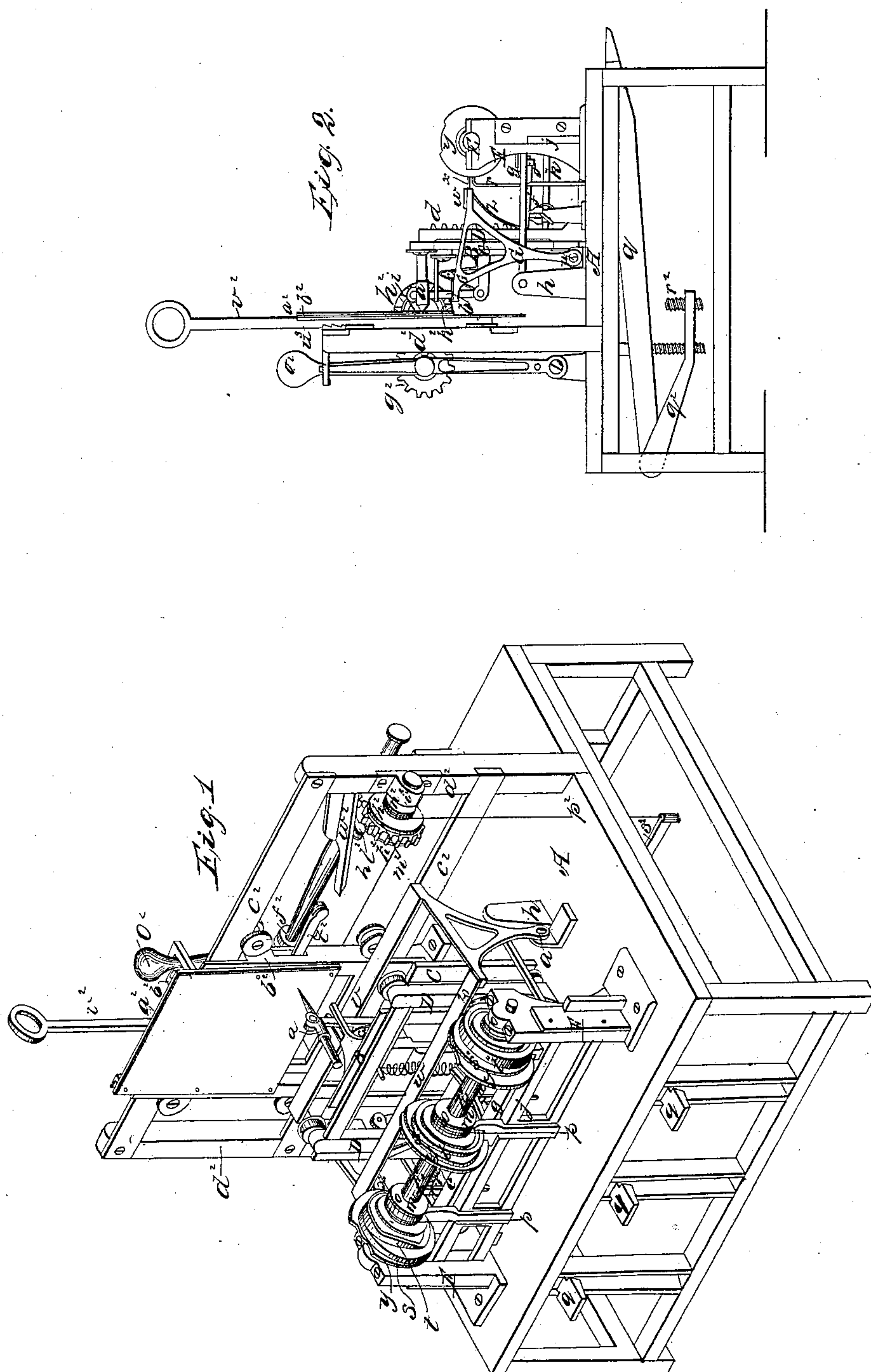


C. THURBER.  
MECHANICAL CHIROGRAPHER.

No. 4,271.

