No. 673,504. Patented May 7, 1901.

I. J. KUSEL.

TELEPHONE SWITCHBOARD.

(Application filed Sept. 27, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

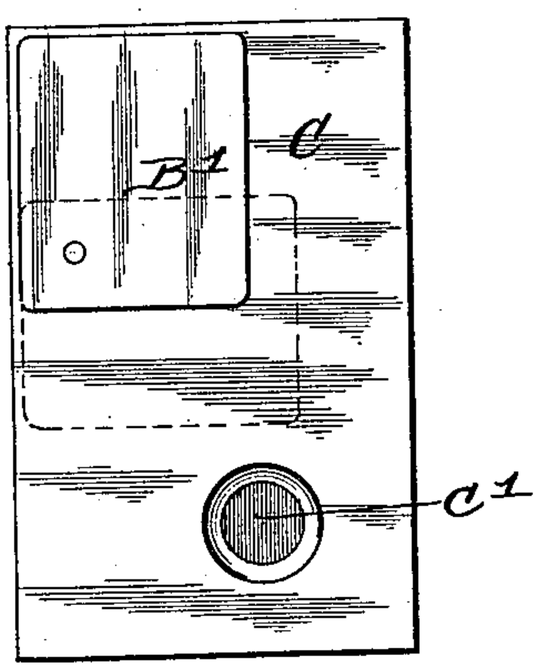


Fig. 2.

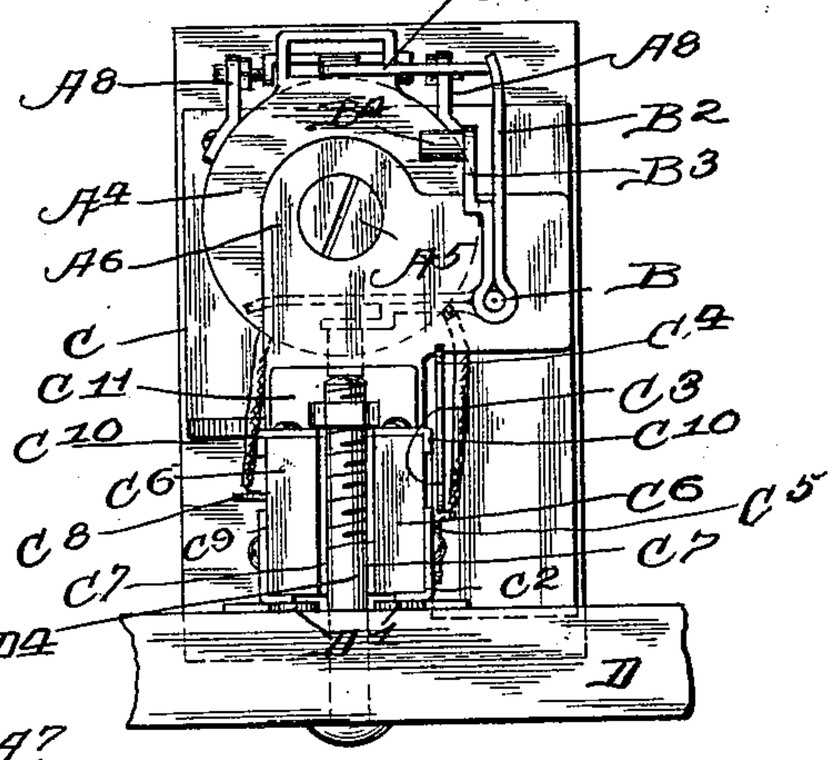


Fig. 3.

