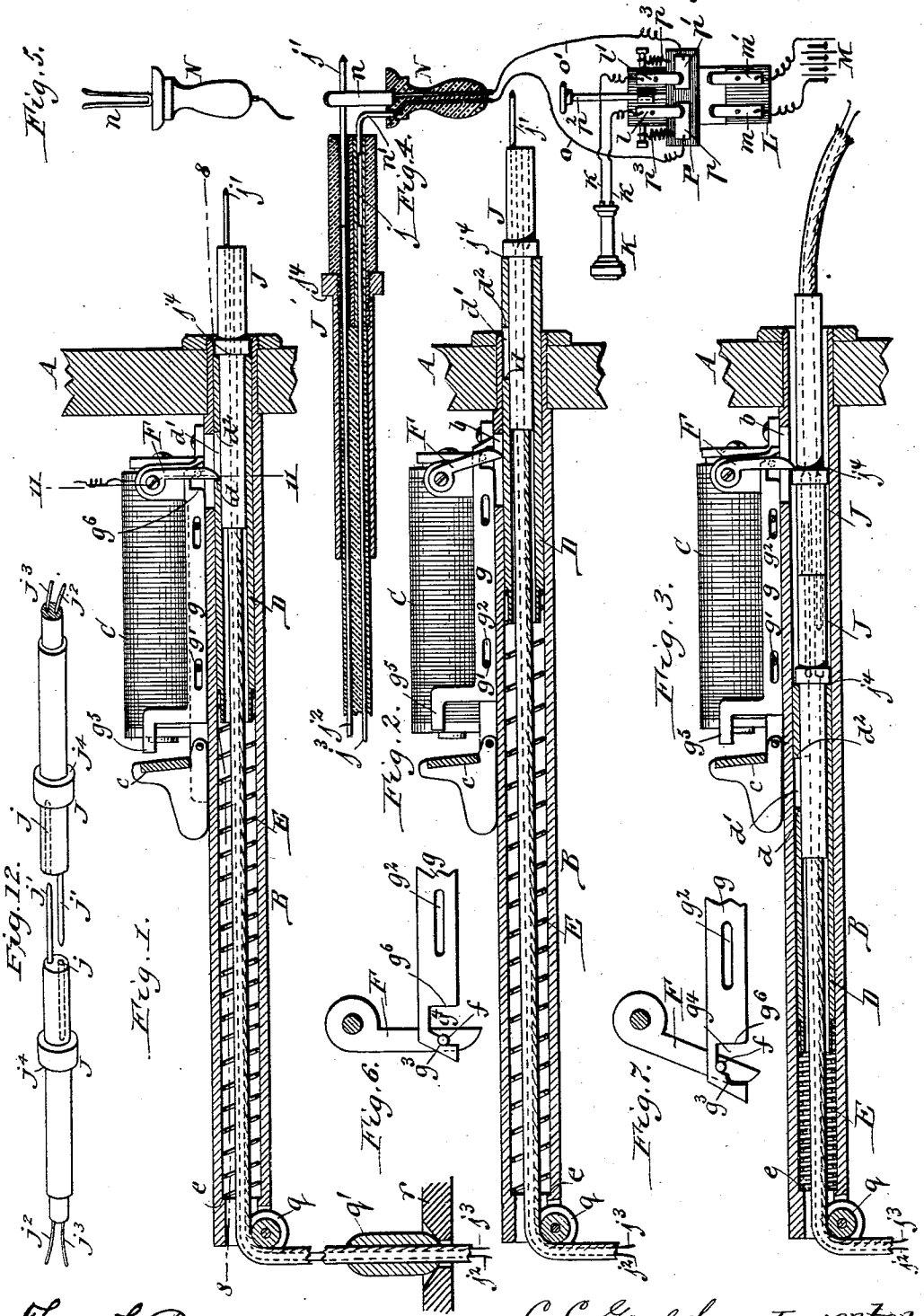
(No Model.) 2 Sheets—Sheet 1.

