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PATENTED JAN. 20, 1903.

J. S. HARRISON.

ELECTRICALLY OPERATED TYPE WRITING MACHINE.

APPLICATION FILED APR. 12, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1.

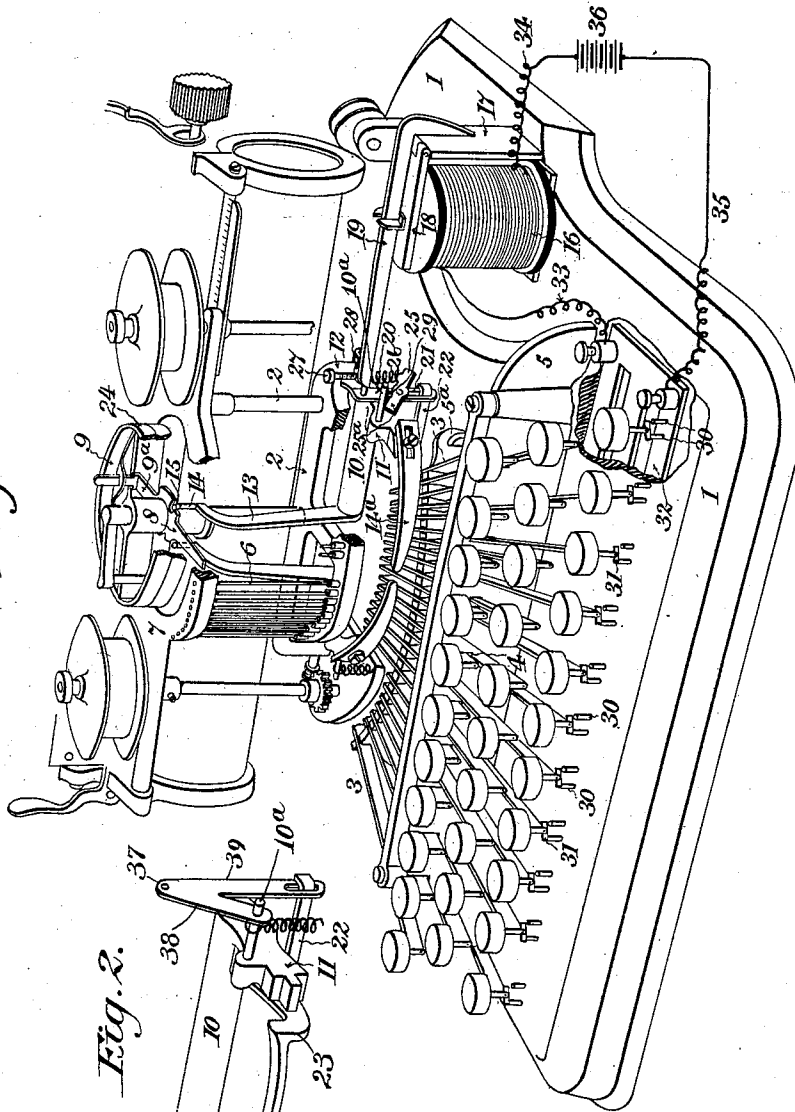
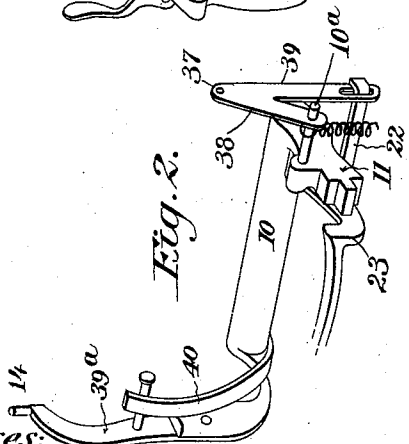


Fig. 2.



