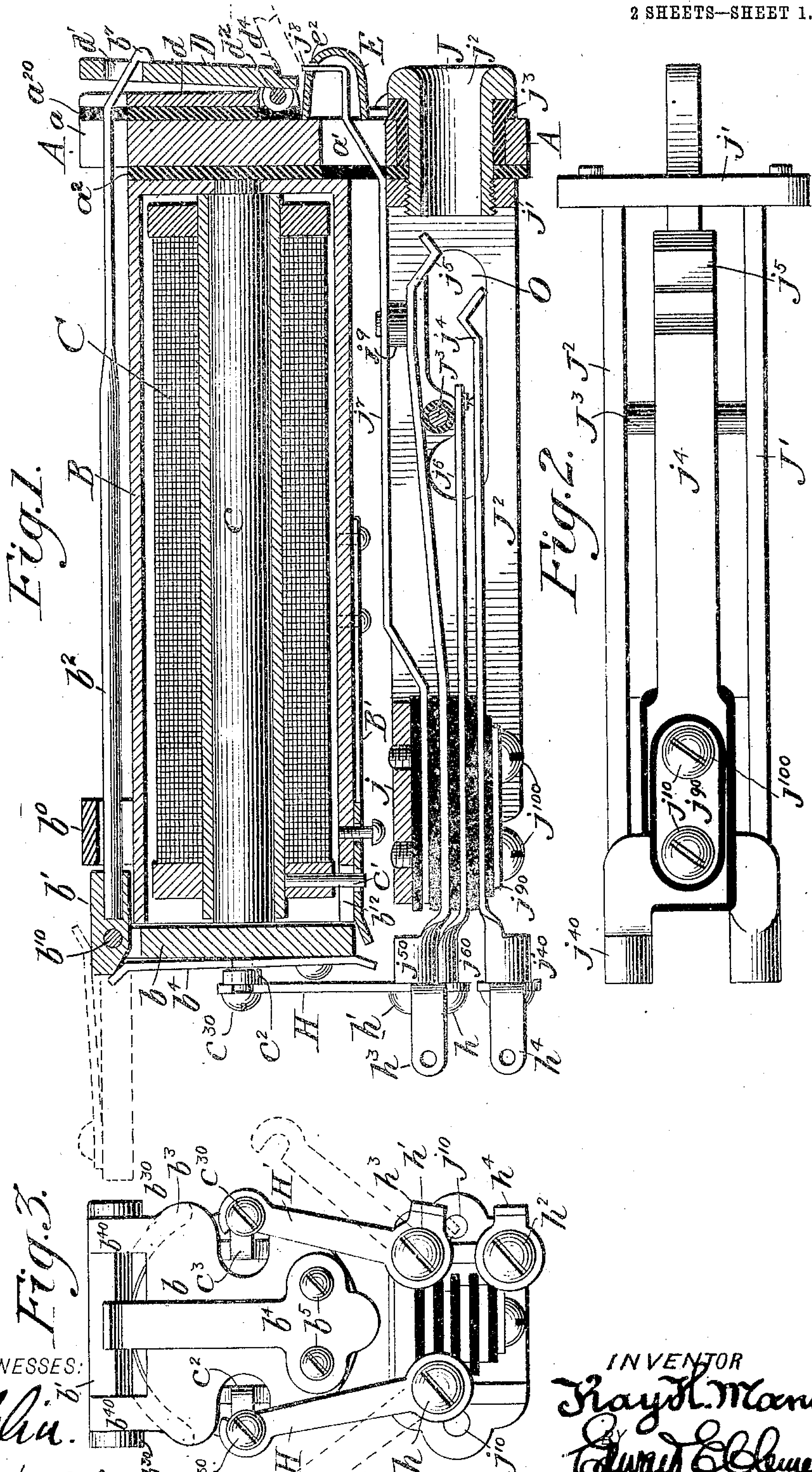
R. H. MANSON.

ELECTRICAL SIGNALING AND SWITCHING APPARATUS.

APPLICATION FILED SEPT. 10, 1906.

934,977. Patented Sept. 21, 1909.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 4.

