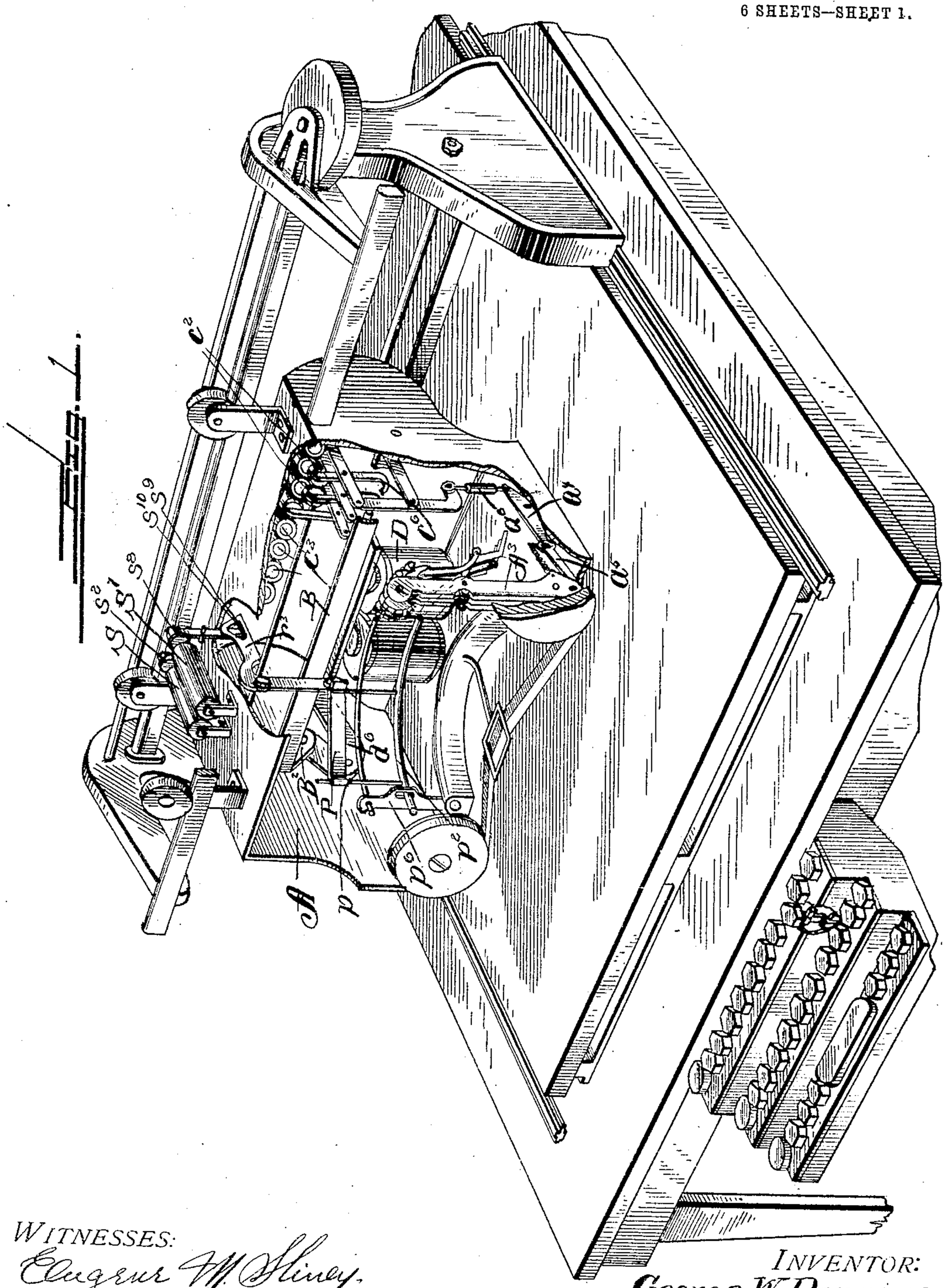
No. 840,120. PATENTED JAN. 1, 1907.

G. W. DONNING.

ELECTRICAL TYPE WRITER SELECTING AND OPERATING MEANS.

APPLICATION FILED MAY 27, 1903.

6 SHEETS—SHEET 1.



WITNESSES:

Eugene W. Stiney.

Emma K. Lamey

INVENTOR:

George W. Donning.

by A. G. Dumont,

his attorney.

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6 SHEETS—SHEET 2.

Fig. 2.

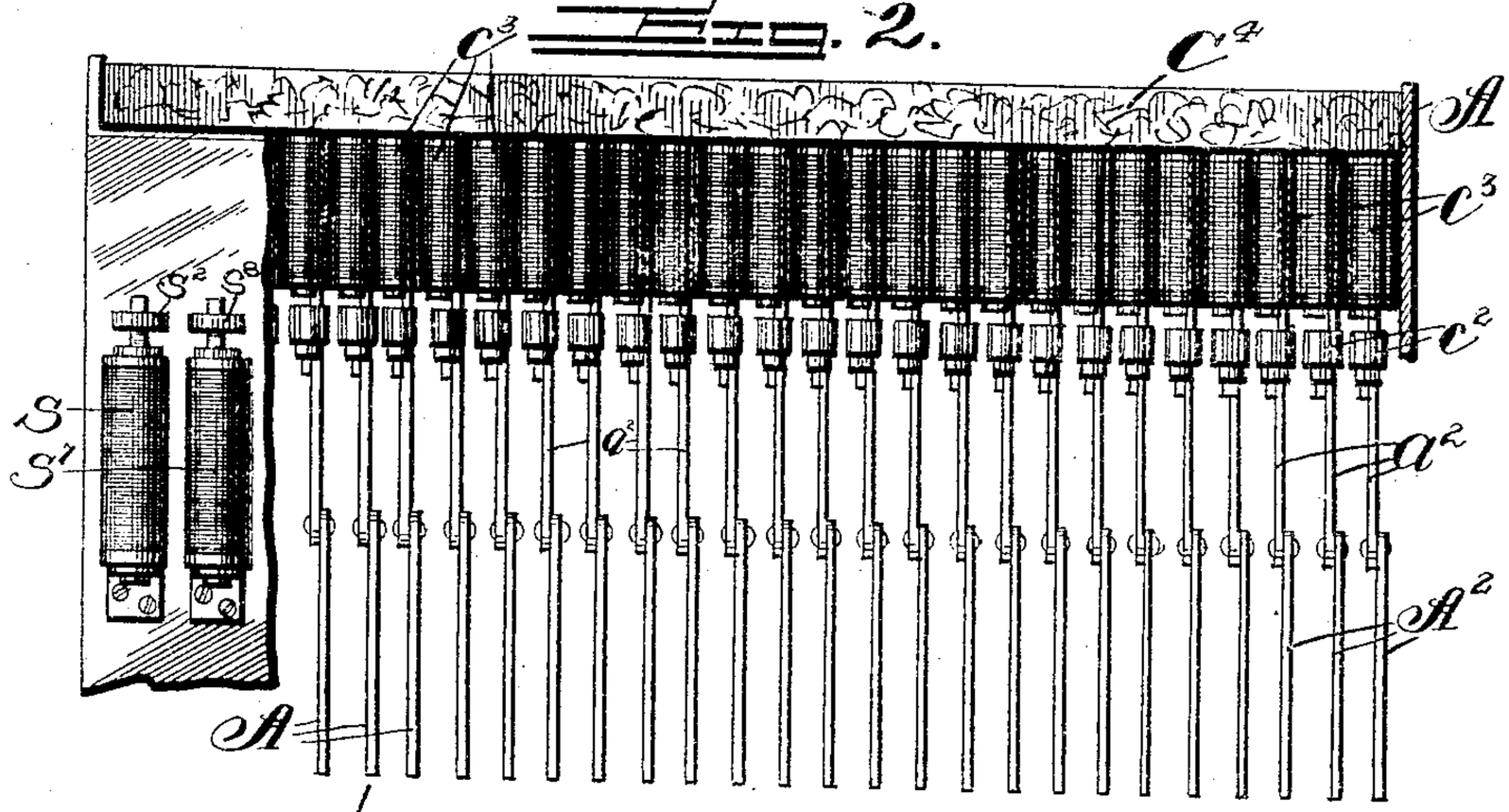

Fig. 3.

