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J. W. SEE & W. N. GRAY.

Signal Box for Telephone Lines.

No. 229,279. **Patented June 29, 1880.**

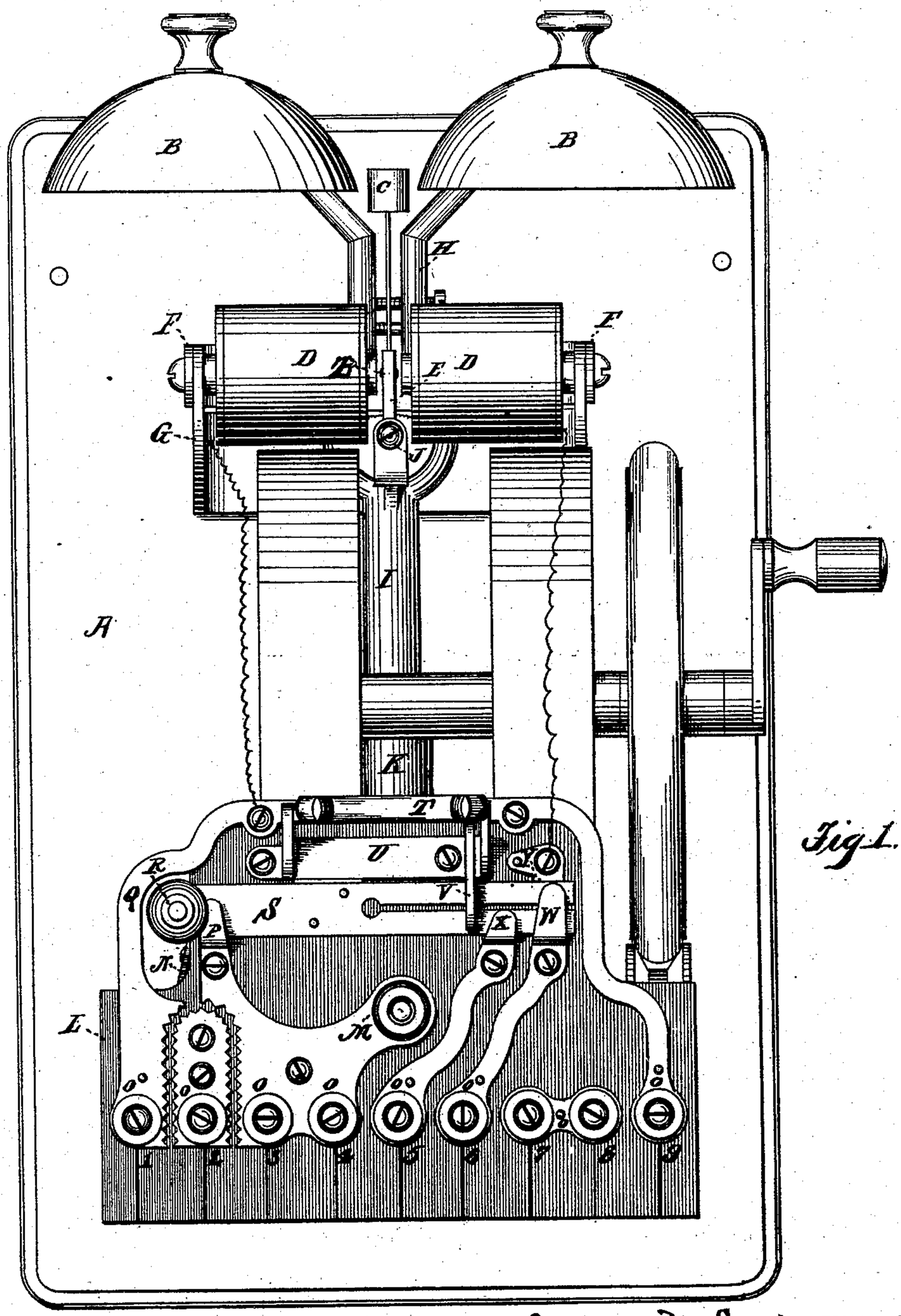

Fig. 1.

WITNESSES:

Geo. P. Langeman,

W. H. Cory

James N. See, INVENTORS.

