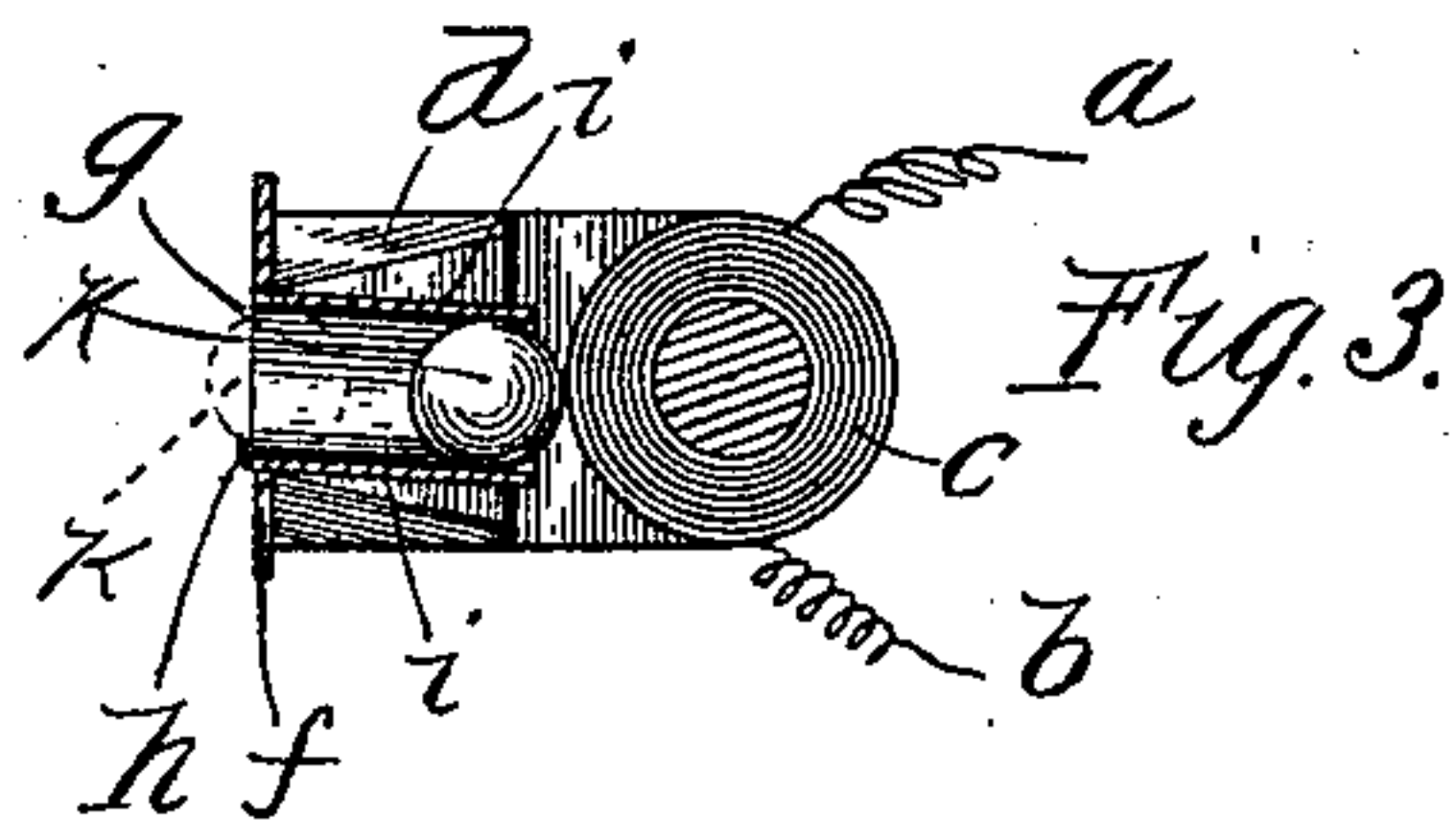
