

M. DAVIS, Dec'd.

M. J. DAVIS, administratrix.

PRINTING MACHINE.

No. 323,024.

Patented July 28, 1885.

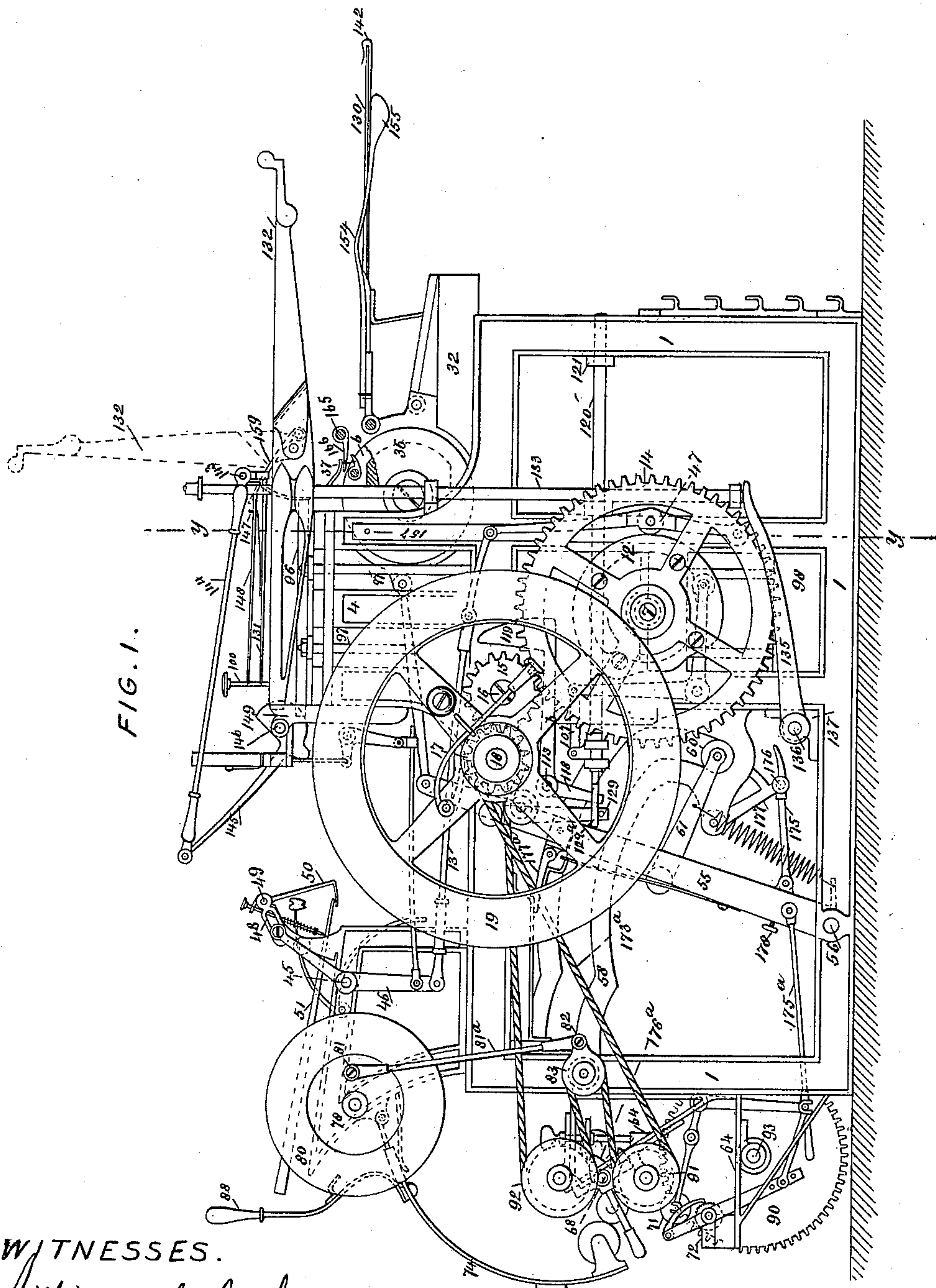


FIG. 1.

WITNESSES.

William H. Kicks  
J. W. Allen

INVENTOR.

Morris Davis by A. Fisking Doane atty

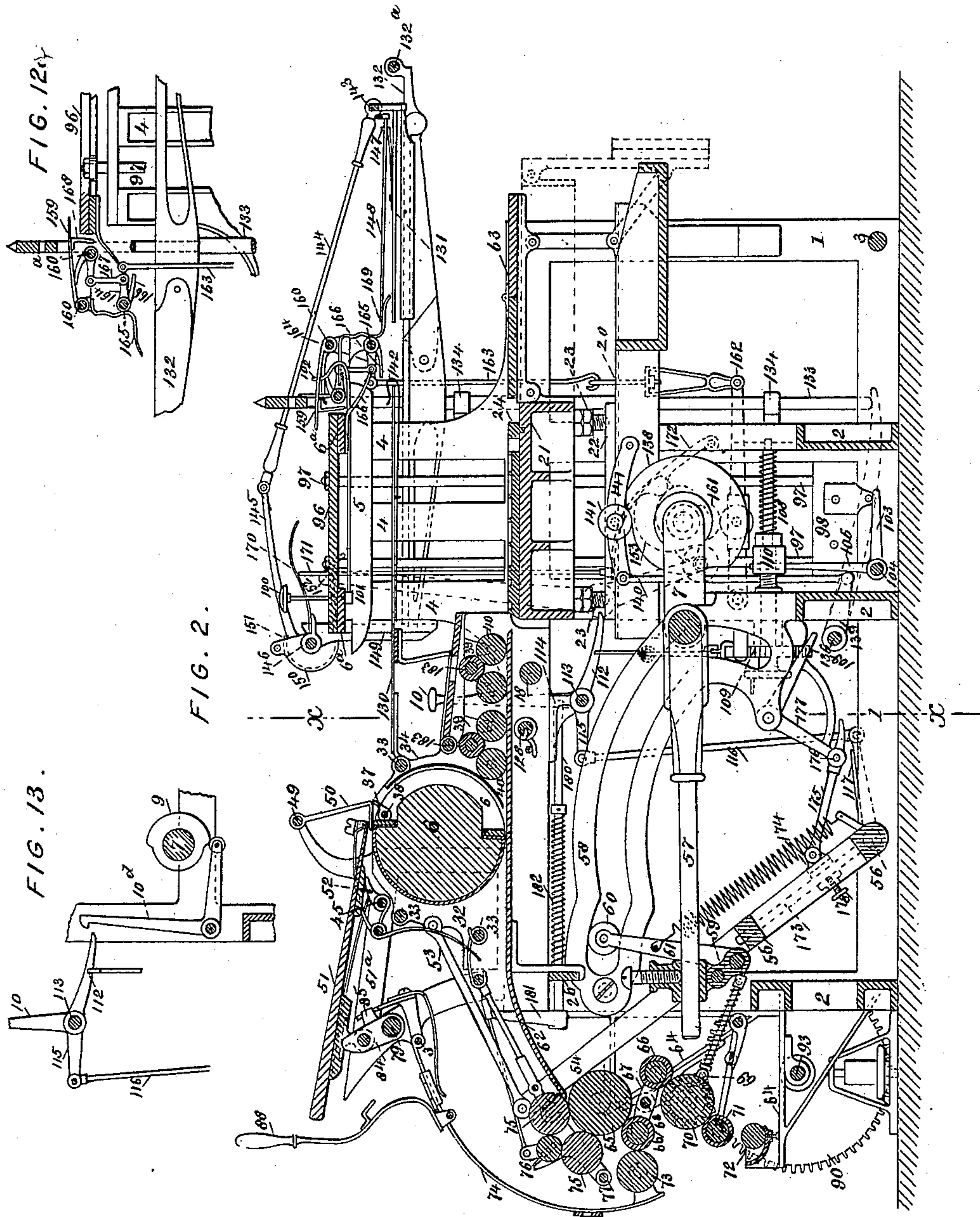
M. DAVIS, Dec'd.