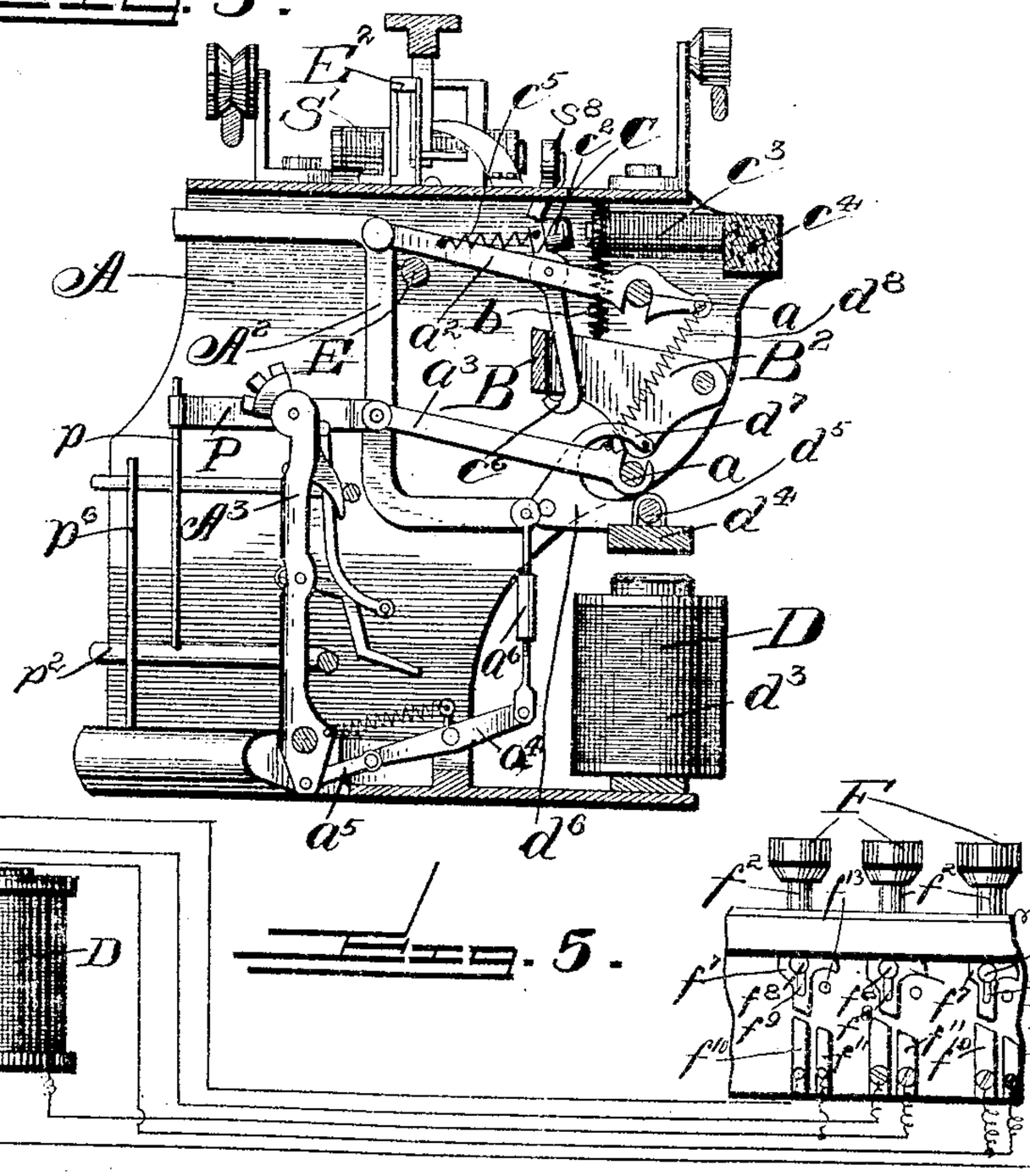

Fig. 5.

WITNESSES:

Eugene W. Hiney.

Emma F. Haney

INVENTOR:

George W. Donning.

by R. F. Osborne,

his attorney

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6 SHEETS—SHEET 3.

Fig. 4.

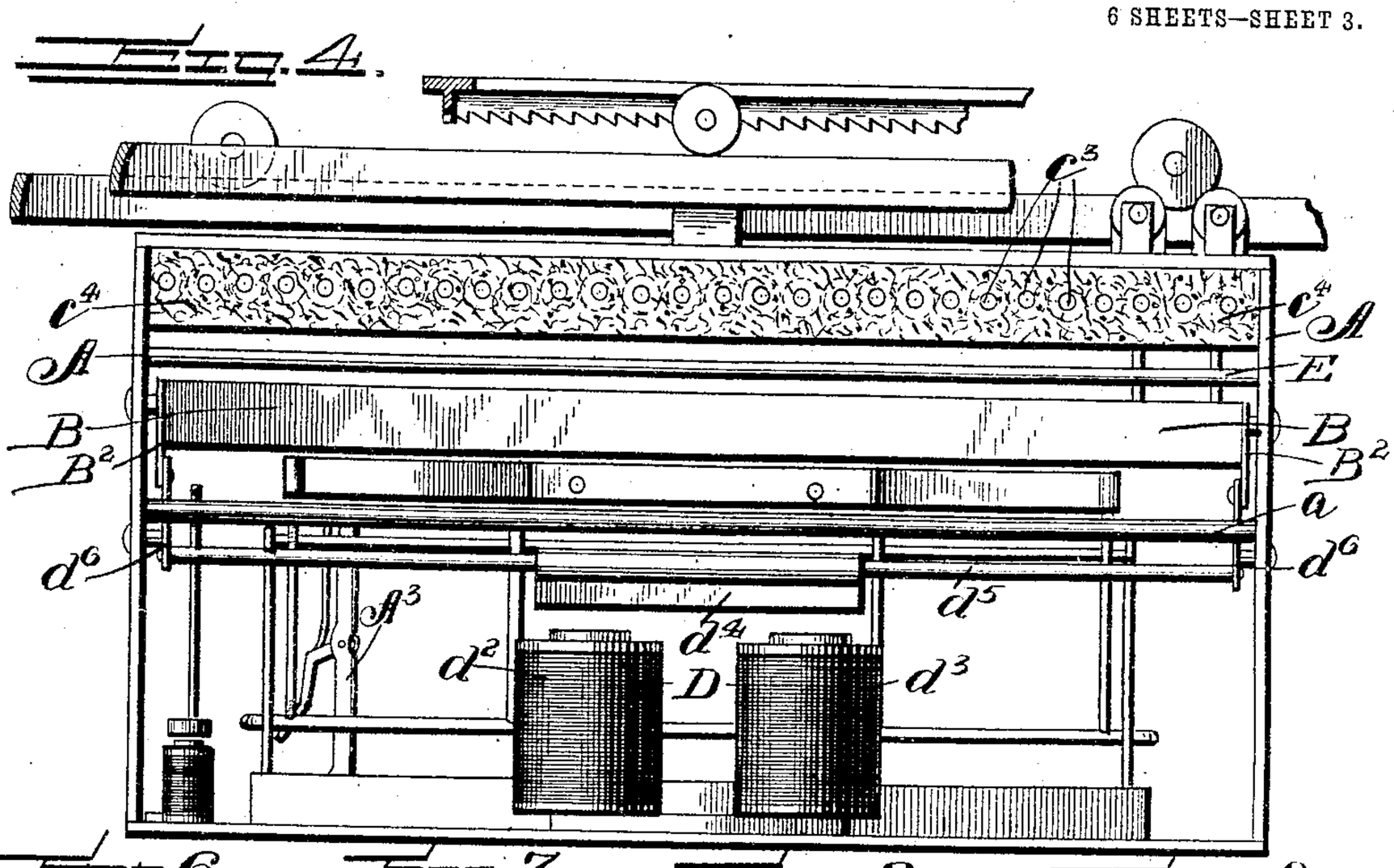


Fig. 6.

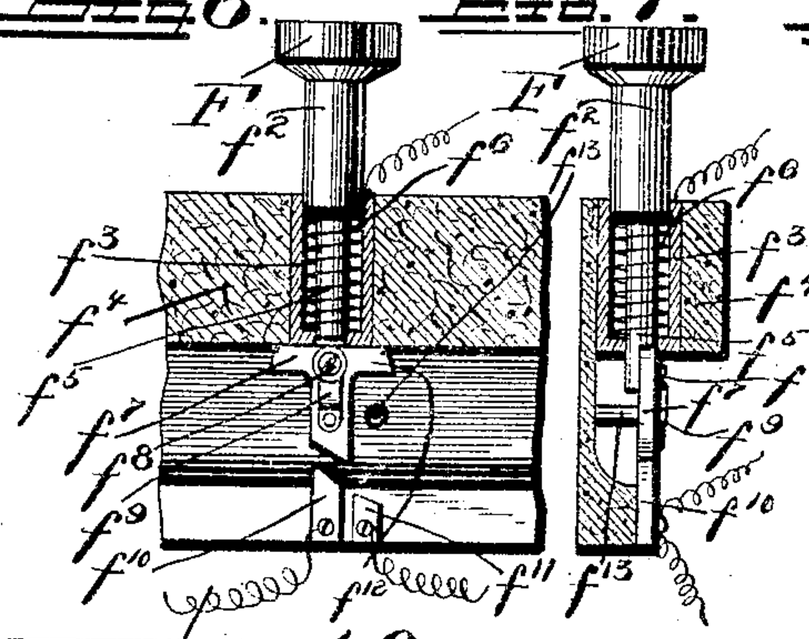


Fig. 7.

Fig. 8.

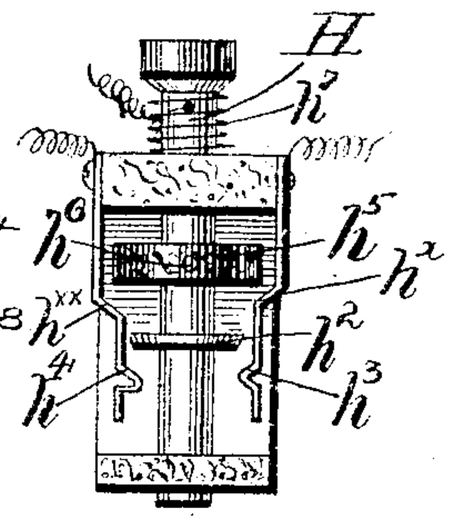


Fig. 9.

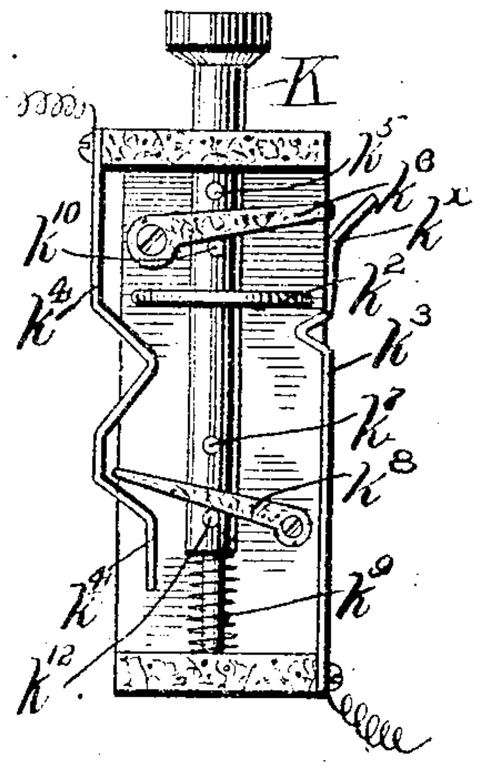


Fig. 10.

