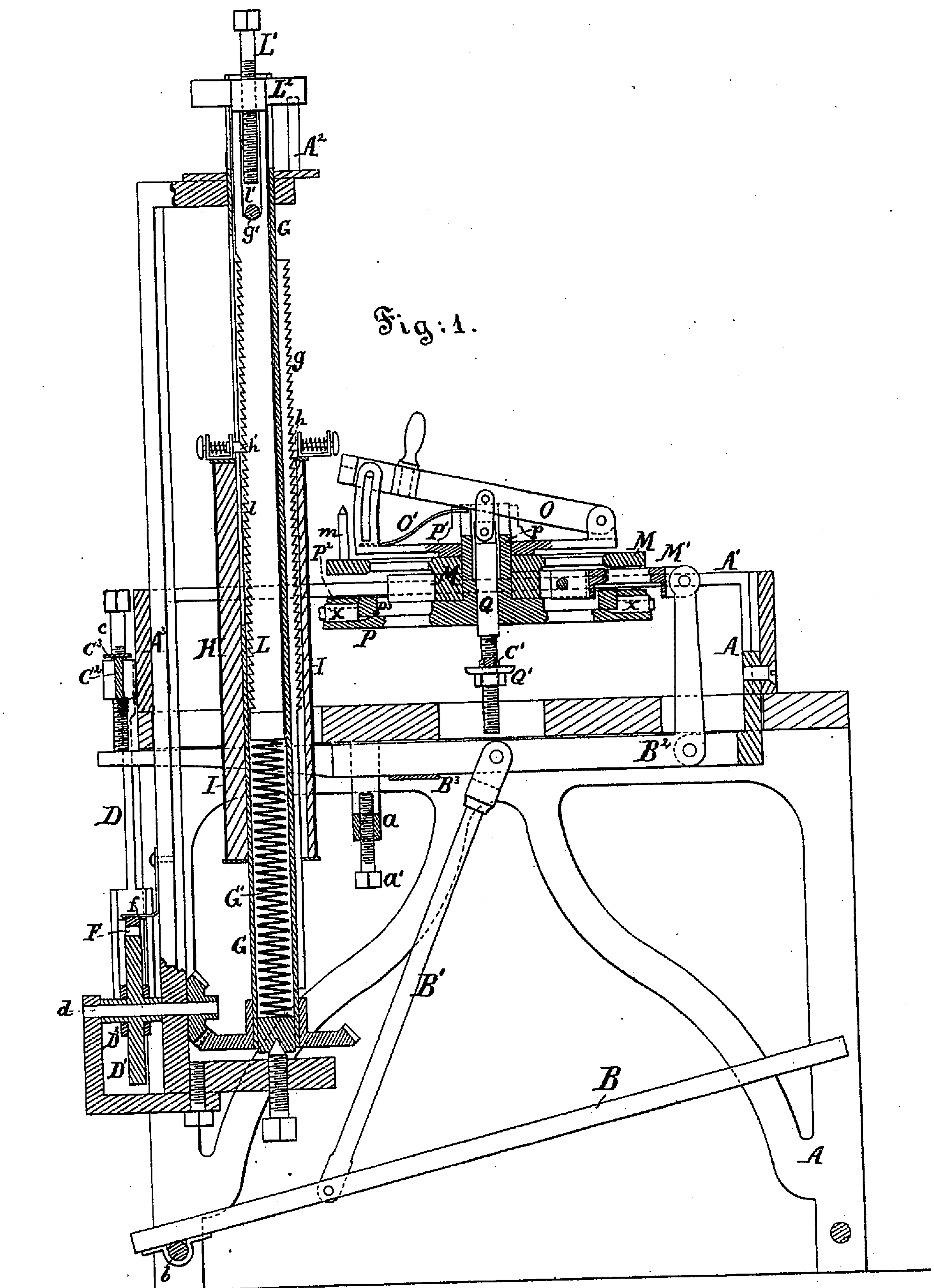
3 Sheets—Sheet 1.

E. T. DAVIS.

Type-Writers.

No. 197,614. **Patented Nov. 27, 1877.**



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Inventor:

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by his attorney

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3 Sheets—Sheet 2.

E. T. DAVIS.

Type-Writers.

No. 197,614. Patented Nov. 27, 1877.

Fig: 2.

