No. 808,277. PATENTED DEC. 26, 1905.

G. E. DUNTON.

ELECTRIC BELL OR GONG.

APPLICATION FILED MAR. 15, 1904.

4 SHEETS—SHEET 1.

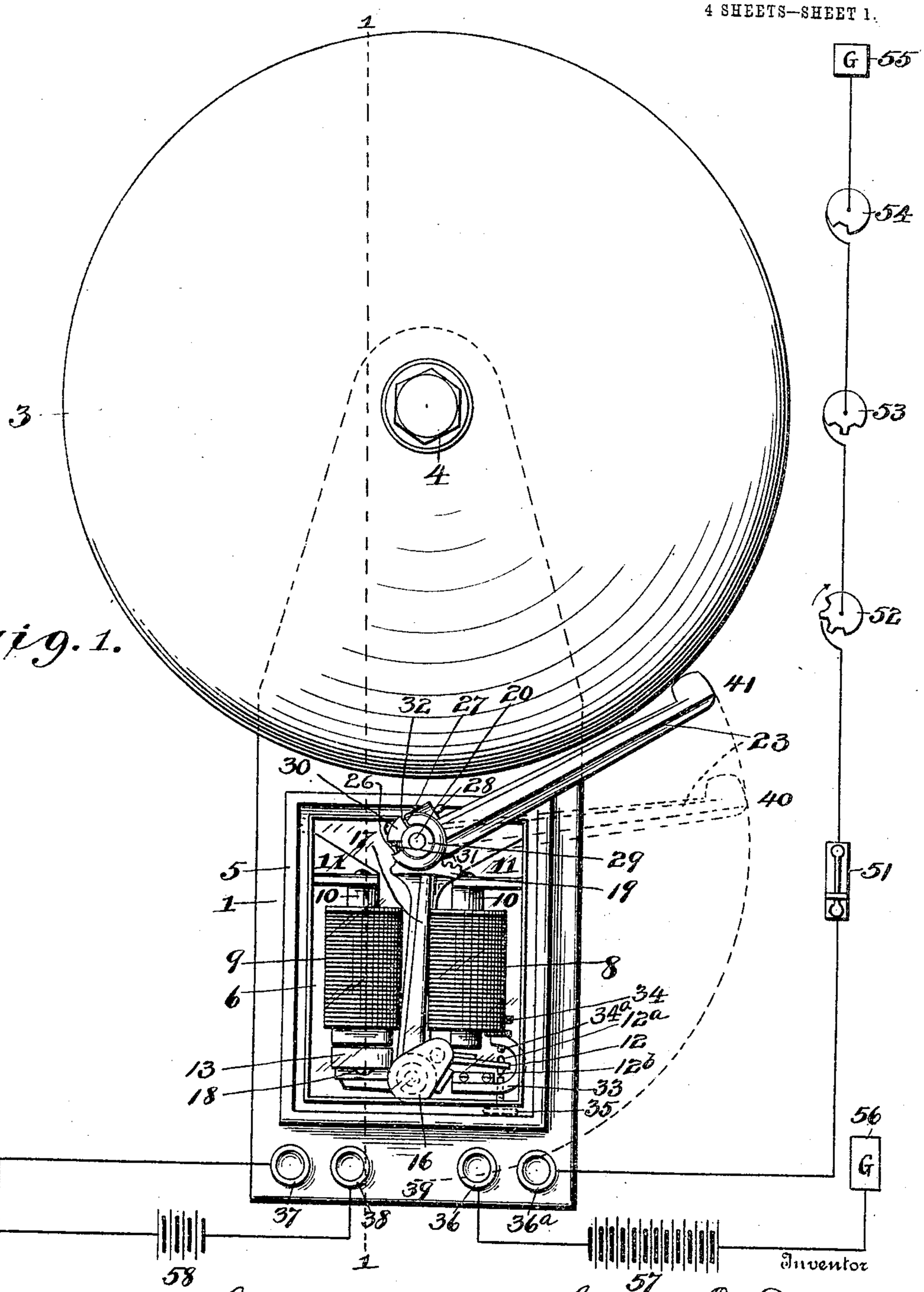

Fig. 1.

