

C. F. BLACKFORD.
 PRINTING PRESS.
 APPLICATION FILED JUNE 24, 1910.

1,107,254.

Patented Aug. 18, 1914.

10 SHEETS—SHEET 1.

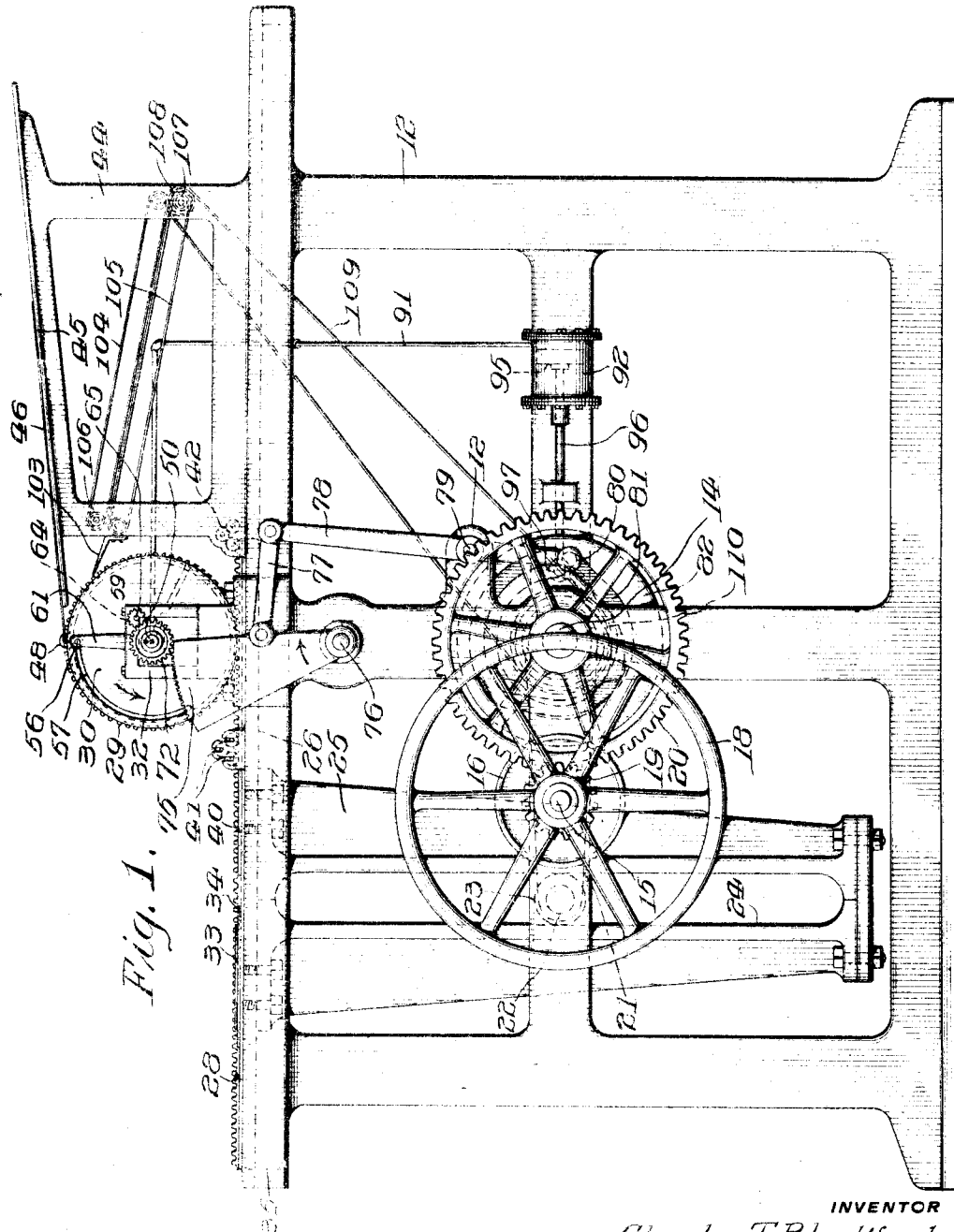


Fig. 1.

WITNESSES
H. J. Hartman
Clifton C. Holloway

BY

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Charles T. Blackford.

Wm. L. Perry

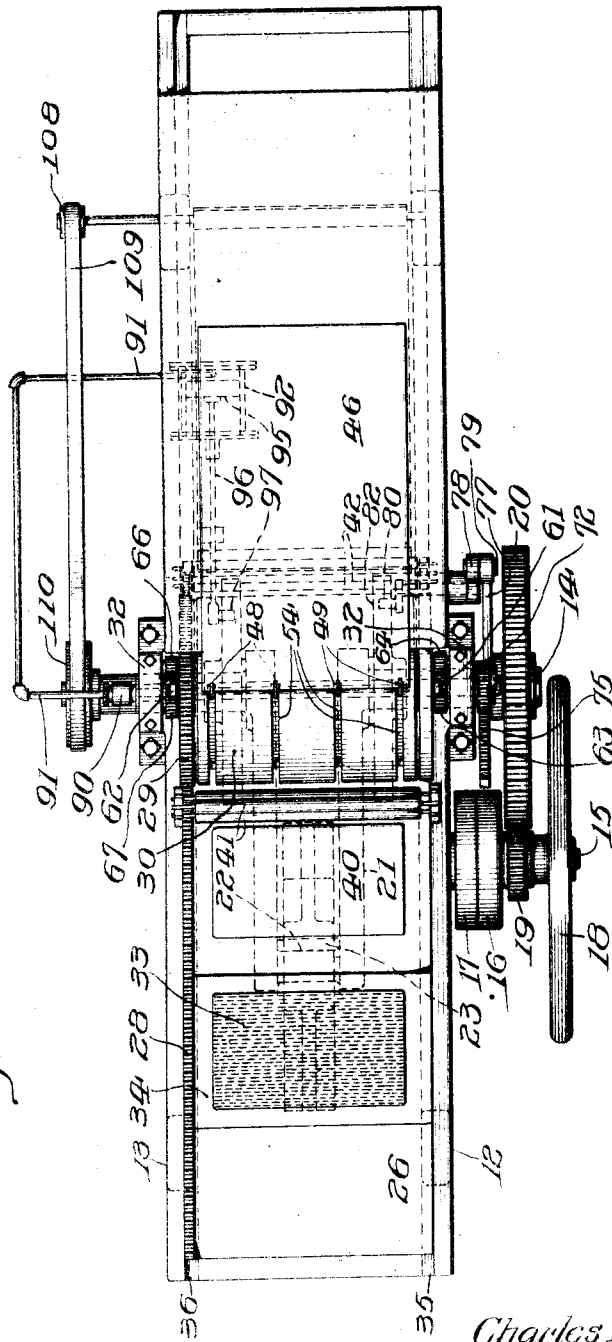
ATTORNEY

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 10 SHEETS—SHEET 2.

Fig. 2.



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10 SHEETS—SHEET 3.

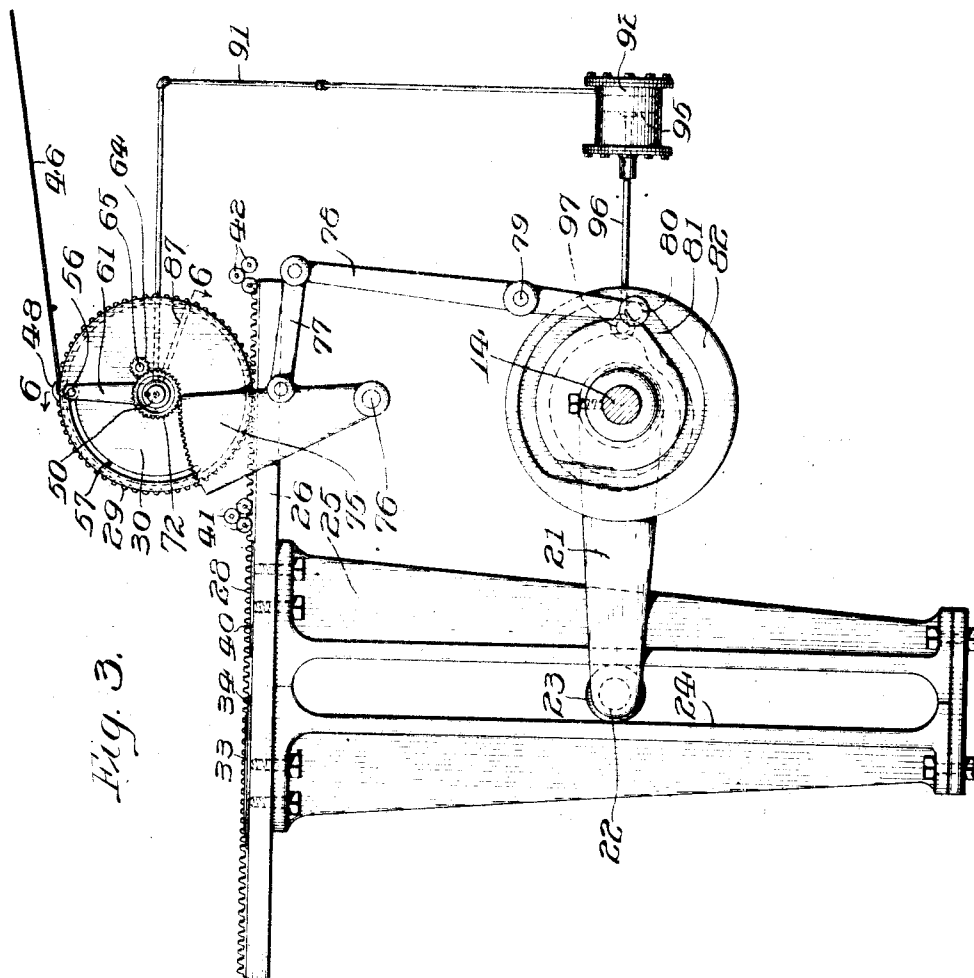


Fig. 3.

