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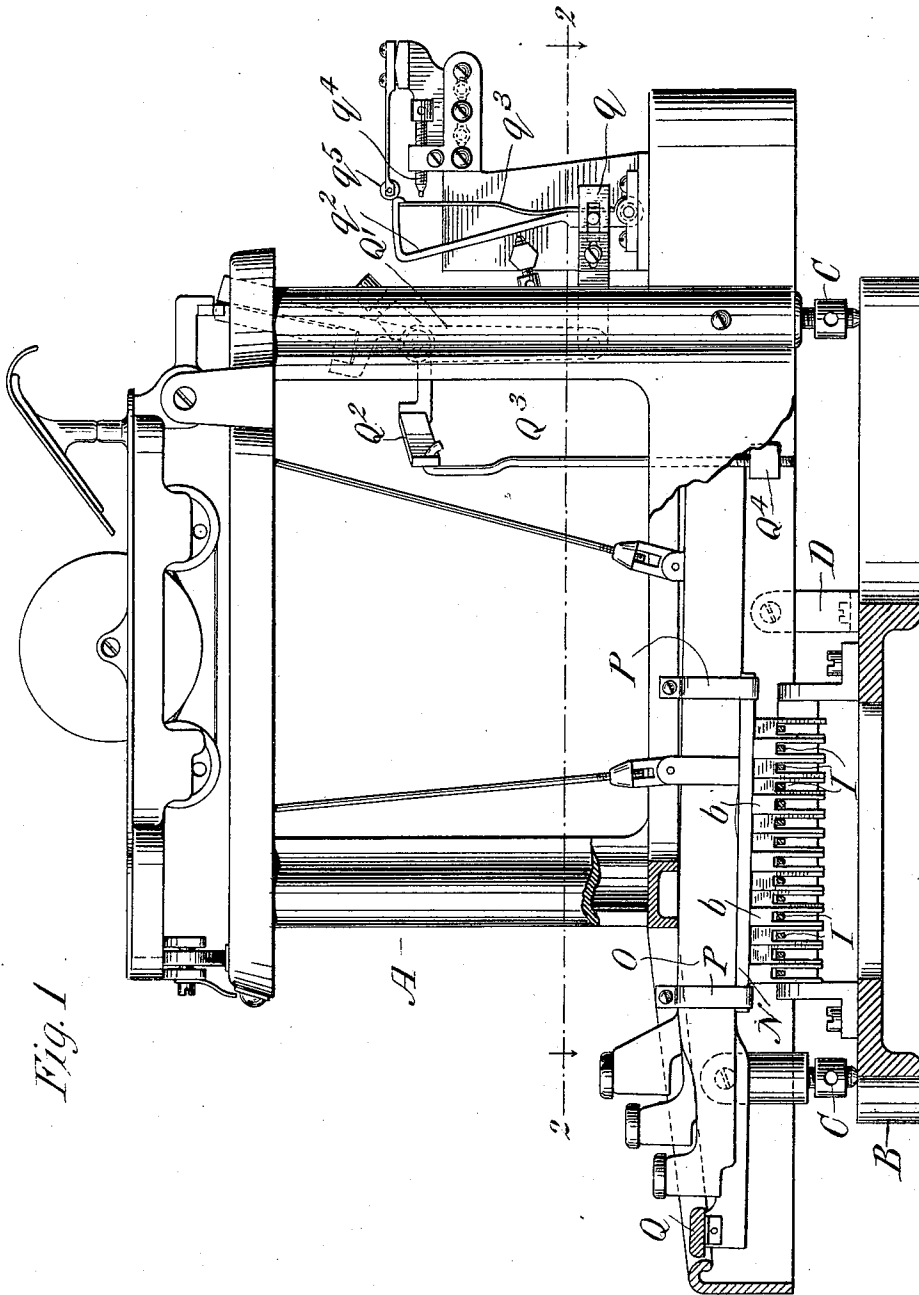
3 Sheets—Sheet 1.

C. L. BUCKINGHAM & E. GERMAN.

PERFORATOR AND CIRCUIT CONTROLLING APPARATUS THEREFOR.

No. 568,514.

Patented Sept. 29, 1896.



WITNESSES:

Henry T. Hirsch.
John C. Sanders.

INVENTORS:

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(No Model.)