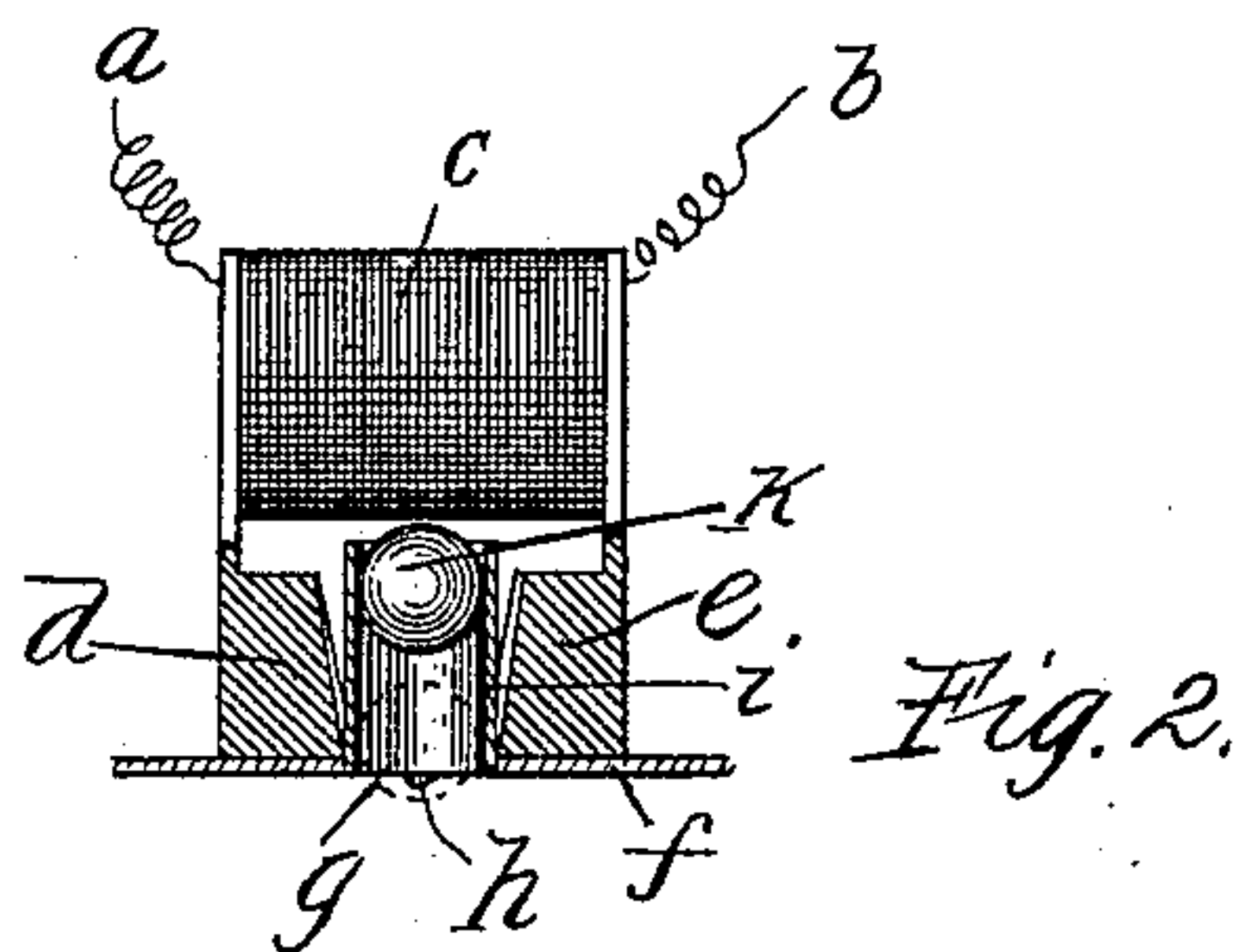
