(No Model.) 4 Sheets—Sheet 1

J. RICHARDSON.

TYPE WRITING MACHINE.

No. 448,996. Patented Mar. 24, 1891.

Fig. 1.

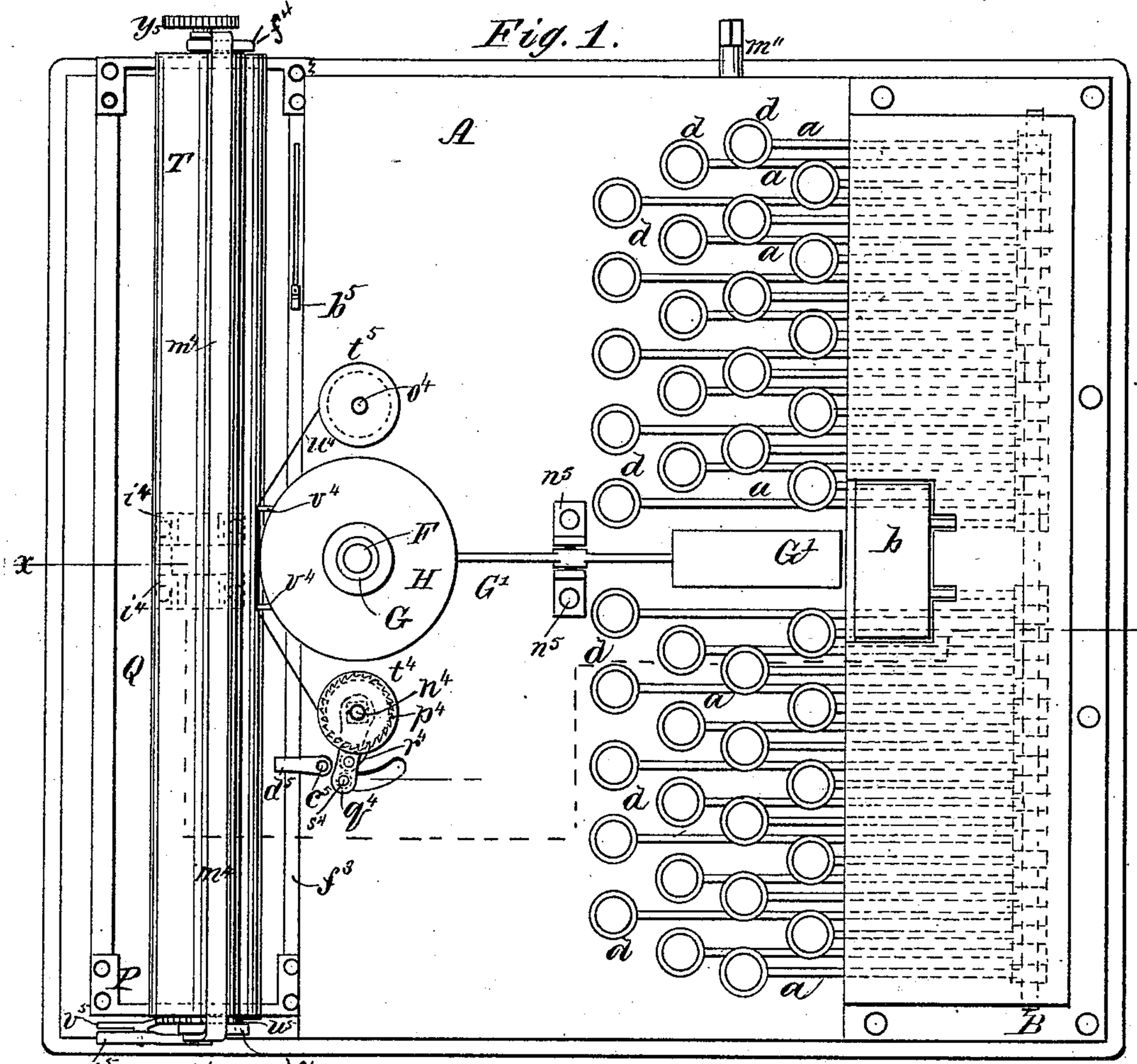

Fig. 2.

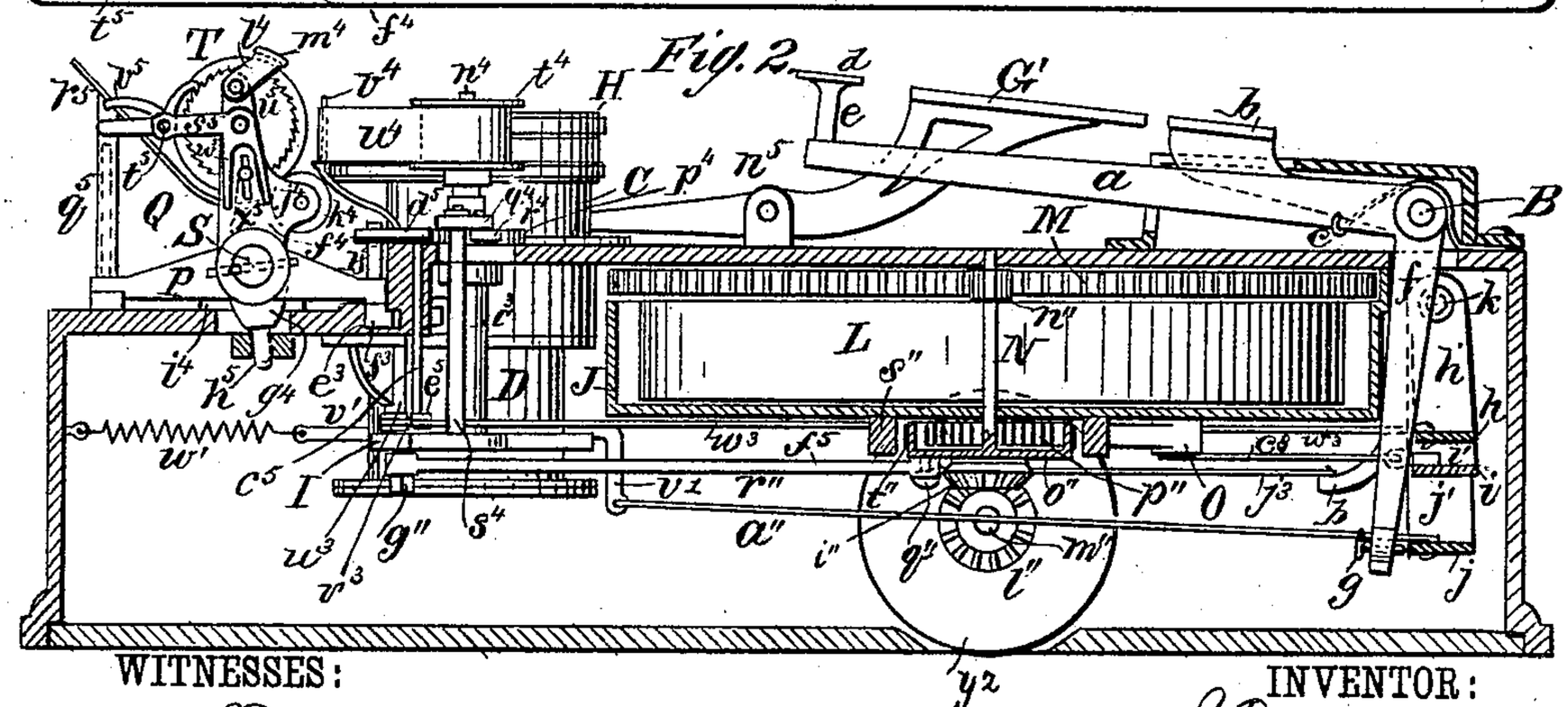

Fig. 3.

WITNESSES:

Donn Twitchell.

C. Sedgwick

INVENTOR:

J. Richardson

BY Munn & Co.

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(No Model.) 4 Sheets—Sheet 2.

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Fig. 4.

