

(No Model.)

6 Sheets—Sheet 1.

J. L. COX.  
PRINTING PRESS.

**No. 539,356.**

Patented May 14, 1895.

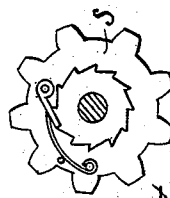
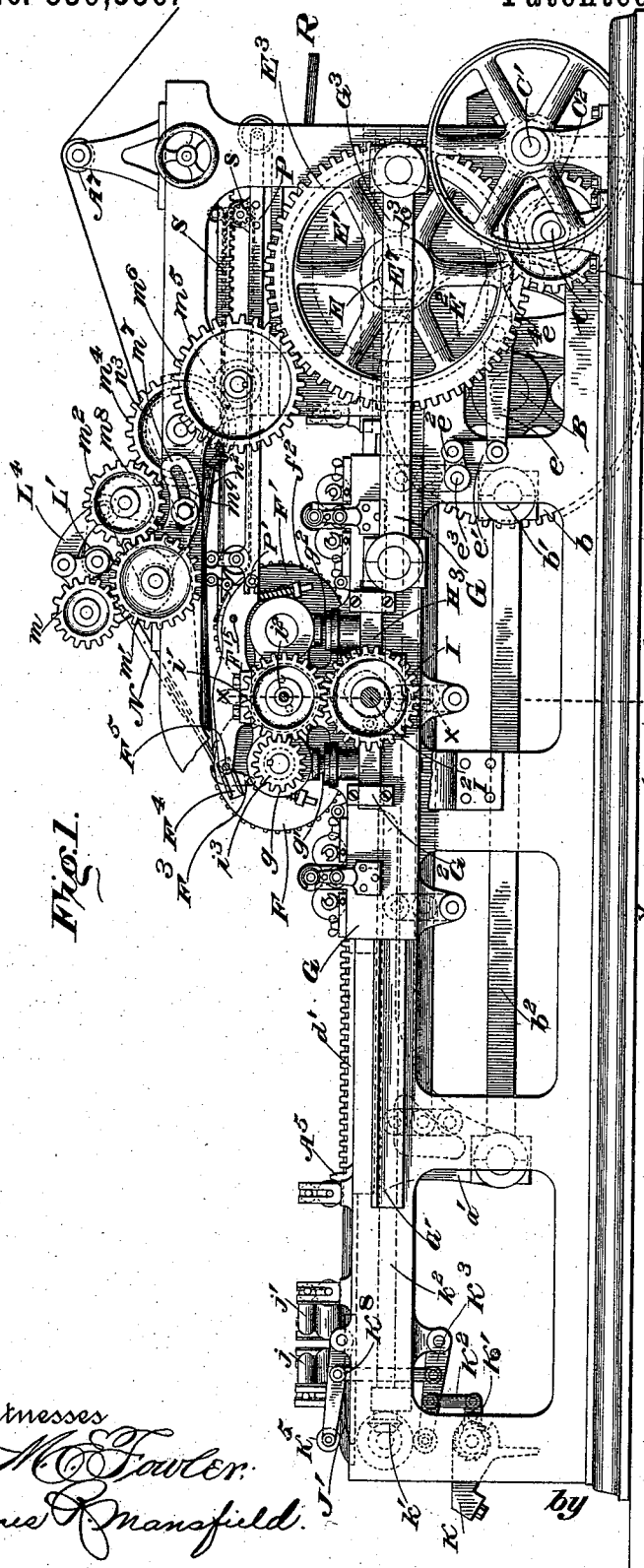
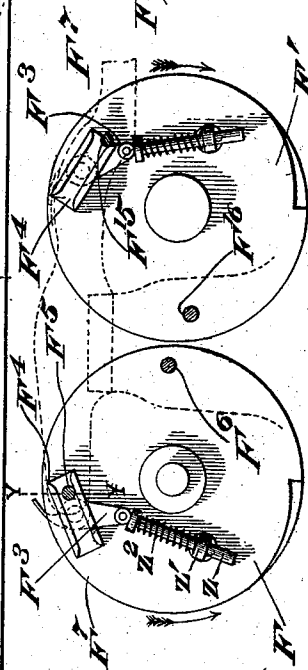


Fig. 4.

Fig 18.



Witnesses  
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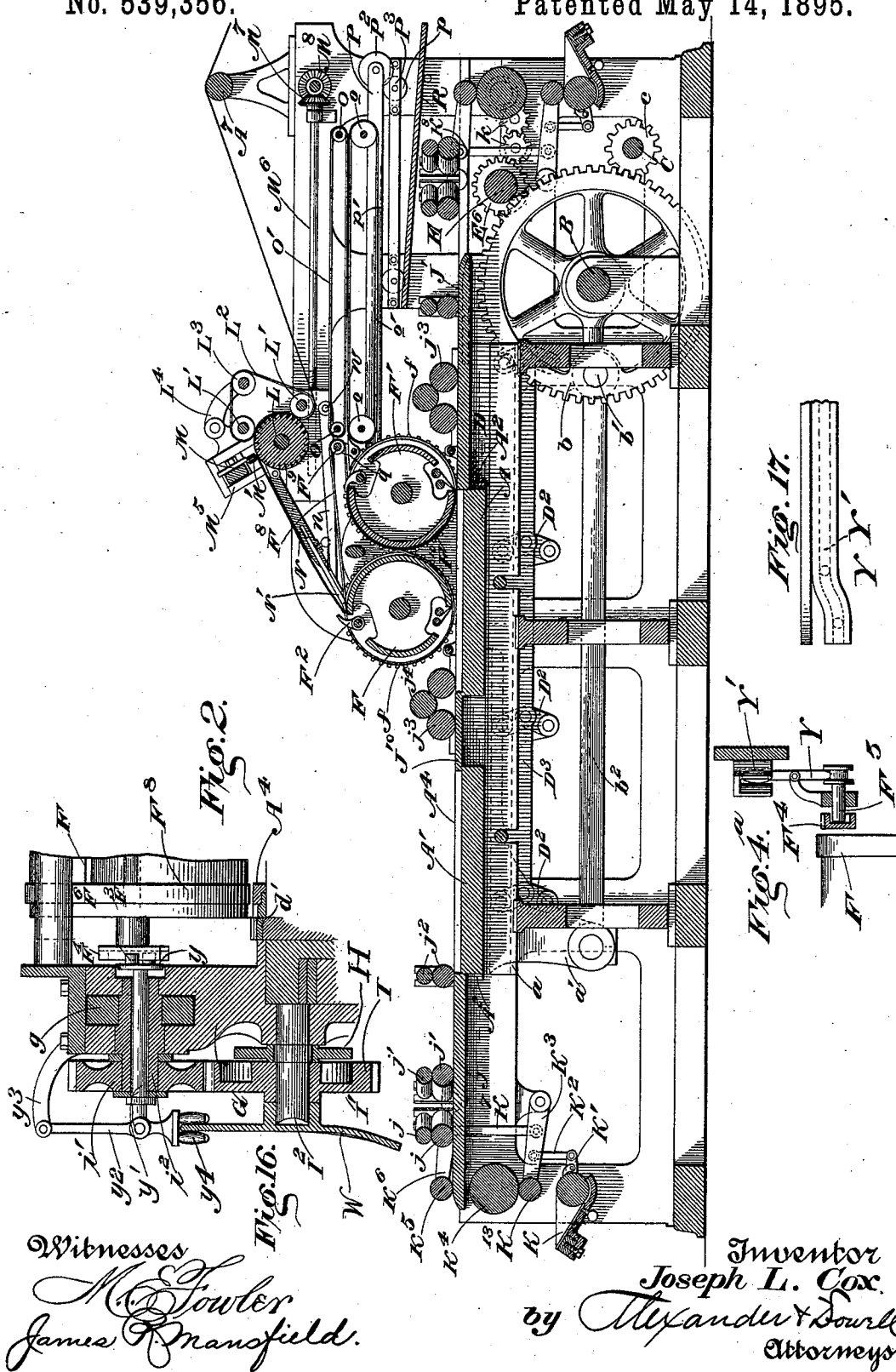
(No Model.)