William N. Gray,

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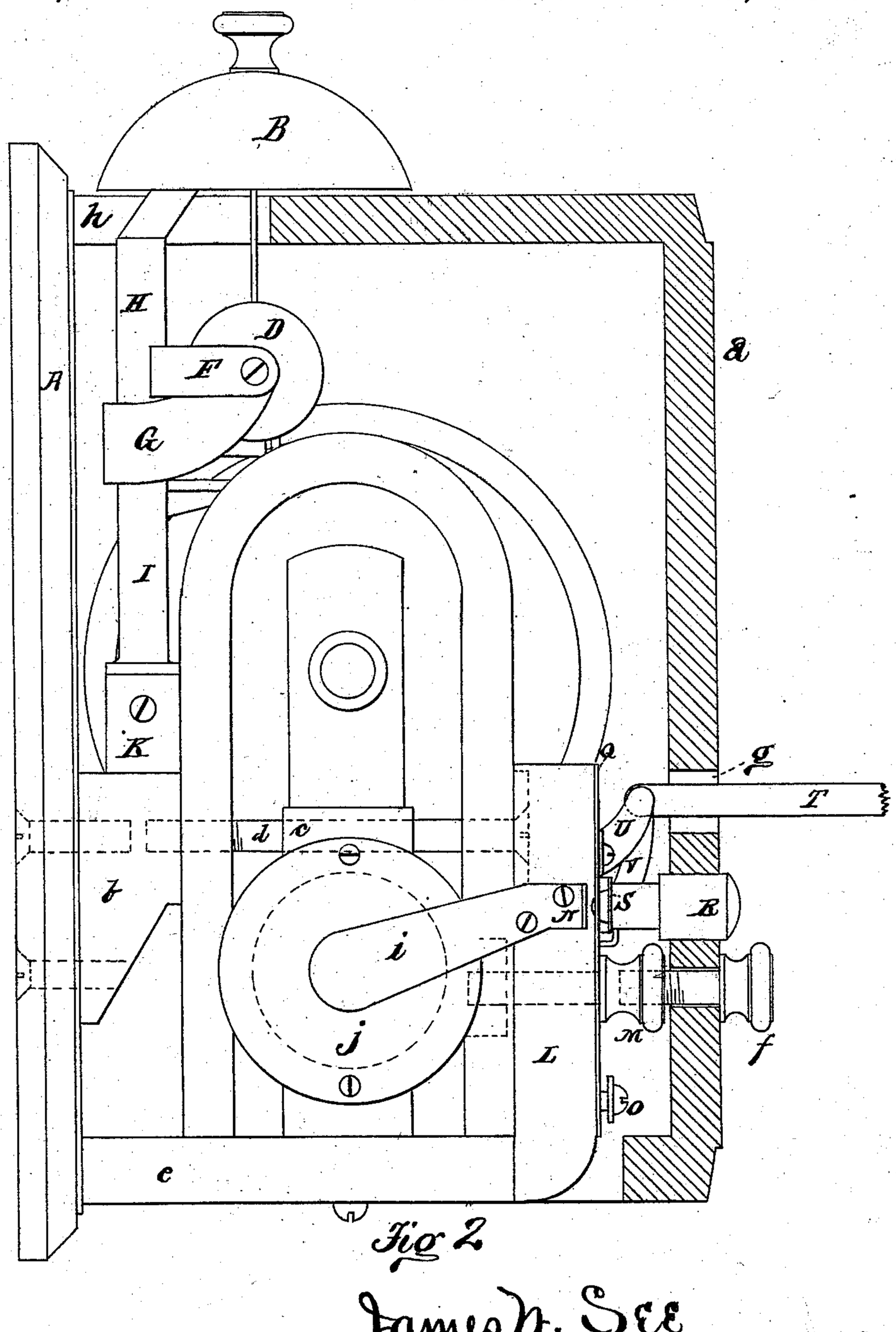

Fig 2.

WITNESSES:

Geo. P. Langman,

W. H. Cory.

James N. See, INVENTORS.