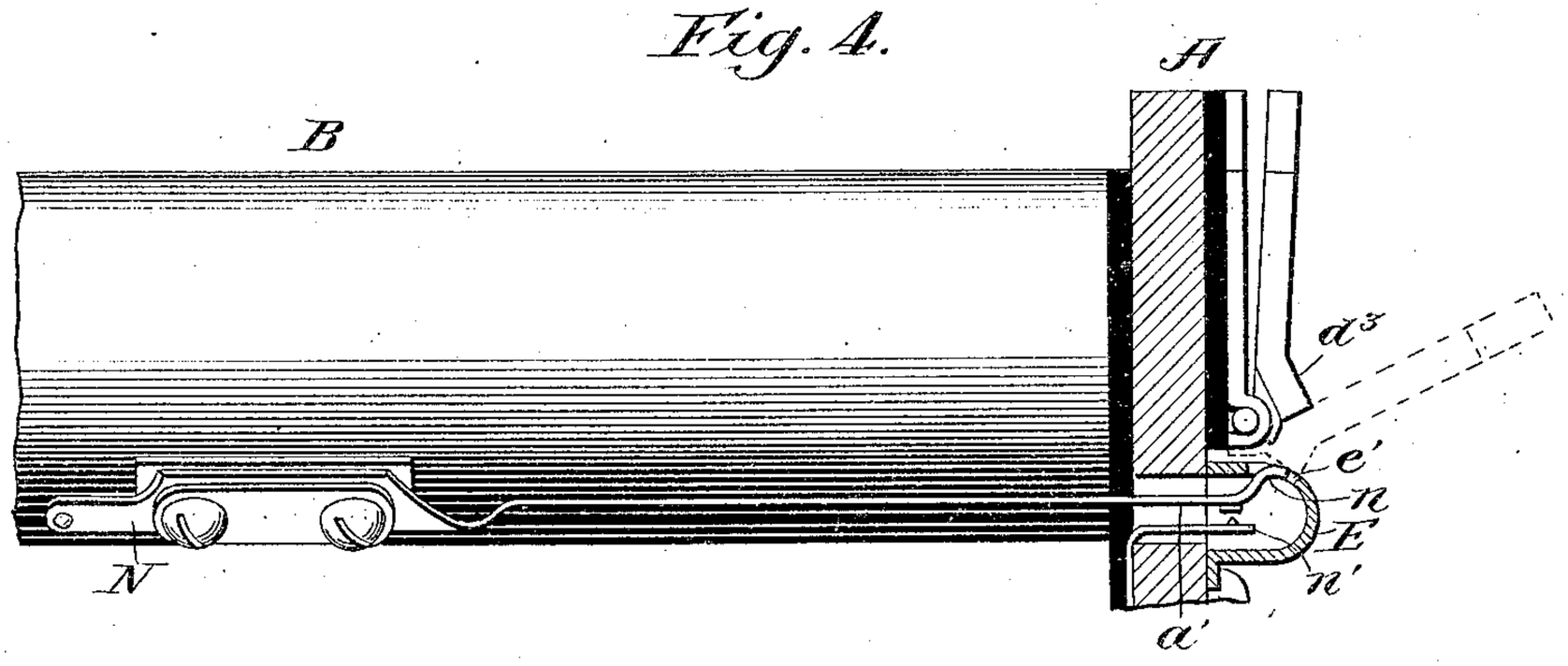
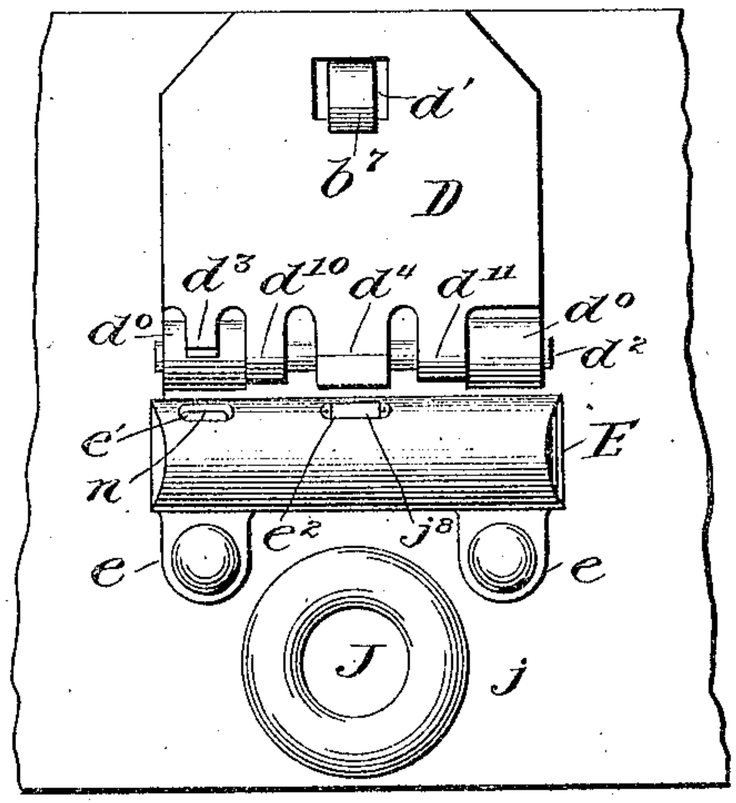


