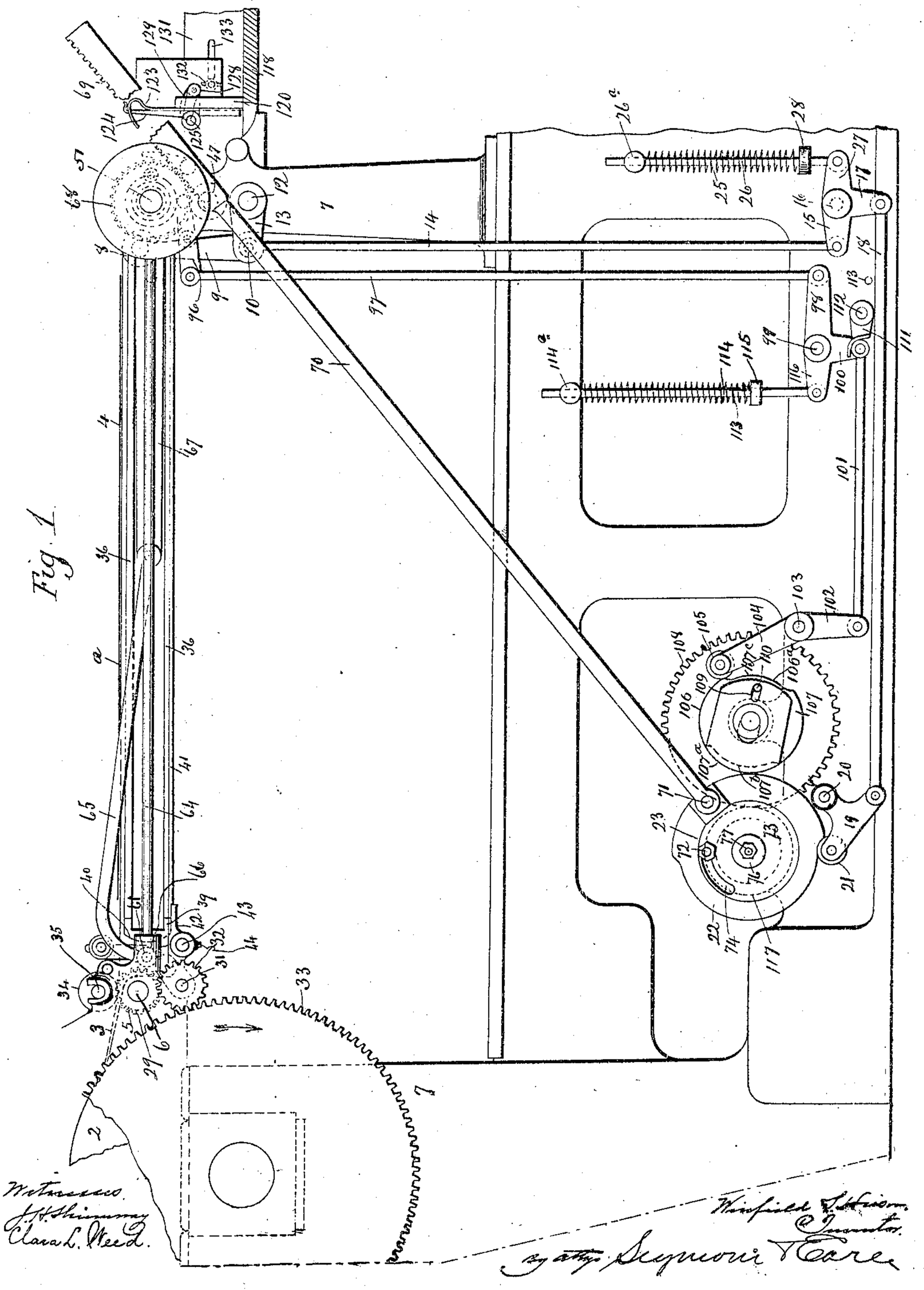
No. 775,657. PATENTED NOV. 22, 1904.

W. S. HUSON.

SHEET DELIVERY APPARATUS FOR CYLINDER PRINTING PRESSES.

APPLICATION FILED JUNE 1, 1904.

NO MODEL. 7 SHEETS—SHEET 1.



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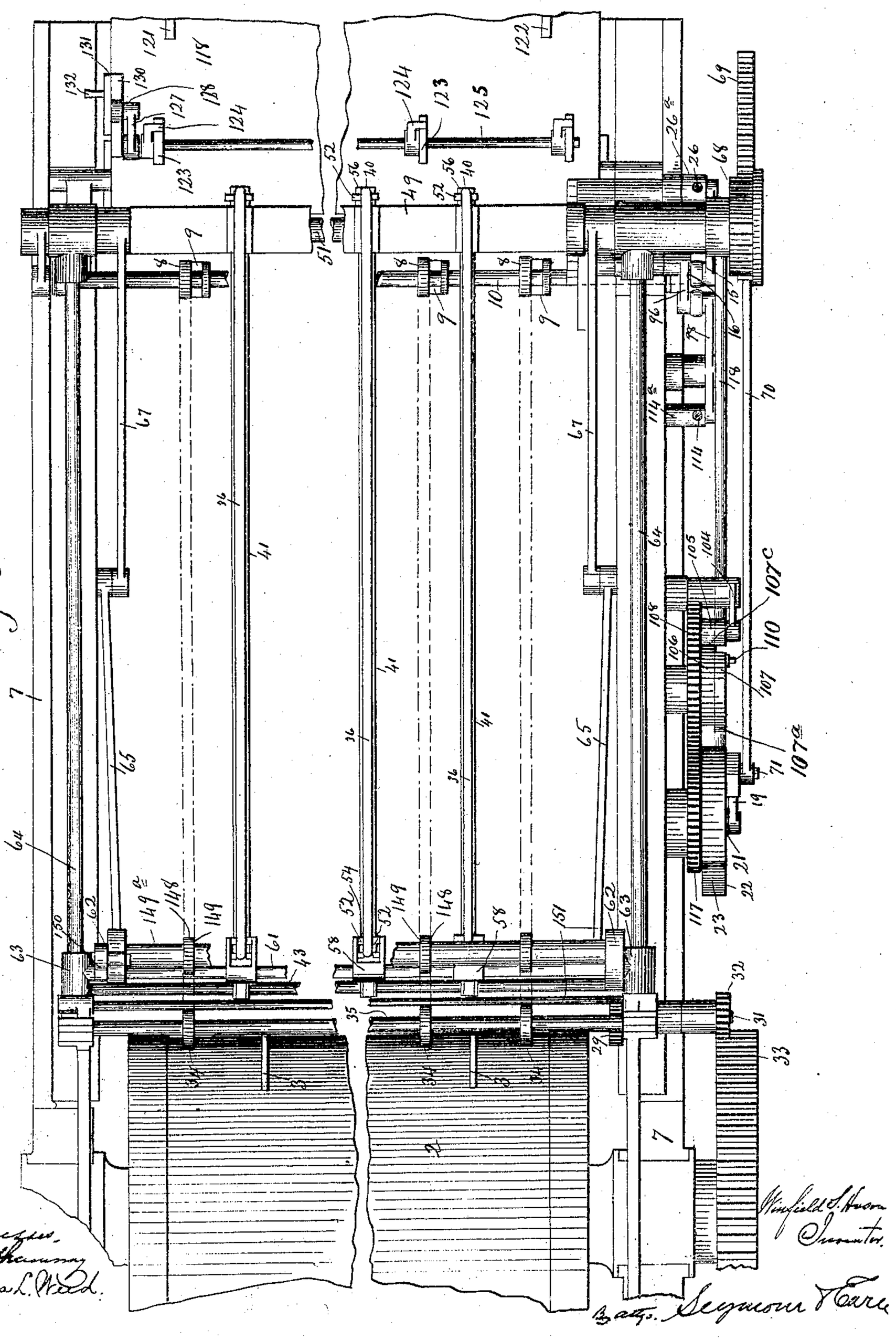
NO MODEL. 7 SHEETS—SHEET 2.

Fig 2



Witnesses.
Chas. L. Wood.

Winfield S. Huson
Inventor.

Atty. Seymour & Earle

No. 775,657. PATENTED NOV. 22, 1904.

W. S. HUSON.

SHEET DELIVERY APPARATUS FOR CYLINDER PRINTING PRESSES.

APPLICATION FILED JUNE 1, 1904.

NO MODEL. 7 SHEETS—SHEET 3.