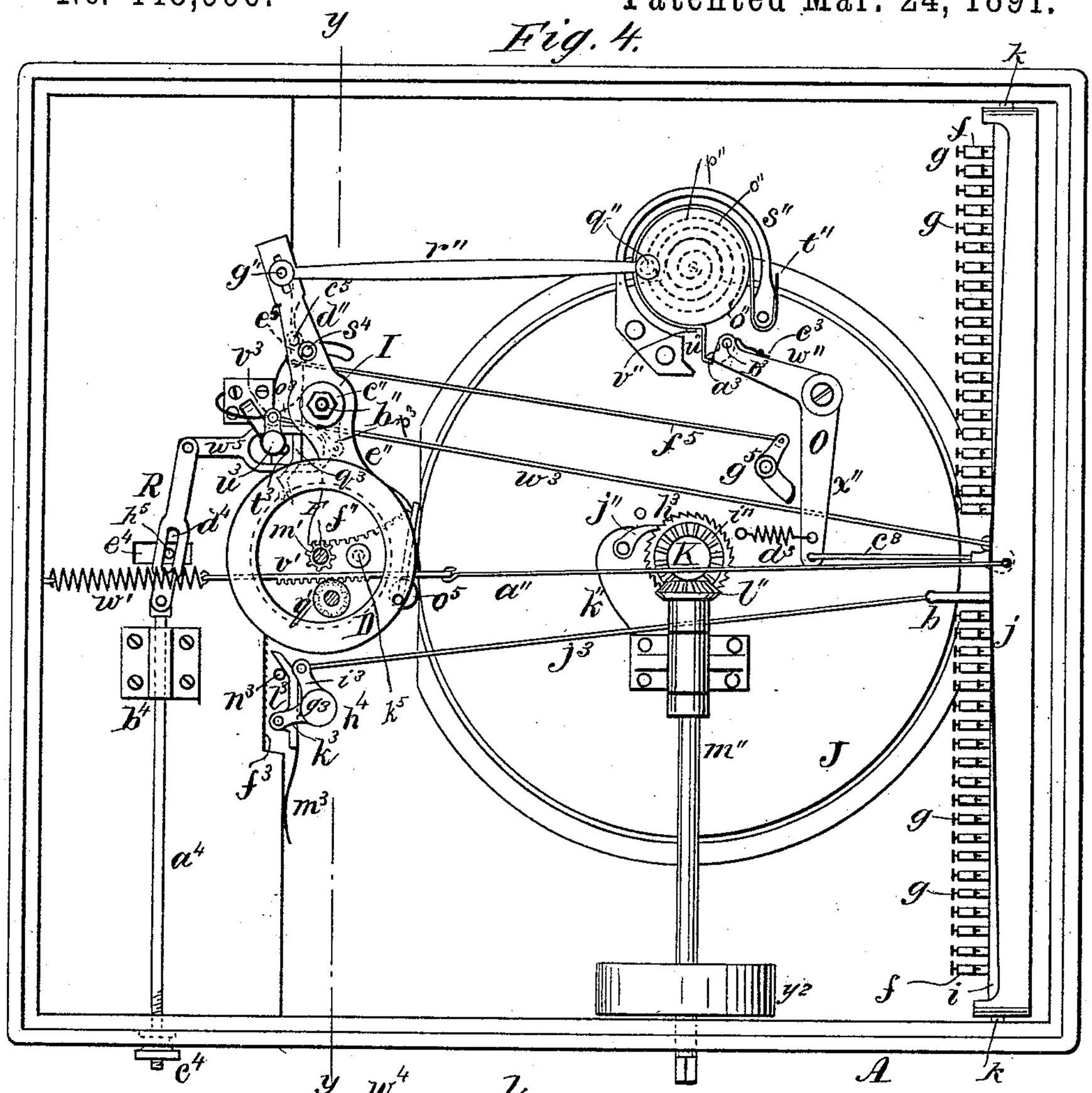


Fig. 5.

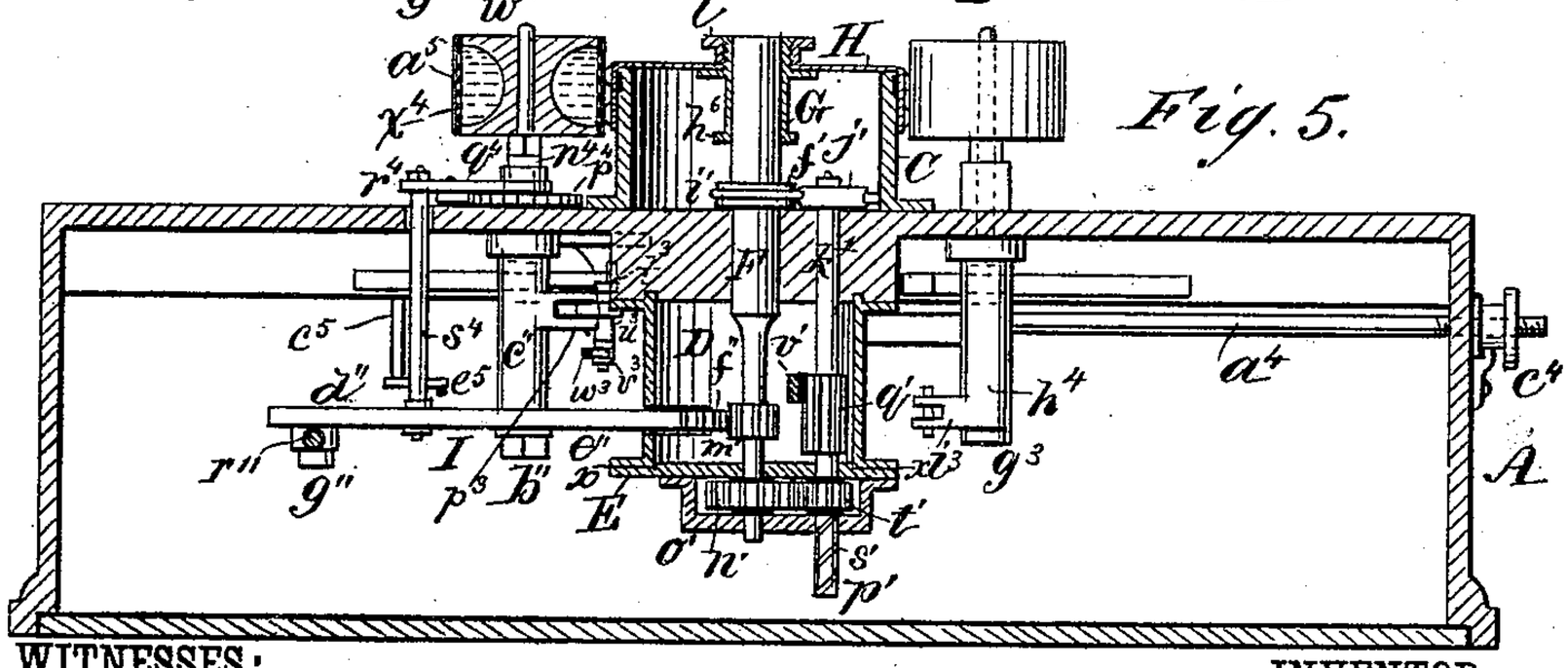
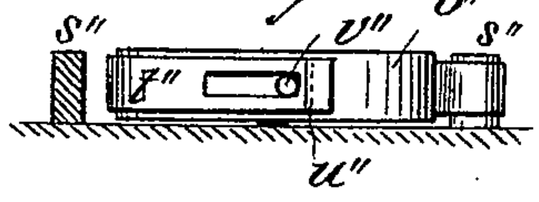


Fig. 6.



WITNESSES:

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J. RICHARDSON.

TYPE WRITING MACHINE.

No. 448,996. Patented Mar. 24, 1891.

Fig. 7.