Fig. 5.



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UNITED STATES PATENT OFFICE.

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ELECTRICAL SIGNALING AND SWITCHING APPARATUS.

934,977. Specification of Letters Patent. Patented Sept. 21 [illegible]09.

Original application filed June 14, 1905, Serial No. 265,242. Divided and this application filed September 10, 1906. Serial No. 334,008.

To all whom it may concern:

Be it known that I, RAY H. MANSON, a citizen of the United States, residing at Elyria, in the county of Lorain and State of Ohio, have invented certain new and useful Improvements in Electrical Signaling and Switching Apparatus, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to electrical signaling and switching apparatus, and particularly to what are known as combined annunciator drops and jacks.

Some features of my invention may be employed to advantage elsewhere than in the combination I have here described, but all are particularly useful in connection with telephone exchange switchboards.

The present application is a division of my prior application, Serial No. 265,242, filed June 14, 1905, for electrical signaling and switching apparatus, and is directed particularly to certain broad features of the invention involving electromagnet structures in general. This includes the front frame of a combined annunciator and spring jack which I have chosen as the specific embodiment to be described and illustrated herein, without being limited thereto. Units of this type are usually assembled and mounted either separately or in strips of ten, and their connection and adjustment in a switchboard are usually assigned to unskilled labor. Moreover, a large percentage of the switchboards of this type are used in small exchanges, frequently isolated, where all repairs, the replacement of parts, and the like, must of necessity be accomplished not only without the assistance of skilled labor, but frequently without any but the most primitive tools. I have designed a combination piece of apparatus to meet these conditions, the results attained in point of convenience and efficiency being of course desirable in any circumstances and in any location.

Briefly stated, my invention comprises a front plate upon which all the parts are mounted, a tubular iron-clad electromagnet end-supported on said plate, a drop shutter with night alarm contacts, controlled by the magnet, a spring-jack lying beneath and parallel with the electromagnet and also end-supported on the plate, and a long spring movable with one of the jack springs when a plug is inserted, to push up and restore the drop shutter. The electrical connections between the winding of the electromagnet and the other parts are made very strong, and are so arranged that they can be thrown out of the way to permit the ready withdrawal of the electromagnet or its spool from the tubular casing. For this no tools are required, and as all parts are interchangeable the greatest facility is thus provided for making repairs.

The specific novel features of my invention will be pointed out in the following detailed description and the claims appended hereto.

The invention is illustrated in the accompanying drawings wherein,

Figure 1 is a vertical longitudinal section through the entire device. Fig. 2 is a bottom plan view showing the frame and springs of the jack. Fig. 3 is a rear end elevation. Fig. 4 is a side view of the electromagnet with portions of the other parts in section, showing my improved arrangement of the night alarm contacts. Fig. 5 is a front view of the complete unit assembled as it appears when mounted in a switchboard.

In the drawings A is the front plate, preferably of metal, which will be described as it is shown, that is in a single unit section, although it may extend to a sufficient length for the accommodation and support of ten or more units. Upon the rear face of this plate I provide a sheet of insulating material a^2, and secured against this in any suitable manner, as by means of screws extending through the front plate, is the tubular iron shell B extending horizontally to the rear, and housing within it the electromagnet C whose core c is secured at the front end to the end of the shell so as to form a good magnetic circuit. At the rear end of the shell I provide a saddle or yoke b^3, screwed or riveted to the shell and having a raised middle portion b^0 and ears b^{30} between which the armature and its detent rod are pivoted. The armature is indicated by the letter b, in Figs. 1 and 3, and is in general shape like a shield, with upwardly projecting lugs b^{40} and side portions cut away to accommodate the magnet terminals. The lugs b^{40} fit against the inner faces of the ears b^{30}, and between these lugs lies the pivot block b' through which and through the lugs and ears