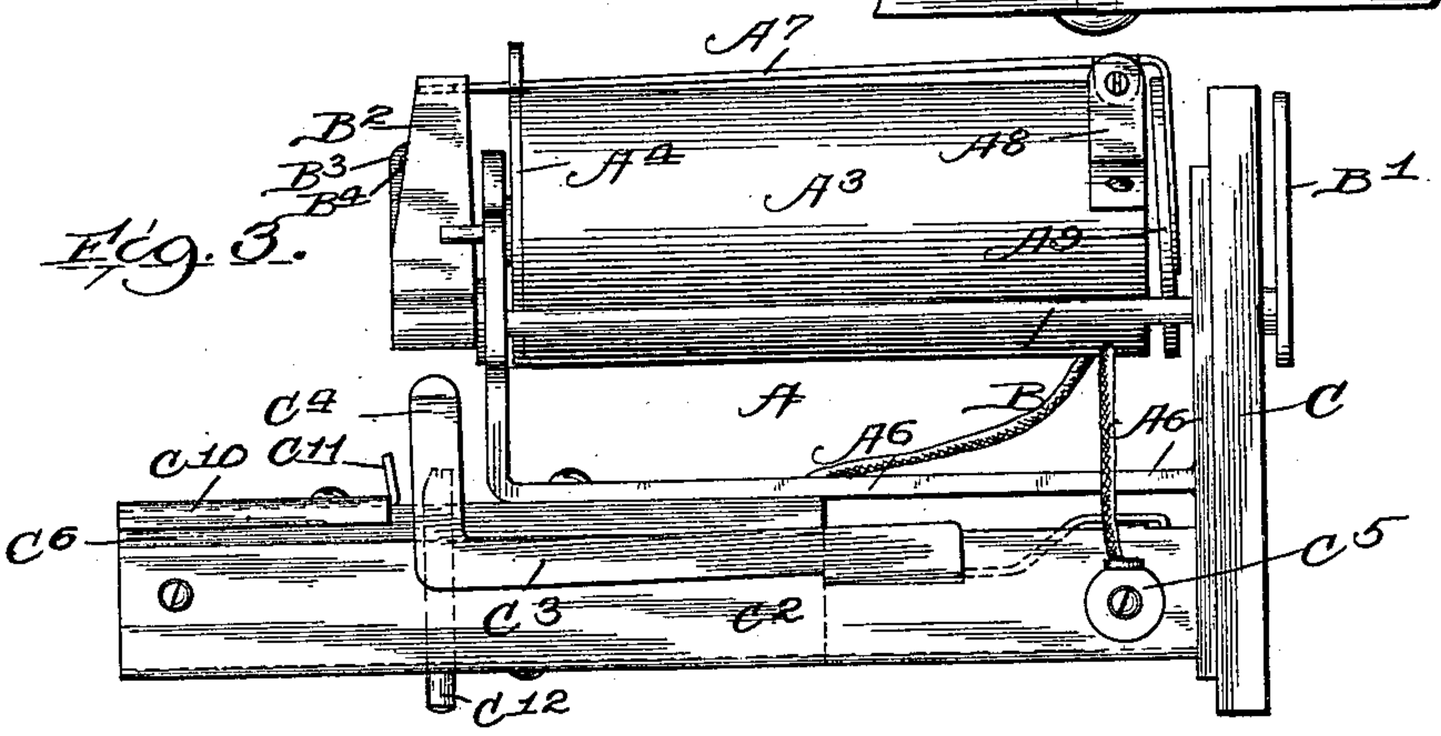
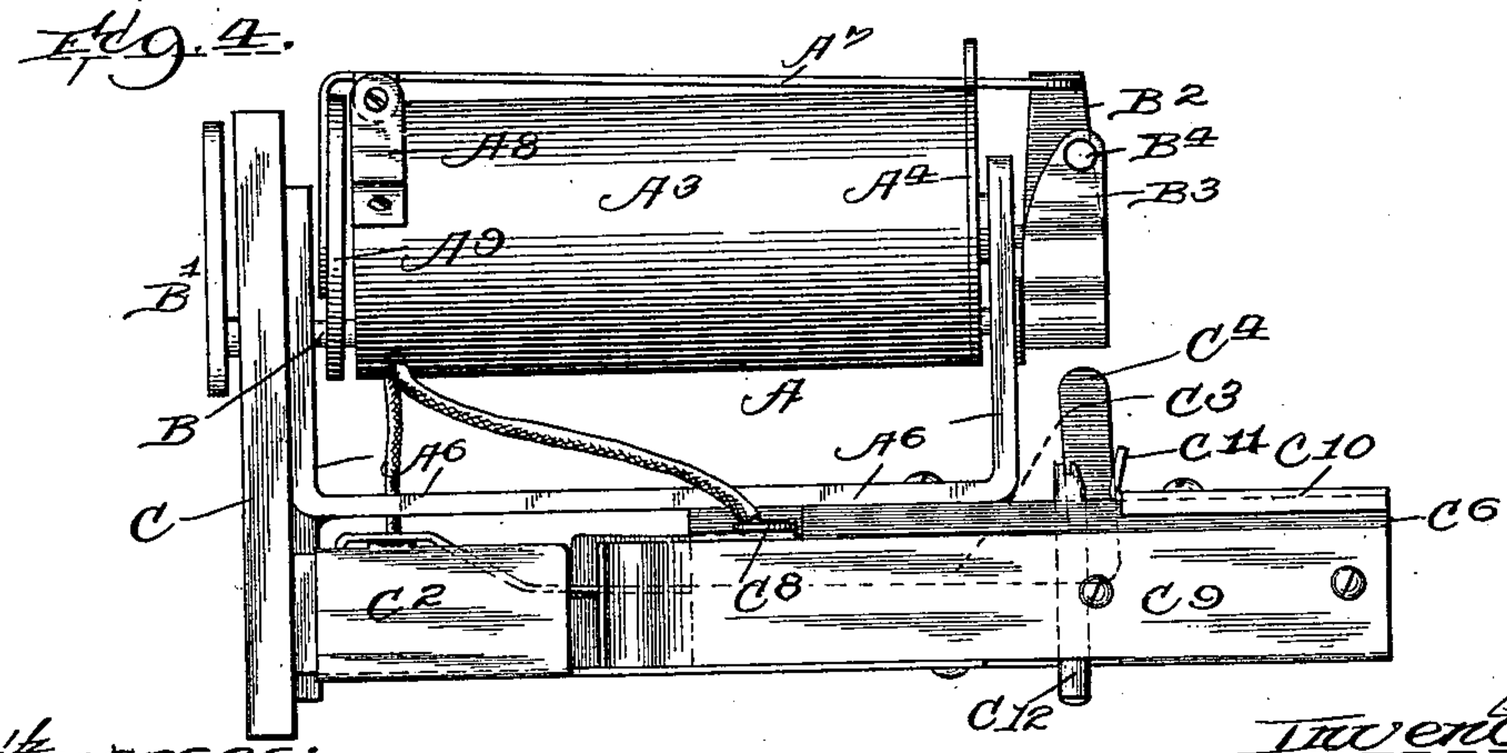


Fig. 4.