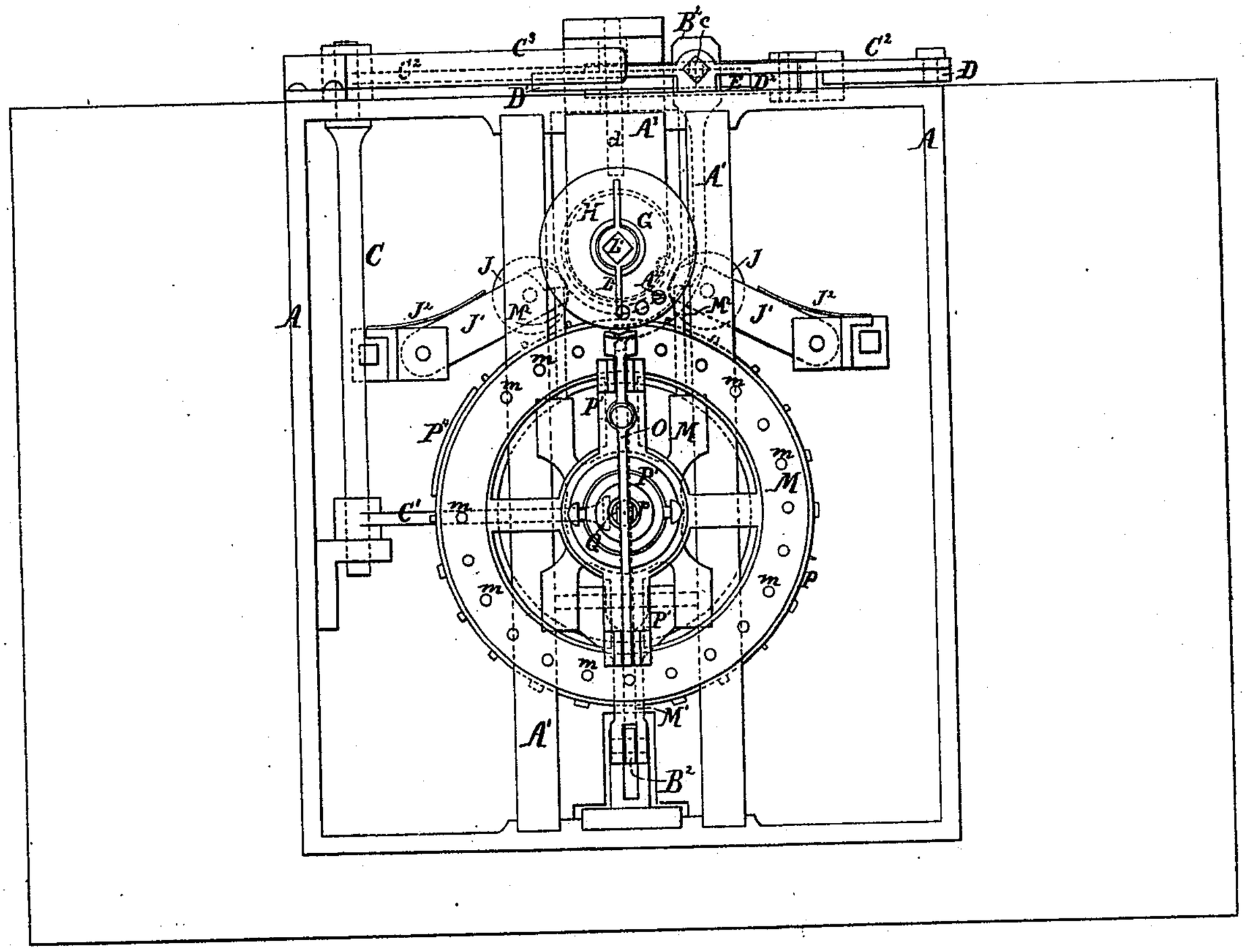


Fig: 4.