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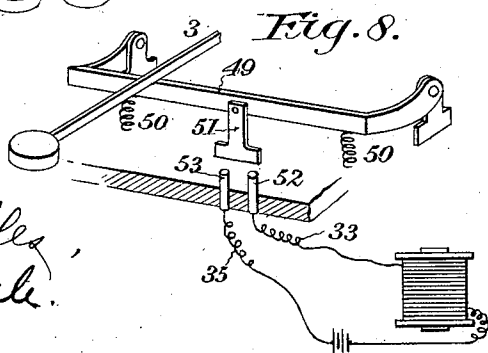
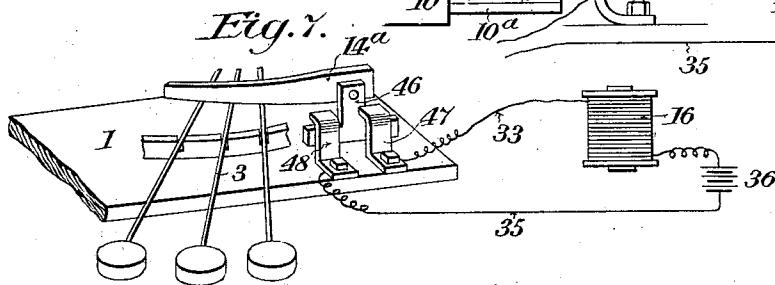
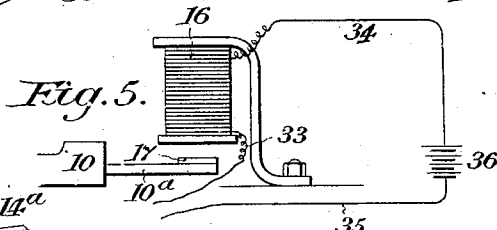
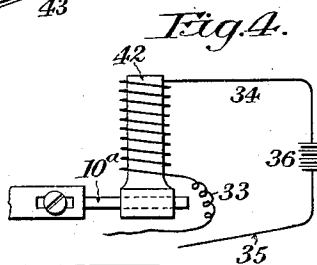
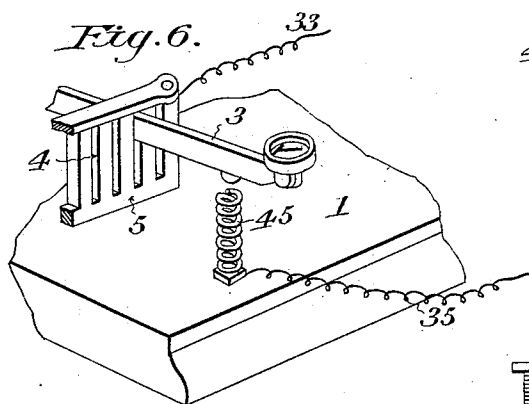
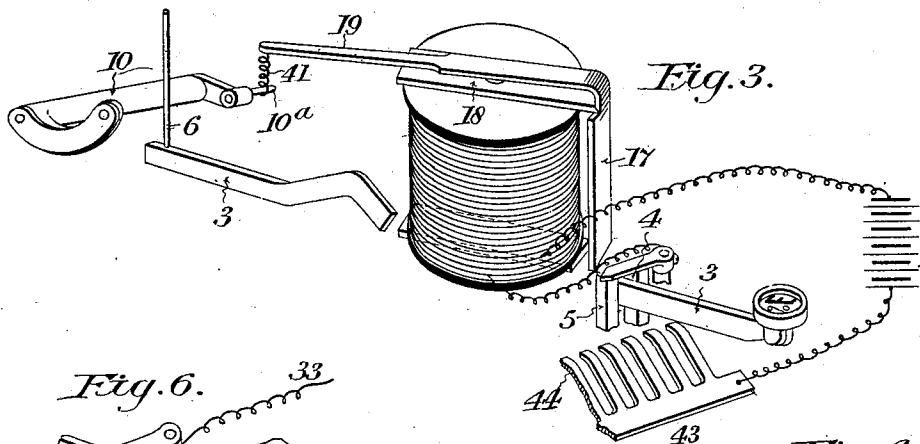
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NO MODEL.

2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

JOHN S. HARRISON, OF SAVANNAH, GEORGIA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO PRENDERGAST ELECTRIC TYPEWRITER COMPANY, A CORPORATION OF MAINE.

ELECTRICALLY-OPERATED TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 718,758, dated January 20, 1903.

Application filed April 12, 1902. Serial No. 102,593. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. HARRISON, a citizen of the United States, and a resident of Savannah, county of Chatham, State of Georgia, have invented certain new and useful Improvements in Electrically-Operated Type-Writing Machines, of which the following is a specification.

