(No Model.)

F. A. PICKERNELL.

ELECTRIC ANNUNCIATOR.

No. 481,120. Patented Aug. 16, 1892.

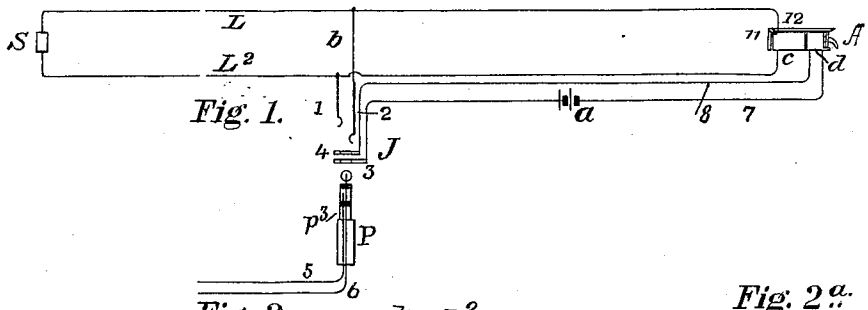

Fig. 1.

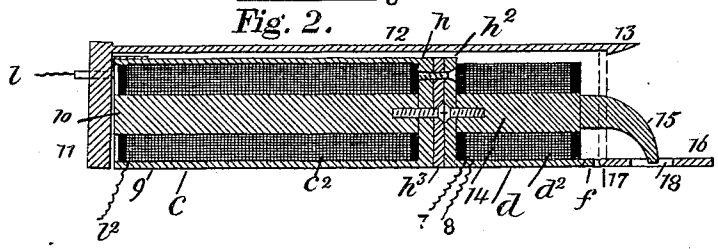

Fig. 2.

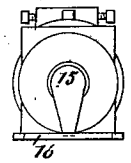

Fig. 2ª.

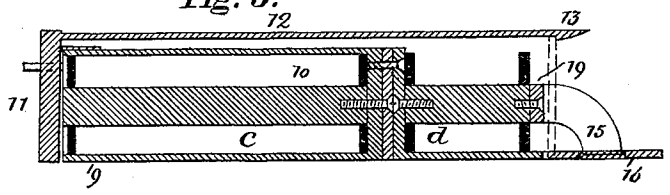

Fig. 3.

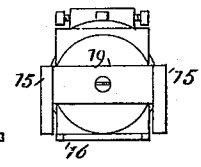

Fig. 3ª.

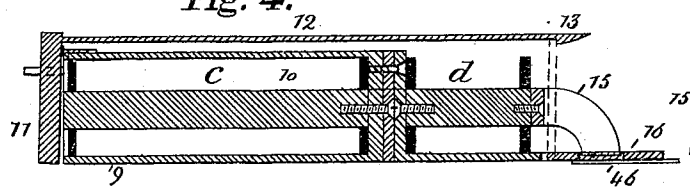

Fig. 4.

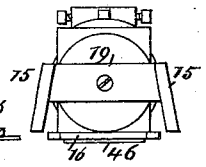

Fig. 4ª.

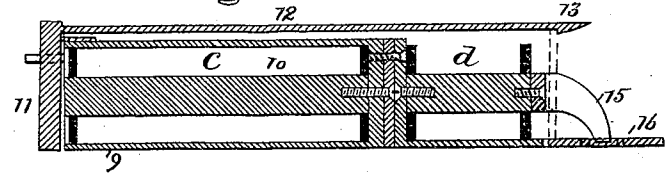

Fig. 5.

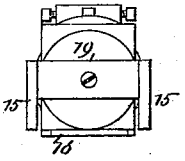

Fig. 5ª.

Witnesses.

Geo. L. Wheelock

Peter Lewis.

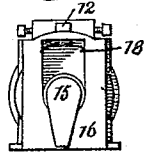

Fig. 6.

Inventor.

Frank A. Pickernell

by Pollard & Mann

his attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FRANK A. PICKERNELL, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY, OF NEW YORK.

ELECTRIC ANNUNCIATOR.

SPECIFICATION forming part of Letters Patent No. 481,120, dated August 16, 1892.

Application filed April 16, 1892. Serial No. 429,459. (No model.)

To all whom it may concern:

Be it known that I, FRANK A. PICKERNELL, residing at Newark, in the county of Essex and State of New Jersey, have invented certain Improvements in Electric Annunciators, of which the following is a specification.