M. J. DAVIS, administratrix.

PRINTING MACHINE.

No. 323,024.

Patented July 28, 1885.



WITNESSES.

William H. Kicks  
J. W. Allen

INVENTOR.

Merwin Davis by A. Sidney Doane atty



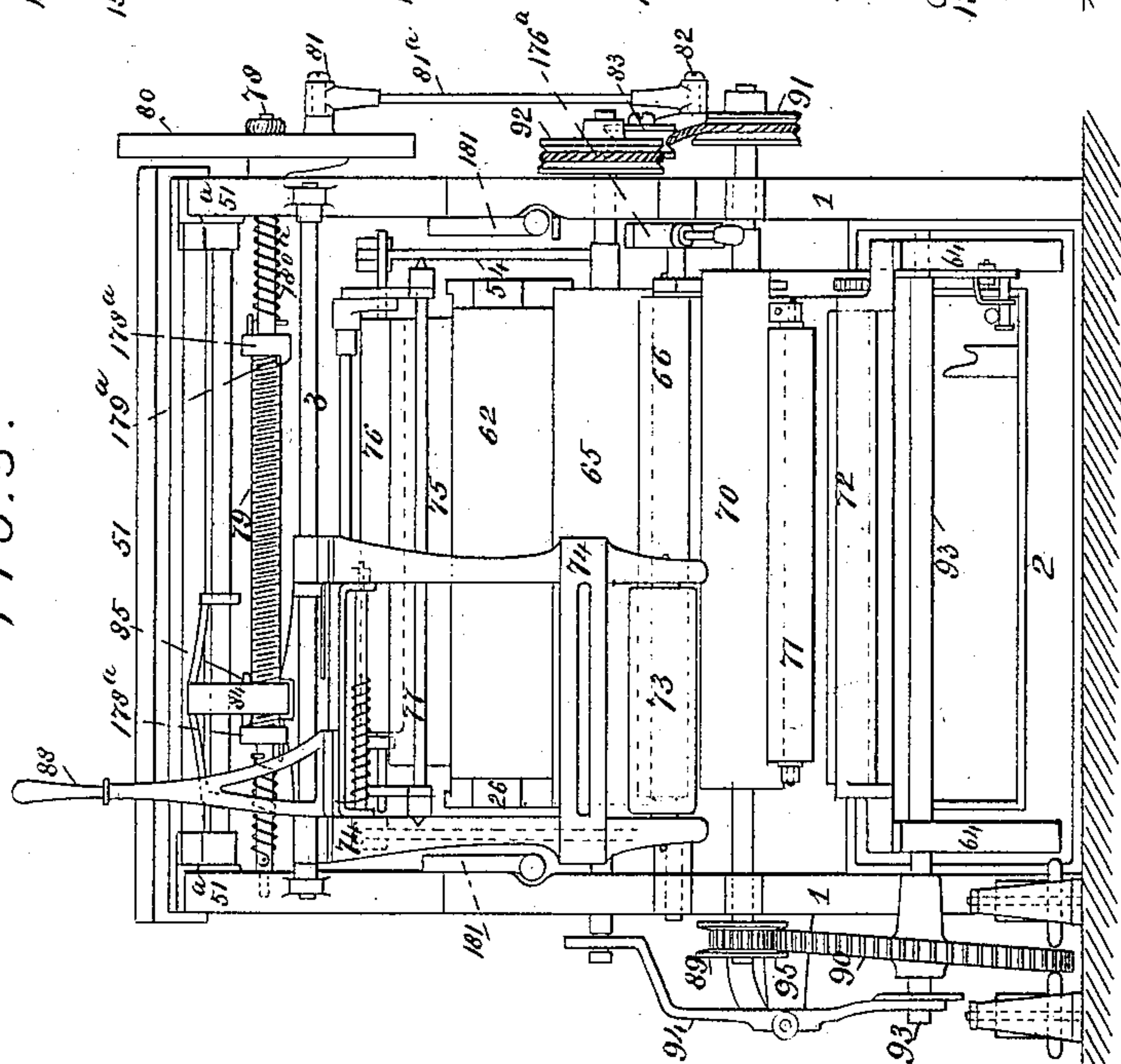
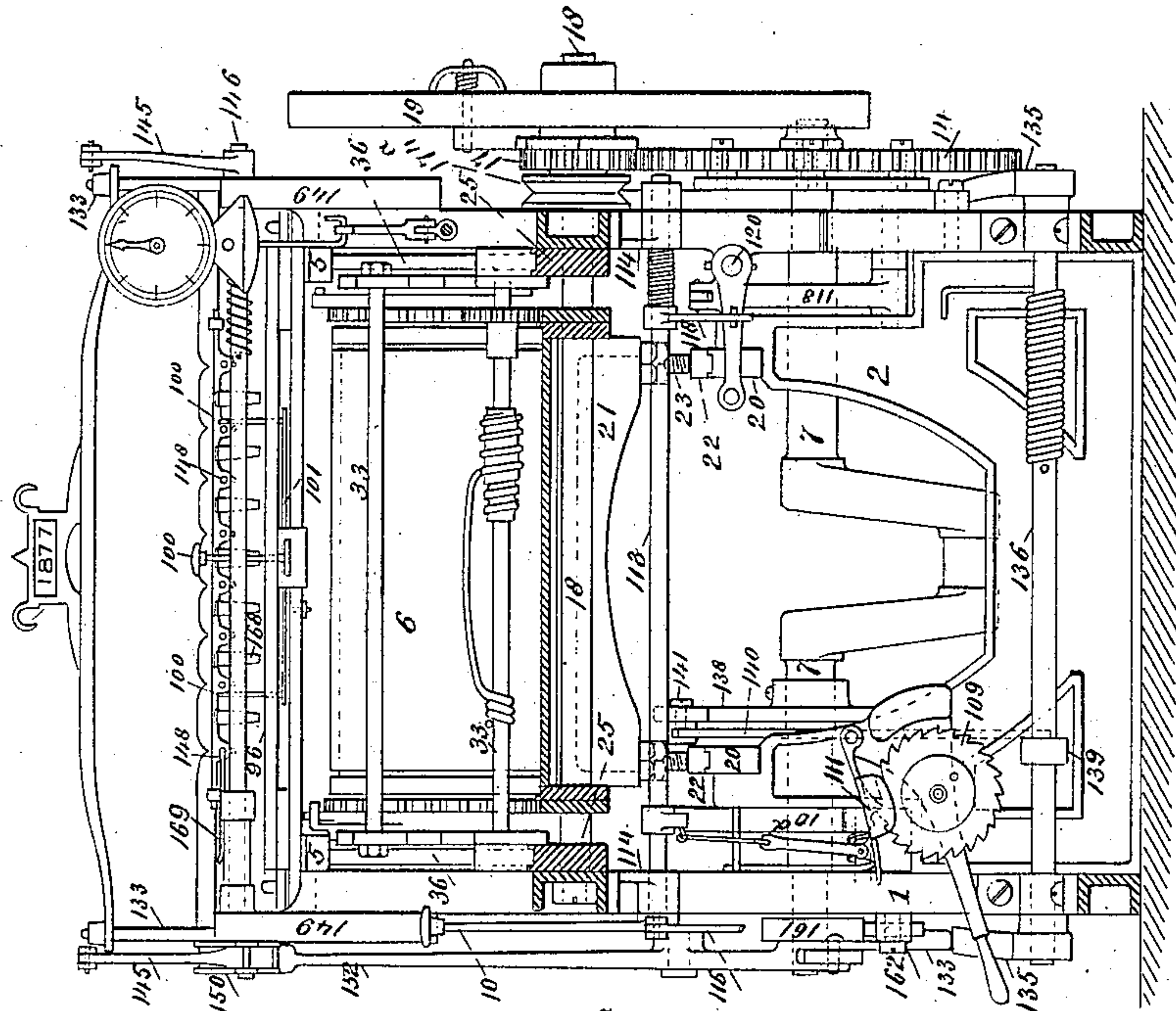
M. DAVIS, Dec'd.

