

No. 672,122.

Patented Apr. 16, 1901.

W. W. DEAN.

APPLIANCE FOR TELEPHONE SWITCHBOARDS.

(Application filed Dec. 8, 1899.)

(No Model.)

2 Sheets—Sheet 1.

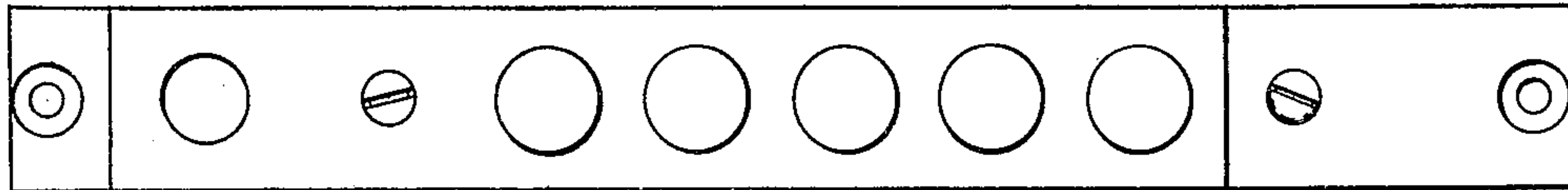


Fig. 1.

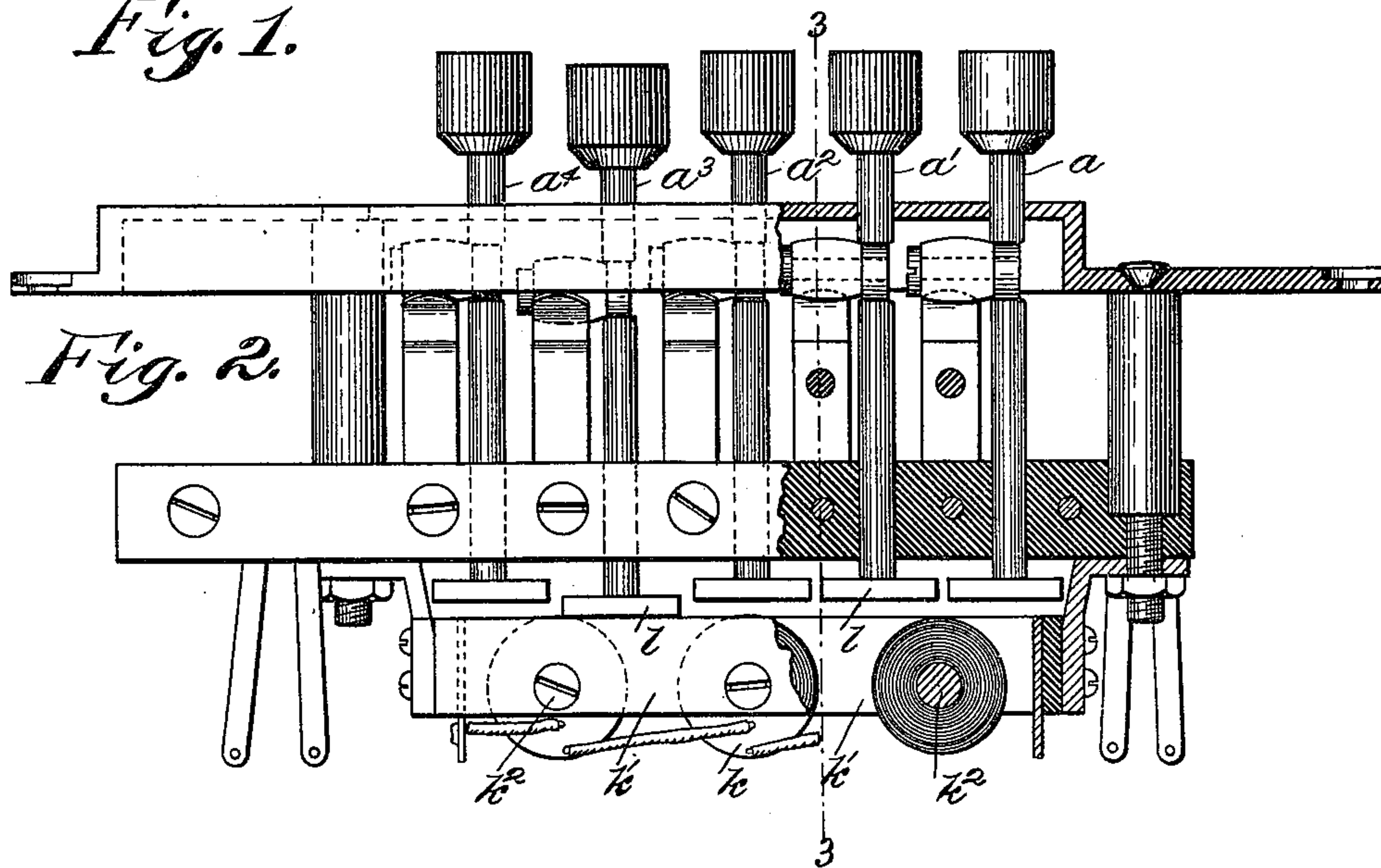


Fig. 2.