C. C. GOULD.

TELEPHONE SYSTEM.

No. 564,745. Patented July 28, 1896.



Witnesses.
Theo. L. Popp.
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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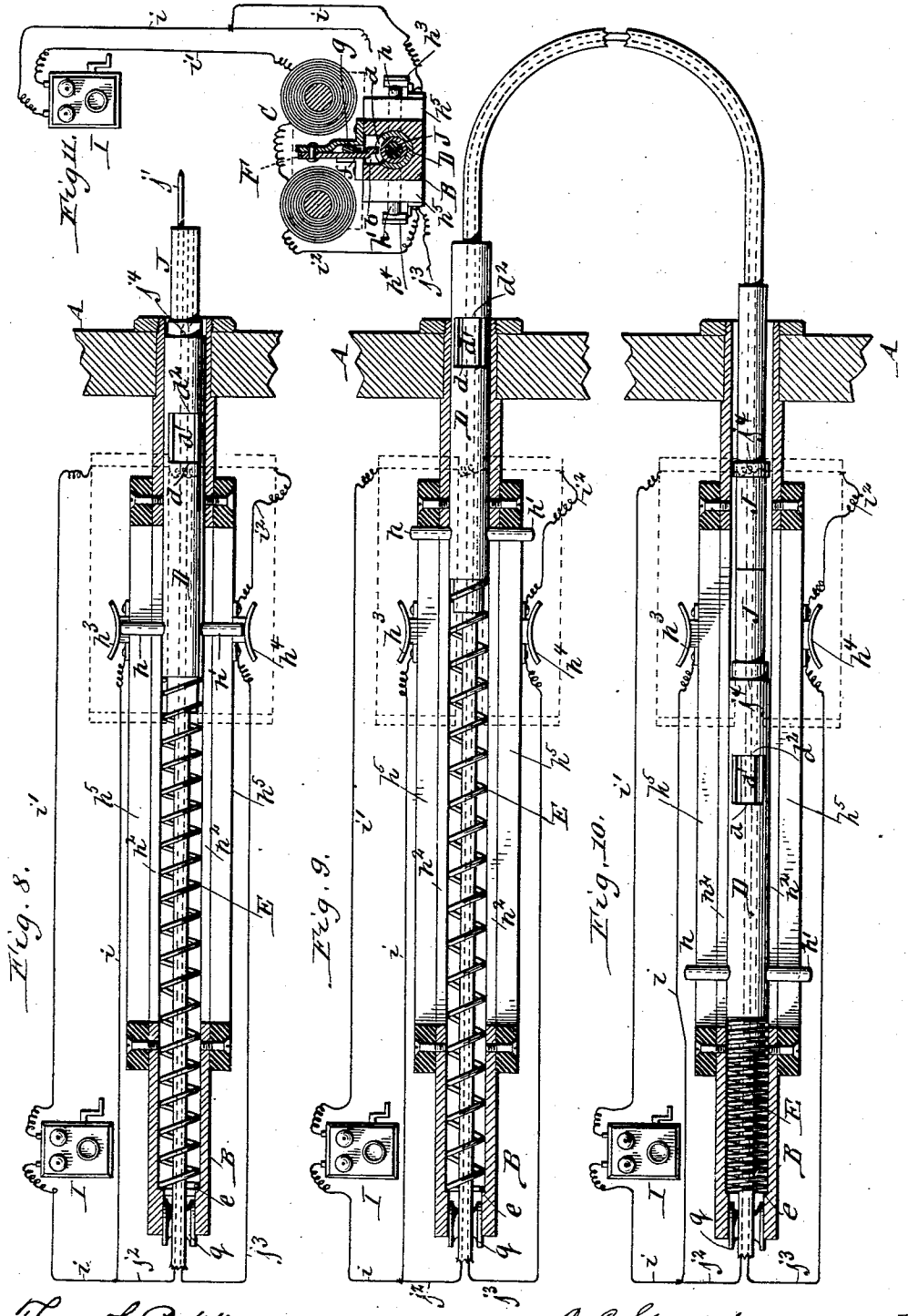

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UNITED STATES PATENT OFFICE.

