

(No Model.)

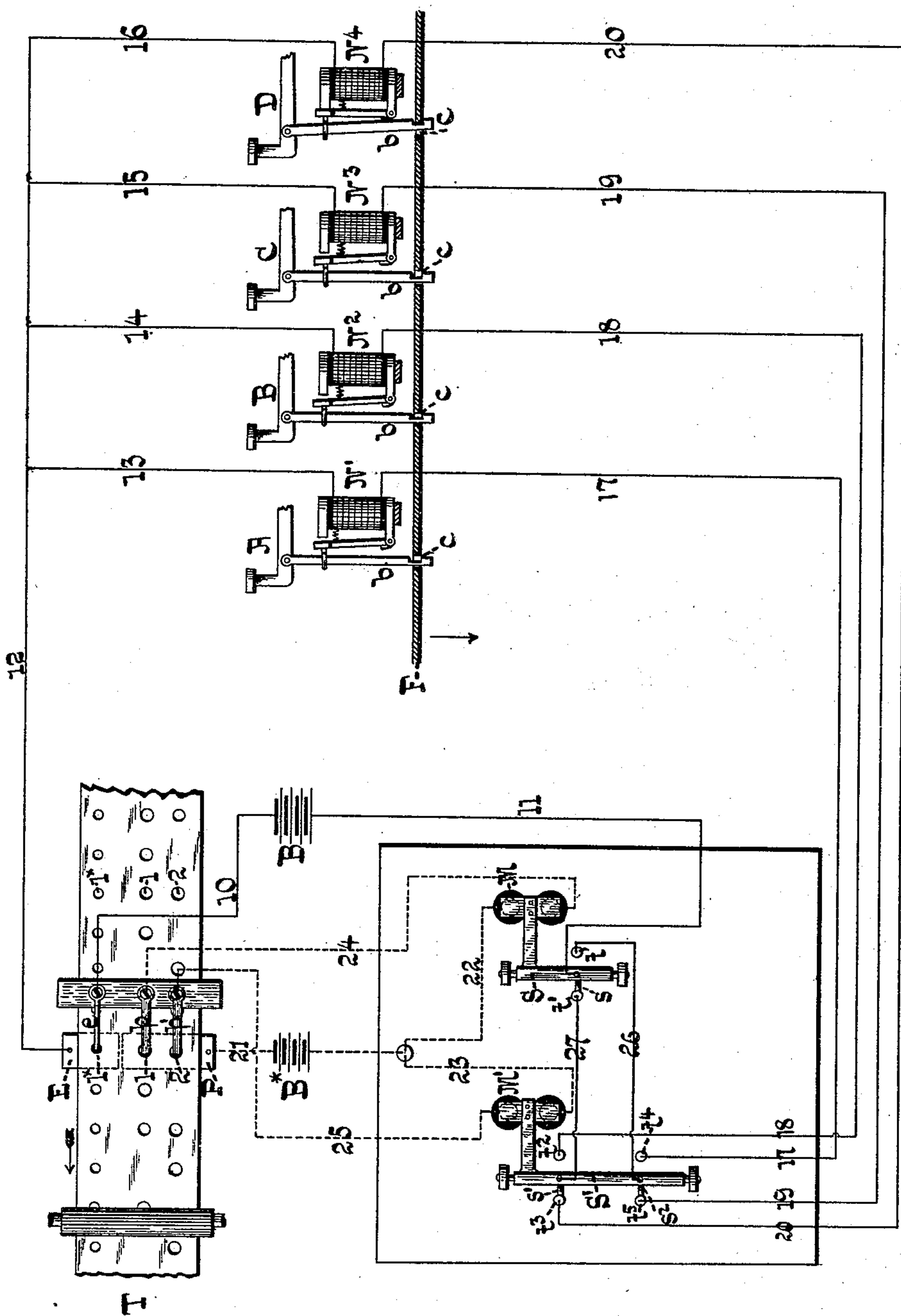
2 Sheets—Sheet 1.

H. S. PRENTISS.
AUTOMATIC KEYBOARD OPERATOR.

No. 487,936.

Patented Dec. 13, 1892.

Fig. 1.