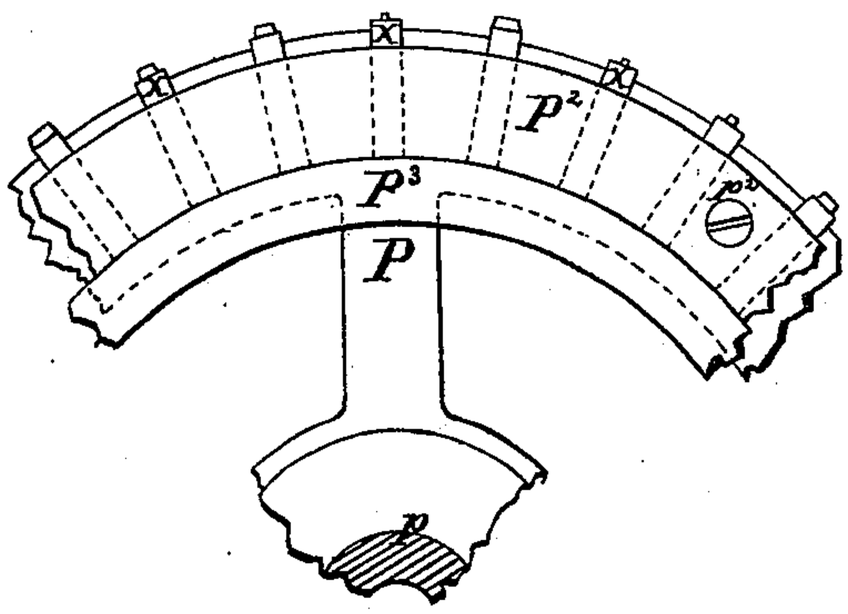
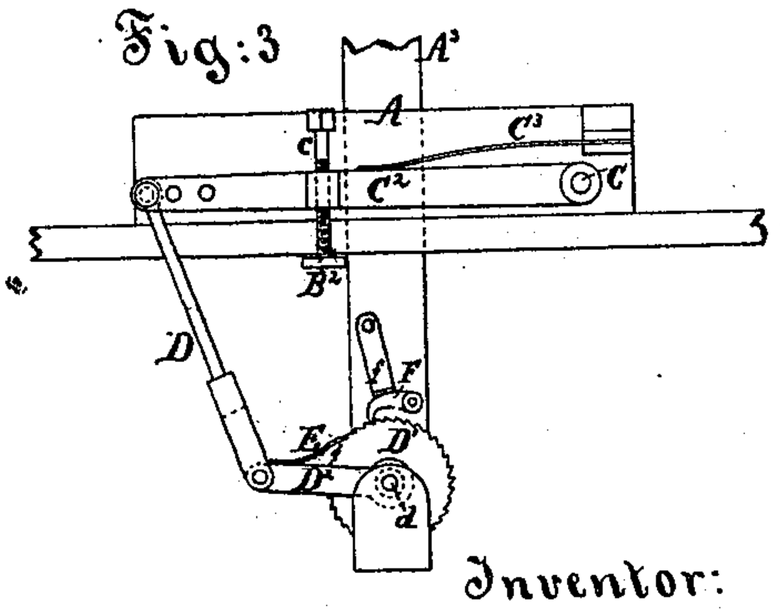


Fig: 3



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3 Sheets—Sheet 3.

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Type-Writers.

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Fig: 5.

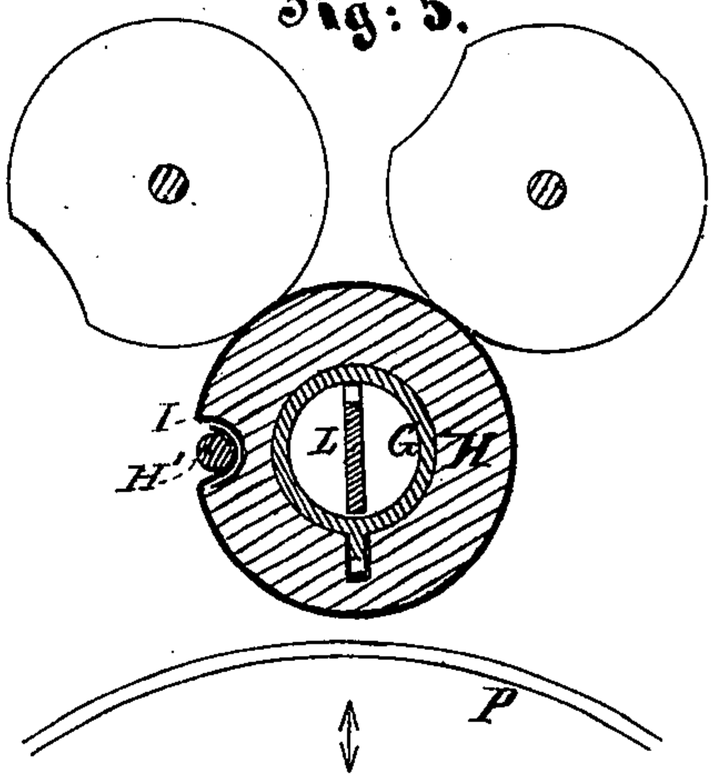


Fig: 6.