This invention relates to visual signals or indicators, and especially to such annunciators as are employed in connection with telephone-circuits in exchange central-station switchboards. With the enormous multiplication of circuits the switchboard apparatus has grown so large that it becomes a problem how to find sufficient space for the efficient and convenient operation of the several appliances. Under these circumstances it is evident that if without in any degree depreciating the character of the service the call-annunciators could be so constructed and arranged that the signal would be displayed until it received attention, and could then be automatically restored to its normal position, it would be possible to place them out of reach, and a large amount of space now occupied by them would be liberated and placed at the service of spring-jacks or plug-sockets and other appliances requiring the personal manipulation of the operators.

Several appliances and modes of arrangement have heretofore been proposed, and my present invention is intended to be worked in association with some of these, its object being to provide an extremely practical and efficient self-restoring annunciator. In pursurance of this object I avail myself of the theory of the magnetic circuit which, though suggested many years ago by Joule, has but recently obtained general recognition; but which when utilized in electrical appliances effects a radical improvement in their construction as well as operation; and my invention consists in a self-restoring annunciator organized to operate by utilizing the tendency of a magnetic circuit to shorten itself and in an annunciator provided with two electro-magnets, one of which by the attraction of its armature (unless the second is energized) unlatches and drops the signal-shutter, which is the armature of the second electro-magnet, while the other or said second electro-magnet when energized attracts the said shutter-armature lifting it if it be down and holding it in place if it be up. The said shutter-armature for this purpose is made wholly or in part of iron, and the core of the said second magnet has a curved projection so as to be in close proximity to the shutter in all positions of the latter.

In the accompanying drawings, Figure 1 is a diagram indicating one suitable arrangement of circuits with which my annunciator is designed to be associated. Figs. 2 and 2^a are respectively a longitudinal section and a front end view of an annunciator embodying my invention, the drop or shutter being down. Figs. 3, 3^a, 4, 4^a, 5, and 5^a are skeleton sections and front end views of modified constructions. Fig. 6 is a front end view of a slight modification of Fig. 2, the shutter being in place.

My locking and self-restoring annunciator consists of two practically distinct electro-magnets *c* and *d*. The first of these is in this instance considerably longer than the second and may be of the same proportions as the standard tubular telephone-annunciator. It consists of an iron core 10, an exciting-helix c^2, an armature 11, and, preferably, a magnetic inclosing shell 9. To the armature, which is hung on pivots in a manner well understood, is secured a lever extension 12, extending backwardly along the electro-magnet and terminating in a hook or latch 13, this engaging with the edge of the signal-shutter 16, the resting position of which is indicated by broken vertical lines, and thereby holding the same and preventing it from falling to give the signal. By the wires *l* and l^2, which are the terminals of the exciting-helix, the electro-magnet can be included in an electric circuit. A sufficiently-strong electric current or series of currents circulating in such circuit will of course magnetize the core, which will attract the armature, and thus slightly elevate the latch end of the lever and release the shutter, which falls, giving the signal. The inner end of the core 10 is preferably armed with an iron heel-piece *h*, which unites the tubular casing 12 with the core, and to this is secured by screws or otherwise an iron cheek h^2, magnetically connected with the inner end of a core 14 of an auxiliary magnet *d*, affixed to the end of the signaling-magnet

c. Instead of the said end pieces being secured by screws to their respective cores they may be made integral therewith; or the two cores may, together with the iron partitions which separate their coils and form magnetic yokes or heel-pieces therefor, be made in a single piece; or, again, the said heel-pieces may be made separate and have an interposed disk h^3, which may be made either of iron or non-magnetic material. The only material point is that the signaling electro-magnet, and more especially the auxiliary electro-magnet, shall both be furnished at their inner extremities with a connection of iron between the end of the central core and the surrounding tube or frame in one case and the foundation plate or base *f*, to which the shutter 16 is pivoted or hinged at 17, in the other. A suitable electro-magnetic helix d^2 is slipped over or wound on the core 14 of the second magnet *d*, which core at its outer end has a tapering and curved extension 15.

The signal-shutter 16 is made of iron and is centrally perforated with a hole 18 slightly larger than the thickness of this projection at such portion thereof as the shutter reaches when in its resting or set position, and this perforation registers with the said projection, as shown, so that when the shutter is down the end of the projection is about on a level with the iron shutter or slightly enters the hole through it, while when the shutter is up the said extension of the iron core projects through it.

