(No Model.) 4 Sheets—Sheet 1.

J. T. HAWKINS.

OSCILLATING CYLINDER PRINTING PRESS.

No. 423,052. Patented Mar. 11, 1890.

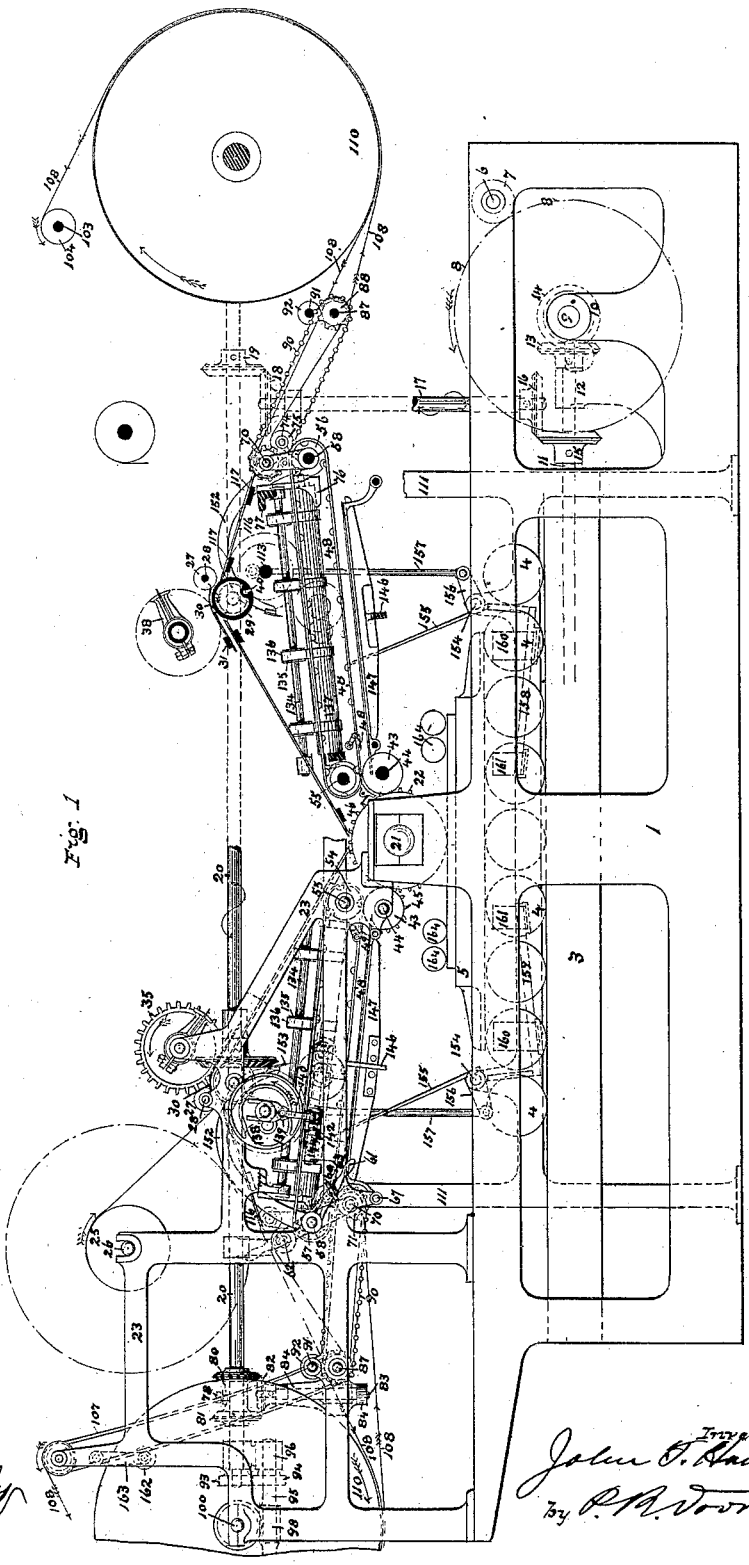

Fig. 1.

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Atty.

(No Model.) 4 Sheets—Sheet 2.