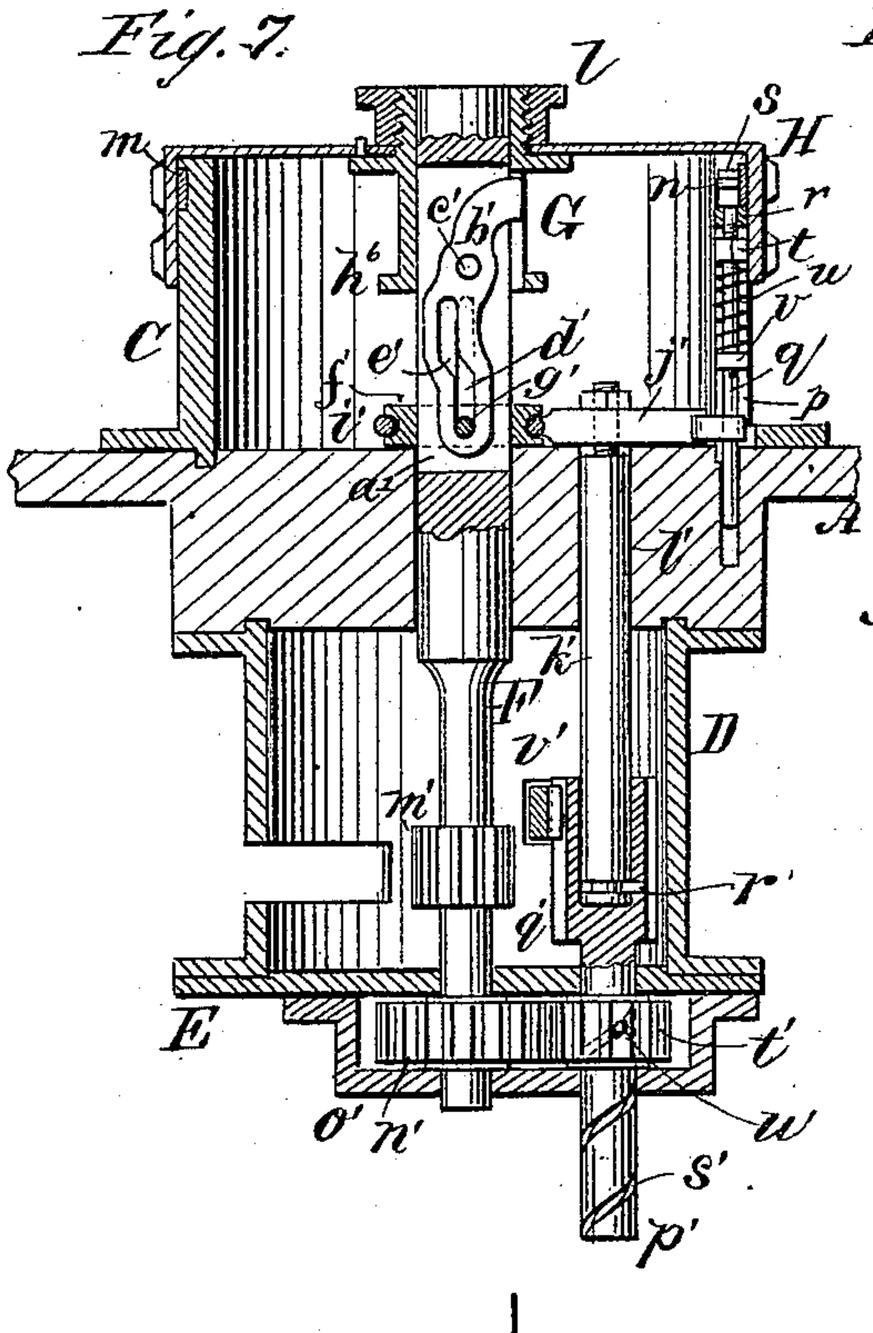


Fig. 8.

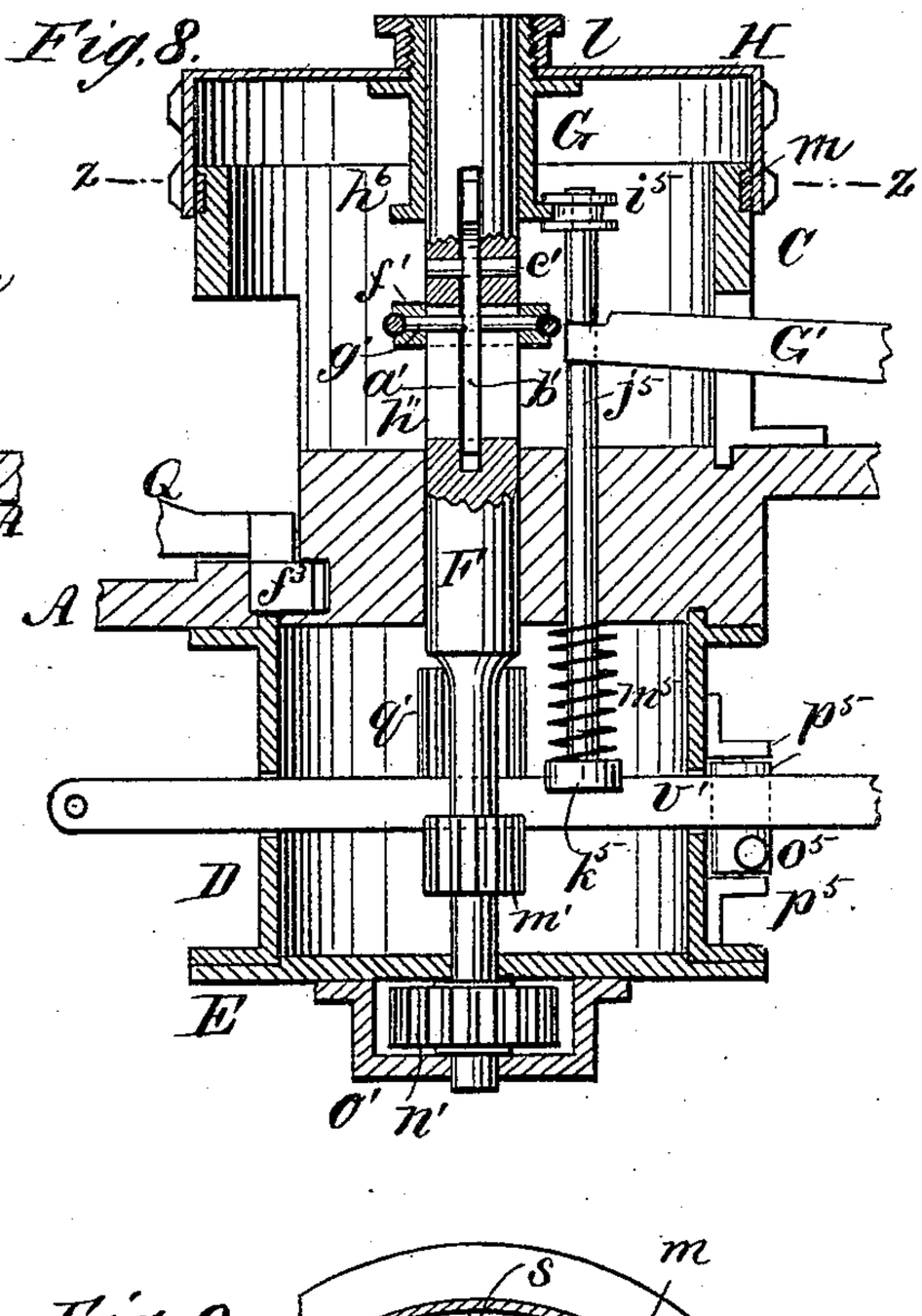


Fig. 9.

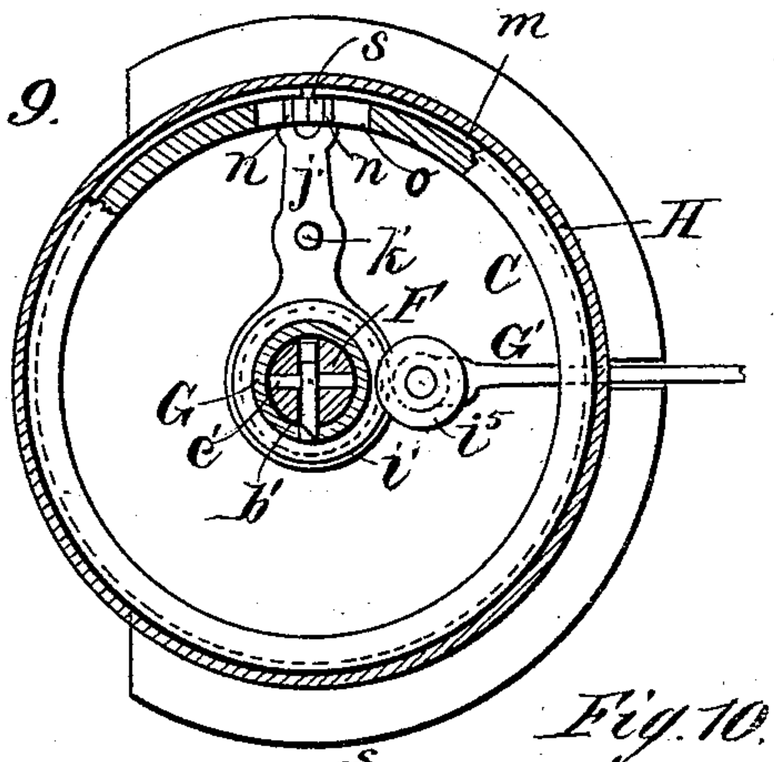


Fig. 10.

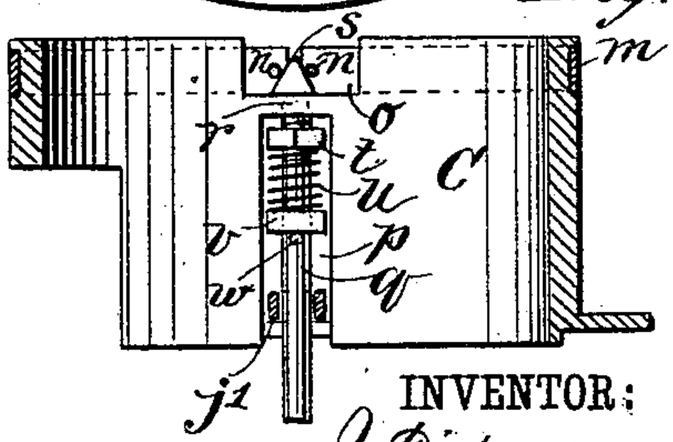


Fig. 11.

