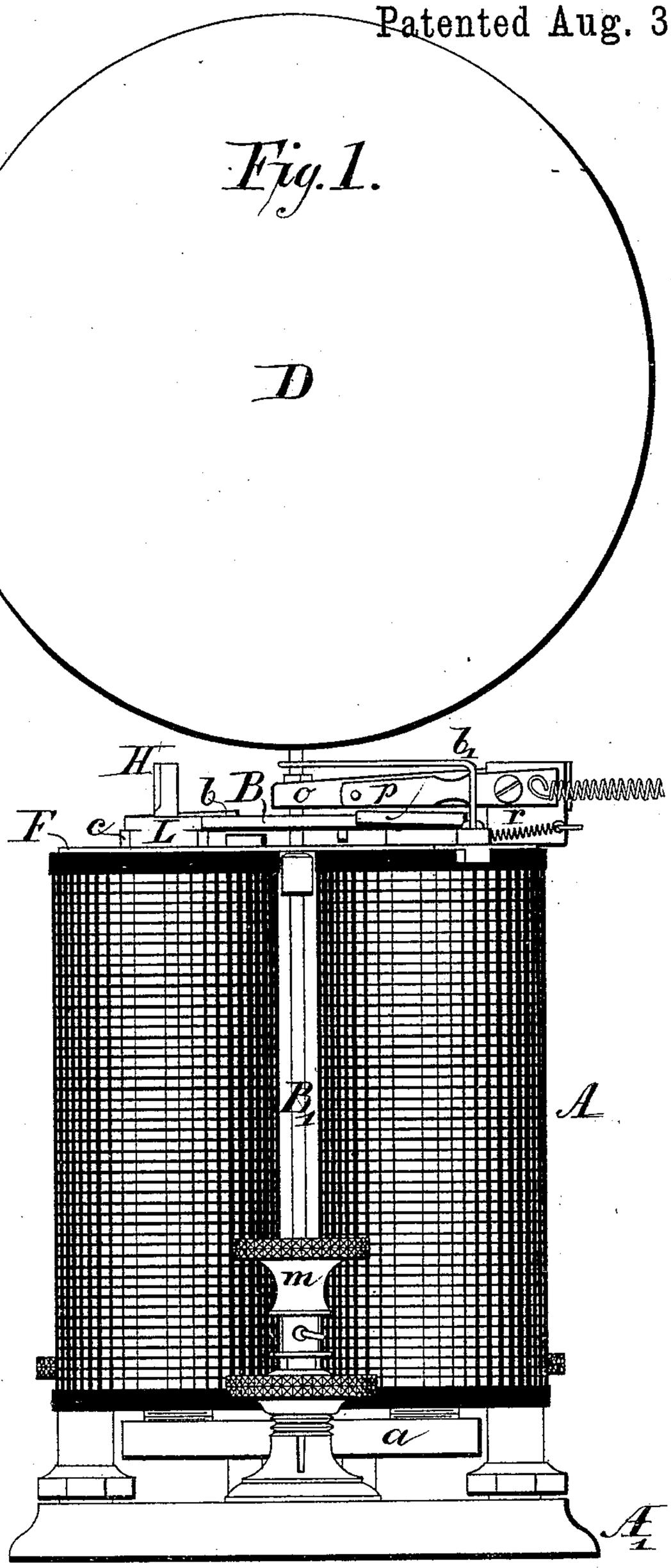
(Model.) 3 Sheets—Sheet 1.

I. FISHER.

ELECTRO MECHANICAL SIGNAL APPARATUS.

No. 246,486. Patented Aug. 30, 1881.

Fig. 1.



Witnesses;
Miller C. Paul
Mc K. Lockwood French.

Inventor;
Israel Fisher;
by his Attorney,
Frank L. Pope.

(Model.) 3 Sheets—Sheet 2.

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No. 246,486. Patented Aug. 30, 1881.

Fig. 2.

