No. 753,365. PATENTED MAR. 1, 1904.

W. U. COLTHAR.

ELECTROMAGNETIC SIGNAL.

APPLICATION FILED JULY 24, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

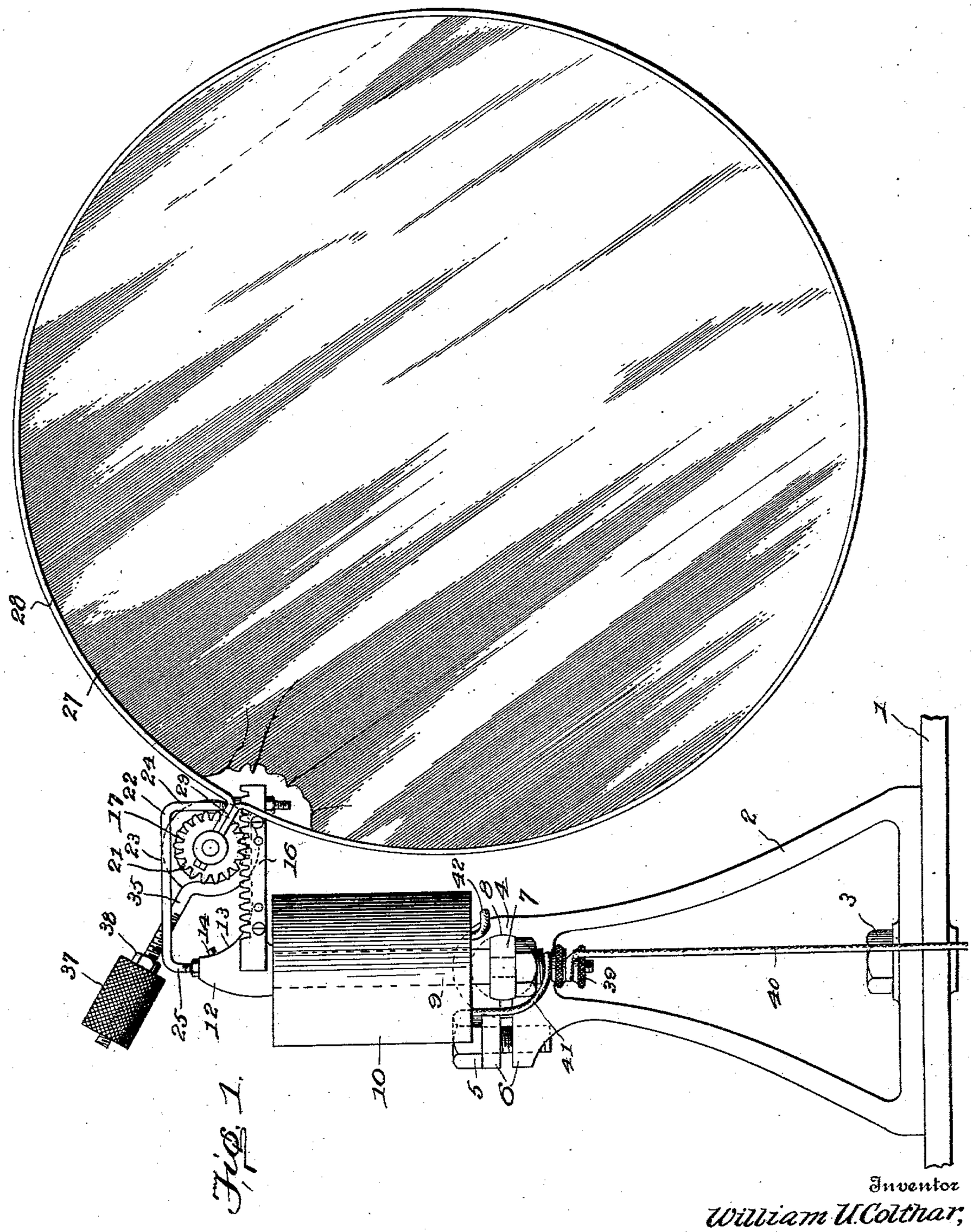

Fig. 1.

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NO MODEL. 3 SHEETS—SHEET 2.