WITNESSES:

A. Faber du Faur
J. Vohr

INVENTOR:

By *Henry S. Prentiss,*
A. Faber du Faur,
ATTORNEY

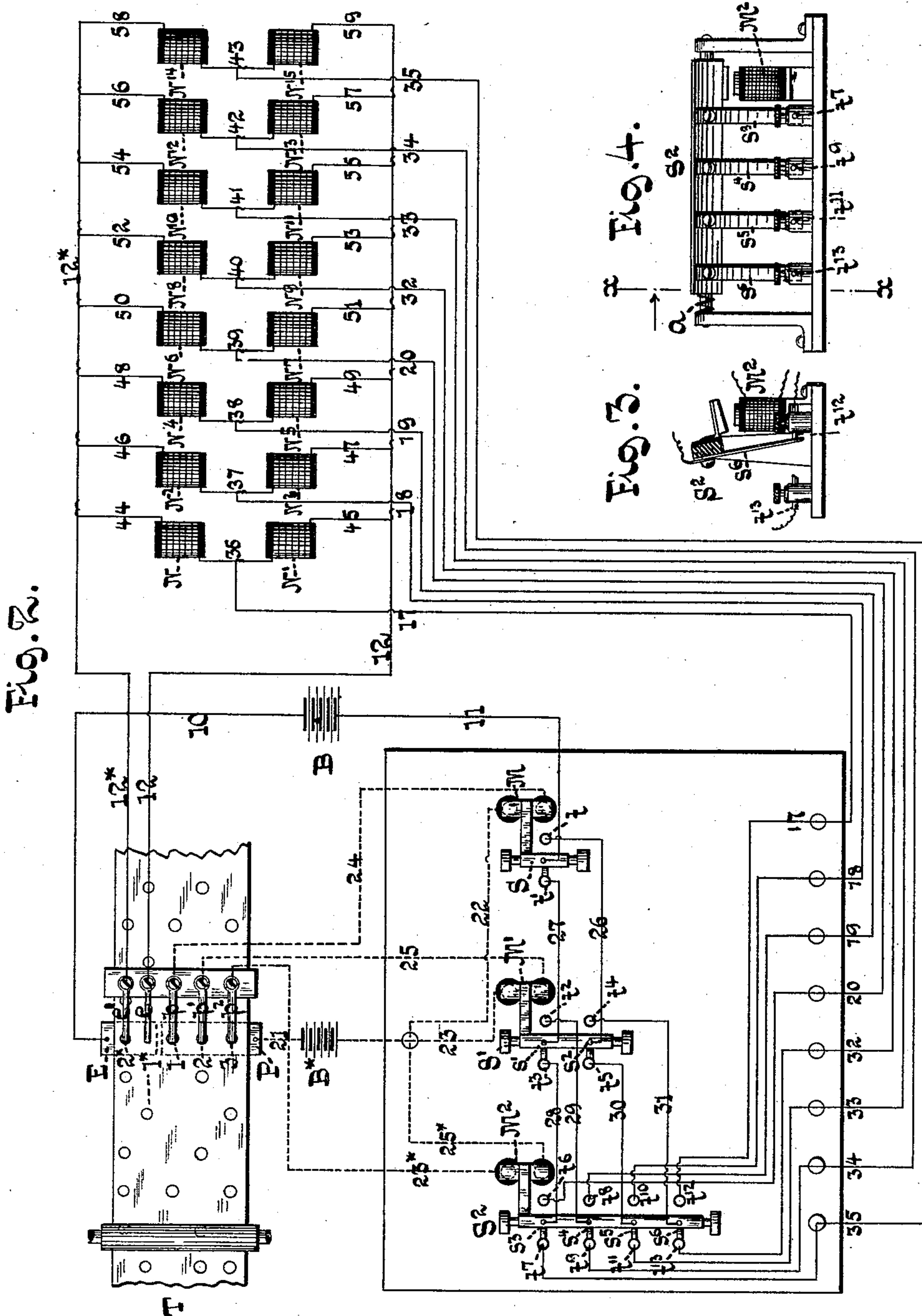
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UNITED STATES PATENT OFFICE.

