(No Model.)

6 Sheets—Sheet 1.

W. SCOTT.

BED AND CYLINDER PRINTING MACHINE.

No. 530,357. Patented Dec. 4, 1894.

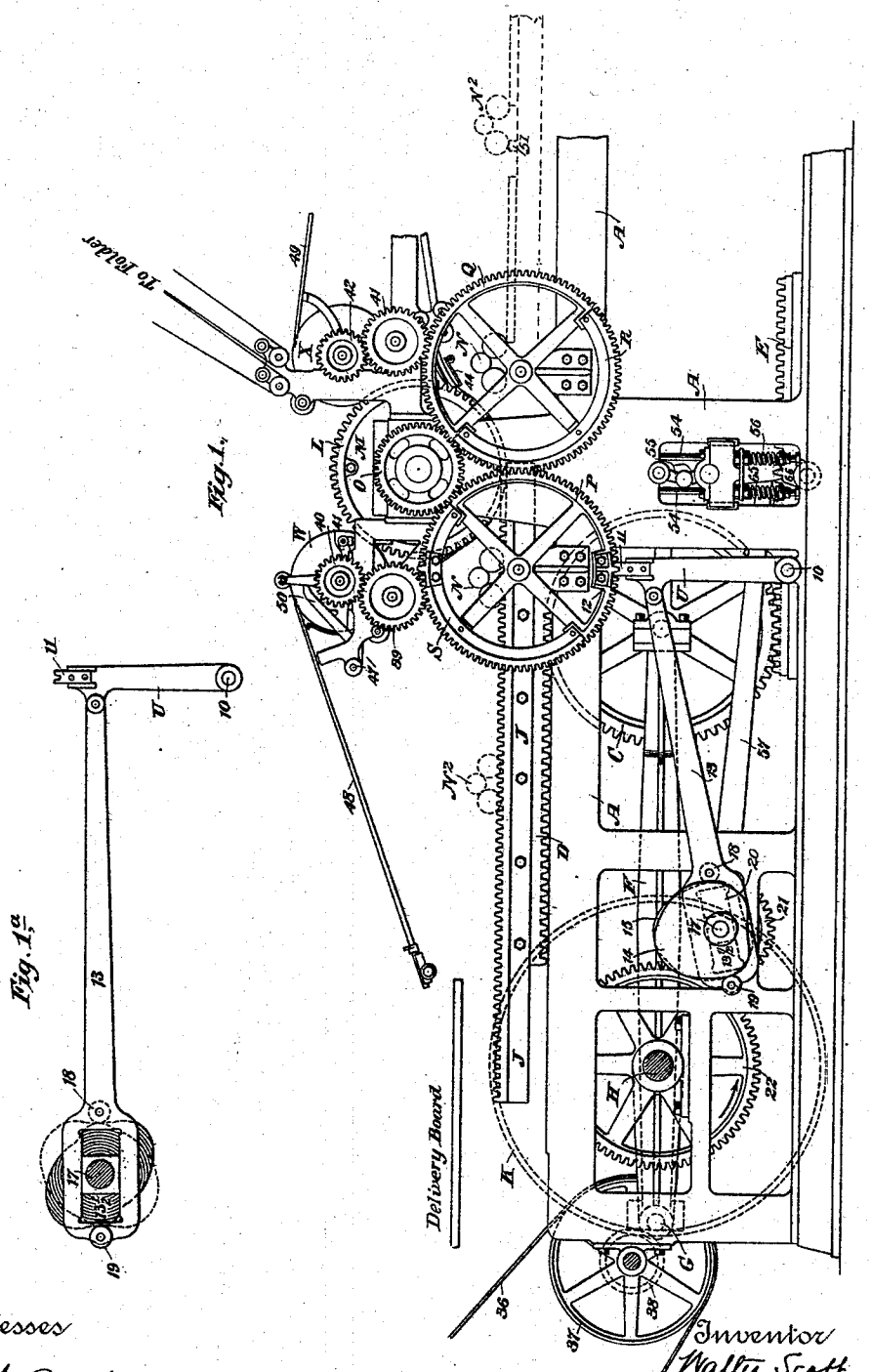

Fig. 1.

Fig. 1a.

Witnesses
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By his Attorneys
Wilcox & Barkley

(No Model.) 6 Sheets—Sheet 2.

W. SCOTT.

BED AND CYLINDER PRINTING MACHINE.

No. 530,357. Patented Dec. 4, 1894.

Fig. 3.

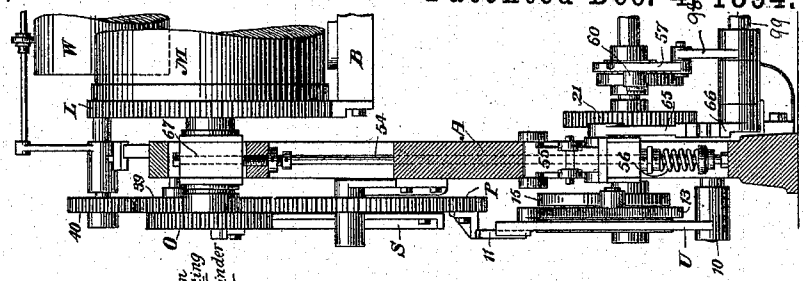
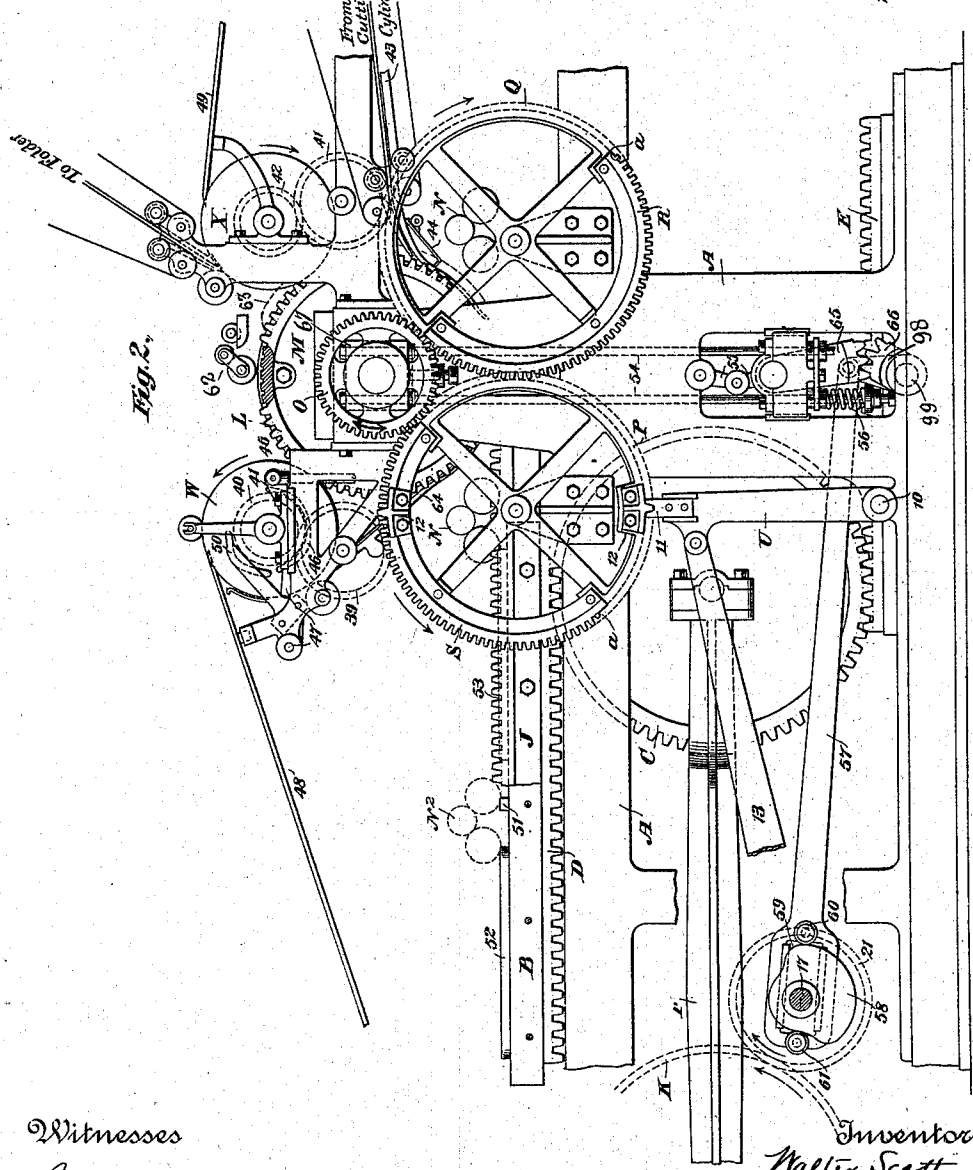