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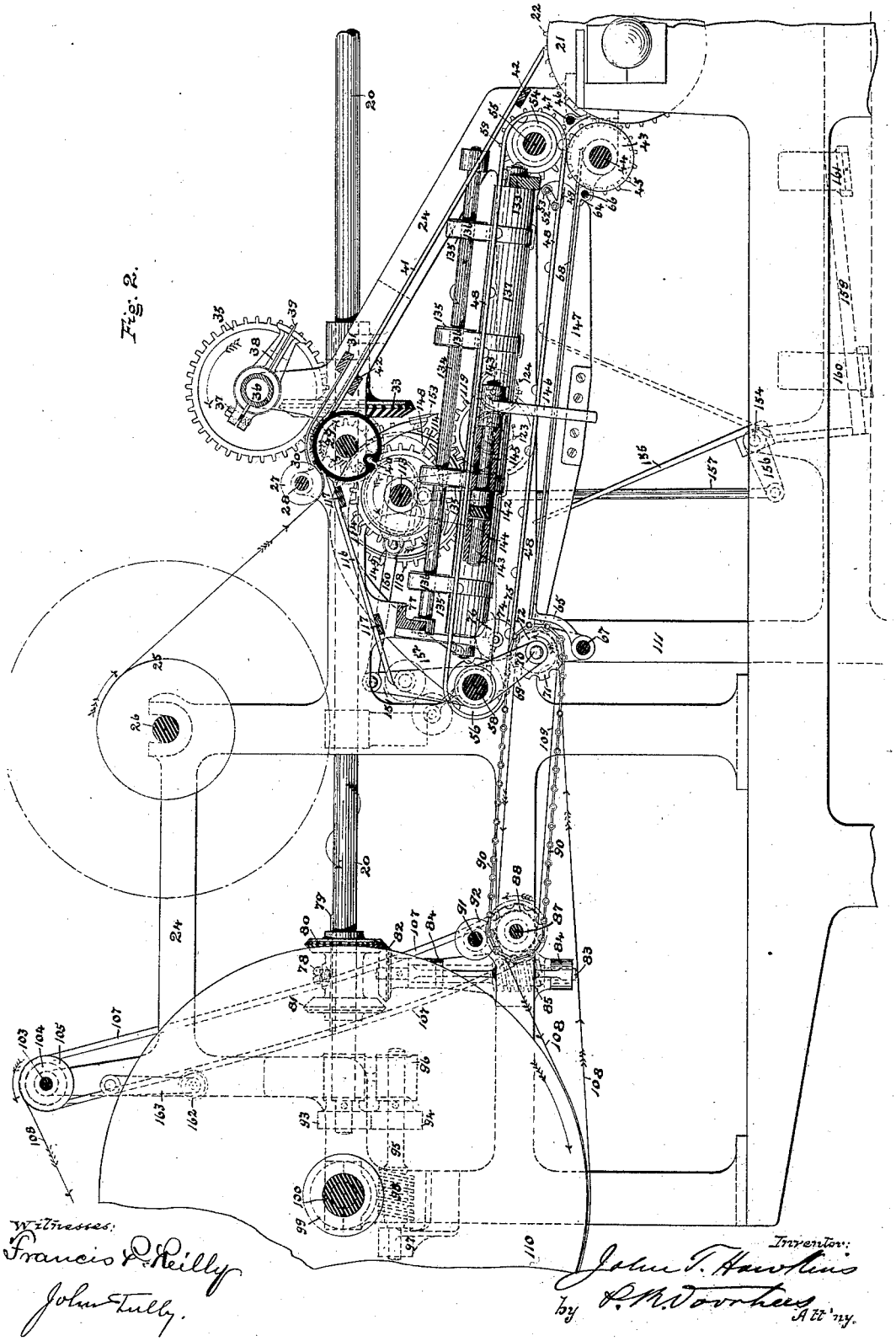
OSCILLATING CYLINDER PRINTING PRESS.

No. 423,052. Patented Mar. 11, 1890.

Fig. 2.



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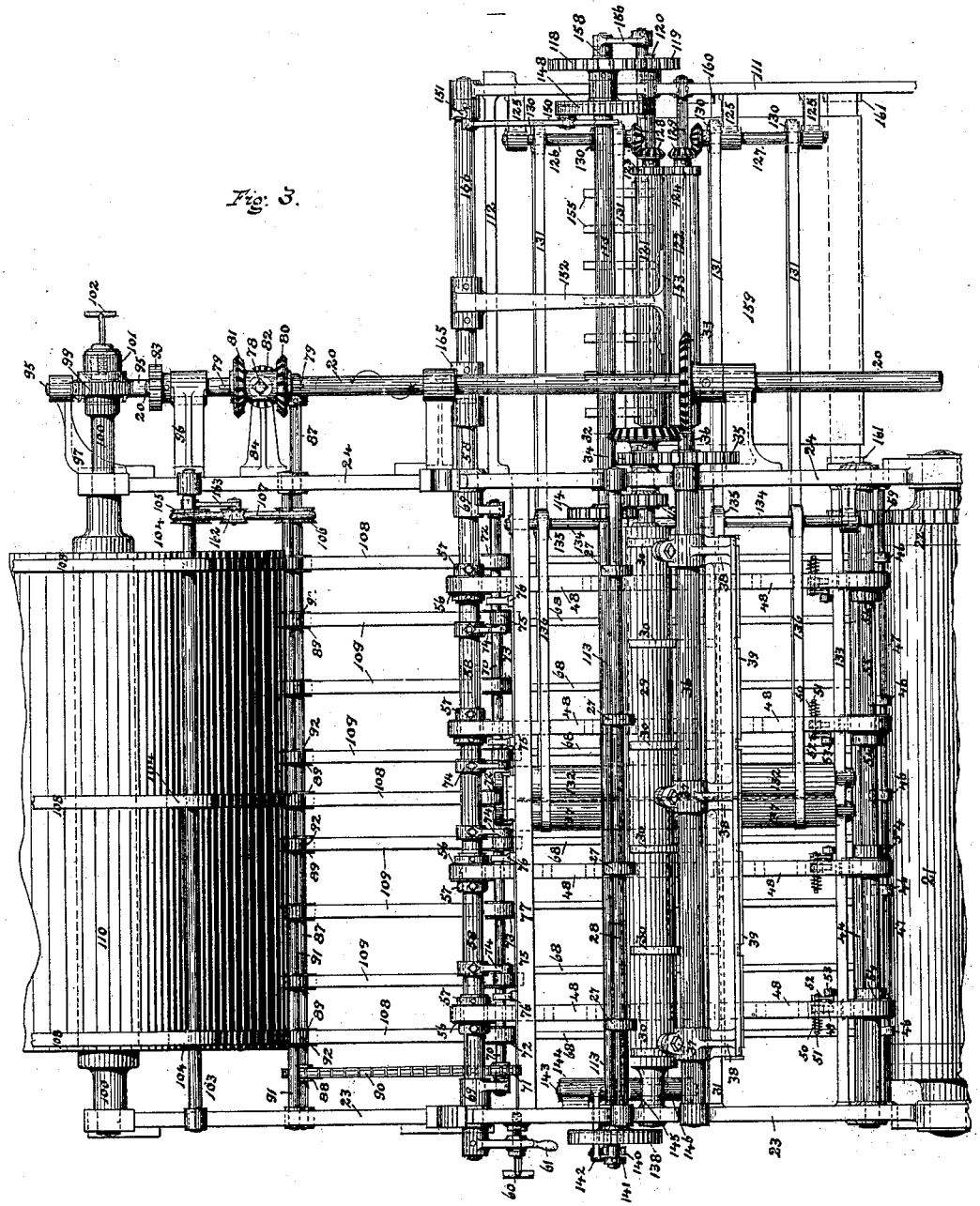
(No Model.) 4 Sheets—Sheet 3.