William A. Gray,

4 Sheets—Sheet 3.

J. W. SEE & W. N. GRAY.

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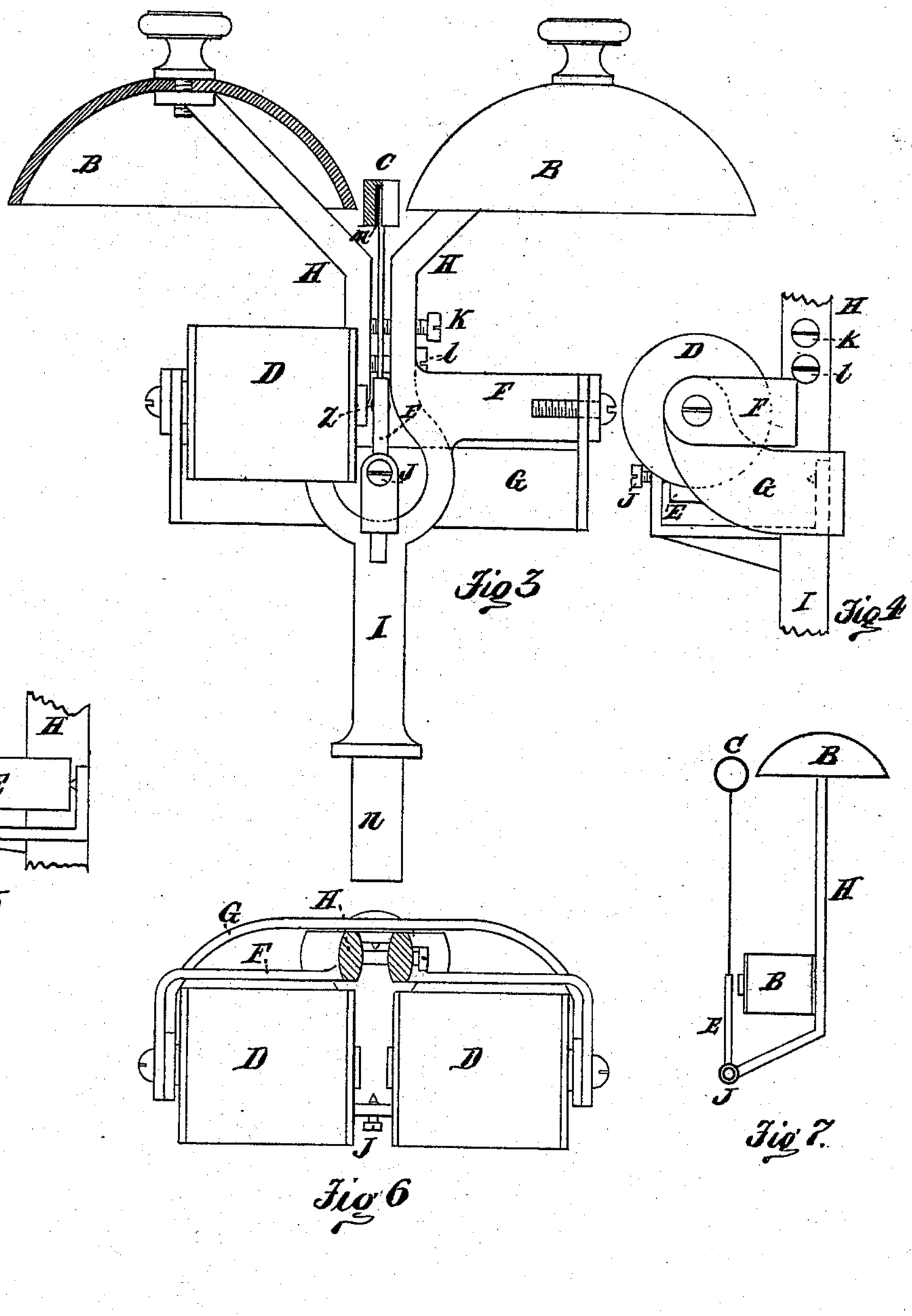

Fig 3

Fig 4

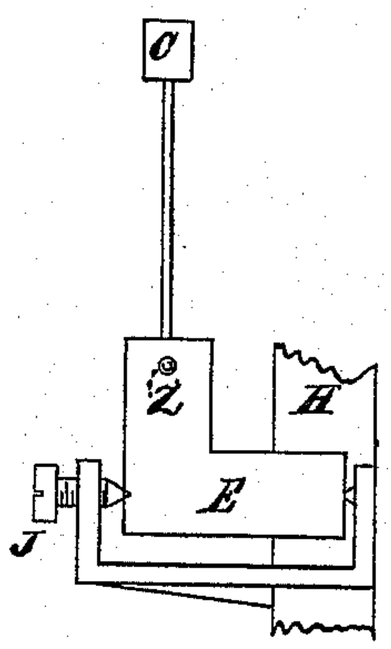

Fig 5

Fig 6

Fig 7

WITNESSES:
Geo. P. Langeman,
W. H. Cory.