Fig. 2.



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(No Model.) 6 Sheets—Sheet 3.

W. SCOTT.

BED AND CYLINDER PRINTING MACHINE.

No. 530,357. Patented Dec. 4, 1894.

Fig. 4.

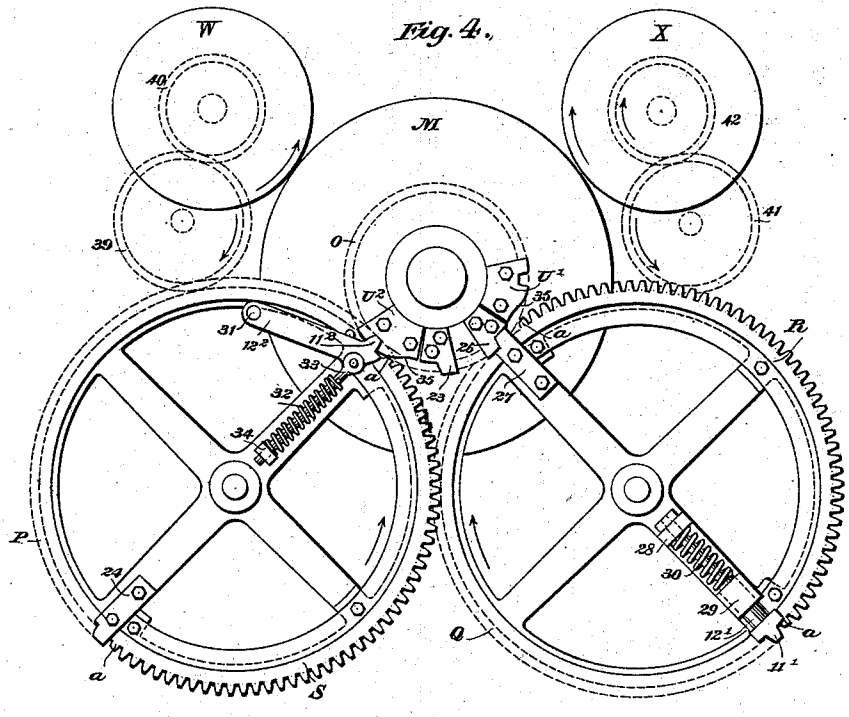


Fig. 12.

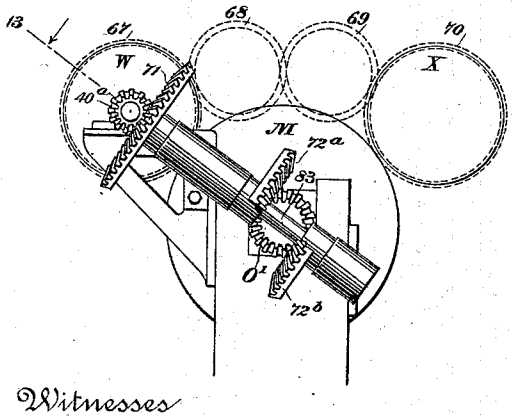
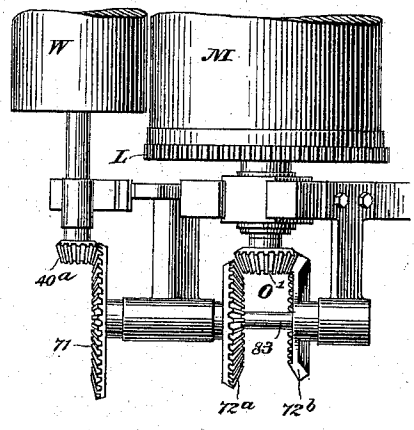


Fig. 13.



Witnesses

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(No Model.) 6 Sheets—Sheet 4.

W. SCOTT.

BED AND CYLINDER PRINTING MACHINE.

No. 530,357. Patented Dec. 4, 1894.

Fig. 4.

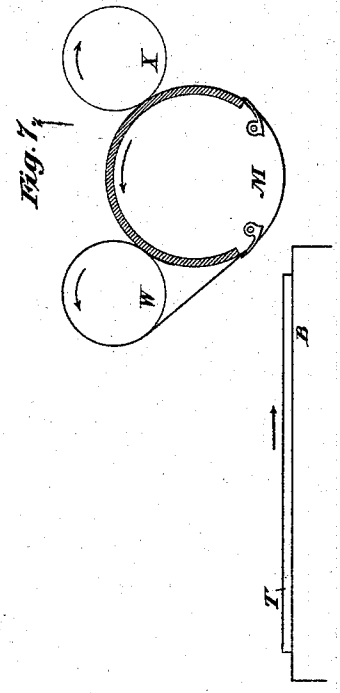


Fig. 8.

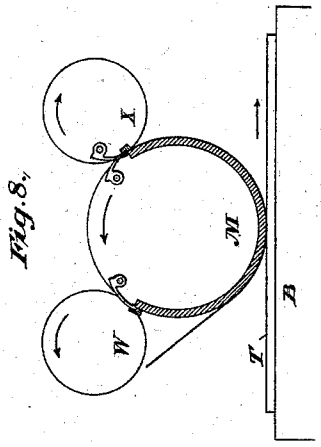


Fig. 5.