Fig. 6

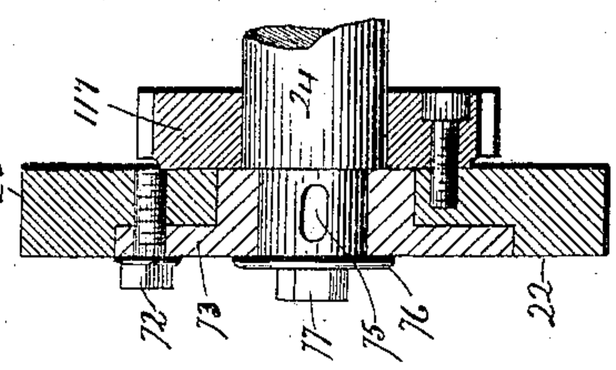


Fig. 5

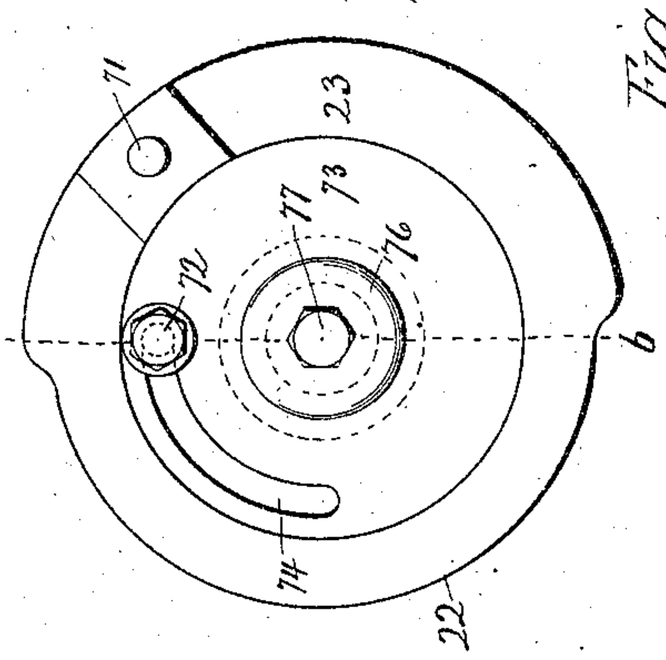


Fig. 7

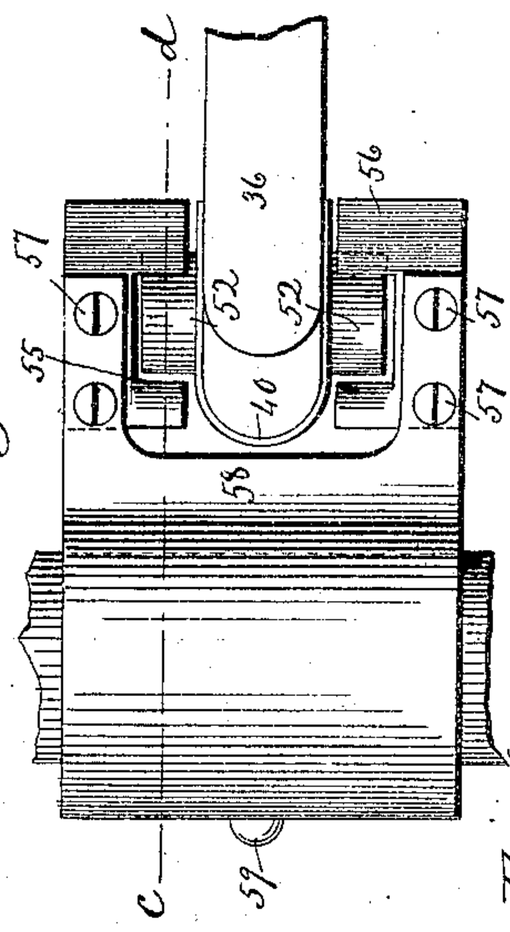


Fig. 8

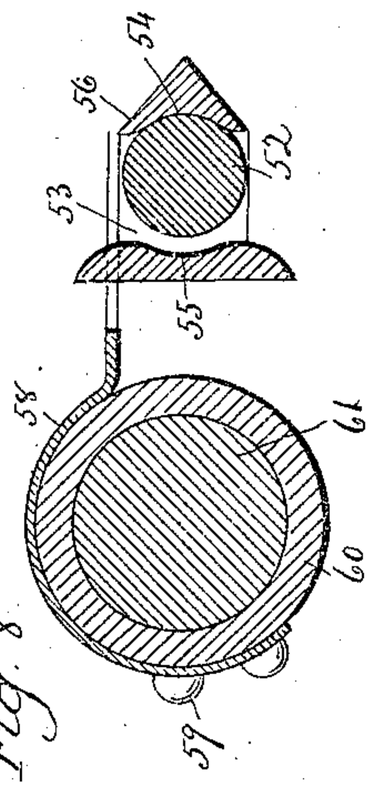


Fig. 3

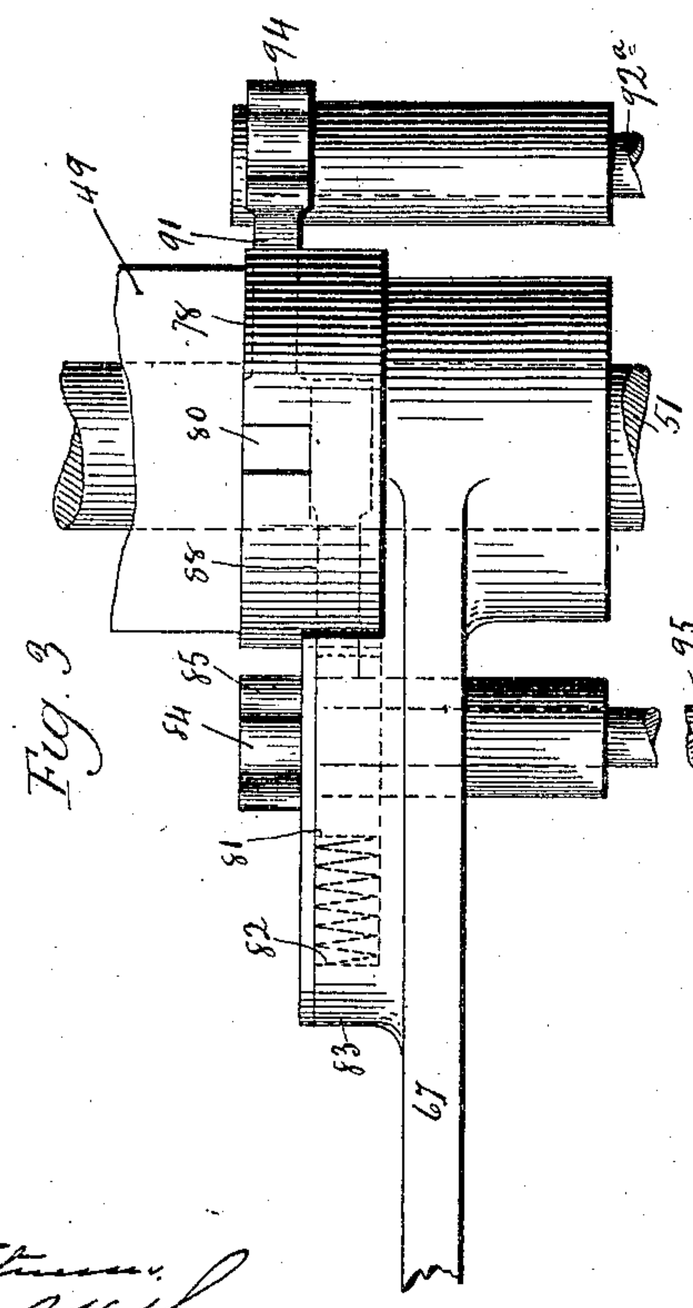
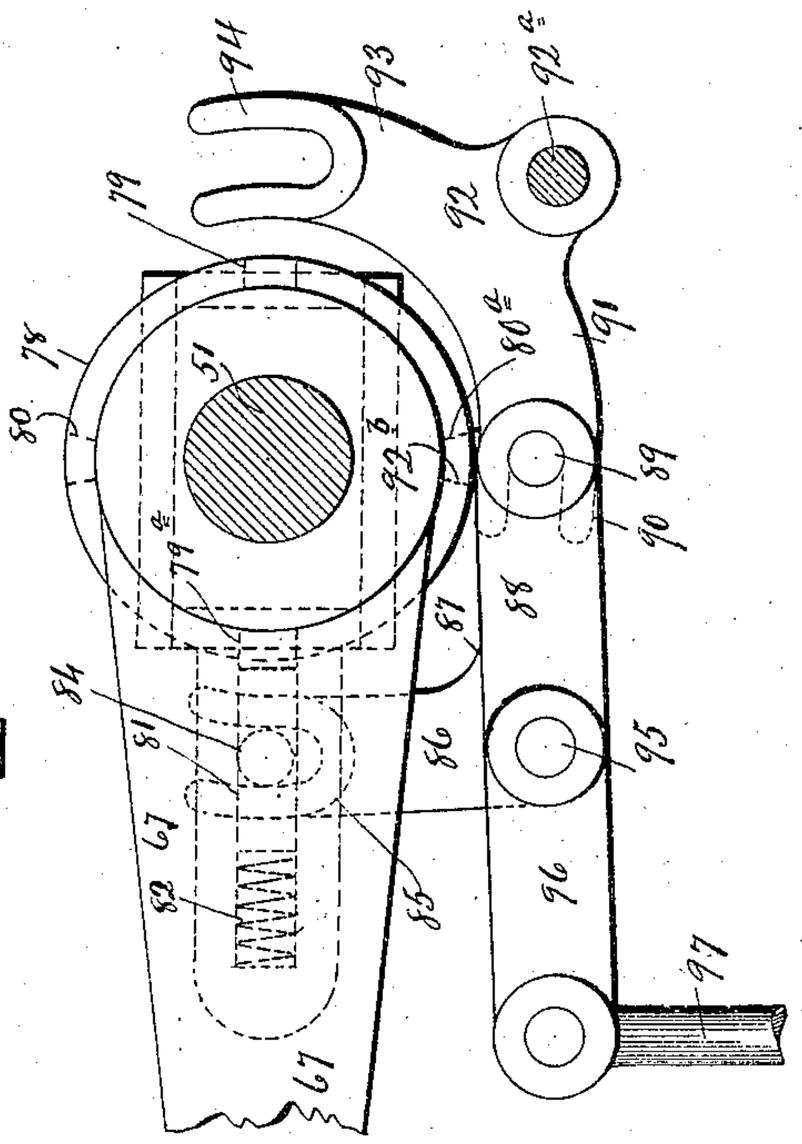


Fig. 4



Witnesses:
J. P. Shumway
Clara L. Reed.

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Inventor.
By attys
Seymour & Earle

No. 775,657. PATENTED NOV. 22, 1904.

W. S. HUSON.

SHEET DELIVERY APPARATUS FOR CYLINDER PRINTING PRESSES.

APPLICATION FILED JUNE 1, 1904.

NO MODEL. 7 SHEETS—SHEET 4.