HENRY S. PRENTISS, OF ELIZABETH, NEW JERSEY.

AUTOMATIC KEYBOARD-OPERATOR.

SPECIFICATION forming part of Letters Patent No. 487,936, dated December 13, 1892.

Application filed June 19, 1891. Serial No. 396,812. (No model.)

To all whom it may concern:

Be it known that I, HENRY S. PRENTISS, a citizen of the United States, and a resident of Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Automatic Keyboard-Operators, of which the following is a specification.

My invention has reference to means for automatically operating keyboards—for instance, the key-boards of type-writing machines and the keys of organs or other similar musical instruments.

With reference to type-writing machines it has for its object to automatically operate the same to rapidly and accurately produce copies, each of which will be an ink or ribbon copy, and consequently not embody the defects of the ordinary carbon-paper copies.

My invention consists, essentially, in providing a series of switches which are set for the operation of any one particular key by the passage of a perforated strip between suitable contacts, the particular perforation or combination of perforations under the contacts determining the position of the switches, all of which is more fully pointed out in the following specification and claims and illustrated in the accompanying drawings, in which—

Figure 1 represents a diagram of the several devices as applied to and operating the keys of a type-writing machine. Fig. 2 is a diagram showing a somewhat-modified form. Fig. 3 is a vertical section in the plane xx , Fig. 4, illustrating the construction of the switches. Fig. 4 is an elevation of Fig. 3.

Similar letters and figures indicate corresponding parts throughout the several views.

In the example illustrated in Fig. 1 I have shown for the sake of simplicity but four keys and the devices made to operate any particular one of said four keys. However, it will be seen from the subsequent description that any number of keys could be included and the devices constructed and arranged to operate the same. In said figure the letter T designates a strip of paper or card-board or other suitable material containing three rows of perforations 1, 2, and 1*, which are formed therein by a series of punches operated in any suitable manner, so that each particular perforation or combination of perforations

will correspond to and set the switches for a particular letter or key—for instance, for one of the letters "A," "B," "C," and "D."

The method of and devices for producing the perforations in the strip being immaterial as far as my present invention is concerned will not be more fully described here. The strip may be fed forward by any suitable known means.

P represents a contact-plate, which, in combination with the brushes p and p' , forms circuit-closers, the one P p for closing the circuit through the electro-magnet M of switch S and the other P p' for closing the circuit through the electro-magnet M' of a switch S', said circuits being ordinarily broken by the passage of the body of the strip T between the two contacts, while whenever a perforation is brought opposite the two parts of either of the two contacts the circuit is closed through the corresponding switch.

E is a second contact-plate separate or insulated from the first, which, combined with the brush e , forms a circuit-closer for closing the circuit through the operating devices of the keys A B C D. The circuit in this case is closed by the row of perforations 1*.

The switch S is provided with a brush s , playing between suitable contacts t and t' . It is normally held against the contact t by a spring a , but is thrown against contact t' whenever the electro-magnet M is vitalized. (See Figs. 3 and 4.) The switch S' is similarly constructed, but is provided with two brushes s' and s'' , playing between two sets of contacts t^2 t^3 and t^4 t^5 , respectively.

The devices for directly actuating the keys or type-bars may be of any suitable construction. For instance, said keys may be depressed directly by the action of electro-magnets, or, as here shown, each key is provided with a pendent catch b , subject to the action of an electro-magnet, as N^1 N^2 N^3 N^4 , which catch passes through an opening c in a plate F, that is turned or drawn downward for the impression by any suitable means. The catches b are normally held clear of the plate F; but upon the vitalization of any one of the electro-magnets N^1 , N^2 , N^3 , and N^4 the corresponding catch is drawn forward to bring it into engagement with the plate. Consequently the corresponding key is depressed.