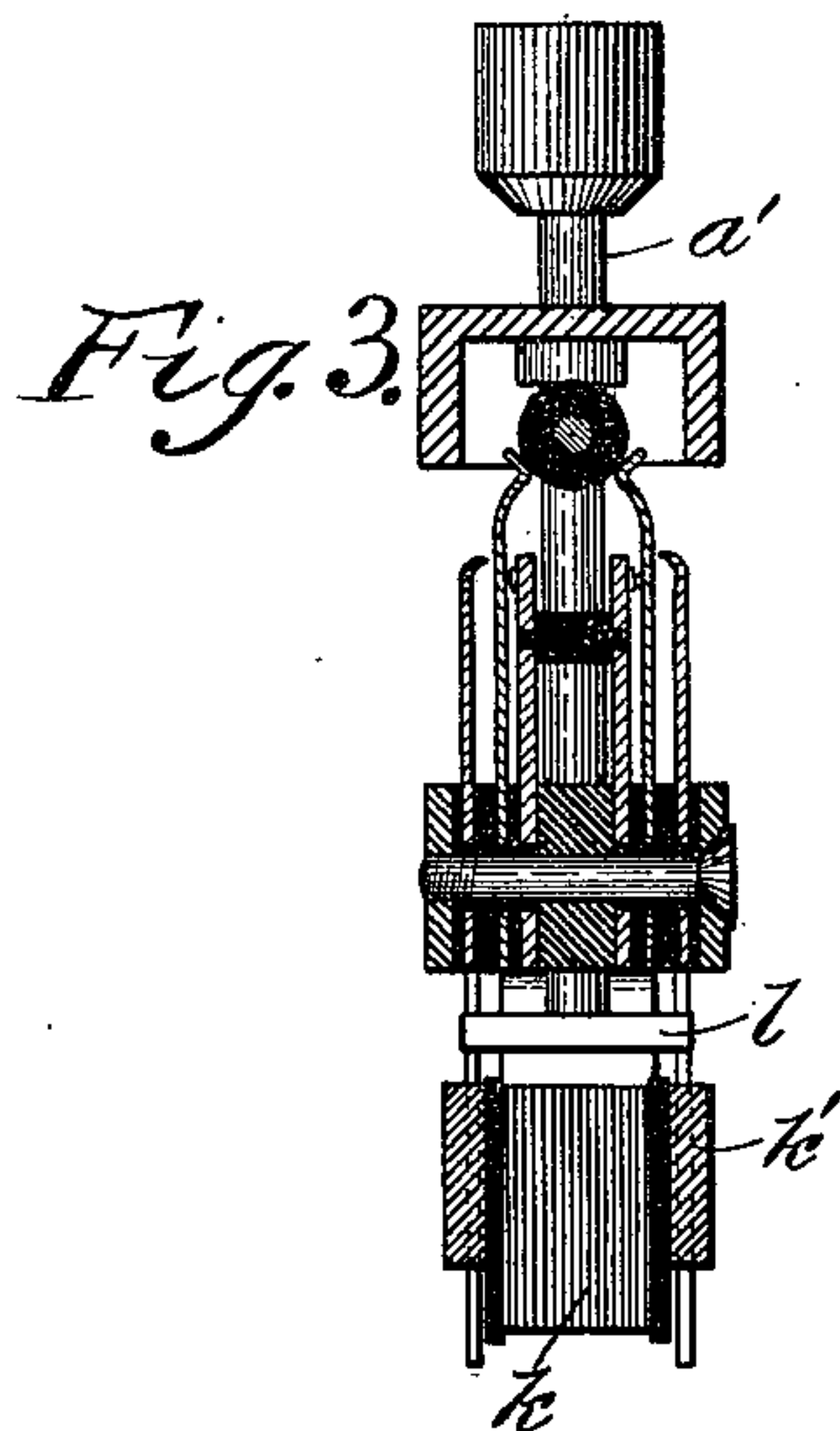


Fig. 3.

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