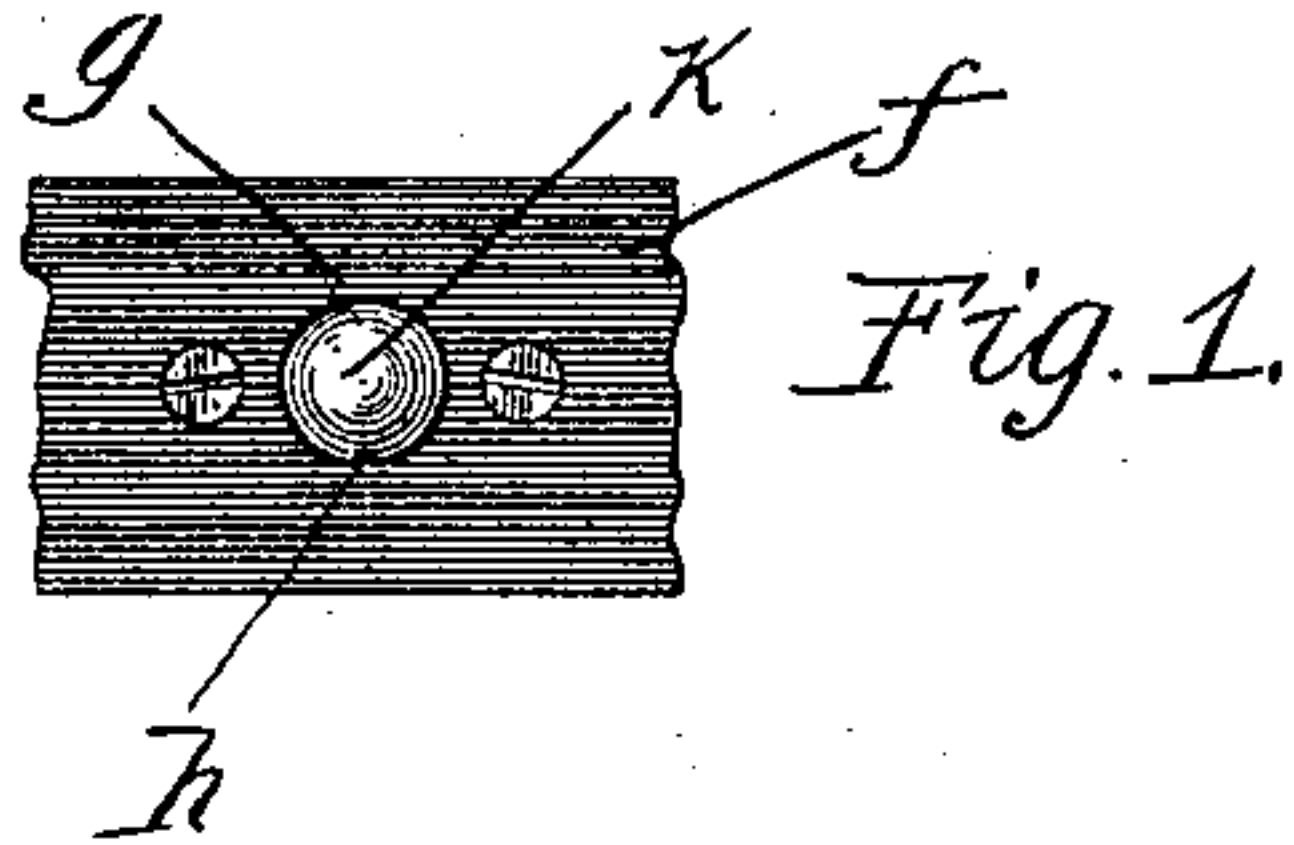