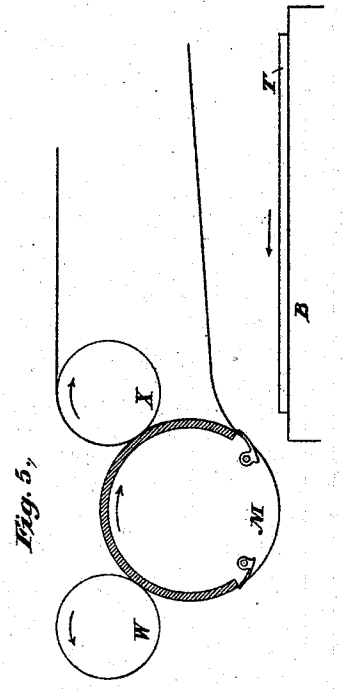
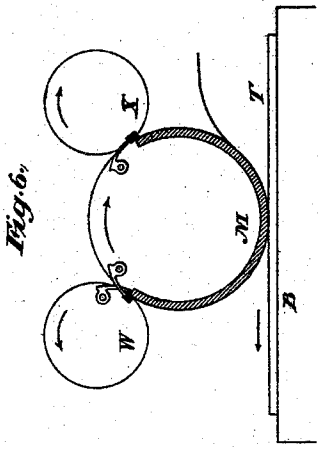


Fig. 6.



Witnesses
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(No Model.) 6 Sheets—Sheet 5.

W. SCOTT.

BED AND CYLINDER PRINTING MACHINE.

No. 530,357. Patented Dec. 4, 1894.

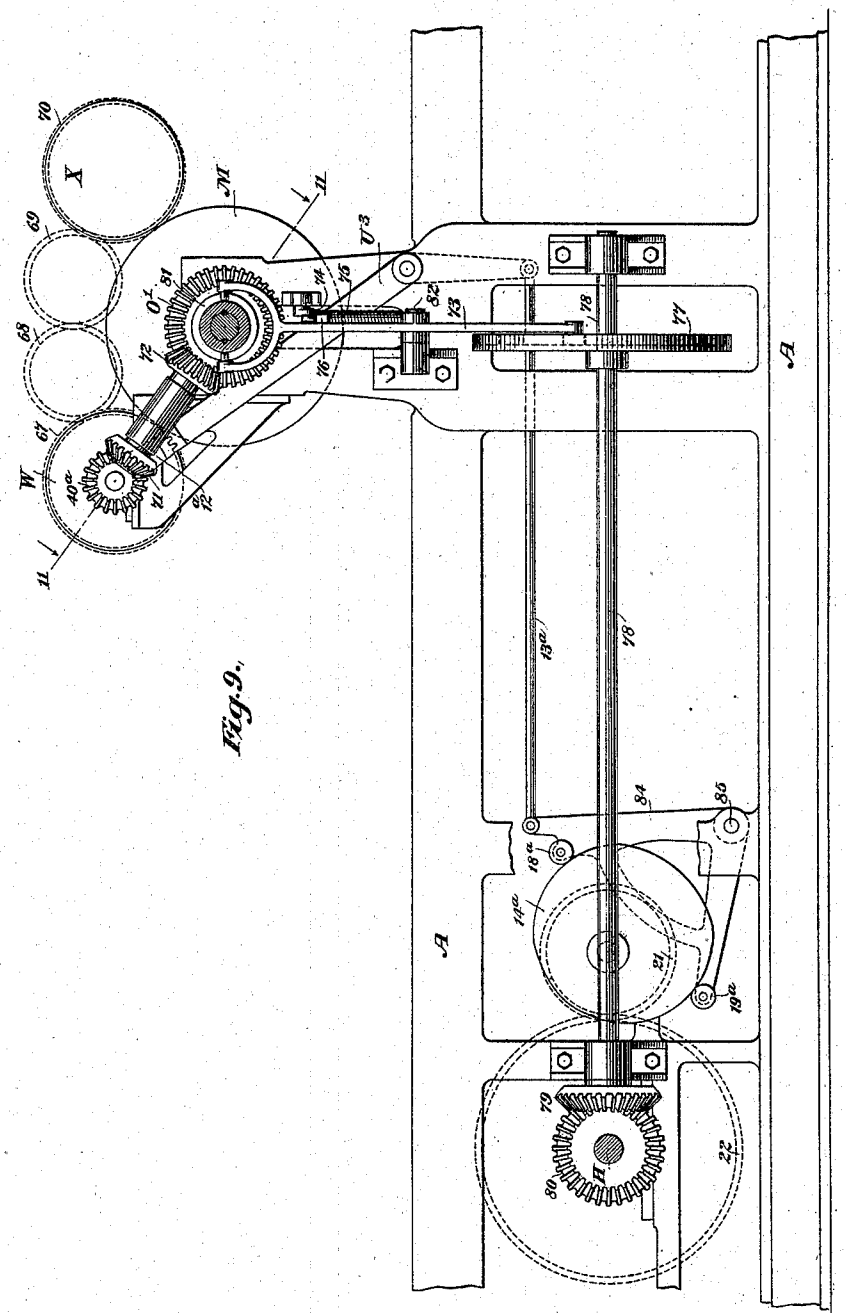

Fig. 9.

Witnesses
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(No Model.) 6 Sheets—Sheet 6.

W. SCOTT.

BED AND CYLINDER PRINTING MACHINE.

No. 530,357. Patented Dec. 4, 1894.

Fig. 11.

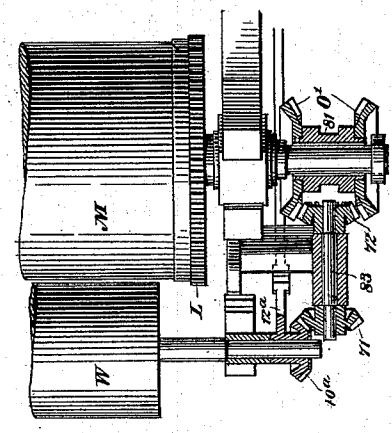
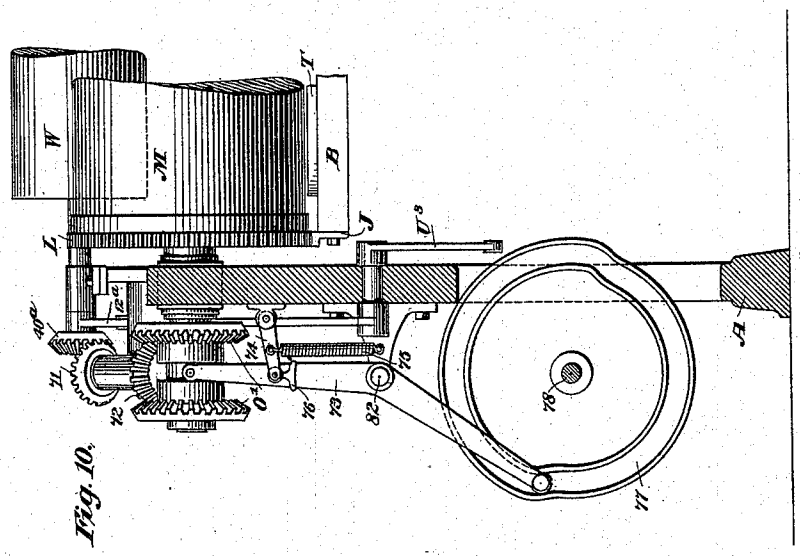


Fig. 10.