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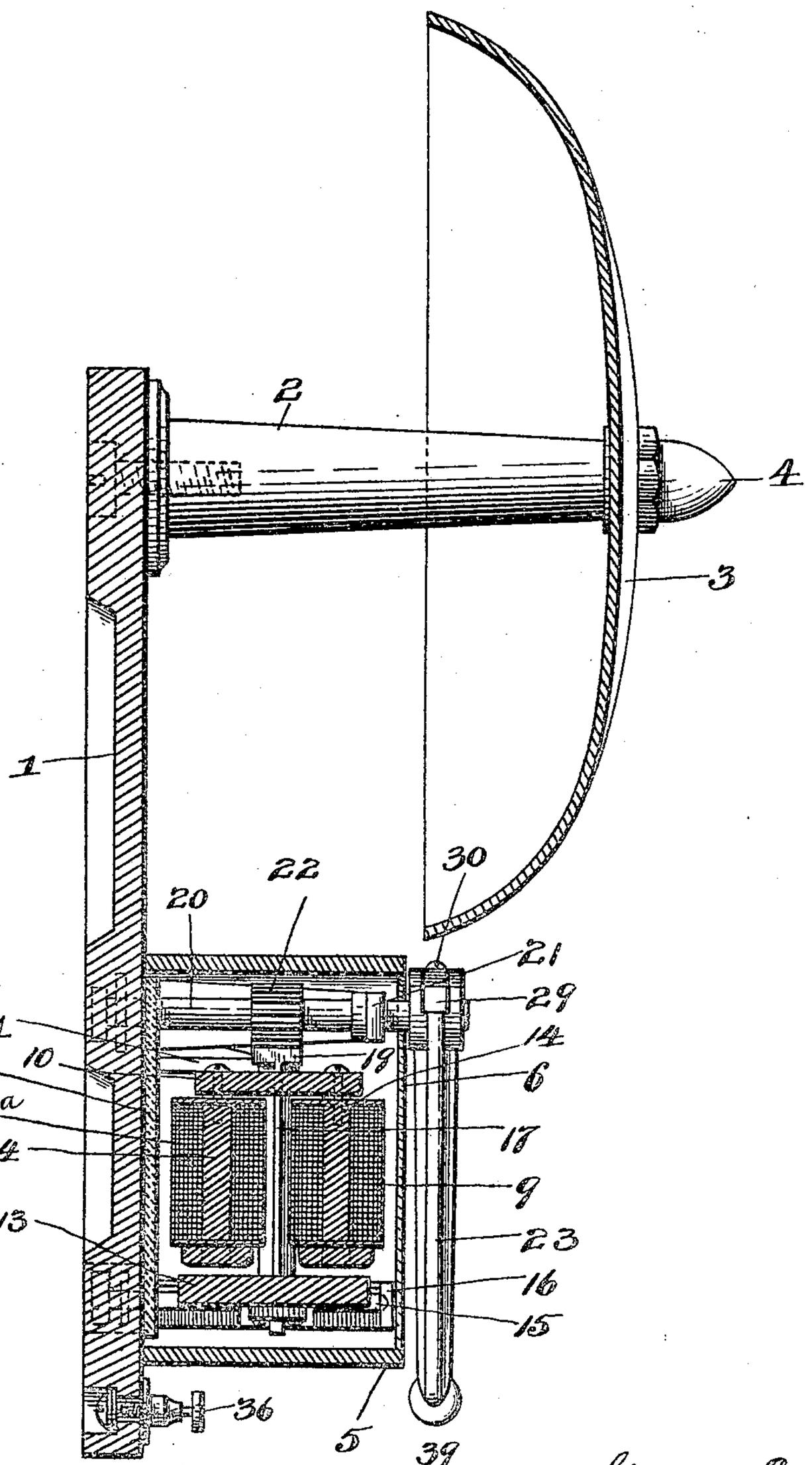
4 SHEETS—SHEET 2.

Fig. 2.



Witnesses

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4 SHEETS—SHEET 3.

Fig. 8.