6 Sheets—Sheet 2.

J. L. COX.  
PRINTING PRESS.

**No. 539,356.**

Patented May 14, 1895.



THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

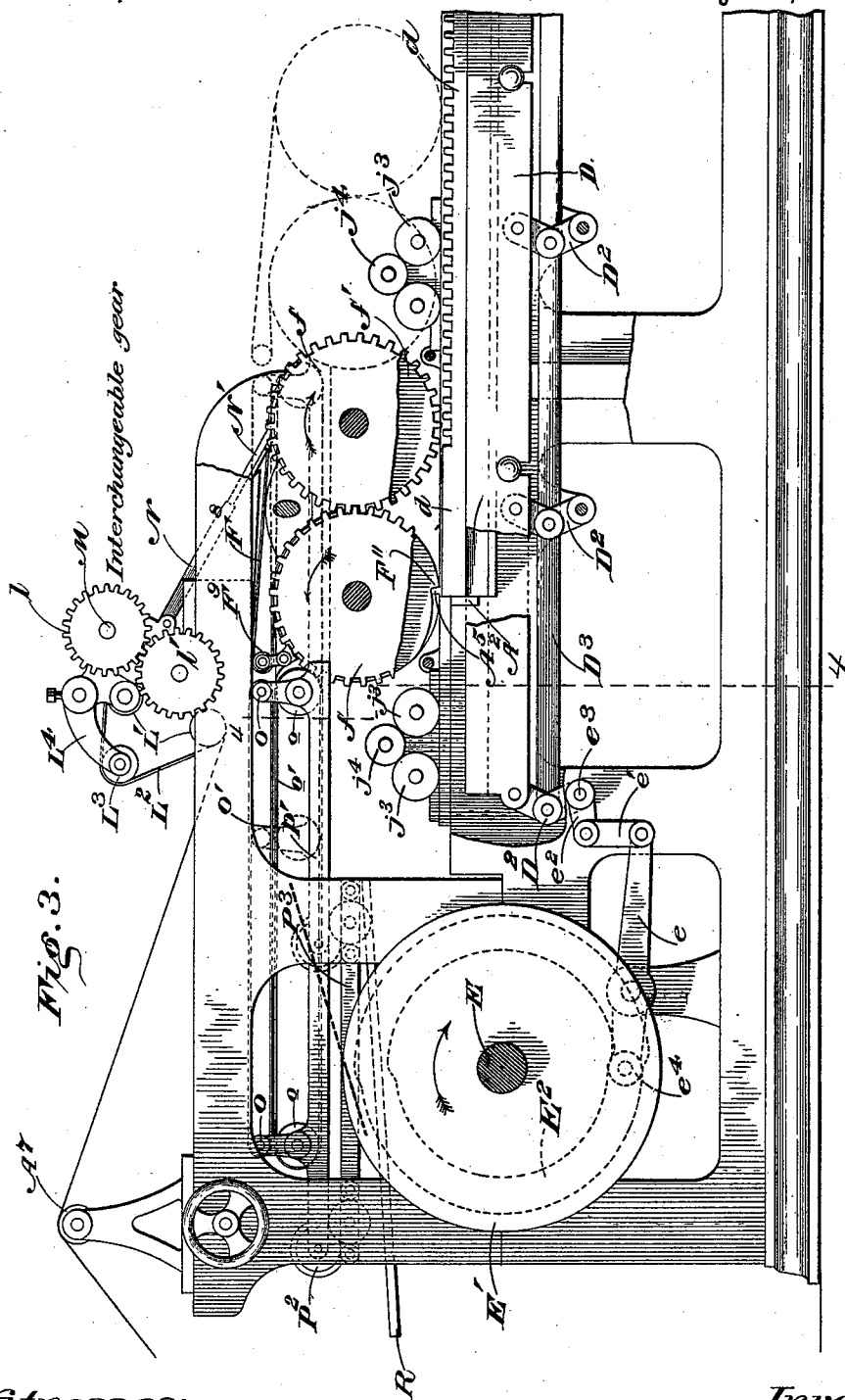
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6 Sheets—Sheet 3.