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(No Model.) 3 Sheets—Sheet 2.

Fig. 5.

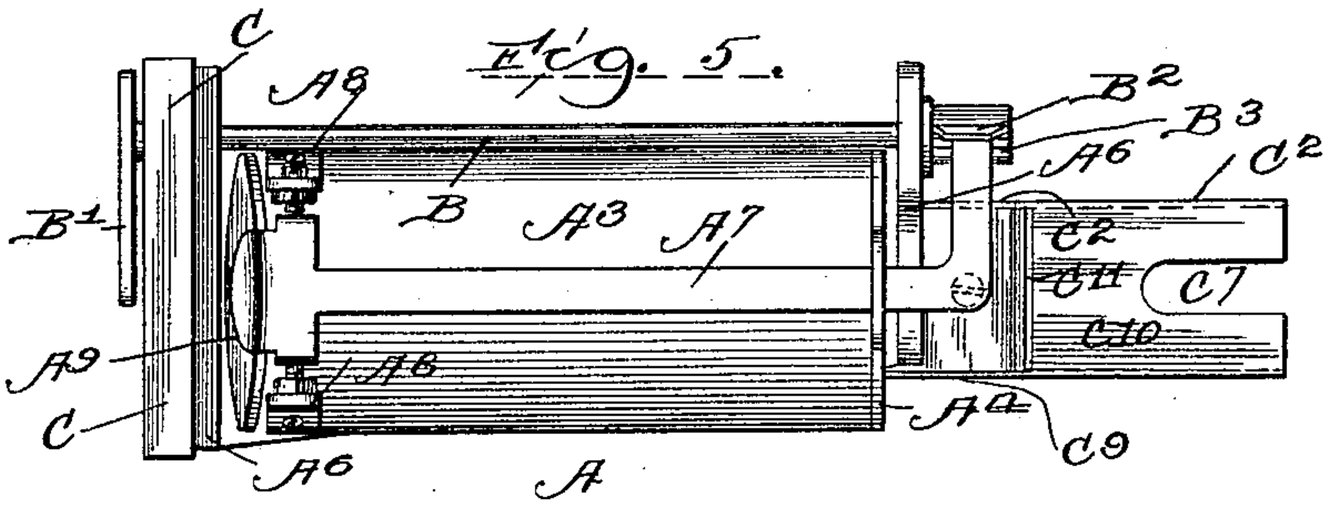


Fig. 6.