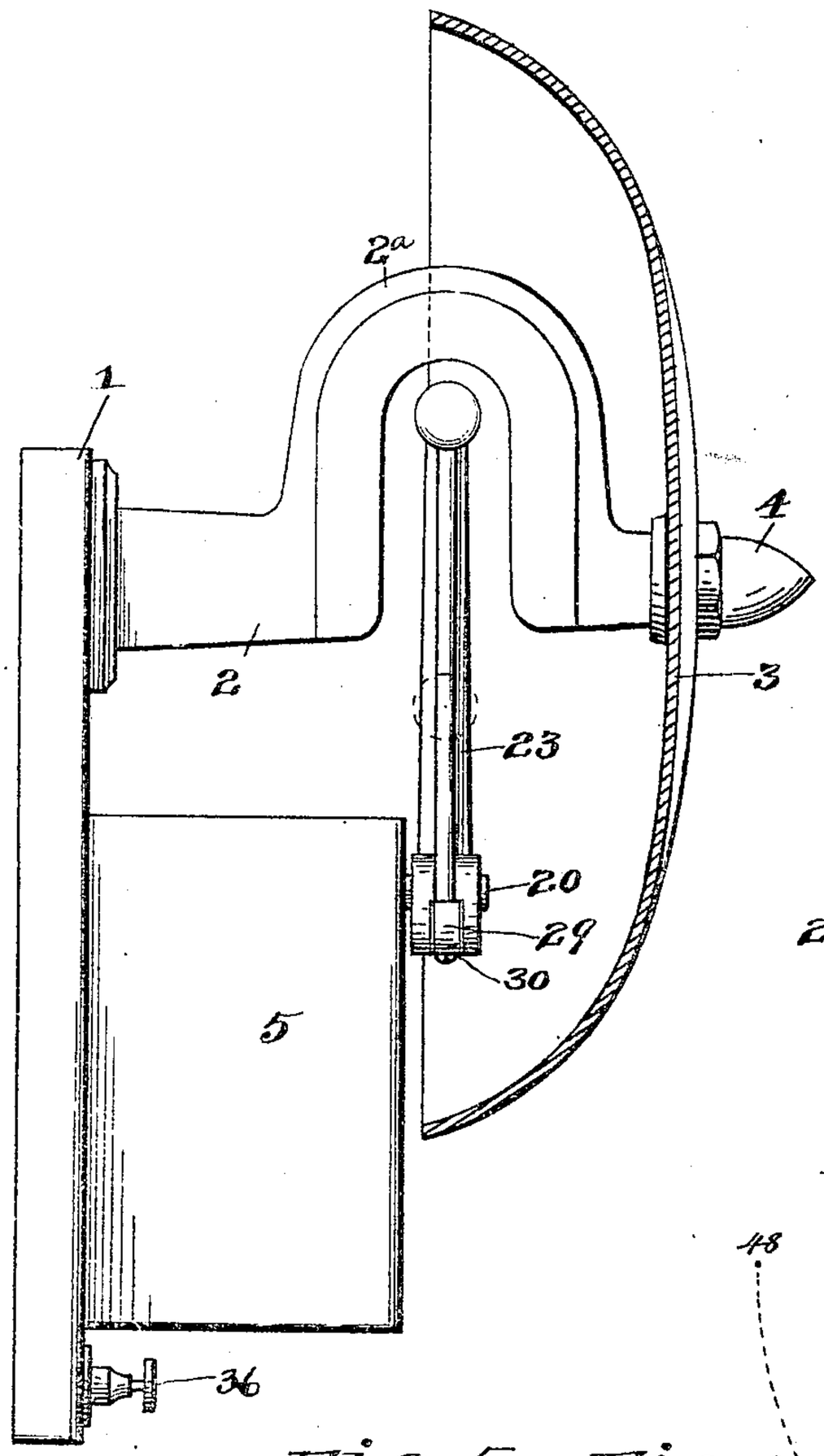

Fig. 5.

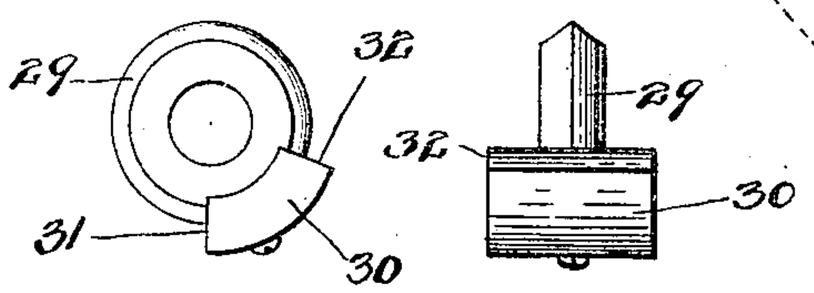

Fig. 3.

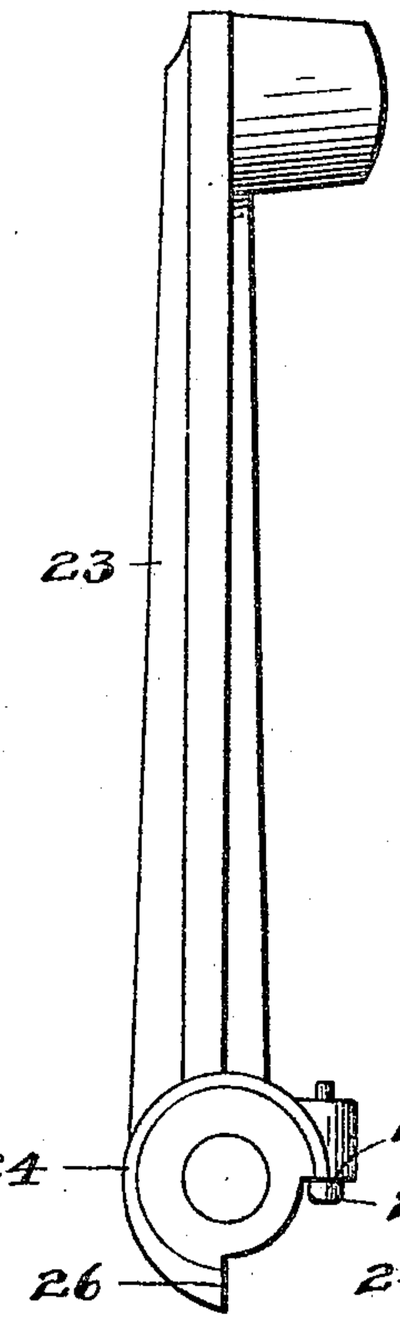

Fig. 4.

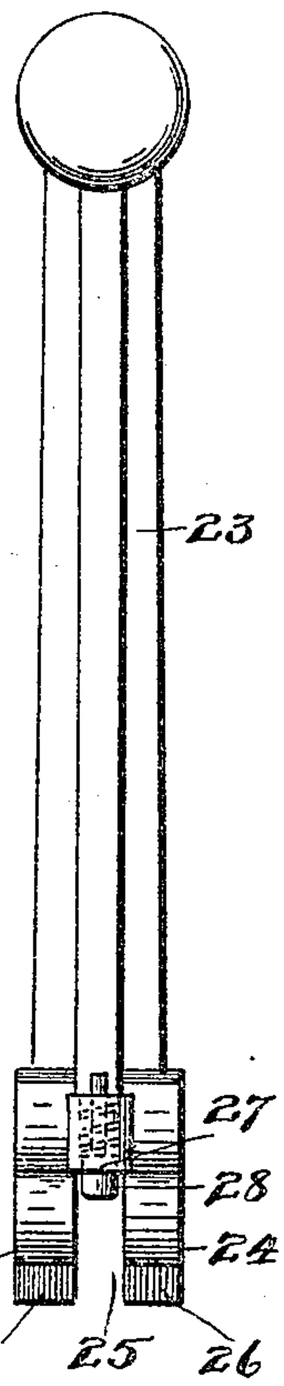

Fig. 7.