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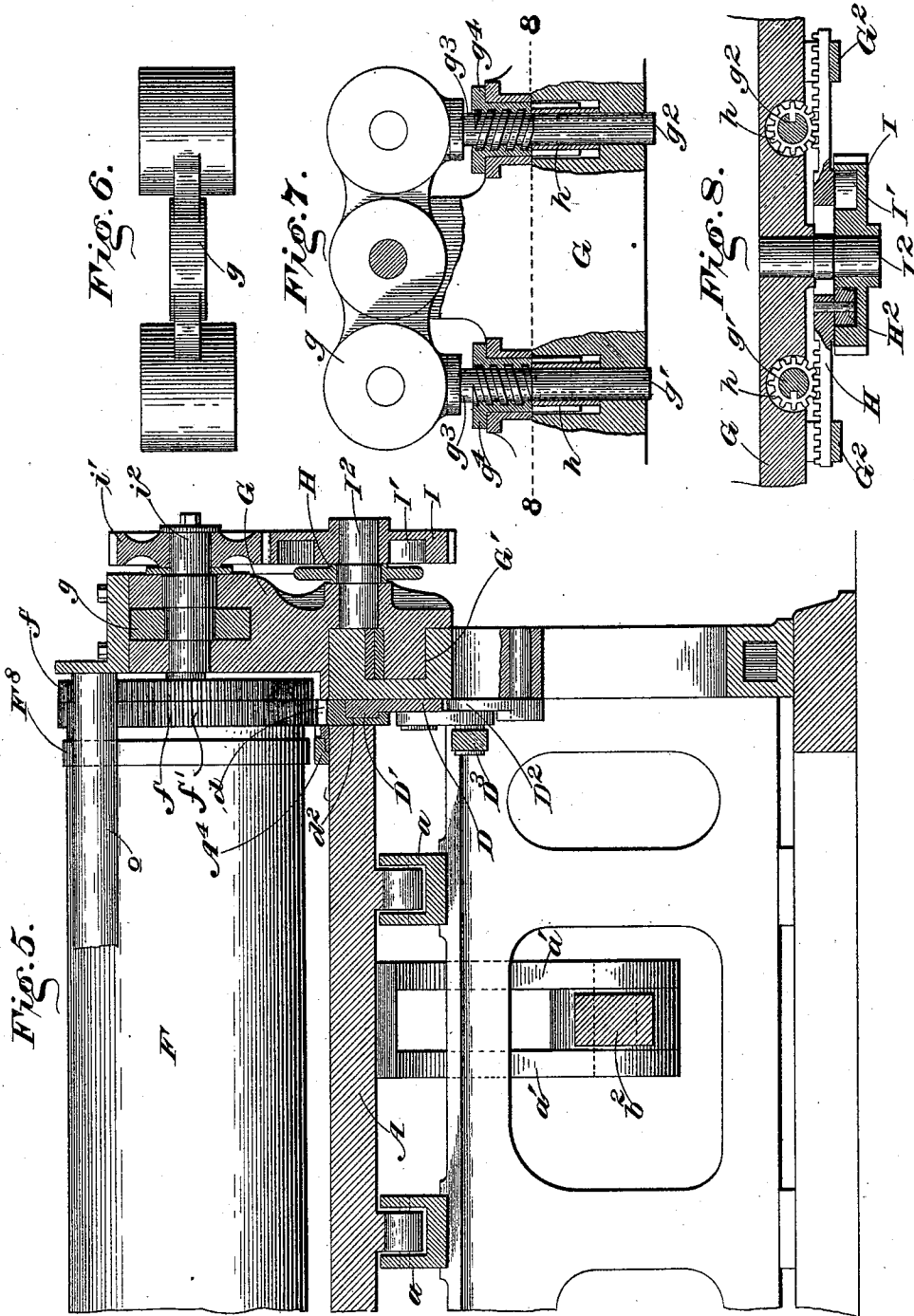
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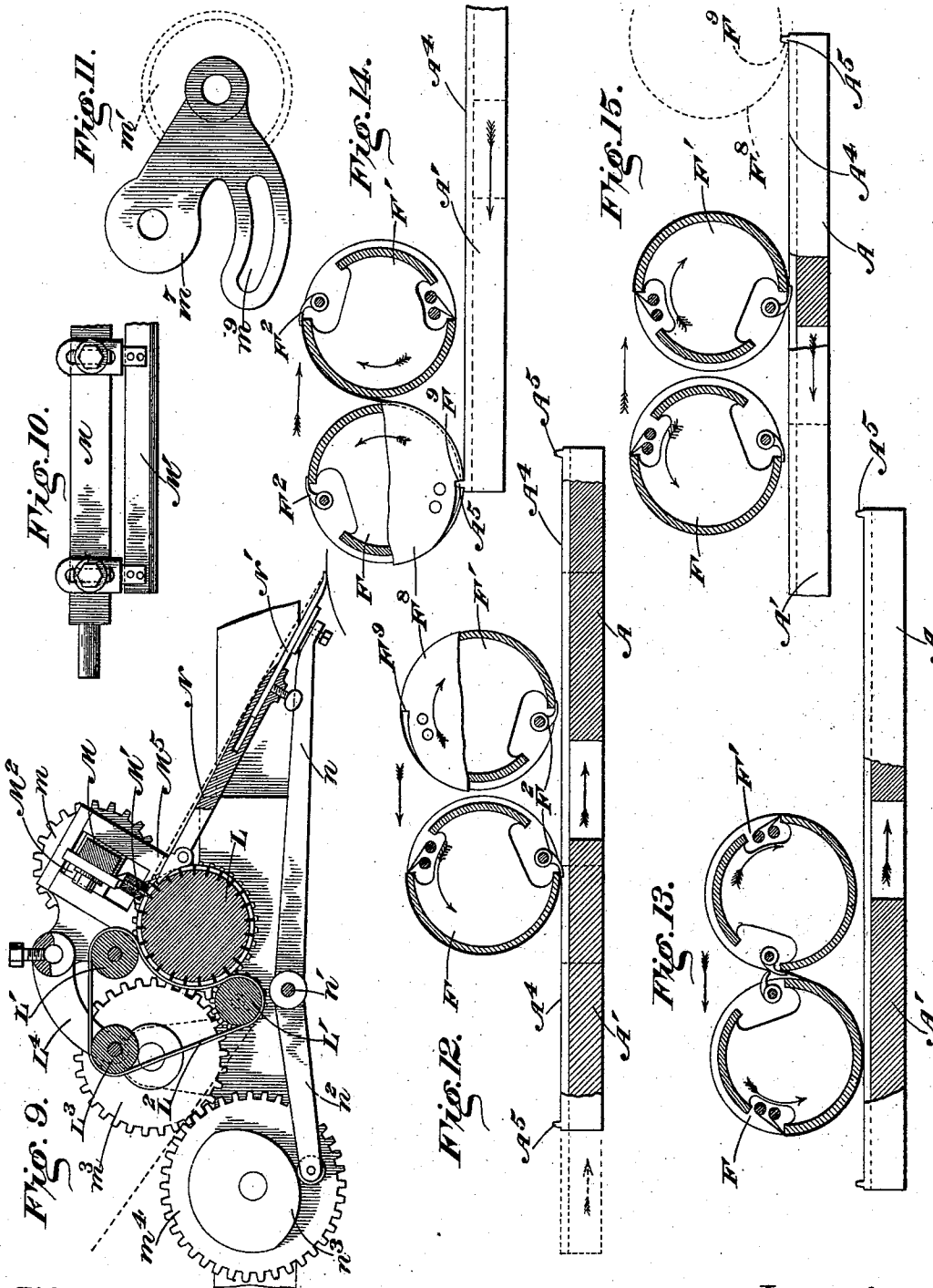
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(No Model.)

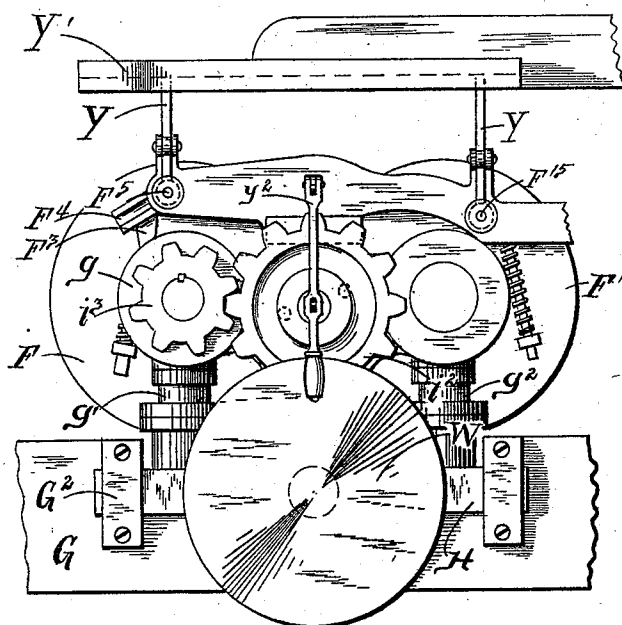
6 Sheets—Sheet 6.

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No. 539,356.

Patented May 14, 1895.

*Fig 18.*



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# UNITED STATES PATENT OFFICE.

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## PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 539,856, dated May 14, 1895.

Application filed April 5, 1894. Serial No. 506,518. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH L. COX, of Battle Creek, in the county of Calhoun and State of Michigan, have invented certain new and  
5 useful Improvements in Printing-Presses; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked  
10 thereon, which form part of this specification.