M. J. DAVIS, administratrix.

PRINTING MACHINE.

No. 323,024.

Patented July 28, 1885.



WITNESSES  
William W. Hoicks  
Purnell

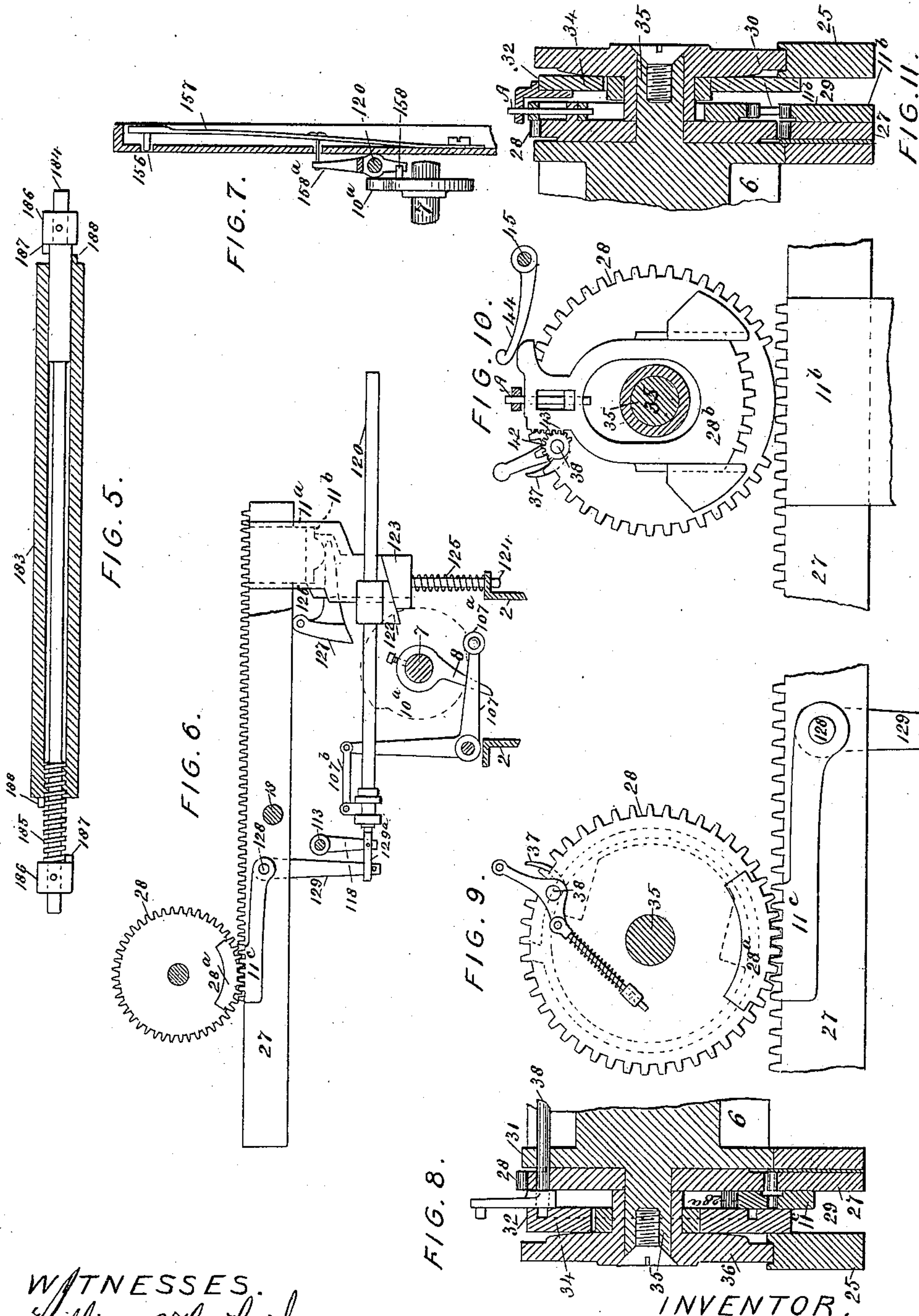
INVENTOR.

Merwin Davis by A. Sidney Bramm atty

M. DAVIS, Dec'd.  
M. J. DAVIS, administratrix.  
PRINTING MACHINE.

No. 323,024.

Patented July 28, 1885.



WITNESSES.  
William H. Hicks  
Gerrard

Inventor.  
Merrin Davis by A. Sidney Doremus atty



# UNITED STATES PATENT OFFICE.

MERWIN DAVIS, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-EIGHTH TO J. W. PECKETT, OF SAME PLACE; MARY JANE DAVIS ADMINISTRATRIX OF SAID MERWIN DAVIS, DECEASED.

## PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 323,024, dated July 28, 1885.

Application filed July 16, 1879.

*To all whom it may concern:*

Be it known that I, MERWIN DAVIS, of Brooklyn, Kings county, New York, have invented, made, and applied to use Improvements in the Construction of Printing-Machines; and I do declare that the following is a full, clear, and correct description of the same, reference being had to the accompanying drawings, making part of this specification, and to the figures and letters of reference marked thereon, in which—

Figure 1 is a side elevation of the machine. Fig. 2 is a vertical longitudinal section through the center of the machine. Fig. 3 is an end elevation showing the inking apparatus. Fig. 4 is a transverse section through the line *x x*, Fig. 2. Fig. 5 is a section of inking-rollers. Fig. 6 is a view of the means employed to lock the counterbalanced segment of a cylinder. Fig. 7 is a vertical section at *y y*, Fig. 1. Fig. 8 is a vertical section of counterbalanced segment of a cylinder, right-hand side. Fig. 9 is an end view of counterbalanced segment of a cylinder, right-hand side, the parts 32 and 36 removed. Fig. 10 is an end view of counterbalanced segment of a cylinder, left-hand side, the parts 32 and 36 removed. Fig. 11 is a vertical section of counterbalanced segment of a cylinder, left-hand side. Fig. 12 is a detached view of the supplemental fingers 159 and 166. Fig. 13 is a detached view of the shaft 113.

In the drawings like parts of the invention are designated by the same figures and letters of reference.

The nature of the present invention consists in improvements in the construction of printing-presses, and will be found to refer more particularly to, first, the means employed to produce an impression; second, the means employed to lock the counterbalanced segment of a cylinder; third, the means employed to unlock the counterbalanced segment of a cylinder; fourth, the means employed to open and close the sheet-taking nippers; fifth, the means employed to give a period of rest to the carriage 32 (supporting the counterbalanced segment of a cylinder) at the termination of each reciprocating movement; sixth, the means em-

ployed to suspend the impression; seventh, the combination, with the cylinders 65 and 70, of a vibrating and wobbling cog-wheel, a flanged pinion and a forked lever; eighth, the alternating rollers with the means for operating them; ninth, the rider, substantially as shown, for the form-rollers; tenth, the sheet-carrier and the means to operate it; eleventh, the combination of a sheet lifter and carrier, and a series of spring-stops; twelfth, the combination of a sheet lifter and carrier and the means to give the same a vertical movement; thirteenth, the combination of the sheet lifter and carrier and the means to give it a horizontal movement; fourteenth, the combination of the sheet lifter and carrier, a series of fingers, and the means to operate them; fifteenth, the combination of a sheet-releasing lever and the means to operate it; sixteenth, the combination of a falling pile-table and the means to support and operate it; seventeenth, the combination of the means to operate the falling pile-table and the means to govern the extent that it shall fall or drop; eighteenth, the combination of a sheet-carrier and a sheet lifter and carrier; nineteenth, the combination of a sheet-carrier, a sheet lifter and carrier, and a falling pile-table; twentieth, the combination of a supplemental rack, 11<sup>a</sup>, and the means to operate it; twenty-first, the combination of the supplemental rack 11<sup>a</sup> and the means to operate it.