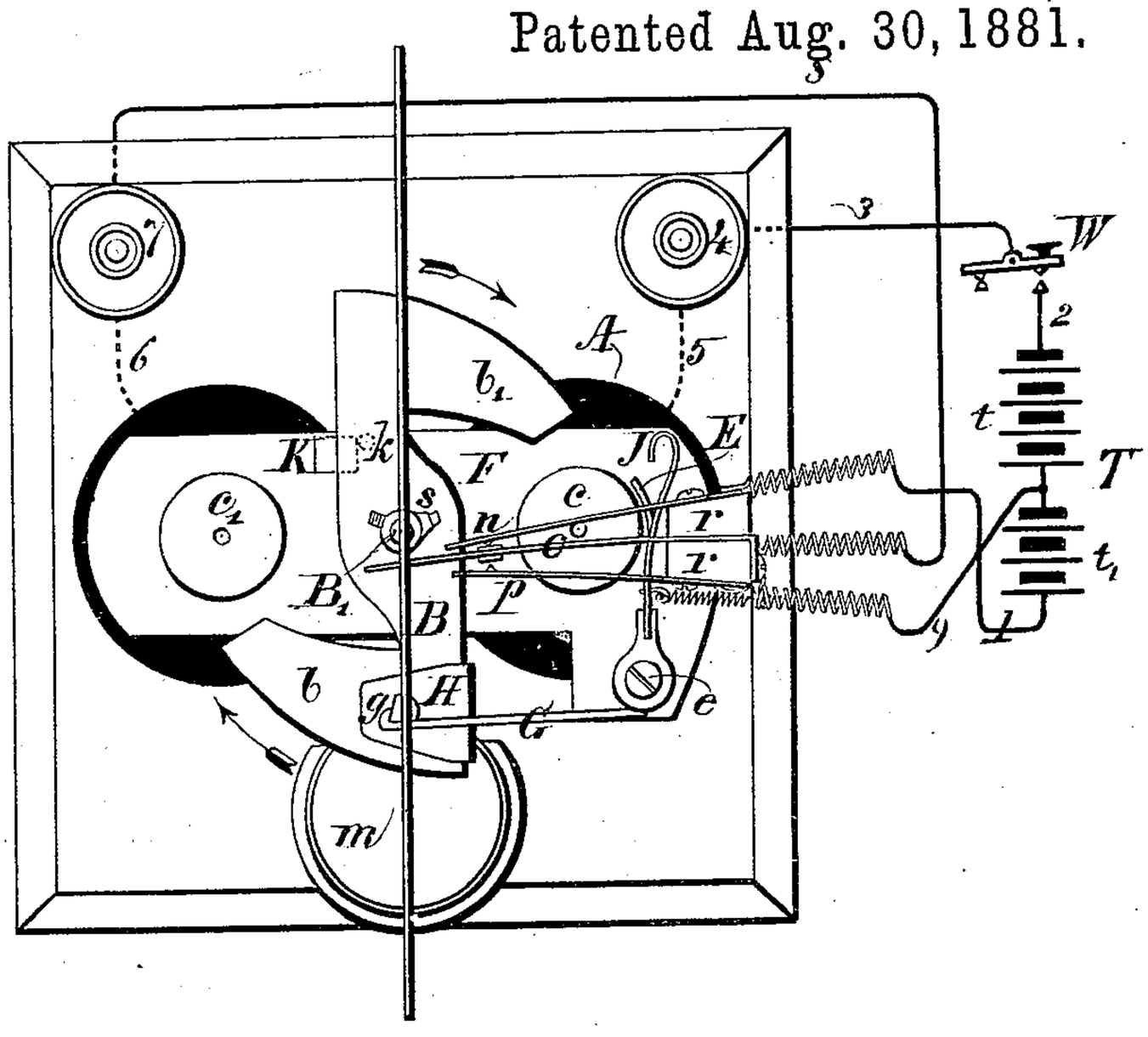