WITNESSES
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10 SHEETS—SHEET 4.

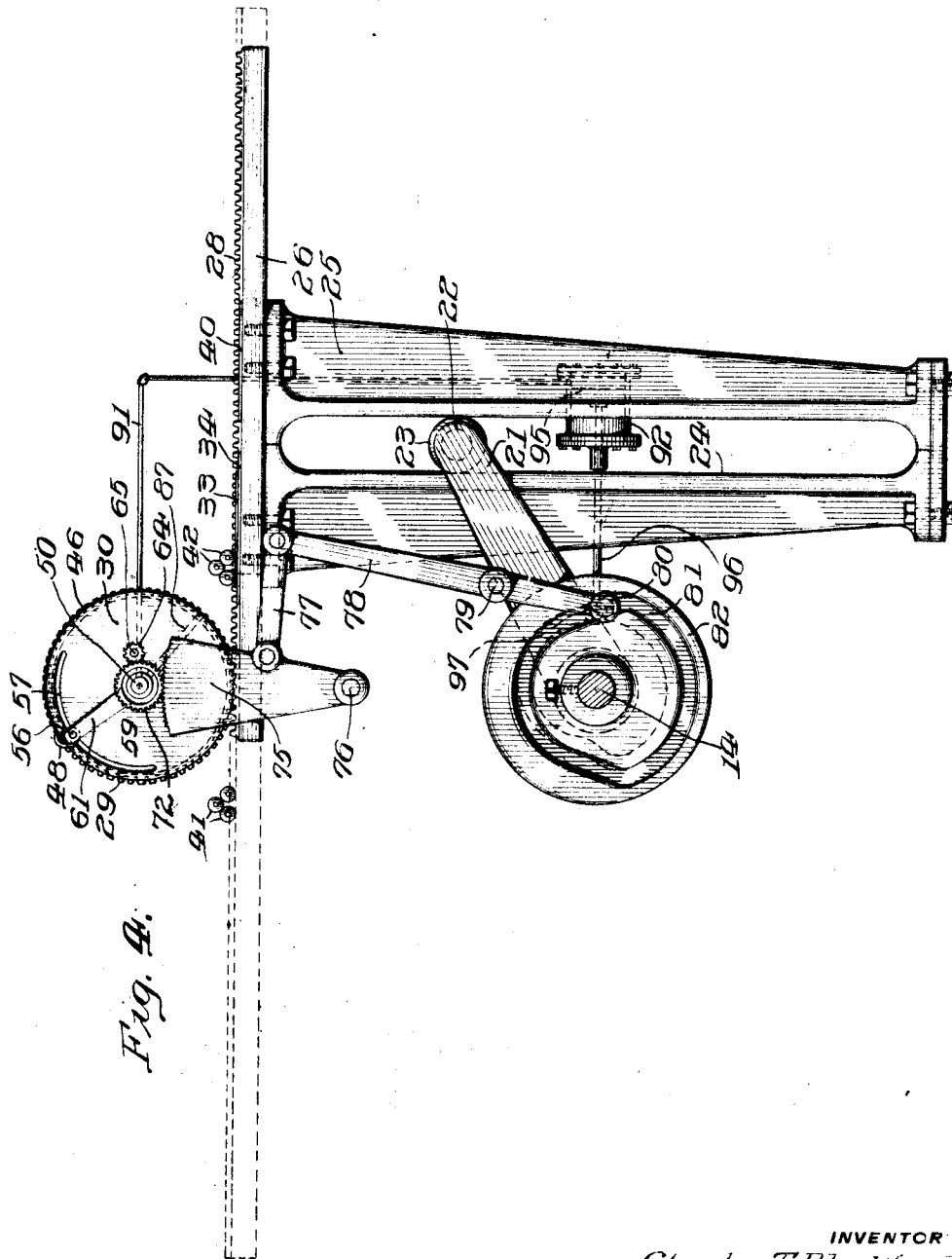


Fig. 4.

WITNESSES
F. J. Hartman.
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10 SHEETS—SHEET 5.

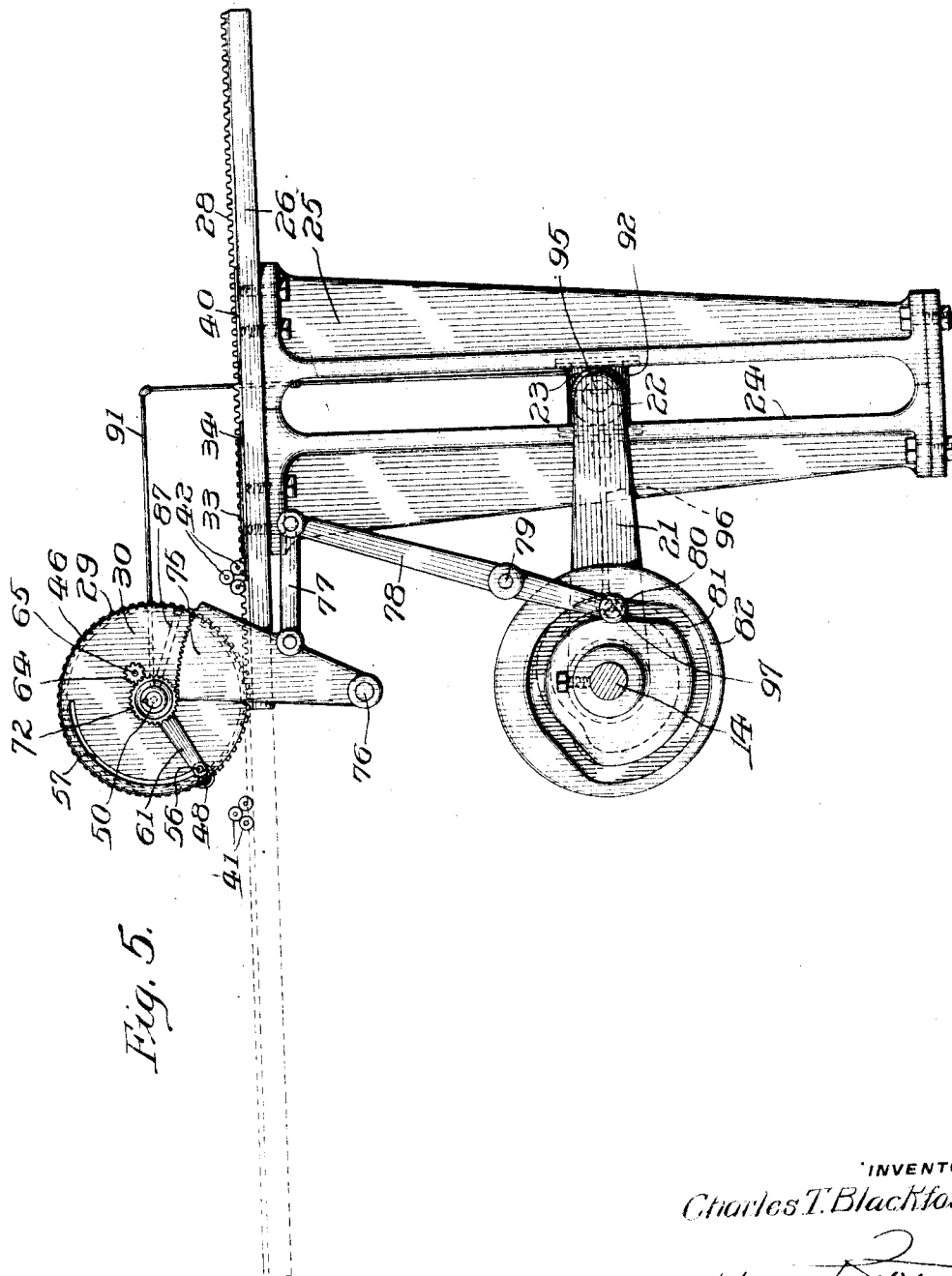


Fig. 5.