The arrangement of the electric circuits is as follows: B represents the main battery, the circuit of which is closed by the row of perforations 1* at contact E *e*, and B* is the switch-battery, whose circuit is closed at either of the contacts P *p* and P *p'* by the rows of perforations 1 and 2. One pole of battery B is connected with contact *e* of the main-circuit closer E *e* by wire 10, the other pole being connected by wire 11 with the brush *s* of switch S. From contact-plate E is led the main wire 12, to which are connected by wires 13, 14, 15, and 16, respectively, the bobbins of electro-magnets N', N², N³, and N⁴, the opposite ends of said bobbins being connected, respectively, by wires 17, 18, 19, and 20 with the contacts *t*⁴, *t*³, *t*⁵, and *t*³ of switch S'. Contact *t* of switch S is connected with brush *s*² of switch S' by wire 26, and contact *t'* of switch S is connected by wire 27 with brush *s'* of the said switch S'. One pole of the switch-battery B* is connected by wire 21 with contact-plate P and the other pole by the respective branch wires 22 and 23 with the electro-magnets M and M' of switches S and S'. The opposite end of the bobbin of electro-magnet M is connected by wire 24 with brush *p* of contact P *p*, and bobbin of electro-magnet M' is connected with brush *p'* of contact P *p'* by wire 25.

The operation is now as follows: Assume, as an example, that the circuit is closed at perforations 1 and 2 and a trifle later at 1*. In this case the circuit of the switch-battery B* passes over wires 22 and 23 to electro-magnets M and M', wires 24 and 25 to contacts P *p* and P *p'*, and wire 21 back to the battery, thereby vitalizing both electro-magnets M M' and setting the switches to bring the brush *s* against contact *t'* and brushes *s'* and *s*² against contacts *t*³ and *t*⁵. The circuit of the main battery now being closed at contact E *e*, the current passes over wire 11, brush *s*, and contact *t'* of switch S, wire 27 to brush *s'* of switch S', contact *t*³, wire 20, electro-magnet N⁴, wires 16 and 12, contact E *e*, and wire 10 back to the battery, thereby vitalizing electro-magnet N⁴ of key D and causing its catch to engage the plate F. On the depression of this plate the corresponding type-bar would be depressed to print the letter "D." Assume that one of the perforations of row 2 is over the contact-plate to close the circuit at P *p'* only. In this case only switch S' is moved, assuming the position shown in Fig. 1, while switch S remains in its normal position—i. e., with brush *s* against contact *t*—and the circuit would be closed subsequently by the main-circuit closer through electro-magnet N³ to actuate Key C. If both contacts P *p* and P *p'* are open, both switches S and S' remain in their normal positions and the circuit of battery B is closed at E *e* through electro-magnet N' to actuate key A, &c. It will be noticed from the foregoing that in this case the function of the row of perforations 1* and the circuit-closer E *e* is to close the

circuit of the main battery at repeated intervals after the switches have been set. Consequently I do not wish to confine myself to the specific means here set forth, as it is evident that the same object could be accomplished by other means than the row of perforations in the strip—for instance, by causing the motor which actuates the plate F or another continuously-moving part of the apparatus to close the circuit at stated intervals, said motor at the same time feeding the strip forward to insure co-operation of the parts.

It is evident that by increasing the number of rows of perforations 1 and 2 and the switches S S' any desired number of keys could be operated. However, it must be here stated that the number of contacts for each switch will be double that of the preceding. For instance, if a third switch is made use of to obtain the full capacity it must be provided with four brushes *s* and eight contacts *t*, thus serving to control eight keys. Again, the same result can be accomplished by increasing the number of the rows of main-circuit closing perforations 1*, as shown in Fig. 2, this method being preferable, in so far that a lesser number of switches is necessary to operate the same number of keys; but the battery expense is greater, owing to the division of the current. In this drawing I have shown three circuit-closers P *p*, P *p'*, and P *p*² for the switch-battery and three switches S, S', and S². With one main-circuit closer E *e* this arrangement would give a maximum of eight keys; but by providing a second main-circuit closer E *e'* the capacity is increased to sixteen keys, or double the number.

