W. W. DEAN.

OPERATOR'S SELECTIVE RINGING KEY OR SWITCH.

APPLICATION FILED JUNE 15, 1903.

987,864. Patented Mar. 28, 1911.

2 SHEETS—SHEET 1.

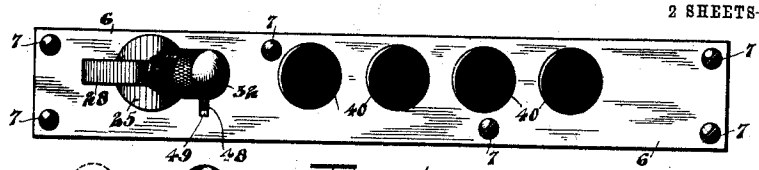

Fig. 1.

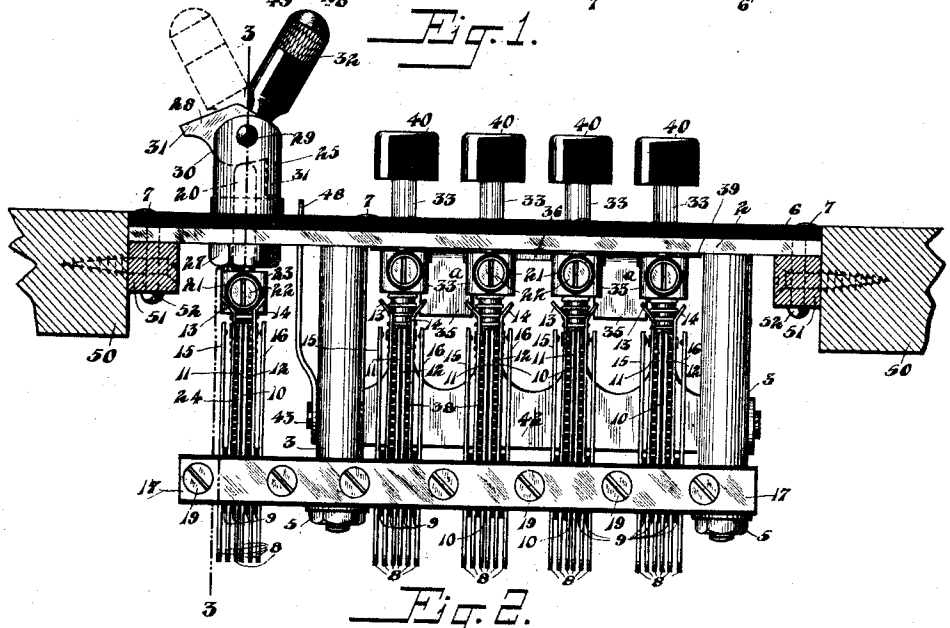

Fig. 2.

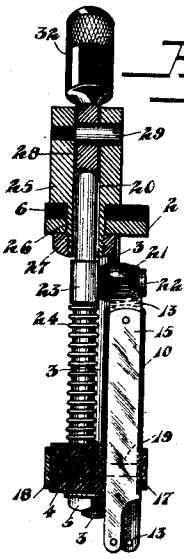

Fig. 3.

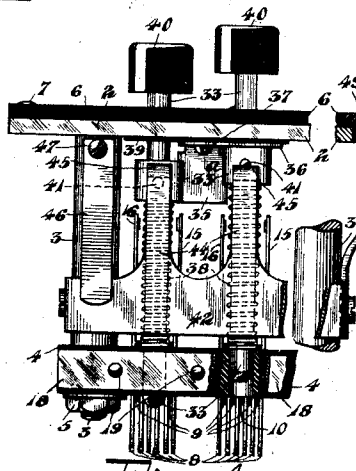

Fig. 4.

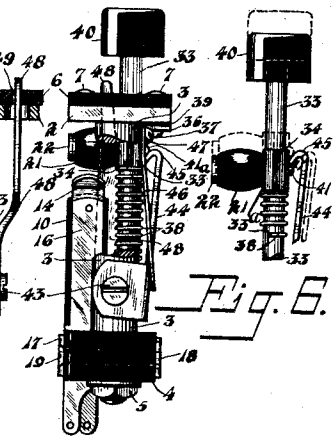

Fig. 5.