Fig. 9

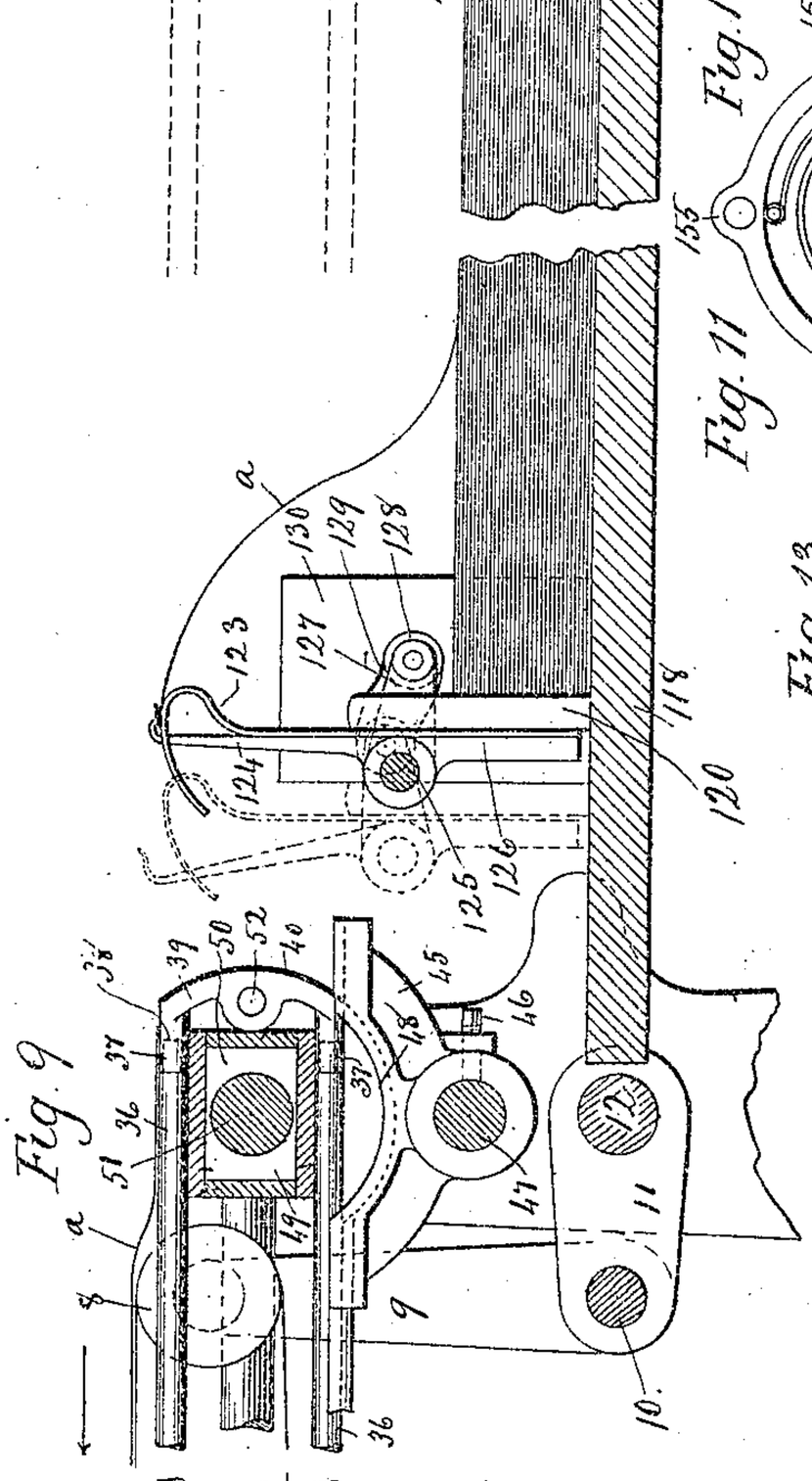


Fig. 11

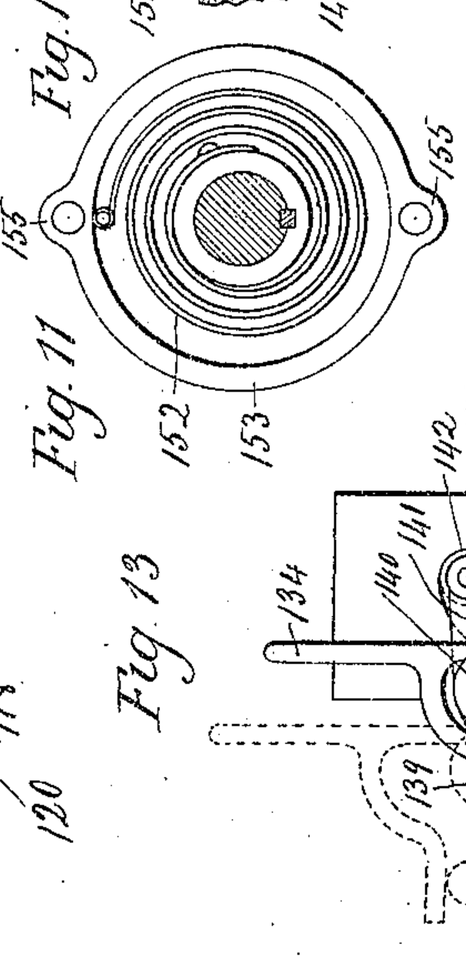


Fig. 12

Fig. 13

Fig. 14

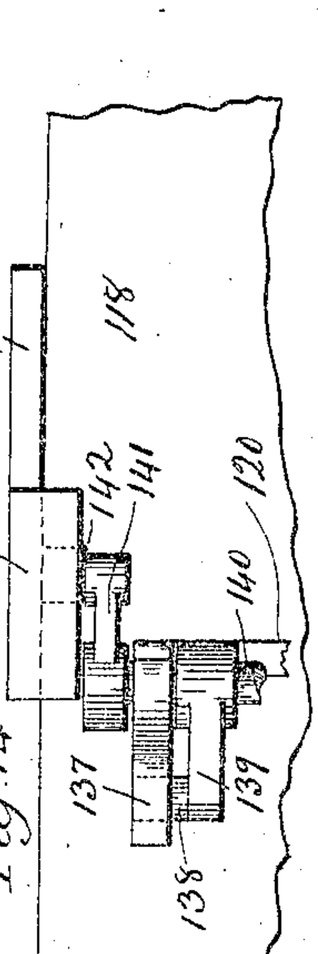


Fig. 14a

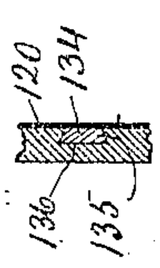
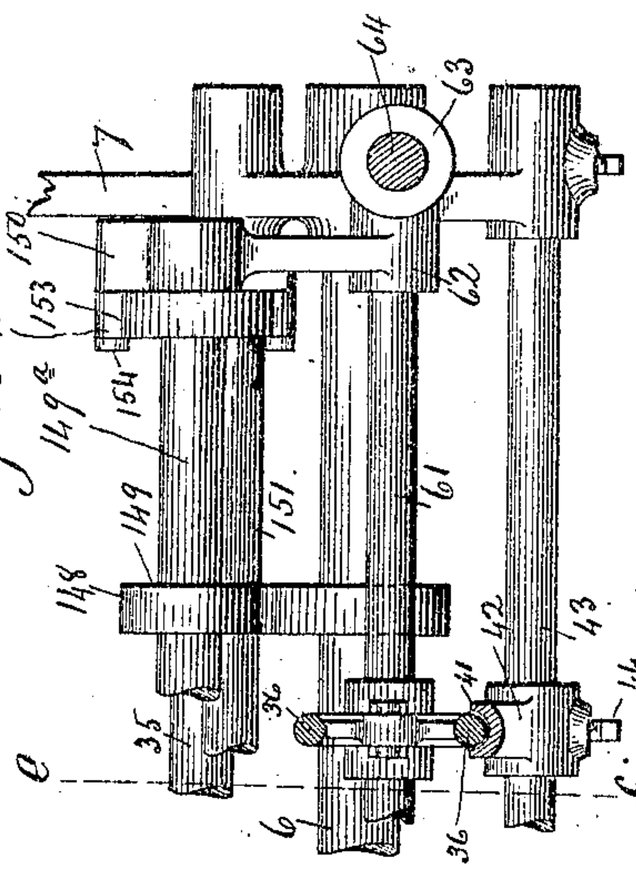
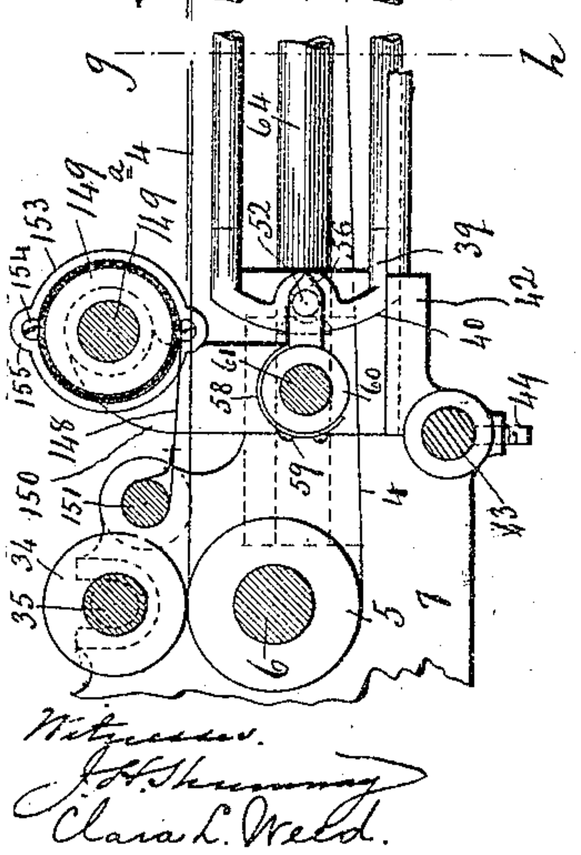


Fig. 10





Witnesses.
Jos. H. Shumway
Clara L. Weld.

Winfield S. Huson
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No. 775,657. PATENTED NOV. 22, 1904.

W. S. HUSON.

SHEET DELIVERY APPARATUS FOR CYLINDER PRINTING PRESSES.

APPLICATION FILED JUNE 1, 1904.

NO MODEL. 7 SHEETS—SHEET 5.

Fig. 15

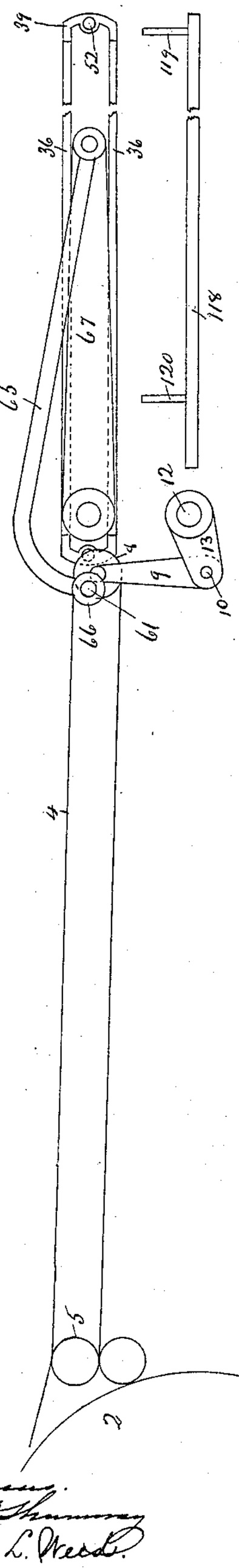
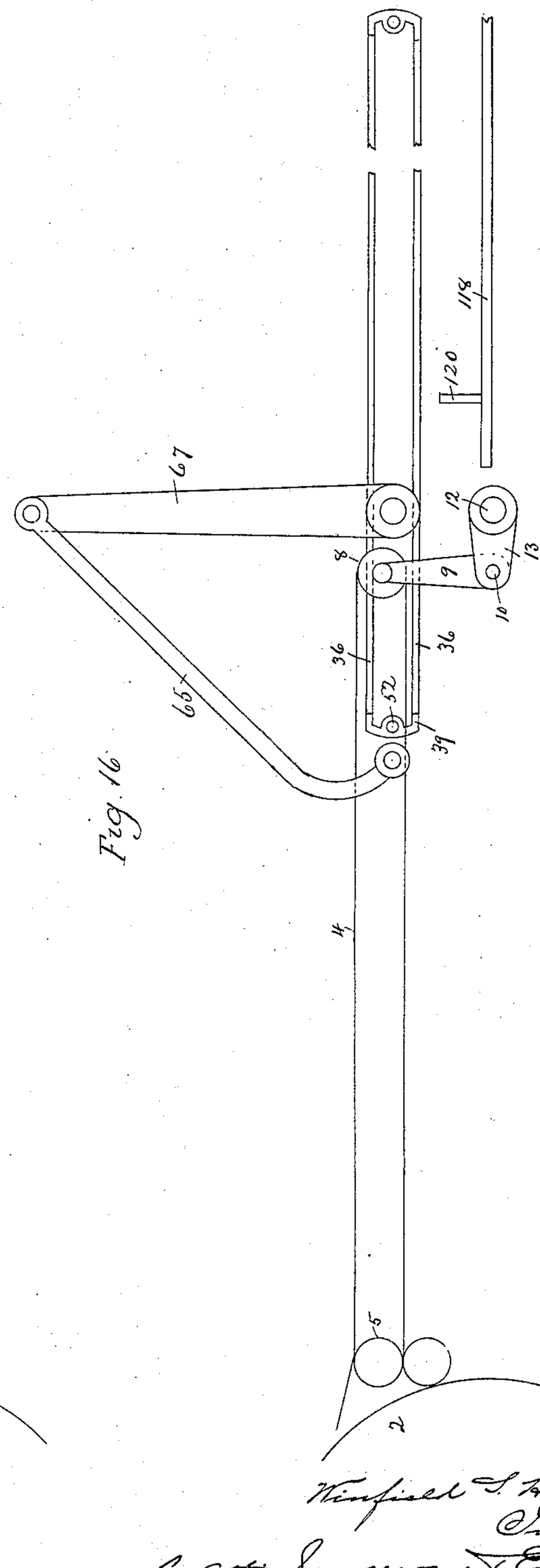


Fig. 16



Witnesses:
J. A. Shumway
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SHEET DELIVERY APPARATUS FOR CYLINDER PRINTING PRESSES.