CLAUDE C. GOULD, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE EASTERN TELEPHONE SWITCHBOARD COMPANY, OF CAMDEN, NEW JERSEY.

TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 564,745, dated July 28, 1896.

Application filed July 5, 1895. Serial No. 554,972. (No model.)

To all whom it may concern:

Be it known that I, CLAUDE C. GOULD, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Telephone Systems, of which the following is a specification.

This invention relates to a telephone system; and it has for its principal object to so organize the system that the operator at the central office cannot listen to the conversation of the subscribers after connecting them.

The invention has the further objects to simplify the construction of the annunciator mechanism and render it more compact, and to improve the apparatus in other respects.

In the accompanying drawings, consisting of two sheets, Figure 1 is a transverse sectional elevation of the switchboard, showing one of the subscribers' lines and connecting parts in their normal position. Fig. 2 is a similar view showing the position assumed by the parts when a subscriber calls up or signals the central office. Fig. 3 is a similar view showing the position of the parts when two subscribers are connected. Fig. 4 is a longitudinal section, on an enlarged scale, of one of the connecting-plugs and the operator's signaling and listening devices connected therewith. Fig. 5 is a side elevation of the coupler at right angles to Fig. 4. Figs. 6 and 7 are fragmentary views, on an enlarged scale, of the detent mechanism whereby the switch plunger and plug are held in position. Fig. 8 is a horizontal section in line 8 8, Fig. 1. Figs. 9 and 10 are similar sections showing the parts in the positions corresponding to Figs. 2 and 3, and also showing the circuit when two subscribers are connected. Fig. 11 is a vertical transverse section in line 11 11, Fig. 1. Fig. 12 is a perspective view of a pair of subscribers' coupling-plugs, showing the same disengaged.

Like letters of reference refer to like parts in the several figures.

A is the upright portion of the switchboard or other support, and B the supporting-frame of one of the annunciators, consisting, preferably, of a horizontal tube secured with its front portion in an opening in the switchboard.

C is the electromagnet or coils of the annunciator, secured to the frame B, and *c* is its armature, which is pivoted to the frame.

D is a tubular switch plunger or socket arranged to slide in the supporting-tube B, and E is a spiral spring arranged in the tube between the rear end of the plunger and an internal shoulder *e*, formed near the rear end of the tube and tending to force the plunger forward into the position shown in Figs. 2 and 9.

F is a catch or locking-pawl which retains the plunger in its inner normal position against the pressure of the spring E, and which is controlled by the armature of the annunciator-magnet. The upper end of the pawl is pivoted by a transverse pin to a standard formed on the frame of the magnet, and its free lower end is adapted to engage against a shoulder *d* of the plunger, which shoulder is formed by the rear end of a longitudinal slot *d'*, arranged in the upper side of the plunger. The tube B is provided on its upper side in line with the slot of the plunger with a similar slot *b*, through which the lower portion of the pawl passes.

g is a locking bar or slide whereby the depending pawl is held in engagement with the shoulder of the plunger. This slide is arranged longitudinally between the coils of the magnet, as shown in Fig. 11, and is guided in its movements by horizontal pins *g'*, secured to the base of the magnet and passing through longitudinal slots g^2, formed in the slide, as shown in Figs. 1, 2, and 3. The pawl is provided with a laterally-extending pin or projection *f*, which is adapted to interlock with a horizontal shoulder g^3 of the locking-bar, as clearly shown in Fig. 6. This shoulder is located in the front edge of a notch or recess g^4, formed in the adjacent front portion of the slide. The plunger, being under the pressure of the spring, tends to swing the pawl forward, but as the pawl swings upward in the arc of a circle the upward pressure of its pin against the shoulder of the slide causes the latter to bind against

its guide-pins g', whereby the slide is held against longitudinal movement and in turn locks the pawl in its effective position.