J. T. HAWKINS.

OSCILLATING CYLINDER PRINTING PRESS.

No. 423,052. Patented Mar. 11, 1890.

Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

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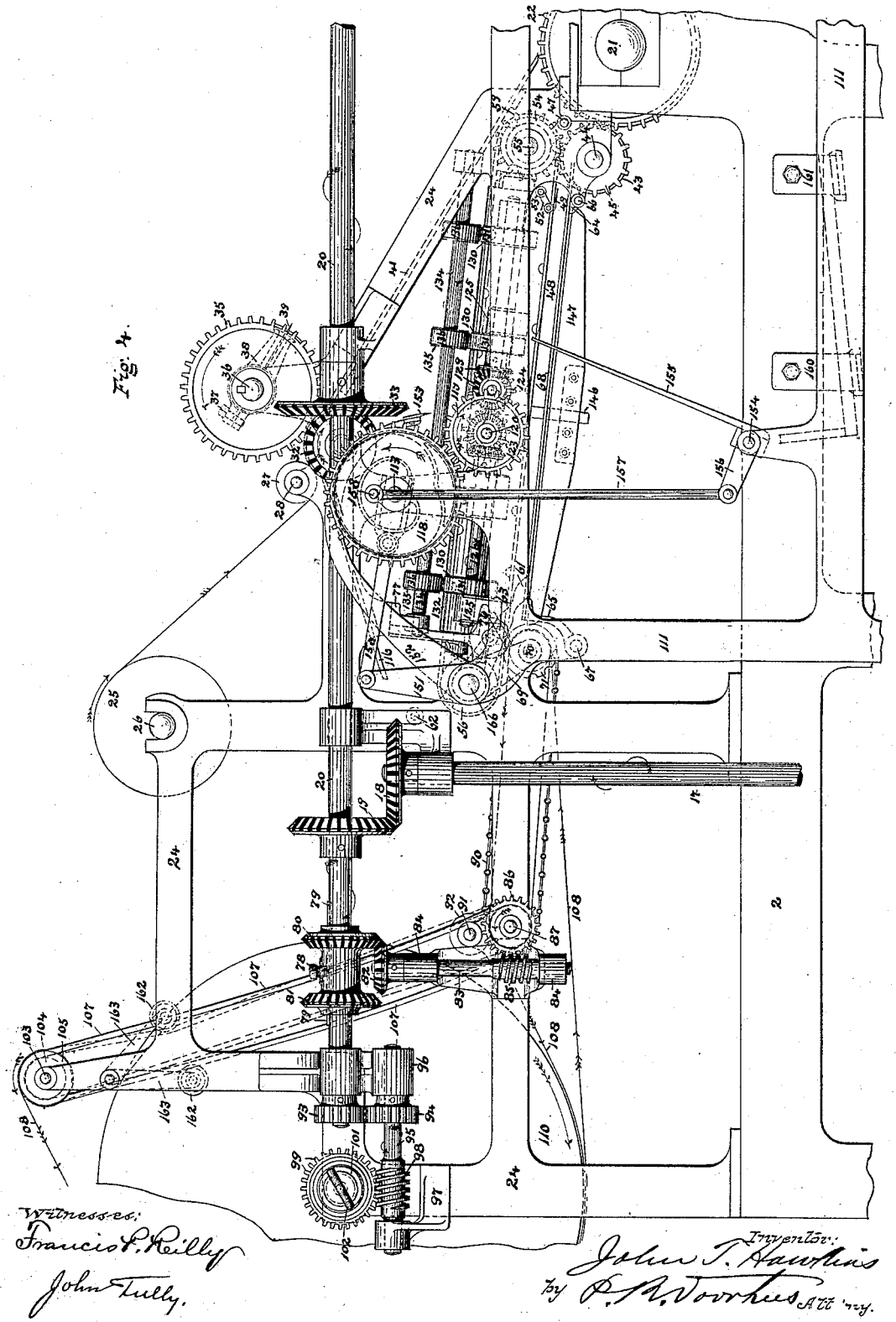
OSCILLATING CYLINDER PRINTING PRESS.