My invention relates to electrically-operated type-writing machines, and more particularly to that class of type-writing machines in which the printing is effected by impressions from a rotary or oscillating type-wheel, whose movements are controlled by key-levers. In this class of machines, a familiar type of which is the Hammond typewriter, the depression of a key on the board accomplishes four results—first, it moves the type-wheel to the printing-point; second, it lifts the stop-pin corresponding to the letter on the key which has been depressed, which stop-pin stops the type-wheel when it arrives at the proper printing-point; third, it releases the hammer-spring, and, fourth, it releases the carriage-spring and the carriage moves forward one notch.

Now one object of my invention is to provide an electrical device for a type-writing machine of this character which will automatically come into action to cause the type-wheel to be moved into printing position without requiring that expenditure of force on the part of the operator as is now required in the manual operation of the key-levers to effect this particular movement. It is believed that the moving of the type-wheel to the printing position takes approximately seventy-five per cent. of the force necessary to depress the key, and hence the use of my invention upon machines of the character designated will obviate the objections to such machines, because it will remove the unevenness and hardness of touch now existing in such machines. In fact, by my invention the key depression can be made even and shorter, as well as lighter, than in any other machine now on the market. Moreover, by my invention it will be possible to use a metal type-wheel in place of the hard-rubber wheel

now commonly used on machines of this kind, and it will therefore make possible a wider extent of manifolding-work on this kind of a machine, which now cannot be done satisfactorily, because in the effort to obtain lightness of touch as now constructed the makers have been compelled to use a wheel so light as to make it impossible to manifold as well as with type-bar machines.

My further object is to provide type-writing machines of the kind designated with electrically-controlled devices for also releasing the carriage-feed and the hammer-operating devices, so that not only may the type-wheel be brought to printing position by electrical means, but the carriage and the hammer caused to act through such electrical means as well, thus involving an expenditure of force on the part of the operator only so far as is necessary to depress each key to bring it into contact with a contact device to close the circuit through the electromagnet or other electrical device whereby the several functions are caused to be performed.

With these objects in view my invention consists in the novel construction and details thereof, as hereinafter described with reference to the accompanying drawings and more particularly pointed out in the claims.

In the drawings, Figure 1 is a broken perspective view of sufficient parts of a type-writing machine showing the application of my invention thereto. Figs. 2, 3, 4, 5, 6, 7, and 8 are detail views of modifications.

Referring now to the drawings, in which the same reference characters refer to the same or corresponding parts in all the views, the numeral 1 indicates the base-board, to which the frame 2 of the machine is attached, on which frame the operating parts of the machines are mounted. The key-levers provided with the various keys are indicated by the numeral 3, said key-levers being vertically guided in slots 4, formed in the guide-bar 5, extending transversely across the bed of the machine. The levers are fulcrumed on the fulcrum-bars 5, one for each bank of the keys, although, if desired, one such bar may be used for all levers. Each lever has its inner end

in contact with the lower end of the stop-pin 6, vertically guided in the type-wheel-supporting structure 7, said pin being adapted to arrest the stop-arm 8, connected to the type-wheel 9, slidably mounted in the type-wheel carrier 24, as is usual in this class of machines.

Journalled on the frame of the machine below the type-wheel-supporting structure on each side of the machine is a rock-shaft 10, having an arm 11 extending outwardly and inside of the standards 12 of the frame, and extending upwardly from said rock-shaft on each side of the machine is a tappet-arm 13, having a stud 14, adapted to engage a notch or extension 15 on the type-wheel arm 9^a in order to oscillate said arm on its pivot to bring the type-wheel to printing position as each key is depressed, these parts being common in this class of machines, and hence require no further detailed description.

In the ordinary form of machine in the different functions effected by the depression of the keys a transversely-extending arm 14^a, carried by the rock-shaft 10 on each side of the machine, is engaged by the key-lever as the key is depressed, thereby oscillating the rock-shaft 10, which transmits motion to the type-wheel-operating arm 9^a to bring the said type-wheel to printing position; but in my invention this arm, it will be understood, may be wholly omitted, as the movement of these parts is effected by the electrical device, which I will now describe, although of course if it is desired for any reason at any time to utilize the manual means said arm may remain.

