No. 700,271. Patented May 20, 1902.

A. M. WHITTEN.

RULING MACHINE.

(Application filed Aug. 31, 1901.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1

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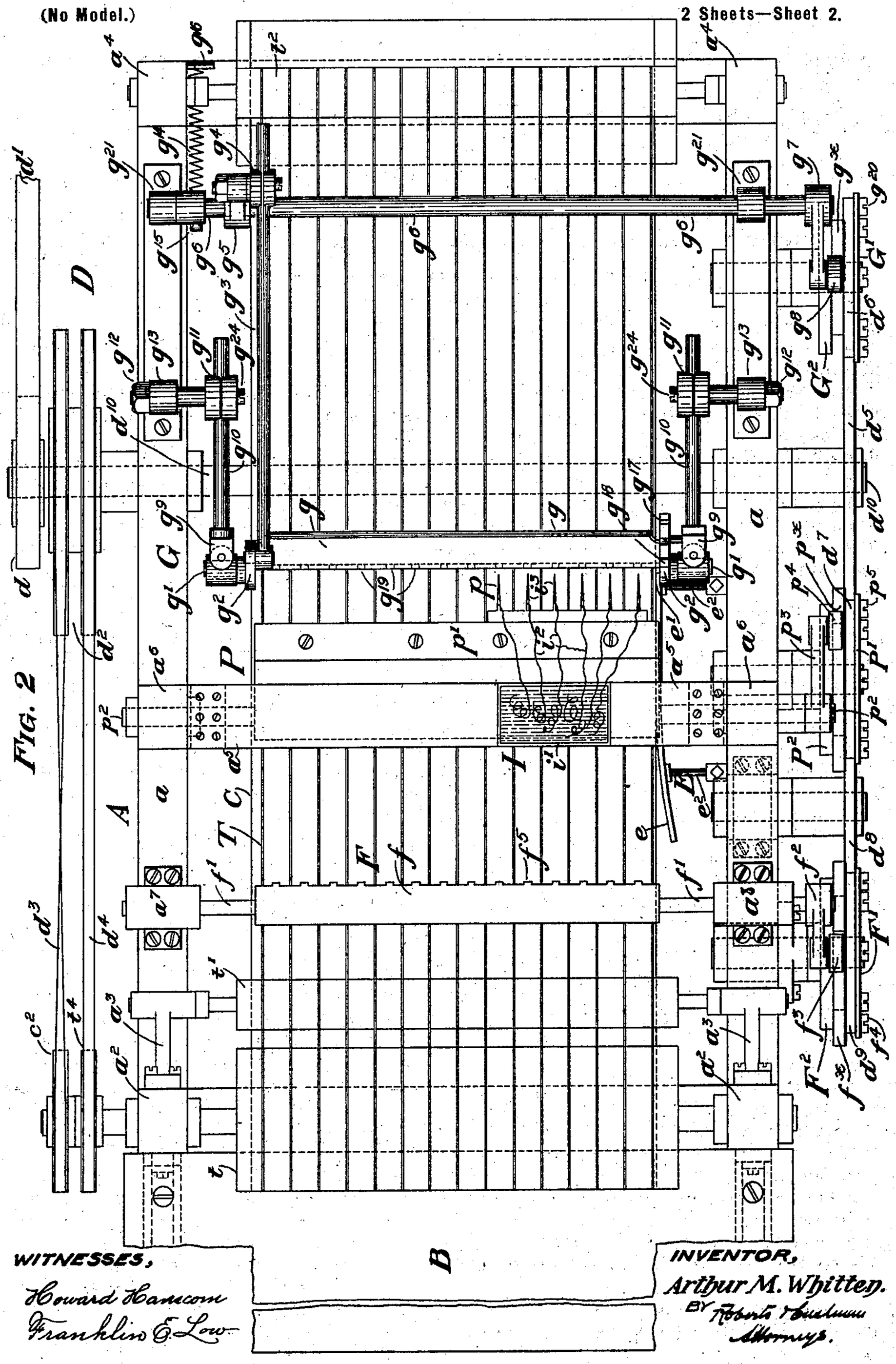

FIG. 2

UNITED STATES PATENT OFFICE.

ARTHUR M. WHITTEN, OF WEST MEDFORD, MASSACHUSETTS, ASSIGNOR TO LIBRARY BUREAU, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

RULING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 700,271, dated May 20, 1902.

Application filed August 31, 1901. Serial No. 73,997. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR M. WHITTEN, a citizen of the United States, and a resident of West Medford, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Ruling-Machines, of which the following is a specification.