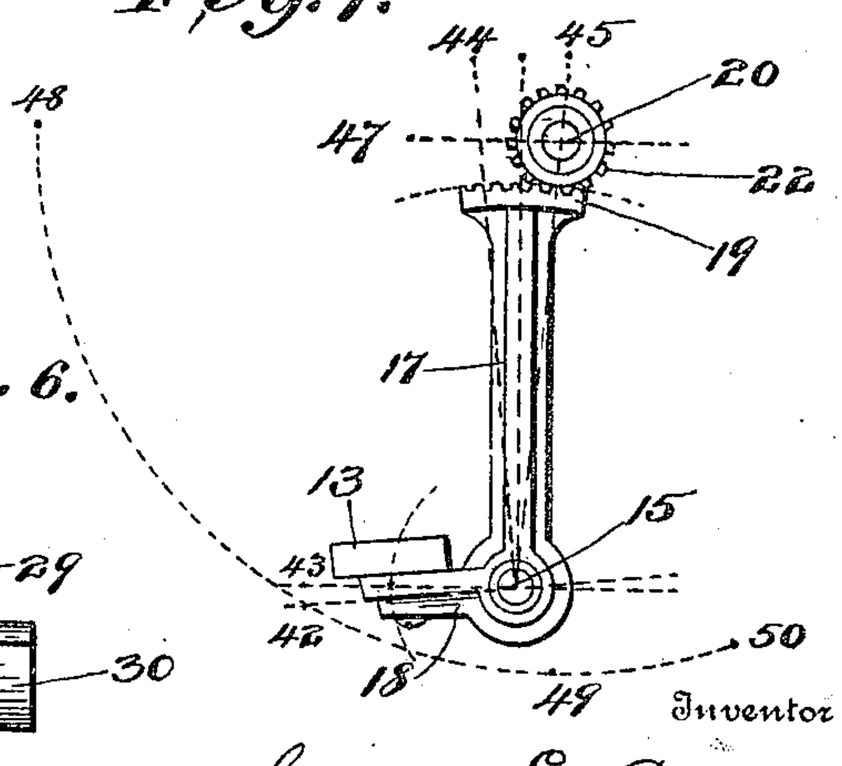

Fig. 6.

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4 SHEETS—SHEET 4.

Fig. 9.

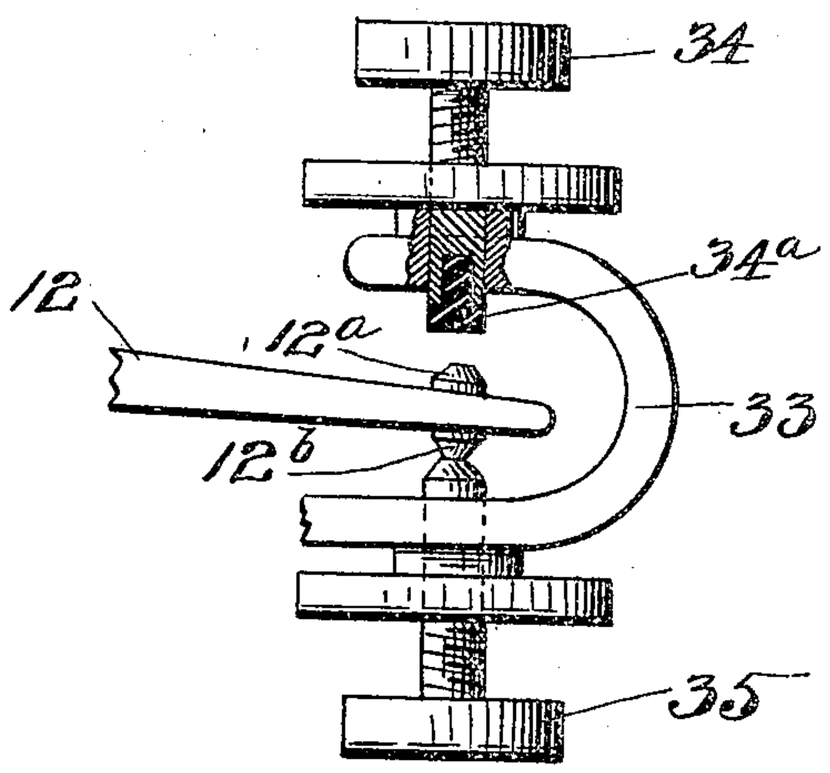


Fig. 10.