This invention is an improved machine for perfecting sheets of paper from a web. Its distinguishing characteristics are, first, two reciprocating traveling impression cylinders  
15 co-operating with two oppositely reciprocating type beds; second, novel means for throwing the cylinders alternately on and off impression; third, novel mechanism whereby each cylinder rotates continuously in but one  
20 direction, while being traveled back and forth, and whereby they are reciprocally driving and driven alternately; fourth, the inking system; fifth, the automatic web cutting and feeding mechanism; sixth, the automatic delivery;  
25 seventh, the capacity for severing and printing sheets of different lengths. Each of these several characteristic features embodies both novel construction and combination of elements, and these several sub-combinations  
30 are united in one complete machine, the essential features, sub-combinations, and general combinations of my invention being stated in the claims forming part of this specification.

Referring to the accompanying drawings,  
35 Figure 1 represents a side elevation of the complete machine, except that part of the gripper trip-pin shifting devices is broken away for the sake of clearness. Fig. 2 is a longitudinal central vertical section thereof.  
40 Fig. 3 represents a side elevation, opposite to that of Fig. 1, of the right-hand end of the machine, that side of the carriage being removed and the frame partially broken away. Fig. 4 is an end view of the two cylinders removed from the frame, showing the mechanism for opening and closing the grippers at the proper times and points. Fig. 4<sup>a</sup> is a detail sectional view on line *yy* of Fig. 4. Fig.  
45 5 is a detail vertical transverse sectional view on line *xx* of Fig. 1. Fig. 6 is a plan view of one of the yokes for carrying the cylinders.

Fig. 7 is a partial side view, partly in section, of a portion of the carriage, showing the means for raising and lowering the cylinders. Fig. 8 is a horizontal sectional view taken through  
55 the dotted line 8 8 shown in Fig. 7. Fig. 9 is a central longitudinal sectional view through the paper-feeding mechanism and table. Fig. 10 is a detail view of the shaft carrying the knife. Fig. 11 is a detail view of the swing-  
60 ing adjustable arm. Fig. 12 is a diagrammatic sectional view showing the cylinders in the position at the beginning of impression. Fig. 13 is a similar view showing the cylinders moved the next step forward with half the  
65 paper imprinted and the grippers on the rear cylinder taking the sheet from the front cylinder. Figs. 14 and 15 are similar views showing the next two positions of the cylinders before they reach position shown in Figs. 1 and  
70 2. Fig. 16 is a detail vertical sectional view on line *xx* of Fig. 1. Fig. 17 is a detail plan view of a portion of one of the guides *Y*. Fig. 18 is a detail view of an automatic clutch for the sheet-delivery carriage. Fig. 19 is a detail  
75 side view of a part of the main frame and carriage, showing the trip-pin operating devices.

The press contains two type beds arranged end to end in the same plane, and together  
80 reciprocated back and forth by means of pitmen and crank wheels. Over these beds are reciprocated, by similar means in directions opposite the movements of the beds, two impression cylinders, which respectively co-op-  
85 erate with forms on the respective beds, and a throw off mechanism is employed so that while the cylinders travel over both beds each will only co-act with the proper one. By having both beds and cylinders reciprocate in  
90 opposite directions, the stroke of each is shortened one half of what would ordinarily be required, if the other were stationary. The cylinders are arranged close together, so that a sheet printed by the first cylinder operating  
95 on the forms on one bed is immediately transferred, reversed upon and perfected by, the second cylinder co-acting with the forms on the second bed.

To facilitate the feeding, transfer, and de-  
100 liverly of the sheet, the cylinders are geared together, and by suitable mechanism, are al-

ternately disengaged from their bed-racks, and therefore can be, and are, continuously rotated in but one direction; during their entire reciprocal movement, one cylinder serving to drive the other on one stroke, and then being driven by such other on the return stroke. This arrangement is especially advantageous; as there is no reversal of motion of the cylinders. The paper is fed in from a web-roll, and severed by an adjustable and variable cutting mechanism, just prior to its grasping by the first cylinder, and the sheets are delivered at the same end of press where fed in.

In the press shown a plate distribution of ample extent to insure fine work is provided, by attaching distributing tables to the outer ends of the beds, which tables operate ductor and distributing rollers; the ink being supplied from fountains at each end of press. Any number of distributing rollers can be arranged to operate on the tables, from which the ink is taken and applied to the type by form rollers mounted on opposite sides of the reciprocating cylinder carriage. A short distributing table may also be used intermediate the beds, and alternately contacted by said form rollers. Thus the forms are freshly inked before each impression, or at each stroke of the cylinders.

When the parts are in the position shown in Fig. 1, the cylinders being at the end of their right hand or backward, stroke, and the beds at the end of their forward or left hand stroke, the front cylinder is in position to receive a sheet from the feed table, and is mechanically "thrown off." The rear cylinder, has just completed its printing stroke, and is clear of the forms; and will not contact with the type faces as a sufficient portion of its periphery is reduced in diameter to insure clearance of the forms until its "throw off" mechanism has lifted it off the type plane. The same is true of the front cylinder when it has finished its impression stroke in position shown in Fig. 14. As the cylinders start forward, and the beds backward, the front cylinder grippers catch the edge of a sheet and take it from the feed board, and during the first half of the forward stroke the front cylinder is gradually lowered to printing position and the rear cylinder gradually raised or "thrown off," so that neither cylinder contacts with the forms on the rear bed on the forward stroke, but the front cylinder does contact with the forms on the forward bed and the sheet is imprinted thereon, the impression being taken during the second half of the forward stroke and completed when the cylinders reach the end of such stroke; the beds simultaneously reaching the end of their back stroke.

When the front cylinder has made three-quarters of a revolution, after it has taken a sheet, and during the printing of such sheet, its grippers release the sheet and simultaneously the grippers on the rear cylinder, nip the

sheet, which then begins to transfer to the rear cylinder; and when the cylinders reach the end of the forward stroke, the sheet is lying partly on the rear cylinder and partly under the front cylinder, (if the sheet be longer than one quarter of the circumference of the cylinders.) As the cylinders start backward, and during the first portion of the backward movement, the front cylinder is mechanically "raised" and the rear cylinder lowered, so that neither cylinder contacts the forward bed during their backward movement, but the rear cylinder contacts the forms on the rear bed and presents the unprinted side of the sheet thereto, the perfected impression being completed as the cylinders reach the limit of their backward stroke, and the beds the limit of their forward stroke. During the next forward stroke of the cylinders the front cylinder takes another sheet from the feed board, and the perfected sheet is delivered from the rear cylinder by a simple apparatus.

This general description will suffice to explain the principles of construction of the press and its mode of operation and the following is a detailed description of the press shown in drawings, parts therein, being indicated by letters of reference marked thereon.

#### *The Beds and Bed Racks.*

A, A', are two flat beds, arranged in same plane, end to end, and rigidly united, virtually one bed with two form-holding surfaces. These beds are mounted on bed-supports *a* of any suitable construction, so that they can be reciprocated endwise, but do not touch the side frames of the machine. They are reciprocated by pitmen *b*<sup>2</sup> connected to wrist-pins *b'* on crank gears *b*, mounted on a shaft B journaled in suitable bearings between the side frames of the press, said crank wheels also being between the side frames. The other ends of pitmen *b*<sup>2</sup> are connected to arms *a'* depending from bed A', or other suitable part of the beds. Gears *b* are driven by pinions *c* on a transverse shaft C journaled in bearings on the side-frames, and otherwise supported between frames, which in turn is driven from any suitable motive power. As shown shaft C is driven by speed reducing gearing from a stub shaft C' mounted in bearings at one side of the press, and driven by belt and pulleys from a motor. Not shown.