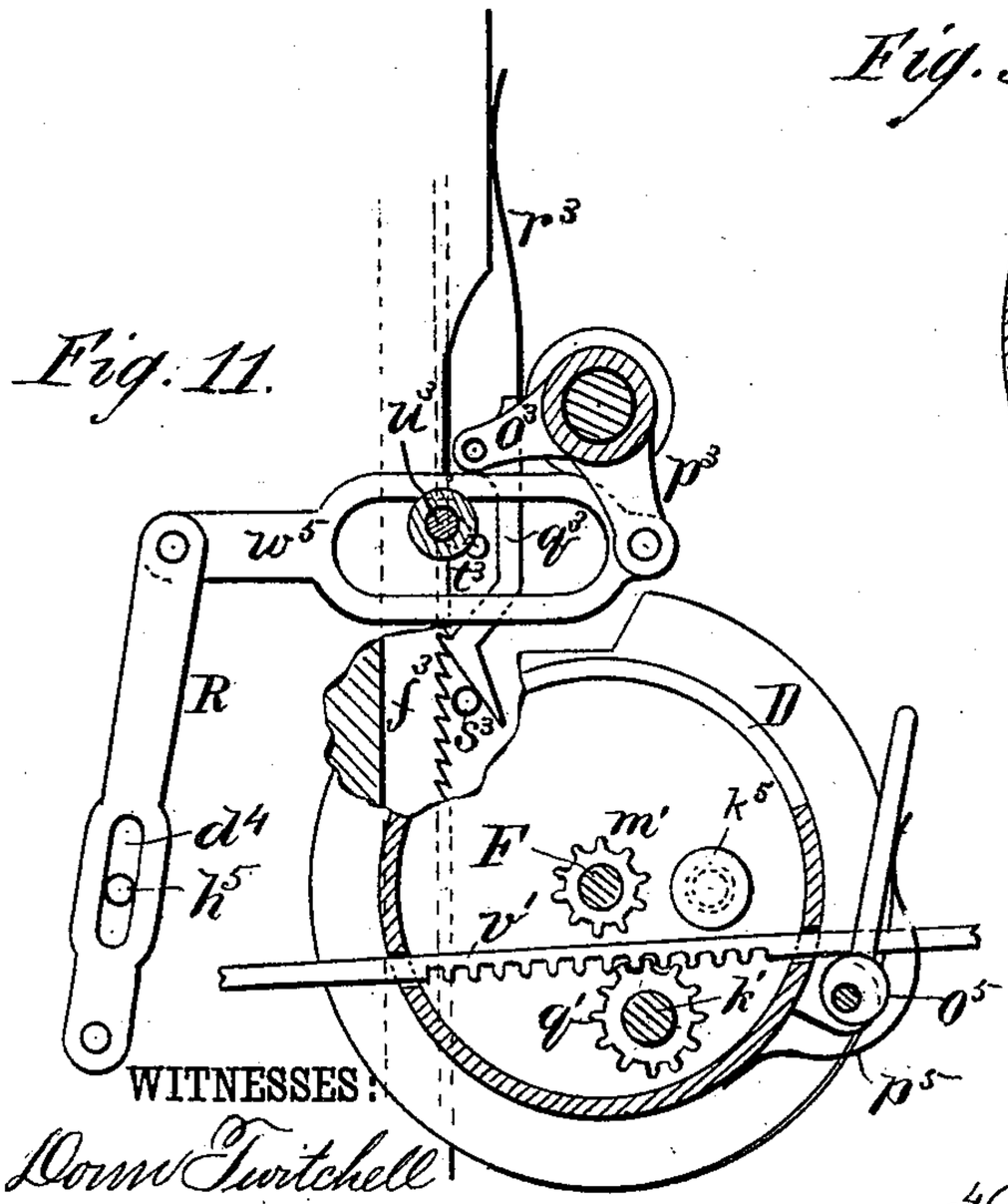
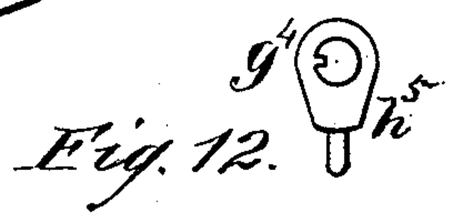


Fig. 12.



WITNESSES:

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C. Sedgwick

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(No Model.)

4 Sheets—Sheet 4.

J. RICHARDSON.

TYPE WRITING MACHINE.

No. 448,996. Patented Mar. 24, 1891.

Fig. 13.

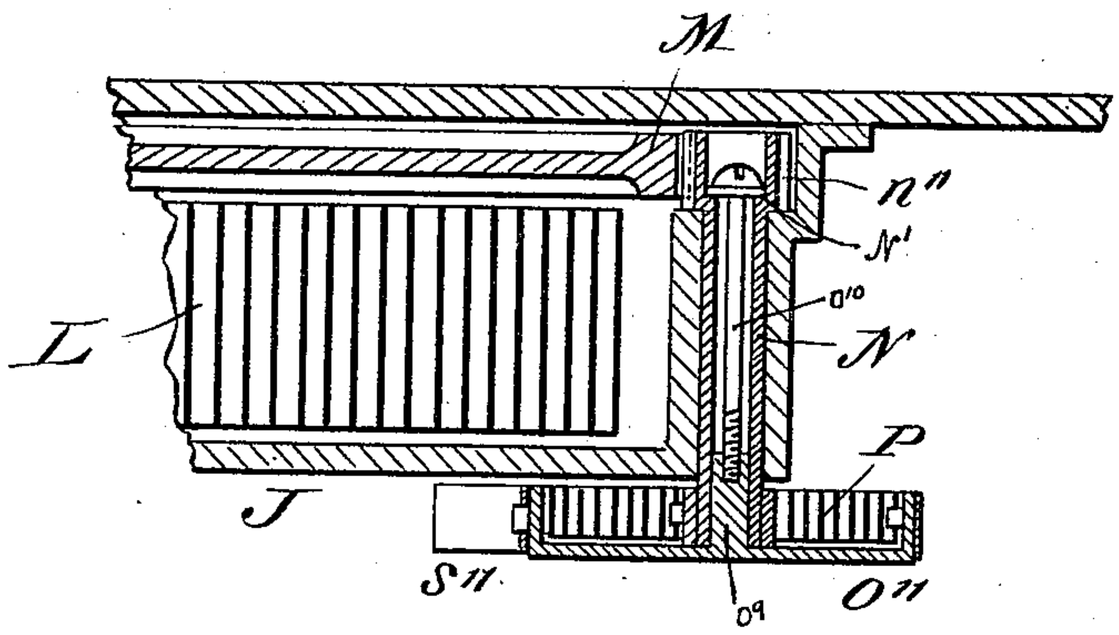
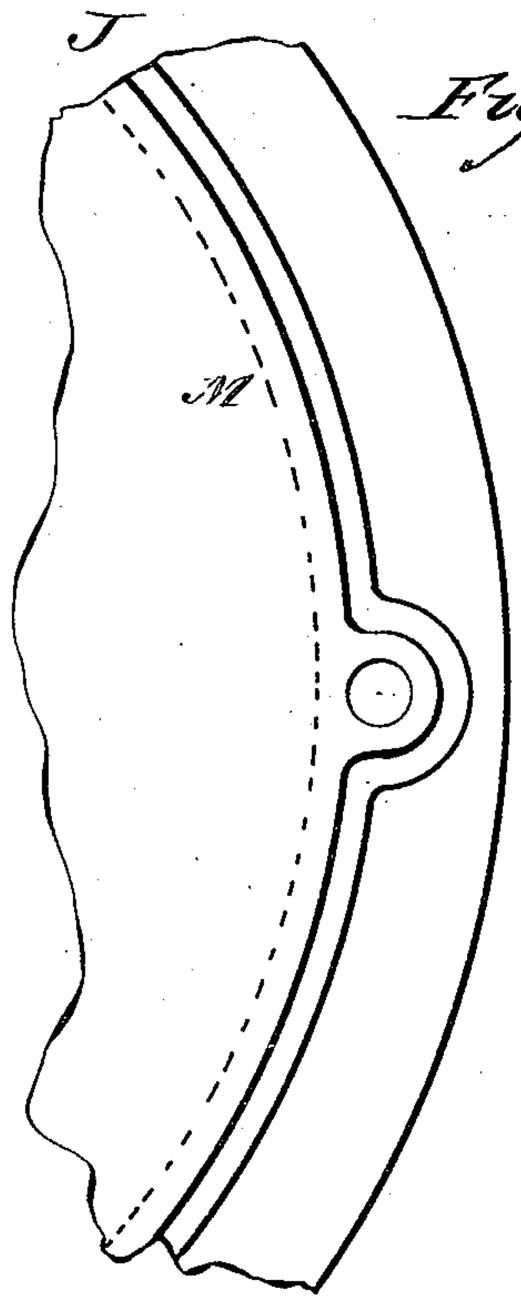


Fig. 14.