No. 423,052. Patented Mar. 11, 1890.

Fig. 4.



Witnesses:
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UNITED STATES PATENT OFFICE.

JOHN T. HAWKINS, OF TAUNTON, MASSACHUSETTS.

OSCILLATING-CYLINDER PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 423,052, dated March 11, 1890.

Application filed July 8, 1886. Serial No. 207,418. (No model.)

To all whom it may concern:

Be it known that I, JOHN T. HAWKINS, of Taunton, in the county of Bristol and State of Massachusetts, have invented certain new and useful Improvements in Oscillating-Cylinder Printing-Machines, which invention or improvements are fully set forth and illustrated in the following specification and accompanying drawings.

The object of this invention is to provide a printing-machine which will print the sheets on one side first from the roll or web, and having thus printed an edition of some five thousand sheets will automatically feed them through a second time and perfect them by printing them on the other side and folding them.

In many newspaper-printing offices where the ordinary cylinder-presses are now used, at speeds varying according to the skill of the feeder and the capacity of the machine, the less important pages, constituting the first side, are printed several hours before the papers are delivered to the carriers, the other pages being reserved for the latest telegraphic news and the most attractive intelligence. It is therefore desirable to hold back the printing of these pages as long as possible, so as to obtain all the latest news, and then to print them at the highest available speed. To hold back the printing of the entire paper until this time would necessitate the use of either the very large and expensive rotary printing-machine, using either stereotyped forms or type-revolving cylinders, or else a number of ordinary cylinder-presses requiring a number of duplicate forms and many attendants; but by this invention the less important pages are first printed, whenever it is convenient, on a double-printing oscillating-cylinder press using a flat form, the sheets of paper being cut from the rolls and fed automatically to the cylinder and then rewound as sheets between tapes on the second rolls, whence, when a sufficient number of sheets have been collected to complete the edition and the form containing the latest news has replaced the first form, said sheets are again automatically fed to the same impression-cylinder, perfected, delivered, and folded ready for the carriers or the mail. As the action of the machine is entirely automatic, and not dependent on the skill of feeders, and as the reciprocating parts of the machine are counterbalanced in accordance with my patent of August 10, 1886, No. 346,911, both sides of the sheets are printed at a high rate of speed approaching that of the vastly more expensive rotary newspaper perfecting presses now in use.

The invention consists of the parts and combinations of parts hereinafter described, and particularly set forth in the claims.

In the accompanying drawings, Figure 1 is a side elevation of the machine looking toward the folding apparatus, the crank-end feeding and delivery mechanism being shown in section through the center of the press. Fig. 2 is an enlarged sectional elevation of the left-hand part of the machine shown in Fig. 1, with the upper part of the side frame removed, so as to more plainly show the feeding and folding mechanisms. Fig. 3 is a plan of the part of the machine shown in Fig. 2, with the bridge-fingers 41 and 116 and roll of paper 25 removed for clearness. Fig. 4 is a side elevation of the crank-end feeding and folding mechanism looking at the machine from the folder side.

In said drawings the several parts are indicated by numbers, as follows:

The numbers 1 and 2 indicate the side frames, and 3 indicates the rib, of the machine, on which the rollers 4, carrying the bed 5, run. The bed may be driven in any one of the well-known ways; but I prefer to use the equilibrated bed-motion shown and claimed in my said Letters Patent. Power is applied to shaft 6, extending across the press and carrying the pinions 7, meshing into the large crank-gears 8, running on the shaft 9, carried in bearings 10 in the side frames.

The remainder of the mechanism for imparting reciprocating motion to the type-bed is omitted as not essential to this invention.

The lower way-shaft 11 of the machine is supported in bearings 12 in side frame 2, being driven from shaft 9 by means of the bevel-gears 13 and 14. Shaft 11 carries the cams which operate various printing mechanisms, as well as the bevel-gear 15, which, through bevel-gear 16, vertical shaft 17, and bevel-gears 18 and 19, actuate the upper way-shaft 20, which drives the feeding, delivery, and

folding mechanisms. The cylinder 21 runs in boxes carried in the side frames. On the end of the cylinder is secured a gear 22, which meshes into a rack (not shown) on the side of the type-bed, and through the medium of which the cylinder is oscillated.