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NO MODEL. 7 SHEETS—SHEET 6.

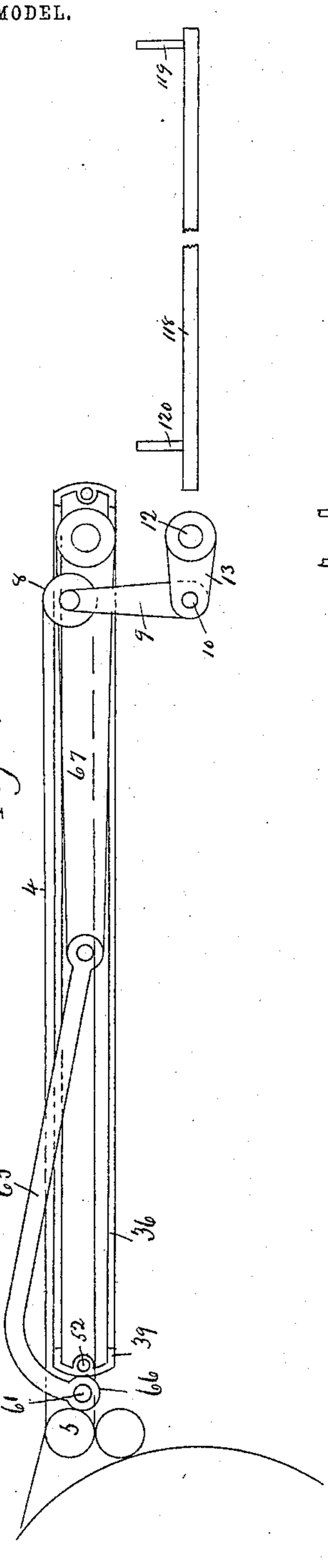

Fig. 17

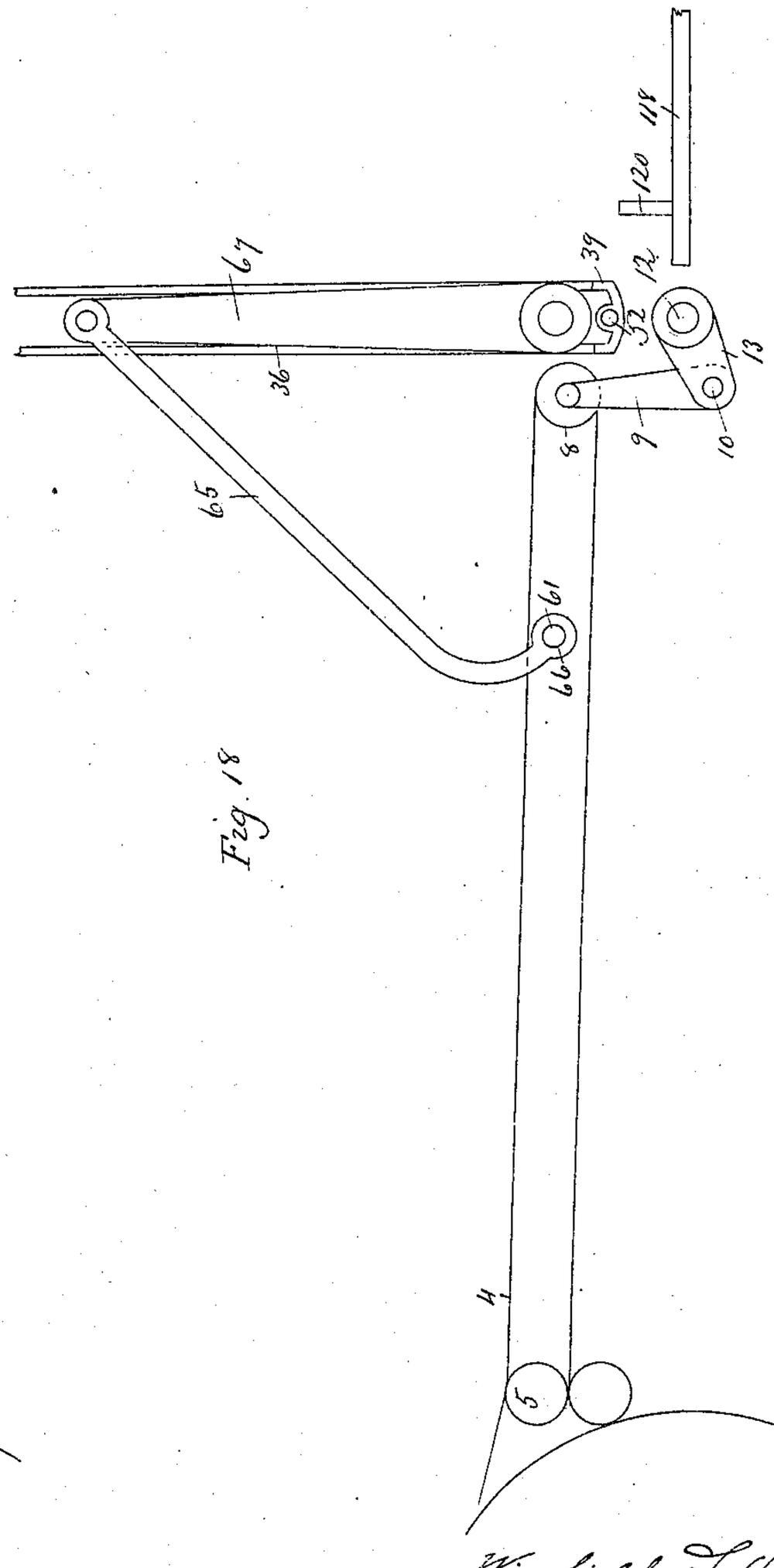

Fig. 18

Witnesses.
J. H. Thompson
Clara L. Reed.

Winfield S. Huson.
Inventor.
By attys Seymour & Earle

No. 775,657. PATENTED NOV. 22, 1904.

W. S. HUSON.

SHEET DELIVERY APPARATUS FOR CYLINDER PRINTING PRESSES.

APPLICATION FILED JUNE 1, 1904.

NO MODEL. 7 SHEETS—SHEET 7.