WITNESSES:

Donn Twitchell

C. Sedgwick

INVENTOR:

J. Richardson

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

JAMES RICHARDSON, OF NORTH TARRYTOWN, NEW YORK.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 448,996, dated March 24, 1891.

Application filed June 15, 1886. Serial No. 205,230. (No model.)

To all whom it may concern:

Be it known that I, JAMES RICHARDSON, of North Tarrytown, in the county of Westchester and State of New York, have invented a new and Improved Type-Writing Machine, of which the following is a specification, reference being had to the annexed drawings, forming a part thereof, in which—

Figure 1 is a plan view of my improved type-writing machine. Fig. 2 is a longitudinal section taken on line *x x* in Fig. 1. Fig. 3 is a detail view of the type-space-regulating lever. Fig. 4 is an inverted plan view, (the bottom board removed,) parts being in section on the line *x x*, Fig. 5. Fig. 5 is a transverse section taken on line *y y* in Fig. 4. Fig. 6 is a side elevation of the escapement. Figs. 7 and 8 are vertical transverse sections of the type-wheel-operating mechanism. Fig. 9 is a horizontal section taken on line *z z* in Fig. 8. Fig. 10 is a vertical transverse section of the turret, showing the brake mechanism. Fig. 11 is an inverted plan view of portions of the paper-feeding, printing, and letter-spacing mechanisms. Fig. 12 is a detail view of the sleeve and arm on the rock-shaft of the paper-carriage. Fig. 13 is a vertical transverse sectional view, parts being broken away, of the casing-drums *o''* J, their springs, shaft N, its pinion, and part of the spur-wheel M; and Fig. 14 is a detail view showing a portion of the drum J in full lines and part of the spur-wheel M in dotted lines.

Similar letters of reference indicate corresponding parts in the different figures of the drawings.

The object of my invention is to make a type-writing machine in which the movements of the type, paper, inking apparatus, and printing-press will be effected by power called into action by but not applied through the keys, in which the type, ink, and paper may be readily changed, in which the uniformity of the impression will not be affected by varying pressure upon the keys, in which the spacing of the letters may be uniform, and the writing always visible to the operator as it goes forward.

My invention consists in mechanism whereby stored power may be used to give an oscillatory motion to a type-wheel to bring the desired letter opposite the platen or roller for printing, and in combination therewith of mechanism similarly actuated for producing an impression, and in various novel features of construction, whereby correct spacing, uniform inking, a uniform impression, and rapid operation are secured.

The frame or body of the machine is preferably formed of a rectangular case A, which incloses the greater portion of the mechanism.

The key-levers *a* are bent at a right angle and are fulcrumed on the rod B, supported above the top of the casing A by suitable standards. Each key-lever is provided with a spring *c*, arranged to return the key to its normal position after having been depressed. The key-levers are made of different lengths to provide space for the finger-pieces *d*, which are mounted on short standards *e*, secured to the free ends of the levers. The arms *f* of the key-levers *a* project downward into the casing A through a slot made in the casing for that purpose and carry near their lower ends a small adjusting-screw *g*.

From the under surface of the top of the casing A are suspended three oscillating bars *h i j* from vertical arms *h' i' j'*, the arms being pivoted on studs *k*, projecting inward from opposite sides of the case A. The three bars *h i j* lie in the paths of the arms *f* of the key-levers *a*, so that when the keys are depressed the bars are swung on their pivots more or less, according to the requirements of the letter or character represented by the key. The lower bar *j*, which is directly opposite the series of screws *g*, is tapered from the middle each way toward its ends, being narrowest at the ends, and this bar is arranged to be pushed backward more or less by a key, according to the location of the key relative to the tapered bar *j*, and through mechanism presently to be described to limit the movement of the type-wheel, and so determine the letter to be printed.

Opposite the center of the key-board and near the rear side of the machine a turret C is secured to the upper surface of the casing A, and concentric with the turret upon the under surface of the top of the casing is secured a hollow supporting-cylinder D. This cylinder D is provided with a head E, in which is journaled the lower end of the ver-

tical spindle F, which is arranged axially in the turret and in the hollow cylinder, and is also journaled in the thickened portion of the top of the casing A. The spindle F is free to rotate and carries at its upper end a flanged collar G, arranged to slide thereon. To the upper flange of this collar is fitted a type-wheel H, having a rim which extends downward over the outer surface of the turret C a sufficient distance to receive one or more rows of type-faces. The type-wheel H is apertured to receive a registering-pin projecting from the upper flange of the collar G, and the wheel is clamped on the collar by a nut *l*, turning on the threaded upper end of the collar. The turret C is grooved circumferentially near its upper edge to receive an annular spring *m*, which is slit and provided on opposite sides of the slit with pins *n*, which project inwardly through a notch *o*, formed in the edge of the turret.

In a longitudinal slot *p*, formed in the side of the turret C, is arranged a rod *q*, which passes upward through a guide *r*, formed in the material of the turret between the slot *p* and the notch *o*, and is provided on its upper end in the notch *o* with a double wedge or dart shaped head *s*, which extends upward between the pins *n*. The lower end of the rod has its bearing in the casing. Upon a threaded portion of the rod *q* in the slot *p* is placed a nut *t*, from which is suspended a spiral spring *u*, which surrounds the rod *q* and carries at its lower end a collar *v*, which rests normally on the pin *w*, passing transversely through the rod.

The spindle F is provided with a longitudinal slot *a'*, in which is pivoted a latch *b'* on the pin *c'*. The upper end of the latch is curved toward the side of the spindle and is beveled at its extremity, as indicated in Fig. 9. The end of the latch below the pivoted pin *c'* is provided with an offset slot *d'*, the upper and lower portions of the slot being connected by a central inclined portion *e'*. A collar *f'* surrounds the spindle F, and is provided with a transverse pin *g'*, which passes through a slot *h''*, arranged in the spindle at right angles to the slot *a'*. The pin also extends through the slot *d'* of the latch *b'*, so that when the collar *f'* is slid up or down on the spindle the engagement of the pin *g'*, carried by the collar, with the inclined portion *e'* of the slot in the latch will cause the latch to be turned on its pivot sufficiently to project the upper end of the latch into or withdraw it from an internal longitudinal groove in the collar G. The collar *f'* is grooved circumferentially and embraced by a ring *i'*, secured to an arm *j'*, carried on the upper end of a rod *k'*, the said rod passing through a hole *l'* in the top of the casing A parallel with the spindle F. The opposite end of the arm *j'* extends toward the rod *q* and is forked to embrace the rod below the collar *v*.

Upon the spindle F, above the head E, is secured a pinion *m'*, and below the head E a spur-wheel *n'*, secured to the spindle F, is inclosed by a cap *o'*, secured to the head E. In the cap *o'* and head E is journaled a spindle *p'*, having upon its upper end a wide-faced pinion *q'*, which is bored axially to receive the end of the rod *k'*. The lower end of the rod *k'* is grooved circumferentially to receive a pin *r'*, projecting from the inner surface of the pinion *q'*.

In the spindle *p'* is formed a spiral groove *s'*, and between the cap *o'* and the head E and upon the spindle *p'* is loosely placed a pinion *t'*, provided with a pin *u'*, which projects into the spiral groove *s'* of the spindle *p'*.

A rack-bar *v'*, passing through holes in the walls of the hollow cylinder D, is held in engagement with the long pinion *q'*. One end of the rack-bar is connected with a spring *w'*, which in turn is connected with the back of the casing A. The opposite end of the rack-bar *v'* is turned downward and connected by the wire *a''* with the bar *j*.

On the stud *b''*, projecting from the under surface of the top of the casing, is journaled a sleeve *c''*, to the lower end of which is secured a lever I, having two arms *d'' e''*. The arm *e''* carries a toothed sector *f''*, which engages the pinion *m'* on the spindle F. The arm *d''* is slotted and carries a stud *g''*.