WITNESSES
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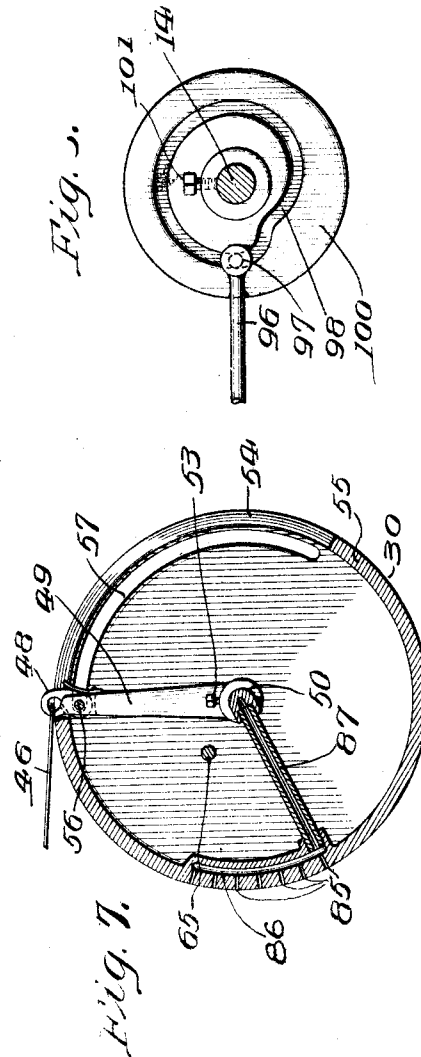
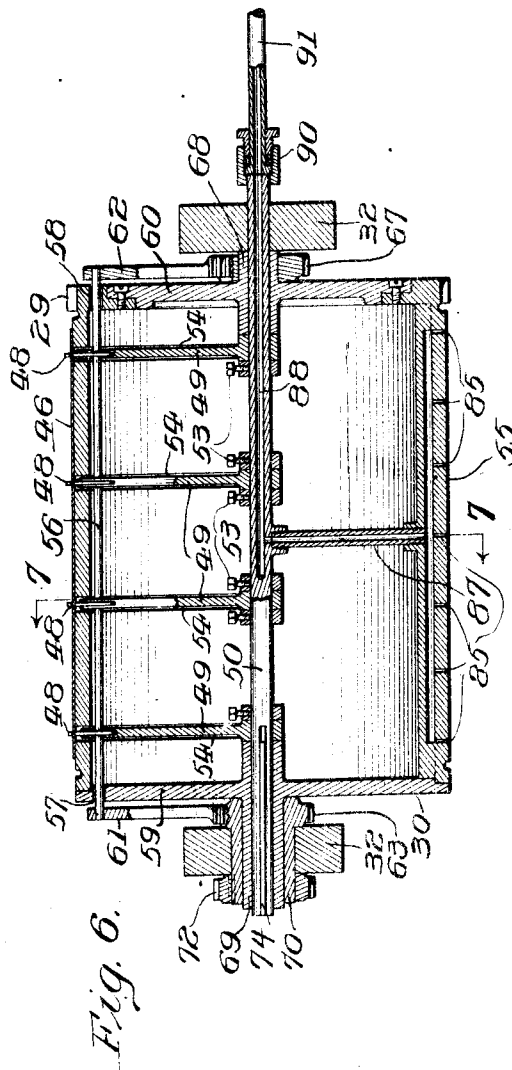
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 APPLICATION FILED JUNE 24, 1910.

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Patented Aug. 18, 1914
 10 SHEETS—SHEET 6.



WITNESSES
H. G. Hartman.
Clifton C. Halliwell

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INVENTOR
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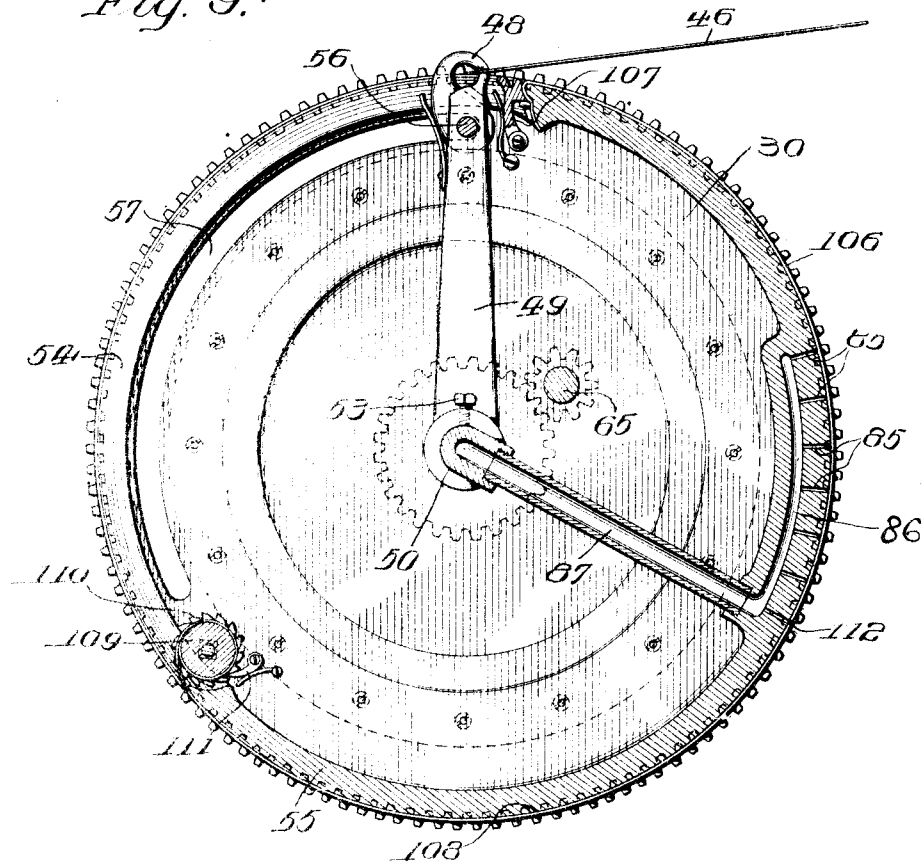
Thomas Bell
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APPLICATION FILED JUNE 24, 1910.

1,107,254.

Patented Aug. 18, 1914.
10 SHEETS-SHEET 7.

Fig. 9.



WITNESSES
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1,107,254.

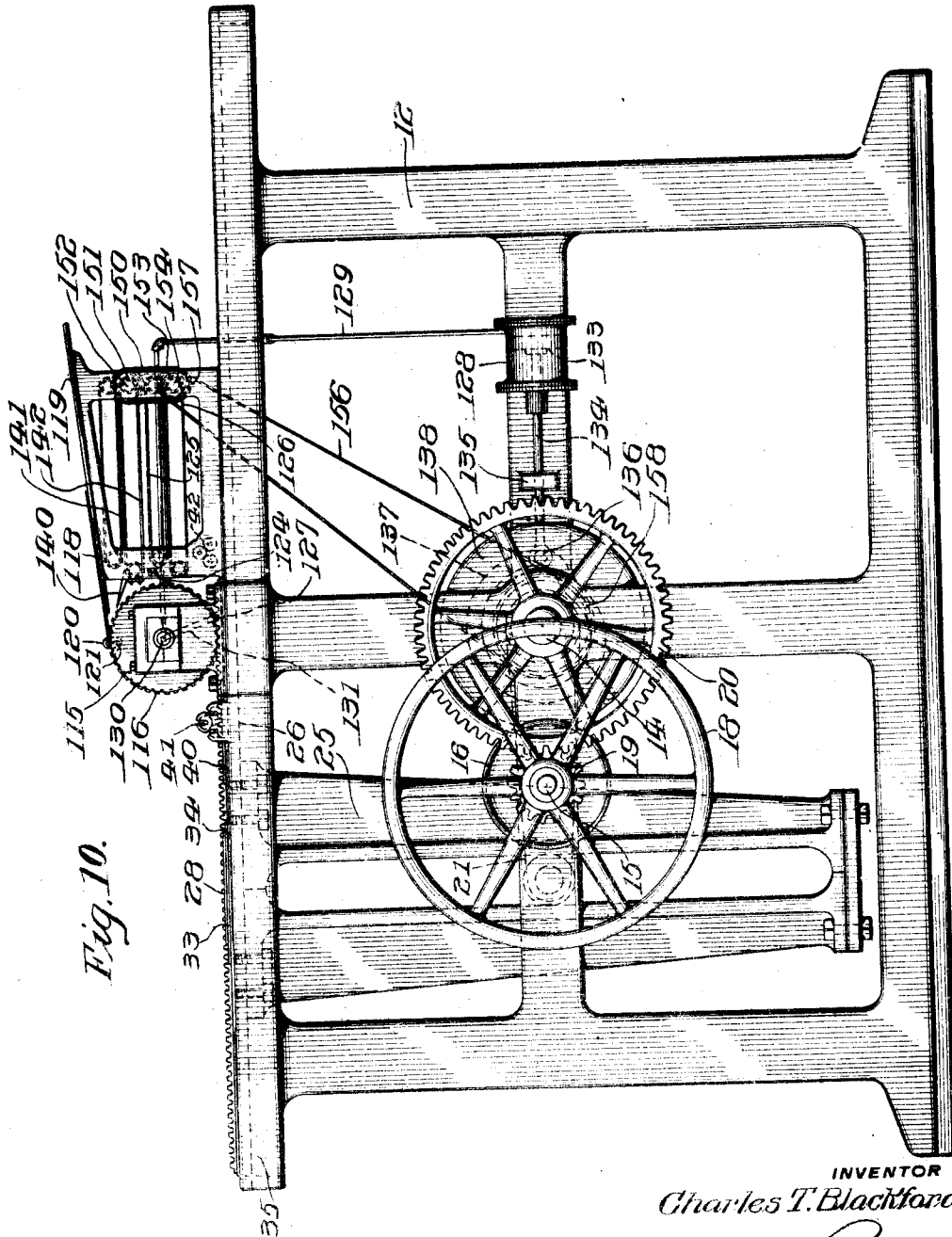


Fig. 10.