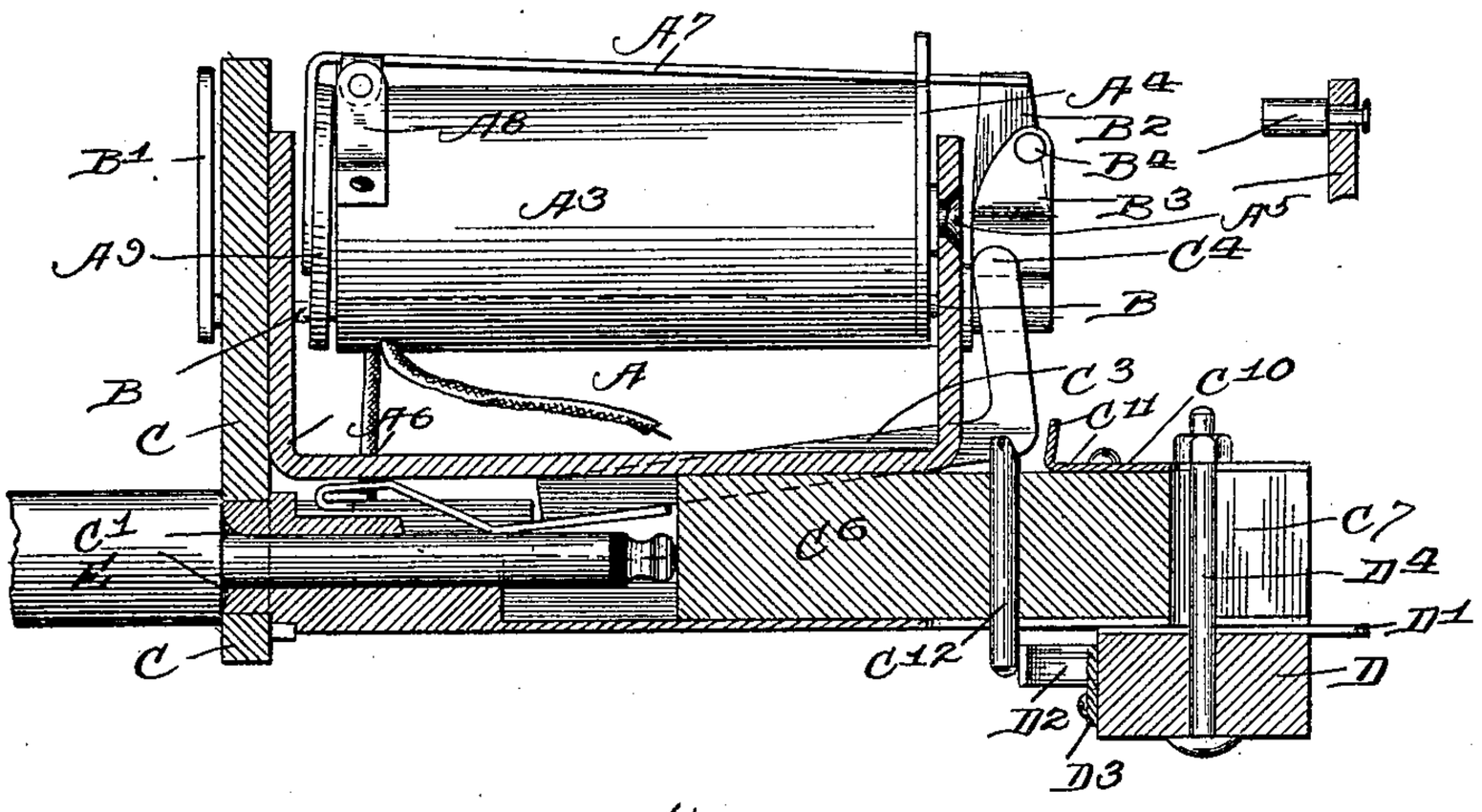
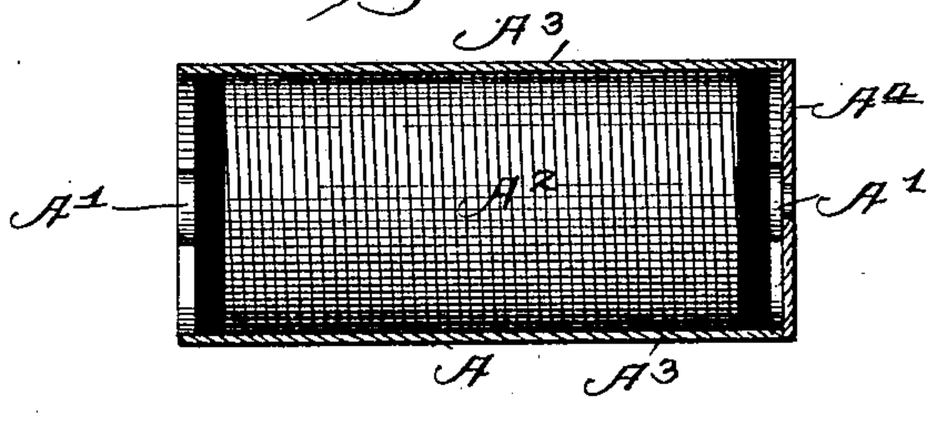


Fig. 8.

Fig. 7.



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(Application filed Sept. 27, 1900.)

(No Model.) 3 Sheets—Sheet 3.