My invention relates to automatic ruling-machines; and it consists in improvements whereby paper sheets or cards can be more accurately and uniformly ruled than heretofore.

The utility of my invention lies especially in mechanical combinations by which a ruling-machine is enabled to rule lines which do not extend from edge to edge of the blank, but which begin at a point or on a line inside the edge and extend therefrom to the farther edge of the blank, like the vertical lines on bill-heads, pages for books of account, and the like.

In the drawings hereto annexed I show an embodiment of my improvements as applied to the well-known Hickox ruling-machine, which employs a cloth-belt conveyer for the paper blanks, in connection with tapes which travel in contact with the belt, and stationary ruling-pens secured to a pen-beam or equivalent support.

In the drawings, Figure 1 is a vertical longitudinal elevation, and Fig. 2 a plan view, of such a machine with my improvements applied thereto.

For convenience in reading the drawings the following system of lettering is used:

A designates generally the frame of the machine, and the stationary parts which compose the frame are indicated by a a' a^2, &c.

B and b b', &c., designate the blank-supply table and the blanks in various positions.

C designates generally the blank-conveyer, the specific parts of which are indicated by c c', &c.

D designates generally the driving mechanism, of which the several parts are indicated by d d', &c.

E designates generally the edge-gage devices, whose subordinate parts are indicated by e e', &c.

F designates generally the front gate, whose component and connected parts are indicated by f f', &c.

G designates generally the stop-gate, whose component and connected parts are indicated by g g', &c.

I designates generally the inking devices, whose component and connected parts are indicated by i i', &c.

P designates generally the pen mechanism, whose component and connected parts are indicated by p p', &c.

T designates generally the moving tapes, which coöperate with the blank-conveyer C, and t t', &c., indicate the several parts of the tape mechanism.

The driving mechanism D derives its power from a main belt d' and belt-pulley d. A double belt-pulley d^2 carries the crossed belt d^3 and open belt d^4, which drive the blank-conveyer and tape mechanism, respectively, by means of pulleys c^2 and t^4, Fig. 2. The pulley d is keyed to the shaft d^{10}, which is hung on the lower side of the frame-plates a, and thereby drives the main gear d^5. The gear d^5 meshes directly with gears d^6 and d^7 and through an idler d^8 and gear d^7 drives the gear d^9. The gears d^6, d^7, and d^9 are secured and impart motion to the cam-frames G′, P′, and F′, respectively. These cam-frames, with the cams secured thereto, constitute the operating mechanism for the stop-gate parts G, the pen parts P, and front-gate parts F, as presently to be described. The gears d^6, d^7, and d^9 are pitched and sized so as to rotate the cam-frames G′ P′ F′ all at the same speed. The arrows on the several belts, pulleys, and gears indicate the direction of their motion when the machine is running.

The blank-conveyer consists of a cloth belt C and tapes T. The belt C passes over the driving-roll c, which is on the same shaft with the pulley c^2, Fig. 2, passes thence in an inclined direction to the cross-bar a^7, thence horizontally to the back roll c', and thence to the driving-roll c. The tapes T pass around the tape-driving roll t, Fig. 1, which is driven by the pulley t^4, Fig. 2, and thence pass in contact with the belt C to the lower back roll t^3, Fig. 1, thence to the upper back roll t^2,

thence to the upper front roll t', and thence to the driving-roll t. The tapes T and belt C move with equal speed, the tapes serving to hold the blanks to be ruled upon the belt C with gentle pressure.

The several mechanisms which compose the machine are mounted on the frame A, which consists of side plates or beams a, legs a', front and back standards a^2 a^4, tape-roll brackets a^3, ink-beam a^5, Fig. 2, and cross-bar a^7. These parts are braced together in the ordinary manner.

Paper or card blanks are introduced into the machine at the table B, where an attendant may sit and feed the blanks one by one into the clutch of the belt C and tapes T, where they pass over and under the driving-rolls c and t. The blanks are carried by the conveyer first to the point b', where the front gate F may act upon them, thence to the point b, where the stop-gate G and ruling devices P come into action, and thence to the point b^2, where they may be delivered into a basket or other suitable receptacle.