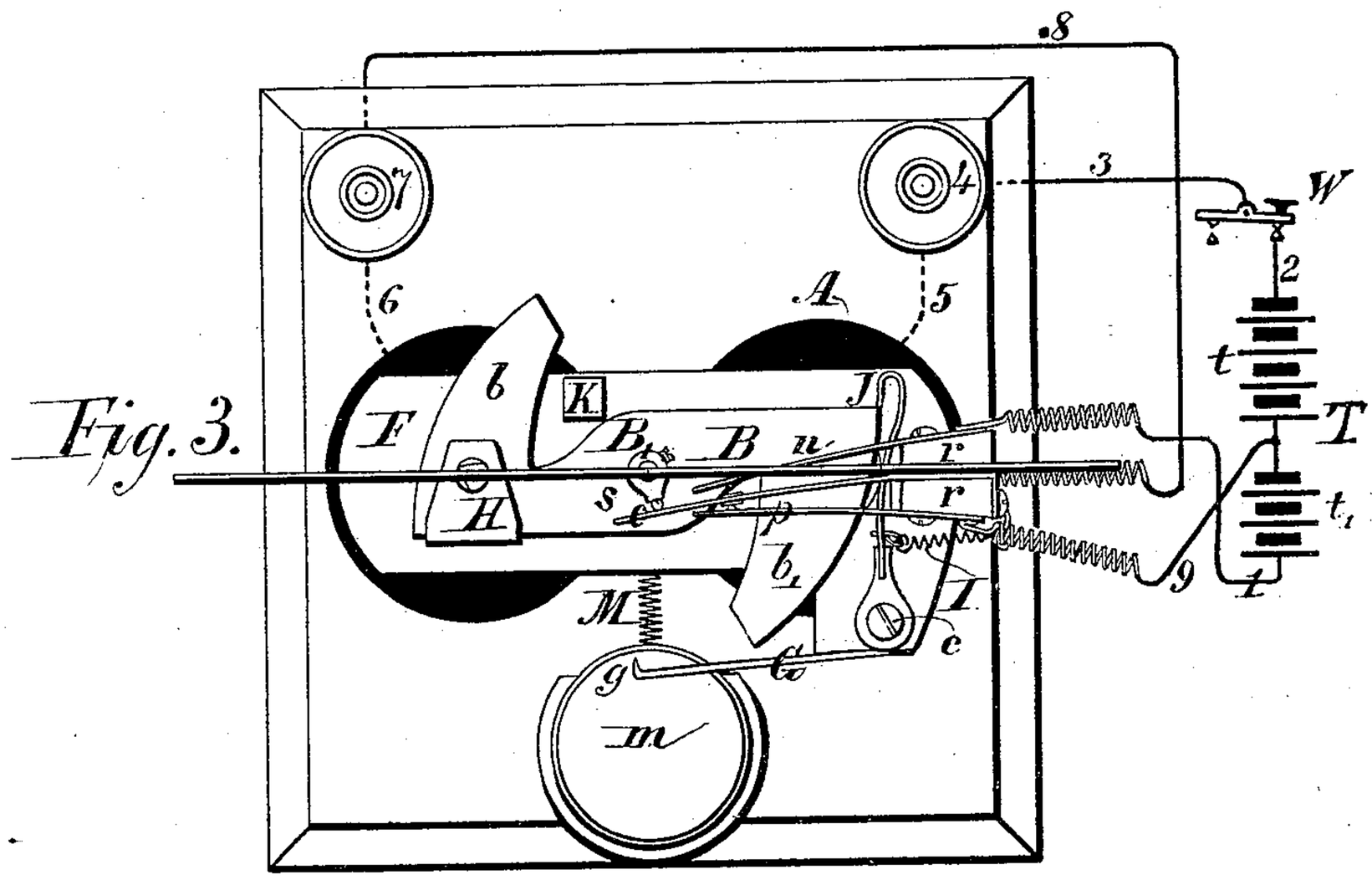


