(No Model.)

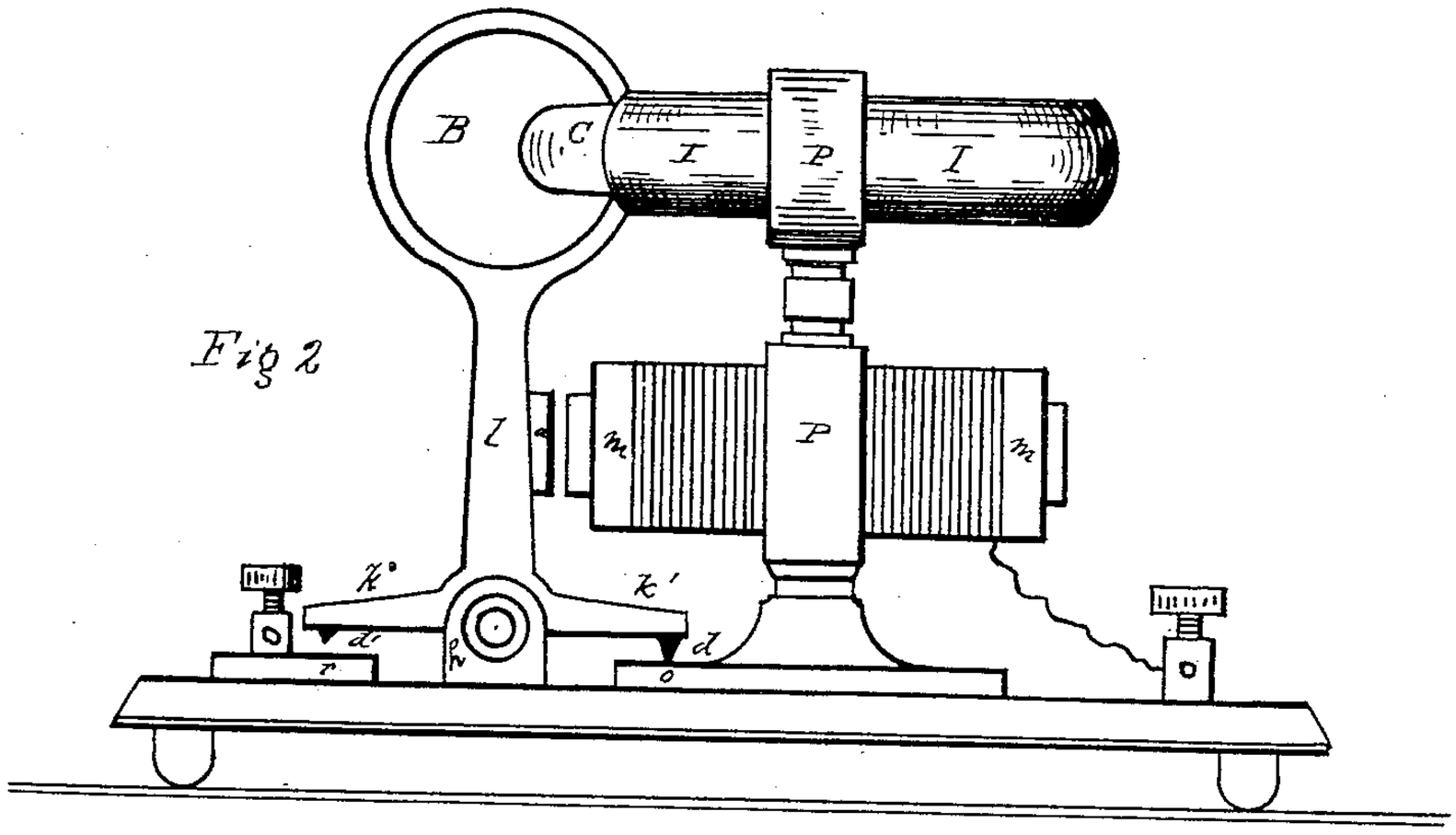
2 Sheets—Sheet 1.

F. J. PATTEN.

TELEGRAPHY.

No. 390,802. Patented Oct. 9, 1888.