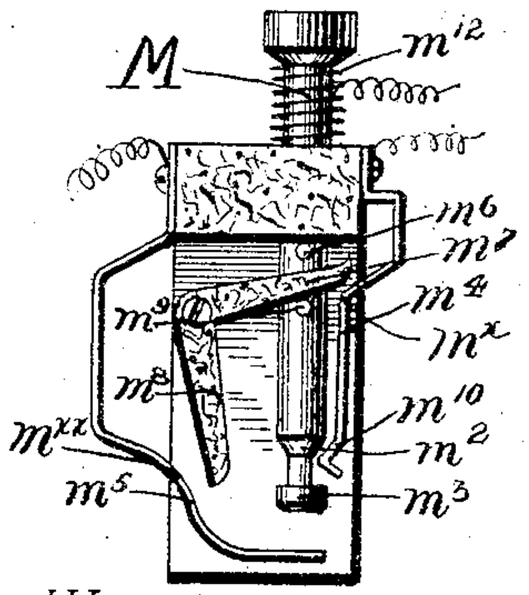
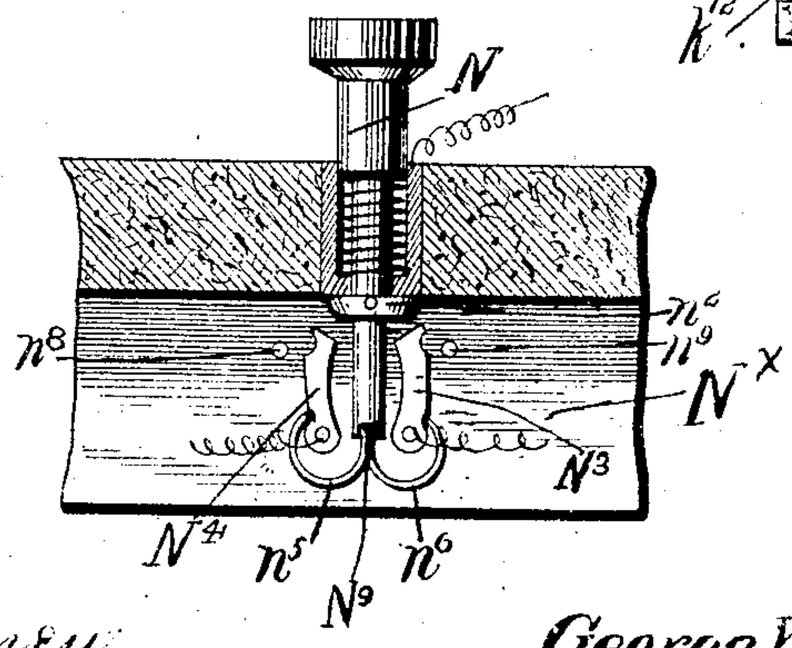


Fig. 11.



WITNESSES:-

Eugene M. Stiney.

Edmund F. Penney

INVENTOR;

George W. Donning.

by R. S. & S. Newton,

his attorney.

No. 840,120. PATENTED JAN. 1, 1907.

G. W. DONNING.

ELECTRICAL TYPE WRITER SELECTING AND OPERATING MEANS.

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6 SHEETS—SHEET 4.

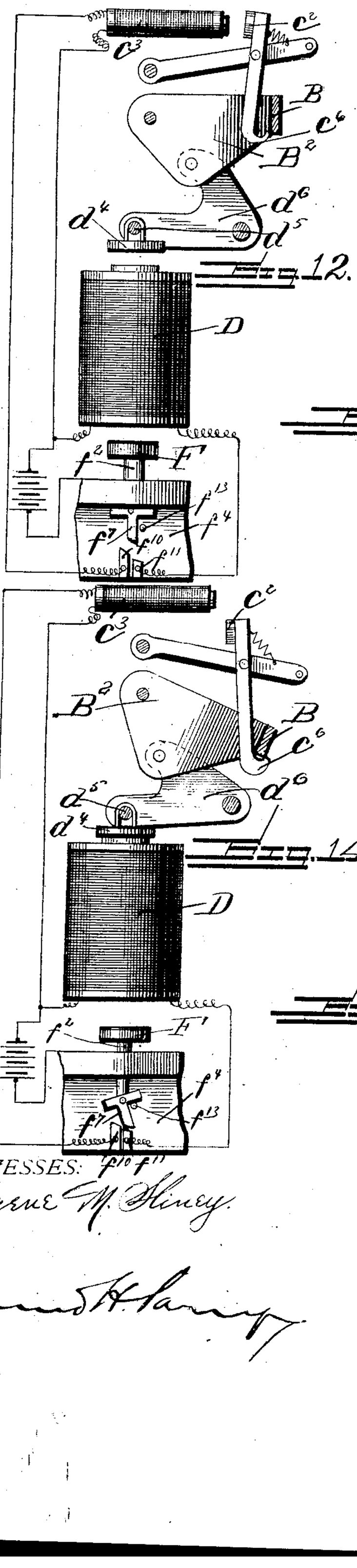
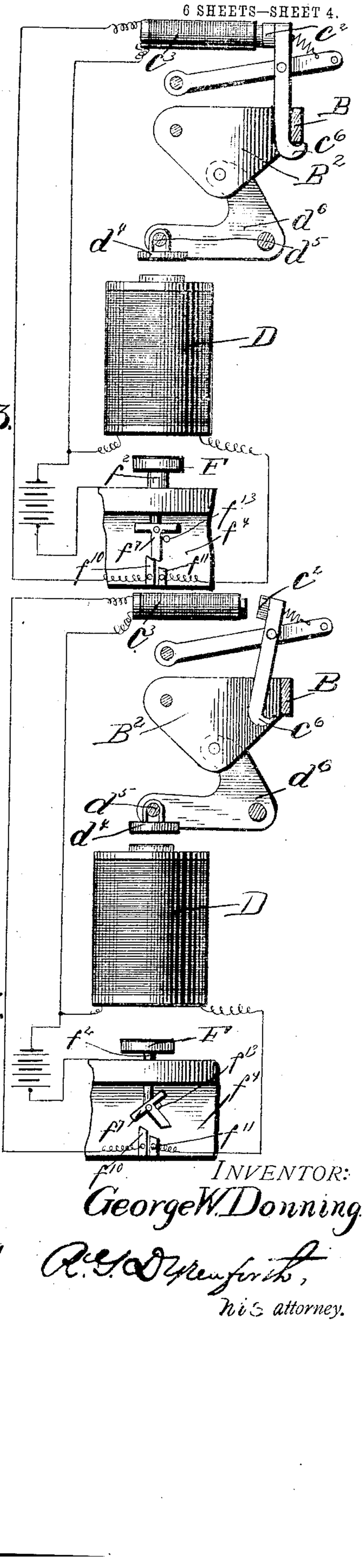


Fig. 12.

Fig. 13.

Fig. 14.

Fig. 15.



WITNESSES:
Eugene M. Hiney.
Edmund H. Lamey

INVENTOR:
George W. Donning.
by R. S. & D. Greenfield,
his attorney.

No. 840,120. PATENTED JAN. 1, 1907.

G. W. DONNING.

ELECTRICAL TYPE WRITER SELECTING AND OPERATING MEANS.

APPLICATION FILED MAY 27, 1903.

6 SHEETS—SHEET 5.

Fig. 16.

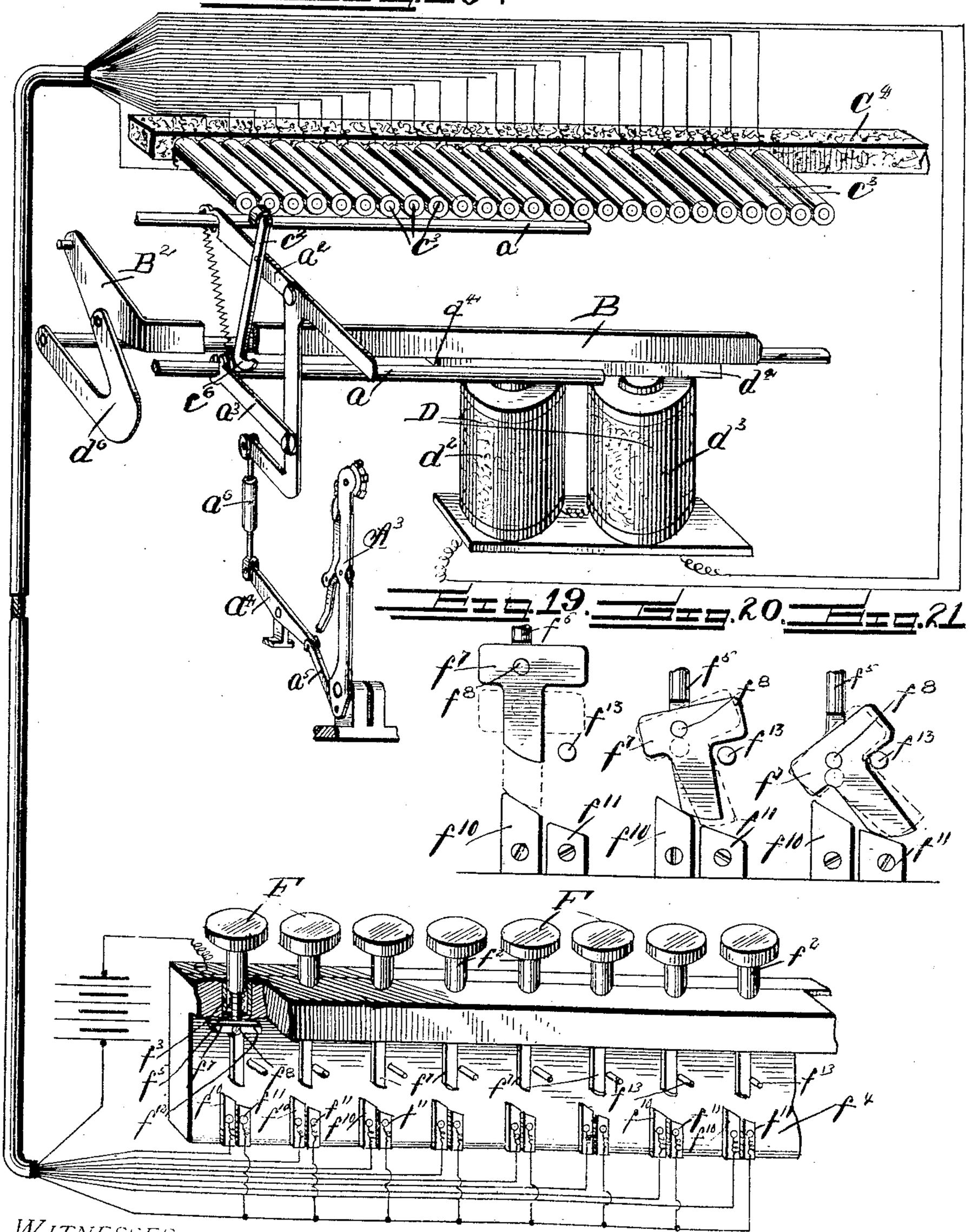


Fig. 19. Fig. 20. Fig. 21.