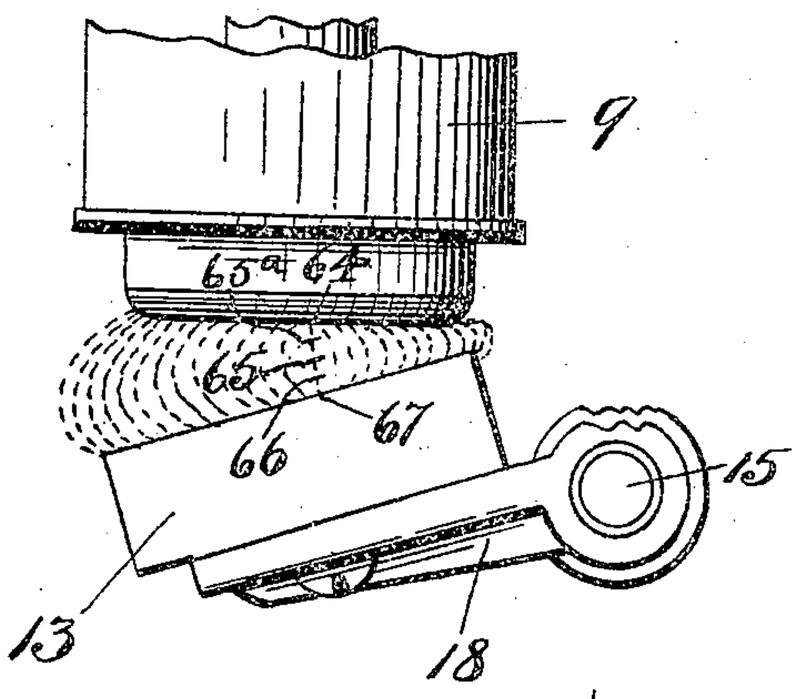
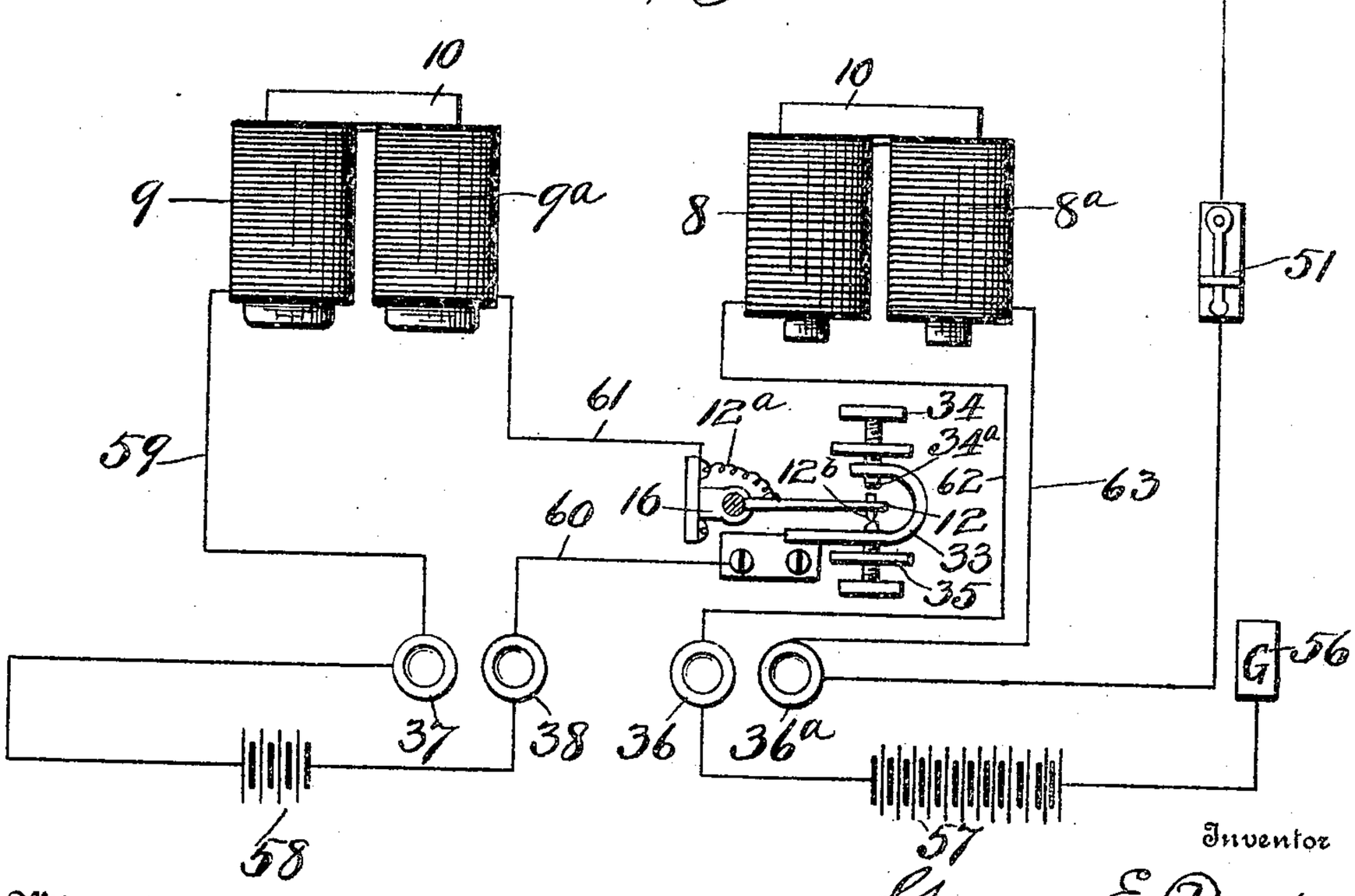


Fig. 11.