passes the pivot pin b^{10}. The lower outer edge of the pivot block is chamfered off to form a normal bearing face for the ends of a spring b^4, secured by screws b^5 upon the lower part of the outer face of the armature. Secured solidly to the pivot block b' and lying along the top of the shell B, is the armature detent rod b^2, whose front end passes through an opening, a, in the upper part of the plate A, and is then bent down at an angle with its axis, terminating in a hook or detent b^7. Upon the upper part of the face of the front plate A is secured in any suitable manner, as by screws passing into the plate, the shutter plate d formed with two bent ears d^9 to receive the shutter pintle d^2, and insulated from the plate A by the interposed rubber or fiber a^{20}. Pivoted upon the pintle d^2 and normally held up in front of the plate d by the hook end b^7 of the rod b^2 is the drop shutter D, having the opening d' through its upper portion for the passage of the detent, and upon its lower edge having four tongues or projections d^3, d^4, d^{10} and d^{11}. (See Fig. 5). The tongues d^{10} and d^{11} are bent over to take around and form bearings for the pintle d^2. The tongue d^4 is for restoring purposes, and the tongue d^3 controls the night alarm contacts.

Below the shutter D the front plate A is cut out to form an opening a' for the passage of the night-alarm and restoring springs, to which further reference will be made and in order to cover this opening as well as to protect the projecting ends of the springs, I provide the box or casing E, preferably formed up out of sheet-metal, with openings, e' and e^2, and ears e, whereby it is secured upon the face plate by rivets or otherwise. (See Fig. 5).

Below the housing E lies the jack J, the working parts of which are supported in a frame composed of two longitudinal side strips J', J², joined at their front ends by a yoke piece j' and at their rear ends by a horizontal yoke-plate j upon which and between the side plates are mounted the various operating springs. The jack frame is secured to the front plate A by the bushed thimble j^2, the insulating plate a^2 extending down between the frame and the front plate and being pierced for the passage of the thimble shank, while the latter is surrounded by the insulating bushing j^3, whereby the jack frame and connecting parts are entirely insulated from the front plate. This is desirable for several reasons one being the prevention of possible crosses or short-circuits between or on the different lines whose units are carried on the same plate, or whose plates are secured on the same metal switchboard frame. This is particularly necessary, also, because one of the night alarm contacts is grounded on the frame, the other being insulated in each case.

The jack springs are four in number, comprising the two contact springs j^4 and j^5, the anvil spring j^6 upon which the spring j^4 normally rests, and the restoring spring j^7, whose forward end j^8 extends out through the opening a' in the front plate, into the box or housing E and is there turned up as shown in Fig. 1, lying below the end of the tongue d^4 on the drop shutter. Intermediate of its ends the spring j^7 rests upon an insulating stud j^9 which is preferably shouldered and has its neck lying in an opening in the spring to prevent lateral displacement. The spring j^5 in the idle condition of the apparatus lies upon a bridge piece or stud J³, extending from side to side of the jack frame and comprising an outer insulating sleeve and an inner metal stud having its ends riveted into the two frame plates. This stud also receives on its under face the thrust of the anvil spring j^6, with which the tip spring j^4 makes strong contact while idle. The adjustment of the parts is such that they will lie in the position shown in Fig. 1 when the apparatus is in disuse, and a careful examination of this figure will show that with my arrangement it is possible to secure both easy assembling and perfect adjustment of the jack before the latter is applied to the front plate at all. When the complete apparatus is finally assembled all together, the steady-pins j^{10} lie in corresponding openings in the rear face of the insulated plate a^2, the jack structure being thus prevented from turning, which it might do if secured by the thimble j^2, only, since this latter is tapped into the yoke j' and unless riveted might in practice be slacked up enough to permit the jack to have some slight play, thereby spoiling the adjustment of the springs and particularly the restoring spring.

The jack springs are secured at their rear ends by being piled up with interposed slips of insulating material upon the cross-yoke j, and held in such position by the clamping plate j^{90} and the screws j^{100}, the latter being bushed if required and tapped directly into the yoke-plate. In order to permit of inspection and adjustment after assembling the jack-springs, I cut out the side plates J' and J², to form openings, O, as shown in Fig. 1.