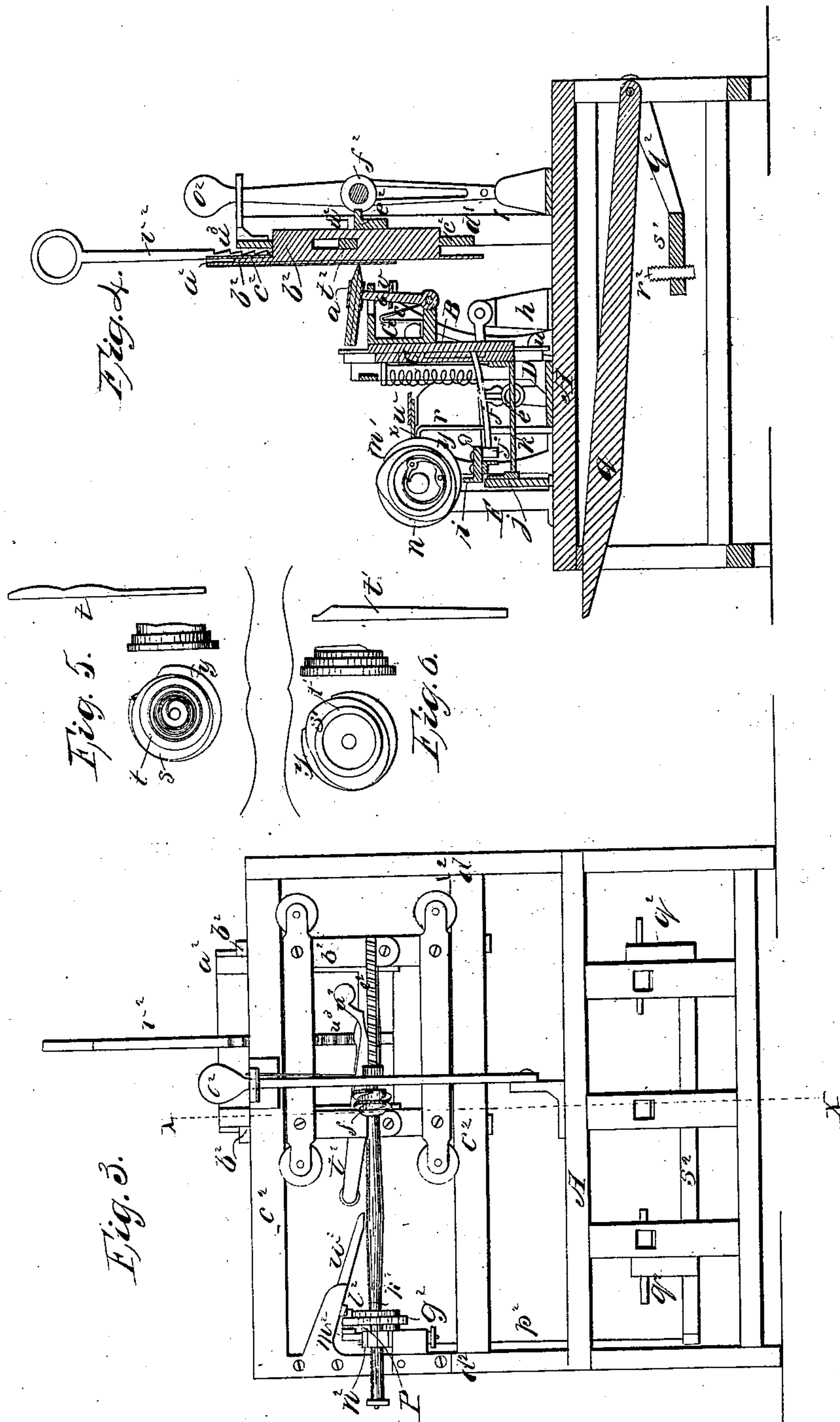
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# UNITED STATES PATENT OFFICE.

CHARLES THURBER, OF NORWICH, CONNECTICUT.

## IMPROVEMENT IN WRITING-MACHINES.

Specification forming part of Letters Patent No. 4,271, dated November 18, 1845.

*To all whom it may concern:*

Be it known that I, CHARLES THURBER, of Norwich, in the county of New London and State of Connecticut, have invented a new and useful machine, called the "Mechanical Chirographer," for writing or forming any kind of figures or characters on paper, &c., and making copies thereof at the same operation; and I do hereby declare that the following is a full, clear, and exact description of the principle or character thereof and of the manner of constructing and using the same, reference being had to the accompanying drawings, which make part of this specification, in which—

Figure 1 is a perspective representation of the machine simply adapted to the formation of three letters or characters, as from these the manner of adding the other letters will be obvious. Fig. 2 is a side elevation; Fig. 3, a back elevation; and Fig. 4 a transverse vertical section taken at the line X X of Fig. 3. The parts which are not visible in these figures will be represented separately and referred to in their appropriate places.

Like parts are indicated in all the figures by the same letters.