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By his Attorneys
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UNITED STATES PATENT OFFICE.

WALTER SCOTT, OF PLAINFIELD, NEW JERSEY.

BED AND CYLINDER PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 530,357, dated December 4, 1894.

Application filed January 22, 1891. Serial No. 378,717. (No model.)

To all whom it may concern:

Be it known that I, WALTER SCOTT, a citizen of the United States, and a resident of Plainfield, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Bed and Cylinder Printing-Machines, of which the following is a specification.

My invention relates primarily to printing machines wherein the impression is taken between a cylinder and a flat bed on which the form is placed, and consists of combinations of devices hereinafter set forth and pointed out in the claims concluding this specification.

My invention has for its objects, first, to print two complete copies, the sheets being in one length and printed on both sides, and to deliver the sheets to a fly or a folding apparatus; second, to print on one side of sheets, the sheets being of any length within the capacity of the machine, *i. e.*, within the length of two complete copies, as spoken of above, and to deliver the sheets; third, to print on both sides of sheets of various lengths and to deliver the sheets, and to attain various other results, as will hereinafter appear. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the machine, some of the smaller parts being omitted for the sake of clearness. Fig. 1ª shows a modification of certain parts. Fig. 2 is an enlarged elevation of part of the machine shown in Fig. 1, the parts omitted in Fig. 1 being shown herein, and one end of the machine being omitted. Fig. 3 is an end elevation, partly in section, of the working parts shown in Figs. 1 and 2. Fig. 4 is an end elevation of a modification of the motion-changing devices. Figs. 5, 6, 7, and 8 are diagrammatic views showing the operation of the printing, reversing, and delivery mechanisms at various stages. Fig. 9 is a side elevation of another modification of the devices for changing reciprocating motion or oscillatory-rotary motion into rotary motion. Fig. 10 is an end elevation, partly in section, of the last modification. Fig. 11 is a view, partly in section on the line 7—7 of Fig. 9, of the last modification. Fig. 12 is an end elevation of another modification of the motion-changing devices. Fig. 13 is a view, partly in section on the line 13, of the last modification.

A suitable frame A supports the operating parts of the machine. The flat bed B on which the type form is secured has a reciprocating motion given it by the rolling gear C, which engages the racks D and E on the bed B and frame A respectively. The gear C is moved by the rod F and crank-pin G. The pin G may be on a suitable crank on the shaft H, in the center of the machine, and the shaft be driven by the gear K at one end thereof, or the gear K may be placed in the center of the machine (in which case its size and location must be such that it will not interfere with the type bed B) and the wrist pin G may be on one side thereof. The gear K may be driven by any suitable means, such as the ordinary belt 36, pulley, 37, and gear 38. Shown in Fig. 1. Racks J, one on each side of the type bed B, engage with ring-gears L on the ends of the oscillating impression cylinder M. The mechanism thus far described is of ordinary and well-known construction.

I place inking rollers N, N, adjacent the impression cylinder for purposes hereinafter set forth.

To carry out some of the objects of my invention, it is necessary that the reciprocating motion of the type-bed, or its rack or racks, J, rather, be changed into a practically continuous rotary motion or motions. The mechanisms by means of which I change the motion of the rack J into the rotary motion referred to will now be described.

A driver gear O, in this instance having a diameter one half that of the cylinder M or gear L, is connected with the latter in any suitable way so as to move rotarily therewith. I have shown it as being so connected through the medium of the impression cylinder and its shaft, since this enables me to attain other objects of my invention. This driver-gear O has an oscillatory-rotary motion given it by the reciprocating rack J and gear L. To change the oscillatory-rotary motion of gears L and O into rotary motion, I employ two segment-gears R and S, though it is obvious that more than two such gears may be used. I do not, therefore, limit myself to two. These segments may be mounted loosely upon one stud and be geared together indirectly, and

in a printing machine be geared to the reversing and delivery cylinders. These segments may also be connected by suitable cranks on their shafts (with which the segments would then be rigid) and connecting rods between the pairs of cranks or by link belts. In another instance, I place a segmental gear, as R, on the side of a gear wheel Q in such a position that the segment may, at proper times, come into mesh with the driver gear O, and I place a similar segment gear S on a gear wheel P, which meshes with the gear wheel Q. The segments R and S approximate in length one half the circumference of the gear wheels on which they are placed. I place these segments R and S relatively to the driver and to each other so that they are separately and alternately in gear with the driver gear O. The gears P and Q mesh with each other but not with the driver gear O. These segments R and S may be constructed so that the leading end of one or the other will be in contact with the driver gear when the latter reverses its movement. This construction has some objectionable points, such as noise, &c. I prefer, therefore, to have a small clearance between these segments and the driver gear in certain positions of the parts (in this instance, two such positions) and to use starter means to cause one or the other of the segments to gear with the driver. This clearance may be obtained by making the segments of such length that they will be out of mesh with the driver at or in certain positions, but I prefer to obtain this clearance by shortening the end teeth of the segments, as shown at *a*, *a*, those teeth *a*, near the driver not being marked, so as to avoid confusion in the lines of the drawings.

To cause the engagement of either of the segments R and S with the driver gear O at the proper times, I employ a starter-bar which may be upon the frame A and have engagement at the proper times with one or the other of two teeth on the side of one of the gear wheels P and Q, or the starter-bar may be placed upon the driver gear O and the teeth may be placed on the sides of the wheels P and Q. In such case, I prefer to use two starter or push bars, for convenience, though one can be used, in case the cylinder M does not make a complete revolution. It is also convenient to place the teeth one on each of the gear wheels, P and Q, and to have them movable radially thereof, or the starter bar may co-operate with teeth on the reversing or the delivery cylinder. The first arrangement, I show in Figs. 1, 1ª, 2 and 3, where the starter-bar is pivoted at 10 to the framework of the machine, and is fitted at its working end with a toothed portion 11, which rolls into engagement with either of the two teeth 12 on the gear wheel P. Of course, the arm 11 can have one, two or more teeth, and the number of teeth 12 on the wheel can be varied accordingly. To cause the starter-bar to perform its functions, I move it in this instance by means of a connecting rod 13, and suitable cams 14 and 15 on a short shaft 17, rollers 18 and 19 on the rod having engagement with the cams. A suitable slot 20 in the connecting rod 13 allows the rod to move on a loose block $13\frac{1}{2}$ relatively to shaft 17; the block acting as a support for that end of the rod. The shaft 17 has a gear 21 which is one-half the size of, and is driven by, a gear 22 on the shaft H.

I sometimes operate the connecting rod 13 and starting-bar U by cams on the shaft H. These cams must be "double;" that is, the bar U must make two complete oscillations to one turn of the shaft H, see Fig. 1ª, and cause the segments R and S to successively engage the driver.