Without regard to their correlation and timing the movements of the several parts of the blank alining, regulating, and ruling mechanisms are as follows:

Proceeding with the blank-conveying belt C, we come first to what I designate as the front-gate mechanism F. This consists of the gate f, mounted on the rock-shaft f', to which is secured the rocker-arm f^2, which carries at its outer end the cam-roll f^3. The rock-shaft f' is journaled in bearings a^8 on the side frames a. By means of screw-bolts f^4 the cam $f^\times$ is secured to the cam-frame F', which consists of a disk integral with or rigidly fastened to the gear d^9. The cam $f^\times$ intermittently acts on the cam-roll f^3, and thereby lifts and lets fall the gate f. When the cam-roll f^3 is riding on the high dwell of the cam $f^\times$, the points f^5 of the gate f touch the belt C at points between the tapes T.

We come next to the ruling mechanism P. This consists of ruling-pens p, which in the machine here shown are metallic channeled quills secured by clamping to the oscillating penholder, which is a beam p', fast on a rock-shaft p^2, which is journaled in the brackets a^6 on the side frames a. A rocker-arm p^9 is secured to one end of the rock-shaft p^2 and carries at its outer end the cam-roll p^4. This cam-roll p^4 is actuated by the cam $p^\times$, which is secured to the cam-frame P' by screw-bolts p^5. The cam $p^\times$ as it passes under the cam p^4 lifts the pens p from the belt C. When the cam-roll p^4 falls from the high dwell of the cam $p^\times$, the pens move down into ruling position by gravity. The pens p are supplied with ink either from flannel or felt pads or from an ink-trough, such as that shown at i'. The inking devices I consist of the trough i' and wicks i^2, which are secured to the pens p at i^3. The trough i' rests upon a cross-bar a^5, extending across the machine between the brackets a^6, Fig. 2.

Next in order is the stop-gate mechanism G. The stop-gate g is secured to short rock-shafts g' by arms g^2. One of these arms g^2 at the side of the machine shown in the upper part of Fig. 2 is extended upward and has jointed to it the link g^3. The link g^3 is adjustably secured to the rocker-arm g^5 by a clamp g^4. The rocker-arm g^5 is secured to a rock-shaft g^6, Fig. 2, mounted on the standards g^{21} and extending across the machine and carrying upon its opposite end the rocker-arm g^7. The arm g^7 carries the cam-roll g^8. A cam $g^\times$, secured to the cam-frame G' by screws g^{20}, causes the cam-roll g^8 to rise and fall as the cam-frame G', which is rigidly secured to the gear-wheel d^6, rotates. An arm g^{15}, secured to the rock-shaft near the arm g^5, has attached to it a retracting-spring g^{14}, which is secured to the stud g^{16} on the machine-frame.

The parts of the mechanism G so far described control the rise and fall of the stop-gate g. When the cam $g^\times$ lifts the cam-roll g^8, it moves the gate g down to the belt C by means of the train of parts described—to wit, rocker-arm g^7, rock-shaft g^6, rocker-arm g^5, link g^3, arm g^2, and shaft g'—and when the cam $g^\times$ passes from under the roll g^8 the retracting-spring g^{11} lifts the gate g.

The gate g is made adjustable with reference to the pens p in the following manner (best observed in Fig. 2:) The short shafts g' are mounted in bearing-blocks g^9, which are pivotally secured to the bars g^{10}. These bars g^{10} are adjustably mounted in clamps g^{11}, secured to standards g^{13} by nuts g^{12}. Screws g^{24} control the pressure of the clamps g^{11} on the bars g^{10}. When it is desired to adjust the position of the gate g with reference to the pens p, the screws g^{24} are slackened and the bars g^{10}, carrying the gate g, are moved to the point desired, the clamp g^4, which holds the link g^3, being eased off to permit the necessary movement of the link. Then when the gate has been properly placed the clamps g^4 and g^{11} are again set tight. At such times it may be desirable also to hold the gate g out of contact with the belt C. For this purpose I provide the catch g^{17}, Fig. 1, pivoted on the block g^9. While the machine is in operation, the catch g^{17} is thrown back to its full-line position, Fig. 1; but when the gate g is to be held fixed, as during adjustments, the gate g is turned by hand, the catch g^{17} placed in the dotted-line position in engagement with the notch g^{18}. The gate g is provided with contact-teeth g^{19}, Fig. 2, which when the gate is down rest on the belt C between the tapes T.