Fig. 6.

Witnesses.

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2 SHEETS—SHEET 2.

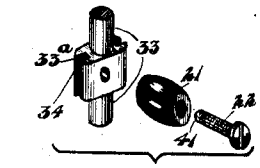

Fig. 8.

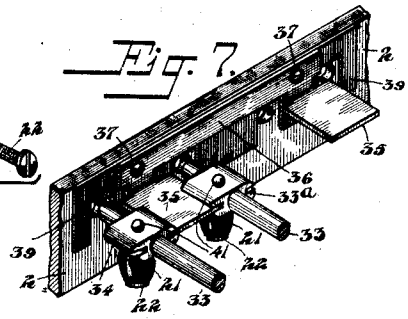

Fig. 7.

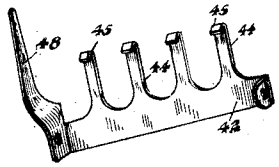

Fig. 9.

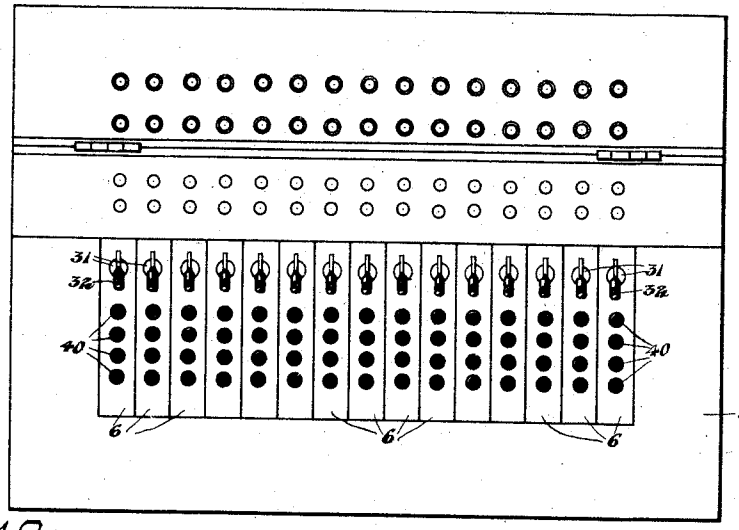

Fig. 10.

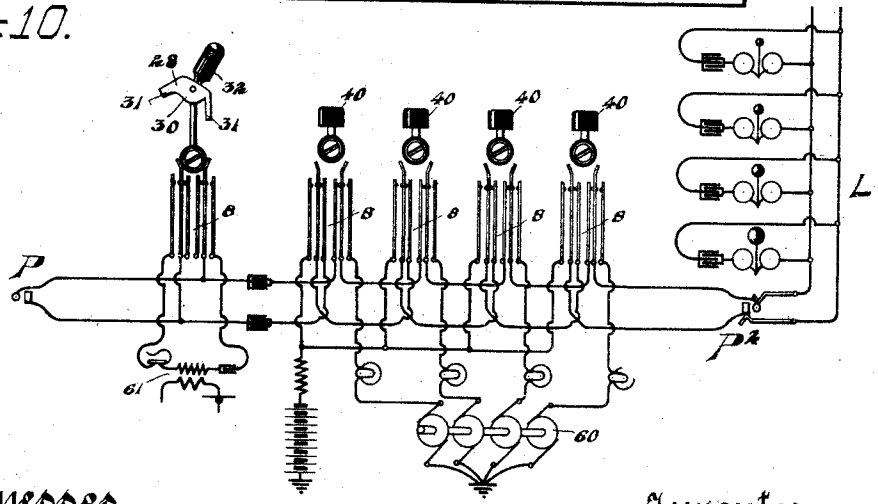

Fig. 11.

Witnesses.
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UNITED STATES PATENT OFFICE.

WILLIAM W. DEAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD & SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

OPERATOR'S SELECTIVE RINGING-KEY OR SWITCH.

987,864. Specification of Letters Patent. Patented Mar. 28, 1911.

Application filed June 15, 1903. Serial No. 161,530.

To all whom it may concern:

Be it known that I, WILLIAM W. DEAN, a citizen of the United States of America, and resident of Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Operators' Selective Ringing-Keys or Switches, of which the following is a specification.