James N. See, INVENTORS.
William A. Gray,

4 Sheets—Sheet 4.

J. W. SEE & W. N. GRAY.

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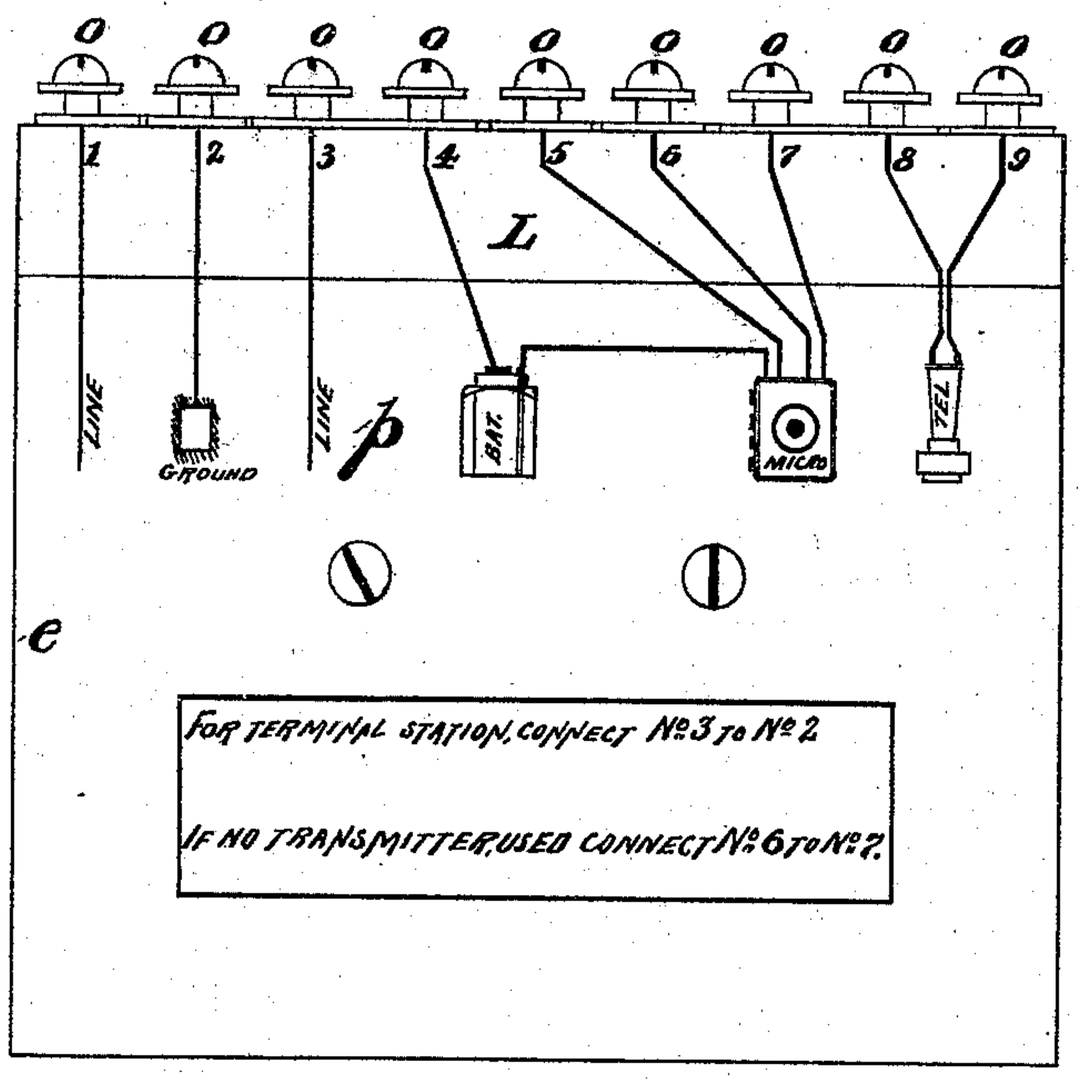