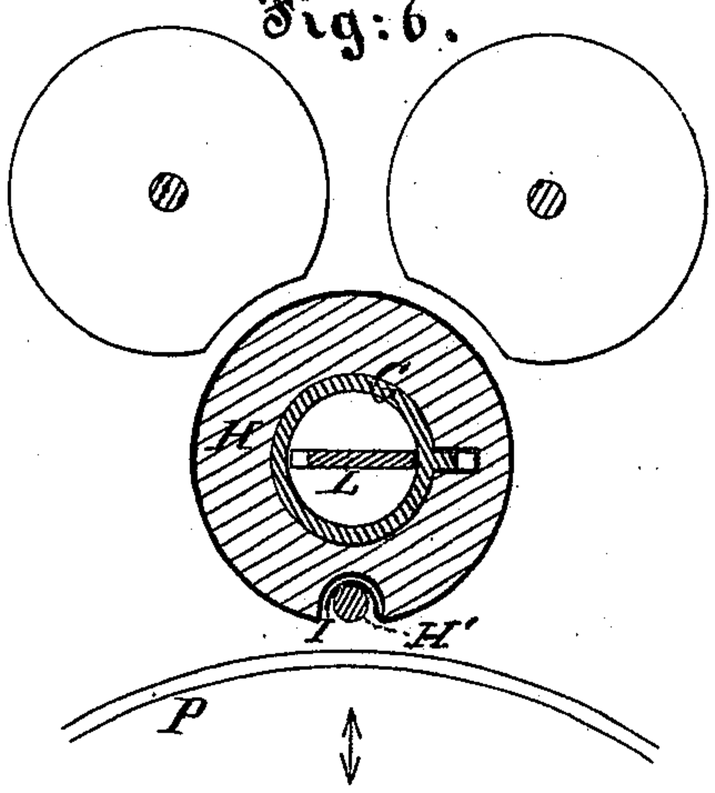
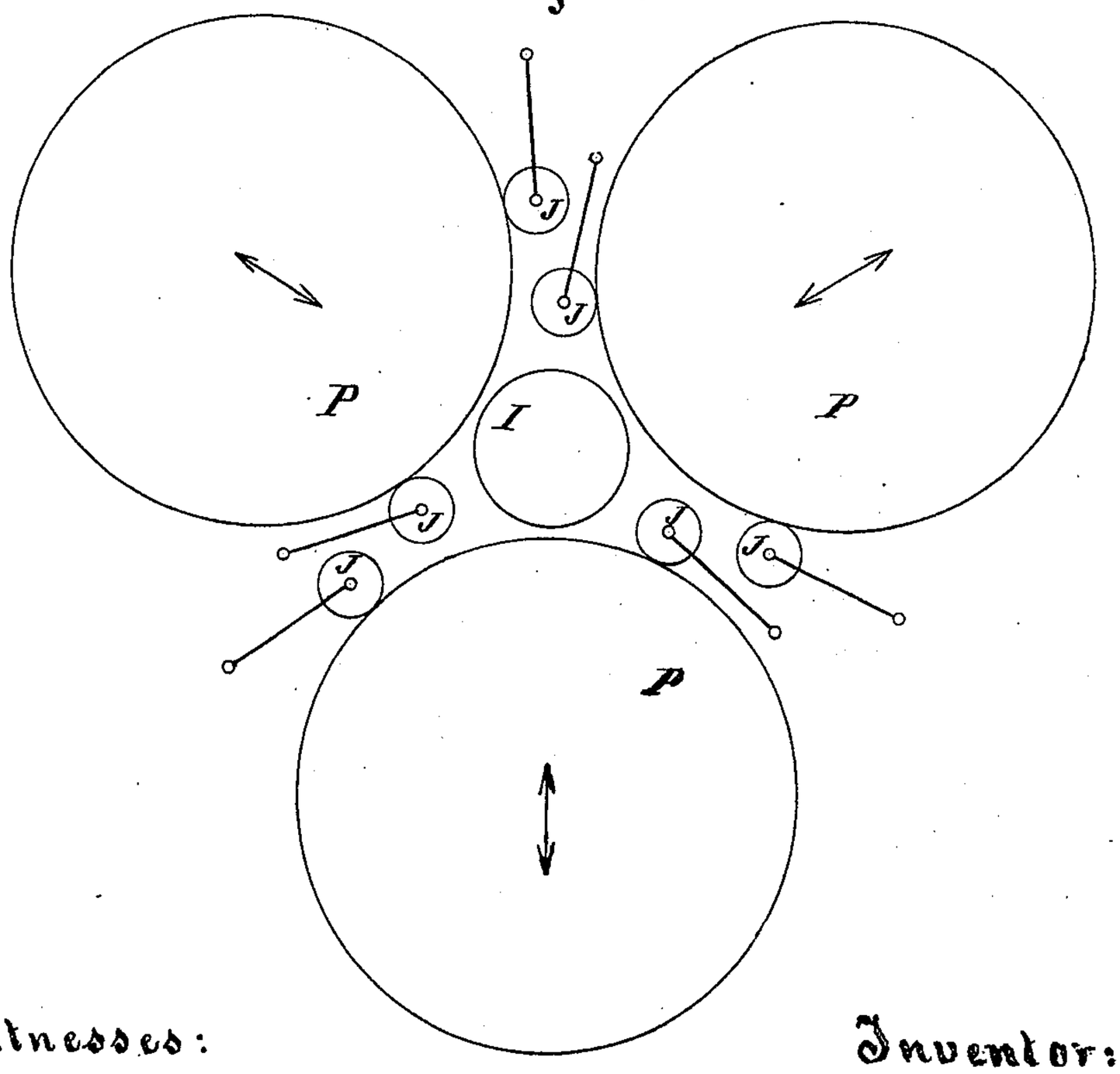


Fig: 7.