The upper stands 23 24 of the machine carry the feeding and delivery apparatus. The roll of paper 25 on its core 26 is placed in sockets in these stands, whence the web of paper is fed between pressure-pulleys 27, fastened on shaft 28, and the cutting-gap cylinder 29. The web is then run over the cutting-gap cylinder 29 and under the overguides 30, which are fastened to the fixed bar 31. Cylinder 29 is driven by the bevel-gear 32 on its end, meshing with gear 33 on shaft 20.

Fastened to the shaft of cylinder 29 is the spur-pinion 34, driving the spur-gear 35 on the end of the cutting-blade shaft 36. Gear 35 is fastened to shaft 36 by means of set-screws and a feather in shaft 36, on which it can be slid so as to take it out of mesh with pinion 34.

On shaft 36 are clamped by bolts 37 three arms 38, to which is fastened the cutting-blade 39, which is thus made to rotate in connection with the cutting-gap cylinder 29, the blade entering into the gap 40 of said cylinder. There are six gaps in the blade spanning the overguides 30, and a sheet whose length is twice the circumference of cylinder 29 is thus severed from the web at every revolution of the cylinder 29 and blade 39, except in the six places mentioned. The pressure-pulleys 27 cause the web to be unwound from the roll 25, and also push the partially-severed web down the incline over the bridge-fingers 41, fastened to bars 42. When the leading edge of the web reaches the cylinder 21 and is about to be taken by the grippers (not shown) of cylinder 21, the tail edge is being partly severed by the blade 39 entering gap 40. The cylinder 21 and bed 5 in the meanwhile having reached one end of their stroke, and the grippers being open, the web enters beneath and is closed upon by the grippers. The cylinder 21, gripping the leading edge of the web, then starts forward in the direction of the travel of the paper at an accelerated speed, which, soon becoming greater than the constant speed given to the web by the cylinder 29, causes a sheet to be completely severed from the web along the line already partially cut by the blade 39. The sheet thus taken is then printed on its first side by forms on the bed 5. The head of the sheet is then delivered to cylinder 43 by a set of the usual sheet-lifter fingers carried in the cylinder 21 under the leading margin of the sheet.

The grippers and sheet-lifting fingers and their mechanisms are not shown, as they form no part of this invention and are clearly shown in my application above mentioned.

The cylinder 43 may consist of a number of wheels fastened to shaft 44, which carries the spur-gear 45, meshing into cylinder-gear 22. A number of sheet-stripper fingers 46, fastened to shaft 47, tend to strip the sheet from the cylinder 21 and to bend it into contact with wheels 43. A series of belts 48, each carrying a gripper 49, held closed by springs 50 on spindles 51, levers 52, and rollers 53, run over sprocket-pulleys 54, fastened to shaft 55, running in the stands 23 and 24, and over sprocket-pulleys 56, running on shouldered collars 57, fastened to shaft 58. Belts 48 and sprocket-wheels 54 and 56 are driven from shaft 55, which carries a gear 59, meshing with gear 45 on shaft 44, which is driven by cylinder-gear 22. Shaft 58 is capable of being moved in its bearings in the stands 23 and 24, but is held in either of its two positions by means of a thumb-screw 60, passing through the arm 61 on the outside of the stand 23 and tapped into the stand 23 either at 62, Fig. 4, as shown in the crank-shaft end of Fig. 1, or at 63, as shown at the opposite end of Fig. 1 and in all the other views.

Extending between brackets 64 and 65, carried on shafts 66 and 67, are a series of bridge-fingers 68, placed a sufficient distance below the belts 48 to support a number of sheets and allow the passage over them of a sheet held by grippers 49.

Secured to shaft 58 are two arms 69, carrying the shaft 70, upon which the chain-wheel 71 and the tape-pulleys 72 and 73 are fastened. To shaft 58 are also secured a series of pressure-pulley arms 74, carrying studs on which run pressure-pulleys 75. The object of these arms 74 is that there may be the same amount of pressure exerted by the pulleys 75 on the tape-pulleys 73 whether there are one or fifty sheets passing between the pulleys. When the thumb-screw 60, passing through arm 61, is placed in the tapped hole 63, the arms 69 and 74 will be in such positions that the grippers 49, carried by belt 48, will cause the sheet which it took from the cylinder 43 to be brought into the bite of the pulleys 73 and 75. The rollers 53 of gripper-levers 52 are caused to be opened by riding on the hubs of wheels 54, and so take the sheets from cylinder 43. The springs 50 keep the grippers 49 closed on the sheet, thus holding it up to the belt and transferring it until the head of the sheet is brought into the bite of the pulleys 73 and 75, when the gripper-rollers 53, rolling on cams 76, projecting down from the cross-stay 77, cause the grippers to be opened and the sheet left in the bite of the pulleys 73 and 75. The grippers then proceed on sufficiently far to clear themselves of the sheet, at which time the bed, having completed its stroke in the direction it started on when the grippers in cylinder 21 took the sheet, reverses and causes the grippers 49, belts 48, pulleys 54 and 43, and cylinder 21 to reverse and retrace their respective paths.