My invention relates to operators' ringing and listening keys adapted for use in connection with telephone switchboards.

It has particularly for its object the provision of a key switch for use in connection with party telephone lines, and is provided with automatic means to indicate the party last called in the use of the switch. Such a device is of advantage in relieving the operators of all mental effort in remembering which party upon the line was last called. For example, when a subscriber upon a party line has been called and fails to respond, the operator, whose attention may have been otherwise engaged for the time being, does not, without some indicating means or unless she happens to remember, know which party has been called. It is thus necessary to connect her telephone with the cord circuit and inquire of the waiting subscriber who was wanted. With an indicating key, however, a glance at the same shows which party was last called and the operator is thereby enabled to again ring the wanted party's bell.

My invention contemplates a structure in which a plurality of key plungers are so mounted in combination with a pivoted catch plate that the depression of any plunger from its normal position will move the catch plate laterally away from all of the plungers so as to release any other plunger which was formerly retained and will then allow the catch plate to move toward the plungers to retain the plunger just depressed in a position below its normal position, whereby the operator can tell at a glance which was the last plunger depressed.

The invention further comprises the novel details of construction, parts and combinations of parts hereinafter described and particularly pointed out in the appended claims reference being had to the accompanying drawings forming a part thereof in which the same reference characters designate like parts throughout the several views and in which—

Figure 1 is a plan view of the key; Fig. 2 is a side elevation thereof; Fig. 3 is a transverse sectional elevation taken on the line 3, 3 of Fig. 2; Fig. 4 is a view of the opposite side of the key from that shown in Fig. 2; Fig. 5 is a view of the opposite end of the key from Fig. 3 and showing the end piece broken away to more clearly illustrate the parts beyond the same; Fig. 6 is a detailed view of one of the key plungers and its retaining catch; Fig. 7 is a view showing the guides for the key plungers; Fig. 8 is a detailed perspective view of the switch spring operating lug and its securing means; Fig. 9 is a perspective view of the retaining catches of the key plungers; Fig. 10 is a plan view showing how the keys are mounted upon the key shelf of a telephone switchboard, and Fig. 11 is a diagrammatic view showing a system in which the device may be conveniently employed.

The framework of the key comprises a top plate 2 from the underside of which depending posts 3 are provided at each end, said posts being secured to said plate in any desired manner as by suitable screws and carry at their lower ends an insulating bar 4 upon which the various switch springs are adapted to be mounted, nuts 5 upon the lower reduced ends of the said posts 3 serving to secure said bar 4 in position. A finishing plate 6, preferably of hard rubber is secured to the upper face of plate 2 by means of suitable screws 7.

Sets 8 of switch springs consisting of parallel upright strips of metal are secured in suitable notches in one edge of the bar 4, the springs of each set being insulated from each other by the insulating wedges 9 and the central wedge 10, which is extended above the bar 4 between the center springs 11 and 12 to form a support for the same. The springs 13 and 14 are flared outwardly at their upper ends and are adapted to be engaged by a suitable lug, projection or

roller carried by the adjacent key plunger to separate them from the inner springs 11 and 12 and to press them into engagement with the outer springs 15 and 16 of the set. These sets of springs are securely held in place by metallic strips 17 and 18 placed upon either edge of the bar 4 and the screws 19 which pass from the strip 17 through the bar 4 and thread into the strip 18.

The set 8 outside of the post 3 is used for listening purposes, while the other sets are used for selective ringing. In order to operate the outside set, a plunger 20 is arranged to slide in a suitable bearing in the top plate 2 and in a suitable aperture in the insulating bottom plate 4, and is provided with an insulating lug 21 secured thereto by a suitable screw 22 passing through the lug and into an enlarged portion 23 of the plunger 20. A coil spring 24 is placed upon the plunger 20 between the shoulder caused by the enlarged portion 23 and the bar 4, said spring serving to normally retain the plunger 20 in raised position at which time the central springs 13 and 14 of the listening set are engaged with the inner springs 11 and 12. A yoke 25 resting upon the plate 6 has a projection 26 passing through said plates 2 and 6 with a nut 27 threaded upon its lower end to secure the yoke in position. An aperture through this yoke provides a bearing for the upper end of the plunger 20. A cam 28 is pivoted upon a suitable screw pivot 29 in the arms of said yoke and serves when vibrated to depress the plunger by means of its cam surface 30 engaging the upper end of the plunger 20. Suitable stops 31, 31 are provided at each end of the cam surface 30 so as to limit the movement of the key handle 32 which is preferably of insulation and secured to the cam 28 in any desired manner. The cam surface 30 is preferably formed so that when the key is moved into the position indicated in dotted lines in Fig. 2, the plunger 20 is depressed and the said handle will remain in that position until manually released.