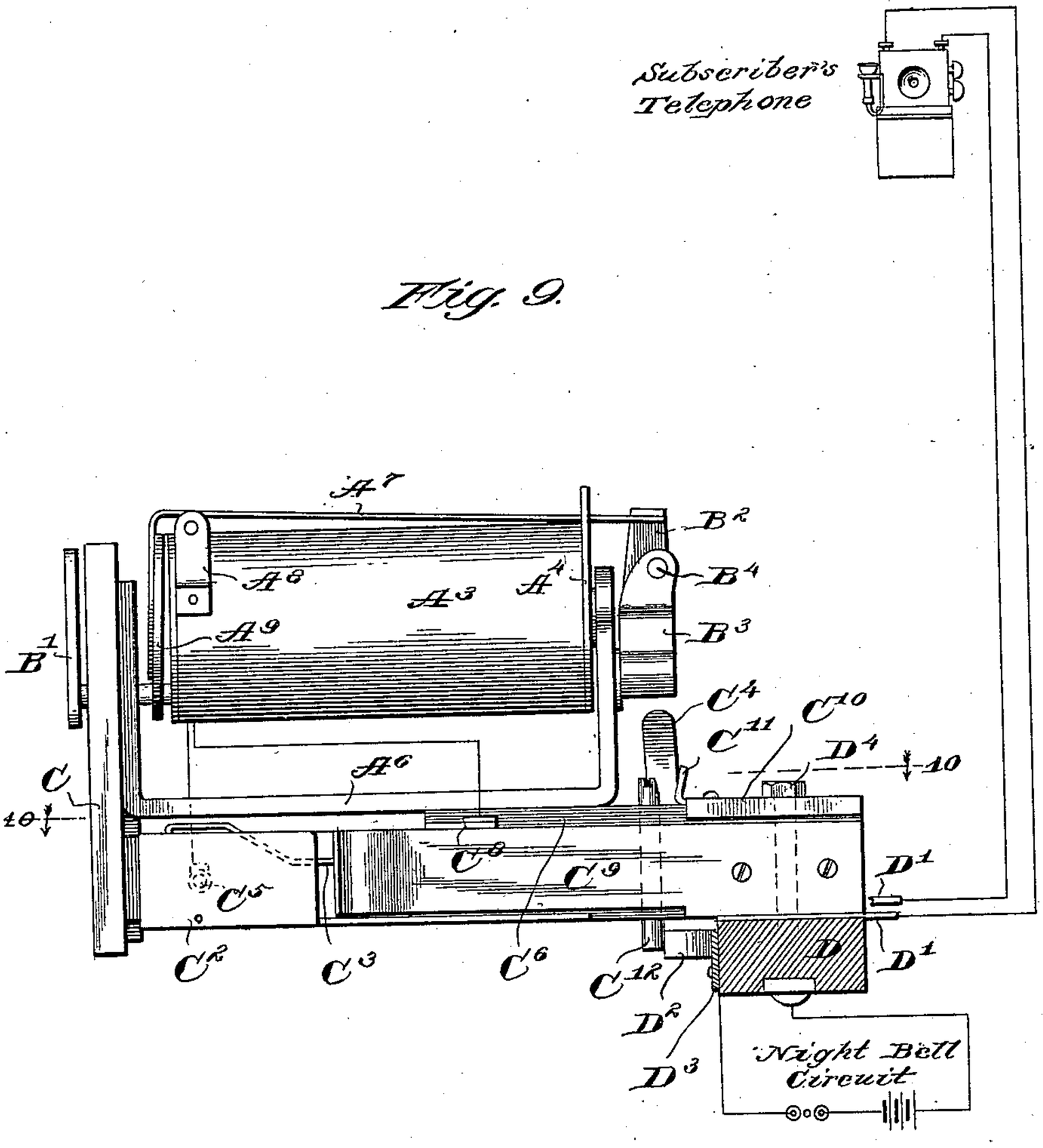

Fig. 9.

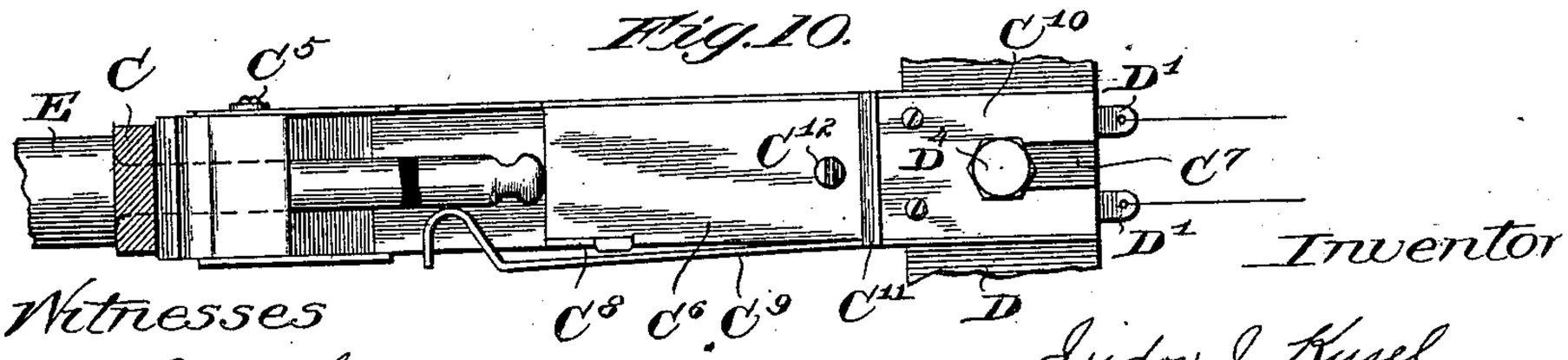

Fig. 10.

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UNITED STATES PATENT OFFICE.

ISIDOR J. KUSEL, OF CHICAGO, ILLINOIS, ASSIGNOR TO EUREKA ELECTRIC COMPANY, OF SAME PLACE.

TELEPHONE-SWITCHBOARD.

SPECIFICATION forming part of Letters Patent No. 673,504, dated May 7, 1901.

Application filed September 27, 1900. Serial No. 31,258. (No model.)

To all whom it may concern:

Be it known that I, ISIDOR J. KUSEL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Telephone-Switchboards, of which the following is a specification.

The object of this invention is the production of a combined spring-jack and drop for telephone-switchboards which shall be compact in form, simple and strong in its construction, easily attachable to the switchboard or removable therefrom, wherein electrical connections between the lines of the board and those of the jack and drop are made or broken by said acts of attachment or detachment, wherein the action of the magnetic coil is strengthened by a tubular shell of a conducting metal, wherein the annunciator-plate falls sidewise in a plane parallel with the face of the board, wherein said annunciator-plate is automatically restored to position by the insertion of a plug into the jack, wherein the jack is not liable to accidental displacement by the jarring of the switchboard, and embodying the other and further improvements herein set forth.

In the accompanying drawings, Figure 1 is a front elevation of this improved jack and drop. Fig. 2 is a rear elevation of the same, showing the means for mechanically attaching the jack and drop to the switchboard and the contacts for its electrical connection therewith. Fig. 3 is a side elevation of said jack and drop. Fig. 4 is a similar view showing the opposite side of said jack and drop. Fig. 5 is a plan view of the same. Fig. 6 is a longitudinal vertical central section through said jack and drop, the tubular shell surrounding the coil being shown entire. Fig. 7 is a longitudinal central section through the tubular shell surrounding the coil. Fig. 8 is a detail view in section, showing the means for loosely mounting the plug which completes the night-bell circuit when the annunciator-plate falls. Fig. 9 is a diagrammatic view showing the night-bell circuit and a subscriber's line in connection with the jack and drop of my invention. Fig. 10 is a horizontal section on dotted line 10 10 of Fig. 9, showing the connection of the subscriber's circuit to the jack and drop.