The slide is provided at its rear end with a rearwardly-extending nose or projection g^5, which stands in the path of the armature in the normal position of the latter, as shown in Fig. 1, so that when the armature is attracted by the magnet it strikes the nose of the slide and moves the latter forward to the position shown in Fig. 2. This movement of the slide permits the pawl to be swung forward and upward by the plunger sufficiently to clear the locking-shoulder d of the plunger, thereby allowing the latter to be pushed outward by its spring. The recess of the slide is of the requisite depth to permit the pin of the pawl to rise above the shoulder of the slide when the pawl is unlocked, as clearly shown in Fig. 2.

h h' represent contact-pins projecting from opposite sides of the plunger and passing through longitudinal slots h^2, formed in the adjacent sides of the supporting-tube.

h^3 h^4 are contact-springs, which are secured to insulating-bars h^5, arranged on opposite sides of the supporting-tube in the path of said contact-pins, respectively, and against which these pins are adapted to bear when the plunger is in its normal position, as shown in Fig. 8.

I is a subscriber's telephone; i, a conducting-wire leading from the contact-spring h^3 to one side of the subscriber's telephone; i', a wire leading from the opposite side of the telephone to the coils of the magnet, and i^2 a wire connecting the coils with the other contact-spring h^4. The metallic plunger forms an electric connection between its two contact-pins. When the parts are in the normal position shown in Figs. 1 and 8, the subscriber's calling or signaling circuit is established through the wire i', the magnet-coils, wire i^2, contact-spring h^4, contact-pin h', plunger D, contact-pin h, contact-spring h^3, wire i, and the subscriber's instrument. Upon calling the central office in this condition of the line the magnet is energized, the armature is attracted, and the latter shifts the slide, thereby unlocking the pawl or catch of the plunger, releasing the latter, and allowing the spring to project it to the position shown in Figs. 2 and 9, whereby the subscriber's calling-circuit is broken by the plunger-contacts h h', leaving the contact-springs h^3 h^4.

J is a coupling-plug adapted to be inserted by the operator in the front portion of the tubular plunger and having two insulated terminals, one of which preferably consists of a metallic socket j and the other of a pin or stem j', projecting beyond the front end of the plug, said socket and stem being parallel with each other and arranged lengthwise of the plug. This pin and socket are adapted to fit the corresponding parts of similar plugs forming the central-office terminals of other subscribers' lines.

j^2 j^3 represent conducting-wires forming part of the subscriber's talking-circuit, and connected, respectively, with the pin-and-socket terminals of the plug, as most clearly shown in Fig. 4. These wires are embedded in an insulating-cord which passes rearwardly through the plunger and the supporting-tube B, and one of the wires, j^2, is connected with the wire i, leading to the subscriber's telephone, while the other, j^3, is connected with the contact-spring h^4.

The coupling-plug is provided with a shoulder or flange j^4, which limits the movement of the plug into the plunger, but which is sufficiently small to enter the supporting-tube B.

K represents the operator's listening-telephone, connected by wires k with a pair of stationary contact-springs l l', secured side by side to a suitable supporting-frame L.

M is a battery or generator having its poles connected with a pair of contact-springs m m', also secured to the frame L and arranged directly opposite the contact-springs l l', which form the terminals of the operator's listening-telephone.

