terminals of any source of altenating current, in the present instance a transformer a^6. The first switch a is constructed to connect together the mains 1 and 2 and simultaneously to connect both of the mains 4 and 5 to the main 2, it being noted that the conductors 6 and 7, forming the metallic portion of the telephone-circuit, are respectively connected to the mains 4 and 5.

The switch a' has its contacts so arranged that the main 1 may be simultaneously connected to the mains 2 and 4 at the same time that the main 3 is connected to the main 5. By switch a^2 mains 3 and 4 may be connected to each other, and at the same time mains 1 and 5 may both be connected to main 2.

Switch a^3 is constructed to connect mains 3 and 4 together at the same time mains 1 and 2 are connected to each other, while switch a^4 when operated connects mains 3 and 5 and 1 and 2, respectively. The operation of the switch a^5 connects mains 3 and 5 and 2 and 4, respectively.

Connected between the two line-wires 6

and 7 and the ground are six instruments B B′–B⁵, the telephone-transmitters *b* and the receivers *b′*, with their associated apparatus, being arranged in the well-known manner. In order to avoid confusion, the telephone apparatus has been shown in connection with the signaling instrument B only, though it is to be understood that in the present instance there is a similar apparatus connected to each of the instruments B′ B²–B⁵.

For the ringing apparatus of each instrument there is provided a bell D, employing a plurality of coils, there being in the case of the instruments B, B′, and B² two of these coils *d* and *d′* and in the case of the instruments B³, B⁴, and B⁵ a third coil *d²*.

Each of the instruments B, B′, and B² is provided with a balance or compensating coil *d³* of a resistance substantially the same as that of either of the coils *d* or *d′* and having one of its terminals connected in every case to one plate of a three-way condenser C. the other two plates of which are connected to the coils *d* and *d′*, respectively. These balance-coils are used because it has been found that when properly proportioned relatively to the other windings of the circuit they cause the most satisfactory distribution of current throughout the system. In the case of the instruments B³, B⁴, and B⁵ the coils *d*, *d′*, and *d²* each have one terminal connected to one of the plates of a three-way condenser C, while the other terminals are connected to the mains 6 and 7 and to the ground.

The framework forming the magnetic circuit of the bell-coils is of a peculiar construction in that it consists of two cores connected by pole-pieces *d⁵*, and these latter are extended along one side of said cores to form substantially triangular extensions *d⁶*, serving as secondary pole-pieces, as shown best in Fig. 8. It will be understood that the above cores and pole-pieces are of magnetic material and that the adjacent ends of the auxiliary pole-pieces have extending between them the bell-armature *d⁷*, this latter being pivotally supported on pointed screws carried in any suitable manner by a supporting-plate *d⁸* of non-magnetic material, which in turn is carried by the pole-pieces *d⁶*. The armature has fixed to it the bell-clapper, (indicated in dotted lines at *d⁹*,) and the bell-gongs *d¹⁰* are preferably carried on rods *d¹¹*, which may, as in the present instance, extend through the auxiliary pole-pieces *d⁶* and serve as supporting means for the plate *d⁸*.

In the case of the instruments B, B′, and B² the coils *d* and *d′* are wound, respectively, on the two cores, while in the case of the remaining three instruments one coil *d* is wound on one core and two other coils *d′* and *d²* on the other core, as indicated diagrammatically in Figs. 2 to 7, inclusive.

The coils of the instruments B, B′, and B² are so connected that they may be supplied with current to cause one of the cores to have a north pole at that end which is connected by a pole-piece with the south pole of the other core, or said cores may be energized so that their north poles are both formed at those ends connected by the same pole-piece. In the first case the magnetic flux takes place from one of the cores through pole-piece *d⁵* to the second core, through the second pole-piece *d⁵*, and to the first core. As a result none or but little of the magnetic flux passes through the auxiliary pole-pieces *d⁶*, and there is consequently no operation of the armature *d⁷*. It may be desirable in order to prevent humming or slight vibration of the armature to retain it in a definite position by means of a spring *d⁴*. In the second case, however, the magnetic flux passes out of both magnet-cores into one of the pole-pieces *d⁵* and flows to the auxiliary pole-piece *d⁶*, forming a part thereof, thence to the armature *d⁷*, to the second auxiliary pole-piece *d⁶*, to the second pole-piece *d⁵*, forming a part thereof, and back to the two cores. In this case, since alternating current is supplied to the core-windings, the armature *d⁷* is oscillated upon its pivot-screws and the bell-gongs *d¹⁰* are alternately struck by the clapper *d⁹*