Like letters of reference indicate corresponding parts throughout the several views.

This combined jack and drop is intended for use in connection with telephone-switchboards of any of the ordinary forms, and, as in other switchboards, two plugs are used—to wit, the answering-plug and the ringing-plug—the former being the plug which the operator inserts into the jack on the circuit of the calling subscriber and the latter the one inserted into the jack on the circuit of the called subscriber. These plugs are electrically connected, and in the circuit formed between them it is intended that the operator's circuit may be included or "bridged in" when it is necessary that she should listen or ring on any subscriber's line.

A night-bell circuit, normally open, is arranged to be closed upon the falling of the annunciator-plate, whereby the alarm-bell of said circuit is caused to ring continuously until by the restoration of the fallen plate the night-bell circuit is again broken. The electrical connections for this night-bell circuit and for the subscriber's lines are permanently secured to contact-points on a stationary portion of the switchboard, which said contact-points are arranged to engage corresponding contact-points on the jack and drop and in electrical connection with the proper lines of the latter, by which arrangement the act of mechanically clamping or securing the jack and drop to the switchboard electrically connects the lines therein with the lines of the board and whereby the detachment of said securing means interrupts said electrical connection. A tubular shell of soft iron surrounds the electromagnet and is connected with the core of said magnet, its purpose being to intercept the magnetic lines of force which envelop the coil, offering said lines of force a good conductor from one pole of the magnet to the opposite pole thereof, thus preventing their mingling with similar lines of adjacent coils and by said mingling producing cross-talk on contiguous lines.

In the embodiment here shown of this invention a clamping screw-bolt forms the se-

curing means between the jack and drop and the switchboard, and the mere tightening or loosening of said bolt connects said jack and drop with the switchboard or disconnects it therefrom electrically as well as mechanically.

In the construction of this jack and drop I provide an electromagnet A, having the core A′ and the usual winding A^2. A tubular shell A^3, permanently closed by the end A^4, surrounds said magnet and is held in position relative to the latter by means of a screw A^5, passing through an opening in the end A^4 and into an axial screw-threaded opening in said core. The screw A^5 also holds the electromagnet and its shell in position upon the supporting-frame A^6. A tilting latch-bar A^7 is pivotally mounted in supports A^8 upon the tubular shell A^3 near the open end thereof. This latch-bar is of non-magnetic material, as brass, and has secured to its downwardly-extending forward end the armature A^9 for said electromagnet. This armature is a circular disk corresponding in diameter to that of the tubular shell A^3. The opposite end of the tilting latch-bar is adapted to engage and hold elevated the annunciator-plate, which will next be described.

B is a shaft capable of an oscillatory motion, journaled in the supporting-frame A^6. At its forward end it bears the annunciator-plate B′, rigidly secured to said shaft at one of its lower corners. The rear end of the shaft B carries the detent-finger B^2, rigidly fixed to said shaft, which detent-finger is adapted to be engaged by the latch-bar A^7 and be held thereby in an elevated position. When an electric current energizes the electromagnet A, the armature A^9 is attracted toward the core A′, lifting the rear end of the pivoted latch-bar A^7 from its engagement with the detent-finger B^2 and permitting the annunciator-plate B′ to fall. The shaft B also has a projecting lug B^3, bearing at its outer end the plug B^4, loosely mounted on said lug, the object of this plug being to complete the night-bell circuit when the annunciator-plate falls. The plug is loosely mounted on the outer end of said lug, so that it may always wedge between the two contact-points of the night-bell circuit and not rest upon one alone, as it might do if rigidly fixed to said lug and the adjustment of the latter was not perfect with relation to said contact-points.

C is the face-plate of the jack and drop, and it has the opening C′ for the reception of the plug. On the rear side of said face-plate C is a metallic base portion C^2, extending to the rear extremity of the jack. This base portion contains the pivoted restoring-arm C^3, the upturned end C^4 of which is adapted to engage the lug B^3, rigidly secured to the shaft B, and by its upward movement to oscillate the shaft B and restore the annunciator-plate to its normal position. The restoring-arm C^3 is so formed that it will be engaged rearward of its pivot by the inserted plug. C^5 is a loop for the attachment of one end of the primary wire of the magnetic coil A′. C^6 is a base-block of non-conducting material, having the vertical slot C^7 at its rear end. It is held rigidly in position by a screw passing through the lower part of the supporting-frame A^6 and another screw extending upward from the metallic base portion C^2. On one of its sides it has the contact-plate C^8 in electrical connection with one end of the primary winding of the electromagnet, and overlying said contact-plate and secured at the rear end of the non-conducting base-block C^6 is the contact-spring C^9, adapted to have contact with the forward end of the inserted plug and also with the contact-plate C^8. When the plug is inserted into the opening C′, the contact-spring C^9 is raised from the contact-plate C^8. A contact-plate C^{10} is secured to the rear end of the non-conducting block C^6 on the upper side thereof and has the upturned lip C^{11}. A stud C^{12} extends vertically through the base-block C^6 at a point adjacent to the upturned lip C^{11}, and it is beveled on the side toward said upturned lip in order to form with said lip an inclined opening for the reception of the plug B^4 on the lug B^3, the upturned lip C^{11} and the plug B^4 constituting the ends of the night-bell circuit to be closed when the space between them is bridged by the insertion of said plug B^4. The stud C^{12} extends downward a little distance below the base-block C^6 in order to engage a spring forming a portion of the night-bell circuit, mounted upon a portion of the switchboard to be next described.