Fig 8

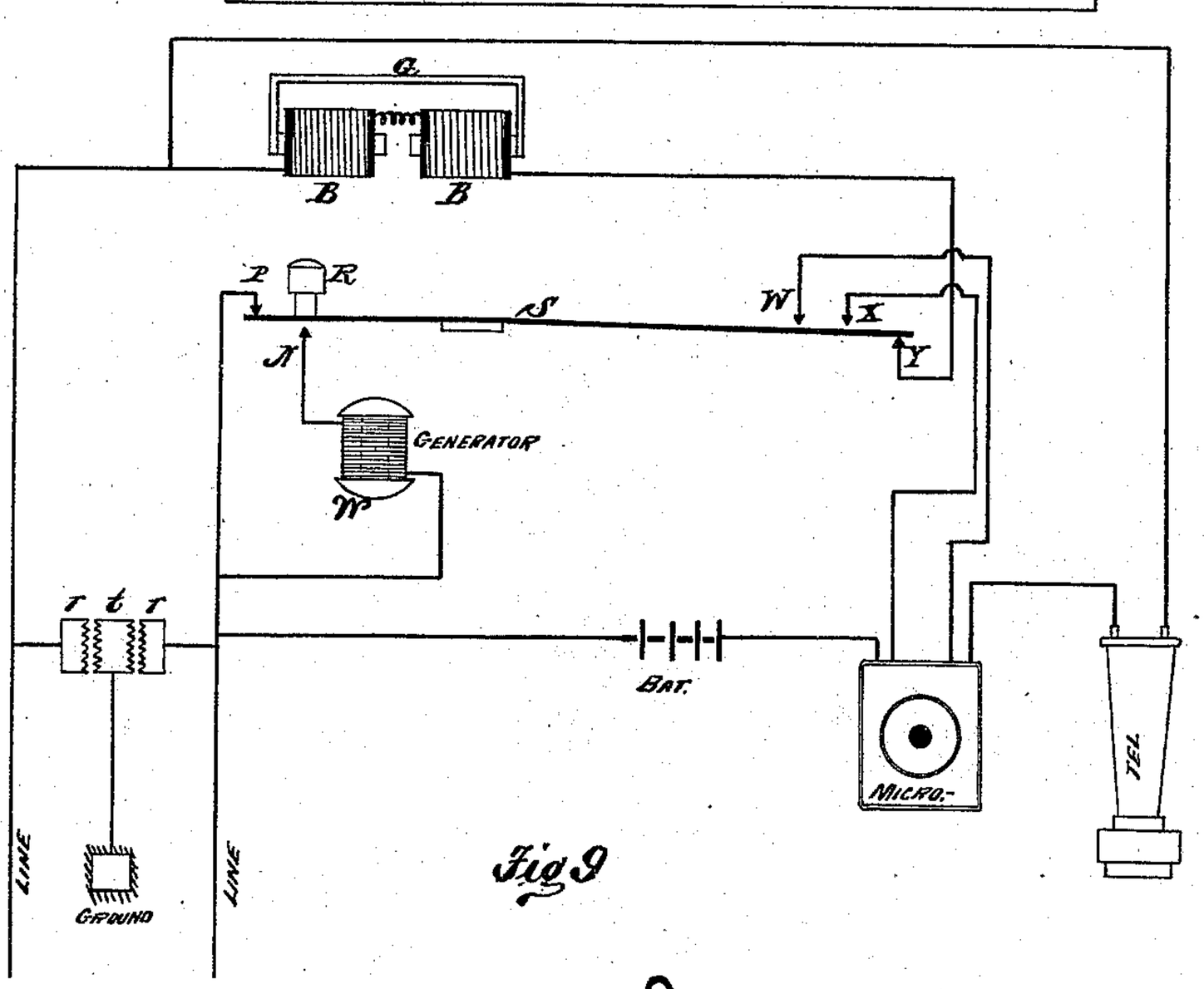

Fig 9

WITNESSES:

Geo. T. Langman,

W. H. Cory.

James N. See, INVENTORS.

William N. Gray,

UNITED STATES PATENT OFFICE.

JAMES W. SEE AND WILLIAM N. GRAY, OF HAMILTON, OHIO.

SIGNAL-BOX FOR TELEPHONE-LINES.

SPECIFICATION forming part of Letters Patent No. 229,279, dated June 29, 1880.

Application filed January 29, 1880.

To all whom it may concern:

Be it known that we, JAMES W. SEE and WILLIAM N. GRAY, both of Hamilton, Butler county, Ohio, have invented certain new and useful Improvements in Signal-Boxes for Telephone-Lines, of which the following is a specification.

Our invention pertains to that class of signal-boxes which contain some form of electrical generator for sending a current over the line to operate a distant signal, and a signal device to be operated by a distant generator, together with sundry switches, by which the course of the circuit may be changed.

The object of our invention is to produce a signal-box which contains no wire connections between the essential terminals of the circuit-connections; to produce a signal-box whose connections can be instantly removed for inspection, repair, or substitution; to produce a signal-box whose connections are so placed as to be susceptible of inspection at every point; to produce a signal-box whose connections are in no wise dependent on the case or hinges of the box proper; to produce a signal-box whose case may be removed, so as to expose the entire mechanism to perfect view, and at the same time leave the functions of the entire mechanism unimpaired; to produce a signal-box whose entire connections can be machine-made, so as to secure the maximum of economy in construction; to produce a signal-box whose every connection between indispensable terminals is composed of a single metallic piece without splice or joint; to produce a box which can be connected up without a special knowledge of its functions; to produce a mechanism which can be treated and operated upon in the factory to its completion and test independent of the case which is to contain it; to produce a receiving-bell mechanism which can be adjusted with a single screw; to produce a bell-hammer which will not communicate its molecular vibrations to the magnetized armature to which it is attached; and to produce a vibrating armature which will rebound from the attracting-core without making actual magnetic contact with the core.