(No Model.)

W. W. DEAN.
ELECTRICAL INDICATING DEVICE.

No. 582,461.

Patented May 11, 1897.



Witnesses:

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UNITED STATES PATENT OFFICE.

WILLIAM W. DEAN, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE BELL
TELEPHONE COMPANY OF MISSOURI, OF SAME PLACE.

ELECTRICAL INDICATING DEVICE.

SPECIFICATION forming part of Letters Patent No. 582,461, dated May 11, 1897.

Application filed September 19, 1896. Serial No. 606,340. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. DEAN, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented
5 a certain new and useful Improvement in Electrical Indicating Devices, (Case No. 12;) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part
10 of this specification.

My invention relates to an electrical signaling device, and more particularly to an electrically-operated visible signal or annunciator of the self-restoring type, said invention further contemplating a novel arrangement of
15 the armature and field of an electromagnet, whereby the self-restoring signal in connection with which said arrangement is shown is made operative with considerably less current than is required by similar devices previously constructed.

In the patent to T. B. Doolittle, No. 511,731, granted December 26, 1893, is shown a self-restoring signal consisting of a paramagnetic
25 ball normally closing a circular opening, but adapted to be withdrawn therefrom and thus give a visual signal when an electromagnet, the core of which is maintained immediately behind the said opening, is energized by the flow
30 of current. The device of the present application is an improvement in several respects upon the construction shown in said patent.

The device of my invention may be briefly described as consisting of an electromagnet
35 provided with an armature, the movement of which serves to present a signal and which lies within the magnetic field of the pole-pieces of the electromagnet, said pole-pieces being shaped partially to inclose the armature
40 and hold it in the position of approximately the maximum magnetic intensity when the electromagnet is energized.

By experiment I have found that a much heavier current is required to actuate an annunciator of the type shown in the patent
45 than is preferably employed in many instances, such as in connection with the signaling device of a telephone-exchange, and, furthermore, a disappearing armature or visual signal operated thereby is not as efficient
50 as a signal that appears upon the actuation

of the device. My improved electrical indicator, which is constructed to meet these difficulties, will now be described more particularly by reference to the accompanying drawings, in which—

Figure 1 is a front elevation of my device as it appears when the signal is given. Fig. 2 is a view of the device from above, shown partly in section, with the signaling-armature
60 in its normal position. Fig. 3 is a vertical sectional view.

Throughout each of the several figures like parts are indicated by the same letter of reference.

Wires *a b* form the terminals of the helix of electromagnet *c*, said wires being connected with the signaling-circuit. The pole-pieces *d e*, extending laterally from the helix, are of peculiar form, as illustrated in Figs. 2
70 and 3, to furnish a magnetic field best meeting the requirements of the device. Said pole-pieces are secured to the front *f*, in which is provided the circular opening *g*, a small detent *h* extending within the opening to retain the ball-armature *k*. Immediately behind the opening and between the pole-pieces
75 is secured the non-magnetic tube *i*, slightly inclined rearwardly, in which is inclosed the ball *k*. Said ball preferably is formed of soft iron plated with silver or covered with white enamel to make the visible signal at the opening *g* more noticeable, in which case the front
80 *f* preferably is black.

The pole-pieces are rearwardly separated
85 from one another, the opening between the same (seen in lateral section) being V-shaped, and the central portion of each is somewhat cut away, so that said poles partially encircle the tube *i* at its forward extremity. The
90 pole-pieces are also beveled above and below, and by reason of the construction described the magnetic field generated between said poles is most intense at the opening *g*.

In placing the above-described indicator in
95 use it should be secured in position approximately upon a level, and in said position the ball-armature *k* normally will remain in the rear of tube *i*, in which it is free to roll, since that end of the tube is slightly lower than the
100 one engaging the front *f*.