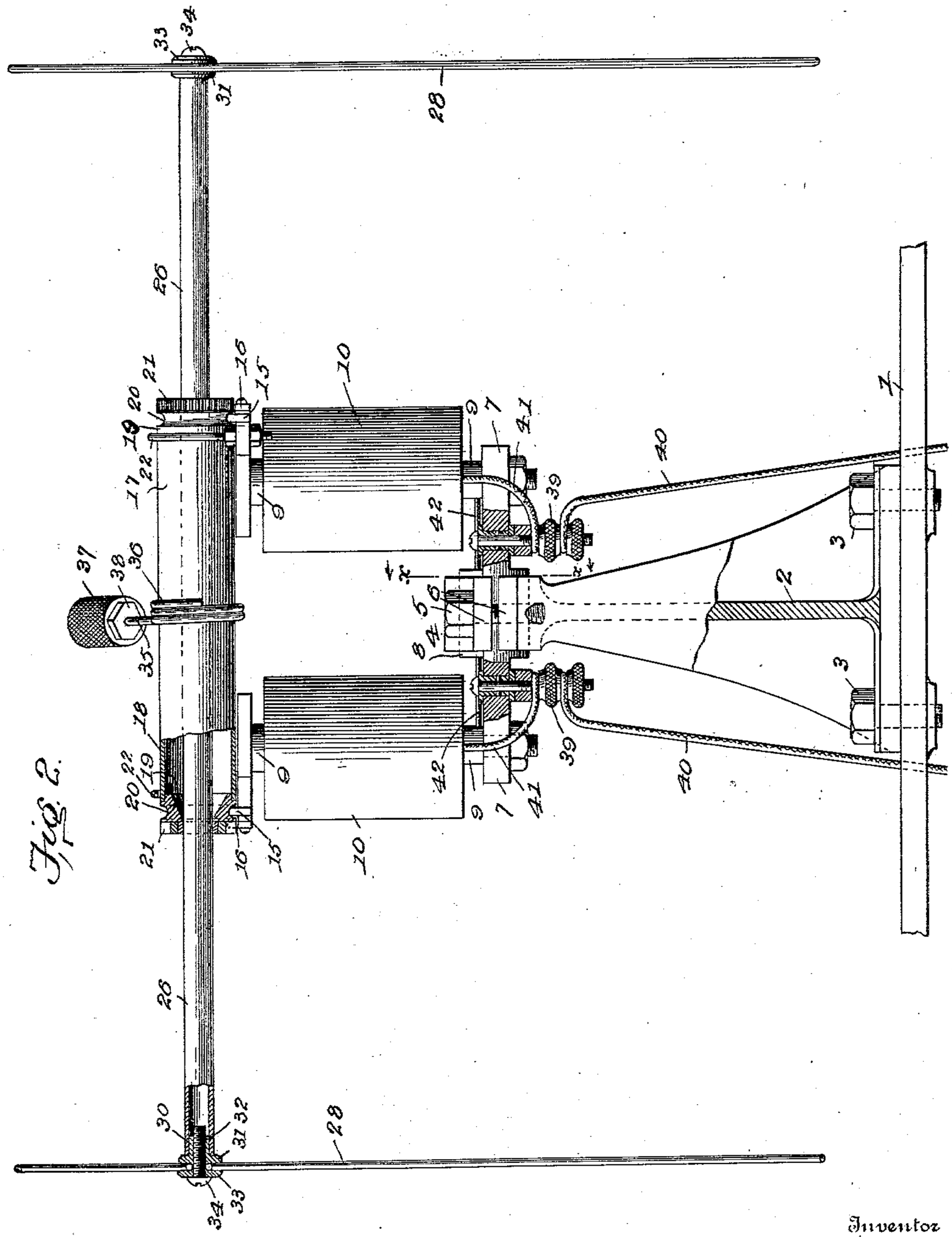

Fig. 2.

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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 3.