WITNESSES:
Eugene M. Henry.
Edmund H. Parry

INVENTOR:
George W. Donning.
by R. G. Dyrenforth,
his attorney

No. 840,120. PATENTED JAN. 1, 1907.

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ELECTRICAL TYPE WRITER SELECTING AND OPERATING MEANS.

APPLICATION FILED MAY 27, 1903.

6 SHEETS—SHEET 6.

Fig. 17.

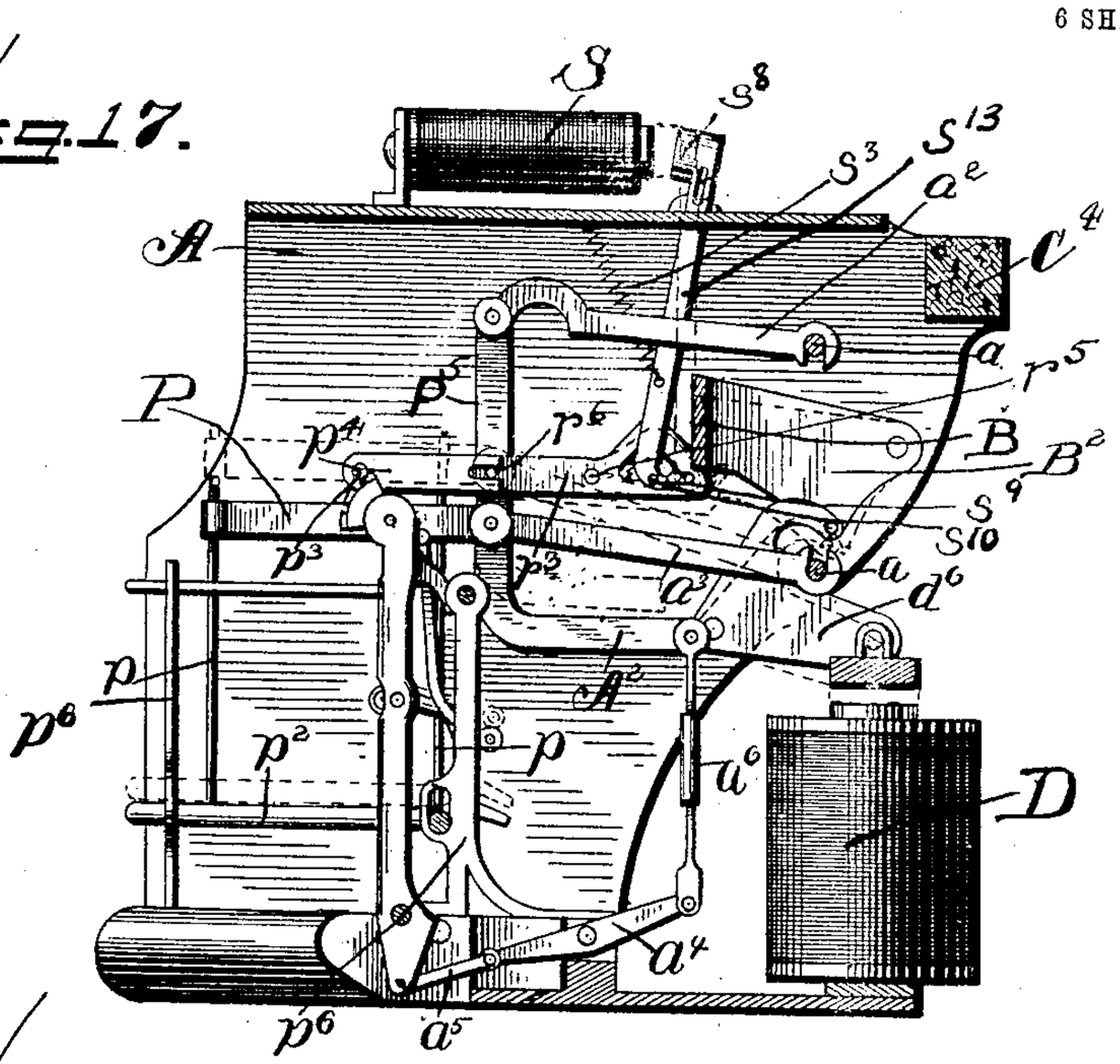
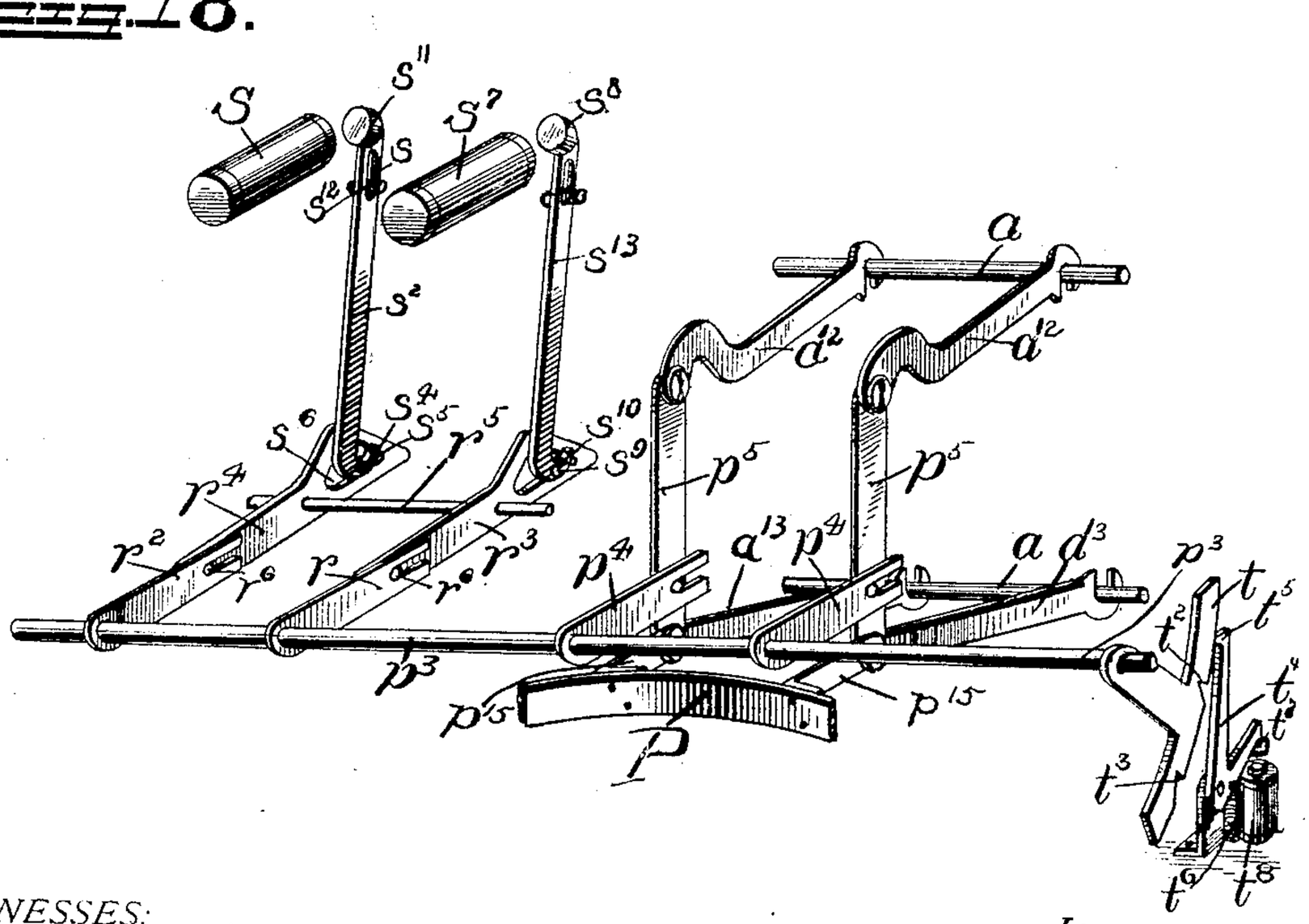


Fig. 18.



WITNESSES:
Eugene W. Stiney.
Emma F. Harney

INVENTOR:
George W. Donning.
by R. G. Dyrenforth,
his attorney.

UNITED STATES PATENT OFFICE.

GEORGE W. DONNING, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO HARRY T. AMBROSE, OF ORANGE, NEW JERSEY.

ELECTRICAL TYPE-WRITER SELECTING AND OPERATING MEANS.

No. 840,120. Specification of Letters Patent. Patented Jan. 1, 1907.

Application filed May 27, 1903, Serial No. 158,962.

To all whom it may concern:

Be it known that I, GEORGE W. DONNING, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Electrical Type-Writer Selecting and Operating Means; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of this invention is to provide an improved means for operating and controlling the writing mechanism for electrically-operated type-writing machines.

Another object is to provide an improved form of selecting and operating magnets and connected parts for operating the type-bars, the type-head-shifting mechanism, ribbon mechanism, its reversal, and other operable parts.

Another object is to provide an improved form of key or switch for controlling and operating such elctrically-operated selecting and operating mechanism.

A further object is to provide key mechanism which will effect a cycle of movement of operative parts, as follows: first, electrical connection with a selecting-magnet to attract an armature-carrying pawl or lever that is suitably fulcrumed and which is thereby positioned for further operation; second, switching of the current to a second magnet to effect electrical connection with a magnet to attract the armature of an actuating power device, during which latter movement the pawl or lever is engaged by the power device and the operative parts (that may be a type-bar or a type-head, a shifting-actuator, or other operating part of a type-writer) are operated for a desired purpose, and, third, to break the circuit in order to cause return of the said parts to normal position, all upon the down movement of the key.

A further object is to provide novel constructions and arrangements for effecting these said operations.

Another object of this invention is to provide an improved form of shifting means especially adapted for use in an electrical type-writer where there is a plurality or a series of characters mounted on a head screwed to each type-bar and a relative movement is necessary between platen or writing surface and the position of the type on the type-bar when the latter is moved to the printing location to cause the characters to be printed.

A further object is to provide in a type-writer type-bars each provided with a movable head carrying a plurality of type, means for effecting a shifting of the type-head thereby to position one of the type on the head for printing, an actuator disposed independent of and contiguous to the type-head for effecting operation of the type-head-shifting mechanism, selecting-magnets arranged to control the type-bar-operating mechanism, selecting-magnets arranged to control and effect operation of the type-head-operating mechanism, selecting-magnets to control and effect operation of the type-head, actuator for shifting the type-head, a universal operating device, and magnets for controlling and operating and controlling the universal power device.