Fastened to the upper way-shaft 20 by means of set-screw 78, and sliding on a feather 79, are a pair of bevel-gears 80 and 81, either

of which can be thrown into gear with the bevel-gear 82, pinned to shaft 83, which is supported in bearings in the bracket 84, bolted to stand 24. On the lower end of shaft 83 is cut a worm 85, which meshes into the worm-gear 86, secured to shaft 87, journaled in the stands 23 and 24. Shaft 87 carries the chain-pulley 88 and the tape-pulleys 89. Shaft 70 is driven by means of a chain 90, passing over chain-wheel 88 on shaft 87 and around chain-wheel 71. Supported in journals in the stands 23 and 24 is a shaft 91, carrying pressure-pulleys 92, rolling on pulleys 89. On each end of the upper way-shaft 20 is pinned a spur-gear 93, meshing in with a spur-gear 94, pinned to a shaft 95, which is carried in brackets 96 and 97, bolted to stand 24. On shaft 95 is fixed a worm 98, meshing in with worm-gear 99, running loose on shaft 100. In the end of shaft 100 is a fixed friction device 101, running in the female part in gear 99, and which, by means of thumb-screw 102, can be regulated to any desired amount of friction. The shaft 100 runs in bearings in the stands 23 and 24, and is the core upon which the papers are collected after having been printed on one side. The shaft 103, running loose in stands 23 and 24, carries rolls of tape 104 and a belt-pulley 105, which is driven from belt-pulley 106, secured to shaft 87, by belt 107. The tapes 108, being thus driven from shaft 87, have the same speed as have tapes 109, running over pulleys 73 and 89. The tapes 108, on leaving the rolls 104, pass around the roll of half-printed papers 110, which are being wound up; thence they pass around tape-pulleys 72 and between tape-pulleys 89 and pressure-pulleys 92, and so to the roll 110, to whose core or shaft 100 their ends are fastened. The tapes 108 and 109 are so speeded that they advance at a constant speed but a very short distance—say one inch—for each sheet presented to them at the bite between pulleys 73 and 75. When the machine is first started and the first sheet reaches pulleys 73 and 75, they bite it, and the grippers 49 are opened by roller 53 passing upon cams 76. Said grippers thus clear themselves of the sheet. When the grippers 49 return, they leave the sheet that they have just carried forward into the bite of pulleys 73 and 75, which pulleys, moving at a very slow speed, will have advanced only a very short distance—say one inch—before the grippers 49 return again with a second sheet, which will be delivered to pulleys 73 and 75 with its head as much behind the leading edge of the first sheet as that sheet has traveled in one complete cycle of motion of the machine. It is thus evident that the first sheet will not have passed from between the pulleys 73 and 75 until there have been as many sheets superimposed upon it as the distance which the tapes 108 and 109 move at each double stroke of the machine is contained an even number of times in the length of the sheet—that is, if the tapes 108 and 109 move one inch forward for each sheet received and the length of the sheet be thirty-two inches, then there will be thirty-two sheets constantly in the bite of pulleys 73 and 75. The sheets thus layered are carried on tapes 108 and 109 between pulleys 89 and 92, whence the tapes 109 start to return, while tapes 108 carry the sheets and roll them up on the roll 110.

The object of the friction device 101 is to allow the roll 110 to have a constant surface velocity equal to that of the tapes 109, no matter whether the roll be small or large. When the roll is small, it makes more turns per minute than when the roll is large, and consequently there is much more slip in the friction device 101 when the roll is large. The screw 102 should be so adjusted as to cause the roll 110 to reel in the sheets with a constant tension on the tapes 108.

Having printed as many sheets as the roll 110 can conveniently carry, the machine is stopped and the forms replaced by others to print the other side. The gear 35 is now thrown out of mesh with pinion 34 by being slid on the feather in shaft 36, thus causing the cutting-blade 39 to become inoperative and out of the way.

The side frame 111 of the folding attachment of the machine is secured to the side frame 2 and to stand 24 by the proper cross-stays, one of which is shown as 112, Fig. 3.

Journaled in stands 23 and 24 and in frame 111 is the folder-shaft 113, carrying a spur-gear 114, through which motion is imparted to it from gear 115, secured to the shaft of cylinder 29 by a set-screw and a feather in the shaft, upon which the gear 115 can be slid.

During the printing of the first side of the paper, as there is no use for the folder, the gear 115 is slid out of mesh with gear 114; but when the last form is put on and the folder is required gear 115 is thrown into mesh with gear 114 and the folder thus put in action.

During the changing of the forms screw 60 should be taken out of tapped hole 63, the lever 61 and shaft 58 rotated to the left, and the screw 60 placed in hole 62, thus causing the arms 69 and 74, the pulleys 72, 73, and 75, the shaft 70, chain-wheels 71, and chain 90 to take the positions shown in the right of Fig. 1.

In order to reverse the motion of the tapes 108 and 109, the screw 78 should be slacked off and the gears 80 and 81 slid along on the key 79, so that the bevel-gear 81 may mesh with bevel-gear 82. The screw 102 should also be run out, so as to render the friction device 101 inoperative and allow the shaft 100 to rotate and the sheets or papers to be unrolled, as may be required, by the pulleys 89 and 92.