Fig. 19

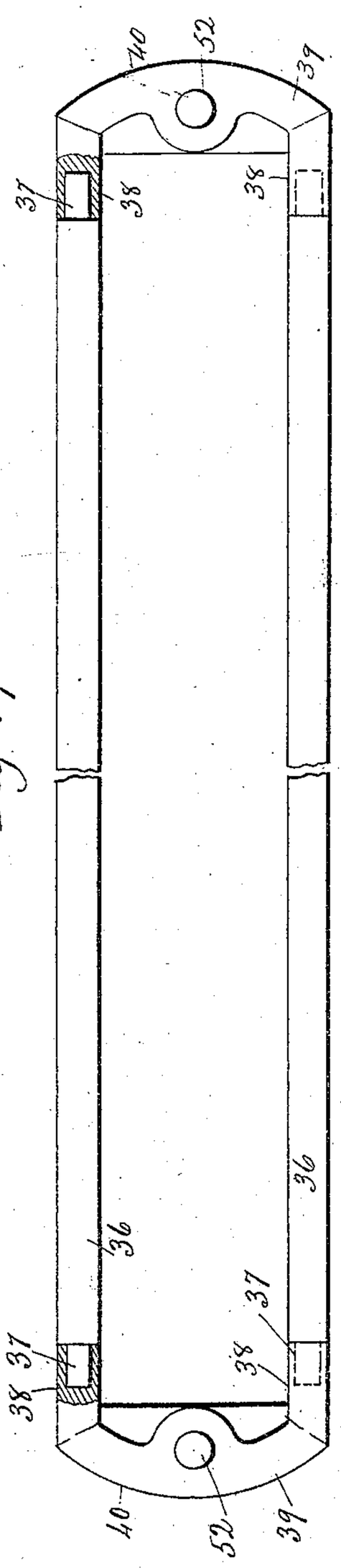

Fig. 20

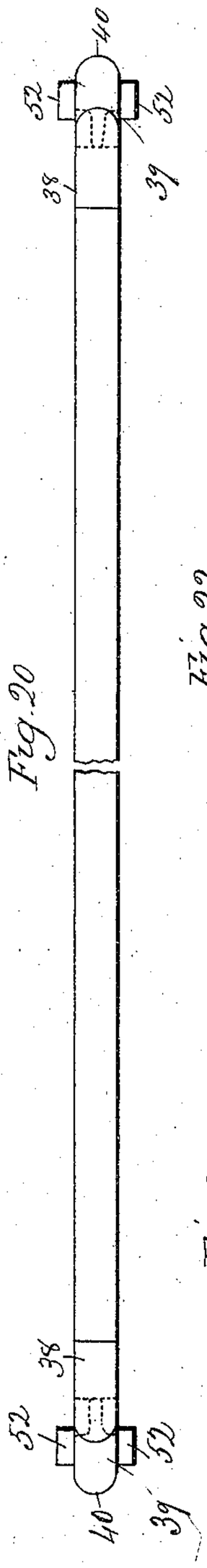

Fig. 22

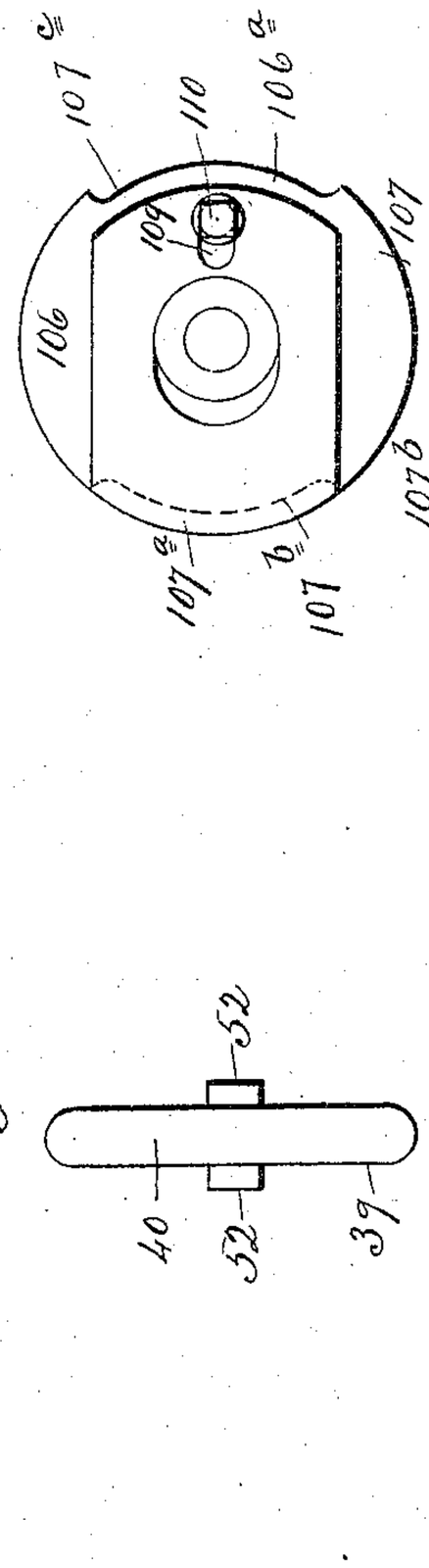

Fig. 23

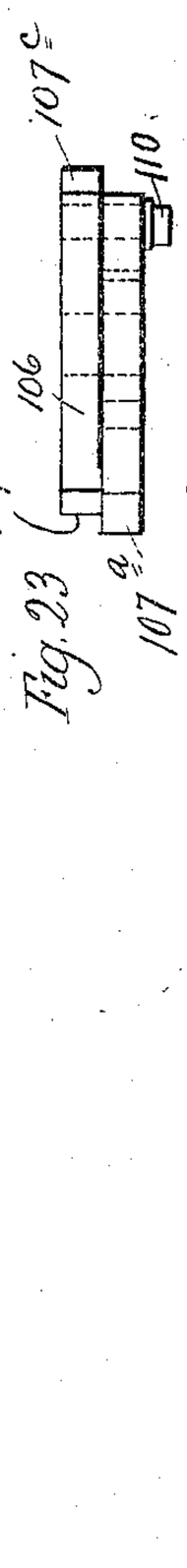

Fig. 21

Witnesses.
J. H. Shumway
A. Smith.

Winfield S. Huson.
Inventor.
By Attys. Seymour & Earle

PHOTO-LITHOGRAPHED BY SACHETT & WILHELMS' LITHO. & PTG. CO. NEW YORK.

No. 775,657. Patented November 22, 1904.

UNITED STATES PATENT OFFICE.

WINFIELD S. HUSON, OF DERBY, CONNECTICUT, ASSIGNOR TO THE WHITLOCK PRINTING PRESS MFG. CO., OF DERBY, CONNECTICUT, A CORPORATION.

SHEET-DELIVERY APPARATUS FOR CYLINDER PRINTING-PRESSES.

SPECIFICATION forming part of Letters Patent No. 775,657, dated November 22, 1904.

Application filed June 1, 1904. Serial No. 210,720. (No model.)

To all whom it may concern:

Be it known that I, WINFIELD S. HUSON, of Derby, in the county of New Haven and State of Connecticut, have invented a new and useful Sheet-Delivery Apparatus for Cylinder Printing-Presses; and I do hereby declare the following, when taken in connection with the accompanying drawings, and the characters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a view in left-hand side elevation of a cylinder printing-press embodying my invention; Fig. 2, a broken plan view of the press; Fig. 3, a broken plan view of the left-hand end of the conveyer rock-shaft and the conveyer box-shaft, together with the means employed for connecting and disconnecting the two shafts; Fig. 4, a view of the same parts in left-hand side elevation; Fig. 5, a detached view in side elevation of the crank-disk which is mounted to the cam-shaft; Fig. 6, a sectional view on the line *a b* of Fig. 5, showing the said disk, the cam-shaft, and the timing-pinion; Fig. 7, a broken plan view showing one of the sheet-conveyers in its coupled relation to its tug-clip; Fig. 8, a view, partly in elevation and partly in section, on the line *c d* of Fig. 7; Fig. 9, a broken contracted view of the press in vertical section on the line *e f* of Fig. 10 looking toward the right from the left-hand side of the press and with the central portions of the sheet-conveyers broken away; Fig. 10, a view on the line *g h* of Fig. 9 looking in the direction of the arrow *a* thereon; Fig. 11, a detached view of the spring and spring-barrel of the overguide-tapes; Fig. 12, a view thereof in vertical section, showing also the shaft on which the barrel is mounted and to which the inner end of the spring is secured; Fig. 13, a broken view, in side elevation, showing one of the modified forms of sheet-intercepting devices which I may employ; Fig. 14, a plan view thereof; Fig. 15, a diagrammatic view showing a sheet-conveyer in its delivering position over the delivery-board; Fig. 16, a corresponding view showing the intermediate position of a sheet-conveyer when the press is adjusted for delivering the sheets printed side up; Fig. 17, a diagrammatic view showing a sheet-conveyer in its sheet-receiving position; Fig. 18, a diagrammatic view showing the intermediate position of a sheet-conveyer when the press is set to deliver the sheets printed side down; Fig. 19, a detached view in elevation of one of the sheet-conveyers with the central portions of its rods and the upper portions of its heads broken away; Fig. 20, a plan view thereof; Fig. 21, an end view thereof; Fig. 22, a detached view in elevation of the converting-cam with its filling-plate; Fig. 23, a plan view thereof.

This invention relates to an improvement in sheet-delivery apparatus for cylinder printing-presses, the object being to produce a compact, comparatively simple, and effective mechanism constructed with particular reference to economy of time and to convenience of use and to delivering the sheets either printed side up or printed side down, or, alternately, printed side up and printed side down.

With these ends in view my invention consists in a sheet-delivery apparatus having certain details of construction and combinations of parts, as will be hereinafter described, and particularly pointed out in the claims.

For convenience of disclosing my present invention, I have shown it as applied to a printing-press of the type illustrated in my prior patent, No. 725,714, granted April 21, 1903, which shows in particular the means employed for driving the printing-cylinder and cam-shaft.

The jogger-board shown and described herein is of the type more fully set forth in United States Patent No. 360,921, granted April 12, 1887.

In carrying out my invention, as herein shown, I employ a two-revolution impression-cylinder 2 of ordinary construction, from which the printed sheets *a* are removed by strippers 3, also of ordinary construction, and by them delivered to a series of horizontally-arranged continuously-traveling endless main

tapes 4, running at their inner ends over tape-pulleys 5, mounted on a tape-pulley shaft 6, journaled at its ends in the main frame 7 of the machine. At their outer ends the said main tapes 4 run over complementary tape-pulleys 8, journaled in the upper ends of a series of vertically-arranged rock-arms 9, secured to a rock-shaft 10, journaled at its ends in arms 11, projecting rearwardly from a rock-shaft 12, journaled at its ends in the main frame 7. The said rock-shaft 12 projects at its left-hand end through the machine-frame 7, and is furnished with a rock-arm 13, connected with the upper end of a link 14, the lower end of which is attached to the horizontal arm 15 of a three-branch lever, hung on a stud 16, and having its depending arm 17 connected with the outer end of a horizontal link 18, the inner end of which is pivoted to a three-armed cam-lever 19, swinging on a stud 20 and carrying a cam-roller 21, which rides on a cam 22, formed on the periphery of the crank-disk 23, Figs. 5 and 6, which is mounted on the cam-shaft 24 of the press. To maintain the cam-roller 21 in contact with the cam 22, I employ a spring 25, encircling a rod 26, attached to the horizontal arm 27 of the three-branch lever aforesaid, the said spring being interposed between the stud 26ª, which guides the rod and a collar 28, mounted on the rod near its lower end. The mechanism just described is employed, as will be explained later on, for raising and lowering the outer ends of the main tapes 4. A pinion 29, mounted on the left-hand end of the tape-pulley shaft 6, meshes into a pinion on the inner end of a short driving-shaft 31, having on its outer end a pinion 32, meshing into the cylinder gear-wheel 33 in the well-known manner, whereby the said tapes are continuously driven.

For the purpose of propelling the printed sheets from the impression-cylinder 2 out upon the said main tapes 4, I employ a series of margin-rollers 34, mounted, as usual, upon a margin-roller shaft 35, journaled at its ends in the main frame 7, and driven in the usual manner by frictional contact with the tape-rollers 5, or, if preferred, by special rollers (not shown) mounted on the tape-roller shaft 6.

Directly below the upper reaches of the main tapes 4 I locate a horizontal series of sheet-conveyers, which constitute in their construction and operation one of the leading features of my present improvement. For delivering the sheets printed side up these sheet-conveyers are confined to reciprocation back and forth in a right line, while for delivering the sheets printed side down the conveyers are swung through a half-circle for delivering the sheets and return in a right line to their sheet-receiving positions, as will be fully explained later on. Each of these sheet-conveyers consists of two corresponding wooden rods 36, formed at their ends with dowels 37, adapted to be entered into the parallel inwardly-opening sockets 38 of two complementary conveyer-heads 39, the outer ends of which are formed with convex bearing-faces 40, on which the conveyers are turned, as upon the ball member of a ball-and-socket joint. These conveyers as thus constructed are precisely alike at either end, so that they may be interchanged end for end in use.

For supporting the said sheet-conveyers in their reciprocating movement back and forth I employ a corresponding number of horizontally-arranged guides 41, Figs. 9 and 10, each consisting of a strip of sheet metal bowed in cross-section to conform to the curvature of the conveyer-rods 36. At their inner ends these guides 41 are secured to a series of heads 42, mounted upon a fixed rod 43, supported at its ends in the machine-frame 7, the heads 42 being secured to the rod 43 by means of set-screws 44. At their outer ends the guides 41 are supported in bracket-like guards 45, secured by set-screws 46 upon a horizontal rod 47, supported at its ends in the machine-frame 7. The upper surfaces of the said guards 45 are formed with concave bearing-faces 48, conforming in curvature to the curvature of the convex bearing-faces 40 of the heads 39 of the sheet-conveyers. Each of these concave bearing-faces 48 may be compared to the socket member of a ball-and-socket joint of which the ball member is formed by the said convex bearing-faces 40. At their outer ends the sheet-conveyers are also supported by the passage through them of a rotary hollow box-like sheet-conveyer shaft 49, Figs. 2 and 9, rectangular in cross-section and containing a series of supporting-blocks 50, by means of which it is supported upon the sheet-conveyer rock-shaft 51, which is journaled at its ends in the machine-frame 7. When the sheet-conveyers are being reciprocated back and forth for delivering the sheets printed side up, the rock-shaft 51 is operated independently of the rectangular shaft 49; but when they are being operated for delivering the sheets printed side down the rectangular shaft 49 is intermittently coupled with the rock-shaft 51 for being turned through half-rotations thereby, as will be explained later on.