In the modification shown at Fig. 4, I employ two starter-bars U′, U^2, on the driver gear, for convenience. These bars engage at proper times with the yielding bars 12′ and 12^2, respectively. The bar 12′ can slide in guide lugs 28, 29, and is normally held outward by a spring 30 surrounding it and engaging the lug 28 and a shoulder on the bar 12′. The bar 12^2 is pivoted at 31 to the gear P and is normally held out by the spring 32 surrounding the rod 33 and engaging against the guide lug 34 for the rod 33. The bars 12′ and 12^2 have each a tooth 11′ and 11^2, for meshing with the starter-bars U′, U^2, respectively. The starter-bars U′, U^2, have cams or inclined surfaces 35 for co-operation with the teeth 11′ and 11^2, since at times the teeth and bars move in opposite directions while in contact. I also employ, to insure the proper timing of the parts, the push lugs 23, 26 on the driver gear, the lug 27 on gear Q and the lug 24 on the gear P. Lugs 26, 27, co-operate in this wise:—When the tooth 11^2 runs up incline 35 on bar U^2 there is a tendency to stop the gears P and Q, owing to friction, but the lug 26 overtakes lug 27 as the segment R rolls out of gear with driver O and pushes the gears Q and P on until tooth 11^2 enters the notch in bar U^2, at which time the driver has reached the end of its oscillation in that direction. Lugs 23, 24 co-operate in like manner as segment S rolls out of gear with driver O. The third form will hereinafter be described. In each modification thus far described, when using this device to drive the reversing and delivery cylinders, I gear the wheels P and Q with said cylinders respectively. Gear 39 connects gear P with the gear 40 on the reversing cylinder W, and gear 41 connects gear Q with gear 42 on the delivery cylinder X. The gears 40 and 42 are one half the size of their respective cylinders. It follows from this fact and from the fact that driver gear O is one half the size of the impression cylinder M, that the speeds of the reversing and delivery cylinders are analogous to that of the impression cylinder. The reversing and delivery cylinders make two turns to each stroke of the type-bed, or in different terms, these cylinders make four turns to one turn of the crank G.

I do not limit myself to any set number of turns of these cylinders, since they can be so proportioned as to make any desired number of turns to one turn of the crank G.

The impression, reversing, and delivery cylinders are each provided with grippers, as shown in Figs. 5, 6, 7, and 8. These grippers are worked in any ordinary way (as by cams) to cause them to operate as and for the purposes hereinafter set forth. The sets of grippers on the cylinder M may be made to open, by a cam, simply, when feed tapes are used to bring the sheets from cutting cylinders, or in cases where a feed board, as 43, and gages, as 44, are used, the grippers can be made to open back into the impression cylinder M in a manner common to drum cylinder or two revolution presses, or as described in my patent, No. 322,132, dated July 14, 1885. Sheet cutting devices may be used, such as are shown in my Letters Patent numbered 456,741 and 487,495, dated the 28th day of July, 1891, and the 6th day of December, 1892, respectively, or in my patent, No. 444,137, dated January 6, 1891.

Cams to operate the grippers on the impression, reversing and delivery cylinders at the proper times may be connected with a side shaft carrying cams for that purpose by suitable rods as in my Patent No. 456,741 above named, such as that shown at 45. One of such cams is shown at 46, supported on the pivoted arm 47 connected to rod 45.

In carrying out one of the objects of my invention, I use the reversing cylinder W as a delivery cylinder to deliver the sheets to the fliers 48. In this case, I use the removable cam 50 to open the grippers, to permit the sheet to go upon the fliers. Of course, when the cylinder W is used as a reversing cylinder, the fliers are not used, and the cam 50 is removed.

The delivery cylinder may deliver the sheet to fliers, as 49, or to tapes to carry the sheet to a folder, and its gripper be timed and operated accordingly.

When the inking rollers are placed adjacent the impression cylinder, as at N, each form is inked four times to each impression taken therefrom when single or half sheets are printed, or full sheets are printed on one side only.

If desired, the sets of inking rollers may be placed at such a distance from the impression cylinder that one set will ink one form only, and the other set the other form only. Such positions are indicated by the references N^2, and allow space for hand-feed of sheets to the impression cylinder M. In this case each form is inked twice by its set of ink rollers for each impression. Hence, the different sides of the sheets could be printed in different colors.

When using the machine to attain the first object of my invention, I place the forms for one side of the sheet at 52 and the forms for the other side at 53, and these forms may occupy the entire space of the bed less the stop 51. Then for each revolution of the crank G there will be printed an "inside" and an "outside," and then an "outside" and an "inside;" and in this instance, the impression cylinder is not lifted from the type-form at all.

When using the machine to print different sized sheets on both sides, or on one sheet for each stroke of the machine, I place the forms as shown, the impression being taken from one form at the stroke in one direction, and from the other form on the return stroke. To prevent imprint on the cylinder from the second form, I raise the cylinder slightly, returning it at the proper time to take the impression. I do this by the rods 54, 54, springs 56 and toggle 55, the shaft of the cylinder M being supported in boxes 67 on rods 54, in the same manner, or one similar thereto, as in my Patent No. 425,710, dated April 15, 1890. Hence this particular device needs no extended description here. In this instance, I operate the toggle by the connecting rod 57 and cam 58, the rod being slotted at 59 and sliding on and supported by a block loose on the shaft 17. Rollers 60, 61, on the rod 57 engage the cam 58 as shown. This rod 57 I make disconnectible from the arm 98 of the shaft 99 for a purpose hereinafter described.

In cases where to prevent set-off I use the oiling rollers 62, and where one copy or sheet is perfected at a time, these rollers 62 can be raised by any suitable means so as not to put any oil on the portion of the impression cylinder which takes the first impression. I prefer to use a cam, as 63, for doing this.

The operation of the various mechanisms hereinbefore described is as follows:—The gear 38 is driven by the pulley 37 and belt 36, and drives the gear K, shaft H, gear 22 and crank pin G. The last operates the rod F, and this rod causes the gear C to roll on the rack E and to drive the rack D and the bed B. The racks J on the bed B, which gear at all times with the gears L, drive the impression cylinder M, giving it an oscillatory-rotary motion. In the positions shown in Figs. 1 and 2, the grippers on the impression cylinder are just a little way above the point where they take the leading edge of a sheet, printed on one side, from the guides 64 leading from the reversing cylinder. Fig. 7 shows the grippers just as they are taking the sheet, or after they have moved down a short distance from their described positions in Figs. 1 and 2. Assuming that the type bed B is in its extreme position to the right in Figs. 1 and 2, the type bed is moved to the left as the crank G moves off the dead center and turns the impression cylinder M in the direction of the arrow thereon in Fig. 5. This figure shows the relative positions of the parts at the moment when the cylinder has moved far enough for the grippers to grasp the leading edge of the as yet unprinted sheet. It also shows a sheet long enough to print both an "inside" and "outside," as the cylinder