D is one of the transverse bars of a switchboard. It has the contact-points D′, which are terminals of a subscriber's line, and the contact-spring D^2 and the contact-plate D^3, both portions of the night-bell circuit. The transverse bar D is vertically perforated and is provided with a screw-bolt D^4, the upper end of which bolt is adapted to extend through the slot C^7 in the rear end of the base-block C^6 and mechanically and electrically connect the jack and drop with the switchboard.

E is a plug of the usual description.

In operation the jack and drop are attached to the transverse bar of the switchboard by means of the screw-bolt D^4. This places the electromagnet on the subscriber's line, the electrical connections being one of the contact-points D′ on the transverse bar D of the switchboard, the contact-spring C^9, the contact-plate C^8, the primary winding of the electromagnet, the connecting-loop C^5, the metallic frame A^6, and the other contact-point D′ of the subscriber's circuit. When a call is made by a subscriber, the electric current passing over the line just specified energizes the electromagnet, and its armature A^9 is attracted toward the core A′ and the shell A^3, raising the latch-bar A^7 from engagement with the detent-finger B^2 and permitting the annunciator-plate to fall. The

plug B^4 falls into electric contact with the stud C^{12} and the lip C^{11}, completing the night-bell circuit. When the plug is inserted in the opening C', its forward end engages the restoring-arm C^3, causing the forward end of the latter to raise the detent-finger B^2 into an elevated position, where it is retained by the latch-bar A^7. The insertion of the plug also mechanically moves the free end of the contact-spring C^9 away from the contact-plate C^8, electrically removing the electromagnet from the subscriber's line and placing the lines of the plug in electrical connection with said subscriber's line in order to permit the operator first to listen over said line to ascertain the subscriber's desires and afterward to connect the calling subscriber with any other number on the board. The lines of force generated by the passage of a current through the coil follow almost entirely the path provided for them by the tubular shell A^3 and the core A' of the electromagnet, thus not only producing a very efficient electromagnet, but also preventing any of the lines of force from extending beyond the limits of the shell. An electromagnet provided for use with the tubular shell is wound to a resistance of from five hundred to fifteen hundred ohms.

I claim as my invention—

1. In a jack and drop for telephone-switchboards, in combination, a jack adapted for the reception of a plug; an electromagnet; an annunciator-plate arranged to fall in a substantially vertical plane; a shaft supporting the plate at one of its ends; a finger carried at the other end of said shaft; and a pivoted restoring-arm arranged to be engaged by said plug coöperating with said finger to restore said annunciator-plate.

2. In a jack and drop for telephone-switchboards, in combination, a jack adapted for the reception of a plug; an electromagnet; a tubular shell surrounding said electromagnet; an annunciator-plate arranged to fall in a substantially vertical plane; a shaft supporting said annunciator-plate at one end of said shaft; a finger carried at the other end of said shaft; and a pivoted restoring-arm arranged to be engaged by said plug, coöperating with said arm to restore said annunciator-plate.

3. In a jack and drop for telephone-switchboards, in combination, a jack adapted for the reception of a plug; an electromagnet; a tubular shell surrounding said electromagnet, which shell is closed at one end and is attached to the core of said magnet; an annunciator-plate arranged to fall in a substantially vertical plane; a shaft supporting the plate at one end of said shaft; a finger carried at the other end of said shaft; and a pivoted restoring-arm arranged to be engaged by said plug, coöperating with said finger to restore said annunciator-plate.

4. In a jack and drop for telephone-switchboards, in combination, a jack adapted for the reception of a plug; a restoring-arm arranged to be engaged by said plug; an electromagnet; an armature for said magnet; an annunciator-plate adapted to fall in a substantially vertical plane; an oscillatory shaft for supporting the plate; and a detent-finger fixed on said shaft, for holding the annunciator-plate elevated.

5. In a jack and drop for telephone-switchboards, in combination, a jack adapted for the reception of a plug; a pivoted restoring-arm arranged to be engaged by said plug; a magnet; an armature; an annunciator-plate adapted to fall in a substantially vertical plane; an oscillatory shaft for supporting the plate; and a detent-finger fixed on said shaft, and a latch for engaging said finger and preventing the oscillation thereof.

6. In a jack and drop for telephone-switchboards, in combination, a jack adapted for the reception of a plug; a pivoted restoring-arm arranged to be engaged by said plug; an electromagnet; an armature for the magnet; an annunciator-plate; an oscillatory shaft for supporting said annunciator-plate, which shaft extends parallel with the core of the magnet; a detent-finger fixed on said shaft; an open night-bell circuit; and means for closing the night-bell circuit when the annunciator-plate falls.