The windings of the bells of instruments B³, B⁴, and B⁵ are so proportioned and connected that the coil *d* on one of the cores and either of the coils on the other core may be so energized as to form similar poles at the same ends, in which case the magnetic flux is compelled to pass through the auxiliary pole-pieces *d⁶* and the armature *d⁷*, so as to oscillate the latter. On the other hand, however, the two coils *d′* and *d²* may be so energized as to neutralize each other, or one of them may be connected to neutralize the greater part of the effect of the coil *d*, in either of which cases there will be no magnetic flux passing through the auxiliary pole-pieces *d⁶*.

Switches *a* to *a⁵*, inclusive, are connected to take advantage of the above-described arrangement of the bell-coils and their respective magnetic circuits, so that if it be desired to ring up the instrument B to the exclusion of the others connected on the mains 6 and 7 the switch *a* will be operated to close its contacts, in which case one of the terminals of the transformer *a⁶* is connected to the ground, while the other is connected to the two windings *d* and *d′* of said instrument in such manner that the magnetic flux is caused to pass through the auxiliary pole-pieces *d⁶*, and consequently result in the ringing of their bell. The remaining five instruments will not be rung, for in the case of the coils of instruments B′ and B² the connections are such that the magnetic flux simply passes in a short or closed magnetic circuit through the main pole-pieces *d⁵* without being forced to

pass through the auxiliary pole-pieces d^6. In the case of the coils of instruments B^3, B^4, and B^5 the two windings d' and d^2 neutralize each other, so that as a consequence the winding d produces a flux which passes solely through the magnet-cores and the main pole-pieces d^5.

It is obvious that the number of instruments connected on a single two-conductor line may be doubled by the use of a pulsating ringing-current instead of an alternating current, though in practice it is thought that the smaller number of instruments would be all that it is desirable to connect on such a single line. If such a pulsating current were used, the three-way condensers would be omitted from the system and the various lines directly connected at the points where the condensers had been previously used, as is shown in Fig. 9. As will be understood by those skilled in the art, the different bells would be suitably polarized to meet the above-noted conditions and a generator a^9 provided of the necessary design and construction.

While the invention is shown and described as used in connection with a telephone system, it is obvious that it may without material change be employed as part of any system of apparatus in which it is desirable to electrically control or cause the operation of a definite one or a number of instruments from a central station through the medium of a minimum number of conductors.

I claim—

1. A system consisting of a plurality of electromagnetic devices each having a magnetic circuit constructed with a plurality of paths for the magnetic flux and having an operating member included in but one of the paths, with means for causing at will the operation of said member on any one of said instruments without operating the members of the other instruments, substantially as described.

2. A system consisting of a plurality of selective switches at a central station, a current-generator, a plurality of electromagnetic devices, and a line having conductors connecting the devices with the switches and generator, each of said devices having a magnetic circuit provided with windings connected to the line and including auxiliary and main pole-pieces, an armature included in the magnetic circuit of said auxiliary pole-pieces only and mechanism actuated by said armature, substantially as described.

3. A system including a plurality of instruments connected on the same line, each instrument having an electromagnetic signaling device provided with a plurality of paths for the magnetic flux, and having an operating member included in but one of said paths, with means for causing at will the operation of said member on any one of said instruments without operating the members of the other instruments, substantially as described.

4. A system including a two-conductor line, a plurality of instruments connected thereto, each instrument having an electromagnetic signaling device provided with a plurality of paths for the magnetic flux, a plurality of windings for each of said devices, an operating member for each device included in but one of the paths for the magnetic flux thereof, and means for causing operation of the signal-operating member of any one of said instruments at will, substantially as described.