Having thus reversed the operation of the delivery mechanism, the machine may be started up. The tapes 108 and 109 start forward at the same speed, but in the opposite

direction to that in which they just moved, and unwind the sheets from the roll 110, tapes 108 being rewound upon their rolls 104. The sheets being still layered are driven on the tapes 108 and 109 by the bite of the pulleys 89 92, between which they pass, and then pass upon the bridge-fingers 116, fastened to bars 117, (not shown in Fig. 3 for clearness,) and so toward the pulley 27 and cylinder 29. When the sheet which was last printed reaches the bite of pulleys 27 on cylinder 29, its speed is increased, and it is quickly taken from the layer of sheets and passed under the guides 30 and down the bridge-fingers 41, being driven by cylinder 29. Just before the leading edge of the first sheet reaches the cylinder 21 and is taken by the grippers the layer of sheets resting on the fingers 116 will have been moved forward sufficient to cause the second sheet to be passed into the bite of pulleys 27 and cylinder 29, and thus separated from the sheets under it. The first sheet, having reached the cylinder 21, is taken by the grippers, printed on its second side, delivered to cylinder 43 by the sheet-lifter fingers, stripped from the cylinder 21 by fingers 46, and its leading edge passed into the bite of grippers 49, which convey it along under the belts 48 and over the bridge-fingers 68. On the end of shaft 113 is secured a spur-gear 118, which, meshing in with gear 119, fastened to the end of shaft 120, drives the folding-rollers 121 and 122 through the spur-gears 123 and 124, secured to them, respectively. The folding-rollers 121 and 122 are journaled in frame 111 and in stand 24.

Journaled in brackets 125, attached to frame 111, are two tape-shafts 126 and 127, driven from folder-rollers 121 and 122 by bevel-gears 128 and 129, respectively. The tape-shafts 126 and 127 carry tape-pulleys 130, over which tapes 131 run, whence they pass around folding-roller 132, journaled in cross-stays 77 and 133. Journaled in the same cross-stays is a shaft 134, carrying pulleys 135, over which tapes 136 run, whence they pass around folding-roller 137, journaled in cross-stays 77 and 133, parallel to folding-roller 132. Folding-roller 137, running in contact with roller 132, which is driven by tapes 131, is caused to rotate and thereby drive the tapes 136, pulleys 135, and shaft 134.

Secured to shaft 113 outside of stand 23 is a cam 138, in which runs a roller 139 on a stud in forked connecting-rod 140. The rod 140 embraces shaft 113, being held in position by collar 141, and at its lower end it is connected to a lever 142, secured to a shaft 143, journaled in brackets 144 and 145, which are attached to stand 23.

On the end of shaft 143 is fastened a folding-knife lever 146, carrying the folding-knife 147.

The shaft 58 projects through the stand 24, and its end carries a collar 165, fastened to a shaft 166, whose other end is journaled in frame 111. The collar 165 and shaft 58 thus form a journal for the inner end of shaft 166.

Secured to shaft 113 inside of frame 111 is a cam 148, which carries a roller 149, running on a stud in the forked connecting-rod 150. The rod 150 embraces shaft 113, and is connected at its other end to a lever 151, fastened to shaft 166.

Pinned to shaft 166 is a folding-knife lever 152, carrying a folding-knife 153.

Journaled in stand 111 and frame 2 is a fly-shaft 154, carrying a fly 155, to which motion is imparted by the arm 156, to which is connected a rod 157, whose upper end embraces a crank-pin 158 in the gear 118.

The sheet having been printed on both sides and delivered by the grippers 49 to a position over the bridge-fingers 68, the grippers 49 are opened by the roller 53, riding on cam 76, when the folding-knife 147 comes up and tucks the sheet in between the folding-rollers 132 and 137. The tapes 131 and 136 then take the sheet thus folded lengthwise and run it out until it gets over the folding-rollers 121 and 122, when the folding-blade 153 comes down and tucks it in between the rollers 121 and 122, and thus causes the second or transverse fold to be made. The sheet twice folded is delivered from the rollers 121 and 122 in front of the fly 155, by which it is deposited on the fly-board 159, carried in brackets 160 and 161, attached to the stand 2 and to the frame 111. The sheets so folded are then taken from the fly-board 159 for delivery to carriers or to a second folding-machine to receive additional folds; or additional folding mechanism may be connected to the machine, and the sheets be thence finally delivered ready for mailing. After the tapes 108 have delivered the layer of sheets to the bridge-fingers 116 said tapes pass around pulleys 72 and 89 and back around the roll of half-printed papers which are being fed out, and so to the shaft 103, upon which they are rewound ready for future use.

In order that the shaft 103 may take up the tapes as fast as they come from the roll 110, a tightener-pulley 162 is used. The pulley 162 runs on an arm 163, which may be fastened to the stand 24 in any desired position, so as to give the belt 107 the required tension, as shown in Fig. 3 and by dotted lines in Fig. 4.

The inking apparatus is not shown, except the form-rollers 164, Fig. 1, as not essential to this invention.

From Fig. 1 it will be readily understood that my invention includes a double-ender machine, that there are two rolls of blank paper from which partially-severed sheets of paper are alternately fed to the cylinder 21, which thus prints a sheet on one side at each stroke of the bed in each direction, and said machine being a self-feeder in printing both sides of the sheet, my invention provides machines not limited by the ability of the at-

tendants to feed the sheets, and which, being equilibrated in all reciprocating and oscillating movements, may be run at high speeds.