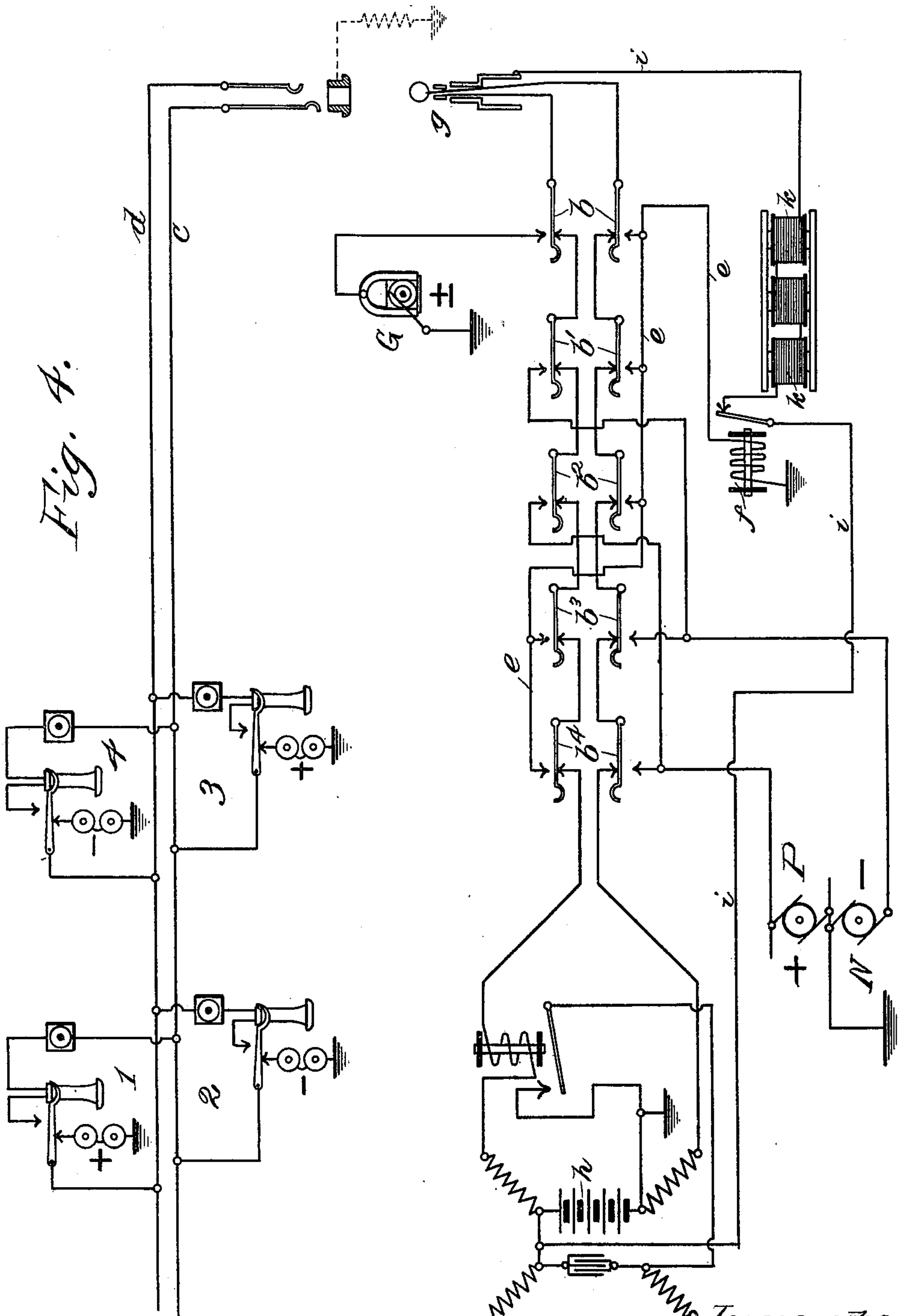
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2 Sheets—Sheet 2.