Mounted upon the base-board of the machine on either side is an electromagnet 16, carrying an armature 17, fulcrumed on the upper pole-pieces 18, which armature carries an arm 19, of non-magnetic material, engaging a link 20. In the lower end of this link is a slot 21, engaging an arm 22, extending outwardly from the rock-shaft arm 23 on the rock-shaft (not shown) journalled on the frame of the machine and controlling the usual carriage-feed and hammer-operating mechanism. Pivottally mounted on said link is a lever 25, having one end 25^a normally in contact with the stud 10^a on the type-wheel-operating rock-shaft 10 and having its other end normally pressed downward by a spring 26, confined by an adjusting set-screw 27, passing through a lug 28 on the link. Projecting from the side of the link is a stop 29 for limiting the upward movement of the operating end of the lever, such stop holding the lever 25 at its point of normal engagement with the pin 10^a.

As the arms on the rock-shaft for releasing the carriage-feed and hammer-operating mechanism always lift a constant distance and the type-wheel-operating arm moves a varying distance according to the position of the keys corresponding to the type on the type-wheel, it will be seen that as the armature always moves a constant distance when

the circuit is completed through the magnet provision must be made for compensating for the differential movement of the type-wheel-operating arm, and such compensation is effected by the construction just described, wherein the spring is made strong enough to cause the end of the lever under the normal strain to lift the type-wheel-operating rock-shaft the proper distance, corresponding to the movement required of the type-wheel arm, to bring the type-wheel to proper printing position; but when this lever has performed its function of lifting the rock-shaft to carry the type-wheel to its proper position as the rock-shaft for operating the carriage-feed and hammer mechanism is further rotated by the continued movement of the link 20 a further strain is exerted upon the lever 25, tending to force the type-wheel stop-arm 8 against its stop-pin 6, which strain is taken up by the yielding connection between said lever and the link.

Any suitable contact devices may be employed under the keys for completing the electric circuit through the electromagnet as each key is depressed, several forms of such devices being shown in the drawings. In Fig. 1 is shown a bridge-contact in which there are two contact-points 30 projecting upwardly from a conducting plate or strip 32 through the base-board and terminating directly under each key, and on each key is pivoted a bridge-piece 31, having one end constantly in contact with one of the contact-points 30, the other end adapted to be brought in contact upon the depression of the key, thereby completing the circuit through the contact-points 30, the conducting-plate 32, wires 33, 34, and battery 36, and magnet 16.

In Fig. 3 the contact is effected through a plate 43, having a series of yielding brushes or teeth 44 normally out of contact with the several keys, the circuit being closed by contact of a key-lever with its corresponding tooth.

In Fig. 6 I have indicated a helical spring-contact 45 under each key-lever, the several spring-contacts being connected together in circuit by any suitable conductor, as will be readily understood by those skilled in the art.

In Figs. 7 and 8 I have shown two forms of circuit-closing devices wherein a single contact-point is utilized for all the keys instead of having a separate contact for each key, as in the former constructions, and these constructions I deem preferable for this purpose when convenient to apply or use them.

In the form shown in Fig. 7 I use a bridge-piece 46, secured to an arm 14^a, taking the place of the ordinary arm 14, the wires 33 and 35 being attached to binding-posts or separated contact-pieces 47 and 48 on the base-board of the machine, the arms of which contact-pieces are normally out of contact with the bridge-piece 46, which is lifted by the arm 14^a as each key is depressed, thereby

bringing the bridge-piece 46 in contact with the two arms of the contact-pieces 47 and 48, thus closing the circuit.

In the form shown in Fig. 8 a similar construction is used wherein an arm 49 is pivotally mounted upon the base-board of the machine, normally held up against the under side of the key-levers at the front of the machine by springs 50. This arm 49 carries a bridge-piece 51, which closes the circuit through the contact-pieces 52 and 53 as each key is depressed, the downward movement of the key-lever pressing the arm 49 downward, thus bringing the bridge-piece 51 in contact with the two contact-pieces. The springs 50 cause the arm 49 to resume its normal position when the key is released.

It will be understood that the modifications illustrated in Figs. 7 and 8 are to be placed on each side of the machine, one for operating in conjunction with half the key-levers.