On the inner face of each side frame of the press, parallel with and directly opposite, the side edges of the beds, a bar D is secured so as to be vertically movable, but longitudinally immovable, in any suitable manner, as by bolts and slots, as shown in Figs. 2 and 3. These bars have lateral flanges D' on their upper inner edges which fit into corresponding grooves *d*<sup>2</sup>, in the sides of the bed racks *d*, *d'*, respectively which racks, therefore, move vertically with the bars, but can be reciprocated thereon, by means of retaining plates A<sup>2</sup>, fastened to the ends of the beds as shown.

The bed-racks, it will be understood, recip-

rocate with the beds, but are not supported thereby, and are vertically movable. The bars D are supported on toggles D<sup>2</sup>, the upper members of which are pivoted to the bars, and their lower members to the side frames, as shown. The several toggles, on the same side of machine, are also connected by and to a connecting rod D<sup>3</sup>, by which they can be closed or opened simultaneously, and therefore raise or lower the connected bar D and its bed-rack. The lower members of the toggles nearest shaft C, are fixed on stub shafts e<sup>3</sup> journaled in the side frames and on the outer ends of each is an arm e<sup>2</sup> connected by a link e' to one end of an oscillating lever e fulcrumed on a bearing on the side of frame, the other end of said lever carrying a friction roller e<sup>4</sup> running in a cam groove E<sup>2</sup> in a disk E' exterior to the main frame, mounted on a shaft E journaled in the main frame above shaft C. These cam grooves are arranged to oscillate levers e simultaneously in opposite directions, twice during each reciprocation of the beds; i. e., when the beds reach their extreme limits of travel and are reversing their motion. Thus the bed racks on opposite sides of the beds, will be alternately elevated and depressed, and one rack elevated as the other is depressed.

#### 30 The Cylinders and "Throw-off" Mechanism.

Two cylinders F, F', are journaled side by side in the extremities of short oscillating bars g, g, centrally pivoted upon uprights rising from reciprocating carriers G, one at each side of the press, guided in ways G' on the side frames thereof beside and exterior to the beds as shown. Below the ends of each bar g are elevated screws g', g<sup>2</sup>, mounted in the carriers, and operated by suitable mechanism so that one will be raised and the other lowered simultaneously. As the upper ends of said screws contact the ends of the superimposed bar g, the latter will be rocked, and one of the cylinders carried thereby will be accordingly lowered, and the other simultaneously depressed.

The screws g', g<sup>2</sup>, are respectively right and left handed, and have heads g<sup>3</sup> which contact opposite ends of bar g, and are only threaded near their upper ends, their lower ends being cylindrical. The threaded portions of the screws engage threaded boxings g<sup>4</sup> which are set into sockets in the carriers, and the lower cylindrical portions of the screws enter cylindrical bores in the bottoms of said sockets. Small pinions h splined on the screws below the screw-threads, project through side slots in the carriers, and are engaged by rack-teeth on the ends of a reciprocating bar or rack H which is secured to the side of carriage by loops or guide caps G<sup>2</sup>. This bar is reciprocated back and forth at proper times, by means of a cam groove I' in the inner face of a gear wheel I mounted on a stub shaft I<sup>2</sup> attached to the side of the carrier below the fulcrum of bar g, rack bar H being yoked around the stub-shaft, as shown, and

having a friction roller H<sup>2</sup> running in the groove I'.

Gear I is rotated by a pinion l' mounted on a stub shaft i<sup>2</sup> (which may also form the fulcrum of bar g) which receives its motion from a pinion i<sup>3</sup> on the outer end of the front cylinder shaft or gudgeon. The mechanism for oscillating the bars g should be duplicated on each side of the press.

The carriers are reciprocated, simultaneously with the beds, but oppositely thereto, by means of pitmen G<sup>3</sup> that are connected thereto, and to wrist pins on crank gear wheels E<sup>3</sup> mounted on shaft E, and driven by pinions C<sup>2</sup> on shaft C. The cam disks E' may be fastened to, or formed with, said gears, if desired.

Cam gear I is so adjusted, and its driving gearing so timed, that it begins to move bar H as the carriers start on the forward stroke, and continues to move said rack during the time the crank wheels E<sup>3</sup> are making one quarter of a revolution (or during the first half of the forward stroke of the carriers) and then holds the bar stationary during the last half of the stroke while crank wheels turn another quarter during the return stroke of the carriers. The rack-bar H is moved backward, during the first half of the stroke (third quarter turn of crank wheels E<sup>3</sup>) and then is held stationary during the last half of stroke (until the crank wheels have finished the last quarter turn, and completed one revolution). At each movement of the rack bar, one cylinder is positively raised and the other positively lowered. Therefore during the first half of forward stroke the front cylinder F is lowered ("thrown on impression") and rear cylinder F' raised ("thrown off impression"), and during the first half of return stroke, rear cylinder F' is "thrown on" and front cylinder F "thrown off," the cylinders operating on the forms as above described.

I propose to reduce the diameter of the non-impressing portions of the cylinders; (or the thickness of the cylinder packing or blanket may render unnecessary such reduction) in order to give me ample time to operate the throw off devices gradually as described; but by constructing the throw off actuating mechanisms so that the bars g are oscillated more rapidly at the beginning of the strokes of the cylinders,—the cylinders could be of equal diameters throughout.

The cylinders are provided with gripper fingers F<sup>2</sup> mounted on rock shafts as usual. On the outer end of each gripper-shaft, at one end of each cylinder,—are crank arms F<sup>3</sup> to which are pivotally connected short rods Z playing through rocking eyes Z' on the ends of the cylinders, and springs Z<sup>2</sup> are strung on the rods Z intermediate said eyes and arms F<sup>3</sup> and are adapted to hold the gripping fingers either open or closed when the gripper shafts are properly shifted—as in the ordinary construction of cylinder grippers. On the end of each gripper shaft is also a grooved or cam T-head F<sup>4</sup> which is adapted to alternately en-

gage trip-pins to open and close the grippers. The T-head of cylinder F contacts alternately trip pins  $F^5$  and  $F^6$  which are automatically shifted at proper times into position to engage the T-head, and are at other times retracted so as not to contact the head which passes twice by each pin during one complete reciprocating travel (two rotations) of the cylinder.

The T-head of cylinder  $F'$  in like manner alternately contacts trip pins  $F^{15}$  and  $F^{16}$ , which are shifted automatically into and out of position.

The trip pins  $F^5$  and  $F^{15}$  are mounted in the upper portion of the carriage and shifted at the proper time into position to be engaged by the T-heads on cylinders F and  $F'$  when the gripper sockets on both cylinders are uppermost, and the cylinders just beginning their forward stroke. These trip pins  $F^5$ ,  $F^{15}$ , are movable and can be shifted longitudinally in and out of position to engage the T-heads by means of levers Y pivoted on arms on the carriage (see Figs. 4<sup>a</sup> and 17) one end of each lever engaging a grooved-head on the adjoining pin, and the upper end of the lever standing in position to engage a cam  $Y'$  secured on the main frame near the feed-board. The lower trip-pins  $F^6$  and  $F^{16}$  are both fixed to block or plate  $y$  secured on the inner end of a rod  $y'$  which passes through a bore in the adjoining stub-shaft  $i^2$  (or fulcrum pin of the adjoining bar  $g$ ) and thus extends to the outside of the carriage. The outer end of rod  $y'$  is pivotally connected to a lever  $y^2$  the upper end of which is pivoted to a bracket arm  $y^3$  on the carriage (or other proper point), and the lower end of said lever ( $y^2$ ) is bifurcated to embrace the edge of a cam disk W that is made fast to and rotates with pinion L. (See Fig. 16.) The edge of disk W is waved or undulated so that the lever  $y^2$  will be vibrated to shift rod  $y'$  in and out once during each reciprocation (two revolutions) of the cylinders;—it being remembered that pinion L only makes one revolution for two revolutions (one complete reciprocation) of the cylinders.