Fig. 3.



Witnesses;
Miller & Earl
Mrs. K. Lockwood French

Inventor;
Israel Fisher,
by his Attorney,
Frank L. Poe

(Model.) 3 Sheets—Sheet 3.

I. FISHER.

ELECTRO MECHANICAL SIGNAL APPARATUS.

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Fig. 4.

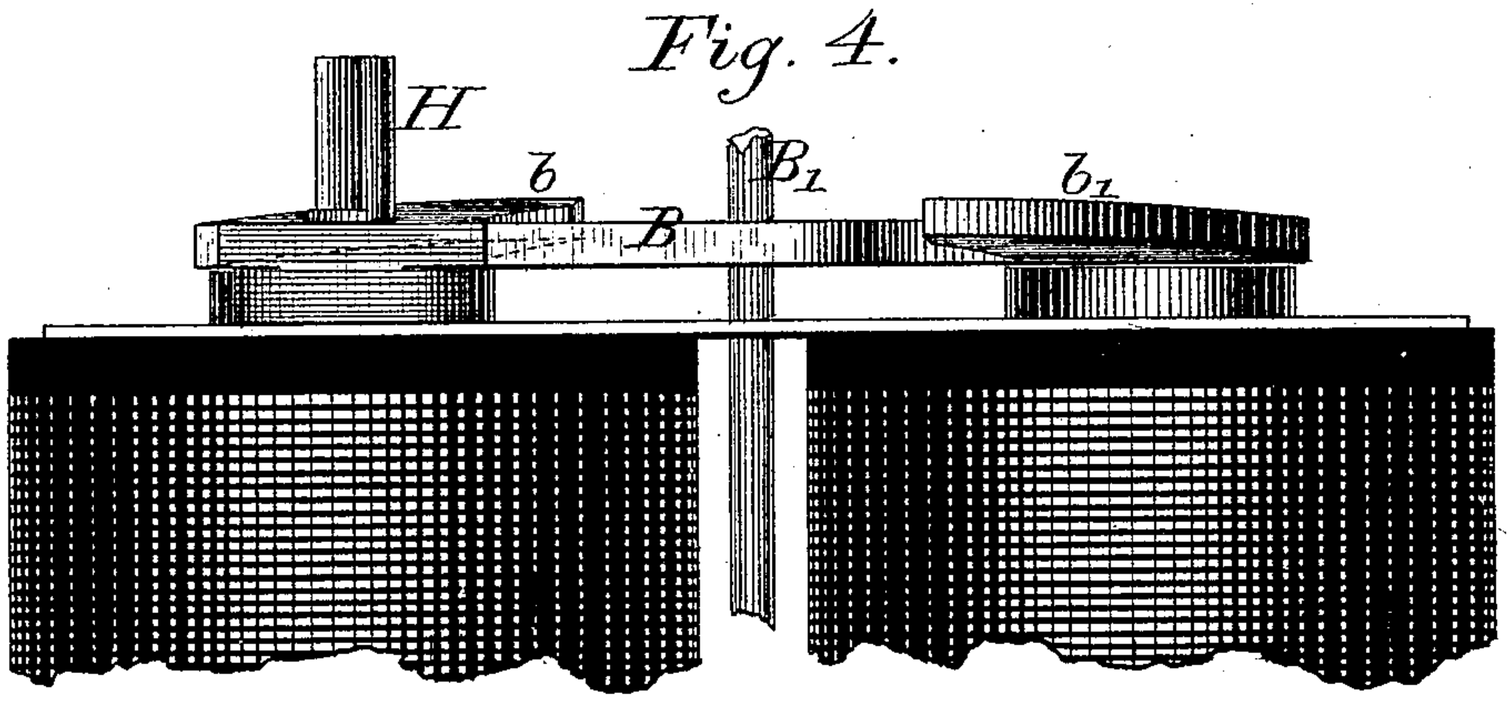
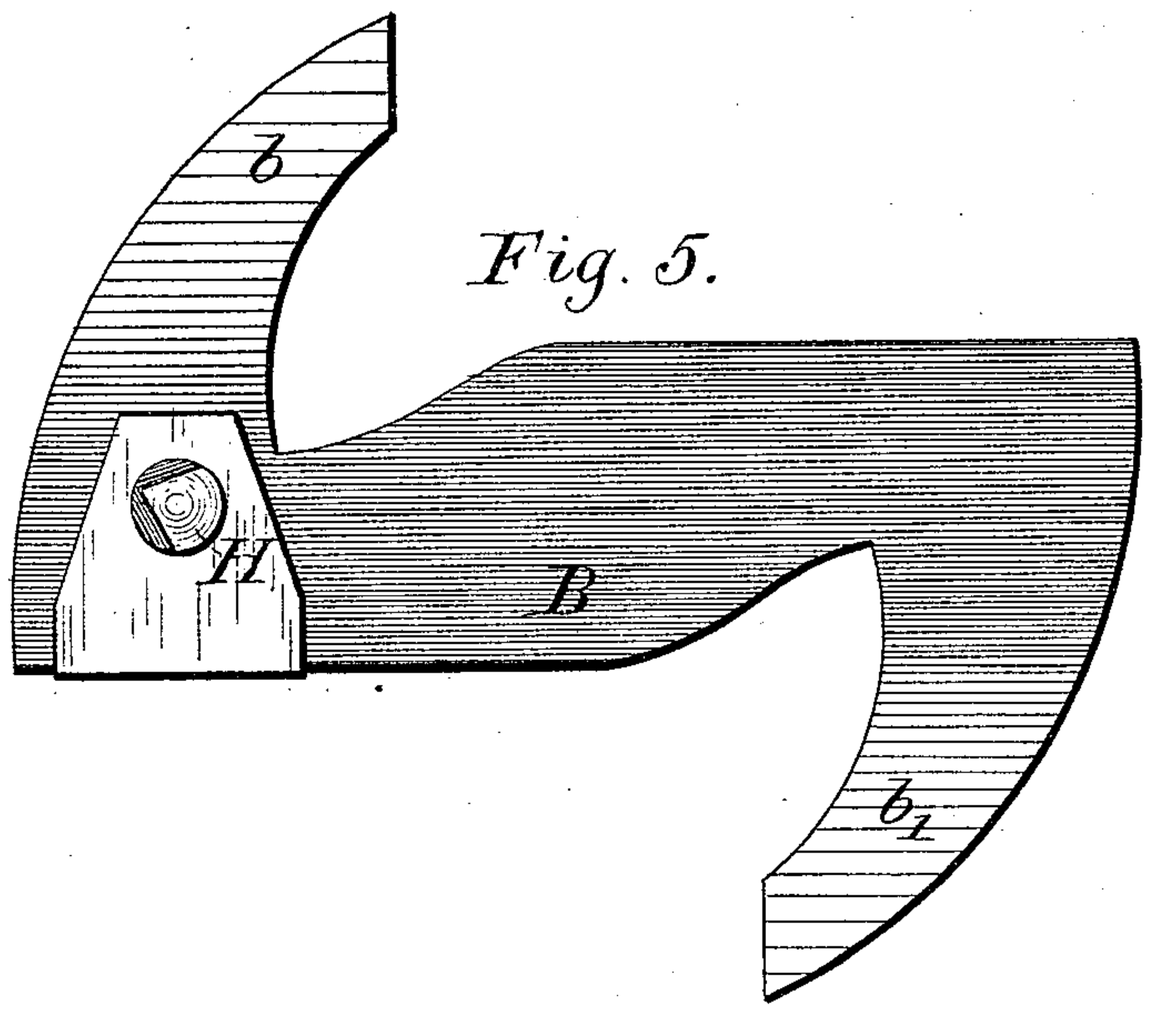