In our signal-box we attach the bell and all connections to the generator. We attach the generator to the back board of the case. We cover certain parts with a removable case. By this plan we may, even after the device is fixed in position for use, remove the case and expose the entire mechanism in operative condition. The back board, not forming a connection between parts, may be removed and still leave us the operative mechanism entire. This allows the mechanism to be completed and tested without handling the cabinet-work.

We attach our receiving-bells to the ends of adjustable levers, and we attach the cores of the electro-magnets to the same levers. The levers pivot at a point coincident with the pivot of the armature. Adjusting the levers therefore adjusts the bells and cores in proper proportion.

We put an elastic cushion where the armature strikes the cores, and thus get a rebounding tendency just when needed, and thus overcome in some degree the coercive force of the cores. We interpose an elastic substance between the bell-hammer and the armature, and thus insulate the latter from molecular vibrations from the former.

We attach a curtain-board to the generator in such a manner as to place the two terminals of the generator in connection with two metallic pieces on the curtain-board. We put all the binding-posts for incoming wires on the curtain-board. We bring the two terminals of the bell-coil wires to the curtain-board. All the essential terminals are thus massed upon the curtain-board, and there, by means of simple machine-made strips and switches of the simplest construction, we change the course of the current as desired, and accomplished by the usual complicated devices, which are very expensive and liable to mishap. This curtain-board attaches to the generator by a single screw. The curtain-board, with all the connections of the box, may thus be instantly removed for repair or substitution. Upon the bottom of the box we delineate the devices included in the various circuits, together with their connections, and we cause the proper binding-posts on the curtain-board to form the proper elements in this delineation. The merest tyro may thus make all the proper connections.

In the accompanying drawings, Figure 1 is a front elevation of the mechanism of our signal-box attached to the back board. Fig. 2 is a side elevation of the same, with the case in vertical section. Fig. 3 is a front elevation

of the receiving device or bell with one coil removed. Fig. 4 is a side elevation of a portion of the same. Fig. 5 is a side elevation of the armature and bell-hammer in position. Fig. 6 is a plan of the electro-magnets in position. Fig. 7 is an elemental sketch illustrating the principle of the bell adjustment. Fig. 8 is a bottom view of the bottom board, &c., and Fig. 9 is a diagram of the connections.

The generator.—The generator is of the common form of magneto device, with a Siemens armature revolving between the poles of permanent magnets. The device as shown in Fig. 2 will be recognized as of the usual form. One terminal of the wire on the armature is supposed to communicate with the outer cylinder of the generator, as usual. We make our connection with this terminal through the medium of the thumb-screw M, which is simply screwed into the body of the cylinder. The other terminal of the armature-wire is supposed to terminate in the spindle of the armature, as usual. We make our connection with this terminal by means of the flat spring *i*, which bears against the end of the spindle in the usual manner.

We will assume the reader to be posted in regard to well-known devices, and will confine our description generally to our improvements.

We attach the generator to the back board by means of a flanged clamp, *b*, as shown. The bolt *d*, passing through the usual clamp on the front of the magnets, screws into the back clamp and binds the parts together, as usual. On top of the cylinder we cast the projection *c*, through which we pass the clamping-bolt *d*, thus holding the parts by suspension as well as by frictional clamping. In the back clamp, *b*, we provide a socket, K, to receive a shank formed on the bell apparatus. To the bottom of the generator we attach a bottom board, *e*.

The bell mechanism.—We use two coils, D D, placed face to face, and a polarized armature, E, vibrating between the faces. The two cores are connected by the curved flexible heel-bar G.

Permanent magnets may be added to our device to increase the force; but for simplicity's sake we make no further mention of them.

I is a shank, whose lower end, *n*, fits into the socket K in the back clamp of the generator previously mentioned. The shank I divides below the coils, and its two branches, H H, separate at the top and receive the bells B B. The two branches are adjusted with reference to each other by means of the screws *k* and *l*. The branches of the stem are provided with side wings, F, to which are attached the cores, as shown. The armature E is pivoted below the cores at J. By manipulating the screws *k* and *l* the branches H can be approached or separated, and as the cores and bells are attached to the branches, the effect is as if the branches were pivoted together at J, while in fact they simply give way to the strain. Fig. 7 is intended to illustrate this more plainly.