A further object is to provide in a type-writing type-bar provided with a movable head carrying a plurality of type means for effecting a shifting of the type-head thereby to position one of the type on the head for printing, an actuator disposed independent of and contiguous to the type-head for effecting operation of the type-head-shifting mechanism, selecting-magnets arranged to control the type-bar-operating mechanism, selecting-magnets arranged to control and effect operation of the type-head-operating mechanism, selecting-magnets to control and effect operation of the type-head, actuator for shifting the type-head, a universal operating device, magnets for controlling and operating the universal power device, and means for effecting return of the parts to normal position.

Another object is to provide a key construction having a slight depression which will perform a dual function, all independently of the return of the key mechanism to its normal position.

Another object is to provide a key construction which will close the electrical circuit, switch it to another circuit, and finally break the circuit and simultaneously therewith cut out the current, all upon the depression of the key and independently of the return of said mechanism to normal position.

Another object is to provide a type-writer, particularly a type-writer known as a "flat-platen book or commercial" machine, the writing mechanism movable over the writing-surface with a stationary keyboard, thereby obviating the necessity of the operator reaching for or following after the writing mechanism in its manifold movements and locations, as is now necessary in machines of this character. This same key construction may be applied where the writing mechanism or carriage remains in one spot and the book and flat platen are made movable electrically for line and letter spacing, or the writing-mechanism carriage may be operated for letter-spacing and the book and platen moved for line-spacing.

A further object is to provide a key construction which will, when coöperating with an outside source of power and when operated, perform several functions—namely, select, operate and permit return of the operated parts independently of the release of the key. The same may be employed to operate the typing and spacing and ribbon-feeding mechanism, another to shift the type-head and spacing and ribbon-feeding mechanism, another to shift the type-head, and another to shift the ribbon, and another for operating any desired mechanism on the machine.

Another object is to provide a key which will switch the current from one magnet or set of magnets to another magnet or set of magnets without cutting out the current or breaking the first circuit until the second circuit has been closed, the break on second circuit and cutting out of current being made upon the complete depression of the key.

With these objects in view and with others my invention comprehends the construction, arrangement, and combination of parts, as hereinafter described and claimed.

In the accompanying drawings, forming part of this specification, and in which like letters of reference indicate corresponding parts, I have illustrated one of many embodiments of my invention, it being understood that other embodiments thereof and a different arrangement of the parts may be utilized without departing from the spirit of my invention.

In the drawings, Figure 1 is a view in perspective of a type-writing machine, showing my invention. Fig. 2 is a plan view, the top plate being removed. Fig. 3 is a vertical section through the middle of the machine. Fig. 4 is a rear elevation. Fig. 5 shows the circuits and their controlling keys or switches. Fig. 6 shows in front elevation one form of controlling key or switch. Fig. 7 is a side elevation of the key. Figs. 8, 9, 10, and 11 show other forms of keys. Figs. 12, 13, 14, and 15 show the key and operating parts in corresponding consecutive positions. Fig. 16 shows in perspective key mechanism, the selecting-magnets, a pawl, a universal power-bar carrying an armature, a magnet arranged to attract the armature and power-bar for operating in this instance a type-bar. Fig. 17 shows the type-shift mechanism in elevation with its respective selecting-pawl and the universal power-bar-operating device, and Fig. 18 is a fragmentary view showing the latter parts in perspective. Figs. 19, 20, and 21 are diagrams showing movements of contacts.

In the several views, in which the same characters of reference indicate the same parts, in a frame A, Figs. 2 and 3, are secured fulcrum-rods $a\,a$, that carry links $a^2\,a^3$, respectively, which latter support bent levers $A^2\,A^2$, each of the bent levers being supported by a link a^2 and a link a^3, preferably arranged in parallelism. When one of the bent levers A^2 is depressed, it will rock a type-bar A^3 through the medium of a lever a^4 and connecting-links $a^5\,a^6$. A spring d^8, shown as connected at its two ends to the links $a^2\,a^3$ at opposite sides of the pivotal supports of the latter, operates to maintain said links normally inclined upward toward their points of pivotal connection with the bent lever A^2 and to return the links and bent lever to normal position after depression to effect printing.

A universal power-bar B extends between the links a^2 and a^3 and is supported at each end by an arm B^2, pivoted to the side plate of the machine. On each of the links a^2 is pivoted an armature-lever C, carrying an armature c^2, arranged to be attracted by one of a series of electromagnets c^3, carried on a bar c^4 of fiber or other suitable non-magnetic material. A retractile spring c^5 serves normally to retain the armature-lever C in the position shown and away from its operating-magnet. The lower end of each of these armature-levers C has a foot or offset c^6, made hook-shaped, as shown, that when the armature-lever is rocked through the influence of its controlling-magnet will be moved under the universal power-bar B; but when the magnet is again deënergized the retractile spring will move the foot away from its position of engagement with the power-bar.

On the base-plate is mounted an electromagnet D, having, preferably, two coils $d^2\,d^3$, constituting a power-bar-operating magnet. An armature d^4 is suspended within the influence of the magnet D, being swingingly mounted on a bar d^5, that is carried by two levers $d^6\,d^6$, the latter being pivoted to the side of the machine. The levers d^6 each have an arm d^7, that is pivoted to one of the arms B^2. A retractile spring b serves to retain the armature, the universal power-bar, and the connected parts in the position shown in the drawings—that is, away from the electromagnet. Consequently when the electromagnet D is energized the armature will be attracted and rock the arms d^6 and B^2 down-

ward and also the universal power-bar B. Now should any of the selecting-magnets be energized, and thereby bring one of the hooks c^6 under the universal power-bar, and thereupon the current be switched to the electromagnet D, the power-bar will engage the hook c^6 in its downward movement, and thereby operate the corresponding type-bar through the aforesaid connecting members, the hooks preventing disengagement while the parts are being acted on by the power-bar.

Immediately underneath each of the links a^2 is arranged the universal bar E, that rocks an escapement disposed at E^2, and thereby effects the letter-spacing of the writing mechanism in the usual and well-known manner. Hence when any of the links a^2 are depressed to cause the operation of the key-bar the universal bar will be operated.

In order first to energize the proper selecting-magnet and then energize the power-magnet, I have provided a key or switch, as shown in Figs. 6 and 7. The key F comprises a stem f^2, arranged to reciprocate in a metallic bushing f^3, mounted in an insulating-plate f^4, of any suitable material. On the stem f^2 is a reduced portion f^5, that carries a coiled spring f^6, arranged to return the key to its normal position after having been depressed. On the lower portion of the stem f^2 is pivoted a substantially T-shaped terminal arm f^7, being carried on a screw f^8. A plate-spring f^9 is secured on the said terminal member and has a forked extremity embracing the shank of said screw between its head and the face of the arm. This spring is slightly bowed in order to produce a certain amount of friction and thereby retard the movement of the terminal arm on the key-stem. It is to be understood that when the key F has been depressed to a point where the pin f^{13} shall have been operated to rock and force the terminal arm or contact-plate f^7 around to cause the circuit to be broken it will then rise under the stress of its spring f^6 and move upward a short distance before the contact-plate f^7 shall have begun to return to its normal position, and at each stage of its ascent the key-stem f^2 will have moved upward far enough so that in ascending the contact-arm f^7 will pass free of and not touch the stationary terminals f^{10} f^{11}. The contact arm or plate f^7 itself is for this reason preferably not spring-actuated so as to spring said contact-arm f^{10} back into normal position, but operates under friction, through the medium of the spring-plate f^9, to prevent its movement until it is forcibly moved. Upon the key being depressed the terminal arm will first engage a stationary terminal f^{10}. It will be observed from Fig. 5 that the contacting faces of these terminals are arranged obliquely to the path of movement of the key and that they are in substantial parallelism. In proximity to the terminal f^{10} is arranged a third terminal f^{11}, but insulated therefrom. The upper face of this terminal f^{11} is also made oblique and is substantially a continuation of the oblique contacting face of its adjacent terminal. The mechanical operation of this switch is as follows: Upon the key being depressed a short distance the terminal plate or cam will first strike the terminal f^{10}, (see Fig. 13,) whereupon the inclined faces will cause the terminal arm to rock, as shown, and upon further depression of the key the terminal will slide along the engaging face of the terminal f^{10} until it will contact with the terminal f^{11} and leave the terminal f^{10}, as shown in Fig. 14. A slightly-further depression of the key will cause the terminal arm to rock still more on its pivot, and its contacting face will have a sliding engagement with the terminal f^{11}, as shown in Fig. 14. A slightly-further depression of the key will cause the arm f^{12} of the terminal to strike a stationary pin f^{13}, that will rock the arm still further and cause it to break contact with the terminal f^{11}, thereby breaking the current, deënergizing the magnet, and permitting return of operated parts irrespective of release of key. Upon the key being released its retractile spring will force the same upward. The terminal arm will be partially returned to normal position by the said stop-pin on its return movement. When the arm f^{12} strikes the insulating-plate f^4, the further upward movement of the same will cause the terminal arm to be rocked until it resumes its normal position in alinement with the path of movement of the key-stem.

One pole of a suitable source of electricity is connected with all of the key-bars. A conductor from the other pole of said source is first passed around a selecting-magnet c^3 and is then connected with the terminal f^{10}, there being one of the keys F, as above described, for each of the selecting-magnets. Another conductor, led from the said last-mentioned pole of the source of electricity, is connected with the power-magnets D and is then connected with the terminal f^{11}. Consequently when any of the keys are depressed it will be observed that a circuit including the appropriate selecting magnet is first closed, which will energize the magnet to move its lever to bring the operating parts, hereinbefore described, into position of engagement. The further movement of the key will position the terminal arm f^7 upon the terminal f^{11}, and the current is transferred to that circuit including the terminal f^{11} and the power-bar-operating magnet D. The energizing of the magnets is so timed that the foot of the selecting-magnet lever remains in its engaging position until it is engaged and moved by the power-magnet depressing the universal power-bar B. A slightly-further movement of the key will cut

out the power-bar and operating-magnet, so that all parts operated electrically may return or be returned to their normal positions by the retractile springs. It will be observed that even though the key be retained in its depressed position the circuits are opened and the type-bars, &c, are at once returned to their normal position, and should another key be depressed before the said key is released the movement of the type-bar resulting therefrom will not cause the latter type-bar to strike the former, as is the case in the usual form of type-writer when one key is operated before another key is released. When the said key is released, since the terminal arm is not rocked back to its normal position until the key-stem has moved upward a short distance there will be no contact or even approximation of the terminals, and consequently neither of the circuits will be closed until a subsequent depression of the key.