To enable those skilled in the arts to make and use my invention, I will describe the construction and operation of the same.

1 are the side frames of the machine, secured together by means of the cross-stays 2 and tie-rods 3, in which the operative parts of the machine are supported. These side frames extend upward in their central parts, as at 4, and form standards. These standards are firmly connected by the cross-bars 6<sup>a</sup>, bolted to the upper ends of the standards. In the angles formed by the intersection of the cross-bars 6<sup>a</sup> with the upper ends of the standards 4, are located the fixed parallel bars 5, rendered unyielding by contact with the undersides of cross-bars 6<sup>a</sup>, to which they are fastened. Underneath these fixed parallel bars the



impressing-wheels 36 of the counterbalanced segment of a cylinder, 6, pass and repass during the reciprocating movements of carriage 32. The function of these bars will be hereinafter described.

7 shows the crank or main shaft of the machine, working in boxes in the side frames, in which it has its bearings, in connection with parts to be hereinafter mentioned.

8 shows a projecting finger secured upon the shaft 7, employed to lock the counterbalanced segment of a cylinder after an impression has been given, and also employed to open the sheet-taking nippers 37, that the printed sheet may be relieved from them.

9 is a surface-cam, secured on shaft 7, (near finger 8,) employed, in connection with bell-crank lever 10<sup>a</sup> and lever 112, to lock throw-off shaft 113, (on the forward movement of carriage 32,) and thus prevent the impressing-segment 6 from revolving or printing.

10<sup>a</sup> is a surface-cam, secured on the right end of shaft 7, employed to operate, through the intersection of bell-crank lever 107, friction-pulley 107<sup>a</sup> and connection 107<sup>b</sup>, the horizontal rod 120, whereby the supplemental racks 11<sup>a</sup> and 11<sup>c</sup> are brought into and out of gear with the right-hand cog wheel, 28<sup>a</sup>, of the impressing-segment 6.

12 is a cam secured upon the shaft 7, employed to close the sheet-taking nippers 37 upon the counterbalanced segment of a cylinder, by and through the upright lever 47, connecting-rod 13, and bell-crank lever 46. Outside of the cam 12, upon the shaft 7, is secured a cog-wheel, 14, gearing into a pinion, 15, supported upon a stud, 16, inserted in the frame, which pinion 15 in turn engages with the pinion 17 upon one end of the fly-wheel shaft 18.

18 shows the fly-wheel shaft, (having its bearings in the frame,) upon one end of which is the pinion 17 and the fly-wheel 19.

20 are the ways upon which the bed 21 of the machine rests. These ways 20 rest at their rear ends upon the cross-stays 2, and at their forward ends upon brackets attached to the side frames 1. The upper portion of these ways are grooved and receive the slides 22, provided with openings properly positioned to receive the lower portions of the impression-screws 23.

21 shows the bed of the press in which the form of types from which the impression is to be taken is secured. This bed is supported by the screws 23, and may be raised or lowered, as occasion requires, by turning them. The upper portion of the bed is provided with a series of openings, 24, the object of which will be hereinafter set forth.

25 are grooved ways, secured upon the inner sides of the frame of the machine and extending its full length. Upon the sides of the grooved ways and in advance of them are fitted the strips 26, supporting the horizontal racks 27, with which the gear-wheels 28 (secured upon the ends of the counterbalanced segment of a cylinder, 6) engage, and to the

inner sides of racks 27 are affixed the ways on which the heads 31 of the impressing-segment roll. A space, 29, is left between the grooved ways 25 and the horizontal racks 27 for the introduction of the supplemental racks 11<sup>a</sup> 11<sup>b</sup> 11<sup>c</sup> 11<sup>d</sup>.

30 shows a guard-ledge, held between the grooved way 25 and the horizontal rack 27, and directly in line with one of the supplemental racks 11<sup>a</sup> 11<sup>b</sup> 11<sup>c</sup> 11<sup>d</sup>.

32 is the frame-work for supporting and carrying the counterbalanced segment of a cylinder, 6, over the form of types secured in the bed 21, while an impression is being given, and during the return movement of the counterbalanced segment of a cylinder after an impression has been given. This consists of the side frames 34, secured together by the tie-rods 33. The side frames are continued in course of manufacture about centrally, so that they rise above their lower portions, and these raised portions are provided with rectangular openings into which are fitted boxes, through which pass the circular bearings 35 of the counterbalanced segment of a cylinder, and upon these bearings are also placed the impression-wheels 36, which run and travel upon the grooved ways 25.

6 represents the counterbalanced segment of a cylinder having upon its ends the circular heads 31, the cog-wheels 28, (with a fraction of their teeth eliminated,) and the journals 35, by which it is held down while giving an impression, and by which it is controlled and moved in the carriage 32.

The shaft 38 (upon which are affixed the sheet-taking nippers 37) has its bearings in the heads 31 of the impressing-segment 6 immediately in front of the forward edge of the segment.

The gear-wheels 28 have, as already stated, several of their teeth cut away, and outside of the cut-away portions of these gear-wheels are placed (on the left side) the supplemental sliding piece 28<sup>b</sup>, and on the opposite side the fixed teeth 28<sup>a</sup>.

The object of using a counterbalanced segment of a cylinder will be fully hereinafter explained.

The lower portion of the frame-work or carriage 32 is slotted, as at 39, to receive the bearings of the rollers 40, intended to ink the form placed in the bed 21, upon the forward and return movements of the counterbalanced segment of a cylinder.

Upon one end of the rod 38, supporting the sheet-taking nippers 37, is secured a semi cog-wheel, 42, which, when the counterbalanced segment of a cylinder is brought into position to receive the sheet of paper to be printed, interlocks with a rack, 43, upon the supplemental sliding piece 28<sup>b</sup>, outside of the gear-wheel 28, operated by finger 44, secured upon shaft 45, upon the opposite end of which is the bell-crank lever 46, the lower end of which is attached to one end of the connection 13, to the opposite end of which connection is at-



5 attached a lever provided with a stud and roller, 47, operated by the cam 12, and thus, by the cam-connection and bell-crank lever, the sheet-taking nippers are closed upon the sheet at the proper time. The upper portion of the bell-crank lever has secured in it a pin playing in the slotted lever 48, secured upon the end of the rod 49, upon which are placed the sheet guides or gages 50, and as the roller 47 engages with the cam 12, the guides or gages 50 are thrown forward and away from the table 51, so as to allow the sheet to be printed to be drawn from it by the sheet-taking nippers 37.

10 51 shows the feed-table of the machine resting upon the standards 51<sup>a</sup>, upon which the sheet to be printed is placed, being laid to or against the guides or gages 50. The front portion of the table rests upon the arms 52, secured upon the rod 45, and as this rod is operated by the bell-crank lever 46, the arms 52 are depressed, the forward portion of the feed-table is dropped, and its front edge brought to the face of the segment, immediately behind the sheet-taking nippers 37.

25 To the rear portion of the frame-work or carriage 32 are attached the forward ends of the connecting-rods 53, the rear ends of which are connected to the upper ends of the oscillating levers 54, secured upon the sides of the frame-work 55, supported upon a rock-shaft, 56, having its bearings in the side frames of the machine, to which frame-work a rocking motion is imparted by the connecting-rod 57, the rear end of which is received within a hinged collar, 59, (secured to the frame-work 55,) and its forward end attached to the crank-pin of the shaft 7.

35 58 shows a slot of three varying curves, (each curve corresponding with a period of rest or motion in the carriage 32 and segment 6,) the forward and rear ends of which are secured to the cross-stays 2. Within this slot 58 plays a roller, 60, supported by a stud secured to the forward end of lever 61, the rear end of which is connected to the hinged piece 59, and by and through the movement of lever 61 (guided by roller 60) a dwell is given to the carriage of the counterbalanced segment of a cylinder immediately before and after the crank passes its centers, thus affording the nippers 37 time to close on the margin of a sheet lying on the feed-table, and after its impression to transfer it to fingers 166.