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UNITED STATES PATENT OFFICE.

GEORGE E. DUNTON, OF NEW YORK, N. Y.

ELECTRIC BELL OR GONG.

No. 808,277. Specification of Letters Patent. Patented Dec. 26, 1905.

Application filed March 15, 1904. Serial No. 198,241.

To all whom it may concern:

Be it known that I, GEORGE E. DUNTON, a citizen of the United States, residing at New York, in the county of New York, State of New York, have invented certain new and useful Improvements in Electric Bells or Gongs; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to an improvement in electric bells or gongs, and has for its object to provide a bell or gong of such a construction that it will be impossible for the hammer to make more than one movement toward the bell or strike more than one blow at each interruption of the electric circuit. By a very short range of action of the armature the hammer will be given a long and powerful stroke, and when the armature has reached its limit of action by being drawn to and abutting against the pole-piece of the magnet, the hammer having moved with it, said hammer will not be arrested, but will continue on in its movement toward the bell by its own momentum and strike the bell a powerful blow equal to the force produced by its own momentum and then immediately assume its normal position ready for another stroke. It also has for its object to provide a bell or gong which is exceedingly simple, durable, and inexpensive in construction and easy of operation.

My invention consists in the construction, combination, and arrangement of the several parts, as more fully hereinafter described and claimed.

Referring to the drawings which illustrate my invention, Figure 1 is a front view in elevation; Fig. 2, a vertical section on the line 1 1 of Fig. 1; Figs. 3, 4, 5, 6, and 7, detail views of the levers and bell-hammer arm for operating the bell; Fig. 8, a side view in elevation of a modified form of bell in which the hammer to operate and strike the bell is on the inside. Fig. 9 is an enlarged detail view, partly in section, of the circuit making and breaking device shown in Fig. 1. Fig. 10 is a detail view of a portion of one of the magnets and its armature, showing the action and direction taken by the magnetic lines of force as they pass from the rounded edges of the pole-piece to the armature; and Fig. 11 is a diagrammatic view showing the bell-circuits and connections.

In the drawings, on which like numerals of reference denote like parts throughout the several views, 1 represents the base-plate of the bell provided at its upper portion with a post 2, screwed or otherwise attached thereto.

3 is a bell mounted on the top of the post and held thereon by a screw-nut 4.

5 is a box mounted on the lower portion of the base-plate, provided with a glass front 6.

7 is a composition plate attached to the base 1 inside the box 5.

8 8^a and 9 9^a are two sets of magnet-coils, each supported by means of their yokes 10 on a bracket 11, extending from the base-plate.

12 and 13 are armatures designed to be attracted by the magnet-coils 8 and 9, respectively. The coils 8 are high-resistance relay or main-line circuit coils wound to correspond with the other coils used in the same circuit relative to their resistance, and the coils 9 are the bell or hammer coils and are wound with a few turns of coarse wire, giving to the coils a very low resistance, making the action of their magnets very powerful and quick and demagnetization instant and complete. The pole-pieces of bell-magnets 9 are rounded at the edges to prevent leakage and are made larger than the pole-pieces of the magnets 8, exposing more attractive surface to the armature 13, which is made proportionately large. The coils of both sets of magnets are wound on soft-steel cores 14, connected to the yokes 10 by suitable screws.

15 is a shaft the inner end of which is journaled in the base-plate 1 and the outer end in a bracket 16. A lever 17 is secured to said shaft and is provided at its lower end with an arm 18, carrying the armature 13 of the bell-coil, and provided at its upper end with a toothed sector 19.

20 is a shaft mounted in a bracket 21 at the upper portion of box 5 and having a pinion or cog-wheel 22 mounted thereon, with which the toothed sector engages.

23 is a bell-hammer lever pivoted loosely on the shaft 20 and provided with lateral bosses 24, having a slot 25 between them and each provided with stops 26 and 27, the stop 27 being provided with a plunger 28, having a spiral spring surrounding the shank of the same, said spring-plunger being for the purpose of immediately retracting the bell-hammer and preventing the same from remaining in contact with the bell after the blow is struck. A collar or sleeve 29 is rigidly fixed to the shaft 20 and is provided with a peripheral projection 30, having inwardly-slanting ends 31 32. The stop 31 is adapted to abut against the end 26, while the spring-controlled

plunger 28 is adapted to abut against the stop 32.

33 is a yoke attached to the base-plate by any suitable means and provided with contact-screws 34 and 35, the contact-screw 34 being provided with an insulating point or tip 34^a, so that when the armature 12 (which is pivoted to the bracket 16 and is provided with contact-points 12^a 12^b) comes in contact with its pole-piece the electrical circuit of the coil 9 will be open—that is, not connected with the batteries operating the bell.