In practice I find that I can constitute the power-electromagnet C of the same or of different resistance than that of the selecting-magnet c^3. In some instances I find it is desirable to have the resistance of the power-magnet less than that of the selecting-magnet, though I do not wish to limit myself to constituting these magnets of different resistance. When the power-magnet is of less resistance, it will be understood that when the terminal arm f^7 moves over the terminal f^{10} to the terminal f^{11} the moment that this terminal arm f^7 bridges the terminals f^{10} f^{11} the current will naturally flow in greater strength through the terminal f^{11} by reason of its inclusion in a circuit of less resistance than that including the terminal f^{10}. However, it is to be understood that the movement of the terminal arm f^7 from the terminal f^{10} to f^{11} is so rapid that movement of the parts will be only as desired—that is to say, the selecting-magnet will have been caused to perform its function of directing its respective pawl to position its hook in the path of the power-bar before the power-bar begins to move. When the current is thrown into the terminal f^{11}, the current will immediately be through the terminal f^{11} to the power-magnet to bring that into operation, and on the further movement of the terminal arm f^7 on the terminal f^{11} this will effect complete operation of the power-magnet. In Figs. 19, 20, and 21 I have illustrated the various positions of the terminal arm f^7 in its path of movement, beginning with the terminal f^{10}, then leaving the same and simultaneously taking upon the terminal f^{11}, and finally leaving that terminal f^{11} and breaking the circuit. The important, desirable, and intended purpose of this construction is the avoidance of the creation of a multiple circuit when the terminal arm f^7 is pursuing its movement while in contact with the terminal f^{10} and then the terminal f^{11}. In this respect particularly my invention is distinguished and differentiated from the present at. This has been accomplished by isolating the selecting-magnets and their respective circuits from the operating or work magnet and its circuit. It will be readily understood that the selecting-magnets, by reason of their required number and location, will be very small whereas the work or operating magnet is much larger to develop the requisite power to effect movement of a part such as a type-bar, shifting and spacing mechanisms, &c. It is obvious that if the wiring on the selecting-magnets is to give resistance equal to that of the work-magnet, as for permitting their working in multiple circuit, this wiring on these selecting-magnets would necessarily have to be of such fine gage, by reason of the limited space permissible for the magnet, that it would fuse under the action of a current sufficient to energize the work-magnet.

In Fig. 8 is shown a modified form of key, in which the key-stem H is connected with one pole from the battery and when depressed first makes contact through a disk h^2 with a flexible terminal h^3 and closes the selecting-circuit, energizing the selecting-magnet, and attracting the lever and armature. A further movement of the stem causes the insulating-disk h^5 to strike the flexible terminal h^3 at $h^\times$ and force the same away from the disk h^2. Instantaneously therewith or just before the disk h^2 contacts with flexible terminal h^4, thereby switching the current from one circuit, which is the selecting-circuit, to the other, which is the power-magnet circuit, and energizing the operating-magnets, which, attracting the armature on the power-bar, cause the other parts of the machine to operate. A further depression of the stem H carries the disk h^2 below the projection on the flexible terminal h^4, and instantaneously therewith the insulating-disk h^5 strikes the flexible terminal h^4 at $h^{\times\times}$ and forces the same away from disk h^2, thereby breaking the circuit and cutting out the current, permitting the various operating parts to return to their normal position without releasing the key carried on stem H. The insulating-disk h^5 now being forced down between the flexible terminals is held there until after the disk h^2 has passed by the contacting points on flexible terminals h^3 and h^4. The pin h^6 carried by stem H having reached the top of the slot provided in the insulated disk h^5, kicks or draws out the disk h^5 from its temporary position, and upon the full return of the stem H to its normal position the disk h^5, is withdrawn to its normal position and the flexible terminals are permitted to return to their normal positions, so as to perform the same function upon next depressing the key. When the key or stem H is fully depressed, the break is made, and precisely the

same result is obtained as by construction shown in Figs. 6 and 7. It is to be understood that the insulating-disk h^5 is slightly broader than the stationary contacting disks h^2 and h^5, being slidably mounted on the stem H by reason of a slot transverse of the disk and a pin h^6 in the stem and working in the slot of slidable disk h^5. The position of the disk and the shape of the flexible terminals are so arranged and timed that the said disk h^5 takes up first one terminal and then the other after disk h^2 has made its contact first with one terminal and then the other, and the disk h^5 will at the proper time force the flexible terminal away from the disk h^2, so that when the key and stem H are retracted by their spring h^7 the insulating-disk will be retained by its engagement with the two flexible terminals until the conducting-disk h^2 shall have passed. It is at this point where the pin in the stem withdraws the insulating-disk upward and away from the flexible terminals, as already described. The insulating-disk h^5 has a sliding movement on the stem H by reason of a pin h^6 in the stem working in a slot in the disk. Hence when the key is retracted by its spring h^7 the insulating-disk will be retained by its engagement with the two flexible terminals until the conducting-disk h^2 shall have passed the projections on these terminals, whereupon the insulating-disk will be drawn upward again. Thus there will be no closure of either of the circuits on the return movement of this key.

In the modification shown in Fig. 9 the key-stem K carries a conducting-disk k^2, that in its downward movement first contacts with the projection on the flexible terminal k^3, closing the circuit through the selecting-magnet. A further movement causes the pin k^5 to act on the insulated lever k^6 to bear against the portion $k^\times$ of the terminal k^3, thus breaking the circuit thorugh the terminal, and then the disk k^2 contacts wi h a projection on the terminal k^4, closing the circuit through the power-magnet. The further movement of the key-stem will cause a pin k^7 on the key-stem to strike an insulating-lever k^8, which latter will strike the flexible terminal k^4 and move it out of range of the disk k^2, cutting out the power-magnet. Now when this key-stem is returned by its spring k^9 the insulating-levers k^6 and k^8 will not be at once moved, but will retain the flexible terminals with their projections out of engaging position with the disk k^2 until the latter shall have passed beyond these projections. Thereupon a pin k^{10} will strike the lever k^6 and cause it to release the terminal k^3. At the same time a pin k^{12} will strike the insulating-lever k^8 and cause it to release the terminal k^4. Thus there is no contact of the terminals on their return stroke.

Another modification of key is shown in Fig. 10, in which the key-stem M has a beveled portion m^2 and at the lower end a head m^3. When the key is depressed, the face m^2 will strike an offset m^{10} on a flexible terminal m^4, thereby energizing a selecting-magnet. A further movement of the stem will cause a pin m^6 on the stem to strike and move the arm m^7 of a bent lever of insulating material, which arm m^7 will strike an offset $m^\times$ and move the blade m^4 away from the face m^2. Simultaneously therewith the head m^3 will engage a flexible blade m^5, thereby cutting out the selecting-magnet and energizing the power-magnet. A further movement of the key-stem will cause the arm m^8 of the bent lever to strike the portion $m^{\times\times}$ of the blade m^5 and move it away from the head m^3, thereby opening the circuit of the power-magnet. Now the arms of the bent lever will engage the blades, so that there is an end thrust that will serve to retain these members in this position with all the terminals separated. Upon the key being released the spring m^{12} will return the stem; but the blades will be both held out of engagement with the stem until the head and beveled face have moved above the position of engagement with the stem, whereupon a pin m^9 will strike the arm m^7 of the bent lever and move this lever back to its normal position, releasing the terminal blades.

In the modification shown in Fig. 11 the stem N carries a metal plate n^2. On a plate $N^\times$ are pivoted terminals N^3 N^4, that have connected therewith springs n^5 n^6, respectively. The other ends of these springs are connected to an insulated extension N^9 of the stem N. When the key is depressed, the plate n^2 first makes contact with the lever N^3, thus energizing the selecting-magnet. Thereupon the plate makes contact with the other terminal N^4, thereby energizing the power-magnet. A slightly further depression of the insulated extension N^9 causes it to relieve the tension on the springs n^5 n^6, to which it is connected, and when the stress of the springs against the levers N^3 N^4 is removed these levers will fly away from the plate n^2 and against the stop-pins n^8 n^9, and thus, being out of contact with the plate n^2, the circuit is broken. It is to be understood that, as shown, the springs n^5 and n^6 are in their normal position for holding the pivoted terminals N^3 N^4 in line or in the path of the plate n^2. Now by reason of the downward movement of the stem N and with it one end of each of the springs there will be an outward movement of the terminals N^3 N^4, carrying with them the other ends of these springs n^5 n^6, and thus the line of draft or pull of the spring is carried beyond the pivotal center of the terminals, so that the tendency of these springs is to withdraw the terminals from contact with their plate n^2. Then they are held in this withdrawn position until, by the returning of the stem to nearly its normal

position, it (the stem) will have carried the plate n^2 out of reach of the terminals before the line of draft of the springs again passes the pivotal centers of the terminals N^3 N^4 and returns them to their normal position.

Referring now particularly to Figs. 17 and 18 of the drawings, showing the type-shifting means, a semiring P is rigidly connected with a curved type-head-shifting bar p^2 by rods p p. A shaft p^3 is rotatably mounted in the frame and extends from side to side. On this shaft is secured a pair of arms p^4 p^4, that are pivotally connected with arms p^5 p^5, which in turn are pivotally connected with parallel links a^{12} a^{13}, similar to links a^2 a^3. The semiring P is rigidly connected, by means of arms p^{15}, with the vertical arms p^5. Hence when this shaft p^3 is rocked it will raise and lower the semiring, the latter being guided in brackets p^6. On the shaft p^3 are rigidly secured arms r r^2. A pair of levers r^3 r^4 is mounted on a short shaft r^5, secured to the side of the machine. Each of these levers carries a pin r^6 r^6, that engage, respectively, forked portions at the extremities of the levers r r^2. Hence when the shaft p^3 is rocked the levers r^3 r^4 will be rocked also. On the top of the machine is mounted an electromagnet S, that serves to rock an armature-lever s^2, that is pivotally mounted on the said top. This lever has a slot s, in which slides its pivotal pin s^{12}, and a retractile spring s^3 tends to move the lever upward for the limit of this slot. The lower extremity of the armature-lever has a foot or offset s^4, that, when the armature is attracted by its magnet, will be rocked against the tension of said spring and be drawn immediately under the universal power-bar B. On the lower portion of this armature-lever is a pin s^5, that rides in a slot s^6 in the lever r^4, which slot is shaped as shown. Another electromagnet s^7 is mounted alongside of the electromagnet S and has an armature s^8, which is mounted on an armature-lever s^{13}, similarly to the armature s^{11}, said lever carrying a pin s^9 on its lower offset extremity s^{10}. The latter pin engages a slot in the lever r^3.