WITNESSES
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Clifton C. Halliwell

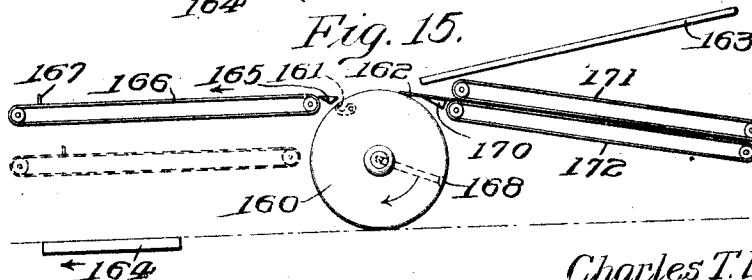
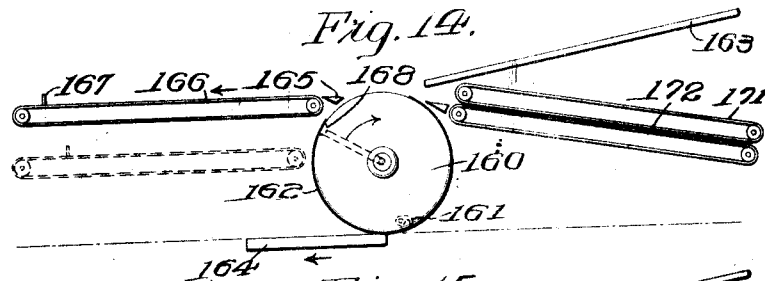
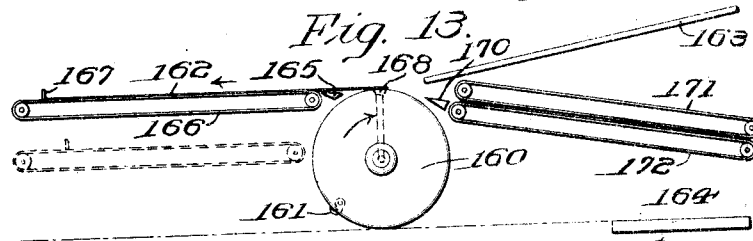
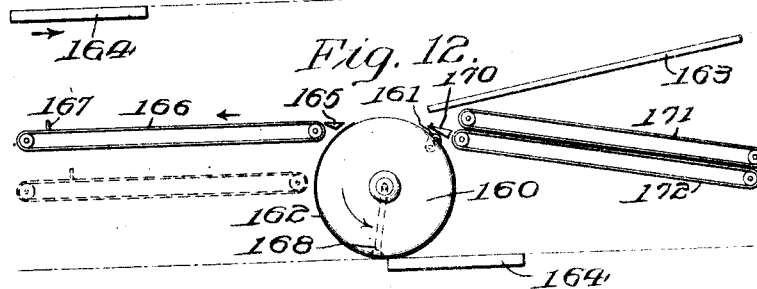
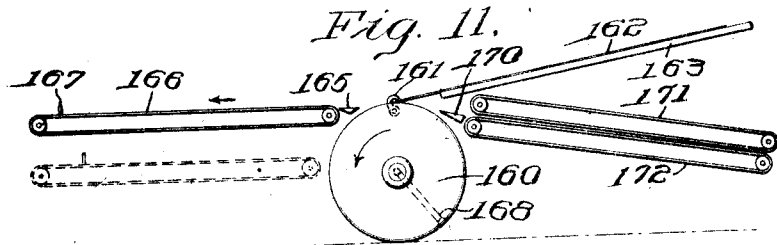
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10 SHEETS-SHEET 9.

1,107,254.



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Patented Aug. 18, 1914.

10 SHEETS—SHEET 10.

1,107,254.

Fig. 16.

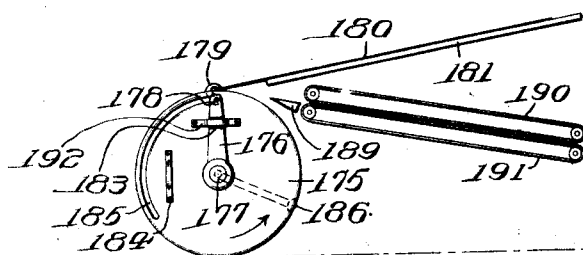


Fig. 17.

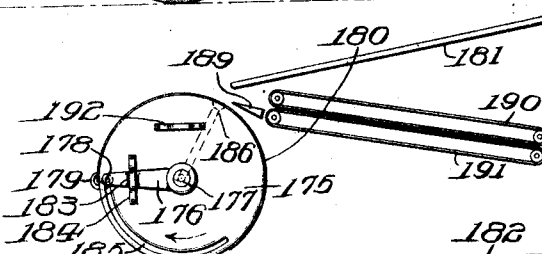


Fig. 18.

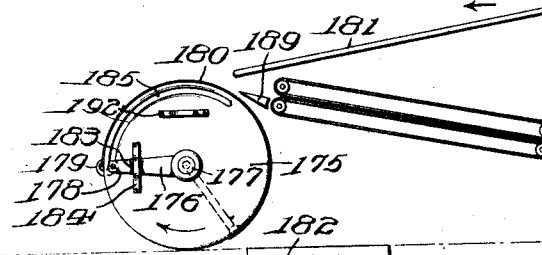


Fig. 19.

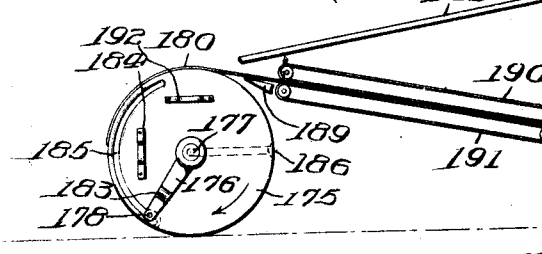
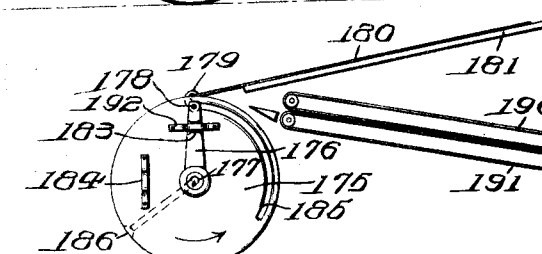


Fig. 20.



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UNITED STATES PATENT OFFICE.

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PRINTING-PRESS.

1,107,254.

Specification of Letters Patent.

Patented Aug. 18, 1914.

Application filed June 24, 1910. Serial No. 563,659.

To all whom it may concern:

Be it known that I, CHARLES T. BLACKFORD, a citizen of the United States, and a resident of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Printing-Presses, of which the following is a specification, reference being had to the accompanying drawings.

10 This invention particularly relates to printing-presses of the class wherein the impression cylinder is opposed to a reciprocatory form-bed.

The principal objects of this invention are, to provide a printing-press with means whereby separate impressions are made by the same type, upon one side of each sheet of paper fed to the press during a complete cycle of the printing mechanism; to provide means to shift said sheet relative to the face of the impression cylinder after being impressed by the type while the type form is traveling in one direction, to present a blank portion on the same side of said sheet for a separate impression by said type on the return stroke of said type form; to provide gripping means to alternately hold the opposite ends of said sheets with respect to the direction of travel of said sheets, substantially in contact with the surface of said impression cylinder; and to provide means whereby the printed sheets may be delivered from the feeding side of said press with their printed side up.

35 Further objects of this invention are, to provide a printing-press of simplified construction, and consequently of economical manufacture, that will have a producing capacity greatly in excess of similar machines of ordinary construction.

40 The form of this invention as hereinafter described provides a printing-press with a reciprocatory form-bed having a rack in toothed engagement with a gear on an oscillatory impression cylinder; means to reciprocate said form-bed; a type form carried by said form-bed; gripping mechanism carried by said cylinder arranged to hold the sheet in one direction of movement of said cylinder; means arranged to shift said gripping mechanism substantially at the termination of each rotative movement of oscillation of said cylinder, to draw the printed portion of said sheet from the region engaged by the type, and to present a blank portion at said region to be impressed on

the reverse rotative movement of oscillation of said cylinder; a duct in said cylinder, opening through a transverse series of perforations in the cylindrical wall of said cylinder; means to produce a partial vacuum in said duct and perforations, whereby the atmosphere impinges upon said sheet and retains it in contact with said cylinder independently of said gripping mechanism at the opposite edge, during the reverse rotative movement of oscillation; means to control the gripping mechanism, and the vacuum producing means, whereby the sheet to be printed is engaged at its forward end, with respect to the direction in which said sheet is to be carried.

This invention further includes the various novel features of construction and arrangement which are hereinafter more definitely specified.

In the accompanying drawings, Figure 1 is a side elevation of a printing-press, showing the preferred embodiment of this invention; Fig. 2 is a plan view of the printing-press shown in Fig. 1; Fig. 3 is an enlarged diagrammatic elevational view of the movable parts exclusive of the frame, showing said parts in the initial position indicated in Fig. 1; Fig. 4 is a diagrammatic elevational view similar to Fig. 3, showing the parts shifted to a position wherein the cylinder and form-bed have nearly completed the first half of their cycle of movement, and showing the gripper arm partly shifted relative to the surface of the cylinder; Fig. 5 is a diagrammatic elevational view similar to Figs. 3 and 4, showing the parts shifted to the position opposite to that shown in Fig. 3; Fig. 6 is an enlarged longitudinal sectional view of the impression cylinder, taken in two planes intersecting on the axial line of said cylinder, as indicated by the lines 6—6 in Fig. 3; Fig. 7 is a staggered transverse sectional view taken in two parallel planes, as indicated by the lines 7—7 in Fig. 6; Fig. 8 is a face view of the pump actuating cam; Fig. 9 is an enlarged transverse sectional view similar to Fig. 7, taken on the lines 7—7 in Fig. 6 and looking at the side opposite to that shown in Fig. 7, and showing in detail the "make-ready" mechanism; Fig. 10 is a side elevational view of a printing-press similar to that shown in Fig. 1, embodying a slightly modified form of impression cylinder; Figs. 11 to 15, inclusive, diagrammatically illustrate

different positions of a modification of this invention, wherein the printed sheet is temporarily discharged from the cylinder after its first impression, and automatically picked up again and carried in different relation to the cylinder surface; and Figs. 16 to 20, inclusive, diagrammatically illustrate a modification of this invention wherein means is provided to temporarily retain the gripper arms in predetermined positions, and the rotation of the cylinder effects the relative shifting of the cylinder surface and the sheet to be printed.