By the mechanisms above described, which are actuated in common by the main shaft d^{10} and which control, respectively, the movements of the front gate f, pens p, and stop-gate g, these three principal tools of the machine are moved toward and from the belt C, coming in contact therewith or with blanks resting upon it at predetermined regular intervals. The manner and the means by which

these intervals are regulated and determined will now be described. The cams $f^{\times}$, $p^{\times}$, and $g^{\times}$ are adjustable circumferentially upon the frames F′, P′, and G′, so that their times of operation on the cam-rolls f^3, p^4, and g^8 may be adjustably determined. This adjustment is effected by the employment of disks F^2 P^2 G^2, which are integral with or keyed to the shafts which rotate with the frames F′ P′ G′ and lie behind the gears d^9, d^7, and d^6. The cams $f^{\times}$, $p^{\times}$, and $g^{\times}$ are crescent-shaped or segmental and slip between the disks F^2 P^2 G^2 and the gears d^9, d^7, and d^6, respectively. The clamping-screws f^4, p^5, and g^{20}, which pass through the frames F′, P′, and G′ and gear-wheels d^9, d^7, and d^6, respectively, are then turned in and bind the cams $f^{\times}$ $p^{\times}$ $g^{\times}$ in their desired positions. A proper number of change-cams are provided for each cam-frame, so that adjustments beyond the range of a single cam may be secured. Thus the relative times when in the operation of the machine the front gate f, pens p, and stop-gate g move toward and touch the belt C or blanks placed thereon can be changed at will.

With respect to blanks which are fed into the machine at B the functions of the principal tools—the front gate f, pens p, and stop-gate g—are as follows: Blanks are fed into the machine at B by the attendant in charge or by automatic blank-feeding mechanism, if such is provided, with as much regularity as possible, the attendant timing his movements so that each blank will strike the teeth f^5 of the front gate f while the latter is in its lower position. The front gate f rests on the belt C during the greater part of the rotation of the cam-frame F′, so that there is little chance of a blank escaping the operation of the gate. This front gate f stops each blank as it is carried forward by the belt C and tapes T, which slip easily on the surfaces of the blank while the latter is held in arrest by the gate. Thus the front gate regulates the spacing of the blanks upon the belt with greater accuracy than the attendant can be expected to attain and insures their delivery to the more actively operative tools—the stop-gate g and pens p.

If an automatic blank-introducing mechanism is provided which insures regular feed of blanks, such mechanism may be timed to meet the requirements of the stop-gate and pens, so that the front gate may be dispensed with. An experienced attendant might become so well trained as to time his movements so accurately that the front gate might be superfluous; but this is hardly to be expected.

It was observed in the preamble of this specification that the improvements to be described were especially useful in ruling blanks only partially, beginning at a point within the edges of the blank. Heretofore on ruling-machines of the belt-conveyer class ruling of this kind has been done by timing the descent and ascent of a gate placed like the front gate f with the descent and ascent of pens placed like the pens p. By this operation the blank was carried without interruption under the pens, which caught the surface of the blank "on the fly." As might have been expected, the ruling done in this way has never been perfect, the pens usually catching the surface of the blank above or below the line where they were intended to begin ruling. With my improvements the front gate f does not have to be timed with special reference to the moment when the pens p descend to the belt C, but with reference to the moment of descent of the stop-gate g. Even this timing of the front gate f is not necessarily exact. It may vary slightly without doing any harm.

The timing of the descents of the pens p and stop-gate g depends upon the character of the work to be done—in other words, upon the width of the space between the front or upper edge of the blank and the point where the ruling is to begin. This space is measured on the blank and is, say, the distance between the top line already ruled across the blank and the upper edge of the blank. The stop-gate carriage, which consists of the bars g^{10} and their connections with the rock-shaft g', is then moved until the points g^{19} of the gate g when touching the belt C are at a distance from the pens, measured along the belt, equal to the unruled space to be left at the top of the blank. Then the cams $p^{\times}$ and $g^{\times}$ are set so that the gate g will descend to the belt C before the pens p and will rise from the belt after the pens p have descended and while they are in contact with the blank. Then the cam $f^{\times}$ is set so that the gate-points f^5 rise from the belt before the gate g descends to the belt by an interval about equal to the time it takes for a point on the belt to travel from the gate-points f^5 to the gate-points g^{19}. This timing is with reference to the travel of a single blank. The blanks may be fed fast enough to cause more than one blank to lie on the conveyer between the gate f and the gate g.

The pen-cam $p^{\times}$ is preferably to be selected of a length which corresponds to the size of the blanks or the length of the lines to be ruled, so that very soon after a blank has drawn out from under the pens the pens will rise. Thus in acting on a blank the stop-gate g always keeps ahead of the pens in the upward and downward movement.

The front gate f and stop-gate g serve to square a blank in the machine, but cannot gage its position sidewise. Therefore I provide a side gage at E, which lies close to the surface of the belt C in front of the stop-gate g and is fixed adjustably to the frame a by brackets e^2. The end E of the side gage is inclined to the direction of movement of blank, while the latter part e' is parallel therewith. The attendant feeds the blanks in on the extreme edge of the belt C, so that they are sure to strike the slightly-inclined

surface *e* and be moved in to be straightened by the straight-edge *e'* before striking the stop-gate *g*.