To the under surface of the top of the casing A is secured a drum J, in the center of which is journaled a shaft K, connected with one end of a volute spring L, the opposite end of which is secured to the rim of the spur-wheel M. Upon the end of the shaft K, projecting below the head of the drum, are secured a ratchet-wheel *h'''* and a miter-wheel *i''*. The ratchet-wheel is engaged by a pawl *j''*, pivoted to the head of the drum J, and is pressed into engagement with the ratchet-wheel by a spring *k''*. The miter-wheel *i''* is engaged by a similar miter-wheel *l''* on the end of a shaft *m''*, journaled in bearings supported by the head of the drum J and in bearings in the wall of the casing A, the end of the shaft outside of the casing being squared to receive the key by which the spring L is wound. Inside the casing A the shaft *m''* is provided with the wheel y^2 to receive a strap for winding with power. On the inner end of the shaft K is loosely placed a spur-wheel M, and in bearings formed in the side of the drum J at a point opposite the stud *g''*, carried by the lever I, is journaled a tubular shaft N, carrying a pinion *n''*, which meshes into the spur-wheel M. Within the lower end of the tubular shaft N, and below the head of the drum J, is loosely placed the short spindle o^9 of a drum *o''*, containing a spring *p''*, one end of which is secured to the inner wall of the drum, the opposite end being attached to the shaft N. The spindle o^9 is engaged by a screw o^{10}, the head of which rests on the shoulder N', formed within the upper end of the tubular shaft N, thereby loosely supporting the drum. The winding of the spring *p''* is arranged relative to that of the

spring L, so that the spring L, acting through the shaft N, always tends to wind the spring p''.

In the lower face of the drum o'' is inserted a crank-pin q'', which receives one end of a connecting-rod r'', the opposite end of which is received on the stud g'' of the lever I. A circular frame s'' is attached to the head of the drum J and partly surrounds the drum o''. To the frame s'' is secured a flat spring t'', which extends partly around the periphery of the drum o'' and is bent outward radially from the surface of the drum, forming an arm u'', the outer end of which is bent over at an obtuse angle, as shown in Fig 4. In the periphery of the drum o'' is inserted a stud v'', which projects a short distance from the drum and is received in a slot formed in the spring t'' near the angle of the arm u''.

To the head of the drum J is pivoted an angled lever O, having two arms w'' x''. The arm w'' carries at its extremity a trip-pawl a^3, arranged to swing on the pivot b^3 and pressed by a spring c^3, so that when the lever O is pulled in one direction the pawl a^3 engages the bent end of the arm u'' of the spring t'' and disengages the spring from the stud v'' permitting the drum o'' to turn. The continued forward motion of the lever O disengages the pawl a^3 from the end of the spring t'', and the spring by its own elasticity immediately returns into contact with the periphery of the drum o'', so that when the drum has completed one revolution the stud v'' again enters the slot of the spring t'' and is arrested by engagement with the spring at the end of the slot. When the lever O is returned to the point of starting, the pawl a^3 passes the angled end of the arm u'' and is again ready for engagement therewith. The extremity of the arm x'' of the lever O is connected by a wire c^8 with the bar i. A spiral spring d^3, connected at one end with the arm x'' of the lever O and at the opposite end with the head of the drum J, serves to return the lever O to the point of starting after having been moved to permit of a single revolution of the drum o''. Each revolution of the drum o'' causes the lever I to make one complete oscillation, and in so doing to carry the pinion m' and spindle F through a little more than one complete revolution in each direction. The movement in excess of a complete revolution is made equal to the spindle movement required to operate the latch and brake mechanism, thus making it possible to utilize an entire circle of type on the type-wheel. The storage of power in the spring p'', contained by the drum o'', permits of the rapid rotation of the drum and the quick back-and-forth movement of the lever I on account of the small inertia of the parts immediately connected with the execution of this movement.

The rear of the casing A is rabbeted and provided with a groove e^3 for receiving the ratchet-bar f^3, forming one side of the frame P of the paper-carriage Q.

Upon the stud g^3, projecting from the under surface of the top of the casing A, is journaled a sleeve h^4, provided with an arm i^3, which is connected by a wire j^3 with the lower end of the independent spacing-key b. The upper end of the sleeve h^4 carries a forked arm k^3, on which is pivoted a pawl l^3, capable of engaging the ratchet-bar f^3, of the paper-carriage. The pawl l^3 is pressed into engagement with the ratchet-bar f^3 by the spring m^3 when the arm k^3 is moved forward in the act of feeding, but is kept normally out of engagement with the ratchet-bar by a pin n^3, projecting from the under surface of the top of the casing A, so that when the independent spacing mechanism is not in use it does not in any way interfere with the free movement of the paper-carriage in either direction.

The sleeve c'', to which the lever I is attached, is provided with two arms o^3 p^3, projecting from the sleeve approximately at right angles to each other. To the arm o^3 is pivoted a hooked pawl q^3, which engages the ratchet-bar f^3, and is provided with a spring r^3, which presses on the rabbeted portion of the casing and tends to throw the pawl into engagement with the ratchet-bar. The pawl q^3 is beveled or angled on opposite sides of the point which engages the ratchet-bar for engagement with the stud s^3, projecting downward from the under surface of the casing-top, and the finger t^3, projecting from the side of the rock-shaft u^3, the said rock-shaft being provided at its lower end with an arm v^3, which is connected by a wire w^3 with the swinging bar h. It will thus be seen that the turning of the shaft u^3 will cause the finger t^3 to engage one of the beveled surfaces in the pawl q^3 sooner or later, and thus determine when the pawl q^3 will be disengaged from the ratchet-bar f^3, thus rendering the feed of the paper-carriage variable.

The amount of motion transmitted to the rock-shaft u^3 is determined by the distance through which any particular key swings the bar h, and this distance is regulated by varying the width of the bar opposite the several key-levers to produce the desired difference in feed for the different letters. The bar h, when regulating the feeding mechanism in the manner described, if engaged by a key which is to print a wide or a narrow letter, will be moved a distance corresponding to the requirements of that letter, and the forward movement of the carriage will be stopped when the pawl is disengaged from the ratchet-bar by striking the finger t^3.

To the arm p^3 is pivoted one end of the link w^5, which is apertured to allow it to pass around the rock-shaft u^3. The opposite end of the link is pivotally connected to a lever R, which is fulcrumed on a rod a^4, passing through a guide b^4, secured to the under surface of the casing-top. The rod extends through the side of the casing and is received in a swivel-nut c^4, by means of which the rod may be moved lengthwise in either direction.

The lever R is provided with a slot d^4. The slotted portion of the lever R extends across a slot e^4 in the top of the casing A.

The paper-carriage Q carries a shaft S, which is grooved throughout its entire length, the groove being shown in cross-section only in Fig. 2, and which carries at its ends arms f^4, and between the ends and within the carriage is placed a sleeve g^4, which carries an arm h^5, passing downward through the slot e^4 in the top of the casing and entering the slot d^4 of the lever R. The sleeve g^4 is journaled in supports i^4, (shown in dotted lines in Fig. 1,) secured to the top of the casing at opposite sides of the slot e^4. The paper-carriage, when moved back and forth in its guides, carries the shaft S through the sleeve g^4, and when the sleeve g^4 is turned by the action of the lever R on the arm h^5 the shaft is made to rock by the engagement of a feather carried by the sleeve and entering the groove of the shaft.

In the arms f^4, which are secured to opposite ends of the shaft outside of the frame of the paper-carriage, are received the journals of the impression-roller T, and in ears j^4, projecting from the front edges of the arms f^4, is journaled a roller k^4, which bears lightly against the roller T and serves to guide the paper upward in front of the type-wheel H.

To the arms f^4, which are prolonged beyond the bearings of the roller T, are pivoted the arms l^4, which are formed on or attached to the bar m^4, which serves as a guide and check for the paper which passes between the roller and the bar m^4, and the said bar is graduated to form a scale for a guide for writing. The bar thus pivoted is arranged eccentrically with reference to its pivots, so that when it is turned on its pivots it will be lifted from the face of the roller T.

On opposite sides of the turret C are journaled the shafts n^4 o^4. The shaft n^4 is provided with a ratchet-wheel p^4, and above the ratchet-wheel an arm q^4 is loosely placed on the shaft and carries a spring-acted pawl r^4, which engages the ratchet-wheel p^4. The arm q^4 is oscillated by a rod s^4, secured to the arm d'' of the lever I, which arm projects through a curved slot in the top of the casing A and is received in an aperture in the free end of the arm q^4. The shaft n^4 is squared above the ratchet-wheel p^4 to receive a bobbin t^4, to which is attached one end of the inking-ribbon u^4.