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UNITED STATES PATENT OFFICE.

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APPLIANCE FOR TELEPHONE-SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 672,122, dated April 16, 1901.

Application filed December 8, 1899. Serial No. 739,610. (No model.)

To all whom it may concern.

Be it known that I, WILLIAM W. DEAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Call-Signal Appliances for Telephone-Switchboards, (Case No. 31,) of which the following is a full, clear, concise, and exact description.

10 My invention relates to a calling appliance or ringing-key for telephone-switchboards; and its object is to provide improved means whereby calling or ringing current once applied to a subscriber's line to operate the call-bell at the substation thereof will be maintained in the circuit until the called subscriber takes his telephone or otherwise answers the signal.

15 My invention relates particularly to a ringing or calling key which when once depressed is held down by a retaining or sticking magnet until the called party answers by removing his telephone from its switch-hook. Preferably the sticking-magnet has pole-pieces which are adapted to engage directly with an iron armature carried by the plunger or other moving part of the calling-key. The energizing-circuit of the magnet is controlled through the agency of the switch at the substation. When the key is depressed to apply a source of ringing-current to the called line, the armature carried by the key sticks to the pole-piece of the magnet, so that the key is held down and maintains the ringing-current on the line independent of any manual assistance. When the called subscriber answers, the current through the magnet is broken, and it becomes deenergized. The plunger is thus released and, impelled by a spring, returns to its normal position, removing the ringing-current from the line.

20 One feature of my invention consists in effecting the release of the ringing-key through the agency of the ringing-current itself, flowing in a return-path back to the central office when the called subscriber has operated his switch-hook to close a bridge of the line through his telephone apparatus.

25 My invention is particularly applicable to party-line ringing-keys for selectively signaling any one of a number of subscribers whose

instruments are connected to the same line. In such case the several plungers of the ringing-key may be mounted one behind another in a line and carry soft-iron armatures upon their lower ends. The retaining or sticking magnet is preferably made of two long bars of iron extending parallel to one another underneath the row of plungers, said bars forming the pole-pieces of the magnet and being joined by a number of core-pieces, each of which is surrounded by a magnetizing-helix. The armatures carried by the plungers are adapted to lie across the tops of the two bars which form the pole-pieces, and the several helices are preferably connected in series.

I will describe my invention more particularly by reference to the accompanying drawings, wherein—

Figure 1 is a plan view of a party-line ringing-key constructed in accordance with my invention. Fig. 2 is a vertical sectional view thereof, one of the plungers being depressed. Fig. 3 is a vertical cross-section on line 3 3 of Fig. 2, and Fig. 4 is a diagram illustrating with the aid of conventional symbols a four-party telephone-line and the selective calling appliance and circuits of my invention at the central office.

The same parts are designated by the same reference characters throughout the several figures.