55 The inking apparatus consists of a partly-curved table, 62, supported between the ways for segment-heads 31, and placed below the feed-table 51, and also of a table, 63, supported in like manner at the opposite end of the machine.

60 To the rear end of the machine, back of and below the partly-curved table 62, are secured the brackets 64, in which are located an upper vibrating cylinder, 65, the alternating rollers 66, (held in the arms 67 upon a shaft, 68, having at its left end the center-passing lever 69, and at its right the E-shaped trip-levers 176<sup>a</sup>) a reciprocating cylinder, 70, a messenger-

roller, 71, and a fountain, 72, also a reciprocating roller, 73, held and carried in a frame-work, 74, moved upon the tie-rod 3, the supply-rollers 75, and a rider-roller, 76, held in the frame-work 77, attached to the rear end of the carriage 32.

75 The form-rollers, or rollers to supply the form with ink, are located in the forward portion of the carriage 32.

78 shows a revolving shaft (having its bearings in the standards 51<sup>a</sup>) provided with a right-handed screw-thread, 79, and having upon its right end (outside of standards 51<sup>a</sup>) a blank-wheel, 80, in which is fixed a stud, 81, over which passes one end of a connection, 81<sup>a</sup>, the opposite end of which is attached to a crank-arm, 82, on a grooved pulley, 83, supported by a stud inserted in the side frame 1. With the right-handed screw-thread 79 (on shaft 78) engages the elongated nut 84, (guided and kept in position by projecting arms passing over the uppermost of the tie-rods in standards 51<sup>a</sup>,) from the inner side of which projects the pin 85. This pin, intercepting a slot in the elastic tongue at the upper part of frame-work 74, carries the frame-work 74, and consequently the roller 73 (located and held therein) from side to side of the press-frames, in accordance with the right or left rotation of the screw-shaft 78. The reciprocating distributing-cylinder 70 has the shaft supporting it provided at its left end (outside of brackets 64) with a flanged pinion, 89, engaging with a vibrating and wobbling cog wheel, 90, and upon its opposite end (outside of brackets 64) a scored pulley, 91. The distributing-cylinder 65 has upon its right end a scored pulley, 92. The vibrating cog-wheel 90 is supported upon a shaft, 93, having its bearings in boxes attached to the brackets 64.

95 is a side piece secured to the left side of frame 1, and supporting a vibrating lever, 94, the forked portions of which pass over the grooved left ends of the vibrating cog-wheel shaft 93 and the vibrating cylinder-shaft 65.

96 shows the table for the reception of the printed sheets, supported upon the columnar rods 97, running through the ribs of side frames 1 and secured in the yokes 98, at the bottom of the side frames. This table is slotted, through which slots project the pins 100, supported upon the rear end of a reciprocating frame-work, 101, (lying underneath the pile-table,) the forward end of which is bent upward, as at 102, so that it may be pushed back by a pin on the underside of secondary sheet-carrier 131. From the sides of the yokes 98 project studs, resting upon levers 103, secured upon the rock-shaft 104, having its bearings in the side frames 1. Upon one side of this rock-shaft 104 is secured a vertical lever, 106, having at its upper end an eye, which passes over the threaded shaft 108, (supported in the cross-stays 2,) upon the rear end of which is keyed a ratchet-wheel, 109, while directly behind the eye of the lever 106 is placed a nut, 110.



111 represents the pawl by which the ratchet-wheel is operated. This pawl is connected by a chain or link to the lever 112, attached to the "throw-off" shaft 113.

5 113 is the throw-off shaft of the machine, having its bearings in the boxes 114, attached to the frames 1. Upon one end of the shaft 113 is the bell-crank lever 115, connected by the rod 116 to the pedal 117, so that either the  
10 hand or foot of the operator may be used to suspend the impression. Upon the opposite end of the shaft 113 are secured the lever 118 and the toe-shaped lever 119, slotted at its upper end, so that when it is elevated the slotted  
15 portion shall embrace the connecting-rod 13 and intercept a stop affixed thereto, thus preventing the closing of the sheet-taking nippers 37. While the lever 118 is vibrated by the movement of the shaft 113, it presses  
20 against the rear end of rod 120 (held in the boxes 121 upon the side frame 1) and moves the same forward, so that the block 122, (provided with an inclined face upon its under side,) operating against the inclined face on  
25 the upper side of block 123, (secured upon one of the supplemental racks, 11<sup>a</sup>,) forces supplemental rack 11<sup>a</sup> downward and out of gear with the cog-wheel of the impressing segment. The supplemental racks 11<sup>a</sup> 11<sup>b</sup> 11<sup>c</sup> 11<sup>d</sup> are employed  
30 to throw the counterbalanced segment of a cylinder into gear while printing a sheet on its forward movement, and out of gear after a sheet has been printed and while it is making its retrograde movement. Two of these  
35 supplemental racks, 11<sup>a</sup> 11<sup>b</sup>, are provided with spindles 124, over which are passed helical springs 125, and one of them, 11<sup>a</sup>, is provided with the block 123, as described above. These racks are inserted in openings at the inner  
40 sides of the main racks 27. The supplemental rack 11<sup>b</sup> is provided with a projecting block, 126, tripped by an L-shaped lever, 127, operated by a finger, 8, upon the shaft 7, so that, as the finger 8 is brought into contact with the  
45 L-shaped lever 127, the rack 11<sup>b</sup> is thrown up, the sheet-taking nippers 37 are opened, and the counterbalanced segment of a cylinder is locked for its return movement. A third supplemental rack, 11<sup>c</sup>, directly in line with rack  
50 11<sup>a</sup>, is lever-shaped and affixed to the right end of shaft 128, passing through the continuous rack 27. From shaft 128 projects a vertical lever, 129, connected by a link, 129<sup>a</sup>, to the lever 118, on throw-off shaft 113, by  
55 which the rack 11<sup>c</sup> is depressed, as occasion requires.

Directly in front of the counterbalanced segment of a cylinder, and hinged to a cross-tie at the forward end of carriage 32, is the horizontal sheet-carrier 130, composed of a series  
60 of strips of wood or metal, with spaces between them, by which the printed sheet is taken from the supplemental fingers 166 and transferred to the sheet lifter and carrier 131.

65 Upon the forward ends of the strips of sheet-carrier 130 are secured the spring-clamps 142, to be hereinafter more fully described.

The hinged slides 132 (connected at their forward ends by a rod, 132<sup>a</sup>, and nuts) are supported near their centers upon the upright  
70 rods 133, (passed through boxes 134, secured upon the side frames 1,) which are elevated and depressed by the levers 135, pinned at their rear ends upon the shaft 136, having its bearings in boxes 137, secured upon the side  
75 frames.

The shaft 136 is operated by lever 139, (passing through cross-stay 2,) upright connecting-rod 140, lever with friction-pulley 141, and cam 138 on crank-shaft 7. The rear ends of  
80 the hinged slides 132 move in the upright grooved ways 149, secured upon the rear of standards 4.

The sheet lifter and carrier 131 is composed of a series of strips of wood or metal, (with  
85 spaces between them,) secured upon a base-bar, 143, with studs at each end, over which studs pass the rear ends of connecting-rods 144, whose forward ends are pinned to the free ends of curved levers 145, secured upon  
90 the rod 146. Placed upon these strips, as judgment may dictate, are the spring-stops 147, which stop and hold the margin of the printed sheet.

Over the sheet lifter and carrier 131 is placed  
95 a sheet-holder, 148, (somewhat similar in construction to 131,) and hinged upon the base bar 143.

Upon one end of the rod 146 is secured a semicircular flanged pulley, 150, to which one  
100 end of a strap, 151, is attached, the opposite end of which is secured in the slotted upper end of lever 152, which has its fulcrum upon a stud secured in the side frame 1, and at its lower end a stud and roller actuated by cam  
105 153, secured upon the left outer end of the crank-shaft 7.