Witnesses:

A. Henry Gentner 2d
H. A. Johnstone.

Inventor:

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New York

UNITED STATES PATENT OFFICE.

EDMUND T. DAVIS, OF NEW YORK, N. Y.

IMPROVEMENT IN TYPE-WRITERS.

Specification forming part of Letters Patent No. **197,614**, dated November 27, 1877; application filed May 1, 1877.

To all whom it may concern:

Be it known that I, EDMUND T. DAVIS, of New York city, in the State of New York, have invented certain new and useful Improvements relating to Type-Writing Machines, of which the following is a specification:

My improved machine is intended for use mainly in producing a sheet printed with types with a suitable transfer-ink, which impressions are afterward to be transferred to stone and printed therefrom by the lithographic process. For this purpose perfection of result is more important than speed of operation.

I propose to use three sets of types, mounted, each set, on a separate wheel, and capable of being used interchangeably as required, one set being the upper and lower case of common Roman type, another the upper and lower case of Italics, and the third the upper and lower of a full-face or in some manner different style of type, to be used for headings and the like. A description of one wheel and its appurtenances will suffice for the whole.

One set alone may be used with tolerable success, and a good portion of the benefits of my invention may be realized thereby.

The wheel slides bodily in a track immediately contiguous thereto, so that the guides are unusually effective in controlling the position without a liability to irregularity in the position of the impression in consequence of any lost motion or springing of the parts. The impression is made not only with the squareness and directness due to a straight movement of the type to and from the paper, and a steadiness due to the confining of all the types rigidly in a large wheel, but also with the exactness of position due to broad and well-fitted guiding-surfaces in immediate contiguity with the wheel.

I provide efficient and convenient means for holding the types in the wheel and for changing them at will.

I graduate the degree of projection of the several types from the wheel according to the surfaces which they present, so as to allow for the amount of yielding due to the elasticity of the material under the varying forces of the impressions. Thus the capital "W," which presents a large surface and requires a large amount of pressure, projects considerably more from the wheel than the "full point." By this means I succeed in producing the impression against a yielding resistance with a force which is graduated. The letters with large faces are distinctly impressed, while the periods and other small-faced characters are not impressed through the paper.

I have a distributing-table, or a considerable area of smooth cylindrical surface on the type-wheel, to aid in maintaining the ink well distributed on the inking-rolls. I provide conveniently for the desired movements of the cylinder on which the paper is held, and I provide screw-pins mounted crownwise in a fixed circle, upon which an inverted V-shaped groove in the operating lever, being pressed by the hand, serves, first, to determine exactly the position of the wheel to print the desired letter; second, to determine the amount of the feed or movement of the paper, with capacity for readily varying it; and, third, allows of being set to a small extent in one direction or another by simply bending the pin.

The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a central vertical section. Fig. 2 is a plan view. The remaining figures represent details on different scales. Fig. 3 is a back view of a portion on a smaller scale. Fig. 4 is a plan view of a portion of the type-wheel on a large scale.

Similar letters of reference indicate corresponding parts in all the figures.

A is a fixed frame-work, of cast-iron or other suitable material. B is a treadle, turning on an axis, *b*, and giving motion, when operated by the foot, through a rod, B^1, to a bell-crank lever, B^2, turning on a fixed center, subject to the action of a spring, B^3. The result of a pressure of the treadle B is a depression of the back end of the lever B^2 and a backward movement of the upper arm thereof, which latter arm produces the impression by moving the type-wheel, as set forth farther on.

M is a ring-shaped carriage, guided by rigid

parallel ways or slides A^1A^1, stiffly connected to the framing A, forming a part thereof. M^1 is a link which connects the carriage M with the upper arm of the lever B^2. Each depression of the treadle B moves the carriage M horizontally on the slides A^1.

P is a type-wheel mounted on the carriage M, with liberty to rotate freely. Its axis is a tube, *p*, which is fitted to turn easily. The type-wheel P is firmly fixed on the tube *p* below the carriage M. A head, P^1, is firmly fitted on the upper end thereof. A rod, Q, hangs loosely in the center of the tube, and carries on its lower end a button, Q′, its upper face being a plane surface, adapted to serve as a stop to arrest the descent of the arm C^1. The upper end of the rod Q is linked to a lever, O, which is centered and guided on the cross-head P^1, as represented, and is forced upward by the spring O′. These parts rotate together.