5. A system including a two-conductor line, a plurality of instruments connected thereto, each having an electromagnetic signaling device provided with a plurality of paths for the magnetic flux, each signaling device including a plurality of windings connected between the ground and the two line conductors, an operating member for each of said signaling devices included in but one of the paths for the magnetic flux, with means at a central station for controlling the current-flow through the windings of the signaling devices whereby the signal-operating member of but one of said devices will be operated, substantially as described.

6. A system including a line, a plurality of instruments connected thereto, each having an electromagnetic signaling device provided with a plurality of paths for the magnetic flux, and each including a plurality of windings connected between the ground and the line, an operating member for each of said signaling devices included in but one of the paths for the magnetic flux, means at a central station for controlling the current-flow through the windings of the signaling devices whereby any signal-operating member of but one of said devices may be operated, with a three-way condenser interposed between the windings and the ground, substantially as described.

7. A system including an alternating-current generator, a two-conductor line, a multipoint-switch for connecting the terminals of said generator to the line and to the ground in a number of different combinations, a plurality of instruments connected to the line, an electromagnetic signaling device for each instrument constructed to have a plurality of paths for the magnetic flux, and a signal-operating member included in but one of said paths, each of the signaling devices having a plurality of windings connected between the line conductors and the ground in a manner different in each instrument, substantially as described.

8. A system including an alternating-current generator, a two-conductor line, a mul-

tipoint-switch for connecting the terminals of said generator to the line and to the ground in a number of different combinations, a plurality of instruments connected to the line, an electromagnetic signaling device for each instrument constructed to have a plurality of paths for the magnetic flux, and a signal-operating member included in but one of said paths, each of the signaling devices having a plurality of windings connected between the line conductors and the ground in a manner different in each instrument, with a three-way condenser connected between the ground and the line conductors at each instrument, substantially as described.

9. A system consisting of a plurality of instruments, a number of switches at a central station, a current-generator, and a line having conductors connecting said switches and generator with the instruments, each of said instruments including a signaling device composed of a plurality of cores provided with windings connected to the conductors of the line and to the ground, main pole-pieces joining said cores to complete the magnetic circuit thereof, and auxiliary pole-pieces for providing a second path for the magnetic flux set up by the winding, an armature included in the magnetic circuit of said auxiliary pole-pieces, and signaling means actuated by said armature, substantially as described.

10. A system including a plurality of electrically-actuated instruments each provided with a signaling device, a line connected to said instruments, a current-generator, and a plurality of switches for connecting said generator to the conductors of the line and to the ground in different combinations and connections, each of the signaling devices of said instruments consisting of a framework of magnetic material having main pole-pieces connected by cores, and auxiliary pole-pieces placed adjacent to the cores, windings on said cores connected to the line conductors and to the ground, an oscillatory armature supported adjacent to the auxiliary pole-pieces so as to be included in their magnetic circuit, a bell, and a clapper therefor connected to said armature, substantially as described.

11. A system consisting of a two-conductor line, a source of current, means for connecting said source to either of said conductors and to the ground or to both conductors independently of the ground, a three-way condenser, and connections from the plates of said condenser to the line conductors and ground respectively, substantially as described.

12. A system consisting of a two-conductor line, a source of current, means for connecting said source to either or both of said conductors and to the ground, and a plurality of instruments each having connections to the two line conductors, with a three-way condenser having two of its plates respectively connected to the said line conductors and in multiple to the instruments, and its third plate connected to the ground, substantially as described.

13. A system consisting of a plurality of magnets each having a plurality of windings, said magnets having frames providing a plurality of paths for the magnetic flux, an armature for each magnet placed to be included in but one of said flux-paths, with means for causing at will simultaneous energization of the windings of any magnet or magnets to cause actuation of the armature or armatures thereof, substantially as described.

14. A system consisting of a plurality of magnets each having a plurality of windings, said magnets having frames each providing a plurality of paths for the magnetic flux, an armature for each magnet placed to be included in but one of said said flux-paths, and a series of switches respectively connected to cause at will the actuation of the armatures of definite ones of said magnets, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM R. WHITEHORNE.

Witnesses:
HELEN E. WHITEHORNE,
R. W. LEIBERT.