N is a coupler whereby the operator may connect the terminals of a subscriber's plug either with the operator's listening-telephone or with the generator. This coupler consists of a handle provided with a pair of contacts or terminals, one consisting, preferably, of a pair of spring-jaws n, adapted to embrace the pin of the plug, and the other consisting of an angular or L-shaped stem n', adapted to fit with its outer or laterally-extending portion into the socket of the plug, as shown in Fig. 4. The terminals of the coupler are connected by wires o o' with the insulated contacts p p' of a pedal-switch P, which is arranged to slide vertically on the frame L, so that when the same is raised, as shown in Fig. 4, its contacts connect with the terminal springs l l' of the operator's listening-telephone, while when it is lowered its contacts connect with the terminal springs m m' of the generator. The switch is provided with an upwardly-extending actuating-rod p^2, terminating in a knob or button upon which the operator presses his foot. The switch is normally held in its raised position by springs p^3, which automatically return the switch to that position when the same is lowered and released.

The operation of my improved telephone system is as follows: When a subscriber calls the central office, the switch-plunger is released, as hereinbefore described, allowing the spring to move it to its outward position and projecting the subscriber's plug to its abnormal position, as shown in Fig. 2. This outward movement of the plug affords a visual signal, whereby the subscriber's call is made known to the operator. By this movement of the plunger the calling or ringing circuit is broken between the contact-springs h^3 and h^4. The operator now loops his listening-

telephone into the main line by attaching the coupler N to the calling-subscriber's plug, whereupon a talking-circuit is established between the subscriber and the operator through the operator's telephone, pedal-switch P, coupler N, stem-terminal j' of the subscriber's plug, wires j^2 i, subscriber's telephone I, wire i', magnet-coils C, wire i^2, contact-spring h^4, wire j^3, and the socket-terminal j of the subscriber's plug. Having ascertained with which subscriber the calling subscriber wishes to communicate, the operator detaches the coupler from the calling-subscriber's plug, connects it with the called-subscriber's plug, and then pushes in the latter sufficiently to break the circuit through the called-subscriber's drop, at the same time depressing the pedal-switch, so as to loop in the generator and ring up the called subscriber. This ringing-circuit is established between the generator and the called-subscriber's line in the same manner as the listening-circuit between the operator and the calling subscriber, above described. In thus signaling the called subscriber the armature of the latter's annunciator is attracted and caused to release the corresponding plunger, causing the latter to assume the outer position. (Shown in Fig. 9.) The desired subscriber being now called up, the operator detaches the coupler from the called-subscriber's plug, connects the calling-subscriber's plug with the called-subscriber's plug, and pushes the two connected plugs into the plunger of the calling-subscriber's line until the shoulder j^4 of the outer plug interlocks with the depending catch or pawl F, as shown in Fig. 3. The two subscribers are now connected, as clearly shown in Figs. 9 and 10, the former figure representing the position of the parts of the called-subscriber's annunciator mechanism and the latter figure the position of the parts of the calling-subscriber's annunciator mechanism. After the calling subscriber has rung up the central office and the called subscriber has been rung up by the operator, the sockets and stems of the subscribers' plugs are the terminals of the respective lines, and upon coupling the plugs the talking-circuit is established between the subscribers.

In pushing the connected plugs into the supporting-tube of the calling-subscriber's line the rear end d^2 of the plunger-slot strikes the pawl F and swings the same backward, which causes its pin to come in contact with the abrupt rear edge g^6 of the notch in the locking-slide, thereby shifting the latter backward to its normal position and locking the pawl. The shoulder of the outer plug, which has passed inward beyond the pawl, is forced against the abrupt side of the pawl by the plunger-spring, as shown in Fig. 3, thereby retaining the plugs within the tube.

As both plugs are locked within the tube the operator cannot gain access thereto for looping in his listening-telephone, and as the unlocking of the pawl can be effected only by the movement of the armature and slides the release of the plugs is in the exclusive control of the subscribers, the pawl not being unlocked and the plugs not being released and allowed to project within reach of the operator until one or the other subscriber rings off. It is therefore impossible for the operator to listen to the conversation of the subscribers after having once connected them.