From the foregoing description it will be seen that upon the depression of a key the circuit is closed through the battery, electromagnet, and contact devices, whereby the electromagnet is energized, the armature attracted by the pole-piece, and its inner end lifted, thereby raising the rock-shaft arm, which moves the type-wheel-operating arm, thus carrying the type-wheel to the printing position corresponding to the key depressed, and at the same time the further upward movement of the armature lever or arm raises the rock-shaft arm controlling the carriage-feed and hammer-operating mechanism to the extreme upward position, thus releasing the carriage after the hammer has delivered its blow, and in this operation the yielding element in the link connection intermediate of the armature and the type-wheel permits the constant lift or movement of the armature with the varying movements of the type-wheel without exerting undue strain upon the parts.

In Fig. 2 I have shown a modified form of the yielding element in the link connection intermediate of the armature and type-wheel wherein, it will be observed, the link and spring-actuated lever thereon are replaced by a single link 37, having two arms 38 and 39, adapted to engage, respectively, the pin and arm on the rock-shaft for operating the type-wheel and rock-shaft and for controlling the carriage-feeding and hammer mechanism. In this case the yielding and differential movements of the type-wheel connection between the armature and type-wheel-operating arm are effected by means of a jointed type-wheel-operating arm 39^a, having a leaf-spring 40 interposed between the two jointed parts and normally tending to keep them in relative positions, as shown in full lines. When the movement of the armature exceeds the movement that must be imparted to the type-wheel-operating arm, in order to bring the type-wheel in printing position corresponding to the key depressed the upper jointed member of the type-wheel-operating

arm will yield to a sufficient extent to compensate for the difference in movement of the parts, and thereby prevent excessive strain on the parts.

In Fig. 3 I have shown a further modified form for operating the type-wheel-actuating arm, which may be useful when it is desired simply to apply to existing machines of this type my invention for operating the type-wheel-actuating mechanism to bring the type-wheel to printing position without using the other features of the invention and without altering the construction of said machines. In this form the arm 19 is connected by a strong helical spring 41, connected with the stud 10^a, the other parts being the same as the construction already described. The provision of the spring connection between the armature and the type-wheel in this form of the device compensates for the varying strain upon the type-wheel rock-shaft, due to the constant movement of the armature and the variable movement of the type-wheel, hereinbefore referred to.

While I believe it to be preferable to use an electromagnet as an actuating device, it will be understood that a solenoid may be used for this purpose, if desired, as shown in Fig. 4, the core 42 in such case operating to perform the function of the movable armature of the magnet and the link connection being still preserved.

It may sometimes be desirable to make the connections between the type-wheel-operating rock-shaft 10 direct instead of through intermediate levers, as hereinbefore described, and in Fig. 5 I have indicated one such construction wherein the magnet is shown as having its armature 17 connected directly to the end of the arm 10^a of said rock-shaft. In this case, however, it will be observed that there is still between the electromagnet and the type-wheel a link connection whereby a positive and direct movement is imparted to the operating devices of the type-wheel and the carriage-feed and hammer-operating mechanism, as in the other constructions.

While my invention may be applied to the type of machines designated without altering any of its parts, I prefer to utilize one of the advantages of my invention, resulting in greater compactness, by shortening the key-levers, as shown, and moving the fulcrum of said levers closer to the type-wheel-supporting structure, as shown in Fig. 1 of the drawings, wherein the keys are brought much closer to the type-wheel-cylinder structure than in the ordinary type of machine, the levers in such case requiring only sufficient length to reach the stop-pin 6 and to give leverage sufficient to enable the operator to move the keys the short distance required to make the electrical contact.

I am aware that it has been proposed to operate the different parts of a type-writing machine by electrical means and also that it has been proposed to operate parts of type-

wheel machines by such means; but my invention differs from devices of this character heretofore devised in that it embodies a direct link connection between the type-wheel
 5 and the magnet or electrical controlling device, which not only adapts it for application to existing machines, but constitutes a simpler and more effective means for this purpose and contributes to material reduction
 10 in the size and weight of such machines.

It is to be understood that where I use the terms "electromagnet" or "electromagnetic device" in the description and claims I intend to include that form known as the "solenoid,"
 15 hereinbefore described, and it will be further understood that while I prefer to use an electromagnetic device as the motor it is obvious that the essential features of my invention may be used with other kinds of motors, in
 20 which the movable element, corresponding to the armature or other movable element of the electromagnetic device, may be connected to the type-wheel-operating mechanism and to the releasing devices for the carriage and
 25 hammer actuating mechanism.