When current is sent through the helix of

the electromagnet, the pole-pieces are energized and the ball-armature immediately is drawn forward up the slight incline to opening *g* in the position of greatest magnetic intensity, giving a visual signal. This signal continues in sight until the electromagnet is deenergized, when the ball rolls back to its first position, thus forming a perfect self-restoring indicator. The armature preferably employed in the device above described is of the bodily-movable type—*i. e.*, the mass of metal constituting said armature is not fixedly attached at any point, said mass being thus adapted to receive movement in its entirety upon the energization of the pole-pieces actuating the armature. By thus arranging the pole-pieces so that the armature lies between them and when attracted passes from a position where the said pole-pieces are comparatively distant from one another to a position of their least separation the signal may be operated by a minimum flow of current. In other words, the armature in its forward movement passes from the path of comparatively few lines of magnetic force to the path of the greatest number of said lines, thus securing the maximum effect from a given current in producing an efficient magnetic field.

When numbers of these indicators are used in the same system, such as a telephone-switchboard, a white signal appearing upon the black face of the indicating-board makes a much more efficient signal than the disappearance of but one of a large number of such signaling-armatures normally showing at the front of the indicating device. The former signal with its attendant advantages is not attainable with the patented device.

I do not desire to be understood as claiming the self-restoring indicator as novel in its entirety, since I hereby disclaim the features of such a device shown in the patent referred to in the first part of this specification.

I claim, however, and desire to secure by Letters Patent, the following:

1. In an electrical signaling device, the combination with an electromagnet of laterally-extended pole-pieces provided thereon, a bodily-movable armature continuously maintained between said pole-pieces, and a support for said armature adapted to permit the bodily movement thereof to the position approximately of the maximum magnetic intensity of the pole-pieces when the same are energized whereby a signal is effected, substantially as described.

2. The combination in an electrical signaling device, with a helix connected with the energizing-circuit, of pole-pieces laterally extending from said helix, an armature normally maintained between the rear inner faces of the pole-pieces, the said pole-pieces being proportioned to secure the maximum magnetic field in the forward portion of the device when

energizing-current is supplied to the helix, whereby the armature is actuated to move forward and effect a signal, substantially as described.

3. In a signaling device, the combination with a helix, of laterally-extending pole-pieces rearwardly divergent from one another, a ball-armature normally maintained between the rear faces of the pole-pieces and adapted to be moved forward between the pole-pieces approximately in the position of greatest magnetic intensity and show a positive signal when the helix is energized by the flow of current, substantially as described.

4. The combination with the helix of an electromagnet, of pole-pieces *d e* rearwardly diverging from one another, and a rolling armature maintained between said pole-pieces adapted to be moved forward to the position approximately of greatest magnetic intensity in the field of said pole-pieces when the same are energized by the flow of current through the helix, substantially as described.

5. In a signaling device, the combination with an electromagnet *c* having laterally-extending pole-pieces approaching one another, of a bodily-moving armature maintained between said pole-pieces, and means for actuating the armature to show a positive signal and remain in the position of the least separation of said pole-pieces when the electromagnet is energized, substantially as described.

6. In an electrical signaling device, the combination with a helix, of the pole-pieces *d e* extending laterally from said helix, the pole-pieces being rearwardly divergent from one another, front *f* provided with an opening *g* registering with the space separating the forward ends of the pole-pieces, tube *i* inclined to the rear, and ball-armature *k* inclosed in said tube and maintained between the pole-pieces, said armature being adapted to be moved forward to the opening *g* in approximately the position of greatest magnetic intensity when current is supplied to the helix, substantially as described.

7. The combination in an electromagnetic device with convergent pole-pieces, of a helix adapted to energize said pole-pieces during the passage of current through the helix, an armature maintained between the inner faces of said pole-pieces adapted to be actuated by the same to assume a position approximately of their maximum magnetic intensity when said pole-pieces are energized, thereby effecting a signal, and means for normally removing the armature from said position, substantially as described.

In witness whereof I hereunto subscribe my name this 16th day of September, A. D. 1896.

WILLIAM W. DEAN.

Witnesses:

GEORGE P. BARTON,
GEORGE L. CRAGG.