Many attempts have been made to contrive an apparatus to form letters or other characters in succession to enable persons to write who do not possess the faculty of governing a pen, and also to enable persons while writing to take a duplicate or duplicates; but, so far as I am informed, these have proved inefficient in practice. The pantograph, it is true, has been used for writing duplicates, and types have been so arranged as by a given movement of mechanism to impress upon paper any required character; but the former has always been considered too unwieldy to be governed by the fingers of a writer, and the latter attended with too much trouble and difficulty. These objections, it is believed, have been overcome and the desired ends attained by this invention, the principle or character of which, and what distinguishes it from all other things before known, consists in communicating to a pen or pencil holder the motions necessary to delineate any and all letters or other characters by motions at right angles to each other, obtained by sets of cams, each set being so formed as to combine the right-angle movements, and thus generate the ver-

tical, horizontal, oblique, and curved lines required to delineate the letters or characters. Each set of cams is actuated by a separate and distinct lever or handle, as in a piano-forte, and the table with the paper, &c., caused to move forward the required distance at the termination of each letter or character by the return motion of the lever or handle.

In the accompanying drawings, A is a frame properly adapted to the reception of all the mechanism. The pen or pencil holder *a* is on a lever, *b*, jointed to a vertically-sliding frame, B, within a horizontally-sliding frame, C, working on the standing frame D. These two frames, sliding at right angles to each other, present the means of communicating to the pen or pencil a vertical or horizontal movement, or any compound of them, by which any diagonal or curved line can be generated, while by its jointed connection with the frame the pen or pencil can be pressed against the paper by a small spring, *c*. The sliding frame B is kept up by the tension of a helical spring, *d*, attached to it and to the horizontally-sliding frame C, and this latter is in like manner drawn to the left by the tension of another helical spring, *e*, attached to it and to the main frame of the machine.

For the purpose of communicating the downward movements to the vertically-sliding frame B, an arm, *f*, projects from it and extends to and under a horizontal bar, *g*, attached to two arms that turn on stud-pins on the standards *h h*, the bar *g* resting on a roller, *f'*, on the end of the arm *f*, so that the frames may move endwise freely while the bar *g* rests on the roller. This bar *g* is provided with studs *i*, one for each set of cams or for each character the machine is intended to make, the upper edge being properly formed to receive the action of the cams, to be presently described.

The horizontally-sliding frame C is permanently connected with a sliding bar, *j*, by means of a brace-bar, *k*, and this sliding bar is provided with a set of studs, *l*, having one side properly formed to be acted upon by face-cams to communicate the horizontal movements. The series of cams are mounted on a horizontal shaft, E, sustained on the standards F F. All the cams on each set are attached to and move together on the shaft between collars *m m*, each set being provided with a



ratchet-wheel,  $n$ , and a spring-hand,  $n'$ , on a drum-wheel,  $o$ , around which a cord,  $p$ , is wound and carried to a lever,  $q$ , by the depression of which the cams are carried around one entire revolution, and there retained by the friction of a spring,  $r$ , while the drum and lever are drawn back by a volute spring within the drum, as represented in section at Fig. 5. There must of course be one set of cams and a corresponding ratchet, drum, and lever for each character intended to be formed, and in the example given in the drawings there are but three sets represented, as this number is deemed sufficient to enable any one skilled in the arts to increase the number at pleasure by simply changing the form of the cams.

The cams  $s s' s''$  are for communicating the vertical motion to the sliding frame B by acting on the studs  $i i i$ , the cam-forms being on the periphery, and  $t t' t''$  are those for communicating the horizontal movements by acting on the studs  $l l$ , the cam-forms in these being on the face. The shape of the first set,  $s$  and  $t$ , to form the Roman capital B, are projected in section 5, the first motion of the pen being vertical to form the bar of the letter, and therefore given by the cam  $s$  only, and then the semicircles, which, being compounds of both motions, are given by the two cams  $s$  and  $t$  acting at the same time. The second set,  $s' t'$ , for the formation of the Roman capital W, is projected at section 6, and this letter being formed of four diagonals, the four strokes of the pen are produced by compounds of the two motions; and the third, for the formation of the Roman capital I, which requires only a vertical stroke, consists of a single volute cam  $s''$ .

For the purpose of removing the pen or pencil from the paper at the end of each letter, there is a frame, G, turning on stud-pins at  $u u$ , with a bar,  $v$ , in front of the pen-holder, and another bar,  $w$ , at the back, provided with studs  $x x x$ , similar to those on the bars of the sliding frames, which are borne against the peripheries of cam-wheels  $y y y$ , attached to and moving with each set of cams  $s$  and  $t$ , by springs  $z z$ , so that at the end of every revolution of each set of cams these studs fall into recesses in the peripheries of the wheels  $y y y$ , by which the pen or pencil is drawn back to relieve the point thereof from the surface of the paper while it is moved forward preparatory to the commencement of another letter; but when the frame is moved forward by the rotation of either of the sets of cams the pen-holder is liberated and pressed against the surface of the paper by the spring  $c$ .