I claim as my invention—

1. In a type-writing machine having a type-wheel, keys, mechanism controlled by the depression of the keys for moving said wheel to
 30 printing position, hammer-operating mechanism, and controlling mechanism for releasing the carriage and hammer operating mechanisms, the combination of an electromagnetic device, a link connection between said electro-
 35 tromagnetic device and the controlling mechanisms for moving the type-wheel to printing position and for releasing the carriage and hammer operating mechanisms, and means for closing the circuit through said electro-
 40 magnetic device, as each key is depressed, whereby, as each key is depressed, the magnetic device is energized and the said controlling mechanisms operated through said link connection, substantially as described.

2. In a type-writing machine having a type-wheel, keys, mechanism controlled by the depression of the keys for moving said wheel to
 45 printing position, hammer-operating mechanism, and controlling mechanism for releasing the carriage and hammer operating mechanisms, the combination of an electromagnetic device, a link connection between the said
 50 electromagnetic device and the type-wheel-moving mechanism and the controlling mechanism for the hammer and carriage operating mechanisms, said link connection having a yielding element interposed between the electro-
 55 magnetic device and the type-wheel-moving mechanism, and means for closing the circuit through the electromagnetic device, as each key is depressed, substantially as described.

3. In a type-writing machine of the character described, the combination with the key-
 65 levers, the rock-shaft, and connected mechanism for moving the type-wheel to printing position, the rock-shaft and connected mecha-

anism for controlling the carriage-feeding and hammer-operating mechanisms, of an electro-
 magnetic device in open circuit with the key-
 70 levers, a link connecting the armature of the magnetic device with the rock-shaft controlling the carriage-feeding and hammer-operating mechanisms, a lever fulcrumed on the
 75 said link and having a yielding connection therewith, one end of said lever adapted to engage the type-wheel-operating rock-shaft, and a contact device operated by the depression of each key-lever arranged to close the circuit through the electromagnetic device,
 80 substantially as described.

4. In a type-writing machine having a type-wheel, keys, and mechanism controlled by the depression of the keys for moving said wheel to printing position, the combination of an
 85 electromagnet having a movable armature, with a link connection between said electromagnet and the mechanism for moving the type-wheel to printing position, and means for automatically closing the circuit through
 90 said magnet, as each key is depressed, whereby, as each key is depressed, an electric circuit is completed through the magnet and key, and the magnet is energized so that the
 95 armature is moved and operates the type-wheel mechanism, substantially as described.

5. In a type-writing machine having a type-wheel and type-wheel-operating mechanism controlled by the depression of the keys, the combination with the key-levers of an electro-
 100 magnet, a movable armature having a link connection with the type-wheel-operating mechanism, a contact device so arranged with respect to the key-levers that, upon the depression of each key, the electrical circuit
 105 through the magnet and key will be closed, whereby, the said magnet will be energized and the armature caused to move and operate the type-wheel-operating mechanism, substantially as described.

6. In a type-writing machine of the character described, having a type-wheel and type-wheel-operating mechanism controlled by the depression of the keys, the combination with
 115 the key-levers, of an electromagnet adapted to be placed in electrical circuit by each key-lever as the latter is depressed to a given point, the rock-shaft for operating the type-wheel-moving devices, an armature pivotally mounted on the magnet, the free end of which
 120 extends within the field of force at one of the pole-pieces of the magnet, said armature having a lever-arm extending therefrom and connected to the rock-shaft, and contact devices so arranged that, upon the depression of a
 125 key to the proper point, the circuit is closed and the electromagnet energized, substantially as described.

7. In a type-writing machine of the character described, the combination with the key-
 130 levers, the rock-shaft and connected mechanism for moving the said type-wheel to printing position, of an electromagnet mounted upon the base-board, an armature pivotally

mounted upon the upper pole-piece of the magnet and extending downwardly to, but normally out of contact with, the lower pole-piece, and an arm on said armature connected
5 with the said rock-shaft, and a contact device so arranged that, upon the depression of the key to a given point, the circuit through the magnet is closed, substantially as described.

8. In a type-writing machine of the character described, the combination with the key-levers, the rock-shaft and connected mechanism for moving the said wheel to printing position, of an electromagnet, an armature fulcrumed upon the upper pole-piece of said
15 magnet and extending toward the other pole-piece, but normally out of contact therewith, and an arm extending at an angle to said armature, a spring connection between said latter arm and the rock-shaft, and a contact
20 device so arranged that, upon the depression of each key to a given point, the circuit will be closed through the magnet, substantially as described.