In said figures, the frame comprises the side standards 12 and 13, which provide bearings for the main shaft 14 and driving shaft 15, which latter carries the usual tight and loose pulleys 16 and 17 and the fly wheel 18, and is provided with the gear 19 in mesh with the gear 20 on said main shaft 14.

The main shaft 14 comprises the crank arms 21, having the crank pin 22, which carries the roller 23, arranged to play in the slot 24, in the depending yoke 25, which is secured to, and carried by the reciprocatory form-bed 26, whereby the rotation of said crank arms 21 imparts a variable rectilinear motion to said form-bed 26.

The form-bed 26 is provided with the rack 28, which is in toothed engagement with the gear 29 on the impression cylinder 30, so that as the form-bed is reciprocated by the engagement of the roller 23 with the yoke 25, the impression cylinder 30 is oscillated thereby at the same surface speed. The impression cylinder 30 is journaled in the bearings 32 on a stationary axis, its surface being at all times in position to impress upon the type 33 of the type form 34, carried by said form-bed 26. The form-bed 26 is mounted to reciprocate in the guides 35 and 36 in the respective side standards 12 and 13, and is provided with the usual ink distributing plate 40, which is arranged to engage the ink distributing rollers 41 and 42 at each reciprocation of said form-bed, said ink distributing rollers being journaled in suitable bearings carried by said side standards 12 and 13.

The side standards 12 and 13 are provided with upwardly extending supports 44, which carry the feeding mechanism comprising the inclined table 45, from which the sheets of paper 46 are fed to the gripping mechanism, comprising the gripping fingers 48 carried by the gripper arms 49, which are loosely mounted on the shaft 50 of the cylinder 30 and prevented from accidental displacement in an axial direction by the collars 52, which are secured in fixed position on said shaft 50 by the set screws 53. The gripper arms 49 extend through slots 54 in the cylindrical wall 55 of the cylinder 30, and are connected by a rod 56 which extends through said gripper arms 49, and projects

through slots 57 and 58 in the end walls 59 and 60 respectively, in engagement with the ends of the gripper levers 61 and 62.

The gripper lever 61 comprises the gear 63, which is in mesh with the gear 64 on the shaft 65 extending through the impression cylinder 30 and journaled in its respective end walls 59 and 60. Said shaft 65 has the gear 66 in mesh with the gear 67 on the lever 62, which is rotatively mounted on the hub 68 of the impression cylinder 30. The gear 63 is rotatively mounted on the hub 69 of said impression cylinder 30 and is provided with a sleeve 70. Said sleeve 70 extends through the bearings 32 and is provided exterior to said bearing with the gear 72, which is normally out of mesh with the sector gear 75, but which, however, is arranged to be rotated by said sector gear, when the latter is shifted in the direction of the arrow indicated thereon, from the position shown in Figs. 1 and 3 to the position indicated in Fig. 5, or when shifted in the reverse direction. The cylinder 30 is conveniently secured to the shaft 50 by the key 74, which is engaged with a keyway in said hub 69.

The shifting of the sector 75 from the position shown in Figs. 1 and 3 to that shown in Fig. 5 effects the movement of the gripper levers 61 and 62, and consequently the gripper arms 49, relative to the impression cylinder 30 in the direction of the arrow indicated in Fig. 1 through an arc limited by the slots 57 and 58, from the rear end of said slots to the forward end during a portion of the rotative movement of oscillation of the impression cylinder 30 as said cylinder is traveling in the direction of the arrow indicated in Fig. 1, and from the forward end to the rear end of said slots during a portion of the reverse movement of said impression cylinder. It is to be noted that the movement of said gripping mechanism is not effected until the cylinder 30 has nearly completed its rotative movement of oscillation in either direction, but is effected in time to present the blank portion of the printed sheet over the region of the cylinder which always registers with the type in either direction.

The gripping fingers 48 may be actuated to grasp and release the sheet of paper 46 in any convenient manner, and as there are many well known forms in prior use which may be employed for effecting such movement of the gripping fingers, it is deemed advisable not to confuse this application by showing such well-known mechanism.

The sector 75 is pivoted to the frame standard 12 at 76, and is connected by the link 77 with the lever 78, which is pivoted at 79 on the frame standard 12 and provided with a cam roller 80 arranged to traverse the cam groove 81 in the cam 82, which is

secured on the shaft 14, said cam groove being so designed as to effect the movement of the sector 75 between the time when the impression of the type 33 on the sheet of paper 46 occurs, and the termination of each rotative movement of oscillation of said cylinder 30.

The gripping fingers 48 are arranged to hold the edge of the sheet of paper 46 in traveling in the direction indicated by the arrow in Fig. 1, until the forward rotative movement of oscillation of the cylinder in said direction is completed, whereupon the opposite edge of said sheet of paper 46 is engaged and held substantially in contact with the surface of said cylinder by atmospheric pressure impinging upon the surface of said paper, which is effected by a partial vacuum produced in the aligned series of perforations 85, in the cylindrical wall 55 of said cylinder. Said series of perforations 85 respectively extend across the cylinder in parallel relation with its axis, at relatively different distances from the gripping fingers, and are in communication with the duct 86, which is formed in the cylinder wall 55 and which is connected by the pipe 87 with the duct 88 leading through the shaft 50, which latter is connected through the stuffing box 90 with the pipe 91 leading to the pneumatic cylinder 92. Said cylinder 92 is provided with the piston 95 having a piston rod 96 provided with a cam roller 97 arranged to traverse the cam groove 98 in the cam 100, which is secured on the shaft 14 by the set screw 101. The groove of the cam 100 is so designed that the piston 95 is slowly moved to form a partial vacuum beginning with the reverse rotative movement of the cylinder 30 in opposition to the arrow indicated in Fig. 1 and continuing until the edge of the paper 46 reaches the delivery side of the press, whereupon said piston 95 is suddenly shifted to create pressure therein, and thereby blow the edge of the paper 46 from the cylinder surface, to be deflected by the stripper fingers 103 and guided thereby between the conveyer belts 104 and 105, which are carried by the rollers 106 and 107. The roller 107, at the outer end of said conveyer belt 105 is provided with the small pulley 108, connected by the belt 109 with the relatively large pulley 110 on the main shaft 14, so that, as may be observed, said conveyer belts are actuated at a comparatively high rate of speed and thereby carry the printed sheets from the cylinder out of the path of the rapidly returning gripping fingers at the termination of the cycle of operation of the cylinder 30.

The press above described operates as follows: Sheets of paper 46 are consecutively fed upon the feeding table 45, with the printing mechanism in the initial position shown

in Fig. 1, to the gripper fingers 48, which by the rotative movement of the cylinder 30, in the direction indicated by the arrow, thereon draws each sheet from the feeding table 45 and presents it in position to be impressed upon one portion of one side thereof, by the type 33, which continues to move toward the right hand, from the cylinder until said cylinder has made approximately one revolution, during the latter portion of which the cam 82 effects the movement of the sector 75 to shift the gripper mechanism forward to the position shown in Fig. 5, which shifts said sheet of paper 46 to such position that its blank region will be impressed by the type 33 upon the reverse movement of the formed 26 and the corresponding rotative movement of oscillation of the cylinder 30 in a direction opposite to that indicated by the arrow thereon in Fig. 1. After the cylinder 30 has made its complete revolution in one direction, however, the cam 100 effects a continued movement of the piston 95 to produce a partial vacuum in the duct 86, which causes the atmospheric air to impinge upon the edge of the paper 46 which is opposite to the edge first gripped by the gripping mechanism, and said piston continues to move in such direction as to maintain said partial vacuum during the reverse rotative movement of oscillation of the cylinder, until said cylinder is in a position to discharge the printed paper sheet. Said piston is then suddenly shifted in the opposite direction to produce pressure within said duct 86 to blow the edge of the printed sheet of paper 46 away from the cylinder, and into position to be guided by the stripper fingers 103, between the opposed conveyer belts 104 and 105, which are rotated at such speed as to quickly withdraw said printed sheet from the cylinder in order to clear the way for the movement of the gripper arms, which is effected by the reverse movement of the sector 75 approximately at the latter portion of the reverse rotative movement of oscillation of the cylinder 30 to its initial position, as shown in Fig. 1, ready to receive the blank sheet of paper.

The impression cylinder may be provided with any convenient form of "make-ready", which, as illustrated in Fig. 9, comprises a blanket 106, preferably formed of heavy paper which may be secured at one end by the clamping device 107, carried by the cylinder 30, and which is wrapped around the depressed surface 108 of the cylinder 30 and attached at the other end to the takeup roller 109, which is journaled in suitable bearings in the cylinder 30 and which is retained in adjusted position by the ratchet 110 and its pawl 111.