For operating the sheet-conveyers each of the heads 39 of each conveyer is furnished with a transversely-arranged coupling-pin 52, Figs. 2, 7, 8, and 9, having correspondingly-projecting ends and adapted to be swung upwardly into and out of a coupling-space 53, formed between the concave faces 54 55 of coupling-blocks 56, secured by screws 57 to the forwardly-projecting ends of yielding sheet-metal clips 58, secured by screws 59 to collars 60, fixed upon a rod 61, which, as suggestive of its function, I shall hereinafter call the "tug-rod," its function being to push and pull the sheet-conveyers back and forth. The said tug-rod 61 is supported at its ends in the corresponding heads 62, Figs. 2 and

10, of sleeves 63, sliding on fixed guide-rods 64, extending parallel with the length of the machine and fixed at their ends in the machine-frame 7 thereof. The tug-rod 61 is itself moved back and forth by means of two links 65, Figs. 1 and 2, of which there is one on each side of the machine. At their rear ends these links are bowed upwardly for clearance and formed with eyes 66, through which the tug-rod 61 passes. At their outer ends the said links are pivotally connected with the inner ends of two rock-arms 67, extending rearwardly from the rock-shaft 51, to which they are rigidly secured, being respectively abutted against the ends of the rotary rectangular shaft 49, which they hold against endwise displacement. Normally the coupling-pins 52 are entered into the coupling-spaces 53 of the coupling-blocks 56. Then as the tug-rod 61 is alternately moved back and forth synchronously with the rocking of the shaft 51 the sheet-conveyers will be pushed outward and drawn inward until this connection is broken by the lifting of the coupling-pins 52 upward out of the coupling-spaces 53, and therefore out of the range of the blocks 56, by the swinging half-circle movement of the sheet-conveyers under the action of the rotary rectangular box-like shaft 49, as will be explained later on.

The shaft 51 is continuously rocked through a half-circle by means of a gear 68, Figs. 1 and 2, secured to its left-hand end at a point outside of the machine-frame 7. This gear is operated by a rack 69, corresponding to the ordinary fly-rack of a printing-press and located at the upper end of a long rod 70, the lower end of which receives a crank-pin 71, Figs. 1, 2, and 5, carried by the crank-disk 23, adjustably secured by a screw-bolt 72, Fig. 6, to a hub 73, formed with a segmental slot 74 for the reception of the said bolt 72 and providing for the rotation of the disk upon the hub for the adjustment of the disk. The said hub 73 is secured by a key 75 upon the left-hand end of the cam-shaft 24 and is prevented from working away from the key 75 by a washer 76 and screw 77. For each revolution of the cam-shaft 24 and crank-disk 23 the tug-rod 61 is moved back and forth, the delivery of each sheet requiring a complete revolution of the cam-shaft. It will be understood, as may be here explained, that the rocking of the shaft 51, and hence the movement back and forth of the tug-rod 61, is continuous, irrespective of the setting of the machine for delivering the sheets printed side up or printed side down; but when the sheets are being delivered printed side up the box-like rectangular shaft 49 is virtually idle, being cut out, so to speak, of action by being uncoupled from the rock-arms 67 of the shaft 51.

To deliver the sheets printed side down, the rectangular shaft 49 must be intermittently coupled with the rock-shaft 51. For this purpose I locate upon the left-hand end of the rectangular shaft 49 a coupling-wheel 78, Figs. 3 and 4, having two bolt-holes 79 79^a, located opposite each other, and also having two locking-slots 80 80^a, located opposite each other and quartering with respect to the bolt-holes 79 79^a. The said bolt-holes 79 79^a receive the end of a bolt 81, operated in its coupling action by a spring 82, which encircles its outer end, the bolt and spring being located in a chambered boss 83, formed upon the inner face of the left-hand rock-arm 67. The bolt 81 is provided with an operating-pin 84, entering a fork 85 in the end of the arm 86 of a bell-crank lever 87, the other arm, 88, of which carries a pin 89, entering a fork 90 in the end of the arm 91 of a two-forked lever 92, the other arm, 93, of which has a fork 94, which receives the said pin 84 when the bolt is swung with the left-hand rock-arm 67 to the limit of its outer movement. The two-forked lever 92 is hung within the machine-frame 7 upon a stud 92^a, mounted therein, while the bell-crank lever 87, although also located within the machine-frame 7, is fixed to the inner end of a short shaft 95, mounted therein and provided at its outer end with a rock-arm 96, attached to the upper end of a long connecting-rod 97, Figs. 1 and 4, the lower end of which is attached to the arm 98 of a three-branch lever hung on a stud 99 and having a depending arm 100, connected by a rod 101 to the depending arm 102 of a cam-lever hung on a stud 103 and having its upper arm 104 furnished with a cam-roller 105, coacting with two cams 106 107, Figs. 1, 2, and 22, corresponding to each other in curvature and length and formed upon the opposite edges of a disk-like cam-plate 106^a, fixed to a timing-gear 108, with which it revolves, the said cam-plate being also formed with two corresponding clearance-spaces or "drops" 107^b and 107^c, located between the ends of the said cams 106 and 107. Each of the said cams and clearance-spaces is approximately ninety degrees "dwell."

For the purpose of temporarily filling up the clearance-space or drop 107^b a filling-plate 107^a is mounted upon the hub of the cam-plate 106^a, so as to have endwise movement thereon. This plate is rounded at one end conformably with the curvature of the cams 106 and 107, so that when the plate is brought into play it virtually unites the said cams and puts the clearance-space 107^b out of use by bridging it over. At its opposite end the plate is formed with a slot 109, receiving a set-screw 110, entering the plate 106^a. Although the said cams are located in a different plane from the plane of the plate, the roller 105 is made wide enough to cover them all, and therefore to ride upon the rounded end of the plate when the same is set to act. It will be observed by reference to Fig. 23 that when the plate is in its operating posi-

tion, as shown therein, the cams 106 and 107 of the cam-disk 106[a] and the rounded end of the said plate together form what is equivalent to three-fourths of a circle, the remaining one-fourth of which is left vacant by the clearance-space 107[c].

The cam-plate and the filling-plate form, as a whole, the converting-cam of the machine. I employ the cams 106 and 107 and the filling-plate 107[a] for delivering the sheets printed side up and printed side down alternately, when desired. I also employ the cams 106 and 107 for continuously delivering the sheets printed side down at which time the filling-plate 107[b] is retired into its cut-out position. Both of the said cams and the said filling-plate are, however, retired when the machine is set for continuously delivering the sheets printed side up. For this purpose I provide, as shown, a cut-out latch 111, Fig. 1, hung on a stud 112 and arranged to be engaged with the outer end of the rod 101, so as to push the same rearward sufficiently to lift the cam-roller 105 away from the path of the cams 106 and 107. When this latch is not in use, it is thrown forward to rest upon the stop-pin 113. Normally the roller 105 is held in position to coact with the cams 106 and 107 by means of a compression-spring 113, encircling a rod 114 and impinging at its lower end upon a collar 115 at the lower end of the said rod and at its upper end against a stud 114[a], through which the rod plays up and down. The said rod 114 is connected with the arm 116 of the three-branch lever comprising the arms 98 and 100 referred to.

In order that the press may be timed properly for the alternating mode of delivering the printed sheets, the timing-gear 108 must have twice as many teeth as the timing-pinion 117 employed for driving it and mounted upon the cam-shaft 24, for the reason that when the alternating method of delivering the printed sheets is employed the rectangular shaft 49 must be turned through a half-circle and then allowed to rest while the machine resumes its normal operation for delivering a single sheet printed side up.

When it is desired to convert the delivery mechanism of the press for continuously delivering the sheets printed side down, the filling-plate 107[a] is set in its retired or cut-out position in which it leaves the clearance-space 107[b] free to be entered by the roller 105 as well as the clearance-space 107[c]. Now as the cam-roller 105 rides off either of the cams 106 or 107 into either of the clearance-spaces 107[b] or 107[c], as the case may be, the spring 113 will be released and operate to lift the rod 97 and swing the levers 87 and 92, so that the tooth 92[b] of the two-forked lever 92 will be retracted from the locking-slots 80 or 80[a] in the wheel 78 simultaneously with the introduction of the bolt 81 into the locking-holes 79 or 79[a] therein, whereby the rectangular shaft 49 will be unlocked from its fixed position in relation to the main frame 7 and coupled to the left-hand rock-arm 67, and therefore in reality to the rock-shaft 51. Now when the crank-disk 23 operates through the rack 69 and pinion 68 to rock the rock-shaft 51 through an arc of one hundred and eighty degrees, turning it outward, the rectangular shaft 49 will be turned with it, whereby all of the sheet-conveyers will be swung outward through an arc of one hundred and eighty degrees for the reason that the said shaft corresponds in its external dimensions to the spaces between the rods 36 of the conveyers, and as the shaft cannot turn within those spaces it compels the conveyer to turn with it, as will be clear from an inspection of Fig. 9. As the rock-arms 67 are swung outward with the rocking of the rock-shaft 51 the operating-pin 84 of the locking-bolt 81 issues from the fork 85 of the arm 86 and moving outward through an arc of one hundred and eighty degrees enters the corresponding fork 94 of the arm 93 of the two-forked lever 92, and as the rectangular shaft 49 has no retrograde movement, but is always turned in the same direction, the bolt 81 must now be retracted from the bolt-hole 79 or the bolt-hole 79[a], as the case may be. This is done by the action of the cam 106 or the cam 107, as the case may be, on the cam-roller 105. In either case the rod 97 is pulled downward against the tension of the spring 113, whereby the lever 92 is operated to retract the bolt 81 from the locking-hole 79 or from the locking-hole 79[a], as the case may be, and to enter its tooth 92[b] into the locking-slot 80 or into the locking-slot 80[a] of the locking-wheel 78. The rectangular shaft 49 is thus uncoupled from the rock-shaft 51, leaving the rock-arm 67 free to swing back through an arc of one hundred and eighty degrees to the limit of their inward movement. In the timing of the press the crank-disk 23 now operates to rock the shaft 51 inward through an arc of one hundred and eighty degrees, the bolt 81 riding back over the periphery of the locking-wheel 78, one or the other of the slots 80 80[a] of which has been entered by the locking-tooth 92[b], carried by the lever 92, which is hung on the machine-frame 7, whereby the box-shaft 49 is virtually coupled with the machine-frame, so as to be held against rotation thereby. Just as the rock-shaft 51 reaches the limit of its inward rocking movement the cam-roller 105 rides off the cam 106 or the cam 107, as the case may be, into the clearance-space 107[b] or into the clearance 107[c], as the case may be, leaving the spring 113 free to act to lift the rod 97 in swinging the levers 87 and 92, so as to withdraw the locking-tooth 92[b] from the slot 80 or the slot 80[a], as the case may be, and shoot the bolt 81 into either the bolt-hole 79 or the bolt-hole 79[a], as the case may be, whereby the box-shaft 49 is uncoupled from the machine-frame and re-

coupled with the rock-shaft 51. Then after a suitable interval the cam 106 or the cam 107, as the case may be, operates to repeat the operation above described. It will thus be seen that through the cams 106 and 107 the levers 86 and 92 are operated for coupling the box-shaft 49 with the rock-shaft 51 and for uncoupling it therefrom, whereby the said shaft 49 is cut into and out of operation intermittently, but this only when the latch 111 is not in use.