The cam  $Y'$  may be in a grooved block so that the ends of levers Y are confined in the groove therein when the cylinders are at the feed end of press and when in this position the trip-pins  $F^5$   $F^{15}$  are projected in position to engage the T-heads.

When the cylinders are in the position indicated in Fig. 1 the gripper fingers on cylinder F are open and those on cylinder  $F'$  are still retaining their nip on the sheet—but are just ready to be opened by this action of this T-head and trip pin  $F^{15}$  in order to allow the sheet to commence its delivery immediately upon the forward movement of the cylinders. Now starting with the cylinders in the position shown in Fig. 1, the action of the gripper mechanism is as follows, (one sheet having been already perfected:) As the cylinders start forward the gripper fingers on the

rear cylinder are opened and the perfected sheet thereon is delivered as hereinafter described.

The gripper fingers of the front cylinder are closed upon the edge of the sheet lying on the feed board as the cylinders start forward—and as the carriage moves on (away from cam block  $Y'$ , the levers Y are shifted by cam  $Y'$  so as to retract trip-pins  $F^5$   $F^{15}$ , which remain retracted during the time the levers Y are disengaged from the cam groove. As the cylinders travel forward pins  $F^6$  and  $F^{16}$  are thrown into position to engage the T-heads, and consequently when the cylinders have made three fourths of a revolution in their forward stroke (at which time they are in the position indicated in Fig. 13) the fingers on cylinder F are opened releasing the sheet, and the fingers on cylinder  $F'$  are simultaneously closed upon the sheet, which is then transferred to and reversed upon cylinder  $F'$  as described. The trip-pins  $F^6$   $F^{16}$  are then retracted out of position to trip the T-heads, and remain so until the next forward stroke of the cylinders. As the cylinders near the end of their return stroke toward the feed board levers Y are again tripped by cam  $Y'$  so as to throw pins  $F^5$   $F^{15}$  into position to trip the gripper fingers on the next forward stroke of the cylinders as described.

In order to facilitate the feed or transfer of the sheet from the feed board to the front cylinder and to take up the sheet on the feed board at a speed equal to or greater than the infeed of the web, I arrange the trip pin  $F^5$  and the feed board, so that the grippers on cylinder F do not close upon the edge of the sheet until the surface of the cylinder is rotating at a speed equal to or slightly greater than the speed of the infeed sheet. Thus the cylinder will nip the sheet after it has started forward. This enables me to feed in the sheet and take it up as it is fed in without its "buckling" or wrinkling on the board—or at any time being stopped in its inward movement. The practical advantage of such an arrangement is obvious, and furthermore as no severed sheet is allowed to lie at rest on the feed board there is no obstruction in the way of the incoming sheet and the rotary infeed and cutters can be operated rapidly. Other suitable gripper finger tripping mechanism may be employed if desired to actuate the fingers at the proper times. The cylinders are geared together by intermeshing gears  $f$ , at one end only, and cylinder F has a gear  $f'$  meshing with rack  $d$ , and cylinder  $F'$  a gear  $f^2$  meshing with rack  $d'$ . Now as rack  $d$  is elevated only during the forward stroke of the cylinders, cylinder  $F'$  is free to rotate contrary to its travel, and consequently is driven by cylinder F. When the cylinders reach the limit of the forward stroke, rack  $d$  is lowered and rack  $d'$  raised into engagement with gear  $f^2$  of cylinder  $F'$ . This leaves cylinder F free to rotate contrary to its travel, during the backstroke of the cylinders, while

cylinder F' is now positively rotated, and drives cylinder F. The accurate rotation of the cylinders in either direction is assured by their intergearing and as each cylinder is positively operated during its printing stroke, by meshing with a bed rack, there is no liability to blur impressions by slip of cylinder over bed.

The cylinders are provided with usual bearers F<sup>10</sup> running on bed-bearers A<sup>4</sup> affixed to the bed. On each end of each bed bearer is a large "register" tooth A<sup>5</sup>, which are designed to keep cylinders moving during the times when the bed racks are being moved into and out of gear, as, at or near the end of travel of the cylinders there is a moment of time when neither of the bed racks is fully in mesh with the cylinder gears. The register teeth at the end of press toward which cylinders are traveling at such time contact with shoulders F<sup>11</sup> in the bearers of the adjoining cylinder (formed by cutting away a portion of each bearer as indicated in Fig. 3), and insure the continued and proper rotation of the cylinders, or prevent back lash thereof, until the bed racks have been properly shifted. The cut away portion of the cylinder prevents contact with the register tooth until it is in operative position, and this clearance is further facilitated by the fact that each cylinder after covering the form and reaching its end of travel immediately begins to rise from the bearer line by the action of the throw-off devices. The cylinder bearers are cut away however, at a point where no ill results can follow, as that portion of the cylinder does not contact with the forms.

#### *The Inking System.*

J, J, are ink distributing tables, attached to each end of the bed frame, and moving therewith. J<sup>10</sup> is an intermediate ink distributing surface between the beds. At each end of the press is a fountain K, whose roll is operated by an ordinary ratchet and pawl, the pawl being carried by a vibrating arm K' connected by a link K<sup>2</sup> to one of a pair of levers K<sup>3</sup>, which carry a ductor roller K<sup>13</sup>, adapted to alternately contact the fountain roll and a drum K<sup>4</sup>. Above this drum is a second ductor K<sup>5</sup> mounted in the ends of levers K<sup>6</sup>, which are connected to levers K<sup>3</sup> by links K<sup>7</sup> and are also provided with friction rollers K<sup>8</sup> arranged to contact with cams J' on the sides of adjoining table J, when it is moved to that end of press. Thus as the beds near the ends of their outer stroke, the cams J', contact rollers K<sup>8</sup> and raise levers K<sup>6</sup>, thereby lifting ductor K<sup>5</sup> away from the drum K<sup>4</sup> and allowing it to rotate partly over the table as the latter moves thereunder; and simultaneously with lifting of ductor K<sup>5</sup> ductor K<sup>3</sup> is raised so as to carry a fresh supply of ink to drum K<sup>4</sup>, and the fountain roller is rotated also. As the table moves back, the ductors drop upon the drum and fountain roll respectively. Drum K<sup>4</sup> adjoining shaft E is rotated by means of a pair of gears k from a

gear E<sup>6</sup> on shaft E, and the other drum K<sup>4</sup> is rotated by means of bevel gears k' from a shaft k<sup>2</sup> extending longitudinally of the press below the beds, and driven by a bevel gear k<sup>3</sup> from a bevel gear E<sup>7</sup> on shaft E. Gears E<sup>6</sup> E<sup>7</sup> may be formed in one piece.