It will be seen that the adjustment affects both the bells and the cores in proper proportion. In order to protect the armature E from molecular vibrations naturally imparted by the hammer C, the latter is bushed with gutta-percha or other similar substance at *m*.

To prevent the armature E from sticking to the cores, and to cause a rebound at each stroke, the rubber cushion *z* is inserted in the armature at some point where it will strike some stationary part—in this case the cores themselves. In order to separate the poles of the armature E it is made in the form shown, with two branches, whose extremities form the poles. The pivots are located one at a pole and the other at the neutral point.

The branches H of the stem may be pivoted to the stem, as mentioned; but in practice the flexible juncture is found best. Without the adjusting feature the construction of the support is simple and effective.

The curtain-board.—L is the curtain-board, on which are placed all the connections. As shown in Fig. 1, this board is placed in front of the generator and at the bottom. The board is held in place by the thumb-screw M, which, as before explained, screws into the cylinder of the generator, and is in electrical connection with one terminal of the armature-wire. The side spring, N, as before mentioned, contacts with the armature-spindle, and thus places the board in electrical connection with the other terminal of the armature-wire. This board may be used with any form of generator, either magneto or voltaic, and the parts should be so arranged that the two terminals of the generator-circuit are brought into contact with connectors on the board, substantially as has been explained. In the present case the signal-box is arranged to receive the two line-wires, a safety ground-wire, two telephone-wires, and the usual microphone-wires, together with a wire from the microphone-battery. A press-button, R, is provided for cutting the generator into circuit when signaling.

An automatic switch, as usual, is provided in the fork T. The telephone is to be hung on this fork when not in use. This cuts the telephone and microphone out of circuit, cuts the battery-circuit, so the battery will not waste, and leaves the bells in circuit. Pressing the button R breaks contact at P and closes contact at N, thus putting the generator in circuit for signaling. Removing the telephone from the forks T allows the spring to break contact at Y and to make contact at W, thereby cutting the bell-coils out of circuit and cutting the telephone and microphone in. At the same time the spring contacts at X, thus closing the battery-circuit. The plan of connecting will be at once understood by inspecting Fig. 9. All the binding-posts O are arranged, as shown, upon the curtain-board. All incoming wires attach here. The posts are numbered as shown: Nos. 1 and 3 are for the lines, No. 2 is for the safety ground-

wire, No. 4 is for the battery-wire, Nos. 5, 6, and 7 are for microphone-wires, and Nos. 8 and 9 are for telephone-wires. Posts are provided for every incoming wire, and it is obvious that their number may be reduced where it is admissible to put more than one wire in a post. The latter plan, however, is not commendable. It will be noticed by inspecting Fig. 8 that all these wires come into the box without outside crossing—that is, their arrangement is the same as that generally found in the microphone, &c.

All the connections on the curtain-board are made by means of simple metallic strips without joints or splices. These strips may be punched from sheet metal or they may be cast. In either case they are very much cheaper than the usual wiring in boxes, which requires much skill and presents many points inaccessible for repair, or inspection even.

The binding-posts O may be of the screw-and-washer variety, as shown in the drawings, or they may be of the usual socket character.

If the strips are cast, socket binding-posts may be cast on their lower ends.

Binding-posts Nos. 1, 2, and 3 are provided with lightning-arresters. If desired, this may be done with any other of the binding-posts on the board.

By inspecting Fig. 9 it will be seen that the left-hand line has two branches; that one branch goes through the bell-coils B and contacts with the spring S at Y when the spring is depressed, as when the telephone hangs on its hook, and that the other branch goes through the telephone, &c., and contacts with the spring S at W when the spring is not depressed. The right-hand line has two branches, as shown. One branch contacts normally with the spring S at P. The other branch includes the generator-coil, and contacts with the spring S at N when the button R is pressed. This arrangement of branches on both lines allows the signal-spring and the automatic switch-spring to be formed of a single piece of metal.

As a matter of course, the plan of connection may be modified and the advantages of the curtain-board still retained. Should the well-known secrecy-switch be desired, its application to our curtain-board would be easily and nicely accomplished without the need of further invention. We desire it understood that we make no claims to switching by means of a lever operated by the weight of the telephone.

The bottom board.—The bottom board *e* (shown in Figs. 2 and 8) is attached to the bottom of the generator, and serves as a bottom for the case. On the bottom of this bottom board, as shown in Fig. 8, we delineate the usual outside accessories of the signal-box, and we cause the binding-post O to form appropriate terminations for the delineated connections, as shown. One not posted in the electrical art may thus connect up the affair in proper shape.