7. In a jack and drop for telephone-switchboards, in combination, a jack adapted for the reception of a plug; a pivoted restoring-arm arranged to be engaged by said plug; an open night-bell circuit; an electromagnet; a tilting latch-bar; an annunciator-plate; an oscillatory shaft for supporting said annunciator-plate; a detent-finger fixed on said shaft; an open night-bell circuit; and means on said shaft, adapted to close the night-bell circuit when the annunciator-plate falls.

8. In a jack and drop for telephone-switchboards, in combination, a base-block having a slot at its rear end; a supporting-frame; an electromagnet; an armature; a detent-finger; a shaft; an annunciator-plate fixed at a point below its center of gravity to said shaft; a contact-point and a contact-spring connected to the ends of a subscriber's telephone-line; and means for forming an electrical connection between said contact-point and the magnet.

9. In an annunciator-drop, in combination, a drop-plate arranged to fall sidewise in a substantially vertical plane; an electromagnet for controlling said drop-plate; a shaft for supporting said drop-plate; a detent-finger on said shaft; a latch-bar adapted to engage said detent-finger; and means for withdrawing said latch-bar from the path of the detent-finger.

10. In an annunciator-drop, in combination, a drop-plate arranged to fall sidewise in a substantially vertical plane; a shaft for supporting said drop-plate; a detent-finger also on said shaft; a latch-bar adapted to engage said detent-finger; an electromagnet; and an

armature for said magnet, for withdrawing said latch-bar from engagement with said detent-finger.

11. In an annunciator-drop, in combination, a drop-plate arranged to fall sidewise in a substantially vertical plane; a shaft for said drop-plate; a detent-finger on said shaft; a latch-bar adapted to engage said detent-finger; an electromagnet; an armature for the magnet, for withdrawing said latch-bar from the path of said detent-finger; and a tubular shell adapted to surround said magnet and confine the magnetic lines of force of said magnet.

12. In an annunciator-drop, in combination, an oscillating shaft; a drop-plate fixed at a point below its center of gravity to said shaft; a detent-finger fixed directly to said shaft, for preventing said drop-plate from falling; a latch-bar adapted to engage said detent-finger; and an electromagnet for withdrawing said latch-bar from the path of said detent-finger.

13. In an annunciator-drop, in combination, a shaft capable of an oscillatory movement; a drop-plate arranged to fall in a substantially vertical plane, fixed on said shaft; a detent-finger also fixed on the shaft; a magnet; an armature; and an arm on said armature adapted to engage said detent-finger.

14. In an annunciator-drop, in combination, a shaft capable of an oscillatory movement; a drop-plate arranged to fall in a substantially vertical plane, fixed at one end of said shaft, and capable of being supported in unstable equilibrium; a magnet; an armature; an arm on said armature; and a detent-finger adapted to engage said arm.

15. In a telephone-switchboard, in combination, a supporting-rail having contact-points for the connection of the subscribers' line-wires, also having contact-points for the night-bell circuit; a series of jacks and drops; a base-block for each of said jacks and drops, each of which base-blocks is provided with a slot for the reception of a securing means, also with contact-points corresponding to the said contact-points on said supporting-rail; a stud extending through said base-block for engaging one line of the night-bell circuit; a plate adjacent to said stud; and a bolt for securing each of said jacks and drops to said supporting-rail, which bolt also makes electrical connection between one of the lines of the night-bell circuit and said plate.

16. In a telephone-switchboard, in combination, a series of combined jacks and drops; contact-points fixed on the switchboard for the connection of a subscriber's line-wires, also contacts for the night-bell circuit; a base-block for each of said combined jacks and drops, each of which base-blocks is provided with a slot for the reception of a securing means, also with contacts corresponding to those for the attachment of the subscriber's line-wires, also having a stud for electrically engaging one line of the night-bell circuit, and a contact-plate having an upturned end, and an opening in the body of the plate; and a securing-bolt passing through a portion of the switchboard and the slot in said base-block, and making contact between said plate having the upturned end and one of the lines of the night-bell circuit.

17. In a telephone-switchboard, in combination, a series of combined jacks and drops; contact-points fixed on the switchboard for the connection of a subscriber's line-wires; a night-bell circuit, one line of which is provided with a projecting contact-spring; a base-block for each of said combined jacks and drops, each of which base-blocks is provided with an opening for a securing means, also having contacts corresponding to those for the attachment of the subscriber's line-wires, also having a stud for engaging the said contact-spring of the night-bell circuit, and having a contact-plate with an upturned end; and a bolt for securing the combined jack and drop to the switchboard, which bolt also forms an electrical connection between one line of the night-bell circuit and the plate having an upturned end.

18. In a telephone-switchboard, in combination, a series of combined jacks and drops; contact-points fixed on the switchboard for the connection of a subscriber's line-wires; a night-bell circuit, one line of which is provided with a projecting contact-spring; a base-block for each of said combined jacks and drops, each of which base-blocks is provided with a slot for a securing means, also having contacts corresponding to those for the attachment of the subscriber's line-wires, also having a stud for engaging the said contact-spring of the night-bell circuit, and having a contact-plate with an upturned end adjacent to the said stud; means for securing the combined jack and drop to the switchboard, which means also forms an electrical connection between one line of the night-bell circuit and the plate having the upturned end; and a plug for making contact between the last-named plate and the said stud when the annunciator-plate falls.

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