Upon one side of the sheet-carrier 130 is attached a prong, 154, with a curved projection, 155, upon its under side, the office of which  
110 is to raise the forward end of the sheet-carrier and enable the spring-clamps 142 to grasp the forward margin of the printed sheet as it is held in supplemental fingers 166. This lifting of the end of the sheet-carrier is accomplished by the intervention of a pin, 156,  
115 projecting from the upper end strip, 157, which strip is operated through lever 158<sup>a</sup>, having its fulcrum on rod 120, (see detail drawing, Fig. 7,) by the supplemental cam 158, secured upon the outer side of cam 10<sup>a</sup>, thus  
120 forcing the pin 156 through an opening in the upper end of the standard to engage with the underside of curved projection 155, and cause the forward end of 130 to rise.

Fingers 159 are a series of prongs and stops secured upon the rod 160, which has its bearings in side pieces affixed to the impressing-bars 5. The rod 160 is vibrated through a lever on rod 160<sup>a</sup>, by the link 167, which has  
130 its lower end attached to a stud on arm 164. (See detailed drawing Fig. 12.)

To the fingers 159 are secured (beneath the back of their forward ends) the stops 168,



which intercept, at the right moment, the forward edge of the printed sheet, and cause it to pass from the sheet-carrier 131 and fall upon the pile-table 96.

5 Upon the rod 165 are a series of fingers, 166, whose upper or supplemental parts are permanently fastened to forward cross-bar of the standards 4. The function of these fingers is to seize the forward margin of a sheet, 10 immediately after it is printed, and hold it during the retrograde withdrawal of the impressing-segment 6, and until it is transferred to the primary sheet-carrier 130, ready for retransference to the secondary sheet lifter 15 and carrier 131.

Upon the left side of the sheet-holder 148 is located the right-angled prong 169, which, actuated by the tongue 170, (hinged to the left side of the rod 146,) rises at the proper 20 time and releases the margin of the sheet from the spring-stops 147. The tongue 170 is operated by the vertical rod 171, the lever 172, and the cam 161. The bed 21 is securely held, during the operation of printing, by a 25 set-screw passing through the left side frame of the press.

173 is a rod secured in the frame-work 55 of the oscillating levers 54, and over this rod is passed a sliding box, 174, to the forward 30 end of which is hinged the rear end of a hooked lever, 175, the hooked end of which is passed over a pin, 176, secured in a bell-crank lever, 177, vibrating upon a stud affixed to the outer side of the slot of three varying 35 curves. The sliding box 174 is held in position upon the rod 173 by a thumb-screw, 178, and as the box 174 is raised or lowered upon the rod 173 the hooked lever 175 will increase or decrease the movement of the bell-crank 40 lever 177, and as this lever controls the movement of the pawl 111 (by which the speed of the ratchet-wheel 109 is governed) the movement of the ratchet-wheel 109 will be increased as the box 174 is raised upon the rod 173, or 45 in like manner decreased when the box 174 is fixed at a lower point on the rod 173, thus allowing the pile-table 96 to accommodate itself to variations in the thickness of the sheets placed upon it.

50 Below the grooved ways 25 are placed the rods 180, with spiral springs 182 wound over them and right-angled projections 181 at their rear, against which the rear ends of the carriage 32 impinge. The function of these rods 55 is to overcome the momentum of carriage 32 on its backward movement, and also to neutralize any looseness of joints or "backlash" in the gearing of the machine.

Such being the construction of the improved 60 machine, its operation may be thus set forth. I will speak first of the means employed to distribute the ink. The fountain being supplied with ink, the messenger-roller placed in position, the "alternators" secured in the 65 frame supporting them, the reciprocating roller inserted in its frame-work, the supply-rollers and their rider positioned in their

frame-work, and the form-rollers located in the forward portion of the carriage 32, motion is communicated to the driving-shaft 7, 70 which sets all parts in the inking apparatus in motion.

I prefer to describe the operation of the machine while it is "breaking up" and distributing the ink preliminary to the placing 75 of the form upon the bed of the press. As the fly-wheel shaft revolves, a rotary motion is communicated through the belt 173<sup>a</sup>, passed over the scored pulley 174<sup>a</sup> upon the shaft 18, and also over the grooved pulleys 91 and 92 80 to the cylinders 70 and 65, and as the cylinder 70 revolves the flanged pinion 89 engages with the vibrating cog-wheel 90 and operates the forked lever 94, by which one of the cylinders is caused to vibrate from the right to the left, 85 while the other vibrates from the left to the right, and so on, and vice versa. The messenger-roller 71 is raised and depressed from and to the "duct-roller" of the fountain 72 by means of a connecting-rod, 175<sup>a</sup>, the forward 90 end of which is attached to the lower part of one of the levers 54, and thus the reciprocating cylinder 70 is supplied with ink from the fountain 72. Between the cylinders 65 and 70 are the alternating rollers 66, 95 held in the double arms 67 upon the shaft 68, the office of which alternating rollers is to assist in the distribution of the ink by bearing alternately upon the cylinders 65 and 70. This alternate movement of the roller 66 is 100 effected by means of an E-shaped lever, 176<sup>a</sup>, secured upon the right end of shaft 68, and operated by a vibrating finger, 177<sup>a</sup>, attached to one of the levers 54. By the movement of the alternating rollers from one cylinder to the 105 other the ink (partially broken up by the lower cylinder, 70,) is supplied to the upper cylinder, 65. The reciprocating roller 73, held and carried in the frame-work 74, is always in contact with the outside alternating 110 roller, and, by its movement from end to end of the alternating roller, assists in breaking up and blending the ink received by the upper vibrating distributing cylinder, 65. In the meantime the inner alternating roller is performing a similar office in giving distributed 115 ink to the upper vibrating-cylinder, 65, which in turn gives its distributed ink to the supply-rollers 75. The to-and-fro movement of the blending-roller 73 is effected by the screw-bearing shaft 78, operated through a blank fly-wheel, 80, by the connecting-rod 81<sup>a</sup>, attached 120 (at its lower end) to the grooved pulley 83. Upon the screw-shaft 78, at each end of the right-handed screw, are the collars 178<sup>a</sup>, having 125 upon their inner side the pins or projections 179<sup>a</sup>. Back of these collars are placed the helical spring 180<sup>a</sup>, the ends of which are attached to the collars and to the shaft 78. As the shaft revolves, to the right or to the left, 130 the right-hand screw, 79, engages with the elongated nut 84, and thus the frame-work 74 is carried, together with the roller 73, from one end of the outer alternating roller to the



other. A projection, 85, upon either side of nut 84 engages with the catches 179<sup>a</sup> upon the spring-collars 178<sup>a</sup>, when, by the resistance offered by the springs 180<sup>a</sup> to the further rotation of the shaft, the crank of the blank-wheel 80 is thrown off its center, and the reciprocating roller, through the counter revolution of the screw-shaft 78, is returned to the opposite side of the machine, where the same operation is repeated, and thus the roller travels from one end of the outer alternating roller to the other. The handle 88 is hinged upon the frame-work 74, and is employed by the operator (at his discretion) to shift the blending-roller 73 to any position upon the outer alternating roller that may be desirable. The supply-rollers 75 and the rider-roller 76 receive the broken-up ink from the distributing-cylinder 65, and supply the same to and upon the partly-curved table 62, from which it is received by the form-rollers 30, and by them applied to the form (when it is placed on the bed) and to the forward distributing table, 63. When the rollers 40 are inking the form placed in the bed of the machine, they are brought successively upon and over the forward distributing-table, 63, and the partially-curved table 62, at the rear end of the machine. The form-rollers have the reciprocating rider-rollers 183 placed over them. The reciprocating rider-rollers 183 consist each of a hollow metal cylinder, passed over a spindle, 184, having at one end a spiral thread, 185, by which a vibratory movement is given to the roller, through the form-rollers 40, at each reciprocating movement of the carriage 32. Upon each end of the spindle 184 are placed the collars 186, from which project the pins or catches 187. The rider-roller 183 has at each end of its head a pin or projection, 188, which, when the roller 183 (from any cause whatsoever) attempts to exceed the limits of its vibration, interlocks with the pin or projection upon the collars 186, and makes it act, at the required time, as if it were immovable upon its spindle, thus preventing any excess in its vibratory movement. It is intended that a rotary motion shall be given to the reciprocating rider-rollers by contact with the form-rollers, and if from any cause the tendency of the roller 183 is to run unduly to one side the interlocking of the pins or projections on the roller with the projections on the collars prevents its further reciprocation, so that the axle and roller simply revolve together without vibration until the motion of the press is reversed. The ink, through the operation of the parts above described, having been thoroughly distributed, the form from which the impression is to be taken may now be placed and secured upon the bed of the machine. The bed is now drawn to the front of the machine over the grooved ways 20, and the form is placed on the same, and, if the form be a small one, or one not occupying the full width of the bed, to economize the use of furniture in locking up the form, a flat bar of