Referring first to Fig. 4, an ordinary four-party telephone-line is illustrated in which the bells at the substations are polarized to respond only to pulsating current of a given sign and are connected in grounded branches from the limbs of the line—that is to say, a positive and a negative bell are connected in grounded branches from one limb of the line and a positive and a negative bell are connected in grounded branches from the other—so that it is evident that any one of the four stations can selectively be signaled from the central office by impressing upon one side or the other of the line pulsating current of proper direction.

At the central office is illustrated a ringing-key for connecting with the line-current of suitable character to selectively operate the call-bell at any station on the line. The

ringing-key is also equipped with means for connecting an ordinary source of alternating ringing-current with the conductors of the calling-plug for use in signaling on individual
 5 lines with ordinary call-bells. The ringing-key is thus provided with five plungers a a' a^2 a^3 a^4 , any one of which may be depressed at will to make suitable circuit changes to signal any station on a four-party line or the
 10 station of an individual line. Thus the plunger a is adapted when depressed to actuate switch-contacts b , which are connected with the source of alternating current G , and the plungers a' a^2 a^3 a^4 are adapted when de-
 15 pressed to actuate switch-contacts b' b^2 b^3 b^4 , respectively. The switch-contacts b' and b^3 when actuated are adapted to connect the grounded source of negative pulsating current N with the limbs c d , respectively, of
 20 the telephone-line to signal-stations 2 and 4, respectively. Likewise the switch-contacts b^2 b^4 when actuated are adapted to connect the grounded source of positive pulsating current P with the limbs d and c , respectively,
 25 of the telephone-line to signal-stations 1 and 3, respectively.

In each pair of contact-springs one spring serves to connect one limb of the telephone-line—that is to say, one strand of the cord-
 30 circuit—with a grounded source of current, while the other spring, its mate, is adapted to connect the other limb of the line by way of the other strand of the cord-circuit to a conductor e , which leads to ground through
 35 the helix of a relay-magnet f . The two strands of the cord-circuit which extend from the tip and ring of the calling-plug g are connected through the normally-resting contacts of the series of ringing-switches with one side
 40 of a repeating-coil, between the two halves of which a centralized battery h is bridged in the usual manner. One side of this battery, the side which is connected with the tip of the plug, is grounded, and the other side of
 45 the battery is connected with a conductor i , which extends to the third contact or sleeve of the plug and is controlled by the relay f , the continuity of said conductor i being broken when said relay is energized. That
 50 portion of the conductor i between the plug and the switch-contacts of the relay f includes the windings of the retaining-magnet k , which will presently be described.

Turning now to the mechanical construction of the switch-key as shown in Figs. 1, 2,
 55 and 3, the plungers are mounted one behind another in a line, and each carries at its lower end a little bar l , of soft iron. Immediately under the row of plungers is mounted the retaining-magnet k , which consists of two long iron
 60 bars k' k'' , disposed parallel to one another and joined by three core-pieces k^2 . A magnetizing-helix surrounds each core-piece, and the three helices are connected together in series
 65 and are included, as has before been stated, in the circuit of the conductor i . When the magnet is energized by the current from bat-

tery h flowing through the helices thereof, it is not strong enough to draw down to it from
 their normal positions the armatures l ; but 70 if while the magnet k is energized one of the plungers be depressed the magnetic flux between the poles of said magnet, which has before been widely dispersed, will be localized
 75 through the armature l of the depressed plunger. Since approximately all the magnetic lines of force now pass through the armature of the plunger which has been depressed, said armature will stick to the pole-pieces of the
 80 magnet, and the plunger will thus be held down. When the current through the magnet ceases, the armature will be released, and the plunger, impelled by the elasticity of the contact-springs which it operates, will be
 85 moved up again to its normal position.