The electromagnet C, either in its entirety or merely as regards the spool and winding, is made removable from the shell B, without tools. According to my preferred construction the core c is riveted at its end to the end of the shell, and the spool containing the windings can be slid in and out by merely throwing up the armature around the pivot b^{10} into the position shown in dotted lines in Fig. 1. With the armature thrown up the coil may be slid out, and a new coil slid in, such substitution being

quite frequently required in cases of burnouts and the like. In order to secure the spool removably in place I provide the outer head with a projecting pin c' which when the coil is inserted passes into a slot b^{12} in the lower edge of the shell and is engaged by a latch spring B′ secured upon the under side of the shell. In order to withdraw the coil this spring is depressed, and when a coil is inserted the spring snaps over the pin and holds it in place.

In order to make electrical connection between the coil and the jack terminals, I provide the solid pivoted hasps H, H′ secured at their lower ends to the proper terminals on the jack frame, and at their upper ends engaging the terminals c^2, c^3 secured to the head of the spool. The hasp H is pivoted on a screw h tapped into the sleeve j^{60} formed up on the rear end of the anvil spring j^6; while the hasp H′ is pivoted on the screw h' tapped into the sleeve j^{50} formed up on the rear end of the contact spring j^5. The contact spring j^4 also has a sleeve j^{40}, which takes a screw h^2, but there is no hasp connection, the only purpose in this case being to provide a solid terminal for attachment of the circuit wires. For this purpose I secure by means of the screw h^2 a tailed washer h^4, having its outer end perforated for the attachment by solder of the line-wire. The other side of the line is attached to a similar perforated tail formed on the hasp H′. It will thus be observed that when the hasps H and H′ are turned up to engage the two terminals c^2, c^3, and the screws c^{30} are tightened upon them, that the magnet winding is bridged across the two springs, j^5, j^6, and as the latter is normally in contact with the spring j^4 and as the springs j^5 and j^4 are the line terminals, it follows that the magnet is normally bridged across the line and is cut out when a plug is inserted.

Referring to Figs. 4 and 5, the arrangement of night alarm contacts is seen to best advantage. The spring N is secured by screws or otherwise to one side of the tubular shell B and has its forward end extending through the opening a' in the front plate and into the box or housing. This end is turned up as shown at n in Fig. 4, and lies in the opening e' to be engaged when the drop is down, this engagement to be effected by means of the tongue d^3 formed on the drop. When the spring is engaged by the tongue d^3 the end n is pressed downward so that a contact carried thereby is pressed against an anvil contact n' supported as indicated from the front plate and grounded thereto. From this it will be seen that only one circuit connection is required to be made for the night alarm circuit when a new unit is attached to the switchboard.

The operation of my improved apparatus is as follows: The parts all being in the position shown in Fig. 1, when signaling current comes over the subscriber's line it passes in by way of the terminal h^3 and hasp H′, through the coil C, back through hasp H to the spring j^6, thence to the spring j^4, and back to line by way of the terminal h^4. The armature b being attracted, the rod b^2 is lifted, the hook b^7 detached from the shutter, and the latter falls. The tongue d^3 then engages the night alarm spring n to close that circuit, and the tongue d^4 comes down upon and overlies the end of the restoring spring j^8, as shown in dotted lines in Fig. 1. It should be stated that this tongue is not essential, the idea being that the restoring spring should engage and lift the drop shutter. When the plug is inserted in response to the call it spreads apart the springs j^4 and j^5, the former lifting off the contact j^6 and thereby cutting out the drop, while the other lifts the stud j^9 and the restoring spring j^7, the outer end of which passes up through the slot e^2 in the box E and lifts the shutter D until it again engages and is retained by the hook b^7. In putting a unit into a switchboard the front plate is secured upon the frame, and the line-wires are soldered to the terminals h^3, h^4. Nothing more is required. In replacing a burned out coil, the screws c^{30} are loosened and the hasps H and H′ thrown down into the position shown in dotted lines in Fig. 3. This exposes the face of the armature b and removes all obstructions, so that by simply inserting the finger below the projecting lower end of the spring b^4, the entire armature can be swung up into the position shown in dotted lines in Fig. 1, being retained there by the pressure of the spring b^4 on the top of the pivot block b'. Then by depressing the end of the spring B′ so as to clear the pin c', the spool may be withdrawn and a new one substituted. The armature is then turned down, the hasps thrown up into position and the screws c^{30} tightened up, when the apparatus is again in condition for operation.