The case or cover.—The case *a* is open at the back and bottom. It is notched at the top at *h*, so as to pass the bell-supports. A mortise, *g*, in front allows the automatic switch-lever T to project and operate. A mortise or hole may be provided in the side for the main shaft. The signal-button R may project, as shown, or it may be short and a supplemental button fixed in the box rest upon it. The case is held to its place by the thumb-screw *f* screwing into the head of the screw M or other convenient point. A lock may be added, if desired. The case being removed leaves the mechanism open for inspection on all sides, with all its connections and incoming wires in place. The case need not go into the hands of the metal-workers, as it is not a part of the mechanism.

We claim as our invention—

1. In a signal-box, the combination, with bells, electro-magnets, and a pivoted armature, of a divided supporting-frame having a bell and magnet coil attached to each division, the two divisions being attached together, either articulately or flexibly, and provided with adjusting-screws for altering their relation to each other, the whole constructed and arranged to operate substantially as set forth.

2. In a signal-bell, the combination, with a divided adjustable frame, of two electro-magnet spools, facing each other and supported by wings projecting from the frame, and a flexible heel-bar uniting the cores of the spools, substantially as set forth.

3. In a signal-bell, the combination, with two electro-magnet spools facing each other, of a flexible heel-bar uniting the cores of the spools, and a supporting-frame having two branches for supporting the spools, a flexible or yielding juncture between the branches, and adjusting-screws for regulating the distance between the cores, substantially as set forth.

4. In a signal-bell, the combination, with a polarized armature and a bell-hammer, of a non-conducting substance interposed between the armature and hammer, whereby the molecular vibrations excited by the jar of the hammer are prevented in a great degree from destroying the polarization of the armature, substantially as set forth.

5. In a signal-bell having a polarized armature arranged to oscillate upon pivots, an L-shaped polarized armature having its poles at the extremities of the branches, and having its pivotal axis in the plane of one of the branches, substantially as set forth.

6. In a signal-box, the combination, with signal-bell having a shank to its frame and an electrical generator, of a socket adapted to receive the shank of the bell-frame, and provided with means for attaching it to the back board of the box and for attaching the generator to it, substantially as set forth.

7. In a signal-box, a magneto-generator having an armature-cylinder provided with a suspension-boss, *c*, combined with the back

clamp *b* and the bolt *d*, substantially as set forth.

8. In a signal-box, the combination, with an electrical generator and a box, of a curtain-board attached to the generator and arranged to receive the connectors, substantially as set forth.

9. In a signal-box, the combination, with an electrical generator and a box, of a curtain-board for receiving the connections, and an attaching-screw in electrical connection with one terminal of the generator, whereby the curtain-board, with its affixed connectors, may be removed from the box without disturbance of other portions, substantially as set forth.

10. In a signal-box, the combination, with an electrical generator, of a curtain-board attached to and removable from the generator, an attaching-screw in electrical connection with one terminal of the generator, and a projecting back spring attached to the board and contacting with one terminal of the generator, substantially as set forth.

11. In a signal-box, the combination, with a gravity-switch device and a push-button, of a double-ended spring arranged in the circuit, substantially as set forth, whereby each end of a single spring may be utilized as a switch.

12. In a signal-box, the arrangement upon a curtain-board of the connections between the essential terminals of the circuit, substantially as set forth.

13. In a signaling device, the combination, with binding-posts arranged to receive the incoming wires and a chart or diagram delineating the accessories of the signaling device, of delineating lines or marks upon said chart, uniting the delineated accessories and the proper binding-posts, substantially as set forth.

14. In a signal-box, the combination, with a case and a curtain-board having attached the binding-posts, connectors, &c., and a back board, of a bottom board supported independently of the case and of less depth than the case, whereby a space for the entrance of wires is provided between the back surface of the case-front and the front edge of the bottom board, substantially as set forth.

15. In a signal-box, the combination, with the curtain-board screw M, having its head internally threaded, of the cover-screw *f*, adapted to screw into the screw M, substantially as set forth.

16. In a signal device for telephone-lines, the combination, with the circuits so arranged that one incoming line is branched and contains upon one branch a signal-receiving device and upon the other branch a telephone, and at the terminal of each branch a stationary contact-point, while the other incoming line is also branched, and contains upon one branch an electrical generator for signaling, both branches terminating in stationary contact-points, of a switch adapted to direct the course of the current from either terminal of one line to either terminal of the other line, substantially as set forth.

JAMES W. SEE.
WILLIAM N. GRAY.

Witnesses:
GEO. P. TANGEMAN,
J. J. MCMAKEN.