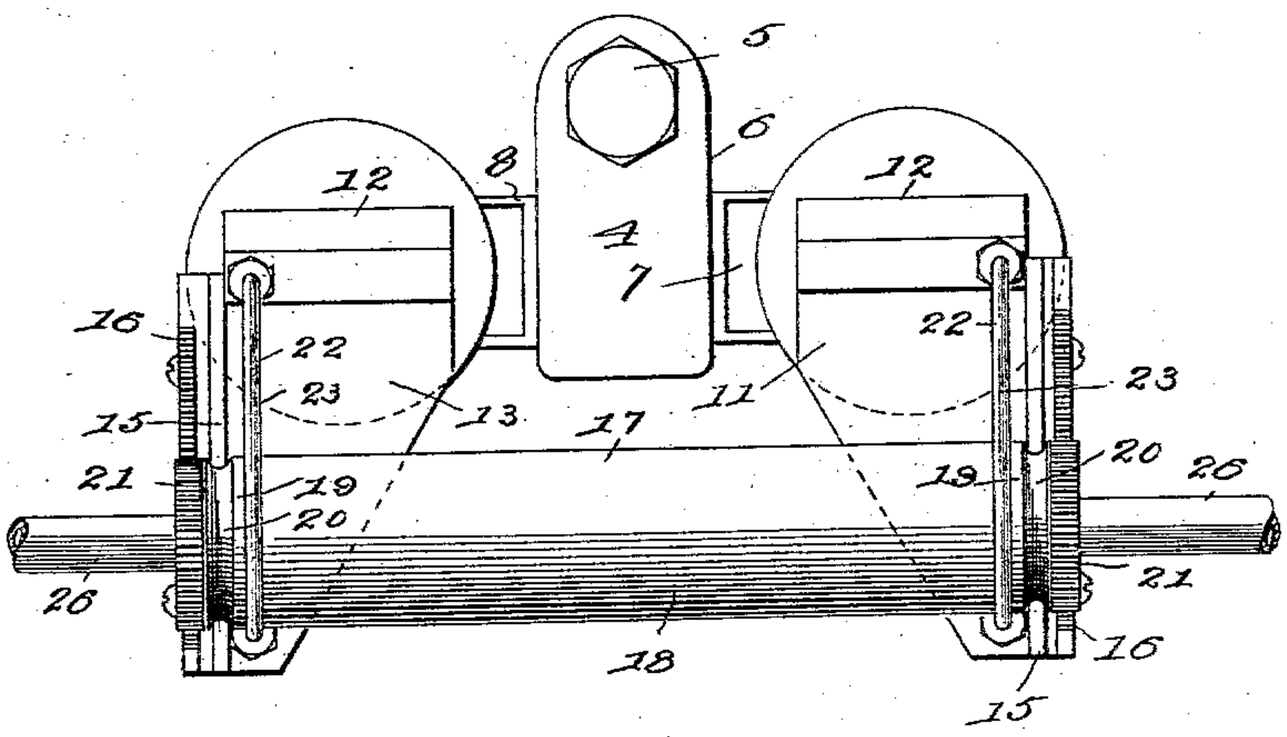
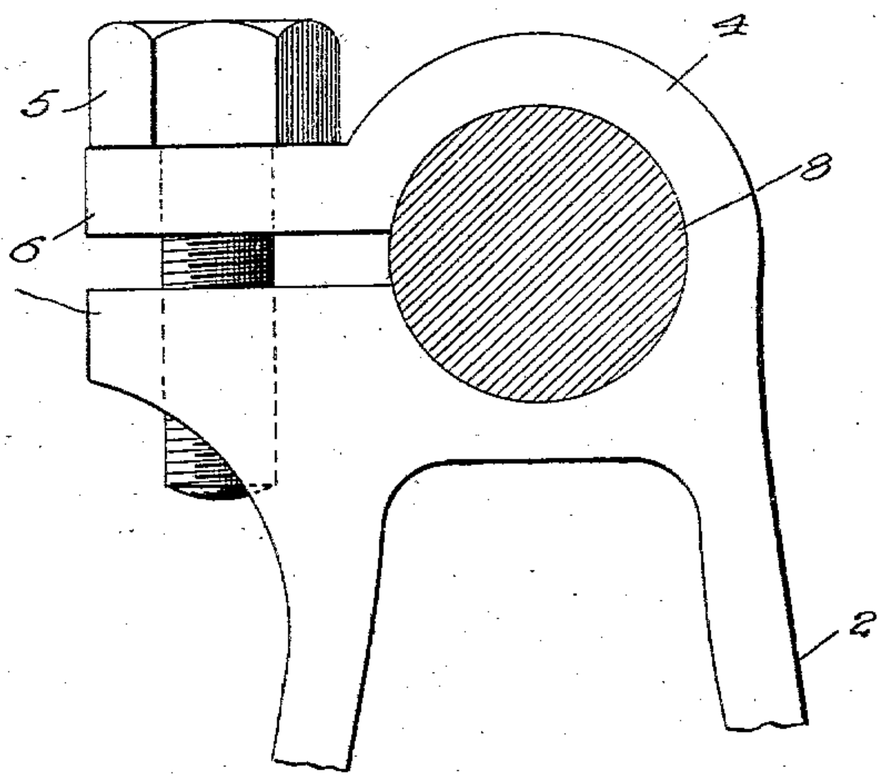