After the "make-ready" blanket 106 is adjusted to the cylinder 30, it may be pre-

ferred to provide apertures 112 in registry with the desired series of perforations 85 in the impression cylinder 30; for instance, if a sheet to be printed is of maximum length, the apertures 112 in the blanket 106 will be made to register with the perforations which are most remote from the gripping fingers 48, and the different series of perforations 85 may be utilized in connection with the printing of sheets of different lengths.

The form of this invention shown in Fig. 10 is particularly adapted to be used with automatic feeding mechanism, of which there are many well known forms. The impression cylinder 115 carries the gear 116, which is in toothed engagement with the rack 28, and which is so proportioned that during each stroke of reciprocation of the form-bed 26, the cylinder 115 makes approximately one and one-half revolutions for each rotative movement of oscillation.

A separate sheet of paper 118 is fed from the feeding table 119 at the beginning of each rotative movement of oscillation, the alternate sheets being gripped by the gripping fingers 120 at the beginning of the forward rotative movement. Said fingers 120 are arranged to oscillate on a fixed pivot 121 to grasp said paper 118, which is carried by said fingers and presented in position to be impressed by the type 33 during said forward rotative movement of oscillation of said cylinder, the discharge of said paper being conveniently effected by the stripper fingers 124, which direct the sheets 118 between the conveyer belts 125 and 126. The further rotation of the impression cylinder 115 presents the gripping mechanism in position to grasp the second sheet of paper 118 during the forward rotative movement of oscillation of said cylinder, and to draw said paper from the feeding table 119, whereupon the opposite edge of the paper from that edge which is gripped by the gripping mechanism overlies the vacuum duct 127, and vacuum is effective during the reverse rotative movement of oscillation of said cylinder 115 by the actuation of the vacuum cylinder or pump 128, which is connected by the pipe 129 through the shaft 130 and pipe 131, with said vacuum duct 127.

Vacuum is produced in the cylinder or pump 128 by the movement of the piston 133, having the connecting rod 134 arranged to slide in the guide 135 and provided with the roller 136 arranged to traverse the cam groove 137 in the cam 138 on the shaft 14. Said groove 137 is so designed as to produce a partial vacuum during a considerable portion of the reverse rotative movement of oscillation of the cylinder 115, until the sheet 118 held thereby is carried to the discharge position at the side of the press from which it was fed thereto.

When the discharge position is reached, the piston 133 is suddenly shifted by the cam 138 in the opposite direction to effect pressure in the duct 127 to blow the edge of the sheet 118 from the cylinder into the path of the stripper fingers 140, which deflect said sheet and direct it between the discharge conveyer belts 141 and 142, which are driven by the belt 150 connecting the pulley 151 on the shaft 152, with the pulley 153 on the shaft 154. Said shaft 154 is driven by the belt 156, which connects the pulley 157 with the pulley 158 on the shaft 14.

Although certain of the parts, such as, for instance, the pipe 91 and the belt 109, shown in Fig. 2, are extended from the press frame merely for convenience of illustration, in practice they may be disposed close to or even between the frame standards to permit free access to the press.

The press illustrated in Fig. 10 is substantially identical with the press shown in Fig. 1, with the exception of the impression cylinder, which, it is to be understood, may be interchangeable, so that the same press frame may be used with the different forms of cylinder, which are interchangeable and which may be substituted one for the other.

In the form of this invention shown in Figs. 11 to 15 inclusive, the cylinder 160 is provided with the gripping fingers 161 arranged to grasp the sheet 162, and by the rotative movement of oscillation of said cylinder in the direction indicated by the arrow in Fig. 11, draws said sheet from the feeding table 163 and presents the forward half of said sheet to be impressed by the type 164, as shown in Fig. 12.

When the forward edge of the sheet 162 reaches a predetermined position, after said sheet is first impressed, it is released by said gripping fingers 161, and directed by the stripping fingers 165 onto the support 166, which is preferably a conveyer belt traveling in the direction indicated by the arrows in Figs. 11 to 15 inclusive, and which temporarily supports the partly printed sheet, which is cast off by the cylinder 160, and which is limited in its movement on said belt by the stop or gate 167 with its rear edge overlying the face of said cylinder 160, as shown in Fig. 13. It may be noted that said belt support may be disposed in different positions as indicated in dotted lines to accommodate sheets of different length. The further rotation of the cylinder 160 presents the vacuum gripping mechanism 168 beneath the end overlying the cylinder, and a partial vacuum is applied to engage said sheet with said cylinder, which latter reverses its rotation of oscillation as the type travels in the direction of the arrow indicated in Figs. 13 and 14 and presents the blank portion of said sheet in position to be impressed by the type upon its return move-

ment of reciprocation. After said sheet has been twice impressed during the cycle of the printing mechanism it is released by the pneumatic gripping mechanism and directed by the stripping fingers 170 between the conveyer belts 171 and 172 and discharged thereby.

In the form of this invention shown in Figs. 16 to 20 inclusive, the impression cylinder 175 is provided with the movable gripper arms 176, loosely journaled on the shaft 177. Said gripper arms 176 are connected by the rod 178, which carries the gripping fingers 179, which are arranged to grasp the sheet 180. By the rotative movement of oscillation of the cylinder 175 in the direction of the arrow indicated in Fig. 16, said sheet 180 is drawn from the feeding table 181 and presented in position to be impressed by the type 182 traveling in the direction of the arrow indicated in Fig. 16 until said cylinder occupies the position shown in Fig. 17 and the type 182 has shifted to the end of its initial stroke of reciprocation, whereupon the gripper arm 176 is temporarily retained by the frictional engagement with the depression 183 in the gripper arm 176, of the retaining spring 184, which is carried by the frame of the press. By the rotative movement of oscillation of the cylinder 175 in the direction indicated by the arrow in Fig. 18, the face of the cylinder 175 is shifted relative to the sheet 180 until the rod 178 is engaged by the end of the slot 185 and the gripper arms 176 are released from the spring 184 by the rotation of said cylinder. The relative movement of the cylinder and sheet presents said sheet in position on said cylinder 175 to be engaged by the vacuum gripping mechanism 186, which holds said sheet in position on said cylinder to present its blank portion to be impressed by the type 182 in moving in a direction of the arrow indicated in Fig. 18. After being impressed by said type twice during the cycle of movement of the printing mechanism, the pneumatic gripping mechanism releases the sheet 180 in the position to be directed by the stripper fingers 189 between the discharge conveyer belts 190 and 191, which are so rotated as to quickly draw said sheet from said cylinder to permit the gripper arms 176 and the fingers 179, carried thereby, to return to their initial position to grasp another sheet 180, as shown in Fig. 20, wherein the extreme initial position of the cylinder 175 and the type 182 are shown, it being noted that said cylinder must be rotated slightly more than a quarter turn, or enough to effect the engagement of the rod 178 with the rear end of the slot 185 before said gripper arms 176 are released from the spring catch 192, which normally tends to hold the gripper arms 176 in their initial position.

It may be here noted that a press con-

structed in accordance with this invention may be operated at a much greater speed than presses heretofore constructed, for the reason that two impressions are made for each feeding operation; therefore, it is obvious that one operator may produce a considerably greater number of impressions with but one form, and consequently with the preparation of one "make-ready." Furthermore, a press constructed in accordance with this invention does not require any means for raising the impression cylinder during the reverse stroke of the formbed, for the reason that an impression is made during each of the forward and backward movements of said bed, and owing to the fact that impressions are made on the sheets of paper during both the forward and backward movements of the press mechanism, said sheets may be discharged from the printing mechanism at the end of the machine from which they were fed, with the printed side up.

It is not desired to limit this invention to the precise details of construction and arrangement herein set forth, as it is obvious that various modifications may be made therein without departing from the essential features of the invention as defined in the appended claims.

Having thus described my invention, I claim:

1. A press having a cylinder, a single means to separately impress separate sheets in different regions on the same side of each sheet during each cycle of the press mechanism, and means movable concentrically relative to said cylinder operative to engage the ends of the respective sheets to hold said sheets.

2. Sheet printing mechanism comprising a movable impression member, a printing surface carrying member, means on said impression member for holding a sheet thereon while it is being impressed, and means for shifting the sheet relatively to said printing surface carrying member after the first impression on the sheet so that a second impression may be taken from the same printing surface upon the sheet at a different point before the sheet is discharged from said impression member.

3. Sheet printing mechanism comprising a movable impression member, a printing-surface carrying member, means on said impression member for holding a sheet thereon while it is being impressed, and means for shifting the sheet relatively to said impression member after the first impression on the sheet so that a second impression may be taken from the same printing surface upon the sheet at a different point before the sheet is discharged from said impression member.