The operation of the type-shift parts is as follows: When the magnet S is energized, it will rock its armature-lever and move the foot s^4 under the power-bar B. Now upon the power-magnet D being energized its armature and connected levers will draw the power-bar downward, which will strike the foot of the armature-lever and carry it downward. This latter movement will cause the pin s^5 on the armature-lever to rock the lever r^4, and hence the shaft p^3, which latter will raise the shifting-bar P for a certain distance, which may be its full range of movement, and when released the retractile springs will return the parts to their former positions. Now when the other magnet s^7 is energized it will operate in the same manner as just described; but the armature-lever s^8 is so constructed that its foot will not be engaged by the power-bar until the latter shall have descended for a part of its movement, and then the armature-lever will be engaged and carried downward. Consequently the semiring P will be raised only for a part of its full range of movement, which may be one-half by proper adjustment of the armature-lever.

In order to retain the shift member P and its operating parts in either of the positions to which shifted, I provide a segment-arm t, secured to the shaft p^3, which segment has notches t^2 t^3. A bent lever t^4 has a lug t^5, that is caused to engage these notches by a spring t^6 when the shaft has been rocked to its said respective positions. The lever t^4 carries an armature t^7, that is attracted by an electromagnet t^8. This latter, when energized, will serve to move the lever out of its notch in the segment-bar, and thereby release the shaft p^3 permitting the parts to return to their normal positions.

It will be observed that the slot s^6 in the lever r^4 has a notched portion at which the pin s^5 on the armature-lever normally lies. The effect of this is that when the other armature-lever is operated and the power-bar rocked the other lever r^3 will be engaged by its armature-pin; but when the lever r^4 is rocked by this movement of the lever r^3 the pin r^5 will move freely in this enlargement of the slot, and consequently the lever r^4 will not draw the armature-lever s^2 downward. It will also be noticed that the lever r^4 has its slot shaped with the same enlargement, for similar reasons. Hence when the lever s^2 is drawn downward the lever r^3 will not draw its engaging armature downward.

While I have shown and described my invention as applied to a type-writer for operating a type-bar to cause it to move to the printing position and also as applied for effecting shifting of the type-head to position one of a plurality of type characters thereon, yet it is to be understood that it has application for effecting shifting of the ribbon mechanism to move the ribbon pathwise and for effecting reversal of the ribbon traverse; furthermore, for effecting return of the carriage to the starting-point; for effecting return or movement of the type-carriage frame, as for line-spacing, and for effecting movement or operation of such other parts of the machine as may be desirable. The important and desirable and intended purpose of the construction characterizing this invention is the avoidance of the creation of a multiple circuit when the terminal arms f^7 in the form of construction illustrated in Figs. 1 to 7, inclusive, is in the course of its movement while in contact; first, with the terminal f^{10}, and then with the terminal f^{11}. In this respect particularly my invention is distinguished and differentiated from the pres-

ent art. The result referred to is described by isolating the selecting-magnets and their respective circuits from the operating or work magnet and its circuit. It will be readily understood that the selecting-magnets by reason of their required number and location must necessarily be very small, whereas the work or operating magnet is preferably much larger, so that it will develop the requisite power to effect movement of the movable or selected part, such as a type-bar, &c. It is obvious that to produce a resistance equal to that of the work or operating magnet, as for permitting the selecting and work magnet to work in multiple circuit, the wiring on these selecting-magnets would necessarily be of such fine gage (by reason of the limited space permissible for disposing such magnets) that such wiring would fuse under the action of a current like that utilized to energize the work-magnet.

My invention may also be used in situations other than in type-writing machines, as in linotype-machines and the like.

Without limiting myself to the construction and arrangement of parts hereinbefore set forth, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electrical type-writer, the combination with a series of movable members, and a source of electric current, of a universal power-bar, actuating means therefor, selective devices associated with the several movable members, and a selective operating device for each member constructed successively to complete the circuit from said source to energize the corresponding selective device and then to switch the current to energize the power-bar-actuating means.

2. In an electrical type-writer, the combination with a series of movable members, and a source of electric current, of a universal power-bar, an actuating-electromagnet therefor, selective electromagnets associated with the several movable members, and a selective operating device for each member constructed successively to complete the circuit from said source to energize the corresponding selecting-magnet and then to switch the current to energize the power-bar-actuating magnet.

3. In an electrical type-writer, the combination with a series of type-bars, and a source of electric current, of a universal power-bar, an actuating-electromagnet therefor, selective electromagnets associated with the several type-bars, and a selective operating-key for each type-bar constructed when depressed to energize the corresponding selecting-magnet and then to switch the current to energize the power-bar-actuating magnet.

4. In an electrical machine, the combination with a selecting and operating device, of a series of type-bar-movable members, a series of operating-levers arranged to operate the movable members respectively, a pair of links arranged to support each of said operating-levers, an armature-lever pivoted on one of each of said pair of links, an armature on each of said armature-levers, an electromagnet arranged to operate each of said armatures, a universal power-bar, an armature connected with the power-bar, an electromagnet arranged to move said armature and thereby rock the power-bar, a lug on each of said armature-levers and arranged to be moved into the path of movement of the power-bar when its armature is attracted by its engaging magnet, means for operating any one of the selecting-magnets, and means operating in succession to the selecting-magnet-operating means for energizing the magnet to rock the said power-bar, substantially as described.

5. In an electrical machine, the combination with a selecting and operating device, of a series of type-bar-movable members, a series of operating-levers arranged to operate the type-bar-movable members respectively, a pair of links arranged to support each of said operating-levers, an armature-lever pivoted on one of each of said pairs of links, an armature on each of said armature-levers, an electromagnet arranged to operate each of said armatures, a universal power-bar, an armature connected with the power-bar, an electromagnet arranged to move said armature and thereby rock the power-bar, a lug on each of said armature-levers and arranged to be moved into the path of movement of the power-bar when its armature is attracted by its engaging magnet, and means for first energizing the selecting-magnet and then successively energizing the power-bar-operating magnet, substantially as described.

6. In an electrical machine, the combination with a selecting and operating device, of type-bars carrying a plurality of characters, a member arranged to be shifted and thereby cause the proper character on each type-bar to occupy printing position when the type-bars are operated, and a universal power-bar, of means for causing the shiftable member to be shifted by the movement of said power-bar, said selecting and operating device comprising means arranged to be projected to a plurality of operating positions and constructed, when it is in its initial position, to effect selection of a printing type-bar and, then, when in a second operating position, to effect operation of said power-bar, substantially as described.

7. In an electrical machine, the combination with a selecting and operating device, of type-bars carrying a plurality of characters, a member arranged to be shifted and thereby cause the proper character on each type-bar to occupy printing position when

the type-bars are operated, and a universal power-bar, of means for causing the shiftable members to be shifted by a normal movement of said power-bar, said selecting and operating device comprising means arranged to be projected to a plurality of operating positions and constructed, when in its initial position, to effect selection of a printing type-bar and, then, when in a second operating position, to effect operation of said power-bar, substantially as described.

8. In an electrical machine, the combination with a selecting and operating device, of a member arranged to be shifted and thereby cause different characters to be printed when the keys are operated, and a universal power-bar, of means for causing the shiftable member to be shifted from its normal position by the movement of the power-bar, means for locking said member in its shifted positions, and means for returning said member to its normal position, substantially as described.

9. In an electrical machine, the combination with a selecting and operating device, of a set of type-bar members, each carrying a plurality of type, a member arranged to be shifted and thereby cause the different type on the keys to print when the type-bar is operated, a universal power-bar, and means for causing the shiftable member to be shifted by the movement of the power-bar, substantially as described.

10. In an electrical machine, the combination with a selecting and operating device, of a set of type members, each carrying a series of type, a shiftable type-head-shifting member arranged to be shifted and thereby cause different type on the type-bar to print when the type member is operated, a universal power-bar, and means for causing the shiftable member to be shifted by the movement of the power-bar, said selecting and operating device comprising means arranged to be projected to a plurality of operating positions and constructed, when projected to its initial operating position, to effect a selection and, when projected to its second operating position, to effect operation of the power-bar, substantially as described.

11. In an electrical machine, the combination with a selecting and operating device, of a type-carrying member arranged to be shifted and thereby cause different characters to be printed when the keys are operated, a shiftable type-head-actuating member, a universal power-bar, an electromagnet arranged to operate the power-bar, means for causing the shiftable member to be shifted by the movement of the power-bar, an electromagnet for controlling said latter means, and an operating-key arranged to be projected to a plurality of operating positions and constructed, when projected to its initial operating position, to cause said latter magnet to be energized and then successively, when projected to a second operating position, to cause the said other magnet to be energized, substantially as described.

12. In an electrical machine, the combination with a selecting and operating key device, of a shiftable type-carrying member arranged to be shifted to a series of positions and thereby cause different characters to be printed when the key device is operated, a shiftable type-head-actuating member, a universal power-bar, means for carrying the actuating member to be shifted from its normal position a certain distance to a different position by the movement of said power-bar, and means operating successively for causing the actuating member to be shifted by said power-bar a certain additional distance to a still different position, the said key device comprising means arranged to be projected to its initial operating position, to effect a selection and, when projected to its second operating position, to effect operation of said power-bar, substantially as described.

13. In an electrical machine, the combination with a selecting and operating key device, of a shiftable type-carrying member arranged to be shifted to a series of positions and thereby cause different characters to be printed when the key device is operated, a shiftable type-head-actuating member, a universal power-bar, an electromagnet arranged to operate said power-bar, means for carrying the actuating member to be shifted from its normal position a certain distance to a different position by the movement of said power-bar, an electromagnet arranged to control said last-mentioned means, means operating successively for causing the actuating member to be shifted by said power-bar a certain additional distance to a still different position, and an electromagnet arranged to control said shifting means, the said key device comprising means arranged to be projected to its initial operating position, to effect a selection and, when projected to its second operating position, to effect operation of said power-bar, substantially as described.