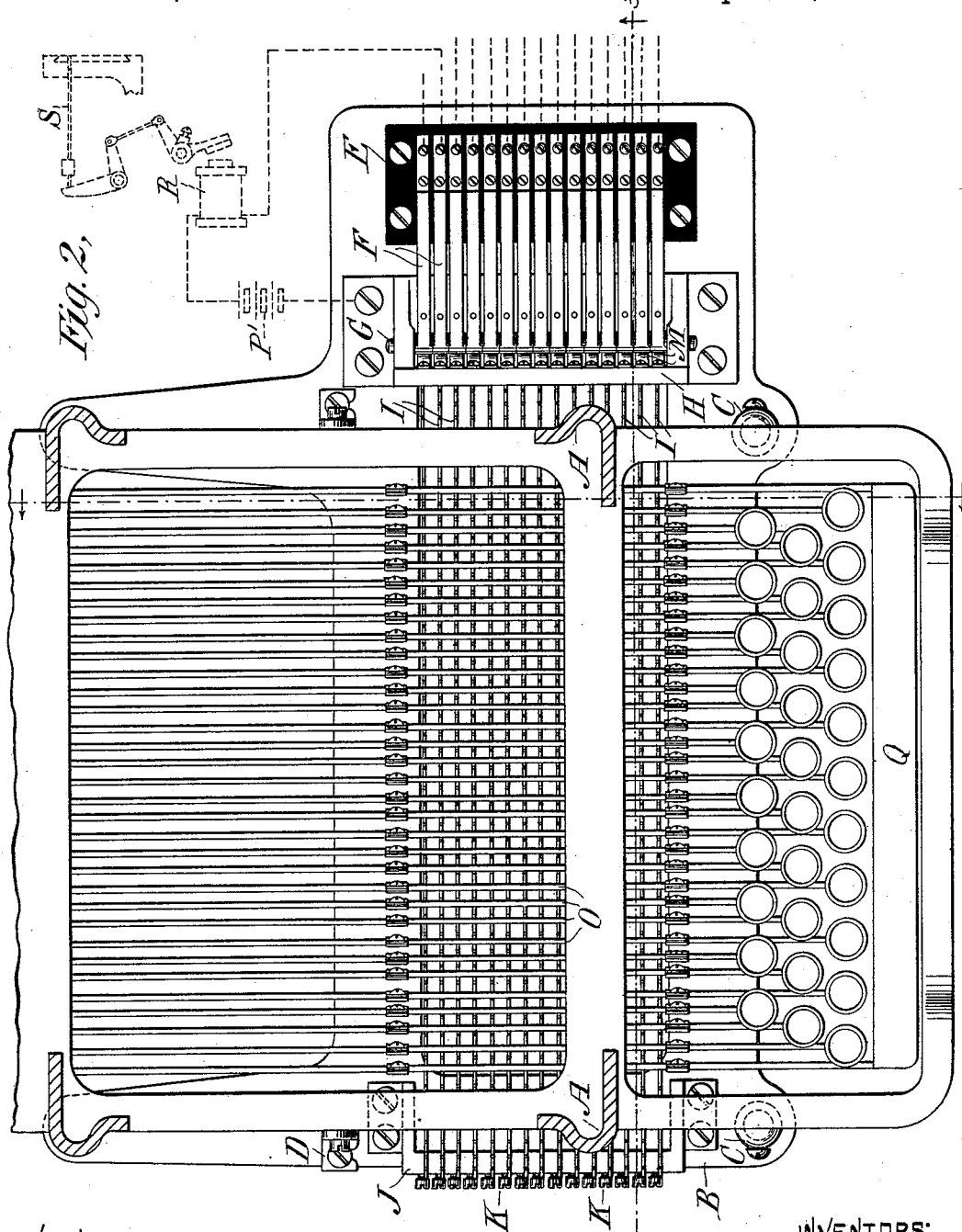
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C. L. BUCKINGHAM & E. GERMANN.

PERFORATOR AND CIRCUIT CONTROLLING APPARATUS THEREFOR.

No. 568,514.

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3-Sheets-Sheet 3.

C. L. BUCKINGHAM & E. GERMANN.

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Fig. 4.