When the sheets are being continuously delivered printed side up and the latch 111 is being used, as heretofore described, it operates through the rod 97 to keep the tooth 92^b of the lever 92 entered into one or the other of the locking-slots 80 80^a of the locking-wheel 78, whereby the box-shaft is kept locked to or coupled with the machine-frame, so that the sheet-conveyers are moved back and forth over it in a right line by the "push" and "pull" action of the tug-rod 61, with which they are coupled through their coupling-pins 52, the box-shaft at this time assisting to support and guide the sheet-conveyers; but when the shaft 49 is rotated by half-turns it operates by means of its rectangular form, as described, to swing the sheet-conveyers, whereby the coupling-pins at their then inner ends will be disconnected from the tug-rod 61 by being lifted vertically out of the coupling-spaces 53 of the coupling-blocks 56. This uncoupling is made possible by the fact that the sheet-conveyers are lifted much more rapidly than the coupling-blocks 56 are moved rearwardly, there being some clearance, moreover, in the coupling-spaces 53 of the coupling-blocks 56. When the sheet-conveyers are being swung over from rear to front by the rectangular shaft 49, the convex bearing-faces 40 of their forward heads turn in the concave bearing-recesses 48 of the guards 45. It will be seen that when the sheet-conveyers have been swung through an arc of one hundred and eighty degrees they will have been changed end for end with respect to the tug-rod 61, which moves outward during the said swinging movement of the conveyers and arrives at the limit of its outward excursion just in time to register the lower ends of the coupling-spaces 53 in the coupling-blocks 56, carried by its tug-clips 58, with the coupling-pins 52 in the then inner heads of the sheet-conveyers, the said pins being at this time slowly lifted as the outer ends of the conveyers are descending into their horizontal positions. In this way the sheet-conveyers now changed end for end are recoupled with the tug-rod 61, which at once draws them in a right line home into their sheet-receiving positions. It is to be particularly noted that the box-shaft 49 does not turn back to restore the sheet-conveyers to their sheet-receiving positions. It always turns by half-rotations in the same direction. The return of the conveyers in a right line into their sheet-receiving positions brings them under the next succeeding sheet, which meanwhile has been printed and is being delivered upon the main tapes 4, so that no time is lost. If the sheet-conveyers were returned by a reverse movement through an arc of one hundred and eighty degrees, that reverse return movement would have to be completed before the beginning of the delivery to the tapes of another printed sheet and time would be lost. In this connection it may be explained that just before the conveyers take the printed sheet, either for moving the same horizontally outward or for swinging it through an arc of one hundred and eighty degrees, the cam 22 operates through the cam-roller 21, carried by the three-armed cam-lever 19 and through the rods 18 and 14 to pull downward upon the rock-arm 13 and rock the shaft 12, so as to depress the arms 11, carrying the tape-rollers 8, whereby the main tapes 4 are depressed at their outer ends and the sheet allowed to settle down upon the conveyers, whereby the headway of the sheet is retarded. On the other hand, when the conveyers reach the limit of their outward movement, whether moved straight outward or swung outward, the spring 25 asserts itself to lift the tape-rollers 8, and hence the tape, into their full-elevated position, in which the upper reaches of the tapes occupy planes above the conveyers and whereby the conveyers on their return or inward movement are permitted to run under the next succeeding sheet.

If it is desired to deliver the sheets alternately printed side up and printed side down, the filling-plate 107^a is put in play by being moved lengthwise until its rounded end is in line with the cams 106 and 107, when it bridges over and virtually eliminates for the time being the clearance-space or "drop" 106^b. One of the two clearance-spaces or drops 107^b 107^c is thus cut out of play, and consequently the levers 87 and 92 are actuated only half as often as before, so that the box-shaft 49 is uncoupled from the machine-frame 7 and coupled with the rock-shaft 51 at every other rocking movement thereof instead of at every rocking movement thereof, as when all of the sheets are being delivered printed side down. The sheet-conveyers will now be moved out and back in a right line for the delivery of one sheet with the printed side up, then swung outward through an arc of one hundred and eighty degrees for the delivery of the next sheet with the printed side down, then returned to their sheet-receiving positions by rearward movement in a right line. Then after receiving the sheet they will move outward in a right line for delivering the sheet printed side up and return in a right line for receiving another sheet to be delivered printed side down by their swinging movement, and so on.

When the sheets are delivered alternately printed side up and printed side down, slip-

sheets will be placed between every pair of printed sheets instead of between every printed sheet, as must be done when they are continuously delivered printed side up or printed side down. By using slip-sheets for every pair of printed sheets instead of for every single printed sheet obviously an economy of time and labor and slip-sheets will be secured. I may also mention here that when the sheets are delivered printed side up and are to be printed on the other side as well it is necessary to turn them all preparatory to backing them up for a second printing. It will be plain, therefore, that when half of the sheets are delivered printed side down it becomes necessary to turn only the other half of the sheets preparatory to backing them up. This also effects a proportional economy of time and saves many sheets which would otherwise be spoiled in handling.

As already explained, any paper-jogger of the type shown in Patent No. 360,921, of April 12, 1887, may be employed. It will therefore be unnecessary for the disclosure of my invention to illustrate and describe a paper-jogger, except so far as may be necessary for an understanding of my improved means for stripping the printed sheets from the sheet-conveyers after the same have delivered the sheets over the jogger-board.

The delivery-board 118, Figs. 1 and 9, is provided upon its upper face in the usual manner with a front jogger-strip 119, a rear jogger-strip 120, and side jogger-strips 121 and 122. These four jogger-strips are adjustable and are moved in concert toward and away from the center of the board 118 by any suitable mechanism, such as that shown in Patent No. 360,921, referred to. By this mechanism they are separated from each other at the time the sheet is delivered and then closed up, so as to "jog" the sheet in one direction or the other, so it will register with the sheets below it, whereby the sheets are uniformly piled up on the board.

In order to insure the stripping of the printed sheet from the sheet-conveyers, I employ a sheet-intercepting device which is combined with the rear jogger-strip 120. This device may be in the form of grippers, as shown in Figs. 1 and 9, or in the form of pickets, as shown in Figs. 13, 14, and 14ª. When grippers are employed, I use a series of fixed sheet-metal under grippers 123, secured to the rear face of the jogger-strip 120, having rearwardly-extending gripping-fingers and coacting with a corresponding number of oscillating upper grippers 124, having forwardly-extending gripping-fingers and mounted upon a rock-shaft 125, journaled in brackets 126, secured to the rear face of the said jogger-strip 120. This shaft is furnished at its right-hand end with a rock-arm 127, carrying a cam-roller 128, located in a cam-path 129, formed in an adjustable plate 130, secured in any desired position of adjustment to a plate 131, fixed to the right-hand edge of the delivery-board 118 by a thumb-screw 132, mounted in it and passing through a long slot 133 in the said fixed plate 131. As the rear jogger-strip 120 moves back and forth the curved cam-path 129 will act, through the cam-roller 128 and the rock-arm 127, to rock the shaft 125, and hence oscillate the upper grippers 124 with respect to the fixed under grippers 123. When the sheet-conveyers have reached the limit of their forward movement, they may be said to be in their sheet-delivering positions, as shown by dotted lines in Fig. 9. At this time the jogger-strips are spread apart to the limit, as shown by the dotted lines in the same figure. At this time also the rock-arm 127 has been operated by the cam-path 129 to rock the shaft 125, so as to swing the upper grippers 124 into their full-open positions, in which they are shown by dotted lines in the same figure. Now just as soon as the sheet-conveyers start rearward the jogger-strips are very rapidly brought toward each other, whereby the upper grippers 124 are swung forward by the said rock-arm 127 into their closed positions to grip the printed sheet by its rear edge upon the upper face of the rearwardly-extending fingers of the fixed under grippers 123. The motion of the conveyers is at this time so slow that the grippers grip the rear edge of the sheet before the conveyers have measurably started on their rearward excursion. Therefore before the conveyers acquire any speed in this rearward movement the sheet is gripped by its rear edge, whereby it is stripped from them. Then as soon as the sheet has been stripped from the conveyers the jogger-strips return to their open positions, whereby the grippers are opened and the sheet dropped upon the pile upon which it is "jogged," and so registered when the next outcoming sheet is about to be delivered, the jogging of one sheet and the delivery of the next succeeding sheet being simultaneously effected. It will thus be seen that the grippers, the operation of which is due to the movement of the rear jogger-strip, intercept the printed sheets and insure their being stripped from the sheet-conveyers.

Instead of employing grippers for intercepting the printed sheets I may employ sheet-intercepting devices in the form (shown by Figs. 13, 14, and 14ª) of vertically-movable pickets 134, having the lower portions of their edges 135 beveled and mounted in vertical dovetail grooves 136 in the outer face of the rear jogger-strip. Each of these pickets is provided with a rearwardly-extending lifting-arm 137, the under face of which is engaged by the bent outer end 138 of a rearwardly-extending rock-arm 139, mounted upon a shaft 140, corresponding to the shaft 125, before described, this shaft 140 being provided

at its right-hand end with a rock-arm 141, carrying a cam-roller 142, moving in a curved cam-path 143, formed in an adjustable cam-plate 144, mounted upon a fixed plate 145, secured to the right-hand edge of the delivery-board, the plate 144 being secured in any position of adjustment upon the fixed plate 145 by means of a thumb-screw 146, passing through a long slot 147 formed therein. Under this construction the pickets are lifted into the path of the printed sheets when the jogger-strips are separated and just before the conveyers start on their rearward excursions. When the conveyers start, the rear edge of the printed sheet upon them abuts against the pickets, whereby the sheet is intercepted and kept within the confines of the jogger-strips, which when they are moved toward each other jog the sheets into registration with the previously-delivered sheets forming a pile on the jogger-board 118.

In order to prevent the printed sheets from curling or being lifted by the air at their outer edges during the period of their delivery from the impression-cylinder upon the main tapes 4, I provide for the employment of a series of supplemental tapes 148, Figs. 2, 9, and 10, which I propose to call "overguide-tapes." These tapes are wound at their outer ends upon overguide-tape rollers 149, mounted on an overguide-tape-roller shaft 149[a], Figs. 2, 9, 10, 11, and 12, supported at its ends in arms 150, made integral with the sliding heads 62. The inner ends of the tapes 148 are fastened to a tape-rod 151, the ends of which are supported in the main frame 7 of the machine. As the overguide-tape-roller shaft 149[a] is moved outward the overguide-tapes 148 are unrolled in a horizontal plane lying directly above the printed sheet being delivered on the main carrying-tapes 4, so that the said overguide-tapes prevent the leading edge of the printed sheet from curling or rising under the action of air-currents. On the return movement of the shaft 149[a] the tapes 148 are rewound upon the rollers 149 by means of a spring 152, Figs. 11 and 12, located in a spring-barrel 153, secured to the machine-frame 7 by bolts 154 passing through its perforated lugs 155. The outer end of the said spring 152 is secured to the barrel 153, while its inner end is secured to a collar 156, keyed to the shaft 149[a]. As the said shaft 149[a] is moved outward the spring 152 is wound up. Then when the shaft moves rearward the spring operates to revolve it for winding the tapes upon the rollers 149. The action of these overguide-tapes is very similar to the action of an ordinary spring shade-roller. The rewinding of these tapes 148 is timed so that it will be completed before the sheet-conveyers are swung for delivering the sheets printed side down.