14. In an electrical machine, the combination with a selecting and operating key device, of a shiftable type-carrying member arranged to be shifted to a series of positions and thereby cause different characters to be printed when the key device is operated, a shiftable type-head-actuating member, a universal power-bar, an electromagnet arranged to operate said power-bar, means for carrying the actuating member to be shifted from its normal position a certain distance to a different position by the movement of said power-bar, an electromagnet arranged to control said last-mentioned means, an operating-key arranged to be projected to a plurality of operating positions and, when pro-

jected to its initial operating position, first to cause said first-mentioned magnet to be energized and, thereupon, successively, when projected to its second operating position, to cause the power-bar magnet to be energized, and a second operating-key arranged first to cause the second-mentioned shift-controlling magnet to be energized and thereupon, successively, to cause the power-bar magnet to be energized, substantially as described.

15. The combination of a rock-shaft, a shiftable member arranged to be shifted by the oscillation of said shaft, a lever secured to said shaft, a lever having one end pivotally connected with said lever and having a slotted portion in its other extremity, an electromagnet, an armature-lever arranged to be engaged by said magnet and having a slotted portion by which it is pivotally supported, a retractile spring connected to said armature-lever and tending to retain it with its pivot at one extremity of said slot, a pin on the other extremity of said armature-lever and engaging said slotted lever at its slotted portion, a universal power-bar, means for rocking the power-bar, said armature-lever having a foot arranged to be moved into the path of movement of said power-bar when the armature-lever is attracted by its magnet, substantially as described.

16. The combination of a rock-shaft, a shiftable member arranged to be shifted by the oscillation of said shaft, a lever secured to said shaft, a lever having one end pivotally connected with said lever and having a slotted portion in its other extremity, an electromagnet, an armature-lever arranged to be engaged by said magnet and having a slotted portion by which it is pivotally supported, a retractile spring connected to said armature-lever and tending to retain it with its pivot at one extremity of said slot, a pin on the other extremity of said armature-lever and engaging said slotted lever at its slotted portion, a universal power-bar, means for rocking the power-bar, said armature-lever having a foot arranged to be moved into the path of movement of said power-bar when the armature-lever is attracted by its magnet, a segment-bar secured to said shaft and containing notches in its periphery, a notched lever arranged to engage the notched portion of the segment when the lever has been rocked and lock the shaft in this position, an armature on said latter lever, an electromagnet arranged to rock said latter lever and cause it to release the said segment and shaft, substantially as described.

17. The combination of a rock-shaft, a shiftable member arranged to be shifted when the shaft is oscillated, a pair of arms secured to said shaft, a pair of levers each pivotally connected with one of said arms, each of said levers having a slotted portion in its other extremity, an electromagnet, an armature-lever arranged to be rocked by said magnet, said armature-lever having a slotted portion at which it is pivotally supported, a retractile spring connected to said armature-lever, a pin on said armature-lever arranged to engage one of said slotted levers at its slotted portion, a power-bar, means for rocking the power-bar, a foot on said armature-lever arranged to be moved into the path of movement of the power-bar when said armature-lever is rocked by its magnet, a second electromagnet, a second armature-lever arranged to be rocked by the second electromagnet, said latter lever having a slotted portion at which it is pivotally supported, a spring arranged to retract said second armature-lever, a pin on said second armature-lever arranged to engage said other slotted lever at its slotted portion, a foot on said second armature-lever arranged to be moved into the path of movement of said power-bar when the armature-lever is rocked by its magnet, said armature-levers having their respective feet so relatively arranged that they will be rocked different distances by the normal movement of the power-bar, substantially as described.

18. The combination of a rock-shaft, a lever secured to said shaft, a shiftable member arranged to be shifted by said shaft when oscillated, a lever secured to said shaft, a pivoted lever connected with said latter lever at one end and having a slotted portion at its other end, an electromagnet, an armature-lever arranged to be rocked by said magnet, said armature-lever having a slotted portion at which it is pivoted, a retractile spring connected to said armature-lever, a pin on said armature-lever arranged to engage said slotted lever at its slotted portion, a universal power-bar, a second electromagnet arranged to operate said power-bar, a foot on said armature-lever arranged to be brought into the path of movement of said power-bar when the armature-lever is rocked by its magnet, a source of electricity, a circuit including said current source and said first electromagnet, a circuit including said current source and said power-bar-operating magnet, and a switch arranged first to close the first-mentioned circuit and thereafter close the last-mentioned circuit, substantially as described.

19. In an electrical type-writer, the combination with a series of movable members, and a source of electric current, of a universal power-bar, actuating means therefor, selective devices associated with the several movable members, a selective operating device for each member constructed successively to complete the circuit from said source to energize the corresponding selective device and then to switch the current to energize the power-bar-actuating means, and means car-

ried by the several movable members for retaining them in operative relation to the power-bar while being actuated thereby.

20. The combination of a series of type-carrying members, a series of operating-levers arranged to operate said members respectively, a pair of parallel links pivotally supported at one end and pivotally supporting said levers at the other end, an armature-lever pivoted on one of each of said pair of links, an armature on each of said armature-levers, an electromagnet arranged to operate each of said armatures, a universal power-bar, an armature connected with the power-bar, an electromagnet arranged to move said armature and thereby rock the power-bar, a hook-shaped lug on each of said armature-levers and arranged to be moved into the path of movement of the power-bar when its armature is attracted by its engaging magnet, means for operating any one of the selecting-magnets, and means for energizing the magnet successive to the operation of the selecting-magnets, to rock the said power-bar, substantially as described.

21. The combination of a series of movable members, a series of operating-levers arranged to operate the members respectively, a pair of parallel links pivotally supported at one end and pivotally supporting said levers at the other end, an armature-lever connected with each of the movable members, an armature on each of said armature-levers, an electromagnet arranged to operate each of said armatures, a universal power-bar, an armature connected with the power-bar, an electromagnet arranged to move said armature and thereby rock the power-bar, a hook-shaped lug on each of said armature-levers and arranged to be moved into the path of movement of the power-bar when its armature is attracted by its engaging magnet, and means operating successively for first energizing the selecting-magnet and thereupon energizing the power-bar-operating magnet, substantially as described.

22. In an electrical machine, the combination with certain moving parts and a series of latches, one connected with each said part, of a selecting-magnet arranged to control each said moving part, an operating-bar arranged to actuate the several moving parts each through its appropriate connecting-latch, an electromagnet arranged to actuate the said bar, a circuit for the latter magnet, a circuit for each said selecting-magnet, a key for each selecting-magnet comprising a reciprocable striking member and a subjacent terminal member, each key being arranged to be projected to a plurality of operating positions and constructed, when projected to its initial operating position, to close the circuit including the appropriate selecting-magnet, and then successively when projected to a second operating position, to switch the current to the circuit of the bar-magnet, substantially as described.

23. In an electrical machine, the combination with a series of working parts, a series of selecting-magnets, each arranged to move one of said parts into a certain position, and an operating-bar, of an electromagnet arranged to engage and operate any of the said working parts that have been positioned by said magnet, a circuit for each selecting-magnet, a circuit for the bar-operating magnet, a key for each selecting-magnet, comprising a reciprocable striking member and a subjacent terminal member, said key to be projected to a plurality of operating positions and constructed, when depressed to its initial operating position, to close the circuit of the appropriate selecting-magnet and, upon further depression, to its second operating position to switch the current to and through the bar-operating magnet and thereby operate the bar, substantially as described.

24. In an electrical type-writer, the combination with a selecting and operating device, of a plurality of movable members, a power-bar, an operating member having a single movable terminal thereon, and a member carrying a plurality of terminals, one of said terminals connecting with selecting-magnets, and other of said terminals connecting with the operating device.

25. In an electrical type-writer, the combination with a selecting and operating device, of a plurality of movable members, a power-bar, an operating member having a single movable terminal thereon, and a member carrying a plurality of coöperating terminals, said terminals having a sliding engagement one with the other.

26. In an electrical machine, the combination with a selecting and operating device, of a type-carrying member arranged to be shifted to a series of positions and thereby cause different characters to be printed when the members are operated, of a universal power-bar, an electromagnet arranged to operate the power-bar, means for causing the shiftable member to be shifted from its normal position to another, predetermined position, by the movement of the power-bar, an electromagnet arranged to control said shifting means, and means arranged to be projected to a plurality of operating positions, and, when in its initial operating position, to position said shiftable member for actuation and, when in a second operating position, to operate said universal power-bar and effect its engagement with said shiftable member, substantially as described.

27. In an electrical machine, the combination with a selecting and operating device, of a series of movable members, a universal power-bar, and an operating member having a single terminal thereon, a stationary member having a plurality of terminals thereon,

said single terminal-carrying member being arranged to have a plurality of operating positions and constructed to engage, in sequence, one and then the other of said plurality of terminals to establish distinct electrical circuits and operate said movable member and power-bar, respectively, and, then, break contact with the same to open the circuits, and a key device arranged to be projected to effect movement of the single terminal, substantially as described.

28. In an electrical machine, the combination with a selecting and operating device, of a series of movable members, a universal power-bar, an operating member having a single terminal thereon, a stationary member having a plurality of terminals thereon, said single terminal-carrying member being arranged to have a plurality of operating positions and constructed to engage, in sequence, one and then the other of said plurality of terminals to establish distinct electrical circuits and operate said movable member and power-bar, respectively, and, then, break contact with the same to open the circuits, a key device arranged to be projected to effect movement of the single terminal, and means for returning said key device to normal position, substantially as described.

29. In an electrical machine, the combination with a selecting and operating device and a series of movable members, of a universal power-bar, means for operating the power-bar, separate selecting means arranged to bring the movable members respectively into position to be engaged by the power-bar, when the latter is actuated, and controlling means for each of said movable members comprising a movable terminal arranged to be actuated to a plurality of operating positions, and a plurality of stationary terminals arranged in juxtaposition and in the path of movement of the movable terminal, electric connections between said terminals and said selecting means, and a single source of electrical supply, substantially as described.

In testimony whereof I affix my signature in the presence of two subscribing witnesses

GEORGE W. DONNING.

Witnesses:

ANDREW W. STEIGER,

CHARLES GIBBS.