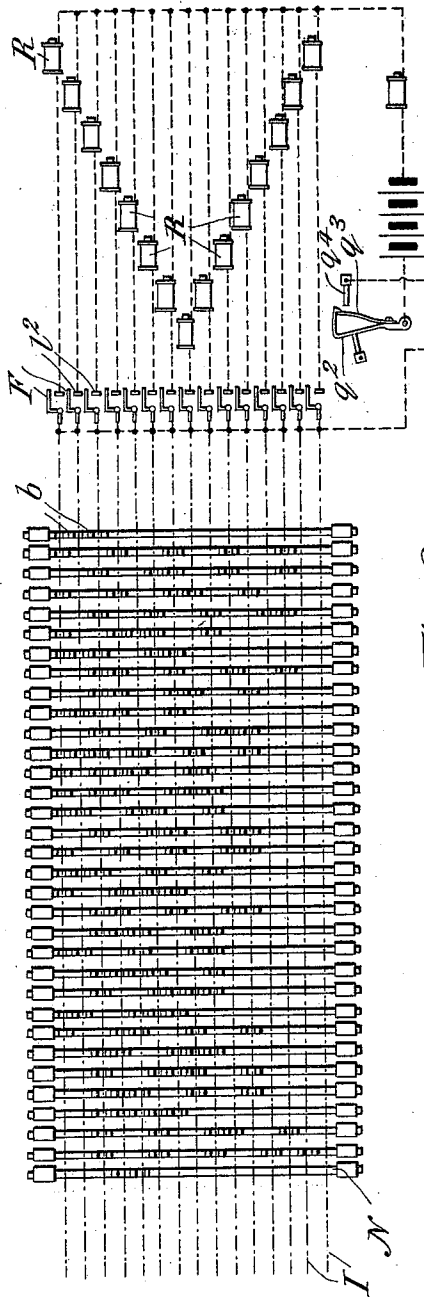
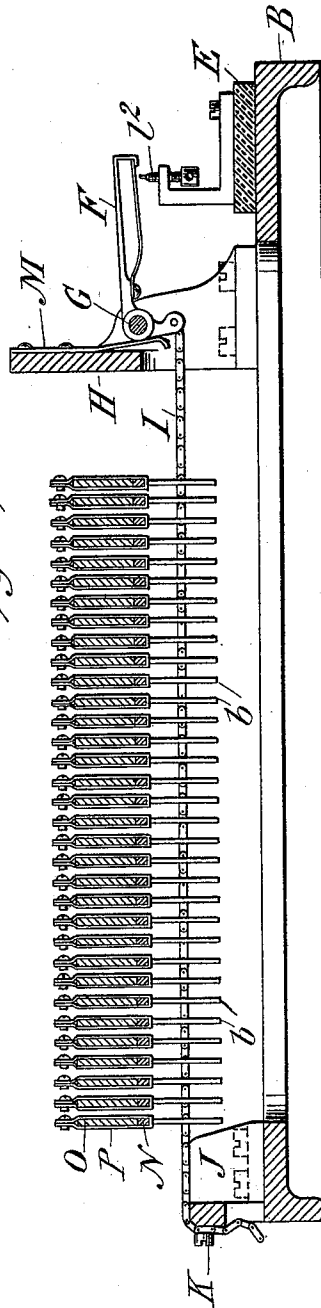


Fig. 3.



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UNITED STATES PATENT OFFICE.

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PERFORATOR AND CIRCUIT-CONTROLLING APPARATUS THEREFOR.

SPECIFICATION forming part of Letters Patent No. 568,514, dated September 29, 1896.

Application filed May 11, 1896. Serial No. 591,051. (No model.)

To all whom it may concern:

Be it known that we, CHARLES L. BUCKINGHAM, residing at New York, in the county of New York, and EMIL GERMANN, residing at Brooklyn, in the county of Kings, State of New York, citizens of the United States, have invented certain new and useful Improvements in Perforators and Circuit-Controlling Apparatus Therefor, of which the following is a specification.

This invention relates to apparatus designed, among other things, for use in controlling the operation of a series of punches of a perforating apparatus suitable for perforating a strip of paper or other material with groups of holes which are different in number or are differently disposed with relation to one another in the different groups. Primarily, the invention is designed for use in a perforating apparatus suitable for perforating a strip of paper adapted to be used in a Wheatstone or other telegraph-transmitter with groups of perforations, each group of which represents a letter of the alphabet or other character.