Fig 2



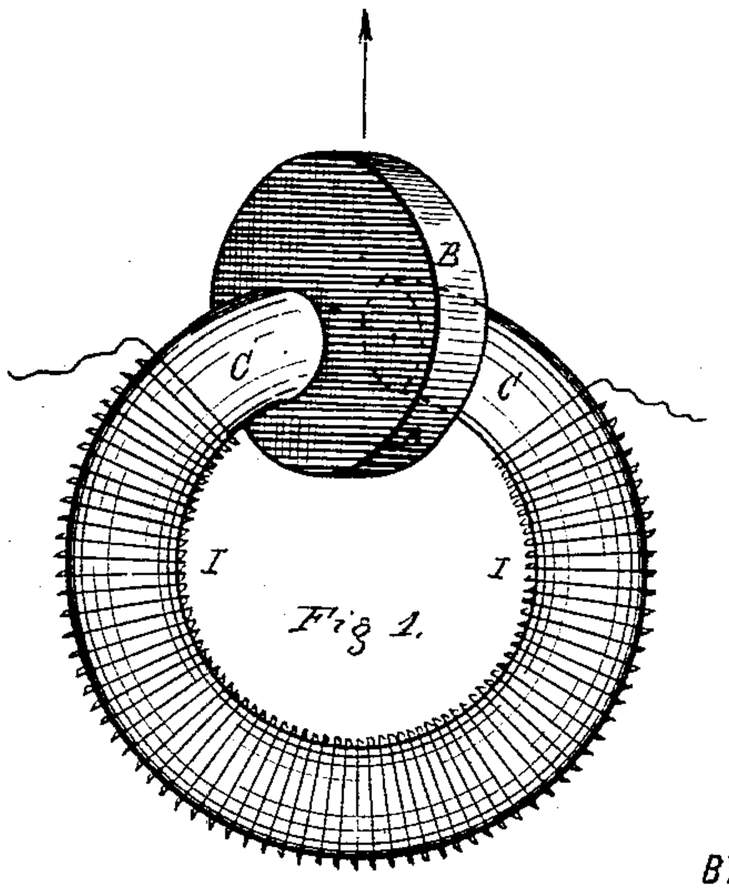


Fig 1.

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(No Model.) 2 Sheets—Sheet 2.

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TELEGRAPHY.

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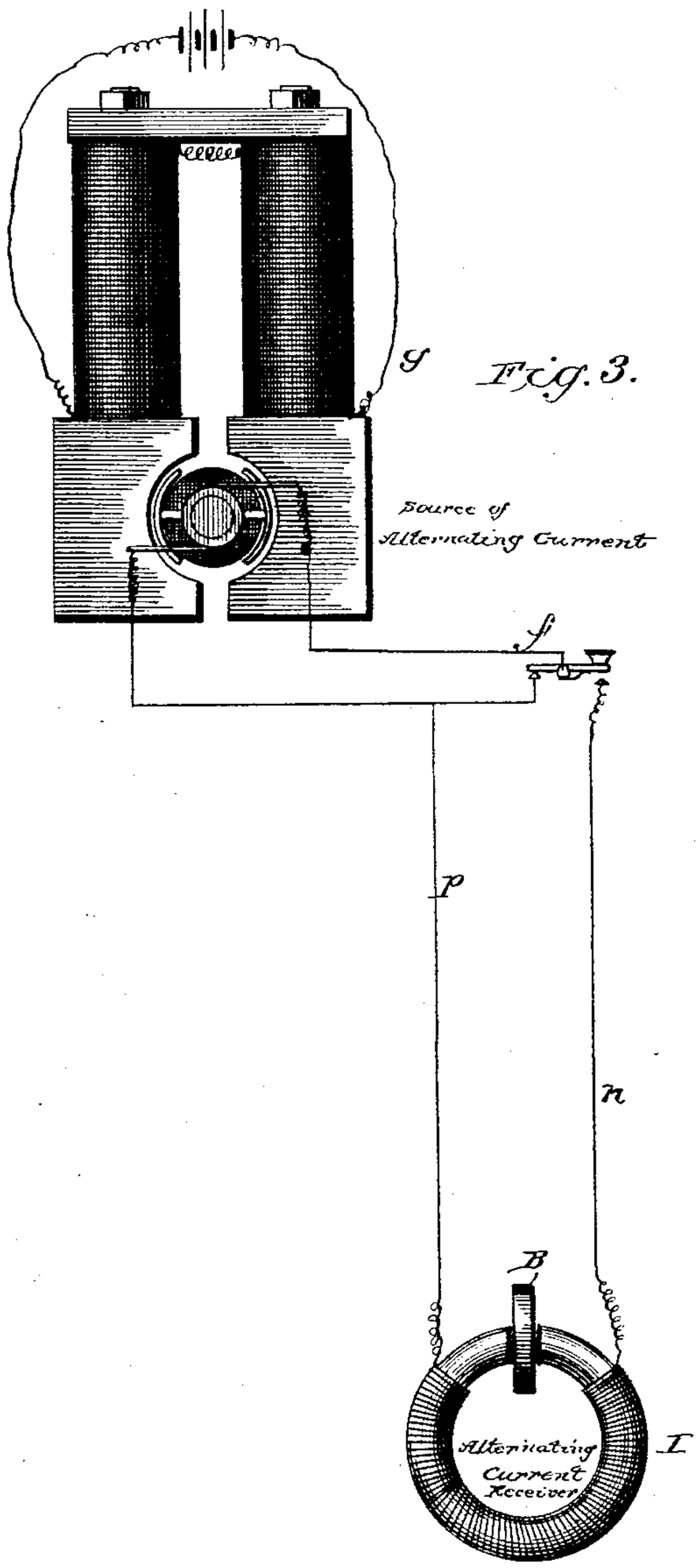