I am aware that many changes may be made in matters of shape or in non-essential details of construction without departing from the spirit of my invention, and I wish it understood that I include all such within the scope and purview thereof.

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

1. An electromagnet comprising a magnetic frame, a spool carrying the magnet winding and adapted to be supported in or on said frame, and a spring latch detachably securing the parts together, substantially as described.

2. An electromagnet comprising an iron shell and core, a spool carrying a winding and adapted to be supported within the shell upon the core, together with a spring latch

detachably holding the spool in position, substantially as described.

3. An electromagnet comprising an iron shell and core, together with a coil removably secured in the shell, and spring locking means for securing the coil in the shell.

4. An electromagnet comprising a frame with an energizing spool detachably held therein, an armature carried on the frame and normally in operative relation with the magnet spool and core, together with means for holding the armature in an inoperative position to permit the removal of the spool, substantially as described.

5. An electromagnet comprising a tubular shell and a spool carrying an energizing winding, detachably secured within said shell, an armature carried upon one end of the structure and normally obstructing the opening thereof, together with means to hold the armature without detaching it so as to clear the end of the tube and permit the removal of the detachable spool, substantially as described.

6. An electromagnet comprising an iron tubular shell and a magnet spool removably secured therein, spring locking means for securing the coil in the shell, an armature secured at one side of the end of the shell and normally extending across the same, together with actuating means secured to the armature to permit its being moved to clear the end of the shell without moving the actuating means.

7. An electromagnet having an iron shell or frame and a detachable spool carrying an energizing winding, means for securing the electromagnet to a support, an armature structure composed of two parts joined together, one part constantly maintained in fixed relation with the coöperating parts of the structure, and the other part of the armature being relatively movable on the first part to permit the magnet spool to be detached without removing the electromagnet from its support, substantially as described.

8. An electromagnet having a two-part jointed armature with means to securely hold the parts when set, in operative and inoperative positions, substantially as described.

9. An electromagnet having a jointed armature in two parts, with means for securing the parts in variable mutual relations, substantially as described.

10. An electromagnet having a jointed armature in two parts, a cam on one part and a spring on the other part bearing on said cam, substantially as described.

11. An electromagnet comprising a supporting frame and a spool carrying an energizing winding detachably secured upon said frame, an armature normally in operative relation therewith but obstructing the path of removal of the spool, circuit terminals for the spool passing through openings in the armature and connecting hasps detachably secured to said terminals and overlying portions of the armature, the whole so arranged that the said hasps may be detached from the terminals, the armature moved into an operative position, and the magnet spool then removed from the frame, substantially as described.

12. An electromagnet having a winding, a spool carrying said winding, and means carried by the electromagnet for engaging the spool when the winding is in operative position, such engaging means adapted to be disengaged while the winding is in its operative position whereby the spool may be removed from the core.

13. An electromagnet having a winding, a spool carrying said winding, and a lock for removably retaining the spool with the winding in operative position relatively to the electromagnet, such lock adapted to be disengaged while the winding is in its operative position whereby the spool may be removed from the core.

14. An electromagnet having a winding, a spool carrying said winding and a lock for removably retaining the spool with the winding in operative position relatively to the electromagnet, and a supporting plate for the electromagnet, such lock adapted to be disengaged to permit removal of the spool without removing the electromagnet from the plate.

15. An electromagnet comprising a tubular shell, a core secured to one end of the shell, an energizing winding adapted to be supported on the core on a removable spool, an armature normally supported in operative position at the other end of the shell, and means for removing the armature from its operative position to permit the removal of the coil and spool from the core.

16. An electromagnet comprising a tubular shell, a core secured to one end of the shell, an energizing winding adapted to be supported on the core on a removable spool, an armature normally supported in operative position at the other end of the shell, and means for removing the armature from its operative position to permit the removal of the coil and spool from the core without changing the adjustment of the armature-supporting means when the armature is replaced in its operative position.

17. An annunciator, including an electromagnet, a spool upon which the same is disposed, a casing within which the spool is contained, and a locking device for holding the said spool in position within the casing including one locking member carried by the spool and a companion locking member

having a mounting substantially stationary with respect to the casing.

18. The combination of an annunciator whose winding is removable with reference to the balance of the annunciator structure, and a locking device having one locking member provided upon the removable winding structure and the other locking member provided upon the balance of the annunciator structure.

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

RAY H. MANSON.

Witnesses:
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