Prior to our present invention it has been proposed to use a gang or gangs of punches operated in different combinations or groups according to the order, relation, sequence, or number of perforations in the character to be perforated, the operation of said punches being controlled by a series of keys acting severally upon a series of punch-controlling devices in the desired order or sequence, such punch-controlling devices being electrical in their nature when the punches are actuated by magnetic power, and in other cases being in the nature of mechanical coupling appliances when the punches are actuated by a suitable mechanical power. In the former case the punch-controlling devices are circuit-closers, and in the latter they may be mere bars or dogs interposed at will between driving and driven members of the machine. The present invention will, however, be described as carried out in connection with punch-controlling devices consisting of circuit changers or controllers which may be used to control circuits of punch-operating magnets.

The invention consists, first, in the combi-

nation, with a series of controlling keys or levers, of a system or series of yielding cords or chains extending transversely across the levers, engaged by said levers in combinations or groupings different for the different levers, and suitable punch-controlling devices connected severally to the several chains or cords.

The invention consists also in a novel keyboard circuit changer or controller composed of a series of key-levers and series of yielding cords or chains extending beneath said levers and engaged thereby in different groupings or combinations to close the circuits in the desired combinations. The circuits may be closed by contact of the levers with the cords or chains, the parts being suitably insulated from one another, or by devices mechanically connected to and operated by said chains or cords when put under strain by the levers.

The invention consists, further, in the combination, with a series of circuit-controllers and actuating devices therefor, of a circuit maker and breaker operated or controlled by said actuating devices in common and placed in a common connection of the said circuit-controllers. This part of the invention is shown as applied to a keyboard circuit maker and breaker or controller, each key of which operates upon one or more of the circuit-controllers, as hereinafter described. By this device the make and break of circuit, or other action of each circuit-controller upon its circuit, may be readily timed and made uniform for all the actuating devices or circuit-controllers. In other words, any want of uniformity in the action of the circuit-controllers or of the keys in the operation of the apparatus for producing changes in the said circuits will be corrected by the single circuit maker and breaker, whose action is the same for all, while, moreover, an adjustment of its action will serve as an adjustment of the electric action of all the said circuit-controllers.

Another object of this part of the invention is to secure a snap action or quick make and break of all of the circuits of a circuit making and breaking apparatus operating upon a plurality of circuits without unduly complicating the apparatus and thereby per-

mitting the use of heavier currents. This is accomplished by the use of a snap-action circuit-breaker placed in the common connection of the individual circuit makers and breakers, said snap-action circuit-breaker being operated or controlled in common by the actuating devices which individually operate upon one or more of the individual circuit makers and breakers, said snap-action device being adjusted so as to break the common connection before the individual circuit-controllers break circuit. Preferably, also, the said snap-action circuit-breaker is adjusted to make circuit after the individual circuit-controllers or circuit makers and breakers. Thus all spark or burning is transferred to one point of the apparatus, where it may be readily taken care of by a condenser or other device, whereas without such common circuit-breaker a condenser or other device would be necessary for each circuit breaker and maker of the apparatus.

The invention consists, further, in the combinations of devices and details of construction hereinafter described, and then specified in the claims.

In carrying out our invention we propose to take an ordinary type-writing machine, preferably of the Remington type, and simply add to it such parts as may be necessary to actuate suitable circuit closers or controllers. This utilization of the type-writer is of advantage in several ways. Any person used to a type-writer can without further instruction operate the machine; also, by putting a sheet of paper in the type-writer a copy of the matter perforated can be made without extra effort. Each lever of the type-writer not only throws a certain type, but through certain appliances mounted thereon it operates to close a series of circuits corresponding to the character of said type.

In the accompanying drawings, which form a part of this specification, Figure 1 represents in side elevation an outline of a type-writer as utilized in carrying out the invention. Fig. 2 represents a horizontal section through the type-writer frame and a plan of perforator attachment. Fig. 3 represents a vertical section taken in the plane of line 3-3, Fig. 2. Fig. 4 represents an under side view of the selecting devices which are attached to the key-levers and also shows in diagram the circuits controlled thereby and controlling the punch-magnets.

We have illustrated our invention as associated with a form of type-writer known as the "Remington." Any other form of type-writer may be used which is capable of carrying the parts which are herein termed the "selecting devices."

A indicates the frame of the type-writer, of which only the main parts are shown. The greater part of these devices are mounted upon a frame or base plate B, upon which the type-writer is mounted, as by means of the leveling-screws C, and upon which its posi-

tion is maintained by means of the clips D. This base-plate may be of any form, but is shown as having a projection at one side, as indicated in Fig. 2, forming a support for circuit-changers, to be presently described.

O indicates key-levers, each constructed and mounted in any suitable way as usual in type-writers.