Fig. 3.

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TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 390,802, dated October 9, 1888.

Application filed September 26, 1887. Serial No. 250,770. (No model.)

To all whom it may concern:

Be it known that I, F. JARVIS PATTEN, a citizen of the United States, and a resident of Fort Sidney, Nebraska, have invented a new and useful Improvement in the Transmission of Signals by the Electric Telegraph, of which the following is a specification.

My invention relates to a telegraphic system in which rapidly-alternating currents are used as the transmitting agency, and embodies a system of this character provided with a novel receiving-instrument which will respond to rapidly-alternating impulses, moving once for many alternations of the transmitting-current. The receiving-instrument may act as a sounder or simply as a relay for a local circuit in which a battery and ordinary sounder may be used. The currents used are such as are generated by an alternate-current dynamo-electric machine, and are rendered independently of their fluctuating character as available for telegraphic communication as prolonged currents of single direction.

The advantage of an alternating current for telegraphic signaling is that the rapid and oft-repeated reversals of current on line, by reason of the successive alternations, completely clear the line of any residual static charge developed by a precedent impulse. Where straight currents, or those of constant direction are used, the line-wire becomes so heavily charged with induced static electricity that the reaction of the latter seriously interferes with rapid and efficient work on the part of the operator. The receiving-instruments respond to the discharge and produce false signals, thus confusing the receiving-operator. This difficulty is so great in lines of any considerable length that special measures are always adapted to neutralize as far as possible the deleterious effects. Artificial lines and expensive apparatus are called into use to accomplish this. By the use of a rapidly-alternating signaling-current the difficulty disappears, the discharge aiding the succeeding reverse impulse. The use of alternating currents heretofore for signaling has been with polarized relays as receiving-instruments. A single impulse must be relied upon to operate the receiver, or else the alternations must be slow enough to permit the relay to keep pace. In my system, however, the alternating impulses follow each other with great rapidity. Under these circumstances a polarized relay would remain quiescent, as the generator is driven so fast that the magnet of the relay could not discharge or charge sufficiently rapidly to correspond to the impulses. In my system it is only when a series of opposite impulses passes over line that a receiver will be affected.

Another advantage arises from the character of the receiver. As it only responds to successive opposite current-impulses, any cross or entanglement of the signaling-line wire with other line-wires cannot affect it, unless that line-wire also carries an alternating current.

In the accompanying drawings, Figure 1 represents a device, illustrating the principle used. Fig. 2 represents the receiving apparatus. Fig. 3 shows a circuit and a single transmitting and receiving station.

The apparatus I have designed is based upon the principle, so called, of "electro-inductive repulsion" of closed coils or circuits when such circuits are placed in proper inductive relation to each other.

The apparatus shown in Fig. 1 will serve to illustrate the action above described.

An iron core shaped in the form of a cut ring has a coil, I I, wound upon its surface. A copper plate, B, either solid or composed of washers laid over each other passes freely in the slot across the ring. The poles of the coil and core are thus brought close together, so as to produce a strong field, in which the secondary closed circuit B can be controlled.

If the copper plate be so placed in the slot that its center is not coincident with the center of the core of the ring, as shown in Fig. 1, and alternating currents are sent through the coils of the rings, there is an immediate tendency to thrust the ring out of the slot, excepting only when the center of the plate is coincident with the center of the core.