The lever O is particularly important. It is the part to which the hand of the operator is applied, and by which the type-wheel is turned to determine what letter or character shall be next printed. It is equipped with a handle, as shown. It plays up and down in a transverse slot in the upper end of the tube *p*. It is centered at one extremity of the cross-head P^1, and plays between two close-fitting parallel guides at the other extremity of said cross-head. This construction insures that the cross-head and its connections shall be controlled by the turning of the lever O. If the latter is accurately placed the cross-head P^1, and consequently the type-wheel P, will be correspondingly placed.

A screw, *c*, having a rounded end adapted to rest and slide on the horizontal arm of the lever B^2, is set in a lever, C^2, which is fixed on a shaft, C, which latter rocks in fixed bearings, and has another rigidly-connected arm, C^1, the end of which latter stands under the type-wheel. Each depression of the treadle B, and consequently of the lever B^2, allows the screw *c*, and consequently the lever C^2, to be depressed. A spring, C^3, acts on the lever C^2 to insure such depression. The depression of the lever C^2 and its connections will always proceed to the full extent allowed by the depression of the lever B^2, unless arrested by some other means.

The under surface of the projecting end of the lever O is formed with a radial V-shaped groove.

Conically-topped screw-pins *m* are tapped into and firmly held in the upper face of the ring M. There are as many pins *m* as there are separate characters in the type-wheel P, and they are correspondingly distributed. The operator, in preparing to print a letter, turns the type-wheel until the lever O stands over the proper pin *m*, which may be marked, if desired, to aid learners. He then depresses the lever O, and the V-shaped groove therein, in coming to rest on its proper pin *m* beneath, turns a little to the right or left in order to receive the pointed top of the pin centrally in its groove. Any movement of this character imparts a corresponding change of position to the rigidly-connected type-wheel P below, and insures that the proper type is presented in the proper position for printing. Now, a movement of the foot of the operator, by depressing the treadle B, lowers the lever B^2, and lowers or permits the lowering of the lever C^2. But the extent to which the lever C^2 will follow the depression of the lever B^2 depends upon which of the pins *m* the lever O is at that moment resting on.

If it rests on a long pin, it holds the rod Q and its button Q′ up, and prevents the sinking of the lever C^1, and consequently of the rigidly-connected lever C^2, but a little ways.

D is a link, which connects the lever C^2 with a short lever, D^2, below. This lever D^2 turns loosely on a shaft, *d*, which has rigidly connected a ratchet-wheel, D^1, equipped with fine ratchet-teeth. A pawl, E, carried on the lever D^2, engages with the fine ratchet-teeth on the periphery of the wheel D^1, and at each depression of the lever C clicks over one or more of the teeth. At each elevation of the lever C it gives a corresponding turning motion to the wheel D^1. F is a pawl turning on a fixed center, and operated by a spring, *f*, to engage with the teeth of the ratchet D^1 and hold all it gets.

A bevel-gear wheel on the shaft D engages in another bevel-wheel on a long and stout upright shaft, G, which carries a cylinder, H, on which the paper I is held. Each movement of the type-wheel P impresses the proper type against the paper I, and also, by lowering the lever D^2, causes the pawl E to change its position on the teeth of the ratchet-wheel D^1. Each return movement of the type-wheel P elevates the lever D^2, and, by turning the ratchet-wheel D^1 to a proper extent, correspondingly turns the paper-cylinder G, and presents a fresh surface to receive the impression of the next type.

The extent of this feeding-motion of the paper after each impression is proportioned to the variable depression of the hand-lever O. If it was depressed upon a short pin, *m*, and consequently depressed a long distance, the button Q′ descended, and consequently the levers C^1, C, and D^2 were allowed to descend a long distance, and a considerable number of the ratchet-teeth in the wheel D^1 were seized, and a large amount of feed-motion was imparted by the ascent of the lever. If, on the contrary, the hand-lever O was depressed upon a long pin, *m*, all these motions were less. The height of the pins *m* is adjusted according to the length of feed of the paper required for the letter which corresponds thereto. A capital "M" or "W" requires a short pin, *m*. A lower-case "i" or "l" requires a tall pin, *m*,

so that after producing the impression the paper will be fed forward only a very small amount.

The types X are clamped in the type-wheel P. Radial grooves, having a depth nearly equal to the depth of the body of the type and a width a little greater than the thickness of the type, are planed or otherwise produced in the wheel P. The several types are applied therein in their proper positions, and then a clamping-ring, P^2, (see Figs. 1 and 4,) is strongly compressed thereon by the aid of screws p^2.