With reference now to Figs. 16 to 18 of the drawings, Fig. 15 shows a conveyer after it has reached its sheet-delivering position by outward movement in a right line for delivering the sheet with the printed side up. In this figure it will be observed that the outer ends of the tapes are depressed. Fig. 16 shows a sheet-conveyer returning from its sheet-delivering to its sheet-receiving position with the rock-arms of the rock-shaft in mid-position. It will be noticed that in this view the outer ends of the main tapes have been lifted to their elevated positions, so that the upper reaches of the tapes are located in a plane above the conveyer. Fig. 17 shows a conveyer in its sheet-receiving position under the main delivery-tapes, which will now be lowered to let the next sheet delivered down upon the conveyers, so that its headway will be retarded thereby. Fig. 18 shows a conveyer in its midway position when being swung by the rectangular shaft from its sheet-receiving to its sheet-delivering position, the outer ends of the tapes being at this time depressed. When the conveyer, as shown by Fig. 18, has reached the limit of its outward swinging movement, it will be in the position shown by Fig. 15 and will be reversed end for end in readiness to be drawn back in a right line, as shown by Fig. 16, into its sheet-receiving position.

In view of the modifications suggested and of others that may obviously be made I would have it understood that I do not limit myself to the construction shown and described, but hold myself at liberty to make such changes and alterations as fairly fall within the spirit and scope of my invention.

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

1. In a printing-press, the combination with the delivery-tapes and the delivery-board thereof, of sheet-conveyers adapted to pass between the said tapes and under the outcoming sheet, and means for swinging the sheet-conveyers from their sheet-receiving positions to the said delivery-board.

2. In a printing-press, the combination with a series of continuously-driven endless delivery-tapes, of sheet-conveyers reversible end for end, and means for lowering the outer ends of the said tapes when the said sheet-conveyers are in their sheet-receiving positions, whereby the headway of the sheet being delivered is checked.

3. In a printing-press, the combination with the delivery-tapes and the delivery-board thereof, of sheet-conveyers adapted to pass between the said tapes and under the outcoming sheet, means for swinging the said sheet-conveyers from their sheet-receiving positions to the said delivery-board and returning them in a right line to receive the next outcoming sheet, and means for lowering the outer ends of the said tapes whereby the headway of the sheets is checked by the said sheet-conveyers.

4. In a printing-press, the combination with a series of continuously-driven endless tapes, of tape-rollers over which the outer ends of the said tapes pass, a rock-shaft, arms carried thereby and having the said rollers mounted in them, sheet-conveyers reversible end for end, and power connections for the said shaft, whereby the said tape-rollers are lowered for lowering the outer ends of the tapes without stopping them, to permit the sheet being delivered to engage with the conveyers, whereby its headway is checked.

5. In a printing-press, the combination with the sheet-delivery mechanism thereof, of over-guide-tapes which are extended over each sheet during the delivery thereof, and then rewound preparatory to the delivery of the next succeeding sheet.

6. In a printing-press, the combination with the sheet-delivery mechanism thereof, of extensible overguide-tapes, a spring for rewinding the same after their extension, and means connected with the outer ends of the tapes, whereby they are extended progressively with the delivery of a sheet after which they are rewound by the said spring, preparatory to the delivery of the next succeeding sheet.

7. In a printing-press, the combination with the delivery-tapes thereof upon which the printed sheets are delivered, of extensible overguide-tapes which are progressively extended over each outcoming sheet as it is being delivered and then rewound and got out of the way preparatory to the delivery of the next succeeding sheet.

8. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of means for utilizing the said sheet-conveyers to deliver the sheets printed side up or printed side down continuously or alternately.

9. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of means for actuating the same back and forth in a right line for the delivery of the sheet printed side up and for swinging them outwardly for the delivery of the sheets printed side down and returning them with their ends reversed in a right line into their sheet-receiving positions.

10. In a printing-press, the combination with a series of sheet-conveyers reversible end for end and provided at their respective ends with complementary convex bearing-faces, bearings coacting with the said faces of the conveyers when the same are being swung outwardly and reversed end for end, and means for operating the conveyers back and forth in a right line for delivering the sheets printed side up and for swinging them outwardly for delivering the sheets printed side down and returning in a right line with their ends reversed to their sheet-receiving positions.

11. A printing-press having a series of sheet-conveyers reversible end for end and each consisting of two corresponding rods and two corresponding heads to which the ends of the rod are attached.

12. A printing-press having a series of sheet-conveyers reversible end for end and each consisting of two corresponding rods and two corresponding heads to which the ends of the rods are attached and the said heads being formed with convex bearing-faces.

13. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of a tug-rod for moving the conveyers out and back in a right line and adapted to have the respective ends of the conveyers coupled with it interchangeably.

14. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of means for moving them out and back in a right line for the delivery of the sheets printed side up, and means passing through the conveyers for swinging them through an arc for the delivery of the sheets printed side down after which the conveyers are returned with ends reversed to their sheet-receiving positions.

15. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of means for moving them out and back in a right line for delivering the sheets printed side up, and means for swinging the conveyers from their sheet-receiving into their sheet-delivering positions for delivering the sheets printed side down after which they are returned in a right line into their sheet-receiving positions, the means for operating the conveyers in a right line being cut out of action when the conveyers are being swung, and vice versa.

16. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of means for moving them out and back in a right line for delivering the sheets printed side up, a rectangular shaft passing through the conveyers, and means for intermittently turning the shaft for swinging the conveyers from their sheet-receiving to their sheet-delivering positions for the delivery of the sheets printed side down, after which reversed end for end they are returned to their sheet-receiving positions.

17. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of a tug-rod adapted to be coupled with their respective ends, and a rectangular shaft passing through the conveyers and rotated to swing them from their sheet-receiving into their sheet-delivering positions, after which they are recoupled with the tug-rod and returned, reversed end for end, into their sheet-receiving positions.

18. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of a rock-shaft, arms carried thereby, links connected with the said arms, a tug-rod reciprocated by the said links, means for in-

terchangeably coupling the ends of the sheet-conveyers with the said tug-rod, whereby they are moved out and back thereby, and means for swinging the said conveyers outward when they are uncoupled from the said tug-rod.

19. In a printing-press, the combination with a series of sheet-conveyers reversible end for end and each provided at each end with a transversely-arranged coupling-pin, of a reciprocating tug-rod for moving the conveyers in a right line, and means carried by the tug-rod for coaction with the coupling-pins of the sheet-conveyers, whereby the same are free to be uncoupled from the tug-rod and reversed end for end, the coupling-pins entering the said means from below and leaving them from above.

20. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of a reciprocating tug-rod for moving the conveyers in a right line, and means for coupling the conveyers at either end with the tug-rod, whereby the conveyers are coupled with the tug-rod for movement in a right line but left free to be disengaged therefrom and reëngaged therewith by a swinging movement.

21. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of a reciprocating tug-rod by means of which the conveyers are moved back and forth in a right line, coupling-pins located in the ends of the conveyers, and coupling-blocks carried by the tug-rod and formed with vertical passages through which the pins may be passed.

22. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of a reciprocating tug-rod for moving the conveyers back and forth in a right line, transversely-arranged coupling-pins mounted in the ends of the conveyers, tug-clips attached to the tug-rod, and coupling-blocks carried by the tug-clips and formed with vertical passages receiving the said coupling-pins.

23. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of a rock-shaft, means for continuously rocking the same, rock-arms located at the end of the said shaft, links connected with the said arms, guide-rod heads sliding thereupon, a tug-rod connected with the said heads and with the said links, whereby the rocking of the shaft operates through the said rock-arms and links to reciprocate the tug-rod, means for connecting the ends of the sheet-conveyers with the tug-rod interchangeably, and means for swinging the conveyers from their sheet-receiving to their sheet-delivering positions during which time they are disconnected from the tug-rod.

24. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of a rectangular shaft passing through them and operated for swinging them from their sheet-receiving to their sheet-delivering positions for delivering the sheets printed side down, a rock-shaft passing through the rectangular shaft, means connected with the said rock-shaft for moving the conveyers back and forth in a right line, and means for coupling the rectangular shaft to the rock-shaft for causing it to turn therewith for swinging the sheet-conveyers as described.

25. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of a rectangular shaft passing through the conveyers which are longitudinally movable on it and which are swung by it from their sheet-receiving to their sheet-delivering positions when it is turned, a rock-shaft passing through the said rectangular shaft, means for continuously rocking the said rock-shaft, and means for coupling the rectangular shaft to the rock-shaft and uncoupling it therefrom, and for holding the former against rotation when not in use for swinging the sheet-conveyers.

26. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of a rectangular shaft passing through the said sheet-conveyers which are movable upon it and which are swung by it, a rock-shaft passing through the rectangular shaft, means for continuously rocking the rock-shaft, coupling mechanism for coupling and uncoupling the said shafts, including two levers, and cams for operating the said coupling mechanism and made adjustable for changing the periodicity of the turning of the rectangular shaft.

27. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of a rectangular shaft passing through the said conveyers which are movable back and forth on it and which are swung by it, a rock-shaft passing through the rectangular shaft, a rock-arm carried by the rock-shaft, a locking-bolt carried by the said arm, a locking-wheel connected with the rectangular shaft and coacting with the said bolt, two two-armed levers having forks for coaction with the bolt and connected together and one of them being adapted to coact with the said wheel for locking the rectangular shaft against rotation, a cam mechanism, and connection between the same and the said levers which are operated thereby for coupling and uncoupling the rock-shaft and the rectangular shaft and holding the latter in its normal position when it is uncoupled from the rock-shaft.

28. In a printing-press, the combination with a series of sheet-conveyers reversible end for end, of a series of guides in which the said conveyers are moved back and forth, a series of guards located at the outer ends of the guides and supporting the sheet-conveyers when they are being moved back and forth and

when they are being reversed end for end, and means for actuating the sheet-conveyers back and forth for delivering the sheets printed side up and for swinging them from their sheet-receiving to their sheet-delivering positions for delivering the sheets printed side down.

29. In a printing-press, the combination with sheet-delivery mechanism, of a delivery-board, jogger-strips movable toward and away from the center of the same, and sheet-intercepting mechanism operated by the movement of the rear jogger-strip for intercepting the sheets within the confines of the jogger-strips as it is delivered over the delivery-board.

30. In a printing-press, the combination with sheet-delivery mechanism, of a delivery-board, jogger-strips located thereupon and movable toward and away from the center thereof, means for delivering the sheets over the delivery-board and between the jogger-strips, and sheet-intercepting mechanism mounted upon the rear jogger-strip and operated by the movement thereof for intercepting the sheets within the confines of the jogger-strips, the said intercepting mechanism comprising fixed lower grippers and oscillating upper grippers.

31. In a printing-press, the combination with sheet-delivery mechanism, of a delivery-board, jogger-strips located thereupon and movable toward and away from the center thereof, a plate adjustably attached to the delivery-board and having a cam-slot, a sheet-intercepting mechanism mounted upon the rear jogger-strip and operated by the movement thereof and comprising a rock-shaft and a rock-arm which latter moves in the cam-path of the said plate.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

WINFIELD S. HUSON.

Witnesses:
FREDERIC C. EARLE,
GEORGE D. SEYMOUR.