9. In a type-writing machine of the character described, the combination with the key-levers, the rock-shaft operated by said key-levers in the normal manual operation of the machine for controlling the type-wheel in its movements to printing position, of an elec-
30 tromagnet, an armature fulcrumed on one of the pole-pieces of said magnet and extending toward, but normally out of contact with, the other pole-piece, a connection between said armature and the said rock-shaft, a contact
35 device having contact-points so arranged that, upon the depression of each key to a given point, the circuit through the magnet may be closed and the armature operated to move the rock-shaft, substantially as de-
40 scribed.

10. In a type-writing machine of the character described, having the operating elements, as described, the combination with the mechanism for controlling the type-wheel-operating mechanism, of an electromagnetic device, a link connection between said electro-
45 magnetic device and the said controlling mechanism, an arm adapted to be moved by the key-levers as the keys are depressed, a single contact device carried by said arm, and contact devices on the machine coöperating with said single contact device to close the circuit through the electromagnetic device, as each key is depressed, substantially
50 as described.

11. In a type-writing machine having key-levers, a vibrating type-wheel bearing characters adapted to be brought to printing position by the vibration of said type-wheel, a
60 motor having a movable element, a yielding connection between the movable element and the type-wheel, and means controlled by the movement of any key-lever for causing the movable element to actuate the type-wheel
65 through such yielding connection, substantially as described.

12. In a type-writing machine having key-

levers, a vibrating type-wheel bearing characters adapted to be brought into printing position by the vibration of said type-wheel, stops
70 for arresting the type-wheel at different points corresponding to the characters to be printed, a motor having a movable element with constant travel, a yielding connection between said movable element and the type-
75 wheel and adapted to permit a differential movement of the type-wheel with respect to the travel of the movable element of the motor, and means operated by the movement of any key-lever for causing the movable ele-
80 ment to actuate the type-wheel through the yielding connection, substantially as described.

13. In a type-writing machine having key-levers, a type-wheel bearing characters adapted
85 to be brought into printing position by the vibration of the type-wheel, stops for arresting the type-wheel at different points corresponding to the character to be printed, a motor having a movable element with con-
90 stant travel, a link connection between said movable element and the type-wheel for vibrating the same, a yielding element forming part of said link connection, and means controlled by the movement of any key-lever for
95 causing the movable element of the motor to actuate the type-wheel through said link connection, substantially as described.

14. In a type-writing machine having key-levers, a vibrating type-wheel bearing char-
100 acters adapted to be brought into printing position by the vibration of said type-wheel, stops for arresting the type-wheel at different points corresponding to the character to be printed, a motor having a movable element
105 with constant travel, a link connection between said movable element and the type-wheel, a spring forming a part of said link connection and adapted to transmit differential movement to the type-wheel for its vari-
110 ous printing positions as the movable element of the motor moves its constant distance, and means controlled by the movement of any key for imparting motion to said movable element, substantially as described.

15. In a type-writing machine having a type-wheel, keys, mechanism controlled by the depression of the keys for moving the type-wheel to printing position, a carriage and a hammer, and controlling means for re-
120 leasing the mechanism for operating said carriage and hammer, the combination of an electromagnetic device, a link connection between said electromagnetic device and the type-wheel-moving mechanism, and means
125 for closing the circuit through the electromagnetic device, as each key is depressed, whereby the electromagnetic device is energized as each key is depressed, and the type-wheel operated, substantially as described.

16. In a type-writing machine having a type-wheel, keys, mechanism controlled by the depression of the keys for moving the type-wheel to printing position, a carriage, a

hammer, and controlling means for releasing
the mechanism for operating said carriage
and hammer, the combination of an electro-
magnetic device, a link connection between
5 said electromagnetic device and the type-
wheel-moving mechanism, said link connec-
tion having a yielding element interposed be-
tween the electromagnetic device and the
type-wheel-moving mechanism, and means
10 for closing the circuit through the electro-

magnetic device as each key is depressed,
substantially as described.

In testimony whereof I have signed my
name to this specification in the presence of
two subscribing witnesses.

JNO. S. HARRISON.

Witnesses:

THOS. H. GIGNILLIAT,
T. F. COOK.