metal may be employed, provided with a pin at each end, on its under side, fitting into circular openings at each side of the bed, and lying in a slightly-diagonal line, so that with ordinary quoins the form can easily be "locked up." The bed is then pushed back upon the grooved ways, so that it occupies the proper position for an impression to be taken, and is secured in this position by means of a set-screw passing through the side frame of the press.

The counterbalanced segment of a cylinder having been provided with a tympan-sheet, and the form "made ready," the operation of printing is as follows: The sheet to be printed is laid upon the feed-table 51, its front edge against the sheet-guides 50, and the counterbalanced segment of a cylinder is brought into the proper position to allow the sheet-taking nippers 37 to grasp the sheet to be printed from the feed-table 51. At this point the fixed supplemental teeth on the side of the cog-wheel 28<sup>a</sup> (on the right-hand side of the press) are brought in gear with the vibrating lever-shaped supplemental rack 11<sup>c</sup>, and the machine being set in motion, as in the case of the ink distribution, the sheet-guides 50 are thrown up and away from the forward margin of the sheet, the forward edge of the feed-table 51 is depressed to the face of the impressing-segment 6, the nippers 37 close on the margin of the sheet, and the impressing-segment is unlocked and free to revolve on its forward movement. The counterbalanced segment of a cylinder, 6, is unlocked, (and made free to revolve in the carriage 32) by the finger 44 engaging with and depressing the supplemental sliding piece 28<sup>b</sup>, (whose slides are affixed to the side of the left cog-wheel, 28,) upon the upper end of which is a pin, A. The counterbalanced segment of a cylinder, 6, supported in the carriage 32, operated by the vibrating levers 54 through the crank-shaft 7, connecting-rod 57, and connections 53, now commences to revolve through the engagement of the cog-wheels 28 with the continuous racks 27. The nippers 37, having already been closed upon the sheet, through the agency of semi cog-wheel 42, rack 43, and finger 44, (operated by shaft 45,) connection 13, bell-crank lever 46, upright lever 47, and cam 12, the impressing-segment 6 in making one-half of a revolution presents the forward part of the sheet to be printed to the front edge of the form, and, in completing its revolution, prints the whole surface of the sheet, and brings its front margin within the grasp of the supplemental fingers 166, which now close upon it and hold it for transference to sheet-carrier 130. The form-rollers 40, (placed in the forward portion of the carriage 32,) during this forward movement of the counterbalanced segment of a cylinder, have passed completely over the form in advance, inked it, and now rest upon the table 63. During the forward movement of the counterbalanced segment of a cylinder the impressing-wheels



36 (placed upon the circular bearings 35) have passed under the impression-bars 5, thus holding the impressing-segment in unyielding contact with the form. At this point the counterbalanced impressing-segment 6 having completed a full revolution its forward movement ceases. The finger 8, upon the shaft 7, now operates the L-shaped lever 127, and through the block 126, upon the supplemental rack 11<sup>b</sup>, elevates this rack, which, engaging with the teeth at the lower end of the supplemental sliding piece, (at left side of cog-wheel 28,) elevates this sliding piece, and forces the pin A (at its upper end) through an opening in a projecting cap upon the side of the carriage 32, and thus the counterbalanced segment of a cylinder is locked and rendered immovable within the carriage 32. As the sliding piece 28<sup>b</sup> (upon the upper end of which the pin A is placed) is thrown up, the rack 43, which forms a part of it, engages with the semi cog-wheel 42, and thus the sheet-taking nippers 37 are opened. The supplemental fingers 166 having been opened through arm 164, operated by connecting-rod 163, and lever 162, actuated by cam 161, are now closed (through the same mechanical devices) upon the margin of the printed sheet, and as the carriage 32, in which the counterbalanced impressing-segment is now locked, commences and continues its retrograde movement, the printed sheet is gradually withdrawn (printed side up) from the impressing-segment and deposited upon the sheet-carrier 130. The sheet-carrier 130, hinged to the forward end of the carriage 32, having been through the retrograde movement of the carriage 32, brought under the printed sheet, and the clamps 142, at forward end of carrier 130, having been raised by means of the prong 154, projection 155, spring-strip 157, pin 156, lever 158<sup>a</sup>, and cam 158 to a line with the supplemental fingers 166, the clamps 142 embrace the margin of the printed sheet, the supplemental fingers 166 are instantly opened, as fully heretofore described, and the carrier 130 then drops, through the retraction of the pin 156, to a horizontal line, releasing the printed sheet from the supplemental fingers 166, and bearing it upon its prongs or slats. At this moment the carriage 32 and also the counterbalanced segment of a cylinder have returned to their proper position to allow a second blank sheet to be taken from the feed-table 51, which sheet is received upon the impressing-segment precisely as the first one was, and the impressing-segment is unlocked, as already described, and its second forward movement commences. The sheet-carrier 130, attached to the forward end of carriage 32, with the first printed sheet lying upon it, (printed side up) is brought, during the second forward movement of the carriage and impressing-segment, immediately over the sheet lifter and carrier 131, the strips or prongs of which are narrower in width than the interstices between the prongs of the upper sheet-carrier, 130, so that the prongs of

each carrier may freely pass each other without contact at their sides. Immediately before the completion of the forward movement of the sheet-carrier 130 the front edge of the sheet lying upon it is brought against the spring-stops 147, by which it is released from the clamps 142. The sheet lifter and carrier 131 is now raised vertically by the ways 132, (attached to the rods 133,) levers 135 and 139, connecting-rod 140, lever 141, and cam 138, and as it rises lifts the printed sheet from the carrier 130, the sheet-holder 148 immediately impinging upon the spring-stops 147 and holding the sheet securely in position upon the carrier and lifter 131. It is now carried in a horizontal line by the action of connecting-rods 144, curved levers 145, flanged pulley 150, lever 152, strap 151, and cam 153 to and immediately above the pile table 96, and this motion continues until the rear end of the sheet almost touches the pins 100 passed through the slots of the pile-table 96. The sheet lifter and carrier 131 having completed its forward movement now commences its return movement; but before it has brought the forward margin of the sheet, inclosed and held between its upper and lower parts, against the stops or guides of fingers 159, the lifting-tongue 170, (impelled by the upright rod 171,) lever 172, and cam 161, impinges against the under side of the right-angled arm 169 and raises the arms or prongs of sheet-holder 148, so that they do not touch the spring stops or guides 147, thus releasing the forward margin of the sheet and allowing sheet carrier 131 to withdraw from it and leave it upon the pile-table 96, its front edge controlled by the stop and pressure fingers 159, and its rear edge by the upright prongs 100 held and reciprocated by the slide 101. During the forward and back, rising and falling movement of the duplex sheet lifter and carrier 131, the counterbalanced impressing-segment 6 has completed its second forward revolution, printed the sheet upon its surface, and delivered its forward margin into the supplemental fingers 166, and has then returned (locked) to its original position under the forward edge of the feed-table 51, ready to take the third and all succeeding sheets and print and deliver them to the supplemental fingers 166, precisely as heretofore described.