Fig. 5.



Witnesses:

Wm. K. L. French,

Miller & Earl

Inventor:

Israel Fisher,

by his Attorney,

Frank L. Dyer

UNITED STATES PATENT OFFICE.

ISRAEL FISHER, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE UNION SWITCH AND SIGNAL COMPANY, OF HARTFORD, CONNECTICUT.

ELECTRO-MECHANICAL SIGNAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 246,486, dated August 30, 1881.

Application filed January 15, 1881. (Model.)

To all whom it may concern:

Be it known that I, ISRAEL FISHER, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Electro-Mechanical Signal Apparatus, of which the following is a specification.

The principal feature of this invention consists of an electro-magnet provided with a peculiarly-constructed armature, which is furnished with one or more wings or blades rotating upon an axis which is parallel to the cores of the electro-magnet and perpendicular to the face of its poles, each of said wings forming a section of a disk, of which the said axis is the center, and presenting an inclined or helical surface to the pole or poles of the electro-magnet. Each of said wings or blades is also preferably horizontally tapered, so as to present a surface of constantly-increasing breadth to the magnetic pole when moving toward it and across the magnetic field.

The invention further consists in combining with said electro-magnet and its armature a signal-disk connected to and moved by said armature.

The invention further consists in actuating said electro-magnet by a battery composed of two sections, and in combining with the armature of said electro-magnet a circuit-changer actuated by the movements of said armature, which acts to disconnect one section of the battery from the circuit which passes through the electro-magnet at or before the time when the signal-disk has been brought in its displayed position.

In the accompanying drawings, Figure 1 is a front elevation of a signal-operating mechanism and visual signal embodying my improvements; and Figs. 2 and 3 are plan views of the same, showing the mechanism in two different positions, respectively adapted to display or conceal the signal disk. Fig. 4 is an enlarged view in elevation, and Fig. 5 is a similar view in plan, showing the peculiar construction of the armature.