moves one way. Fig. 6 shows the relative positions of the parts when the reversing cylinder's grippers are grasping, and the impression cylinder's grippers are loosing, the leading edge of the sheet. (It must be borne in mind that in this instance, the rod 57 is disconnected from the arm 98, and that the cylinder M is held down by the toggle.) Fig. 7 shows the relative position of these parts after the crank G has passed the dead center to the left (the position shown in Fig. 1) and has moved the bed to the right a short distance, far enough for the grippers on the impression cylinder to be in position for grasping the leading edge of the sheet after it has been turned upside down by the reversing cylinder. Fig. 8 shows the relative positions of these parts at the moment when the grippers of the delivery cylinder are grasping, and the grippers of the impression cylinder are loosing, the sheet. In Figs. 6 and 8, the sheet is but little more than half printed on the bottom side. The arrows in Figs. 5, 6, 7 and 8 indicate the directions in which the parts are moving. Fig. 5 shows the parts as a new sheet is coming into the impression cylinder, and a printed one well on its way out from the delivery cylinder. When printing on sheets shorter than the one shown in Figs. 5, 6, 7 and 8, (that is, when using the machine to carry out the third object of my invention,) the rod 57 is connected up as shown in Fig. 2, and the impression cylinder is raised and lowered as hereinafter described.

Returning now to the mechanism in the positions shown in Figs. 1, 2 and 3, and remembering what has been said above about the location of the grippers on the cylinder M, and that short sheets (see third object of my invention) are to be printed on, the operations of the parts are as follows:—The crank G moves downward, causing the rod F to roll the gear wheel C to the right upon the rack E and to drive the rack D and the type bed in the same direction, but twice as fast as the wheel C. The bed B by its racks J and the gears L causes the impression cylinder M to turn. At the proper time, the gear 22, acting through the gear 21, shaft 17 and cams 14, 15, on the rod 13 and starter-bar U moves them to the right. Bar U, by its arm 11 and the tooth 12, starts the gear P to moving in a direction contrary to the hands of a watch. Gear P starts gear Q in the opposite direction, and thus the segment R is thrown into gear with the driver gear O, which now becomes the sole source of motion for gears P, Q, the reversing and delivery cylinders and the intermediate gears, the bar U and tooth 12 having rolled out of mesh. The cam 58 and rod 57 rock the gears 65 and 66, thus operating the toggle 55 and lowering the cylinder M to take an impression from the form 53, and when the crank G is at its lowest point, these parts are almost ready to raise the cylinder M so as to clear the form 52 to avoid receiving an impression upon its surface from the form during the next quarter turn of the crank G. The crank G, wheel C, bed B, cylinder M, gears P, Q, &c., continue to move until the crank G is on the dead center to the right of the shaft H in Figs. 1 and 2. The sheet printed upon has been taken by the delivery cylinder X and run partly on the fliers 49 or toward the folder. Owing to the relative sizes of the gears 21 and 22, the starter-bar—during the half turn of the crank—will have been moved to its extreme positions to the right and left and will have rolled into mesh with the tooth 12 shown at the top of the gear P in Figs. 1 and 2, but which will now be at the bottom position. The segment R is disengaged from the driver O when the crank G is on this dead center, the tooth a thereof being to the right of a line joining the centers of the gears O and Q. The segment S is now in position to have its tooth a engaged with the driver O when the gears P and Q are again put in motion by the starter-bar. The crank G now moves up and to the left. The bed B moves from its extreme right hand position toward the left and turns the impression cylinder accordingly. The cams 14, 15, move the starter-bar to the right, causing the segment S to mesh with the driver O. The driver causes the gear P to move, its top to the left hand, and gear Q the other way. Thus it is in this instance that the reciprocating motion of the racks J, or the oscillatory-rotary motion of the driver O, is changed into rotary movement in the gears P and Q, or in parts geared to them.

At the proper time, the grippers of the impression cylinder take the paper (unprinted on either side) as shown in Fig. 5, and it is about at this time that the cam 58, which is in the position shown in Fig. 2 when the crank is on either dead center, begins to rock the segments 65 and 66, causing the descent of the cylinder M to take an impression from the form 52. When the crank G is vertically above the shaft H, the cam 58 has made a half turn and is rocking the segments 65 and 66 the other way, thus raising the cylinder M to clear it from the form 53; and when the crank G has reached the position shown in Figs. 1 and 2, the other parts are as shown therein.

When using this machine to print upon but one side of a sheet of any length up to the capacity of the machine, I use the removable cam 50 to cause the cylinder W to act as a delivery cylinder, and replace the cam 58 by one shaped to rock the segments 65 and 66 so as to hold the impression cylinder down during the stroke of the bed in one direction, and to lift it during its stroke in the other direction. I also use the fliers 48 in this case.

In Figs. 9, 10 and 11 I show a modification of the means whereby the reversing and delivery cylinders are caused to rotate each in its own direction. In these figures, the shaft H, gears 22 and 21, cylinders M, W and X are as in Figs. 1, 2 and 3, the cylinder M being driven in the way hereinbefore described.

The driver gear O′ in this instance is in the form of a double bevel gear, and is splined to the shaft of the cylinder M, so as to have a sliding movement thereon, and its size or pitch is one half that of the cylinder M, with which it rotates. I fit the reversing cylinder with a bevel gear 40^a, of one half the size of the cylinder, and I place the bevel gear 71 in mesh therewith. The gear 71 is fast on the shaft 83. At the other end of the shaft 83 I place the bevel gear 72. The shaft 83 rotates in suitable bearings. The driver gear O′ can be moved into engagement with either side of the gear 72. Preferably, the gear O′ is so made that in its mid-position it is entirely clear of the gear 72. Preferably, the driver gear is shifted to its mid-position just before the cylinder M has completed its oscillation in either direction, and is moved into contact with the gear 72 just after the cylinder M has begun to oscillate in the other direction. The driver gear is moved at the proper times by the forked lever 73, pivoted at 82, which engages the groove 81 in the gear by two pins. The lever 73 is operated by the face cam 77 on the shaft 78. The shaft 78 is driven by the shaft H through the gears 79 and 80. The cam 77 gives two throws to the lever 73 to each revolution of the shafts 78 and H. A roller on the lever 73 engages in the cam 77.

To aid the cam 77 in throwing the lever 73 and to prevent any undue motion of the lever, I sometimes use the lever 74 on the frame A, and which is held downward by the spring 75, and the toothed lug 76 on the lever 73. A roller on the end of the lever 74 reduces friction. In the position shown in Fig. 10 the roller is on top of the tooth of the lug 76 ready to snap down on the outer side of the tooth, since the top of the cam 77 moves to the left in that figure.

To prevent shock and to secure the proper timing of the parts, I sometimes employ the starter-bar in this case. The starter-bar U^3 is suitably pivoted in the framework A, and is provided with a short rack on its working end. The bar is operated by means of the rod 13^a, lever 84 pivoted at 85 and the cam 14^a. The lever 84 is provided with positive and negative rolls marked 19^a and 18^a, respectively. The working end of the starter bar rolls into engagement with the teeth 12^a on an arm from the shaft of the reversing cylinder, and by these means gives an initiatory movement to the gears 71 and 72 at the moment the driver gear is coming into mesh with the gear 72. In this instance, I drive the delivery cylinder X by means of gears 68, 69 and 70 from the gear 67 on the reversing cylinder.