I indicates yielding cords, chains, or similar devices of any desired number extending across the machine, beneath the levers, transversely thereto and in position to be engaged by parts projecting from said levers when the same are depressed. These chains or cords are at one end suitably fastened to a bridge-piece J, and at the other are connected to devices which keep them under tension or serve to take up the slack when they are relieved from the pressure of the levers. These tension devices may be springs, as will be presently described, which serve also as springs which restore circuit changers or controllers or other punch or circuit controlling devices to their position of rest.

Attached to each lever O, so as to engage with the chains I when the lever is depressed, is a selecting device N, by the spacing of the projections of which the particular chains or cords to be engaged are selected or determined.

Circuits may be closed through operation of the key-levers by connecting the cords or chains to circuit-changers of the form to be now described or of any other suitable form. These circuit-changers also serve as a form of punch-controlling device, when connected as hereinafter described, to punch operating-magnets.

Upon a projection from the base-plate B are mounted contacts $\mathcal{L}$, from which lead circuits 1 to 15. These contacts are insulated from each other, as by means of the block of insulation E. Coöperating with these contacts is a series of circuit-making levers F, which may be of any convenient form or pattern, but are here shown as elbow-levers mounted on a rod G, secured in a frame H, attached to the base-plate B. One arm of each of the said elbow-levers is attached to one of the yielding connections I, which are connected at their opposite ends to a bridge-piece J, mounted upon the opposite sides of a base-plate B. These chains may be secured to the bridge by any suitable means, such, for instance, as clamping-screws K. Suitable springs, as blade-springs M, bear against the short arms of said levers to keep said flexible or yielding connections I taut and the levers F out of engagement with the contacts $\mathcal{L}$.

The selecting devices N may be attached to the key-levers in any suitable way and may be of any desired construction capable of actuating the contact-levers through engagement with said chains, but they are here shown as consisting of bars provided with downwardly-extending forks b, which straddle said chains. As a convenient manner of

attaching the selecting devices to the key-levers O, we have shown straps P, passing around the ends of the bars N, and key-levers. Each selecting device is provided with a certain number of the forks *b*. The one in the front, as shown in Fig. 1, carries five of said forks, while others, as shown in Fig. 4, carry six, with the exception of the two end levers, which together carry five of said forks and are connected to the space-bar Q of the machine. These forks, as will be seen in Fig. 4, are so arranged that each key selects a certain defined group of chains, or, in other words, actuates a certain defined group of contact-levers or circuit-changers F. When used with a perforator, these groups are so chosen that they shall control the punches for making groups of perforations corresponding to the characters carried by the respective keys to which the selecting devices are attached. For instance, the key bearing the letter "a" will carry a selecting device which will cause the group of perforations to be punched which represents the letter "a," and so on. The space-bar Q, which is mounted upon the two outside levers, has allotted to it a group of five forks *b*, three of which are shown upon the right-hand lever and two upon the left. This group controls the operation of the circuit changers or controllers which serve to bring into operation the punches for punching a series or group of perforations representing a space, and this takes place at the same time that the spacing mechanism of the type-writer is operated.

For the purpose of indicating the connection between this improvement and the perforating mechanism we have shown, diagrammatically and mainly in dotted lines in Figs. 2 and 4, magnets, as R, each of which controls one of the perforating-punches typified at S in Fig. 2. Each magnet is in a circuit fed from the source of energy indicated at P', which circuits form a common return through the support for the contact-levers.

In Fig. 2 only one of the punch-controlling magnets is illustrated, whereas the full set is illustrated in Fig. 4. The chains I are indicated in Fig. 4 by broken lines and the circuits of magnets R by dotted lines. By means of the adjusting or leveling screws C the proper distance between the selecting forks and chains may be obtained. The number of circuit-changers and the number of flexible or yielding connections I may be varied in accordance with the number of punching-magnets or other magnets which are to be controlled from the type-writer. We have shown fifteen circuit-changers, whereas in reality more or less may be used. It is thus seen that though the attachment may be constructed for controlling a specified number of magnets it may readily be adapted to a less number by omitting one or more of the chains. If a particular one of the magnets, such as a punch-actuating magnet, is to be

operated, no matter which key or circuit-changer is actuated, such magnet may be placed in the common return, as shown, thereby dispensing with one of the circuit-changers.