The ink deposited upon tables J is distributed thereon by the angle distributing rollers j, j', and straight distributors j<sup>2</sup>, and is supplied to the forms by form rollers j<sup>3</sup>, mounted upon the carriers at the outer sides of the cylinders, as shown. A distributor roll j<sup>4</sup> can be mounted above and between the form rollers, and these may all be driven by suitably arranged gearing, not forming part of this invention, from small racks secured to the beds or in other suitable manner. The form rollers ink the forms during both the movements of the cylinders, and in advance of the printing.

#### *The Feed.*

At the end of press above the driving shafts, are located the feed and delivery mechanisms, mounted in an upward extension of the main frame.

The web is led in from a paper roll, not shown, over a roller A<sup>7</sup> to and under a roller L' and between it and a lower cutting cylinder L, up over and partly around said cylinder, between it and another roller L', the web being pressed to the cylinder by endless tapes L<sup>2</sup> running over rollers L' and a third roller L<sup>3</sup> which is mounted in adjustable arms L<sup>4</sup> arranged so that it can be adjusted to regulate the tension of the tapes. Above the lower cutting cylinder is the co-acting cutting cylinder or shaft M carrying an adjustable cutting blade M'. This shaft or cylinder M is geared to make one revolution for each revolution of the crank wheels, or reciprocation of printing cylinders, and is driven by a train of gears from one of the gear-crank wheels E<sup>3</sup>, as shown. In detail, it has a pinion m on one end, which meshes with an adjustable pinion m', meshing with a gear m<sup>2</sup>, on a stub shaft that extends through the side frame and has a similar sized gear m<sup>3</sup> on its inner end, which meshes with a gear m<sup>4</sup> that meshes with a pinion m<sup>5</sup> on a stub shaft journaled in the side-frame, and on the outer end of said shaft is a gear m<sup>6</sup> which meshes with the adjoining crank-gear wheel E<sup>3</sup>. The pinion m' is mounted on an adjustable segment m<sup>7</sup>, which is pivoted on the stub shaft carrying gears m<sup>2</sup>, m<sup>3</sup>, so that pinion m' can be moved in relation to said shaft without disengaging it from gear m<sup>2</sup>. The segment can be locked by a bolt m<sup>8</sup> passing through a slot m<sup>9</sup> therein as shown.

On the other end of shaft M, opposite gear m, is detachably secured a pinion l, which meshes with a pinion l' fixed on the adjoining end of cylinder L. The lower cutting cylinder L has a number of longitudinal slots (say twenty-five) one inch apart, and its gear l' has two teeth for each slot, (i. e., fifty teeth,) and gear l has two teeth for each inch of paper to be

severed. Thus if it is desired to cut sheets twenty-five inches long the gear  $l$  should have fifty teeth; but if, for instance, it is desired to cut a twenty-four inch sheet, the gear  $l$  would be removed and replaced by one having forty-eight teeth, and by simply providing a set of interchangeable gears  $l$ , to be placed on the shaft M, to drive cylinder L any desired length of sheet can be cut. For every inch of paper less than twenty-five, the change gear  $l$  should have two teeth less, and for every inch of paper over twenty-five the change gear should have two teeth more. The slots in the cylinder L, being but one inch apart, some slots therein will always register with the knife, whether the sheet to be cut is long or short. The shaft M is journaled in boxes  $M^2$  adjustable toward or from the cylinder L, and when the gear  $l$  is changed, it is necessary to adjust shaft M toward or from the cylinder so as to make the substituted gear  $l$  mesh with gear  $l'$  on cylinder L, and pinion  $m'$  is shifted by the segment  $m^8$ , to permit this adjustment; yet can still mesh with pinions  $m$ ,  $m^2$ . When shaft M is shifted the knife  $M'$  is adjusted so as to properly co-act with cylinder L.

The cutting cylinders, and feeding mechanism, are carried in frames  $M^5$ , which are adjustably mounted on the main frame so that when shorter sheets are to be cut the feed devices are moved toward the cylinder, and when longer sheets are to be cut the feed devices are moved from the cylinders. The frames can be adjusted by means of screw-shafts  $M^6$  engaging threaded sockets in said frame, and operated by means of bevel gearing  $M^7$  from a transverse shaft  $M^8$  at the end of press. The adjustable pinion  $m'$  also compensates for the adjustments of the feed devices, and is shifted up or down as pinion  $m$  is moved nearer to or farther from pinion  $m^2$ , (the shaft of the latter being fixedly journaled in the main frame.) The feed table N is pivoted to the frames  $M^5$ , and is provided with telescoping fingers  $N'$  on its lower edge, which can be lengthened or shortened, according to the length of sheet being fed, and the position of frames  $M^5$ . The table is elevated and lowered at the proper time by means of an arm  $n$ , mounted on a shaft  $n'$  which is rocked by means of a crank arm  $n^2$  having a friction roller on its end running in a cam groove  $n^3$  in the back of gear  $m^4$ , or a plate attached to said gear or its shaft, as shown.

#### *The Delivery.*

The delivery mechanism consists of two pairs of upper and lower tape rollers O,  $o$ , journaled in suitable bearings on and near opposite ends of a sheet carriage P, the front end of which is detachably connected to the carriers, near the tops of the rear cylinder, as shown at P', or in other suitable manner, and the rear end is provided with rollers  $P^2$  running upon ways  $P^3$  attached to the side frames

of the press above the main driving shafts and below the feed mechanisms. Friction rollers  $p$  are arranged between these ways and the side frames, and support the side pieces  $p$  of carriage P when it is disengaged from the carriers and moved back out of the way, as for instance when the pressman is placing forms on the rear bed. Endless tapes O'  $o'$  run over these rollers O, their meeting sides being about in line with the tops of the cylinders as shown. The upper inner roller  $o$  lies close to roller  $F^9$ , and the inner lower roller O lies close to the periphery of the cylinder  $F'$ , when the carriage P is fastened to the cylinder carriage; and to bridge the space between the top of the cylinder and top of roller O a director or stripper  $q$  is employed. When the sheet is released by the gripper fingers of cylinder  $F'$  the edge of sheet passes over said director and between the tapes O,  $o$ , by which it is carried out and supported on the carriage P, during the forward travel of the cylinders, the rotation of cylinder  $F'$  assisting in the delivery of the sheet. Then as the carriage moves back the tapes O,  $o$ , are stopped, and when the cylinders have reached the end of their backward stroke the sheet carriage is just above the delivery table R. As the cylinders again move forward, the tapes O,  $o$ , are again traveled and the sheet carried thereby is dropped upon the table R, the carriage virtually slipping from beneath the sheet, and at the same time the perfected sheet brought back on cylinder  $F'$  is given up to these tapes, so as one sheet is dropped on the table R another is drawn into the carriage P. The tapes are traveled at the proper times by means of a pinion  $s$  mounted loosely on the shaft of the outer roller O and meshing with an inverted rack S fastened to the side frame of the press. The pinion  $s$ , operates the roller when the carriage is moved forward, by means of any suitable automatic clutch device or ratchet which clutch or ratchet is automatically disengaged when the carriage travels backward.

The operations of the several parts, separately and together, is sufficiently clear from the foregoing description, and therefore

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

1. In a printing press the combination of type beds with a pair of oscillating bars, a pair of cylinders mounted on opposite ends of said bars, and means for reciprocating and oscillating said bars, substantially as described.