A is an electro-magnet of the usual horseshoe form, which is preferably mounted in an upright position upon a base, A′, as shown. The parallel cores of the electro-magnet A are connected together by a soft-iron yoke, *a*, in the usual manner.

B is the soft-iron armature of the electro-magnet A. It is mounted upon an upright shaft or axis, B′, which turns in a step-bearing in the yoke *a*. The armature B is of a peculiar form, being composed of a section of a horizontal disk or plate having the axis B′ in its center. It is formed into two wings or blades, *b* and *b′*, which are preferably horizontally tapered toward their extremities, as best seen in Figs. 2 and 3. The lower surface of the wings *b* and *b′* is of a helical form, being inclined to the plane of the horizontal faces of the magnet-poles *c c′*. The points of the wings are at the greatest vertical distance from the horizontal plane of the pole, and the central portion of the armature nearest it. This is best seen at *b′* in Fig. 1, which represents the apparatus in the same position as it is shown in in Fig. 3.

It will therefore be understood from the above description that when an electric current traverses the coils of the electro-magnet A its poles *c c′*, Figs. 2 and 3, become magnetic and exert their attraction simultaneously upon the extremities of the wings *b* and *b′* of the armature B, and tend to cause it to revolve horizontally upon its vertical axis B′ in the direction indicated by the arrows, and this effect will continue so long as the electric current flows, or until the armature B has been brought into the position in which it is represented in Fig. 3. The strength of the magnetic attraction between the poles *c c′* and the wings *b b′* of the armature constantly increases as the latter moves across the magnetic field, for the reason that the mass of the armature which is within the attractive sphere of each magnetic pole gradually becomes greater as the broader part of the armature comes into its vicinity; and moreover, in consequence of its inclined form, the mass is brought nearer and nearer to the pole of the magnet as the armature revolves. By reason of this peculiar form of construction I am enabled to produce a horizontal rotation of an armature in a plane per-

pendicular to the axis of the cores and parallel to the face of the poles by the direct force of magnetic attraction without any intermediate mechanism—a result which is of great importance in the application of an electro-magnet to the movement of visual signals and other devices of like character. It will be seen that the axis B′, upon which the armature B is mounted, moves through the distance of one-fourth of a complete revolution during the operation which has been described.

When a visual signal is designed to be operated by this mechanism a suitable signal disk or target, D, is mounted upon the shaft D′, as shown in the figures. It will be readily understood that by turning the shaft B′ through the distance of one-fourth of a revolution the target D will be placed at right angles to its former position, so as to give a different indication. For example, when employed as a railway-signal the position shown in Fig. 2 may indicate "danger," while that shown in Figs. 1 and 3 may, in like manner, indicate "safety." When the apparatus is employed in this manner to operate a visual signal it is preferable that means should be provided whereby the signal may be securely locked in each of its two positions. This I prefer to effect by means of a supplementary or independent armature, E, (best seen in Fig. 2,) mounted upon a pivot at *e* upon a stationary plate, F, which may be supported by the electro-magnet A or otherwise. The arm G projects at right angles from the pivot *e*, and carries a latch or detent, *g*, which takes hold of a pin, H, upon the upper surface of the armature B by virtue of the tension of the spring I. J is another spring detent or latch, which is also attached to the supplementary armature E, but upon the opposite side of the pivot *e*. It will be understood, therefore, that when no current is traversing the coils of the electro-magnet A the supplementary armature E and its attachments will remain in the position shown in Fig. 2, the latch or detent *g* being engaged with the pin H. This prevents any motion of the armature B in the direction indicated by the arrows, while at the same time its motion in the opposite direction is limited by the pin *k* on the under side of the armature resting against a fixed stop, K, which may be attached to the plate F, as shown. So soon, however, as the electric current traverses the electro-magnet A, and the pole *c* becomes magnetic, the armature E is attracted and brought into contact with it, which withdraws the detent *g* and releases the pin H on the armature B, so that the latter becomes free to obey the attraction of the magnet A and move into the position shown in Fig. 3. When it reaches this position a downward projection, L, upon the armature brings up against the pole *c′* of the electro-magnet, and the movement of the armature is thereby arrested, while at the same time the detent J, by reason of its elasticity, drops in behind the rear corner of the armature B, as seen in Fig. 3, and thus securely locks it in its new position. When the current through the electro-magnet A is interrupted the detent J is withdrawn from the path of the armature B by the action of the spring I, and the armature then becomes free to return to its normal position by the action of a retracting-spring, M, the tension of which may be adjusted in the usual manner by means of a suitable adjusting screw or pin, *m*.