Many changes may be made in the construction of the different parts of our device and also in the manner of operating the circuit-changers from the keys or key-levers, and the device may be electrically connected to the perforator in any desired manner, that shown being simply for the purpose of illustration. The circuit-changers may operate to make or break the circuits and various well-known relay connections may be inserted between the circuit-changers and the punch-controlling magnets. These changes do not affect the purposes or scope of our invention.

One form of circuit maker and breaker in the circuit common to the individual circuit-controllers and one way of operating the same so that it shall act whenever any one or more of said circuit-controllers are actuated by the key-levers is as follows: This common circuit maker and breaker is adjusted so as to break the common connection before the individual circuit-controllers already described break circuit and is adjusted also, by preference, to close the common connection after said circuit-closers close circuit. By this device the make and break of circuit or other action of each of the individual circuit-closers may be readily timed and made uniform for all of the key-levers. In other words, any want of uniformity in the action of the circuit-controllers operated upon by the selecting key-levers will be corrected by the single or common circuit maker and breaker, whose action is the same for all; but it will be necessary to adjust the individual circuit-breakers so that there shall be no spark apparent at these points. Under the condition of no spark at individual breakers the circuit must have been first broken at the common break. Thus an adjustment of the action of this single circuit maker and breaker will serve as an adjustment of the electric action of all the circuit-controllers. This common circuit maker and breaker is of great importance also from the fact that it may readily be constructed to have a very rapid snap action in breaking and making circuit, thereby permitting the use of heavier currents without unduly complicating the apparatus by introducing the snap action into each of the individual circuit-controllers.

By the use of this common circuit maker and breaker all spark or burning is transferred to one point of the apparatus, where it may be readily taken care of by a condenser or other device, whereas without such common circuit-breaker a condenser or other device would be necessary for each of the circuit makers and breakers of the apparatus, or else the volume or strength of current which it would be possible to employ in connection with them would be limited.

A further advantage in employing individual breaking devices in combination with a common breaker is found in the fact that the punch-magnet branches all remain closed among themselves at the instant of rupture at the common break. By this means any one magnet may discharge itself among the others, thereby avoiding much of the spark that would otherwise appear at the common break. Obviously no such mutual inductive discharge could occur if the punch-magnet branches were first broken, or if a common break were not employed.

One way of connecting this common circuit maker and breaker to the key-levers so that it will be actuated whenever any one of said levers is operated is to connect it to the space-feed device of the type-writer. Thus, as shown more particularly in Fig. 1, the rock-shaft which carries the feed-escapement for the type-writer is provided with a depending arm Q' , (shown in dotted lines,) which serves to reciprocate a bar q , that connects by a device having lost motion with an upright lever q^2 , pivoted at its lower end upon the frame of the apparatus, as shown, and provided with a blade-spring q^3 , normally engaged with a hook on the end of the upper or free end of the lever q^2 . The bar q has an elongated slot into which projects a pin on the lever q^2 . The lever is rocked by this connection, which connection provides a lost movement. The spring q^3 is adapted to engage with and make contact upon a stop q^4 , mounted upon but insulated from a standard or bracket, as shown. When any one of the key-levers O is depressed, the rock-shaft carrying arm Q' is rocked by means of the operating-bar Q^3 , to which are connected the rods Q^2 , joined at their lower ends by a bar Q^4 , upon which the key-levers bear when depressed. By this means the bar q is moved and the circuit is closed between q^3 and q^4 . There is, however, a certain amount of lost movement provided, as just described, which is adjusted so that circuit will be closed at the point q^4 only after the circuit closers or controllers which are actuated by the selecting devices have closed circuit. The connection at q^4 completes another break in the circuit, as shown in the diagram Fig. 4. When any key-lever O rises, the bar q moves back, but with a lost motion, but so adjusted that the connection will be broken between q^3 and q^4 before it is broken at the contacts l^2 of the individual circuit closers and breakers. Hence any arc or sparking that occurs will take place at the common circuit-breaker $q^3 q^4$. Moreover, the bar q will have attained a rapid motion before bar q^2 is started upon its back movement.

The snap action or quick make and break is provided not only by the quick blow due to motion between q and q^2 , but also by the roller q^5 upon the end of a blade-spring, which roller bears against the edge or corner of the

hook upon lever q^2 and is adjusted to assist in forcing the arm q^2 backward by a spring action, thereby causing its spring q^3 to move quickly out of contact with q^4 .