It is obvious that the delivery cylinder X may be driven from the gear O′ by the means shown, and the reversing cylinder be made the follower, without departing from my invention.

In the modification shown at Figs. 12 and 13, I employ two half segments 72^a and 72^b on the shaft 83, which are alternately driven by the gear O′, so that the shaft 83 moves in but one direction. In the position shown, the segment 72^b is the first to become engaged with the driver as the cylinder M moves its top to the left. Then as the cylinder M oscillates in the opposite direction, the segment 72^a becomes engaged, the segment 72^b having previously been freed from the driver. The parts marked 71, 40^a and W are the same as in Figs. 9, 10 and 11 and need no further description.

Instead of driving the type bed by the crank and wheel movement shown, it may be driven by any other well-known means used for that purpose, or a regular mangle movement by means of a rack and pinion may be employed.

For purposes of illustration, I have shown a machine in which the impression cylinder oscillates a little more than a full turn. I do not, however, in this part of my invention, limit myself to a machine in which the impression cylinder turns as described. It may oscillate more or less than a full turn without departing from my invention, since the sizes or proportions of the parts may be varied to suit the occasion.

I prefer to use the starter bar in the modification shown in Figs. 12 and 13, but I do not limit myself to the use of such a bar, either in this or any other of the cases shown, since the parts may be so proportioned and timed in all the cases as to operate without this bar, and I regard such constructions as coming within my invention.

The oiling rollers may receive oil at proper times from the fountain shown by means usually employed for that purpose.

It will be observed that, in those forms of my invention shown and described, one of the driver and follower parts of the gearing connecting the oscillating impression cylinder with the sheet-reversing or delivery cylinder is single and the other double. Thus, in Figs. 1, 2, 4, 12, and 13, the driver is single and the follower is double, while in Figs. 9, 10 and 11 the reverse is the case.

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

1. The combination of a to and fro moving driver, a follower coacting therewith, one of said driver and follower parts being single and the other double said follower moving only on its own axis or axes and said parts being disengaged when the driver stops, and means for causing them to re-engage when the driver starts up again, substantially as described.

2. The combination of an oscillating driver gear, rotatory segmental gears alternately engaging said driver and being disengaged therefrom at the end of each movement thereof, and means for engaging them successively therewith one at a time as the driver starts up, substantially as described.

3. The combination of an oscillating driver

gear, a double follower whose components have motion of rotation only and in opposite directions and are alternately driven by said driver, and gearing connecting said components of said follower, substantially as described.

4. The combination of an oscillating driver gear, a double follower whose components have motion of rotation only and in opposite directions and are alternately driven by said driver, gearing connecting said components, and means for meshing said components successively with said driver, substantially as and for the purposes described.

5. The combination of an oscillating driver gear, rotatory segmental gears alternately engaging said driver and being disengaged therefrom at the end of each movement thereof, a to-and-fro moving starter-bar, and teeth coacting with said bar to successively mesh said segmental gears with said driver, substantially as described.

6. The combination of an oscillating driver spur gear, segmental spur gears alternately engaging therewith and being disengaged therefrom at the end of each movement thereof, gearing connecting said segmental gears, a to-and-fro moving starter-bar, and teeth for coaction therewith to cause said segmental gears to stop and to mesh successively with said driver, substantially as described.

7. In a printing machine, the combination of an oscillating impression cylinder, a driver gear thereon, two segmental gears with which the driver acts successively, one being driven by the driver as it oscillates one way, the two rolling out of mesh as or before the driver reverses, the driver and the second segmental gear being meshed as the driver oscillates the other way, a sheet-manipulating cylinder, and gearing connecting said cylinder and said segmental gears together, substantially as and for the purposes described.

8. In a printing machine, the combination of an oscillating impression cylinder having a driver gear, two segmental gears with which the driver successively acts, means substantially as described for controlling the segmental gears as each disconnects from the driver gear at or before the end of an oscillation of the driver and for connecting the driver gear to the other at or after the beginning of the next oscillation thereof, a sheet-manipulating cylinder, and gearing connecting said cylinder and said segmental gears together, substantially as and for the purposes described.

9. In a printing machine, the combination of an oscillating impression cylinder provided with a driver-gear, rotatory segmental gears, starter-means for causing them to mesh successively with the driver gear, and a sheet-manipulating cylinder connected with said segmental gears, substantially as described.

10. In a printing machine, the combination of an oscillating impression cylinder provided with a driver gear, rotatory segmental gears geared together, starter-means for causing them to mesh successively with said driver, and a sheet-manipulating cylinder geared to said segmental gears, substantially as described.

11. In a printing machine, the combination of an oscillating impression cylinder having a driver gear, rotatory segmental gears, starter-bar and teeth for successively meshing them with the said driver, and a rotatory sheet-manipulating cylinder connected with said segmental gears, substantially as described.

12. In a printing machine, the combination of an oscillating impression cylinder provided with a driver gear, rotatory segmental gears, a vibrating starter-bar, and teeth for successively meshing them with the driver, and a rotatory sheet-manipulating cylinder connected with said segmental gears, substantially as described.

13. In a printing machine, the combination of an oscillating impression cylinder having a driver gear, rotatory segmental gears, a vibrating starter-bar and teeth for meshing them successively with the driver, a cam for moving the starter-bar, and a rotatory sheet-manipulating cylinder connected with said segmental gears, substantially as described.

14. In a printing machine, the combination of an oscillating impression cylinder having a driver gear, a rotatory sheet-manipulating cylinder, gearing between said rotatory cylinder and said driver, said gearing being clear of the driver at each reversing thereof, starter-bar, and teeth co-acting therewith at times, whereby shock is prevented and the gearing meshed with the driver, substantially as described.

15. In a printing machine, the combination of an oscillating impression cylinder having a driver gear, a rotatory sheet-manipulating cylinder, gearing connecting said rotatory cylinder and said driver, said gearing and driver disconnecting at each stop of the driver, and means for connecting them again as the driver starts, substantially as described.

16. In a printing machine; the combination of the oscillating impression cylinder having a driver gear O, segmental gears, R, S, meshing gears P, Q, on which segments S, R, are placed, starter-bar U, teeth 12, means for operating the starter-bar, a reversing or delivery cylinder and gearing connecting it with one of gears P Q substantially as described.

17. In a printing machine, the combination of a rotatory sheet-manipulating cylinder, an oscillating impression cylinder, a driver, a follower, and gearing connecting said follower and said sheet-manipulating cylinder, and one of said driver and follower parts being single and the other double, the components of the double part moving in opposite directions, one component meshing with the single part during the movement of the impression cylinder in one direction, and the other component meshing therewith during the other movement of said cylinder, substantially as described.

18. In a printing machine, the combination of an oscillating impression cylinder, its driver-gear, a rotatory reversing cylinder, having a gear thereon, gearing intermediate said gears, said driver and said intermediate gearing being clear of each other at each turn of the driver, starter-bar and teeth with which the bar engages at times to give an initial movement to parts to prevent shock, substantially as and for the purposes described.