In order that a good magnetic circuit may be arranged for the second magnet, it will be seen that the iron plate or base h^2, to which the core 14 is attached, continues by the base-plate *f*, as described, clear to the end of the coil, and that the iron shutter is mounted directly thereon. When the said shutter has fallen to give the signal, the circuit of the coil d^2 being closed and there being an electric current flowing through the said coil acting to magnetize the core 14, the magnetic circuit extends through the iron core 14, the iron frame-plates h^2 and *f* to the iron shutter 16, and thence through the air-gap in the hole 18 to the end of the projecting horn 15. The tendency of this magnetic circuit is to shorten itself as much as possible, and in carrying out this tendency the iron shutter is lifted, the iron part of the circuit becoming shorter and the air-gap constantly becoming narrower as the hole through the shutter approaches the thicker portions of the projections 15. Instead of a hole through its center the iron shutter may be slotted, as shown at 18 in Fig. 6. The ends 7 and 8 of the auxiliary coil d^2 may be led out in any desired way and connected with any circuit including a suitable source of electricity and a circuit-closer, and supposing such circuit to have been closed when the shutter has not fallen to give the signal, it is evident that the core 14 becoming thereby magnetized will exercise attraction on the said shutter and will hold the same and prevent it from falling, this holding effect taking place also, of course, in the former case, where the electro-magnet *d* is first required to lift the shutter from its fallen position.

In Fig. 1 is shown my annunciator arranged in connection with switchboard-circuits to receive call signals from a distant station, which manifest themselves by dropping the shutter, and to have its shutter held and prevented from giving false signals should it not have already fallen, or to have its shutter automatically restored and then held in place, should it have fallen, by the act of plugging a connection to the line which such annunciator represents.

The main magnetic coil *c* of the annunciator A is connected with the two wires L and L^2, leading from a sub-station S, branches being led from each to spring-jack contacts 1 and 2 for the purpose of connecting with other lines through the intermediation of plug-connectors P and link conductors 5 and 6, attached thereto.

The plugs in a manner well understood are inserted into the spring-jacks or plug-sockets J and their tip and first sleeve-contact surfaces, which terminate the conductors 5 and 6, respectively, register with the contact-springs 1 and 2.

The auxiliary annunciator coil or helix *d* is, by means of the conductors 7 and 8, connected in the local circuit of a suitable source of electricity, such as a battery *a*, which circuit is normally open at two proximate contact-surfaces insulated from one another and from the other apparatus and placed at the proper plug-sockets in the form of metal rings 3 and 4, through which the plug must pass when inserted in its socket. A circular contact-surface p^3, mounted on the stem of the plug, can be arranged when the plug is in place to make contact with and unite the said two rings, so as to keep the local circuit closed as long as the plug remains in its socket. Signaling-currents traversing the main line thus excite the principal magnet *c* and release the shutter 16 to give the call-signal, while the current of the battery *a* flows in the local circuit, including the auxiliary magnet *d*, when the same is closed by inserting the plug, and this excites the said auxiliary magnet, which attracts its iron shutter-armature, if the same is in place, locking it there, and, if it has fallen, first raising it to the normal position and then locking it there.

The annunciator so far described tends to shorten the magnet-circuit of its auxiliary magnet both through the iron and also by the increase in the cross-section of the projecting horn as the shutter rises.

In Figs. 3 and 3^a an iron cross-piece 19 is screwed to the end of the core 14, and this is provided with curved iron side pieces 15, between which on the energization of the magnet the iron shutter is raised, shortening the magnetic circuit through the iron only, the

cross-section of the side pieces suffering no change.

Figs. 4 and 4ª show a modified construction, in which the curved iron side pieces 15 are set with a slight flare at their ends, and the magnetic circuit in this case is shortened as the shutter rises through both iron and air gap, the cross-section of the side pieces being uniform.

In connection with this form I point out that it is not necessary to provide that the entire shutter shall be made of iron, and that should lightness in any special case be a desirable feature an iron armature 16 of proper conformation may be caused to support a shutter 46 of aluminum or any suitable material, which shall be considered as the visual signal.

The construction shown in Figs. 5 and 5ª shows side pieces which taper toward the end, as does the horn 15 of Fig. 2, so that in this construction the magnetic circuit shortens through the iron, as well as by the widening of the side pieces or tongues.

An annunciator embodying the features described is very simple and economical in construction and at the same time very efficient.

Having thus fully described my invention, I claim—

1. A self-setting annunciator having an electro-magnet organized when excited to release the single drop or shutter and an auxiliary electro-magnet organized to reset or restore the said shutter by shortening or reducing the resistance of a magnetic circuit, including the core and armature of said electro-magnet, substantially as described.

2. The combination of an electro-magnet, an armature therefor, a latch controlled thereby, and a signal-shutter engaged by said latch, of a second electro-magnet provided with an iron base extending from its heel-piece, and a core having a curved projection, the said signal-shutter constituting the armature of the said second electro-magnet and the magnetic circuit of said second electro-magnet being through the said core, shutter, iron base, and heel-piece, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 13th day of April, 1892.

FRANK A. PICKERNELL.

Witnesses:
CHARLES D. M. COLE,
F. W. DUNBAR.