It is obvious that this common circuit maker and breaker might be of any other desired construction and operated, by connection with other parts of the apparatus, so as to come into action in the manner described to break the circuit before any of the individual circuit-closers break, and also preferably to make the circuit after said individual circuit-closers make circuit. It will also be apparent that other constructions of devices for giving a snap action might be employed, as well understood in the art of circuit makers and breakers.

The manner of electrically combining this common circuit-breaker with the individual circuit changers or breakers is indicated in the diagram Fig. 4. The mechanism for operating them is omitted, but it is to be understood that their actuating devices are in any case so combined with the common circuit-breaker or its actuating device as to produce an operation of the latter to accompany each operation of the circuit-changers no matter which one or more of the latter may be actuated at each operation. The magnets shown in the diagram may be punch-actuating magnets or any other translating devices. The one in the common circuit may be omitted or not, as desired.

What we claim as our invention is—

1. In a perforator, the combination with a series of controlling-keys or key-levers, of a system of yielding chains or cords transverse thereto and punch-controlling devices connected to said chains or cords.

2. The combination with a series of circuit-changers, of a series of flexible actuating connections extending therefrom and connected to a fixed point at their opposite ends, a series of key-levers extending transversely to said connections, and selecting devices, one connected to each lever for operating upon a defined group of said connections.

3. In an electromagnetic perforator, the combination with a series of circuit-making levers and a series of contacts therefor located in the respective circuits of the punch-actuating magnets, connections extending from said levers for actuating the same, a series of key-levers, and means carried by said levers for operating upon said connections.

4. The combination, substantially as described, of a series of circuit-controllers and actuating devices therefor, and a circuit-breaker governed by said actuating devices in common, and placed in a common connection to the said individual circuit-controllers, as and for the purpose described.

5. The combination with a keyboard circuit maker and breaker, each key of which controls or governs one or more circuits, of a circuit making and breaking device placed in

a common connection of said circuits, and controlled or operated by said keys in common, as and for the purpose described.

6. The combination with a keyboard circuit-controller each key of which governs one or more circuits, of a circuit maker and breaker placed in a common connection of said circuits and controlled or operated by said keys in common, said circuit maker and breaker being adjusted as described to break the circuit after the keys have completed their action upon the individual circuits at another point.

7. The combination, substantially as described, of a keyboard circuit-controller each key of which governs one or more circuits, and a circuit maker and breaker placed in a common connection of said circuits and connected with said keys through devices having lost motion.

8. The combination, substantially as described, of a series of keys or key-levers, a series of circuit-closers actuated by said keys in different combinations as described, a series of magnets one for each circuit controlled, and a circuit maker and breaker operated by said keys in common and placed in the common connection of the circuits, as and for the purpose described.

9. The combination substantially as described, of a keyboard circuit-controller, a series of circuits leading respectively to perforating-magnets, a series of individual circuit-closers for said circuits, two or more of which are adapted to simultaneous operation, a snap-action circuit-breaker placed in the common connection of the circuits and adjusted as described, to break the common connection after the keys have completed their individual action upon the several circuits.

10. The combination, substantially as described, of a series of circuit-controllers and actuating devices therefor, and a snap-action circuit-breaker operated or controlled in common by said actuating devices and placed in the common connection of said circuit-controllers.

11. The combination, substantially as described, of a series of circuit-controllers, a series of actuating-keys operating on the same in different combinations as described, and a snap-action circuit-breaker operated or controlled by said keys in common and placed in a common connection of said circuit-controllers.

12. The combination, substantially as described, of a series of circuit-controllers and actuating devices therefor, of a circuit maker and breaker having lost motion and placed in a common connection of said circuit-controllers, said circuit maker and breaker being operated or controlled by the actuating devices in common.

13. The combination, substantially as described, with a type-writer, of a series of circuit-controllers actuated by the keys of said type-writer, and a circuit maker and breaker placed in the connection common to said circuit-controllers and mechanically connected with the space-feed device of the type-writer.

14. In a keyboard circuit changer or controller, the combination with a series of key-levers, of a series of yielding cords or chains extending beneath said levers transversely thereto and engaged thereby in different selected combinations or groups, as and for the purpose described.

15. The combination, substantially as described, with a series of punch-actuating magnets, of a series of circuit-controllers operating upon the circuits of said magnets, independently as described, according to the combination of punches to be actuated, and a circuit breaker and maker in a connection common to said circuit-controllers, as and for the purpose described.

Signed at New York, in the county of New York and State of New York, this 7th day of May, A. D. 1896.

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Witnesses:

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