The inner end of each type abuts against a ring, P^3, which may be perfectly concentric to the axis, and would hold the faces of the several types out to a uniform extent if the types were of uniform length; but I graduate the length of the types by removing some of the metal from the back ends, removing the most from the periods, a little less from the small letters, and so upward until the large types are allowed to remain full length. The very largest types, as capital "M" and capital "W," may have a little added to their length, say, one thickness of paper. Thus the working faces of the types project to variable distances, and, the impression movement being uniform, the impression is made more severe for the large-face type and less severe for the small-face type. This compensates for the unavoidable springing of the shaft G, and causes all the impressions to be practically uniform.

The types are inked by the inking-rollers J, which are mounted in levers J^1, turning on fixed centers, and held to their work by springs J^2. These inking-rollers turn freely on their axes, and roll with the turning of the type-wheel P, with which they are in contact. They also move with the sliding motion of the type-wheel with each impression. The severity of the contact between the types and the ink-rollers is softened by the action of the thrust-pin M^2, which extends from the carriage M, and presses against a suitable arm on the lever J^1. There is one such arm and one such thrust-pin for each lever J^1.

A portion, P^4, of the surface of the type-wheel P is left smooth or unfitted with types. This rolls against the ink-rollers with each turning of the type-wheel, and keeps the ink evenly laid or distributed on the ink-rollers.

My construction is peculiarly adapted to obtain not only very perfect impressions, but also unusually-accurate spacing of the letters. Ordinary imperfections of workmanship, or even considerable mistakes in the locating of the centers of the several types in the type-wheel, may be compensated for by slightly deflecting or bending the pins *m*. Thus, for example, suppose the lower-case "i," with the very small amount of feed of the paper, is found to encroach a little upon the next letter; in other words, it is printed too far ahead on the paper. The evil is remedied by adjusting the pin *m* corresponding to that type by applying any suitable tool to the side of the pin and striking it a sufficient blow to slightly bend it. This changes the position of the pointed top of the pin, so that in future when the lever O is brought down upon it the type-wheel P does not stand in the same position as before, but is enough changed to bring the impression in the right place. This adjustment, by bending the pins *m*, must, of course, be the last adjustment of the pins, as any turning of these screw-pins *m* after they are bent would violently disturb the adjustment.

The shaft G is made hollow or tubular, and carries in its lower part a spring, G′, which lifts on a bar, L, extending upward in the interior. This bar is formed with a rack, *l*, with which engages a ratchet or sliding catch, *h′*, which works through a long vertical slot in the tubular shaft G. The shaft G has, on its outside, a similar rack, *g*, which receives a corresponding ratchet or sliding catch, *h*. These catches *h h′* are mounted on the upper end of the paper-cylinder H. They control the position thereof. When it is desired to lower the paper-cylinder, these catches *h h′* must be forcibly drawn out, by the hands, or otherwise, from their engagement with their respective racks *g l*. Then the paper-cylinder H may be freely lowered.

It is desired to elevate this cylinder to a uniform distance at the commencement of each line. I effect this by simply pressing down the interior bar L, and liberating it again. In depressing the bar L the catch *h* holds the cylinder H by remaining engaged with the rack *g*. The rack *l* sinks past the catch *h′* a few notches. Now, on removing the pressure of the hand from the bar L, and allowing the latter to be raised again by the force of the spring G′, the rack *l* acts on the catch *h′*, and compels a corresponding elevation of the cylinder H, the catch *h* sliding idly on its rack *g* during this upward movement, and then again engaging and contributing to hold the whole firmly in the new position.

The bar L has a slot, *l′*, in which lies a pin, *g′*, which is fixed in the tubular shaft G. The slot allows the vertical movement of the bar L within the shaft G.

The extent of this intermittent vertical movement of the cylinder from one line to another may be graduated by turning the screw L^1 at the top. This screw is tapped into the bar L, as shown, and its end forms the upper boundary of the slot *l′*.

In depressing the bar L the pin *g′* forms a stop, and thus the screw L^1 regulates the depth to which the bar L can be depressed at each movement, and consequently the height to which the cylinder H will be raised at each movement.

A^2 is a pin set in the fixed frame-work. At the beginning of each line the tubular shaft G and its connections should be turned by the hand until an arm, L^2, projecting from the shaft G, strikes the pin A^2. This arm may be set in

the bar L, and extend through a slot in the tubular shaft G. I have shown it as so made, and, thus arranged, it performs the double functions of aiding to adjust the position of the cylinder H in commencing each line, and also of forming a convenient finger-piece for the application of the hand in depressing the bar L and forcibly turning the whole when necessary. I prefer to act on the arm L^2, and to facilitate this I extend a corresponding arm in the opposite direction from the bar L, the tubular shaft G being slotted on each side to allow this.