The other sets of springs are operated by plungers 33 passing near their upper ends through suitable apertures in the plates 2 and 6 and at their lower ends through corresponding apertures in the insulating bar 4. Each plunger is provided with an enlarged portion 33^a immediately beneath the top plate 2 having vertical grooves 34 formed in the adjacent edges thereof and adapted to engage the edges of the guiding plates 35, see Fig. 7, which are placed between the adjacent pairs of keys and are preferably bent up from the strip 36 secured to the bottom of the plate 2 by means of suitable screws 37. Coil springs 38 are placed upon the lower ends of the plungers between the enlarged portions 33^a and the bar 4. These coil springs tend to raise the plungers into their uppermost position and since the enlarged portions 33^a which form stops to limit the upward movement of the plungers would cause considerable noise by striking against the lower face of the top plate 2 when raised by the springs, a sound deadening plate 39 is placed upon the lower side of the top plate 2 and is secured into position by means of the guiding strip 36. This sound deadening plate or buffer may be formed of red fiber, felt, or other suitable material.

Each plunger, as in the case of the listening key plunger is provided with an insulating block 21 secured to the enlarged portion 33^a by means of the screw 22 passing therethrough and threading into the enlarged portion 33^a. When the plungers are depressed therefore the lugs 21 engage between the flaring ends 13 and 14 of the middle springs and spread them apart to free them from the inner springs 11 and 12 and to press them into engagement with the outer springs 15 and 16. When pressure is removed from the plungers the coil springs 38 cause them to raise to thus free the springs 13 and 14. The plungers are provided with insulating handles or push buttons 40 which may be of hard rubber and are preferably of different colors.

In order that the plungers may themselves indicate the last set of ringing switches operated I provide means for holding the push buttons out of their normal positions when once used until another one of the set of keys is depressed, when the one which was previously retained is returned to normal position and the second one operated is retained in its indicating position. This is accomplished by extending the ends 41 of the screws 22 beyond the face of the enlarged portion 33^a of the plunger. A plate 42 shown separately in Fig. 9, is pivoted by screws 43 to the outside of the posts 3, 3 of the frame. At points intermediate of its length the pawls 44 rise and are provided with inwardly turned catches 45 at their upper ends. These catches when the plungers are in normal position stand just beneath the ends 41 of the screws 22 but when the plungers have been depressed to operate the switches and the pressure is removed from the buttons 40, the ends 41 of the screws engage the catches 45 and the buttons are thereby held from being raised by the coil spring 38 to normal position. When any plunger is depressed, the end 41 of screw 22 thereof engages the upper sloping side of the corresponding catch 45 and moves it outwardly thereby tipping the plate 42 to free any other plunger that is being retained in depressed position. A suitable leaf spring 46 is secured at its upper end by a screw 47 to one side of the post 3 to cause the said catches 45 to be yieldingly pressed toward the plungers. In order that the plate

42 may be tipped without depressing any of the plungers it is provided with a preferably integral extension 48 at one end which projects up through an aperture 49 formed in the top plates 2 and 6. The end of this extension projects slightly above the top of the plate 6 as shown in Fig. 2 so that it may be readily engaged by the finger of the operator to free the catches from the plungers of the ringing keys. Owing to the long leverage of the catch arms 44 the additional pressure required to operate the plungers by reason of the said catches it not noticeable. The wear is reduced to a minimum by hardening the projecting ends 41 of the screws 22 and the catches 45. These keys are preferably arranged side by side in a row on the hinged key shelf 50 of the telephone switchboard as shown in Fig. 10, one being used for each cord circuit with which the operator is provided. These keys are let into the framework of the keyshelf as shown in Fig. 2, the ends of the top plates resting preferably upon a suitable bar 51 extending the full length of the opening in which the said keys are placed and secured thereto by suitable screws 52. These bars 51 are supported at their ends as well as by screws extending in the shelf 50.