Having thus fully described my improvements, as of my invention I claim—

1. In a double-acting printing-machine printing from flat forms, the combination of an oscillating impression-cylinder, as 21, with a delivery mechanism for delivering the sheets when printed on the first side into a stepped or layered roll of sheets, consisting of cylinder 43, stripper-fingers 46, sprocket-pulleys 54 and 56, belts 48, grippers 49, bridge-fingers 68, pressure-pulleys 75, pulleys 72 and 73, chain 90, chain-wheels 71 and 88, tapes 108 and 109, rolls of tapes 104, pulleys 89 and 92, and collecting-roll 110, substantially as and for the purposes set forth.

2. In a double-acting printing-machine printing from flat forms, in combination with an oscillating impression-cylinder, as 21, and a delivery mechanism, substantially as described, for delivering the sheets when printed on the first side into a stepped or layered roll of sheets, bridge-fingers 116, feeding-rollers 27 29, bridge-fingers 41, and folding delivery mechanism, substantially as described, whereby said sheets are redelivered to said impression-cylinder to be printed on their second sides, and thence delivered perfected and folded, substantially as and for the purposes set forth.

3. In a printing-machine, mechanism consisting of the following-named elements in combination: sprocket-pulley 54, running on shaft 55, sprocket-pulley 56, running on collars 57, secured to fixed shaft 58, belts 48, grippers 49, springs 50, spindles 51, levers 52, and rollers 53, driven from the impression-cylinder 21 by gears 22, 45, and 59, bridge-fingers 68, cam 76, pressure-pulleys 75 on arms 74, running on pulleys 73, secured with pulleys 72 to shaft 70, running in arms 69, secured to shaft 58, journaled in stands 23 and 24, chain-wheels 71 and 88, belt 90, tapes 108 and 109, pressure-pulleys 92 on shaft 91 and tape-pulleys 89 on power-shaft 87, power-gear 99, friction device 101, hand-screw 102, shaft 100, carrying winding-tapes 108 and partly-printed sheets, shaft 103, carrying rolls of tapes 104, belt 107, and pulleys 105 106, all arranged and combined substantially as described, whereby the sheets are delivered into a stepped or layered roll when printed on one side, preparatory to being automatically fed to the machine again for printing the second side, substantially as set forth.

4. In a printing-machine, mechanism consisting of the following-named elements in combination: shaft 100, having thereon sheets layered or stepped, substantially as described, forming a roll 110, pulleys 89 on a power-shaft 87, pressure-pulleys 92 on a shaft 91, tapes 108 and 109, chain-wheel 88, chain 90, chain-wheel 71 and pulleys 72 and 73, secured to a shaft 70, journaled in arms 69, fastened to shaft 58, located so that said tapes 108 and 109 will cause the sheets to be delivered upon the bridge-fingers 116, feeding-rollers 27 on shaft 28, power feeding-cylinder 29, and bridge-fingers 41, whereby the sheets are automatically unwound from said layered roll, and thence automatically fed to be printed, substantially as and for the purposes set forth.

5. In a printing-machine, in combination with cutting-cylinders 29 and cutting-blade 39, secured to a shaft 36, bridge-fingers 41, and impression-cylinder 21, provided with grippers and lifter-fingers and actuating mechanism therefor, as described, mechanism consisting of a delivery-cylinder 43 on shaft 44, stripper-fingers 46, sprocket-pulleys 54, running on shaft 55, sprocket-pulleys 56, running on collars 57, secured to fixed shaft 58, belts 48, grippers 49, springs 50, spindles 51, levers 52, and rollers 53, driven from the impression-cylinder 21 by gears 22, 45, and 59, bridge-fingers 68, cam 76, pressure-pulleys 75 on arms 74, running on pulleys 73, secured with pulleys 72 to shaft 70, running in arms 69, secured to shaft 58, journaled in stands 23 and 24, chain-wheels 71 and 88, belt 90, tapes 108 and 109, pressure-pulleys 92 on shaft 91 and tape-pulleys 89 on power-shaft 87, power-gear 99, friction device 101, hand-screw 102, shaft 100, carrying tapes 108 and partly-printed sheets, shaft 103, carrying rolls of tapes 104, belt 107, and pulleys 105 106, all arranged and combined substantially as described, whereby the sheets are cut from the web, fed to said impression-cylinder 21, printed on their first side, and delivered into a stepped or layered roll preparatory to being automatically fed to the machine again for printing the second side, substantially as and for the purposes set forth.

6. In a printing-machine, in combination with a shaft 58, journaled in stands 23 24, and arms 61, secured, as described, by a hand-screw 60, arms 69, shaft 70, pulleys 72 73, chain-wheels 71, belt 90, and core-shaft 100, whereby the path of the sheets first passed to said core-shaft may be easily and quickly changed to allow said sheets to return by the same track, but diverted so as to be a second time printed, substantially as and for the purposes set forth.

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FRANCIS R. REILLY.