Referring to Fig. 2, it will be seen that the electrical connections of the switches and contacts for the switch-battery are on the same principle as before, an additional branch leading from the switch-battery B* to the electro-magnet M², the opposite end of the bobbin being connected by wire 23* with the additional circuit-closer P *p*². In the main circuit the brushes *s*³, *s*⁴, *s*⁵, and *s*⁶ of the additional switch S² are connected, respectively, with contacts *t*³, *t*², *t*⁵, and *t*⁴ by the wires 28, 29, 30, and 31, said brushes playing between contacts *t*⁶, *t*⁷, *t*⁸, *t*⁹, *t*¹⁰, *t*¹¹, *t*¹², and *t*¹³. In this example the electro-magnets N N' N², &c., are arranged in a multiple-arc system, 12 and 12* designating the two wires from the main-circuit closers E *e* and E *e'*, to which wires the bobbins of the electro-magnets are connected by wires 45 47, &c., and 44 46, &c. The wires 17 18 19, &c., from the contacts *t*⁵ *t*⁶, &c., are branched and connect each with two electro-magnets N N' N² N³, &c. Assuming in this case that the three switch circuit-closers are closed and one main-circuit closer E *e* is closed, all three switches S S' S² will be in their changed positions and the current in the main circuit will pass over wire 11, brush *s*, contact *t'*, brush *s'*, contact *t*³, brush *s*³, contact *t*⁷, wire 35, electro-magnet N¹⁴, wire 12*, circuit-closer E *e'*, and wire 10 back to battery,

thereby vitalizing electro-magnet N¹⁴. Should circuit-closer E e have been closed and E e' open, the current would have been closed through electro-magnet N¹⁵.

5 I do not wish to restrict myself to the application of the device to any particular form of type-writing machine or to operating the keyboard, as it is evident that the devices could be arranged to act directly upon the
10 type-bars or type-wheel.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a device of the character specified, a series of circuit-closers, a series of switches
15 operated by the passage of a perforated strip between the circuit-closers, and a main-circuit closer for closing the circuit through the contacts set by the switches, substantially as described.

20 2. In a device of the character specified, a series of switches, secondary-circuit closers operated by the passage of a perforated strip to individually or in combination set the switches for the passage of a current through
25 a particular circuit, and a main-circuit closer for establishing the current through the particular circuit set by the switches, substantially as described.

3. In a device of the character specified, a
30 series of switches, secondary-circuit closers operated by a perforated strip to individually or in combination set the switches for the passage of a current through a particular circuit, and a main-circuit closer operated at regular
35 intervals by a series of perforations in said strip to close the circuit through the contacts set by the switches, substantially as described.

4. In a device of the character specified, a series of switches, secondary-circuit closers
40 operated by the passage of a perforated strip to individually or in combination set the switches for a particular key, and a main-circuit closer for subsequently closing a current through the contacts made by the switches,
45 substantially as described.

5. In a device of the character specified, a series of switches controlled by electro-magnets, a series of circuit-closers constructed to individually or in combination set the switches

for a particular circuit, and a main-circuit
50 closer operated at regular intervals to establish the current through the particular circuit set by the switches, substantially as described.

6. In a device of the character specified, a
55 series of switches in which each successive switch has an increased number of contacts, a circuit-closer for each switch adapted to close a circuit to actuate its particular switch, and a main-circuit closer for establishing a
60 current through the particular circuit set by the switches, substantially as described.

7. In a device of the character specified, a series of secondary-circuit closers, a main-circuit closer, and a series of switches in which
65 each successive switch has an increased number of contacts, the moving contact of the first switch being connected to one wire of the main-circuit closer and the contacts of the end switch being in the circuits through
70 which the current is closed by the main-circuit closer and the stationary contacts of the intermediate switches being in electrical connection with the moving contacts, substantially as described.

8. In a keyboard-operator for type-writing
75 machines, an electro-magnet for each key, a series of circuit-closers, a series of switches operated by the passage of a perforated strip between the circuit-closers, and a main-circuit
80 closer for closing the circuit through the contacts set by the switches, substantially as described.

9. In a device of the character specified, the combination of the keys or bars A, provided with pivoted catches, electro-magnets
85 adapted when vitalized to attract the catches, and a vibratory plate having perforations entered by the catches, substantially as described.

In testimony that I claim the foregoing as
90 my invention I have signed my name, in presence of two witnesses, this 12th day of June, 1891.

HENRY S. PRENTISS.

Witnesses:

H. W. HELFER,

A. FABER DU FAUR, Jr.