When the armature B and signal-target D have been brought by the action of an electric current of sufficient power into the position represented in Fig. 3 it will be obvious that a much smaller attractive force will be entirely sufficient to retain the armature and signal in position, it being only necessary that the attraction should be sufficient to keep the supplementary armature and its detent J from falling back, thus avoiding the unnecessary consumption of battery-power, which must otherwise ensue in case the signal is required to be held in position by a constant current for the greater part of the time, as is frequently the case in practice. I prefer to make use of a device whereby a section of the battery is disconnected from the electro-magnet, which actuates the signal as soon as the same is brought into position. This I effect by means of a commutator or switch, which is operated by the armature itself.

n, *o*, and *p* are three metallic springs mounted upon suitable supports, *r r*, which serve to insulate them from each other. The middle spring, *o*, is considerably longer than the other two, and is so adjusted that when in its normal position of rest it will press against the spring *n*, as shown in Fig. 2, by virtue of its own resiliency. The pin S is placed upon the upright shaft B′, and is so situated with reference to the projecting end of the spring *o* that when the apparatus moves into the position shown in Fig. 3 the pin will press against the extremity of the spring *o* and separate it from contact with the spring *n*, at the same time pressing it into contact with the spring *p*, whereby the necessary change in the electrical connections is effected.

The battery connections are shown in Figs. 2 and 3 by means of a skeleton-diagram. The battery T is composed of two sections, *t* and *t′*, and one of its terminals is connected by the wire 1 with the spring *n*. The other terminal of the battery is connected by the wire 2 to a key or other circuit-closer, W, from which a wire, 3, goes to the binding-screw 4, which is connected with one terminal of the electro-magnet A by means of a wire, 5. The other terminal, 6, of the electro-magnet goes to the binding-screw 7, which is connected by the wire 8 with the spring *o*. Finally, the spring *p* is connected by means of a wire, 9, to a point between the sections *t t′* of the battery T. The result of this arrangement of circuits is that when the signal-armature has been brought into position (shown in Fig. 3) the portion of

the battery represented by t' is disconnected and only the portion t remains in action to hold the signal in position.

A very efficient apparatus of this kind, for some purposes, may be constructed with an electro-magnet having but a single helix and core, in which case the armature may have but a single wing or blade; or it may be provided with two wings at opposite ends of the core, facing its respective poles. The principle of operation in these modifications remains the same as in the apparatus hereinbefore described.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of an electro-magnet and an armature which moves toward and from its poles in a plane perpendicular to the axis of the cores and parallel to the face of the poles of said electro-magnet, and which presents an inclined or helical surface to the said poles.

2. The armature of an electro-magnet, constructed substantially as hereinbefore set forth, consisting of two wings or blades rotating upon an axis parallel to the cores of the electro-magnet, which present an inclined or helical surface to the respective poles of said electro-magnet.

3. The combination, substantially as hereinbefore set forth, of an electro-magnet, an armature which moves toward and from its poles in a plane perpendicular to the axis of the cores and parallel to the face of the poles of said electro-magnet, and a detent controlled by an independent armature which normally locks the first-mentioned armature in its position of rest, but is withdrawn by the action of the same electric current which is employed to effect the movement of the first-mentioned armature.

4. The combination, substantially as hereinbefore set forth, of an electro-magnet, an armature which moves toward and from its poles in a plane perpendicular to the axis of the cores and parallel to the face of the poles of said electro-magnet, a detent controlled by an independent armature which is held in position to lock the first-mentioned armature by the action of the same electric current which effects the movement of the said armature, and a spring which withdraws the locking-detent from the first armature when the second armature is released.

5. The combination, substantially as hereinbefore set forth, of an electro-magnet, an armature, a signal-disk mechanically connected to and moved by said armature, a battery for actuating said electro-magnet, which battery is composed of two sections, and a circuit-changer actuated by the movement of said armature, which disconnects one section of said battery from the electro-magnet just before the signal-disk has been brought to its displayed position.

In testimony whereof I have hereunto subscribed my name this 28th day of December, A. D. 1880.

ISRAEL FISHER.

Witnesses:

TRACY HOWE,

JOHN H. GREENE.