Fig. 4.



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UNITED STATES PATENT OFFICE.

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ELECTROMAGNETIC SIGNAL.

SPECIFICATION forming part of Letters Patent No. 753,365, dated March 1, 1904.

Application filed July 24, 1903. Serial No. 166,817. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM U. COLTHAR, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Electromagnetic Signals, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to electromagnetic signals, and has for its object to provide a signal of the semaphore type electrically operated which shall be simple and inexpensive in construction and which shall require such a small amount of power to operate it that a very few battery-cells will be sufficient for this purpose at a relatively slight cost for renewal.

To these ends my invention consists in certain novel features, which I will now proceed to describe and will then particularly point out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of a structure embodying my invention in one form. Fig. 2 is a front elevation, partly in section. Fig. 3 is a detail plan view, and Fig. 4 is an enlarged detail sectional view taken on the line *x x* of Fig. 2 and looking in the direction of the arrows.

In the said drawings, 1 indicates a suitable supporting bracket or table on which the signal is mounted.

2 indicates a base or standard adapted to be connected to the bracket 1 by bolts 3 or in any other suitable manner and serving as a support for the fixed and movable parts of the signal. This standard terminates at its upper end in a split collar 4, controlled by a clamping-screw 5, passing through lugs 6 at the rear of the collar 4 and threaded into the lower lug.

7 indicates a bar of iron forming the cross or connecting bar of the electromagnet, said bar 7 having its end portions flattened or with plane parallel upper and lower surfaces, as is usual with such cross-bars. The central portion of the bar 7 is cylindrical in form, as indicated at 8, to fit within the clamping-collar 4, in which it is located. By reason of this construction the bar 7 may be turned axially, so as to adjust the position vertically and horizontally of the parts supported by said bar. These parts comprise the cores 9 of the electromagnet, the coils of which are indicated at 10. Each core 9 is provided with a pole-piece 11, extending laterally from the axis of the core and of outwardly-decreasing sectional area or width, as shown in Fig. 3. These laterally-extending pole-pieces are located on the same side of a plane passing through the centers of the cores, and they extend in the same direction and are substantially parallel and flat on their upper surfaces. It will also be noted that they are of increasing bulk or size as they approach the cores. Each pole-piece is also provided above the corresponding core with an upwardly-extending portion 12, the front face of which is preferably concave, as indicated at 13, to conform to the shape of the rolling armature hereinafter referred to. This upwardly-extending portion 12 acts as a stop or buffer to limit the movement of the armature in a rearward direction and is provided with a pin or projection 14, of brass or other diamagnetic material, with which the armature comes into contact, and is thus prevented from coming into contact with the extension 12 of the pole-piece itself. Each pole-piece is preferably provided on its outer edge with a track or way 15, of brass or other diamagnetic material, and with a rack 16 of similar material. The tracks and racks are parallel with each other and with the corresponding parts on the other side of the magnet.