The desideratum in regard to plate B is that any current induced in it shall find a closed circuit. In the form shown this is evidently the case and said induced current can flow freely from one part of the plate to the other. The plate B is therefore a closed circuit for the secondary or induced current, and this circuit is mounted in inductive proximity to the core C and coil I, and pivoted so as to

rock away under the influence of the alternating current.

In the apparatus, receiving-instrument, or relay I have designed this device is made the basis of a receiver adapted to the transmission of signals by means of rapidly-alternating currents sent over the line by means of an ordinary key and through the coils of the receiver connected in the usual way in a main-line telegraphic circuit. Fig. 2 represents such a receiving apparatus or relay. The circular block or plate B is poised in indifferent equilibrium upon an upright arm or lever, *l*, upon which it is free to move about the hinge at *h*. At the base of the lever *l* two arms project at right angles to the upright lever, and these are provided with stops *k* and *k'*, that come in bearing at *r* and *o* when the lever is moved both ways, so as to throw the plate B in and out of the slot cut into the ring C, in which it is partially inserted. The right-hand stop, *k'*, is so adjusted that the plate B cannot enter the slot far enough to make its center coincident with that of the core, and the other stop has such adjustment that when in bearing the soft-iron armature *a*, secured to the upright lever *l*, is not removed beyond the effective attraction of the electro-magnet *m*, the function of which will be explained later.

The upright P carries the cut-ring and alternate-current induction-coil I. It also carries an ordinary electro-magnet, *m m*, whose coils are included in a separate battery-circuit, and this magnet is so placed in the upright P that when the right-hand contact, *k'*, is in bearing at *d* its armature *a* does not come in contact with the magnet-pole. The stops are further so adjusted that when the right-hand stop is in bearing the lever *l* inclines but slightly to the right of the vertical position, and is held there by its own weight as well as the attraction of the magnet *m* exerted upon the armature *a*.

The terminals of the induction-coil I are connected in the main line *n* of the telegraphic circuit, (see Fig. 3,) and if, therefore, connection is made by means of a key, *f*, at a distant station with an alternating-current dynamo-electric generator, *g*, placed in the line-circuit by operation of the key alternating-currents will be thrown into the coils I through the main line wire, and this current through its inductive effect will give rise to an immediate repulsive effort exerted upon the plate B to force it out of the slot and bring the left-hand contact, *k*, in bearing against the anvil *r* with an audible click. This contact may be made to close a local circuit, or the apparatus itself by proper mounting may be used as an ordinary sounder. Instantly upon breaking the circuit at the sending-station the inductive action upon B ceases, and the magnet *m*, drawing its armature *a*, brings the right-hand contact, *k'*, in bearing at *o*.

The electric transmission of telegraphic signals by continuously alternating currents is thus rendered possible. At the different stations of the line alternating-current dynamo-electric generators producing many alternations of current per second are used as the source of electric energy instead of a battery, being connected, like the latter, through an ordinary telegraph-key to the line, so that by making the ordinary Morse signals the alternating currents of the generator are momentarily switched from an earth or closed-circuit connection and thrown into the main line during the time that any key closes the main-line circuit.

I am aware that an electro-magnet adapted to operate a movable inductive part *per se*, is not new, as such a device is shown in Letters Patent No. 363,186, Figs. 9, 21, and 22. My invention embodies the application of rapidly-alternating currents to signaling systems and renders the use of long lines practicable.

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

1. In a telegraph system, the combination of a circuit, an alternating-current generator at one station, a key for controlling the alternating transmitting-current developed by said generator, and a receiving-instrument at a distant station, comprising an electro-magnet and a signaling device carrying an inductive part in operative relation to said magnet, whereby, when alternating currents are passed through the electro-magnet, the inductive part will be acted upon.

2. In a telegraph system, the combination of a circuit, an alternating-current generator at one station, a key for controlling the alternating transmitting-current developed by said generator, and a receiving-instrument at a distant station, comprising an electro-magnet and a signaling device carrying an armature in operative relation to said magnet, whereby, when alternating currents are passed through the electro-magnet, the armature will be acted upon.

In testimony that I claim the foregoing as my invention I have hereunto subscribed my name, in the presence of two witnesses, this 20th day of September, 1887.

F. JARVIS PATTEN.

Witnesses:
M. COHN,
J. GUTFREUND.