Fig. 11 shows a diagram of a party telephone line L on which four subscribers' stations are placed, each being provided with a bell and condenser in a bridge of the line conductors. In the particular system of this party line, each subscriber is provided with a bell adapted to respond to alternating current of a particular frequency, the frequency differing for each station. At the central office, a generator 60 is provided with means for supplying current of the different frequencies required to operate the bells at the substations. P and P^2 indicate the answering and calling plugs of the operator's cord circuit which may be of any suitable type. The key 32 controls the connection of the operator's instrument 61 with the cord circuit, while the keys 40 control the connection of the generator 60 with the cord circuit in such manner that the desired party upon the telephone line may be selectively called. The strands of the calling end of the cord circuit are completed serially through the normal contacts of the said sets of springs but when the springs of the keys 40 are operated the normal connection of the cord circuit is broken and the generator 60 is suitably connected therewith to impress upon the telephone line L current of the proper frequency.

While I have described my invention with particular reference to the details of construction which have been worked out for commercial purposes, I do not desire to be limited in all respects to the specific construction so described for it is apparent that various changes and modifications may be made without departing from the scope or principle of the invention.

I claim:—

1. In an operator's key, the combination with a suitable framework having a top plate, of a plurality of plungers adapted to reciprocate through said top plate, each plunger having an enlargement beneath the top plate provided with suitable grooves, and a plate secured to the lower face of said top plate and having guiding portions bent at right angles thereto and passing between alternate pairs of plungers with their opposite edges engaging within the corresponding grooves in said enlargements, substantially as described.

2. In an operator's key, the combination with a suitable framework, of a plurality of plungers mounted to reciprocate therein, switch springs mounted at the side of the plungers, insulating projections carried by the plungers to operate said springs, said projections being secured to the plungers by means of suitable screws passing through the projections and the plungers, the ends of said screws extending beyond the opposite sides of the plungers, and catches arranged to engage said projecting ends of the screws to retain the plungers out of normal position when they have been operated and pressure is removed therefrom, substantially as described.

3. An operator's key comprising a comparatively long and narrow top plate, a post depending from said plate at each end, a bottom plate similar to and parallel with said top plate secured to the lower ends of said posts, a plurality of vertically reciprocating key plungers passing through apertures in said top and bottom plates and guided thereby, sets of switch springs carried by the said bottom plate and disposed adjacent the said plungers in position to be operated thereby when depressed, a pivoted catch plate extending along at the side of said plungers beneath the top plate and adapted to retain the plunger last operated beneath its normal position and to release any other plunger that was formerly retained thereby, substantially as described.

4. An operator's key comprising a comparatively long and narrow top plate, a post depending from said plate at each end, a bottom plate similar to and parallel with said top plate secured to the lower ends of said posts, a plurality of vertically reciprocating key plungers passing through apertures of said top and bottom plates and guided thereby, sets of switch springs carried by the said bottom plate and disposed adjacent the said plungers in position to be operated thereby when depressed, a catch plate extending along at the side of said plungers beneath the top plate and having

its ends bent at an angle and pivoted to said posts, said plate having portions adapted to engage and retain the plungers out of their normal position after they have been depressed, the arrangement being such that the depression of one plunger releases any retained plunger, substantially as described.

5. An operator's key comprising a comparatively long and narrow top plate, a post depending from said plate at each end, a bottom plate similar to and parallel with said top plate secured to the lower ends of said posts, a plurality of vertically reciprocating key plungers passing through apertures of said top and bottom plates and guided thereby, sets of switch springs carried by the said bottom plate and disposed adjacent the said plungers in position to be operated thereby when depressed, a catch plate extending along at the side of said plungers beneath the top plate having its ends bent at right angles and pivoted to said posts, said plate having an upwardly-extending projection at the side of each key plunger, said projection having its upper ends bent inwardly and downwardly to form a catch adapted to engage a corresponding projection or shoulder upon the key plunger, whereby whenever a plunger is depressed the catch plate is swung upon its pivots to free any other plunger and to retain the one depressed, substantially as described.