When the subscribers ring off, the pawl which interlocks with the connected plugs is unlocked and both plugs are released and allowed to project outside of the supporting-tube, the inner plug and the plunger of the calling subscriber projecting to the position shown in Fig. 2, which position is already occupied by the called-subscriber's plunger. The operator now disconnects the calling-subscriber's plug from the called-subscriber's plug, again inserts the called-subscriber's plug into its socket or plunger, and then pushes the two plungers, by means of the projecting plugs, to the normal position, (shown in Figs. 1 and 8,) when the ringing-circuits are again established and the lines are ready for another call. In restoring the plungers to this position the front edges of the plunger-slots d strike the rear side of the pawls F and swing them backward, causing their pins to shift the locking-slides to their normal position, as hereinbefore described, and locking the pawls in place.

It will be observed that the subscribers' plugs act not only as couplings, but serve also as visual signals to the operator and as push-buttons for restoring the plungers to their normal position. This sliding signal plug or button is much more compact than the usual drop, and a greater number of the same can therefore be placed in a given area.

To enable the operator to distinguish the plugs they are numbered or otherwise marked.

The cord containing the conducting-wires of each plug passes over a guide-roller q, journaled at the open rear end of the supporting-tube and is provided outside of the tube with a weight q' for partly taking up the slack of the cord. In the normal position of the plug the weight rests upon or against a stop, consisting, preferably, of a horizontal bar or shelf r, located below the tube, and sufficient slack is left between the weight and the plug to permit the latter to move outward with the plunger without affecting the weight, thus preventing the weight from counteracting the force of the plunger-spring. When the plug is removed from the plunger for connecting it with another plug, the slack of the cord is taken up and the weight is raised from the stop or shelf, and upon returning the plug to its socket in the plunger the weight takes up the principal portion of the slack and descends upon the shelf.

I claim as my invention—

1. In a telephone system, the combination with a talking-circuit and a ringing or signaling circuit, of an electromagnet arranged in

the ringing or signaling circuit and having an armature, a follower or plunger sliding on a supporting-frame, and adapted to carry a push-button or plug forming a visual signal, contacts arranged on said plunger, a contact included in the ringing-circuit, a contact included both in the talking and ringing circuits, both of said circuit-contacts being arranged in the path of the plunger-contacts, a catch controlled by the armature of the electromagnet, whereby the plunger is held in its normal position, and a spring whereby the plunger is forced outward when released, substantially as set forth.

2. The combination with a supporting-frame, and a switch plunger or follower guided thereon, of an electromagnet having an armature, a catch or pawl engaging with said plunger, and a locking-slide operated by the armature of the electromagnet and interlocking directly with the catch or pawl, substantially as set forth.

3. The combination with a supporting-frame and a switch plunger or follower guided thereon, of an electromagnet having an armature, a swinging pawl or catch engaging with said plunger and having a pin or projection and a locking-slide operated by the armature of the magnet and having a locking-shoulder against which the pin or projection of the pawl engages substantially as set forth.

4. The combination with a supporting-frame and a switch plunger or follower guided thereon, of an electromagnet having an armature, a swinging pawl or catch engaging with said plunger and having a pin or projection and a locking-slide operated by the armature of the magnet and having a locking-shoulder against which the pin or projection of the pawl engages in the normal position of the slide and a shifting shoulder against which said pin engages for returning the slide to its normal position, substantially as set forth.

5. The combination with a supporting-frame and a switch-plunger guided thereon and having a longitudinal slot forming front and rear shoulders, of an electromagnet having an armature, a swinging pawl or catch adapted to engage against the rear shoulder of the plunger, and having a pin or projection and a locking-slide operated by the armature of the magnet and provided with a notch or recess having an abrupt rear wall and provided in its front wall with a horizontal locking-shoulder against which the pin of the pawl engages, substantially as set forth.