4. Sheet printing mechanism comprising a rotatable impression member, a printing-

- surface carrying member, means on said impression member for holding a sheet thereon while it is being impressed, and means for shifting the sheet circumferentially of said impression member after the first impression thereon so that successive impressions may be taken from the printing surface on the sheet at different points before the sheet is discharged from said impression member.
5. Sheet printing mechanism comprising a rotatable impression member, a printing surface carrying member, means connected with said impression member for holding a sheet thereon while it is being impressed, and means for shifting said holding means and sheet circumferentially of said impression member so that successive impressions may be produced on the sheet at different points in its length, the successive impressions being taken during successive rotations of the cylinder.
6. Sheet printing mechanism comprising a rotatable impression member, a printing-surface carrying member, movable means carried by said impression member for holding a sheet thereon while it is being impressed, and means for shifting the said means and sheet circumferentially of said impression member so that successive impressions may be taken from the same printing surface upon the sheet at different points in the length of the sheet, the successive impressions being taken during successive rotations of the cylinder.
7. Sheet printing mechanism comprising a rotatable impression member, a reciprocating printing-surface carrying member, movable means carried by said impression member for holding a sheet thereon while it is being impressed, and cam controlled means for causing the said means to shift the sheet circumferentially of said impression member, so that successive impressions may be taken from the same printing surface upon the sheet at different points in the length of the sheet, the successive impressions being taken during successive rotations of the cylinder.
8. In a printing press having a cycle of operation, the combination with a cylinder of means to impress a separate sheet during each cycle of said press, said means comprising a single type form, means to present one portion of said sheet to said form during one portion of said cycle, and to make an impression on said portion of said sheet from said form, and means engaging the front edge of said sheet, movable concentrically with respect to said cylinder, operative to present another portion of the same side of said sheet to said form during another portion of the cycle of said press, and to make an impression from said form on said other portion of said sheet.
9. In a printing press, the combination with a reciprocatory type form, of an oscillatory impression cylinder opposed to said form, means on said cylinder to hold a sheet to be impressed by the type of said type form in one direction of movement of said type form, and means on said cylinder to shift said sheet to present an unprinted portion thereof to be impressed by the type during its movement in the opposite direction.
10. In a printing press, the combination with a reciprocatory type form of an oscillatory impression cylinder geared to be shifted in accordance with the movement of said type form, means arranged to reciprocate said type form, means on said cylinder arranged to hold a sheet to be impressed by the type when moving in one direction, and means to shift said sheet with respect to said cylinder, to present a blank region of the impressed side of said sheet to be impressed by said type when moving in the opposite direction.
11. In a printing press, the combination with a form-bed, of means arranged to reciprocate said form-bed, a type-form carried by said form-bed, an impression cylinder geared to oscillate in accordance with the reciprocation of said form-bed, gripping means carried by said cylinder and arranged to hold a sheet to be impressed by the type when moving in one direction of reciprocation, and means to shift said grippers with respect to said cylinder to draw the impressed sheet around said cylinder to present a blank region of said sheet to be impressed by said type in the movement of said form-bed in the opposite direction of reciprocation.
12. In a printing-press, the combination with a reciprocatory form-bed, of a type form carried by said form-bed, a main shaft, a crank arm on said main shaft connected to reciprocate said form-bed, a rack carried by said form-bed, an oscillatory impression cylinder having a gear engaged with said rack, gripping mechanism carried by said cylinder arranged to hold a sheet of paper to be impressed by the type in one direction of reciprocation of said form-bed, a gear on said gripping mechanism, a sector normally out of engagement with said gear, and a cam on said main shaft arranged to rock said sector into and out of engagement with said gear to shift said gripping mechanism and thereby present a blank region of said sheet of paper to be impressed by said type in the opposite direction of reciprocation of said form-bed.
13. In a printing press, the combination with a reciprocatory form-bed, of means to reciprocate said form-bed, a type form carried by said form-bed, an oscillatory impression cylinder connected to oscillate in accordance with the reciprocation of said

form-bed, gripping mechanism carried by said cylinder and arranged to hold the forward edge of a sheet of paper to be impressed by the type when traveling in one direction, means to shift said gripping mechanism to present a blank region of said sheet to be impressed by said type in the opposite direction of reciprocation, and means operative from within said cylinder and extending transverse to the movement of the sheet arranged to hold the opposite edge of said sheet during the second impression thereof.

14. In a printing-press, the combination with an oscillatory cylinder, of means to hold a sheet of paper at its forward edge in one direction of movement of oscillation of said cylinder, and means to hold the opposite edge of said sheet of paper during the opposite movement of oscillation, without removing said sheet from said cylinder.

15. In a printing-press, the combination with an oscillatory cylinder, of means to hold the forward edge of a sheet of paper in one direction of oscillation of said cylinder, fixed pneumatic means on said cylinder operative to engage the opposite edge of said sheet in the opposite direction of movement of oscillation of said cylinder, and means embracing said cylinder arranged to determine the operative position of said pneumatic means.

16. In a printing-press, the combination with an oscillatory cylinder, of means to hold one edge of a sheet of paper in one direction of oscillation of said cylinder, means to form a partial vacuum beneath the outer edge of said sheet to hold said sheet in the opposite movement of oscillation of said cylinder, and movable means embracing said cylinder arranged to determine the operative position of said pneumatic means.

17. In a printing-press, the combination with a cylinder, of means to hold one edge of a sheet of paper during a portion of the rotative movement of said cylinder, means to shift said paper with respect to the surface of said cylinder, while in contact with the surface of said cylinder, and pneumatic means to hold the opposite edge of said sheet during the balance of movement of said cylinder.

18. In a printing-press, the combination with an oscillatory cylinder, of gripping mechanism arranged to hold one edge of a sheet of paper during a portion of the oscillation of said cylinder, means to shift said gripping mechanism to shift said sheet relative to the surface of said cylinder, and means to form a partial vacuum local to the opposite edge of said sheet to hold said paper during the balance of oscillation of said cylinder.

19. In a printing-press, the combination with an oscillatory cylinder, of gripping

mechanism arranged to hold a sheet of paper during a portion of the oscillation of said cylinder, means to shift said gripping mechanism, to shift said sheet with respect to the surface of said cylinder, and pneumatic means arranged to hold the opposite edge of said sheet during the reverse movement of oscillation of said cylinder, and to release said sheet at a predetermined point in the oscillation of said cylinder.

20. In a printing-press, the combination with an oscillatory cylinder having a series of alined perforations, of gripping mechanism carried by said cylinder arranged to hold one edge of a sheet of paper during the rotation of said cylinder in one direction, means to shift said gripping mechanism to shift said sheet with respect to the surface of said cylinder during said rotative movement, and means to form a partial vacuum in said perforations to hold the opposite edge of said sheet during the reverse rotary movement of said cylinder, and to create pressure in said perforations to shift the edge of said paper from said cylinder at a predetermined point in the oscillation thereof.

21. In a printing-press, the combination with a reciprocatory type form, of an oscillatory cylinder geared to oscillate in accordance with the reciprocation of said type form, gripping mechanism carried by said cylinder and arranged to hold one edge of a sheet of paper during the rotative movement of said cylinder in one direction, to present said sheet to be impressed by the type during said rotative movement, means to shift said gripping mechanism after said sheet has been impressed, to shift said sheet with respect to the surface of said cylinder to present a blank region of said sheet to be impressed by said type in the opposite rotative movement of said cylinder, and pneumatic means to hold the opposite edge of said sheet during said opposite rotative movement of said cylinder, and to blow the edge of said sheet from said cylinder at a predetermined point in the movement of said cylinder.

22. In a printing-press, the combination with a type form, of means to reciprocate said type form, a cylinder connected to be oscillated by the reciprocation of said type form, gripping mechanism carried by said cylinder and arranged to hold one edge of a sheet of paper during the rotative movement of said cylinder in one direction, to present said sheet to be impressed by the type, means to shift said gripping mechanism to shift said sheet with respect to the surface of said cylinder, during said rotative movement, after being impressed, to present a blank region of said sheet to be impressed by said type during the opposite rotative movement of said cylinder, pneumatic mechanism arranged to engage the opposite edge of said

sheet during said opposite rotative movement of said cylinder, and means to actuate said pneumatic mechanism at selective regions in the movement of said cylinder, to engage and release said sheet.

23. In a printing-press, the combination with feeding mechanism, of an impression cylinder, a reciprocatory form-bed, type carried by said form-bed, means connected to oscillate said cylinder in accordance with the reciprocation of said form-bed, means to carry a sheet on said cylinder to be impressed on one side by said type at each rotative movement of oscillation of said cylinder, and means to deliver the printed sheet blank side down at the end of the machine from which it is fed.

24. In a printing-press, the combination with feeding mechanism, of an impression cylinder, a reciprocatory form-bed, type carried by said form-bed, means connected to oscillate said cylinder in accordance with the reciprocation of said form-bed, means to carry a sheet on said cylinder to be impressed on one side by said type at each rotative movement of oscillation of said cylinder, and means to deliver each printed sheet at the end of the machine from which it is fed, with its blank side down.

25. In a printing-press, the combination with an oscillatory impression cylinder having a slot, of a reciprocatory type form cooperative with said cylinder, to impress a sheet to be printed, gripper arms carried by said cylinder and arranged for oscillation with respect thereto, means on said arms extending through said slot arranged to limit the oscillation of the reverse rotative movement of relative oscillation of said cylinder and said arms to shift said sheet with respect to the face of said cylinder, pneumatic gripping mechanism arranged to hold the opposite edge of said sheet during the reverse rotative movement of oscillation of said cylinder, and to present a blank portion of said sheet to be impressed by said type during said reverse rotative movement of said cylinder, and means to discharge said printed sheet from said cylinder.