In the modification shown in Fig. 8 the construction and arrangement of the several parts is the same as heretofore described, but the box containing said parts is moved upward on the base-piece and the base-piece is provided with a post 2 for supporting the bell and has an upwardly-extending loop or arch 2^a for the purpose of allowing sufficient space for the bell-hammer to operate and strike the bell on the inside instead of on the outside. The short range of action of the bell-coil armature is multiplied by its being attached to the end of lever 17, with the fulcrum placed nearer relatively to the power applied than the resistance. This lever is in turn compounded with the bell-hammer arm, which is the striker of the bell or gong, in which the fulcrum is still nearer to the point of applied power. In this manner the action of the armature of the magnet, which at the pole-piece of the magnet is through one-eighth of an inch, is multiplied at the striker of the gong to a sweep through an arc of one hundred and ten degrees. As the striker moves with an accelerated velocity, that acceleration must bear some relation to and be controlled by some action between the striker and the pole-piece of the electromagnet. The action which governs and is transmitted to the striker of the gong takes place between the magnet pole-pieces and the armature of the magnet, depending upon the values of magnetic attraction between the pole-pieces of the magnet and its armature. This magnetic force varies inversely with the square of the distance, and consequently if at a given point the value of the magnetic attraction between the pole-piece and the armature—say at its greatest distance from the pole-piece, as at 67—is one then when it has moved forward toward the pole-pieces to a point 65, at which the distance is halved, then the value of the magnetic attraction at this point becomes four by virtue of the law of inverse squares. When it has reached a point 65^a, at which the distance to the pole-pieces is only one-fourth of the whole or of that from the point from which it was at rest, then the value of the magnetic attraction becomes sixteen. The fact is potent that the armature is free to move with the lever to which it is attached from the lever's fulcrum, its only resistance being the movement of the striker. Its velocity will accelerate with a value nearly or quite equal to that of the magnetic attraction of the armature toward the pole-pieces as the distance between the armature and the pole-pieces decreases. If I were to arrive at the approximate speed or velocity of the striker at a given point as it comes nearer to the gong, I would have the value of the magnetic attraction at that point of the armature (or the corresponding position) multiplied by the factor of the striker's instantaneous velocity.

The operation is as follows: The bell or gong having been placed in position, the terminals are connected with the wires of the main line, which are grounded at 55 56 for return in series with the devices 51 52 53 54 for interrupting the circuit, other gongs, (not shown,) and the source 57 of electrical supply. The binding-posts 36 36^a, representing the terminals referred to, place the relay-coils in series with the main or signaling circuit. The wire 62 connects the binding-post 36 with the relay-coils 8, wire 63 connects binding-post 36^a with the relay-coils 8^a, and the wire 59 connects the binding-post 37 with the bell-coils 9. The bell-coils 9^a are connected with the relay-armature 12 through the medium of the wire 61, bracket 16, and bond-wire 12^a, and when the contact-point 12^b engages the point of the screw 35 the circuit will be continued through yoke 33 to wire 60, which connects with the binding-post 38. The two binding-posts 37 and 38, representing the terminals of the bell or striker coil, are connected with the source of electrical supply 58, supplying energy for those coils alone. The bell is then ready for operation.

If the gong is installed for closed-circuit work, as is the case in fire-alarm-telegraph service, the main circuit, in which are the relay-coils, is closed, excepting at the moment of causing the bell or gong to be struck, by the operation of one of the breaking devices 52 at some point in the circuit which interrupts the momentary passage of the electric current or opens the circuit. If on open-circuit work, conditions are exactly the opposite.

Assuming that the bell or gong has been installed in a fire-alarm telegraph-circuit and properly connected, the electric current passes continuously around through the relay-coils 8, and by its action on the cores of the coils they become electromagnets under the influence of the passing electric current. By the laws of magnetic attraction the armature 12 of the relay 8 is held and maintained firmly against its pole-pieces. The contact-point of the armature 12 is held firmly against the thumb-screw 34, which is tipped with an insulating-point. Under these conditions the bell-coil 9 is inactive and remains in this normal condition as long as the relay-circuit is closed or the current is uninterrupted in the signaling or main-line circuit. An alarm of fire is sounded from a distant box 52 by start-

ing the operating mechanism, which consists, briefly, of a "break-wheel," so called, operated by a spring which is wound up sufficiently to carry the wheel around the desired number of times by pulling down and releasing a hook. The wheel has longitudinal slots cut around its periphery representing the number of the box from which the signal is sent. A contact-spring rests upon the periphery of this wheel, and at the instant one of the slots passes under this spring the contact between the two is broken, interrupting or stopping the passage of the current in the entire relay-circuit. 51 is a break-key used in stations instead of the above wheel. At the instant of interruption or breaking of the current in the relay-circuit the following actions take place at the bell or gong: The armature 12 of the relay-coil 8 is no longer attracted to the pole-piece of the relay, it having ceased momentarily to be an electromagnet, and by the force of gravity falls, its contact-point striking the contact-point 35 of the yoke 32. This action closes the bell-circuit by connecting the binding-post 38 through the yoke 33, the contact-point 35 with the contact of the armature 12 representing one end of the bell-coil wire. The other end of the coil-wire being connected with the other binding-post 37 completes the bell-circuit, placing each bell, if there are more than one on the main line, directly in series with its own and individual battery or source of electricity.

The instant the bell-coils 9 are connected with the batteries or other sources of electricity the following action takes place: The magnets become active or energized and owing to the increased active surfaces of their pole-pieces powerfully attract the armature 13, which is attached to the arm 18. At the instant that this action takes place the working parts of the bell or gong are in the respective positions shown in Fig. 2, the armature 13 being dropped down and away from the pole-pieces and the bell-hammer arm being in the position shown.