19. In a printing machine, the combination of a reciprocating type-bed, an oscillating impression cylinder, sheet-reversing apparatus, a delivery-cylinder, means for raising and lowering the impression cylinder, and disconnectable devices for operating said means, whereby complete copies of one or two signatures may be printed and delivered, substantially as described.

20. In a printing machine, the combination of a reciprocating type-bed, an oscillating impression cylinder, sheet-reversing apparatus, means for raising and lowering the cylinder and disconnectible devices for operating said means, and inking rollers placed adjacent the impression cylinder, whereby the form is inked twice when printing the full length of the bed and four times when printing the half length of the bed, substantially as described.

21. In a printing machine, the combination of an oscillating impression cylinder, a sheet-reversing cylinder at one side thereof, a sheet-delivery cylinder at the other side thereof, both the reversing and delivery cylinders being constructed to deliver sheets to fliers or other receiver, gearing driving the delivery and reversing cylinders progressively each in its own direction, said gearing disengaging at or about the end of each oscillation of the impression cylinder, and means for causing it to re-engage at or about the beginning of said oscillations, substantially as described.

22. In a printing machine, the combination of an oscillating impression cylinder, a rotary delivery-cylinder, sheet-fliers to which it delivers sheets, gearing driving said delivery-cylinder, said gearing disengaging at or about the end of each oscillation of the impression cylinder, and means for causing said gearing to re-engage at or about the beginning of said oscillations, substantially as described.

23. In a printing machine, the combination of a reciprocating type-bed, an oscillating impression cylinder, its driver-gear, a reversing cylinder rotating in but one direction, and segmental gears moving in opposite directions and geared together and to the reversing cylinder substantially as and for the purposes described.

24. In a printing machine, the combination of an oscillating impression cylinder, its driver-gear, a reversing cylinder, two segmental gears moving in opposite directions and gearing connecting them together and to the reversing cylinder, whereby the reversing cylinder is caused to rotate in one direction, substantially as and for the purposes described.

25. In a printing machine, the combination of an oscillating impression cylinder, its driver gear, a reversing cylinder, a delivery cylinder, segmental gears moving in opposite directions and gearing connecting them together and to the reversing and delivery cylinders, whereby these cylinders are caused to rotate, each in its own direction, substantially as and for the purposes described.

26. In a printing machine, the combination of an oscillating impression cylinder, its driver-gear, a reversing cylinder, two segmental gears, gearing connecting them and the reversing cylinder, and starter-means for moving the segment-gears successively into contact or mesh with the oscillating driver gear, one at each turn of the same, substantially as and for the purposes described.

27. In a printing machine, the combination of an oscillating impression cylinder, its driver-gear, a reversing cylinder, two segmental gears, gearing connecting them together and to the reversing cylinder and a rocking toothed starter-bar, and teeth, for moving the segments into mesh with the driver gear one at each turn of the same, substantially as and for the purposes described.

28. In a printing machine, the combination of an oscillating impression cylinder, its driver gear, a reversing cylinder, two segmental gears, gearing connecting them together and to the reversing cylinder, a rocking starter-bar, cams and connections for operating said bar, all substantially as and for the purposes described.

29. In a printing machine, the combination of an oscillating impression cylinder, M, its driver-gear, O, a reversing cylinder, W, two segmental gears, R, S, gears P, Q, connecting them, and gears 39, 40, connecting the gear P to the reversing cylinder, substantially as and for the purposes described.

30. In a printing machine, the combination of an oscillating impression cylinder, its driver gear, a reversing cylinder, a delivery cylinder, two segmental gears, gearing connecting them together and to the reversing and delivery cylinders, and starter-means for moving the segmental gears into mesh with driver gear one at each turn of the same, substantially as and for the purposes described.

31. In a printing machine, the combination of an oscillating impression cylinder, its driver gear, a reversing cylinder, a delivery cylinder, two segmental gears, gearing connecting them together and to the reversing and delivery cylinders, a rocking starter-bar, and teeth for moving the segments successively into mesh with the driver gear, one at each turn of the same, substantially as and for the purposes described.

32. In a printing machine, the combination of a reciprocating type bed, an oscillating im-

pression cylinder, its driver gear, a reversing and a delivery cylinder, each rotating in its own direction, gearing substantially as described intermediate said driver gear and said rotating cylinders, and means for raising and lowering the impression cylinder, substantially as and for the purpose described.

33. In a printing machine, the combination of a reciprocating type-bed, an oscillating impression cylinder, its driver gear, a reversing and a delivery cylinder, each rotating in its own direction, means for raising and lowering the impression cylinder, and disconnectible devices for operating said raising and lowering means, substantially as and for the purposes described.

34. In a printing machine, the combination with an oscillating impression cylinder, its driver gear, a reversing and a delivery cylinder, two segmental gears, two intermeshing gear wheels each carrying one of the segmental gears, and each geared, the one to the reversing cylinder, the other to the delivery cylinder, and two teeth on one of the gear wheels, of a rocking toothed starter-bar for engaging the teeth, and causing the segments to mesh successively with the driver, one at each turn of the same, substantially as and for the purposes described.

35. In a printing machine, the combination with the reciprocating type bed, oscillating impression cylinder having a driver gear of one half its diameter, a reversing cylinder, of two segmental spur gears, (each equal to or approximately equal to a stroke of the bed) geared to the reversing cylinder whereby the surface speeds of the cylinders are equal, substantially as and for the purposes described.

36. In a printing machine, the combination of a reciprocating type-bed, an oscillating impression cylinder, sheet-reversing cylinder, cam and connecting mechanism for raising and lowering the impression cylinder once for each movement of the bed, substantially as and for the purposes described.

37. In a printing machine, the combination of a reciprocating type-bed, an oscillating impression cylinder, mechanism substantially as described for raising and lowering the cylinder, oiling rollers, and a cam on the cylinder for raising the oiling rollers from that part of the cylinder which takes the first impression on the sheet, substantially as and for the purposes described.

38. In a printing machine, the combination of a type-bed, an oscillating impression cylinder, mechanism substantially as described for raising and lowering the cylinder, oiling rollers and means for raising the oiling rollers from that part of the cylinder which takes the first impression, substantially as described.

39. In a printing machine, the combination of an oscillating driver, two gears connected together, moving in opposite directions, one of said gears meshing with the driver as it oscillates one way, the other as it oscillates the other way, and a sheet reversing cylinder connected with said gears, substantially as described.

40. In a printing machine, the combination of an oscillating impression cylinder, a rotatory sheet-manipulating cylinder, gearing driving said rotatory cylinder, said gearing disconnecting at the end of each movement of the impression cylinder, and means connecting said gearing at the beginning of each movement of said impression cylinder, substantially as described.

Signed at New York, in the county of New York and State of New York, this 15th day of January, A. D. 1891.

WALTER SCOTT.

Witnesses:
R. W. BARKLEY,
F. GOODWIN.