To facilitate the piling of the sheets the pile-table 96 is caused to drop a certain distance as each printed sheet is placed upon it, the distance it shall drop being governed by the thickness of the sheet to be printed. The mechanical devices employed (in connection with the pile-table) to effect this result have already been referred to, as has, also, in a great measure, their operation. They consist of the ratchet-wheel 109, the pawl 111, the screw-shaft 108, as well as the means by which (at the discretion of the operator) the speed of the ratchet-wheel 109 is increased or decreased, so as to govern the fall of the pile-table 96. As a result of this arrangement, when the last



sheet has been piled (the table meanwhile having dropped, at each impression, only the thickness of one sheet) it occupies the same relative position to the prongs of the sheet-lifter and carrier 131 as did the first printed sheet.

To ink the form more than once, or to distribute the ink before printing, or to suspend the operation of the nippers, (in case of mis-feed upon the feed-table,) the throw-off mechanism of the press is employed. This is so constructed that either the hand or foot of the operator may be made available to operate it. When either of these is employed, the toe-shaped lever 119 is elevated and intercepts a collar on the connecting-rod 13, thus preventing it from operating bell-crank lever 46, and, through it, the shaft 45 and finger 44, and allowing the impressing-segment 6 to make its forward movement without revolving, at the discretion of the operator. The guard-ledge 30, in line with the supplemental rack 11<sup>b</sup>, guarantees the locking of the counterbalanced segment of a cylinder on its return movement, as it prevents the pin A from leaving its position in the projecting cap on carriage 32. The dwell of the counterbalanced segment of a cylinder at each end of the carriage movement is effected by the slot of three varying curves, and occurs when the impressing-segment is in position to receive a sheet from the feed-table 51, and also when the sheet-taking nippers 37 are transferring the printed sheet to the supplemental fingers 166. The impressing-segment is counterbalanced because the periphery of its impressing part is of greater radius than the other half, and it is desirable that the part of smallest radius shall equal in weight, or counterbalance, the larger side of it; in other words, to make the segment revolve as if it were a perfect cylinder of equal density throughout.

Having specified the component parts of my invention, I shall now designate what I claim as new and useful, and desire to secure by Letters Patent—

1. The combination of a bed, 21, a carriage, 32, to which a reciprocating movement (with a dwell at its termination) is imparted by a modification of the crank movement, and a counterbalanced segment of a cylinder, 6, located in said carriage, which is free to revolve on its forward movement, but not on its return movement, being locked, substantially as shown, the same constructed and operating substantially as hereinbefore described.

2. The combination, with the counterbalanced segment of a cylinder, 6, and carriage 32, of the supplemental rack 11<sup>b</sup>, the L-shaped lever 127, the finger 8 on shaft 7, the supplemental sliding piece 28<sup>b</sup>, Fig. 10, and the pin A, combined and operating substantially as hereinbefore described.

3. The combination, with the counterbalanced segment of a cylinder, 6, and carriage 32, of the supplemental sliding piece 28<sup>b</sup>, (see Fig. 10,) the finger 44 attached to shaft 45,

the bell-crank lever 46, connecting-rod 13, upright lever 47, and cam 12 on crank-shaft 7, the same constructed and operating substantially as hereinbefore specified.

4. The combination, with the sheet-taking nippers 37, of the rod 38, the semi cog-wheel 42, the rack 43, the finger 44, the shaft 45, the bell-crank lever 46, connection 13, upright lever (with stud and roller) 47, and cam 12, combined and operating substantially as and for the purpose specified.

5. The combination of the sheet-taking nippers 37, of rod 38, the semi cog-wheel 42, rack 43, sliding piece 28<sup>b</sup>, supplemental rack 11<sup>b</sup>, L-shaped lever 127, and the finger 8 on shaft 7, constructed and operating substantially as specified.

6. The combination of the frame provided with the curved slot 58, roller 60, lever 61, hinged support 59, frame-work 55, connecting-rod 57, and crank shaft 7, constructed and operating substantially as described, for the purpose of giving a period of rest to the carriage 32 at the termination of either reciprocating movement.

7. The combination of the counterbalanced segment of a cylinder, the throw-off shaft 113, operated by the hand-lever 115 or pedal 117, the toe-shaped lever 119, lever 118, shaft 128, link 129<sup>a</sup>, lever 129, and connecting-rod 13, the same combined and operating substantially as described.

8. The alternating rollers 66, supported by the double arms 67 on shaft 68, in combination with the E-shaped lever or trip 176<sup>a</sup>, the spring finger or pawl 177<sup>a</sup>, oscillating lever 54, and the center-passing lever (with spiral spring) 69, combined and operating substantially as and for the purpose set forth.

9. The vibrating roller 73, frame-work 74, right-handed screw 79, shaft 78, collars 178<sup>a</sup>, projections 179<sup>a</sup>, spiral springs 180<sup>a</sup>, blank-wheel 80, connecting-rod 81<sup>a</sup>, crank-pin 82, elongated nut 84, pin 85, and grooved pulley 83, substantially as and for the purpose set forth.

10. The rider for the form-rollers 40, in combination with the spindle 184, spiral thread 185, collars 186, and pins or projections 187 and 188, operating substantially as and for the purpose set forth.

11. The combination, with the sheet-carrier 130, of the prong 154, (with curved projection 155,) the pin 156, strip 157, and cam 158, operating a lever, 158<sup>a</sup>, for the purpose of raising the forward end of the sheet-carrier 130, operating substantially as set forth.

12. The sheet lifter and carrier 131, composed of a series of strips of wood or metal secured upon a bar, 143, and provided with the spring-stops 147, operating substantially as and for the purpose set forth.

13. The combination, with the sheet lifter and carrier 131, of the hinged ways 132, rods 133, levers 135, shaft 136, cam 138, lever 139, connecting-rod 140, and lever 141, for the purpose of giving a vertical movement to the sheet



lifter and carrier 131, operating substantially as and for the purpose set forth.

14. The combination, with the sheet lifter and carrier 131, of the hinged ways 132, vertical rods 133, connecting-rods 144, curved levers 145, shaft 146, flanged half-pulley 150, strap 151, lever 152, and cam 153, for the purpose of giving a horizontal movement to sheet lifter and carrier 131, operating substantially as and for the purpose set forth.

15. The combination, with sheet lifter and carrier 131, of the fingers 159, (held upon the rod 160,) the cam 161, lever 162, arm 164, rod 165, connecting-rod 163, lever on rod 160<sup>a</sup>, and link 167, operating substantially as set forth.

16. The combination of the sheet-releasing lever 169, the tongue 170 upon the shaft 146, the carrier 131, the lever 172, upright rod 171, and cam 161, operating substantially as and for the purpose described.

17. The combination of the vertical standards 97, the yokes 98, levers 103, rock-shaft 104, and lever 106, with the threaded shaft 108, ratchet-wheel 109, and nut 110, substantially as and for the purpose described.

18. The combination of the ratchet-wheel 109, shaft 108, pawl 111, rod 173, sliding box 174, hooked lever 175, pin 176, bell-crank lever 177, and thumb-screw 178, substantially as and for the purpose described.

19. The combination, with the sheet-carrier 130, of the sheet lifter and carrier 131, substantially as and for the purpose described.

20. The combination, with the sheet lifter and carrier 131, and falling pile-board 96, of the sheet-releasing lever 169, substantially as and for the purpose described.

21. The combination, with the supplemental rack 11<sup>a</sup>, of the inclined block 123, the inclined block 122, rod 120, lever 118, and shaft 113, substantially as and for the purpose described.

22. The combination, with the supplemental rack 11<sup>c</sup>, of the shaft 128, lever 129, link 129<sup>a</sup>, lever 118, and throw-off shaft 113, substantially as and for the purpose described.

MERWIN DAVIS.

Witnesses:

A. SIDNEY DOANE,

WILLIAM V. H. HICKS.