Upon the shaft o^4 is loosely placed a bobbin t^5, which contains the inking-ribbon. The bobbins t^4 t^5 are interchangeable, and when by the action of the pawl and ratchet the inking-ribbon is unwound from the bobbin t^5 and wound upon the bobbin t^4 the bobbins may be interchanged and the ribbon will be rewound upon the bobbin t^5.

At the rear of the type-wheel are arranged two wire springs v^4, over which the inking-ribbon u^4 is stretched in its passage from one bobbin to the other. These wire springs have only enough strength to prevent the inking-ribbon from touching the type-wheel when the type-wheel is revolving and no impression is being taken. The wire springs v^4 are curved outwardly at the lower portion of the vertical part to prevent the ink-ribbon from falling and are bent forward and secured to the top of the casing A in position to be engaged by the roller k^4 when the said roller, together with the paper-roller T, is pushed forward in the operation of printing, so that at the instant of taking the impression from the wheel H the ribbon u^4 closely envelops the portion of the type-wheel nearest the roller T, and is thus prevented from touching the paper-roller, except at a point opposite the character from which the impression is taken.

When it is desirable to print directly from the type-wheel without the employment of an ink-ribbon, I provide ink-rollers w^4, which are chambered around their peripheries and provided with a perforated covering x^4, over which is stretched a cloth or felt band a^5, which is kept saturated with printing-ink carried in the cavity of the roller. The inked surface rolls in contact with the periphery of the type-wheel and supplies the type with ink.

The ratchet-bar f^3 has a longitudinal groove, in which is adjustably secured a stud b^5, which projects a short distance above the top of the casing A, and upon the upper end of a shaft c^5, journaled vertically in the casing, is secured an arm d^5, which projects over the ratchet-bar f^3 and into the path of the stud b^5. The lower end of the shaft c^5 is provided with an arm e^5, which is connected by a wire f^5 with one arm of the bell-crank lever g^5, pivoted to the head of the drum J. The other arm of the bell-crank lever may be brought into the path of the escapement-lever O by the touching of the arm d^5 by the stud b^5, thus preventing the return of the lever O to the point of starting, and in this manner stopping the action of the machine at a point in the writing determined by the position of the stud b^5.

So long as the type-wheel H revolves in its normal position only lower-case type will be brought into use, and when it is desirable to print capitals the type-wheel must be raised. To accomplish this, the collar G is provided with a flange h^6, which is received in the groove of a roller turning on the upper end of a rod j^5, which passes through a hole in the top of the casing, and is provided at its lower end with a head k^5, between which and the under surface of the casing is placed a spring m^5. The rod j^5 is notched in opposite sides to receive the forked end of the capitalizing-key lever G′, which is pivoted in standards n^5 and projects through a slot in the turret C. The capitalizing-key lever G′ is arranged opposite the spacing-key lever b in the mid-

dle of the key-board, so as to permit of depressing the said capitalizing-key lever, if desirable, simultaneously with the type-keys.

To prevent the rack-bar v' from moving during the excursion of the lever I, an eccentric-lever o^5 is pivoted in ears projecting from the side of the hollow cylinder D, the arm of the lever projecting into the path of the toothed sector f'', carried by the lever I. The lever o^5 is pressed into engagement with the rack-bar v' by a curved spring p^5, secured to the cylindrical casing D.

The paper-carriage Q carries standards q^5, which support a paper-guide r^5, consisting of a plate of metal inclined at a suitable angle and curved forward under the roller T toward the contact of the roller K^4 with the roller T.

The operation of my improved type-writing machine is as follows: The mainspring L being wound and paper slipped into place on the printing-roller T, the key representing the character to be printed is depressed. The arm f of the key-lever engages the bar j during the prescribed portion of its forward swing, drawing forward proportionally the rack-bar v', rotating the shaft p', and raising the arm j', thus shifting the pin g' to such a position with reference to the part e' of the cam-slot d' that the type-wheel will be detached from the spindle and held in position for printing when the letter of the key is opposite the printing-roller. The bar h, being also engaged by the key-lever, turns the rock-shaft w^3 by means of the wire w^3 and brings the finger t^3 into a position which will detach the paper-carriage-feeding pawl q^3 from the ratchet-bar f^3 when the paper-carriage has been moved through the space required for the letter about to be printed. The same movement of the key-lever brings it into engagement with the bar i, which draws back the arm x'' of the lever O, releasing the spring t'' from the stud v'', allowing the drum o'' to make one revolution. During the forward movement of the crank carried by the drum the lever I is swung on its pivot, turning the spindle F through the engagement of the sector f'' with the pinion m'' on the spindle, and by the connection of the spindle F with the pinion t' through the spur-wheel n', carried by the spindle, the shaft p', rod k', and arm j' are raised by the rotation of the pin u' in the spiral groove of the shaft p', the shaft being prevented from rotation by the engagement of the rack-bar v' with the pinion q'. When the collar f', which is lifted by the arm j', is raised sufficiently to bring the pin g', carried by the collar, into engagement with the inclined portion e' of the slot d' in the latch b', the latch is withdrawn from the slot in the collar G, and at the same instant the annular spring m is expanded by the engagement of the double-wedge-shaped head s with the pins n, the rod q, carrying the head s, being forced upward by the engagement of the arm j' with the collar v, attached to the spring u. The expansion of the annular spring m in this manner creates sufficient friction between the spring and the inner surface of the type-wheel to instantly arrest the motion of the type-wheel. After the arrest of the type-wheel in the proper position for printing the letter of the key depressed the spindle F, being detached from the collar G, continues to rotate. The forward movement of the arm e'' of the lever I moves the lever R through the medium of the connecting-link w^5, and the lever R imparts motion to the arm h^5, turning the sleeve g^4, thereby rocking the shaft S of the paper-carriage and moving the roller T, with the paper carried thereby, forward toward the type-wheel; but before the contact of the paper with the type-wheel or with the ribbon interposed between the type-wheel and paper the springs v^4 are pushed back by the roller k^4, so that only that portion of the inking-ribbon u^4 which is in contact with the type to be printed is pressed by the roller T as it is brought forward by the continued forward motion of the parts, as already described. During the latter half of the revolution of the drum o'' the motion of the lever I is reversed, turning the spindle F in a reverse direction, and when the spindle reaches the point at which the latch b' was withdrawn from the collar G the reverse movement of the mechanism required to withdraw the latch returns it to its position in the collar, so that the collar is engaged by the latch, and the type-wheel, simultaneously released by the spring m, is returned to the point of starting. The spring m contracts as soon as the collar v is relieved of the pressure of the arm j', as the rod q then drops partly by the action of gravity and partly by the pressure of the pins n n, projecting from the spring m. The release of the brake-spring m is effected by the withdrawal of the front end of the bar j' from the collar, the pressure of the pins n n, projecting from the spring m, upon the sides of the head s being sufficient to force the head s from between the pins, and thus allow the spring m to contract. The reverse movement of the printing-lever carries the printing-roller away from the type-wheel and releases the springs v^4, so that both the paper and the ink-ribbon are removed from the face of the wheel before the wheel is re-engaged for its return. Before escapement is released and the lever I set in motion the cam-lever o^5 is kept out of engagement with the rack-bar v' by the lever, so that the rack-bar is free to move; but the first movement of the lever I releases the cam-lever o^5, allowing it to grip the rack-bar v' and hold it until the return of the lever I to the point of starting. Thus, although the finger may be slipped from the key before the work it has initiated is completed, the rack-bar v' cannot stir until the re-engagement of the type-wheel is effected and all the power-moved parts have returned to the position of rest. When

it is desired to employ a capital letter, the capitalizing-key G′ is depressed, carrying up the type-wheel and bringing the row of capital letters into position for printing. The independent spacing is effected by depressing the key-lever *b* in the manner already described. The spring L is wound from time to time by hand or continuously by power, and the power thus furnished is employed in effecting the movement of the type-wheel and the press action, thereby reducing the work of the keys mainly to releasing the escapement. At the end of the line or at any other time when the machine is at rest (the pawls being then normally detached from the ratchet-bar f^3) the paper-carriage may be easily moved back to the point of starting or forward at will. The line-spacing is effected by means of a lever s^5, pivoted to one of the arms f^4 or the paper-carriage, and carrying a spring-acted pawl t^5, arranged to engage the ratchet w^5, secured to the shaft of the roller T. The pawl t^5 is provided with an arm v^5, by which the pawl may be disengaged from the ratchet w^5 when desirable. The lever s^5 is provided with a forked arm w^5, which extends down the side of the arm f^4 upon opposite sides of an adjustable stud x^5, the arms of the fork being made divergent, so that the movements of the lever s^5 may be variously limited by the position of the stud in the fork w^5. On moving the stud downward toward the wider end of the fork the lever s^5 will be movable through a greater arc and the spacing between the lines made wider than when the stud is nearer the pivot of the lever. When it is desirous to rapidly advance the paper by the rollers k^4 T, the milled head y^5, secured to one of the axles of the rollers T, is turned. To reverse the paper movement, the scale-bar m^4 is lifted and the milled head turned in the opposite direction.