26. In a printing press, the combination with an oscillatory impression cylinder, of a reciprocatory type form cooperative with said cylinder to impress a sheet to be printed, gripper arms carried by said cylinder arranged for oscillation with respect thereto, means on said arms arranged to limit the reverse rotative movement of relative oscillation of said cylinder and said arms to shift said sheet with respect to the face of said cylinder, gripping mechanism arranged to hold the opposite edge of said sheet during the reverse rotative movement of oscillation of said cylinder and to present a blank portion of said sheet to be impressed by said type during said reverse rotative

movement of said cylinder, and belts to discharge said printed sheet from said cylinder.

27. In a printing press the combination with an oscillatory impression cylinder, of a reciprocatory type form cooperative with said cylinder to impress a sheet to be printed, gripper arms carried by said cylinder arranged for oscillation with respect thereto, means on said arms arranged to limit the reverse rotative movement of relative oscillation of said cylinder and said arms to shift said sheet with respect to the face of said cylinder, and gripping mechanism arranged to hold the opposite edge of said sheet during the reverse rotative movement of oscillation of said cylinder, and to present a blank portion of said sheet to be impressed by said type during said reverse rotative movement of said cylinder.

28. In a printing press, the combination with a type form, of means to reciprocate said type form, a cylinder connected to be oscillated in accordance with the reciprocation of said type form, gripping mechanism carried by said cylinder and arranged to hold one edge of a sheet during the rotative movement of said cylinder in one direction, to present said sheet in registry with said type, means to shift said gripping mechanism a predetermined extent, to shift said sheet with respect to the surface of said cylinder after being impressed, a blank portion of said sheet being thus held in position to register with said type and to be impressed thereby during the opposite rotative movement of said cylinder, mechanism arranged to engage the opposite edge of said sheet during the opposite rotative movement of said cylinder, and means to actuate the gripping mechanism to engage and release said sheet in a predetermined sequence.

29. In a printing press, the combination with a type form of means to reciprocate said type form, a cylinder connected to be oscillated in accordance with the reciprocation of said type form, gripping mechanism carried by said cylinder and arranged to hold one edge of a sheet during the rotative movement of said cylinder in one direction, to present said sheet in registry with said type, means to shift said gripping mechanism a predetermined extent, to shift said sheet with respect to the surface of said cylinder after being impressed, a blank portion of said sheet being thus held in position to register with said type and to be impressed thereby during the opposite rotative movement of said cylinder, and mechanism arranged to engage the opposite edge of said sheet during the opposite rotative movement of said cylinder.

30. In a printing press, the combination with an oscillatory cylinder, of gripping mechanism arranged to hold said sheet at the front edge during a portion of the os-

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cillation of said cylinder, means to shift said gripping mechanism with respect to said cylinder to present said sheet in a different position on said cylinder, and means on said cylinder arranged to hold the opposite edge of said sheet during the reverse movement of oscillation of said cylinder, and to release said sheet at a predetermined point in the oscillation of said cylinder.

31. In a printing press, the combination with an oscillatory cylinder, of gripping mechanism arranged to hold a sheet of paper during a portion of the oscillation of said cylinder, means to shift said gripping mechanism, to shift said sheet with respect to the surface of said cylinder, and means carried by said cylinder arranged to hold said sheet on said cylinder during the reverse movement of oscillation of said cylinder, and to release said sheet at a predetermined stage in the oscillation of said cylinder.

32. In a printing press, the combination with an oscillatory cylinder having a series of alined perforations, of gripping mechanism carried by said cylinder arranged to hold one edge of a sheet of paper during the rotation of said cylinder in one direction, means to shift said gripping mechanism to shift said sheet with respect to the surface of said cylinder during said rotative movement, and means including said perforations effective to hold the opposite edge of said sheet during the reverse rotary movement of said cylinder and effective to distend the edge of said paper from said cylinder at a predetermined stage of the oscillation thereof.

33. In a printing press, the combination with an oscillatory cylinder, of gripping mechanism arranged to hold one edge of a sheet of paper during a portion of oscillation of said cylinder, means to shift said gripping mechanism to shift said sheet relative to the surface of said cylinder, and means acting upon the under side of said sheet, local to the opposite edge of said sheet to hold it during the balance of oscillation of said cylinder.

34. In a printing press, the combination with a reciprocatory type form, of an oscillatory cylinder arranged to oscillate in accordance with the reciprocation of said type, means to feed a cut sheet, and position its edge in a predetermined relation with said cylinder to be impressed by said type, and means on said cylinder arranged to shift said sheet to present a blank region thereof in such predetermined registry with said cylinder as to be impressed by said type in spaced relation adjacent to said first impression during the return movement thereof.

35. In a printing press, the combination with an oscillatory cylinder, of a type form, means to hold a sheet at its forward edge in

one direction of movement of oscillation on said cylinder, said sheet being arranged to receive two impressions side by side, means to shift said sheet on said cylinder after being once impressed, and means to hold the opposite edge of said sheet during the opposite movement of oscillation to affect an impression upon a blank region of said sheet.

36. A printing press having reciprocatory type, of an oscillatory cylinder operative to present cut sheets in predetermined registry with said type, and means to engage said sheets adjacent to their forward edges to register them in different positions around the periphery of said cylinder, to receive separate impressions upon the same side of said sheet by the same type, with a predetermined space between said impressions.

37. A printing press having a reciprocatory form, arranged to make a plurality of impressions upon different regions of the same side of a cut sheet, by the same type, means to feed cut sheets into a predetermined registry with said type, and means operative to grip said sheet adjacent to its forward edge and to hold it in one position to receive an impression by said type and to shift said sheet longitudinally of the press to a position to be impressed at another region by said type, and means operative to hold the opposite edge of said sheet during the second impression.

38. A printing press having means to separately impress different regions on the same side of cut sheets during each cycle of the press mechanism, and means to grip and release the opposite edges of said sheets at predetermined intervals.

39. In a printing press, the combination with an oscillatory cylinder having perforations in its peripheral wall connected with an air conduit, and a blanket embracing said cylinder and having apertures registerable with selected apertures in said cylinder.

40. In a printing press, the combination with an oscillatory cylinder having perforations in its peripheral wall connected with an air conduit, a blanket embracing said cylinder and having apertures registerable with selected apertures in said cylinder, and means operative to adjust said blanket on said cylinder.

41. In a printing press having a cycle of operation and making a plurality of impressions on a single sheet during each cycle, a single type form, means to bring one portion of said sheet and said form into registry with each other during one portion of the cycle of said press to enable an impression to be taken on said portion of said sheet from said form, means engaging the forward end of said sheet to bring another portion of said sheet and said form into registration with each other to enable an impression to be taken on such portion of the sheet

during another portion of said cycle of said press, and means to take impressions from said form on said portions of said sheet at proper times during the said cycle.

42. A printing couple, one member of which is cylindrical, and a single type form carried by the other member of the couple, said cylindrical member having means carried entirely thereby for attaching a sheet to it, said means being adapted to shift the sheet circumferentially on the cylinder to thereby present the sheet to the type form for two separated impressions.
43. A printing couple, one member of which is cylindrical and having an impression surface thereon, and the other member of which carries a single type form, and means carried entirely by the first named member adapted to shift the sheet circumferentially therearound said shifting means operating when the type form carrying member and the impression surface of the cylindrical member are out of contact with each other.
44. A printing couple, one member of which is cylindrical and rotatable about an axis, and having also an impression surface, and means rotatable about said axis adapted to shift a sheet circumferentially partially around said cylindrical member whereby different portions of the same sheet are placed on the impression surface of the cylindrical member.
45. The printing couple one member of which is cylindrical and carries only a single impression surface, and the other member of which is a single type form separate from the cylindrical member but contacting therewith in making the impressions, said cylindrical member having means for positioning the sheet upon it and being also adapted to shift the sheet circumferentially of the cylindrical member, thus permitting two separated impressions from the single form on the same side of the sheet.
46. A printing couple, one member of which is cylindrical, and means carried entirely by said cylindrical member adapted to grip and shift a sheet on said member, said means being bodily movable angularly and circumferentially relatively to said cylindrical member.

47. In a printing press, the combination

with an impression cylinder and a type carrying member, of means rotatable about the same axis as the cylinder, said means being adapted to grip and shift a sheet circumferentially around the cylinder, said means acting to shift the sheet between the periods when the impression cylinder and type carrying member are in contact.

48. A printing couple, one member of which is cylindrical, grippers carried by said cylindrical member and means for moving said grippers circumferentially of the cylindrical member, said means comprising a shaft having a pinion thereon, a toothed segment coöperating with said pinion, a cam gear and an arm connected with said segment and controlled by the cam gear.

49. In a mechanism adapted to print on separate sheets, a printing couple, one member of which is cylindrical, and a single type form carried by the other member of the couple, said cylindrical member having means carried entirely thereby for attaching a sheet to it, and means for causing intermittent printing impressions between the type and a sheet carried by the cylinder to form an impression on the sheet, and mechanism for changing the relative positions of the sheet and the type form between said intermittent printing impressions, whereby separated impressions are received by the surface of the sheet from the single type form, while on the cylindrical member.

50. In a mechanism adapted to print on separate sheets, a printing couple, one member of which is cylindrical, and a single type form carried by the other member of the couple, said cylindrical member having means carried entirely thereby for attaching a sheet to it, and mechanism for shifting the surface of the sheet in a curvilinear path relative to the single type form between the printing impressions, whereby the sheet is impressed on the same surface by the single type form at separated portions.

In witness whereof, I have hereunto set my hand this 24th day of June, A. D., 1910.

CHARLES T. BLACKFORD.

Witnesses:

ALSTON B. MOULTON,
E. C. OWEN.