6. In a telephone system, the combination with a ringing-circuit and a talking-circuit, of an electromagnet arranged in the ringing-circuit and having an armature, a switch plunger or follower sliding on a supporting-frame and having a socket, a catch engaging with the plunger and controlled by the armature of the magnet, and a coupling-plug included in the talking-circuit and adapted to be inserted in the socket of the plunger, substantially as set forth.

7. In a telephone system the combination with a ringing-circuit and a talking-circuit, of an electromagnet arranged in the ringing-circuit and having an armature, a plunger or follower sliding on a supporting-frame and having contacts arranged in the ringing and talking circuits and located in the path of the plunger-contacts, and a coupling-plug having a pair of conducting-wires connected respectively with the main line and the contact of the talking-circuit, substantially as set forth.

8. The combination with a supporting-frame and a switch plunger or follower guided thereon, of an electromagnet having an armature, a swinging pawl or catch engaging with said plunger and having a pin or projection and a locking-slide operated by the armature of the magnet and having a locking-shoulder, and a coupling-plug adapted to be inserted in the plunger and having a shoulder or flange adapted to engage against said pawl for shifting the slide to its normal position, substantially as set forth.

9. In a telephone system, the combination with a ringing-circuit and the talking-circuits of two subscribers, of coupling-plugs connected with said talking-circuits respectively, and adapted to be coupled together, and a lock or catch which is controlled by the ringing-circuit and whereby the plugs are retained in their coupled position, substantially as set forth.

10. In a telephone system, the combination with a ringing-circuit and the talking-circuits of two subscribers, of coupling-plugs connected with said talking-circuits respectively, and adapted to be coupled together, a tube or inclosure adapted to receive said plugs, an electromagnet included in the ringing-circuit and having an armature and a catch adapted to retain the plugs in said tube or inclosure and controlled by the armature of said electromagnet, substantially as set forth.

11. In a telephone system, the combination with a ringing-circuit and the talking-circuits of two subscribers, of coupling-plugs connected with said talking-circuits respectively, and each having a flange or shoulder, a tube or socket adapted to receive said plugs, an electromagnet included in the ringing-circuit and having an armature and a catch adapted to interlock with the shoulder of the outer plug and controlled by the armature of the electromagnet, substantially as set forth.

12. In a telephone system, the combination with a coupling-plug having a socket and a projecting stem, of a coupler consisting of a handle provided with a contact projecting forwardly from its front end and adapted to engage with the stem of the coupling-plug, and with a laterally-extending terminal wire or stem adapted to fit into the socket of the plug, substantially as set forth.

13. In a telephone switch system, the com-

bination with a talking-circuit and a ringing-circuit, of an electromagnet arranged in the ringing-circuit and having an armature, a hollow switch plunger or follower sliding on a support and arranged to establish the ringing-circuit when in its normal position, and a terminal plug adapted to engage with said plunger and having a conducting wire or wires extending rearwardly through the plunger, substantially as set forth.

14. In a telephone system, the combination with a talking-circuit and a ringing-circuit, of a switch plunger or follower controlling said circuits, a spring operating against the plunger and tending to move the same outward in its support, a terminal plug adapted to be inserted in the plunger and having a conducting wire or wires extending rearwardly from the plug, a take-up weight connected with said wire or wires, and a shelf or support arranged to intercept said weight before the same takes up the entire slack of said wire or wires, substantially as set forth.

15. In a telephone system, the combination with a talking-circuit and a ringing-circuit, of a hollow switch plunger or follower controlling said circuits, a spring operating against the plunger, a plug adapted to be inserted in the plunger and having a conducting wire or wires extending through the plunger, a take-up weight connected with said wire or wires, and a shelf or support arranged to intercept said weight before the same takes up the entire slack of said wire or wires, substantially as set forth.

Witness my hand this 25th day of June, 1895.

CLAUDE C. GOULD.

Witnesses:
HENRY W. MARSTON,
WALTER H. FARRER.