The sheet of paper or other substance to be written upon is attached to a frame,  $a^2$ , which slides vertically in a frame,  $b^2$ , that runs horizontally between two wings,  $c^2 c^2$ , attached to standards  $d^2 d^2$ . The back of the frame  $b^2$  is provided with a rack,  $e^2$ , the teeth of which receive the threads of an endless screw,  $f^2$ , on the shaft of a cog-wheel,  $g^2$ , which receives its motion from another cog-wheel,  $h^2$  that turns freely on a stud-pin,  $i^2$ , and is provided with a

ratchet-wheel,  $k^2 k^3$ , on each side, the one,  $k^2$ , to receive a pawl,  $l^2$ , to prevent the cog-wheel from moving back, and the other,  $k^3$ , for the hand  $m^2$ , jointed to a drum,  $n^2$ , to act upon, so that by the turning of the drum  $n^2$  by means of a lever,  $s^2$ , and cord  $p^2$ , coiled around it, a horizontal motion is communicated through the whole train to the paper on the descent of the lever, but not on its ascent, this being prevented by the pawl  $l^2$ . The lever  $s^2$  is in the usual form of a treadle, extends entirely across the machine and under the series of levers  $q q q$ , and has an arm,  $q^2 q^2$ , at each end (only one of which is visible in the drawings) that turn on stud-pins at the back of the frame, so that the lever or treadle  $s^2$  is set in motion by either of the levers  $q$ , and the lever or treadle  $s^2$  is further provided with a set-screw,  $r^2 r^2 r^2$ , for each lever  $q$  to act upon, so that the spaces between each letter can be regulated at pleasure, some requiring the paper to be moved more than others in proportion to their width. The shaft of the endless screw  $f^2$  is hung in a shipper-lever,  $o^2$ , for the purpose of throwing the screw out of gear to permit the paper to be moved back at the end of each line, and in this back movement the paper is moved up the width of one line by means of the lever  $t^2$ , provided with a spring-catch,  $u^2$ , that takes into ratchet-teeth  $w^3$  on a vertical bar,  $v^2$ , on the back of the frame to which the paper is attached. As the paper moves forward the lever descends and the catch falls in below one tooth, and when it is moved back the end of the lever runs up an inclined plane,  $w^2$ , attached to the frame which carries up the paper.

By reference to the drawings it will be seen that the slides work on rollers for the purpose of reducing friction; but these may be dispensed with and the slides constructed and arranged in any manner best suited to the judgment of the constructor.

Various modes of applying the principle of this invention have been contemplated—such, for instance, as hanging each set of cams on a separate axle instead of one common axle. The face-cams for giving the horizontal movements may be dispensed with, and a cam on the periphery substituted therefor by interposing a lever arrangement to change the vertical into a horizontal movement—an arrangement well-known to machinists, and which therefore needs not to be represented; employing a rack on each lever  $q$ , the teeth of which take into cogs on a cog-wheel, to be substituted for the drum and cord described above; or a segment-rack may be attached to an elbow-lever or to the end of the lever, to take into the teeth of the cog-wheels that actuate the sets of cams; or, instead of having the cams separate from the levers and turning on separate centers, the cams may be attached to the end of the lever and so arranged as to act on the sliding frames in manner substantially similar to the cams above described, except that in this case the cams will be projected on a segment instead of an entire circle. The frame that carries the paper



may be carried by a pinion instead of an endless screw, or by a toothed belt. For the sliding frames levers may be substituted to form the connection between the cams and the penholders to give the requisite movements to the pen; but in this case it will be necessary to reverse the form of the cams, as the motions will necessarily be reversed. In short, all these movements may be effected by any of the known mechanical equivalents or such as may be hereafter invented, as the substitution of these equivalents one for another are matters well known to those skilled in the mechanic arts, and the selection of any or either of them must be governed by the judgment of the constructor. The principle and the mode of application, as it has been essayed, being fully described above, any skillful machinist will have no difficulty in substituting any of the equivalents for the movements described.

It will be obvious that by lengthening out the machine to carry two, three, or more pens and a corresponding number of sheets of paper any desired number of copies may be made at one and the same operation without changing the parts of the machine which produce the movements.

Having pointed out the principle of my invention and the manner of constructing and using the same, and indicated some of the variations in construction which may be made without changing the principle or character which distinguishes it from all other things before known, what I claim as my invention, and desire to secure by Letters Patent, is—

1. Communicating the motions to the pen or pencil by means of cams acting on frames, so that the vertical and horizontal strokes can be given by separate movements and the oblique and curved strokes by the combined action of the two, substantially as herein described.

2. Giving to the sheet of paper or other substance to be written upon a horizontal movement for spacing off the letters and a vertical movement for the lines, in combination with the movements of the pen or pencil, substantially as herein described.

CHARLES THURBER.

Witnesses:

DAVID YOUNG,  
CHS. M. KELLER