It will be observed that the rim of the type-wheel is supported from within by the turret at the instant of printing, so that no strain is put upon the wheel or spindle. This construction permits of the employment of a very light type-wheel having little inertia.

By the use of a driving-spring between the motive power and printing mechanism I am enabled to secure a quick action of the said mechanism.

The adjustment of the lever R to accommodate different thicknesses of paper or several thicknesses and to regulate strength of the impression is arranged so that the greatest leverage is secured when the strongest impression is required.

The arrangement of the paper-carriage with the sliding rock-shaft and an actuating-lever journaled in fixed supports and receiving the sliding rock-shaft in the manner described permits of effecting the printing movement by the oscillation of the paper-carrying roll of the paper-carriage without obstructing the path of the paper or interfering with the use of carbonized sheets for manifolding.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, in a type-writer, of a spindle having a reciprocating rotary motion, an oscillatory type-wheel loosely mounted on the spindle, and means, substantially as herein shown and described, for disengaging the type-wheel from the spindle at any time in the rotation of the spindle and re-engaging the type-wheel on the return of the spindle to the point of disengagement.

2. In a type-writing machine, the combination of a spindle having a reciprocating rotary motion, an oscillatory type-wheel mounted loosely on the spindle, means, substantially as described, for engaging the type-wheel during a portion of or the whole of a revolution of the spindle and disengaging the type-wheel during any further rotation of the spindle, and brake mechanism, substantially as described, for arresting the motion of the type-wheel when disengaged from the spindle, substantially as shown and described.

3. The combination, in a type-writing machine, of a type-wheel-carrying spindle provided with a pinion and an oscillating lever furnished with a toothed sector adapted to engage the pinion of the type-wheel-carrying spindle, the power-driven crank and a rod connecting the crank with the oscillating lever, and an escapement for securing the releasing and stopping of the crank at the beginning and end of each revolution, substantially as shown and described.

4. In a type-writing machine, the combination, with the oscillatory type-wheel-operating lever, of a hollow drum mounted loosely on a power-driven shaft, a spring connecting the drum with the shaft, an escapement for permitting successive isolated revolutions of the drum, and mechanism, substantially as described, intermediate between the drum and the oscillating type-wheel-actuating lever.

5. In a type-writing machine, the combination of the spindle F, arranged to rotate alternately in opposite directions, and the sleeve G, mounted loosely on the spindle, the type-wheel H, carried by the sleeve and provided with rows of type or characters, the latch *b′*, pivoted in the spindle and adapted to engage the sleeve G during a part or the whole of a revolution, the capitalizing-key G′, and intermediate devices, substantially as described, for shifting the position of the sleeve G and type-wheel H, substantially as shown and described.

6. The combination, with the type-wheel H, having a downwardly-projecting rim, of the turret C, grooved circumferentially near its upper end, a slit annular spring *m*, placed in the groove of the turret, and means, substantially as described, for expanding the slit spring against the inner surface of the rim of the type-wheel, substantially as shown and described.

7. In a type-writing machine, the combination, with the rotating type-wheel, the circumferentially-grooved turret C, and the spring m, provided with inwardly-projecting pins n, of the rod q, having a wedge-shaped head, and means, substantially as described, for moving the rod q upward and bringing the wedge-shaped head into engagement with the pins of the annular spring.

8. In a type-writer, the combination, with the brake-spring m, of the type-wheel brake-operating rod q, provided with the nut t, mounted on the threaded portion of the rod, the spring u, suspended from the nut and surrounding the rod, the collar v, attached to the free end of the spring u and surrounding the rod q, forming a yielding contact for the rod-operating arm, and means, substantially as described, for moving the collar v, substantially as shown and described.

9. In a type-writing machine, the combination of the type-wheel H, the spindle F, provided with longitudinal slots a' h'', arranged at right angles with each other, the latch b', pivoted in the slot a' and provided with an offset slot d', the circumferentially-grooved collar f' surrounding the spindle and provided with the pin g', passing through the slot h'' of the spindle and through the slot d' of the latch b', the arm j', encircling the collar f', and provided with a forked end loosely embracing the rod q, the rod k', supported parallel with the spindle, the spirally-grooved shaft p', swiveled to the rod k', the pinion t', provided with the pin u', entering the spiral groove of the shaft p', and the pinion n' on the spindle F, arranged to mesh with the pinion t', substantially as shown, and described.

10. In a type-writing machine, the combination of the slit spring m, provided with the pins n, the rod q, provided with the wedge-shaped head s, the nut t, spring u, and collar v, the arm j', the rod k', carrying the arm, the spirally-grooved shaft p', the pinion t', provided with the pin u', projecting into the groove of the shaft, the pinion n', engaging the pinion t', the spindle F, the rotating type-wheel, and mechanism for imparting alternate rotary motions to the spindle F, substantially as shown and described.

11. In a type-writing machine, the combination, with the rod k', the spirally-grooved shaft p', and the pinion t', provided with the pin u', projecting into the spiral groove of the shaft p', of the elongated pinion q', attached to or formed on the shaft p', the spring-retracted rack-bar v', the connecting-wire a'', the swinging bar j, the series of key-levers a, and the type-wheel having rows of type or characters, spindle F, and means, substantially as set forth, for operating said spindle, substantially as shown and described.

12. In a power-driven type-writing machine, the combination, with the ratchet-bar f^3, the power-actuated oscillating lever I, the arm o^3, carried thereby, and the connecting-rod r'', and spring-actuated crank-wheel o'', of the spring-acted pawl q^3, arranged to engage the ratchet-bar, substantially as shown and described.

13. The combination, with the ratchet-bar f^3 and bent pawl q^3, arranged to engage the ratchet-bar, and means, substantially as described, for reciprocating the pawl, of the rock-shaft w^3, provided with the finger t^3, the arm v^3, the notched bar h, connecting-rod, and the series of key-levers a, whereby the time of the disengagement of the pawl q^3 from the ratchet-bar f^3 is varied according to the width of the letter to be printed, substantially as shown and described.

14. The combination, with the lever I and the arm p^3, connected therewith, of the slotted lever R, the adjustable fulcrum-rod a^4, the link w^5, connecting the lever R and the arm p^3, the sleeve g^4, journaled in fixed supports, the arm h^5, carried by the sleeve and entering the slot of the lever R, and the grooved rock-shaft S, journaled in the paper-carriage, the arms f^4, and the paper-roller T, substantially as described.

15. The combination, with the paper-roller T, of the ratchet u^5, the forked angled lever s^5, pivoted to the arm f^4 and provided with a hooked pawl for engaging the ratchet, and the adjustable stud x^5, projecting from the arm f^4 through the forked end of the lever s^5, substantially as shown and described.

16. The combination, with the paper-carriage Q and lever O, of an adjustable stud b^5, carried by the ratchet-bar f^3, the rock-shaft c^5, journaled in the casing A and provided at its upper and lower ends with arms d^5 e^5, the arm d^5 extending into the path of the stud b^5, an angled lever g^5, pivoted to the head of the drum J, and a wire f^5, connecting the arm e^5 with the lever g^5, substantially as described.

17. The combination, with the pinion of the type-wheel-shifting mechanism, of the rack-bar v', the spring-acted eccentric-lever o^5, and the oscillating lever I, the eccentric-lever extending into the path of the oscillating lever I, substantially as described.

18. In a power-driven type-writer, the combination, with a type-wheel and the impression devices acting in connection therewith, of a main driving-spring, an intermediate spring connected with and kept under tension by said mainspring, and mechanism connecting the said intermediate spring with the said type-wheel and impression devices, substantially as set forth.

19. In a type-writing machine, the combination, with the printing mechanism, substantially as described, and a lever I for operating it, of the paper-carriage having a rock-shaft on which it slides, a lever R, operated by the lever I and connected with the said rock-shaft for rocking it, and an adjustable fulcrum for said lever R, whereby its throw may be adjusted and rock-shaft rocked

to a greater or less degree thereby, substantially as set forth.

20. In a type-writing machine, the combination, with the paper-carriage Q, of a rock-shaft S, movable with the paper-carriage and roller-platen T, a centrally-arranged sleeve g^4, journaled in fixed supports and receiving the rock-shaft S, and the arm h^5, attached to the sleeve g^4, substantially as shown and described.

JAMES RICHARDSON.

Witnesses:
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EDW. M. CLARK.