While the action transpires instantaneously, I will describe it in detail. As the armature 13 is drawn to the pole-pieces the lever 17 is carried forward, turning on its pivotal shaft 15. This causes the toothed sector 19 to engage the pinion 22, causing the said shaft to turn one-quarter around, describing an arc of ninety degrees.

By the actions just set forth the bell-hammer arm 23 is carried from its position of rest 39 to 40. (See Fig. 1.) At this point the armature has traversed its allotted distance, meeting the pole-piece, where it is held until the relay-circuit is again closed, opening the bell or gong circuit by separating the contact-points 12^b 35; but the bell-hammer arm being swiveled upon the pivotal shaft 20 continues to move by its own momentum from position 40 to 41 through an arc of from ten to fifteen degrees, striking the bell or gong at its edge.

To hasten the reaction of the bell-hammer arm, the plunger 28 is forced against the stop 32 on the collar 29, which depresses the coil-spring of the plunger at the instant the bell or hammer arm comes in contact with the bell or gong. This forces the bell or hammer arm from the position 41 back to the position 40. If the bell-coil is still electrified, the bell or hammer arm will remain in the position 40 until the circuit is open, when it will drop to the position 39 by force of gravity.

The multiplication of the range of action will be readily understood by reference to Fig. 7. At the points indicated by the stars on the lines 42 and 43, representing the distance through which the armature 13 acts, is multiplied in the lever 17 to the distance between the lines 44 and 45 at points at which these lines intersect the teeth of the sector the pinion is turned through an arc of ninety degrees, (indicated by the lines 46 and 47.) The sweep of the bell-hammer arm is represented by the dotted line 48, 49, and 50, the action caused by the movement of the armature 13 being from points 48 to 49, the inertia or momentum carrying the bell-hammer arm from the points 49 to 50.

I do not desire to be understood as limiting myself to the specific details of construction and arrangement as herein described and illustrated, as it is manifest that variations and modifications may be made in the features of construction and arrangement on the adaptation of the device to various conditions of use without departing from the spirit and scope of my invention and improvements. I therefore reserve the right to all such variations and modifications as properly fall within the scope of my invention and the terms of the following claims.

What I claim is—

1. An electric bell or gong comprising a bell-hammer mounted freely on a single pivot supported in stationary bearings, an armature, a magnetically-controlled device for operating said armature and swinging the bell-hammer axially with said pivot a portion of the distance toward the bell, and means for allowing the hammer to move axially on said pivot the balance of the distance by its own momentum, substantially as described.

2. An electric bell or gong comprising a bell-hammer mounted freely on a single pivot, an armature, a magnetically-controlled device for operating said armature and swinging the bell-hammer axially with said pivot a portion of the distance toward and from said bell, and means for allowing the hammer to move axially on said pivot toward and from said bell, substantially as described.

3. An electric bell or gong provided with electromagnets, a shaft provided with an oscillatory lever provided with an armature at

one end designed to be attracted by said magnets, and a toothed sector at the opposite end, a shaft provided with a pinion engaging said sector, and with a loosely-mounted bell-hammer arm having stops on the periphery of its inner end, and means mounted rigidly on said shaft with which said stops are designed to engage, substantially as described.

4. An electric bell or gong apparatus provided with electromagnets, a shaft provided with an oscillatory lever, having an arm with an armature designed to be attracted by said magnets, and a toothed sector, a shaft provided with a pinion engaging said sector, a bell-hammer arm loosely pivoted on the shaft provided with bosses having stops on their peripheries, a sleeve fixed to said shaft provided with a peripheral projection having stops at each end against which the stops of the bell-hammer arm abut, substantially as described.

5. An electric bell or gong apparatus provided with electromagnets, a shaft provided with an oscillatory lever having an arm with an armature designed to be attracted by said magnets and a toothed sector, a shaft provided with a pinion engaging said sector, a bell-hammer arm loosely pivoted on the shaft and provided with laterally-extending bosses having stops, a slot between said bosses, a sleeve rigidly fixed on said shaft and extending into said slot, said sleeve provided with a peripheral projection having ends against which the stops of the bell-hammer arm are designed to abut, substantially as described.

6. An electric bell or gong apparatus provided with electromagnets, a shaft provided with an oscillatory lever having an arm provided with an armature designed to be attracted by said magnets and a toothed sector, a bell-hammer arm loosely pivoted on the shaft and provided with stops, a spring-plunger seated in one of said stops, a sleeve rigidly fixed on said shaft provided with a projection against which the said spring-plunger is adapted to contact, substantially as described.

7. An electric bell or gong apparatus provided with electromagnets, a shaft provided with an oscillatory lever having an armature at one end designed to be attracted by said magnets and a toothed sector at the opposite end, a shaft provided with a pinion engaging said sector and a loosely-mounted bell-hammer arm, and a base-piece, provided with a post, on which a bell or gong is mounted, said post having an arch designed to allow bell-hammer arm to operate and strike the bell from the inside, substantially as described.

In testimony whereof I affix my signature in the presence of two witnesses.

GEORGE E. DUNTON.

Witnesses:
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RICHARD I. WHITE.