2. In a printing press the combination of type beds a pair of oscillating bars, a pair of reciprocating carriers carrying said bars, and a pair of cylinders mounted on opposite ends of said bars, with mechanism for oscillating said bars, substantially as described.

3. In a printing press the combination of type beds a pair of oscillating bars, reciprocating carriers carrying said bars, and cylinders mounted on opposite ends of said bars, adjusting screws under the opposite ends of

said bars, and means for simultaneously raising one screw and lowering the other, substantially as specified.

4. In a printing press the combination of  
5 type beds a pair of oscillating bars, reciprocating carriers carrying them, and cylinders mounted on opposite ends of said bars; with adjusting screws under opposite ends of each bar, and pinions and sliding racks for simultaneously rotating said screws, substantially  
10 as set forth.

5. In a printing press the combination of  
type beds a pair of oscillating bars, reciprocating carriers carrying them, and cylinders  
15 mounted on opposite ends of said bars; with adjusting screws under opposite ends of each bar, and pinions and sliding racks for simultaneously rotating said screws, a cam for reciprocating said bar mounted on the carrier  
20 and gearing for operating said cam from the cylinders, substantially as described.

6. The combination in a printing press of  
two reciprocating beds, and two oppositely reciprocating cylinders, with a bed-rack for each  
25 cylinder meshing with a gear thereon, and mechanism for alternately throwing the said racks into engagement with and alternately disengaging them from, their cylinders, substantially as set forth.

7. The combination with the beds and cylinders, of the bed racks meshing with the cylinder gears, the toggles supporting said racks, and mechanism for operating said toggles so  
30 as to alternately raise and lower the racks, substantially as and for the purpose set forth.

8. The combination with the beds and cylinders, the vertically movable bars, carrying the bed racks and mechanism for raising one bar and simultaneously lowering the other,  
40 alternately, and gears on the cylinders respectively meshing with the bed racks substantially as described.

9. The combination of a reciprocating bed and oppositely reciprocating traveling cylinder, with a bed rack reciprocating with the bed, and non-reciprocating mechanism for elevating and lowering said rack, into and out of engagement with the cylinder gear, substantially as specified.

10. The combination of two reciprocating beds, and two oppositely reciprocating traveling cylinders; and mechanism for alternately "throwing off" the cylinders, so that they only contact with the proper bed; with  
50 bed racks reciprocating with said bed and meshing with cylinder gears, vertically movable bars supporting said racks, and mechanism for alternately raising and lowering the racks, substantially as described.

11. The combination with a pair of reciprocating type beds; with a pair of oppositely reciprocating carriers, oscillating bars mounted on said carriers, cylinders carried by said bars, and means for oscillating the bars, substantially as and for the purpose set forth.

12. The combination with a pair of reciprocating type beds; with a pair of oppositely

reciprocating carriers, oscillating bars mounted on said carriers, cylinders carried by said bars, and means for oscillating the bars, and mechanism whereby each cylinder is continuously rotated in but one direction, substantially as and for the purpose set forth.

13. The combination of a pair of reciprocating type beds, and racks reciprocated therewith; the pair of oppositely reciprocating carriers, the oscillating bars carried thereby, the cylinders mounted on said bars, and respectively geared to the opposite racks, and means for oscillating said bars; with mechanism for alternately throwing the bed racks into engagement with the corresponding cylinder gear, all substantially as set forth.

14. In a printing press the combination of a pair of reciprocating type beds, the bed racks reciprocated therewith and the vertically movable non-reciprocating bars supporting said racks and mechanism for alternately lowering said bars; with a pair of oppositely reciprocating cylinders, intergeared, and respectively geared to the opposite bed racks; and mechanism for alternately throwing said cylinders "off impression" so that one prints on the forward stroke from forms on one bed, the other on the backward stroke from forms on the other bed, substantially as described.

15. The combination of a pair of reciprocating beds, ink tables at each end of and between said beds, ink fountains and distributing rolls at each end of the beds, and ductor mechanism whereby the ink is supplied from the fountains to the drums and thence to the end tables; and stationary distributing rolls above the tables; with a pair of reciprocating cylinders, and form inking rollers mounted at each side thereof, all substantially as and for the purpose described.

16. On a printing press the combination of a type bed a reciprocating cylinder, a sheet delivery carriage connected therewith, endless tapes on said carriage for receiving the sheet from the cylinder, a stripper for directing sheets from the cylinder to the tapes a pinion on said carriage meshing with a stationary rack, and clutch mechanism for transmitting motion from the pinion to the tape-rollers when the carriage travels in one direction, substantially as described.

17. In a printing press the combination of a type bed a reciprocating cylinder rotated continuously in but one direction, and mechanism for supplying sheets of paper thereto; with a delivery carriage connected to and traveling with said cylinder, endless sheet carrying tapes on said carriage, tapes and a stripper for directing a sheet from the cylinder into said carrying tapes, and mechanism whereby said carrying tapes are traveled only when the carriage is moving in one direction, substantially as described.

18. The combination of a pair of reciprocating gripper cylinders, the trip pins mounted on the cylinder carriage; the cam disk and

lever mounted on the carriage for simultaneously operating the adjoining trip-pins; and the independent oscillating levers for respectively operating the other pins; and a stationary cam guide for actuating said oscillating levers, substantially as described.

19. In a printing press the combination of two reciprocating beds, and two oppositely reciprocating cylinders, having gears on opposite ends; with bed-racks meshing with said gears and reciprocating with the beds and mechanism for alternately raising and lowering the bed racks, so that only one is in engagement with its cylinder at a time, substantially as described.

20. In a printing press the combination of two reciprocating beds, and two oppositely reciprocating cylinders, having gears on opposite ends; with bed racks meshing with said gears and mechanism for alternately raising and lowering the bed racks, so that only one is in engagement with its cylinders at a time, with gearing between said cylinders whereby each cylinder is rotated continuously in but one direction, opposite to the rotation of the other cylinder, substantially as described.

21. The combination of two connected reciprocating beds, toothed crank wheels, mounted on one shaft, and pitmen for reciprocating the beds, located below the beds and between the side frames of the press; and two oppositely reciprocating cylinders, and toothed crank wheels, mounted on another shaft, and pitmen for reciprocating the cylinders, located exterior to the side frames; and a driving shaft and pinions thereon mesh-

ing with said toothed crank wheels, substantially as described.

22. The combination of the reciprocating gripper cylinder with a trip-pin mounted on the cylinder carriage having a grooved collar, a lever mounted on the carriage engaging said collar at one end, and a stationary guide or cam arranged to be engaged by and rock said lever thereby retracting or projecting said pin, substantially as described.

23. The combination of the pair of reciprocating gripper cylinders, the co-acting type beds, and means for alternately throwing said cylinders on and off impression; with the trip-pins for the grippers, mounted on the cylinder carriage and means substantially as described for projecting or retracting the pins as required in the operation of the press, substantially as specified.

24. The combination with the reciprocating beds, and the co-acting oppositely reciprocating cylinders; of the bed racks reciprocating with the bed, respectively meshing with a gear on one cylinder; and the bed bearers each having an end tooth adapted to engage a shoulder in the cylinder bearer and prevent backward movements of the cylinders when either rack is lowered; and mechanism for alternately raising and lowering said racks, substantially as set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JOSEPH L. COX.

Witnesses:

CHAS. ZANG,

RICHARD MCCARTHY.