The extent of the depression of the treadle B is regulated by a screw, *a'*, which is tapped through a strap or keeper, *a*, under the lever B^2, and arrests the descent of the latter with mathematical exactness.

When three, or any number more than one, of the type-wheels P are employed, it is not necessary to correspondingly duplicate the mechanism for operating the paper-cylinder; but the change of action from the printing with one wheel to the printing with another necessitates the turning of the paper-cylinder partly around preliminary to such change. The arm A^3 of the framing which supports the upper end of the shaft G should, in such case, be replaced by a stout beam or arch, extending across the whole top of the machine, thus leaving a clear space for the several type-wheels to act in. The inner ends of the ways or slides A^1 require to be supported independently by stout posts or otherwise, and, the several type-wheels P being placed in position with their several guides, provision must be made for operating each at will by the same or different treadles.

Various modifications may be made in the details. A separate screw may be mounted behind each type to force it out or allow it to be pressed back at will, as required, to secure a more delicate adjustment; or, on the other hand, it may be sufficient, in most cases, to simply grind off a little from the inner ends of the smallest types, and to allow the others to remain ungraduated.

The pin H', which I have shown as sunk into a groove in the paper-cylinder to hold the paper, may be replaced by more elaborate clamping means for holding the paper. The treadle, which I have shown as operating with a large amount of motion, may work satisfactorily with much less motion.

The ink-rollers, which I have shown as two, mounted each close to the printing-point, one on each side, may be farther apart, and there may be greater number. Elaborate distributing-rollers may be connected to apply the ink.

Instead of allowing the long tubular shaft G to be unsupported, and providing the above compensations for the variable spring in printing different types, I can back the paper-roller H by one or more short smooth rollers pressing against the paper above the printed part, or between the lines of print. As such rollers, bearing with force against the paper, would interpose friction to resist the necessary raising and lowering of the paper-cylinder, I provide a hollow side in each backing-roller, which hollow side is to be turned toward the main roller preliminary to every raising or lowering movement.

Fig. 5 is a plan, showing such modification with the backing-roller in position for use. Fig. 6 is a corresponding plan view, showing the backing-roller in position to allow the raising or lowering of the paper-cylinder. Fig. 7 is a plan view, showing the arrangement for the use of three type-wheels, as above described.

Some of the features of the invention may be useful without the others. Thus, I can operate very successfully without the pins *m*, by simply providing other means to determine the position of the wheel, and having a continuous rim of varying height upon the dial-plate to determine how low the lever C^1 and, consequently the lever D^2, may sink at each movement.

I claim as my invention—

1. The ways A^1, carriage M, and type-wheel P, in combination with the paper-cylinder H, as herein specified.

2. In combination with the slender, and consequently yielding, paper-roller H, the revolving type-wheel P, clamping-ring P^2, and fastening means p^2, when the types X are set to project forward to unequal distances from the axis, as and for the purposes herein set forth.

3. The thrust-pins M^2, in combination with the levers J^1, ink-rollers J, and springs J^2, and with the carriage M and type-wheel P, the latter having both a rotating and bodily movement, as herein specified.

4. The ink-table P^4 on the type-wheel P, in combination with the inking-rollers J, paper-cylinder H, and means, substantially as described, for imparting a bodily as well as rotary motion, as herein specified.

5. In combination with type-wheel P, revolving and moving bodily, as described, the adjustable pins *m* on the carriage M, and the lever O, recessed on its under face, the recess or the pins or both being formed with inclined surfaces adapted to serve as and for the purposes described.

6. The internal bar L and rack *l*, in combination with the tubular shaft G and rack *g*, spring G', paper-cylinder H, pawls *h h'*, and with the type-wheel P, as herein specified.

7. The pin *g'* in the tubular shaft G, in combination with the bar L, having a slot, *l'*, and with the adjusting-screw L^1, adapted to adjust the space between the lines, as herein specified.

8. The arm L^2 on the internal bar L, in combination with a corresponding arm on the opposite side, and with the tubular shaft G, provided with slots adapted to perform the dou-

ble functions of finger-pieces for the depression of the bar L and as turning means for effecting the rotation of the whole, at will, as herein specified.

9. The paper-cylinder H, with means for turning it around to any desired extent, at will, in addition to the provisions for feeding, as shown, in combination with two or more type-wheels, P, arranged to apply from different directions, as herein specified.

In testimony whereof I have hereunto set my hand this 28th day of April, 1877, in the presence of two subscribing witnesses.

EDMUND T. DAVIS.

Witnesses:
A. HENRY GENTNER,
CHAS. C. STETSON.