6. In an operator's ringing key, the combination with a suitable framework, of a plurality of key plungers mounted to reciprocate therein, a set of switch contacts actuated by each plunger, each of said plungers having a normal, an intermediate and an operative position and being adapted to impress ringing current on the line when in the last mentioned position, means to retain said plungers in said intermediate position after the corresponding switch contacts have been operated, and a finger piece projecting through the top plate of said framework adjacent the plungers and adapted to be manually operated to release said plungers, substantially as described.

7. In an operator's ringing key, the combination with a suitable framework, of a plurality of key plungers mounted to reciprocate therein, a set of switch contacts actuated by each plunger, each of said plungers having a normal, an intermediate and an operative position and being adapted to impress ringing current on the line when in the last mentioned position, a suitable catch serving to retain the last one of said plungers to be operated in its intermediate position after its switch contacts have been operated and the ringing current cut off, and to permit any other retained plunger to return to normal position, and guiding plates depending from the lower side of the top plate of the said framework and engaging projections upon the said plungers to prevent them from rotating in their reciprocation, substantially as described.

8. In an operator's ringing key, the combination with a suitable supporting frame, of a plurality of vertically reciprocating key plungers passing through apertures in said frame, sets of switch springs carried by the frame and disposed in positions to be operated by said plungers when depressed, a pivoted catch plate extending along at the side of said plungers, and adapted to retain the plunger last operated beneath its normal position, and to release any other plunger which was formerly retained, substantially as described.

9. In an operator's ringing key, the combination with a suitable supporting frame, of a plurality of reciprocating plungers supported by said frame, sets of switch springs carried by the frame and disposed in positions to be operated by said plungers when depressed, a catch plate extending along at the side of said plungers and adapted to be moved toward and away from the plungers to retain the plunger last operated beneath its normal position and to release any other plunger which was formerly retained, substantially as described.

10. In an operator's ringing key, the combination with top and bottom plates, of plungers extending through apertures in the top plate, sets of switch springs mounted in the bottom plate in position to be actuated by the depression of said plungers, a projection carried by each plunger below the top plate, a laterally movable catch plate extending along the side of said plungers and having portions adapted to engage said projections to hold the last depressed plunger in a position below its normal position, the movement of said plunger to said position being adapted to move the catch plate to release any other plunger formerly retained thereby, substantially as described.

11. In an operator's selective ringing key, the combination with a top plate, of a post depending therefrom near each end of the top plate, a bottom plate secured to the lower ends of said posts, reciprocating plungers extending through alined openings in the top and bottom plates, sets of switch springs supported by the bottom plate in positions to be actuated by the reciprocation of said plungers, a catch plate extending along the side of said plungers and pivoted to the lower portion of said posts, so that the upper portions of said plate may be moved about the pivots toward and away from said plungers, the upper portion of said plate being adapted to retain the last plunger operated beneath its normal position, and to release any other plunger that was formerly retained, substantially as described.

12. In an operator's ringing key, the combination with a suitable supporting frame, of a plurality of vertically reciprocating plungers, and a plurality of switch springs carried by said frame, each of said plungers having three distinct positions, a normal position, an intermediate position, and an operative position, said plungers being adapted to actuate said springs when in the last mentioned position to put ringing current upon the line, and a laterally movable catch plate extending along at the side of said plungers and adapted to release any of said plungers from the intermediate position when any other of said plungers is depressed to its operative position, substantially as described.

13. In an operator's ringing key, the combination with a suitable supporting frame, of a plurality of vertically reciprocating key plungers passing through apertures in said frame, a spring engaging member secured to each plunger, sets of switch springs carried by the frame and disposed in positions to be engaged and operated by said members when said plungers are depressed, catches disposed at the side of each of said plungers, said catches being rigidly secured together and being adapted to move laterally about a common center, said catches being adapted to retain the plunger last operated beneath its normal position and to release any other plunger which was formerly retained, substantially as described.

Signed by me at Chicago, county of Cook, State of Illinois, this 12th day of June 1903.

WILLIAM W. DEAN.

Witnesses:
EVA A. GARLOCK,
ROBERT LEWIS AMES.