The rolling armature is indicated as a whole by the reference-numeral 17 and comprises a body portion 18 in the form of a hollow cylinder of iron or other paramagnetic material. It is supported at a suitable distance above the pole-pieces 11, with its central axis, parallel to the plane passing through the core centers. It is preferably provided at each end with a collar 19, having a circumferential groove 20 to travel on the corresponding track or way 15 and with a pinion 21 to mesh with the corresponding rack 16. The collars 19 are preferably of brass or other diamagnetic material, as are also the pinions 21. At each end of the armature there is located a

guard or retainer 22, comprising a body portion 23, extending parallel with the track 15, immediately above, but not in contact with the body of the armature, and vertical portions 24 and 25, connected, respectively, to the outer end of the pole-piece 11 and to the upper end of the extension 12: These guards or retainers are preferably constructed of brass or other diamagnetic material, and their body portions prevent the armature from moving upward sufficiently to leave the tracks or ways 15, while their front end portions 24 form stops to limit the forward movement of the armature. The racks and pinions serve to maintain the armature in a position parallel with the plane passing through the core centers, which function they accomplish in an obvious manner by preventing one end of the magnet from advancing or receding faster or slower than the other end.

Through the axial center of the rolling armature 17 there passes a shaft 26, connected to the armature, so as to partake of its rolling motion, this connection being preferably effected by securing together said shaft and the collars 19 in any suitable manner. This shaft 26 is preferably hollow or tubular, as shown, for the sake of lightness and is preferably constructed of brass or other diamagnetic material. Said shaft projects some distance beyond the armature at one or both ends, and in the present instance, the signal being a double signal, the shaft is shown thus extended at both ends. At each end of the shaft a signal-disk is connected therewith, the disk being preferably eccentric relatively to the shaft. The construction which I prefer for this purpose is that shown, in which the signal-disk 27 is carried by a circular frame or rim 28, the meeting ends of which are extended radially to form the signal-arm 29, which is clamped to the end of the shaft 26. To effect this connection, there is secured in the end of the shaft 26 a sleeve 30, terminating at its upper end in a clamping-head 31 and provided with a threaded aperture 32. Opposite the clamping-head 31 lies a similar clamping-head 33 and a clamping-screw 34, passing loosely through an unthreaded aperture in the head 33 and screws into the aperture 32. The two parts of the signal-arm 29 are clamped by this screw between the heads 31 and 33, being bent so as to pass around the screw 34. The signal-disks tend to roll the armature away from the magnet to its forward position, which is that shown in the drawings, in which position the signal shows "danger." This action is resisted by a suitable counterbalance, preferably arranged so as to nearly but not quite overcome said action. The arrangement of counterbalance which I prefer is that shown, in which an arm 35 is secured to the armature centrally thereof and projects radially therefrom, the counterbalance being adjustable upon said arm. I prefer to effect the connection between the arm and armature by coiling a portion of the arm around the body of the armature, as indicated at 36, so as to hold itself in position frictionally. By reason of this construction the arm may be adjusted around the armature when the apparatus is being assembled, tested, or regulated, and after the proper position of the arm has been determined the coil may be permanently secured by soldering or otherwise. The counterweight is indicated at 37 and is preferably screwed upon the arm 35, which is threaded to receive it, so that the counterweight may be adjusted longitudinally of the arm by simply turning it. A lock-nut 38 serves to secure the counterweight in position after adjustment.

The binding-posts are indicated at 39, the battery-wires at 40, the wires connecting the coils with the binding-posts at 41, and the wire connecting the coils at 42.

In the preferred form of my invention the apparatus is so set that the armature moves in a horizontal plane, the connection between the standard and magnet being such as to permit the ways on which the armature rolls to be adjusted into horizontal position. When the circuit is closed, no current passes through the magnet, and the signal remains at "danger," with the armature at the front forward end of its path. When the circuit is closed, the magnet is energized, and the armature rolls rearward toward the cores of the magnet, at the same time swinging the signal up out of indicating position or into a position to indicate safety. When the circuit is again broken, the overweight of the signal-disks rolls the armature back to its original position, and the signal again points to "danger." The construction is such that but very little power is required to move the armature, and therefore a battery of a comparatively small number of cells may be used, and such battery will not require frequent renewal. The expense of operating the signal is therefore comparatively slight, and the danger of failure to operate on account of a current of insufficient force is largely obviated. The arrangement is such as to prevent the armature from coming into actual contact with the pole-pieces, which contact might cause it to "stick" or cease its rolling movement.