The operation of the ringing appliance may briefly be described as follows: When one of the plungers of the ringing-key is depressed to connect a given grounded source of current with one strand of the cord-circuit of
 90 the calling-plug, and so with one limb of a telephone-line, into whose spring-jack said plug has been inserted, the other limb of the line is connected by way of the other strand of the cord-circuit through the helix of mag-
 95 net f to ground. Current will thus flow from the grounded source at the central office to earth through the signal-bell at the called station. Since no current yet flows through the magnet f , its armature will remain in its nor-
 100 mal unattracted position. The circuit of conductor i will therefore remain closed at the relay f and current will flow from the battery h through the conductor i and the windings of magnet k to the third contact or sleeve of
 105 the calling-plug and thence to ground in the usual manner by way of the test-ring of the jack which has been plugged into. This circuit to ground from the test-ring of the jack is well known in the art and need not be de-
 110 scribed. The ringing-current will therefore remain connected with the line, and the subscriber's signal-bell will be operated until he takes his telephone from its hook to answer
 115 the call. The removal of the telephone from its hook causes the bridge-circuit through the telephone apparatus to be closed between the two limbs c d of the line. Current now flows
 120 out over one limb of the telephone-line through the telephone apparatus at the subscriber's station and back over the other limb of the line through the conductor e and the helix of relay-magnet f to ground. The mag-
 125 net f is thus energized and attracts its armature, breaking the circuit of conductor i . This deprives magnet k of current, so that it is deenergized and the depressed plunger is released, automatically cutting off the ringing-current from the line.

Having now described my invention, I
 130 claim as new, and desire to secure by Letters Patent, the following:

1. The combination with a metallic-circuit telephone-line extending from a substation to

a central office, of a call-bell included in a grounded branch from one limb of the line at the substation, telephone apparatus included in a bridge of the line and a switch actuated in the use of the telephone, for closing the circuit of said bridge through the telephone apparatus, an operator's ringing or calling appliance at the central office comprising a manually-operated plunger or actuating part with a circuit - changer operated thereby and a grounded source of ringing-current, whereby the ringing-current may be applied to the limb of the telephone-line wherewith the signal-bell at the substation is connected, the other limb of the line being grounded at the central office, whereby the ringing-current may return to ground at the central office when the subscriber operates his switch to close the bridge of the line through his telephone apparatus, an armature carried by the plunger of the calling appliance, an electromagnet adapted to engage said armature to hold the plunger down, and a circuit for energizing said electromagnet including a source of current, and controlled by the flow of ringing-current in the return-path to ground at the central office, whereby the subscriber's call-bell is operated until he responds to the call, as set forth.

2. The combination with a metallic-circuit telephone-line extending from a substation to a central office, of a call-bell included in a grounded branch from a limb of the line at the substation, telephone apparatus at the substation and a switch adapted to connect the same in a bridge of the line, a grounded source of ringing-current and a key at the central office for connecting the same with the limb of the telephone-line wherewith the signal-bell at the substation is connected, the

other limb of the line being grounded at the central office, whereby ringing-current may return to ground at the central office when the subscriber operates his switch to close the bridge of the line through his telephone apparatus, means for locking the key to maintain the ringing-current on the line, and means, controlled by the flow of current in the return-path to ground at the central office, for releasing the key, substantially as set forth.

3. The combination with a metallic-circuit telephone-line extending from a substation to a central office, a signal-bell at the substation in a grounded branch from the line, a spring-jack for the line at the central office and a plug and plug-circuit for making connection therewith, a grounded source of calling-current, a calling-key adapted to apply said source of calling-current to one side of the plug-circuit, a switch at the substation actuated in the use of the telephone, for bridging the line, a grounded branch from the other side of the plug-circuit, adapted to be connected therewith by said calling-key, a magnet *k* adapted to hold said calling-key in its depressed position, a local circuit including a source of current for exciting said magnet, said local circuit being established in connecting the plug-circuit with the line, and a relay included in the said grounded branch from the plug-circuit, for breaking the said local circuit, substantially as described.

In witness whereof I hereunto subscribe my name this 19th day of September, A. D. 1899.

WILLIAM W. DEAN.

Witnesses:

DE WITT C. TANNER,
JAY W. SKINKLE.