The progress of a blank through the machine is as follows: After being inserted between the belt-roll *c* and tape-roll *t* the blank is carried to the front gate *f*, which momentarily checks its progress. Then the front gate *f* lets it go to the side gage E, which places it in the proper position laterally. Then it strikes the stop-gate *g*, and while it is held still by the stop-gate *g* the pens *p* descend exactly upon the line where ruling is to begin, the stop-gate *g* rises, the blank is drawn forward under and in contact with the pens, is ruled thereby, and passes to the delivery end of the machine. The pens *p* rise before the next blank comes along, the intervals between blanks having been regulated by the front gate *f*.

Blanks which have been ruled by the aid of my improvements show none of those faults and irregularities which mar work done as heretofore. The blank is always stationary when the pens move down upon it. If the preliminary adjustment of the stop-gate and the timing-cams has been properly made, the work will be perfectly done.

What I claim, and desire to secure by Letters Patent, is—

1. In a ruling-machine, the combination of a blank-conveyer, a penholder and a stop-gate relatively adjustable one to the other and each movable to and from the conveyer, the stop-gate behind the penholder, pens carried by the penholder, means for intermittently moving the penholder and the stop-gate to and from the conveyer, and mechanical connections whereby the movements of the stop-gate to and from the conveyer are made to precede the movements of the penholder to and from the conveyer, respectively.

2. In a ruling-machine, the combination of a blank-conveyer, a penholder and a stop-gate relatively adjustable one to the other and each movable toward and from the conveyer, the stop-gate behind the penholder, pens carried by the penholder, adjustable cams for intermittently moving the penholder and the stop-gate to and from the conveyer, whereby the movements of the stop-gate to and from the conveyer are made to precede the movements of the penholder to and from the conveyer, respectively.

3. In a ruling-machine, the combination of a blank-conveyer, a penholder and a stop-gate, each movable to and from the conveyer, the stop-gate behind the penholder, pens carried by the penholder, means for intermittently moving the penholder and the stop-gate to and from the conveyer, a front gate, situated in front of the penholder, means for moving the front gate to and from the conveyer, and mechanical connections whereby the movements of the stop-gate to and from the conveyer are made to precede the movements of the penholder to and from the conveyer, respectively, the front gate being timed to move from the conveyer before the stop-gate descends thereto, by an interval not greater than the time occupied by a point on the conveyer in passing from the front gate to the stop-gate.

4. In a ruling-machine, the combination of blank-conveyer, a penholder and a stop-gate, each movable to and from the conveyer, the stop-gate behind the penholder, pens carried by the penholder, means for intermittently moving the penholder and the stop-gate to and from the conveyer, a front gate, situated in front of the penholder, adjustable cams for intermittently moving the penholder, stop-gate, and front gate to and from the conveyer, whereby the movements of the stop-gate to and from the conveyer are made to precede the movements of the penholder to and from the conveyer, respectively, the front gate being timed to move from the conveyer before the stop-gate descends thereto, by an interval not greater than the time occupied by a point on the conveyer in passing from the front gate to the stop-gate.

5. In a ruling-machine, the combination of a blank-conveyer, a penholder, a stop-gate, a carriage therefor movably and adjustably mounted on the machine-frame, the stop-gate behind the penholder, pens carried by the penholder, means for intermittently moving the penholder and the stop-gate to and from the conveyer, and mechanism whereby the movements of the stop-gate to and from the conveyer are made to precede the movements of the penholder to and from the conveyer, respectively.

6. In a ruling-machine, the combination of the blank-conveyer, penholder and pens, stop-gate, adjustable supporting-bars therefor, brackets for said bars, adjustable actuating-link for the stop-gate, pen-cam and stop-gate cam, and connections therefrom to the penholder and stop-gate, respectively, whereby the movements of the stop-gate and penholder are made to alternate, substantially as described.

7. In a ruling-machine, the combination of a blank-conveyer, a penholder and a stop-gate, each movable to and from the conveyer, the stop-gate behind the penholder, pens carried by the penholder, and a side gage provided with a leading-in guide and a straightening edge, located over the conveyer close to the same end in front of the stop-gate.

Signed by me at Boston, Massachusetts, this 29th day of August, 1901.

ARTHUR M. WHITTEN.

Witnesses:
ROBERT CUSHMAN,
FRANK S. HARTNETT.