While I have described a construction in which the armature moves in a horizontal plane, relying upon overbalance to cause it to recede from the magnet, it is obvious that a slight downward inclination of the plane of movement away from the magnet would accomplish the same result, and I consider such an arrangement as being within the scope of my invention. It will also be obvious that various modifications in the arrangement of parts and structural details may be made with-

out departing from the principle of my invention. I therefore do not wish to be understood as limiting myself to the precise details of construction hereinbefore set forth and shown in the accompanying drawings.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electromagnetic signal, the combination, with an electromagnet, of a signal, and a rolling armature controlling the signal, substantially as described.

2. In an electromagnetic signal, the combination, with an electromagnet, of a signal, and an armature controlling the signal and rolling in a plane transverse to the plane of the magnet, substantially as described.

3. In an electromagnetic signal, the combination, with a substantially vertical electromagnet, of a signal, and an armature controlling the signal and rolling in a substantially horizontal plane, substantially as described.

4. In an electromagnetic signal, the combination, with an electromagnet, of a signal, and a rolling armature controlling the signal and normally remote from the magnet, said armature rolling toward the magnet when the latter is energized, and away from the magnet when the latter is inert, substantially as described.

5. In an electromagnetic signal, the combination, with an electromagnet, of a rolling armature, and a signal carried by and eccentrically related to said armature, substantially as described.

6. In an electromagnetic signal, the combination, with an electromagnet, of a rolling armature, and a signal carried by and eccentrically related to said armature, said signal being overweighted to roll the armature away from the magnet when the latter is inert, substantially as described.

7. In an electromagnetic signal, the combination, with a vertical electromagnet having laterally-extending pole-pieces, of a rolling armature supported so as to move over said pole-pieces, and a signal carried by said armature, substantially as described.

8. In an electromagnetic signal, the combination, with a vertical electromagnet having laterally-extending and outwardly-diminishing pole-pieces, of a rolling armature supported so as to move over said pole-pieces, and a signal carried by said armature, substantially as described.

9. In an electromagnetic signal, the combination, with a vertical electromagnet having laterally-extending pole-pieces and ways or tracks, of a rolling armature provided with a signal and supported on said ways or tracks above said pole-pieces, substantially as described.

10. In an electromagnetic signal, the combination, with an electromagnet having laterally-extending pole-pieces and diamagnetic tracks, of a rolling armature provided with a signal, and supported and guided by said tracks above said pole-pieces, substantially as described.

11. In an electromagnetic signal, the combination, with an electromagnet having laterally-extending pole-pieces and parallel tracks and rack, of a rolling armature provided with a signal and having grooved collars to fit said tracks and pinions to engage said racks, substantially as described.

12. In an electromagnetic signal, the combination, with an electromagnet having laterally-extending pole-pieces and tracks and ways, of a rolling armature provided with a signal and supported on said tracks or ways, and guards or retainers extending above said armature to maintain it in position on said tracks, substantially as described.

13. In an electromagnetic signal, the combination, with a vertical electromagnet having laterally and vertically extended pole-pieces, of a rolling armature traveling over said laterally-extended portions of the pole-pieces and toward and from the vertically-extended portions, substantially as described.

14. In an electromagnetic signal, the combination, with a vertical electromagnet having laterally and vertically extended pole-pieces, of a rolling armature traveling over the laterally-extending portions of said pole-pieces toward and from the vertically-extended portions thereof, and means for preventing said armature from contacting with said pole-pieces, substantially as described.

15. In an electromagnetic signal, the combination, with a vertical electromagnet, and a rolling armature provided with a signal and traveling on laterally-extending ways carried by said magnet, of a standard with which said magnet is adjustably connected, whereby the plane of travel of the armature may be adjusted, substantially as described.

16. In an electromagnetic signal, the combination, with an electromagnet, and a rolling armature, of a shaft concentric with the armature and partaking of its movements, and a signal carried by said shaft and eccentrically located relatively thereto, substantially as described.

17. In an electromagnetic signal, the combination, with a standard having a split clamping-collar, of an electromagnet having a cross-piece fitted and adjustable in said collar, and a rolling armature mounted on ways carried by said electromagnet, substantially as described.

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

WILLIAM U. COLTHAR.

Witnesses:
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IRVINE MILLER.