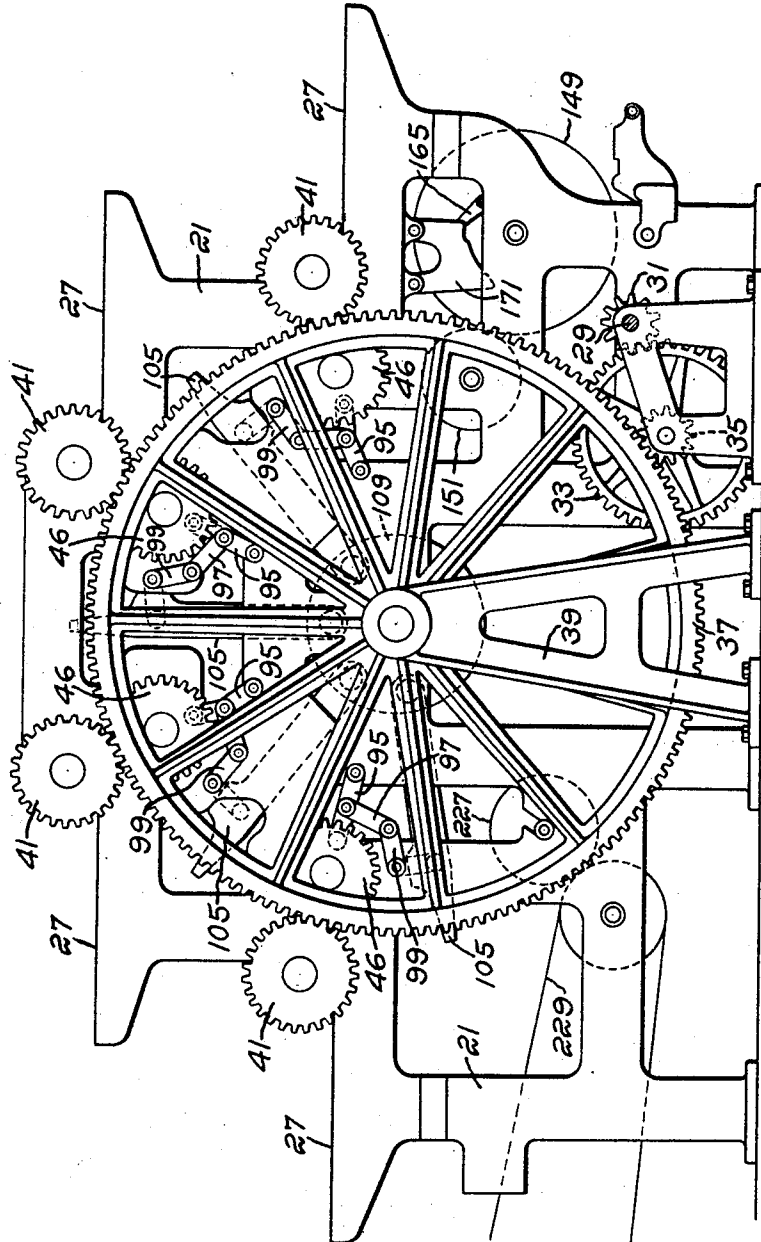


1,399,360.

Patented Dec. 6, 1921.

9 SHEETS—SHEET 1.

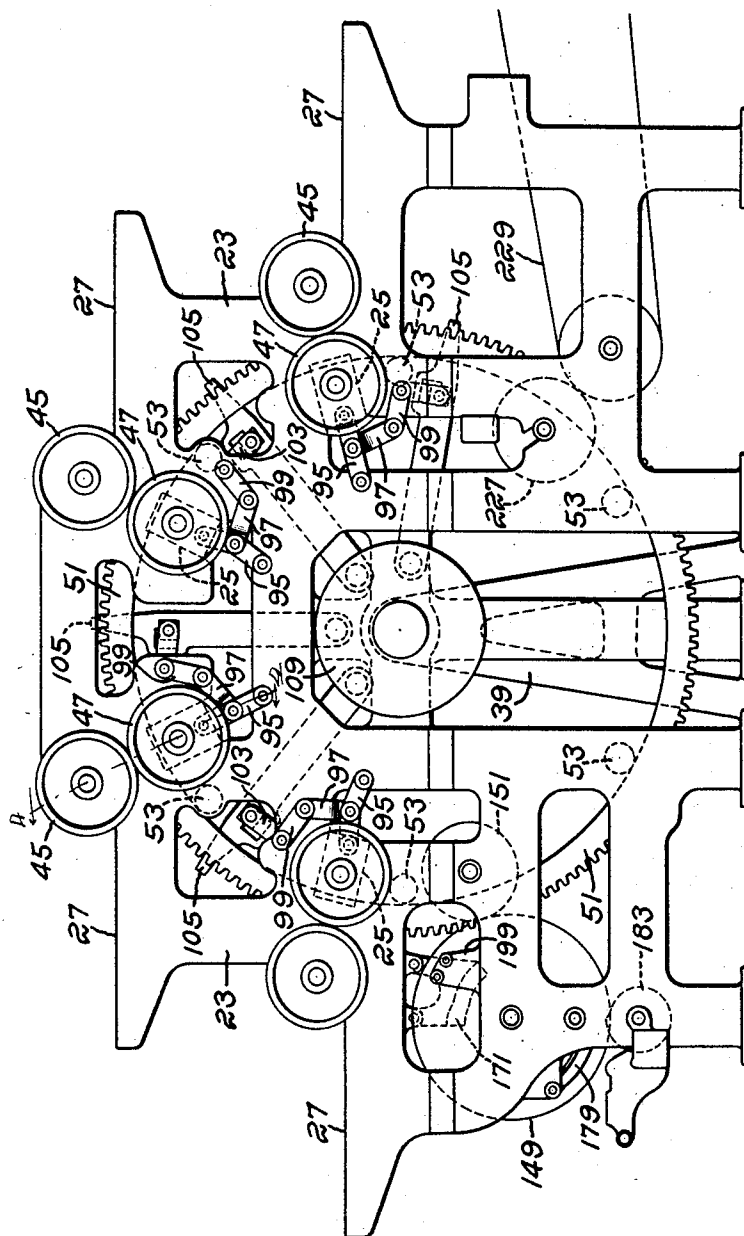
Fig. 1.



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9 SHEETS—SHEET 2.



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9 SHEETS—SHEET 3.

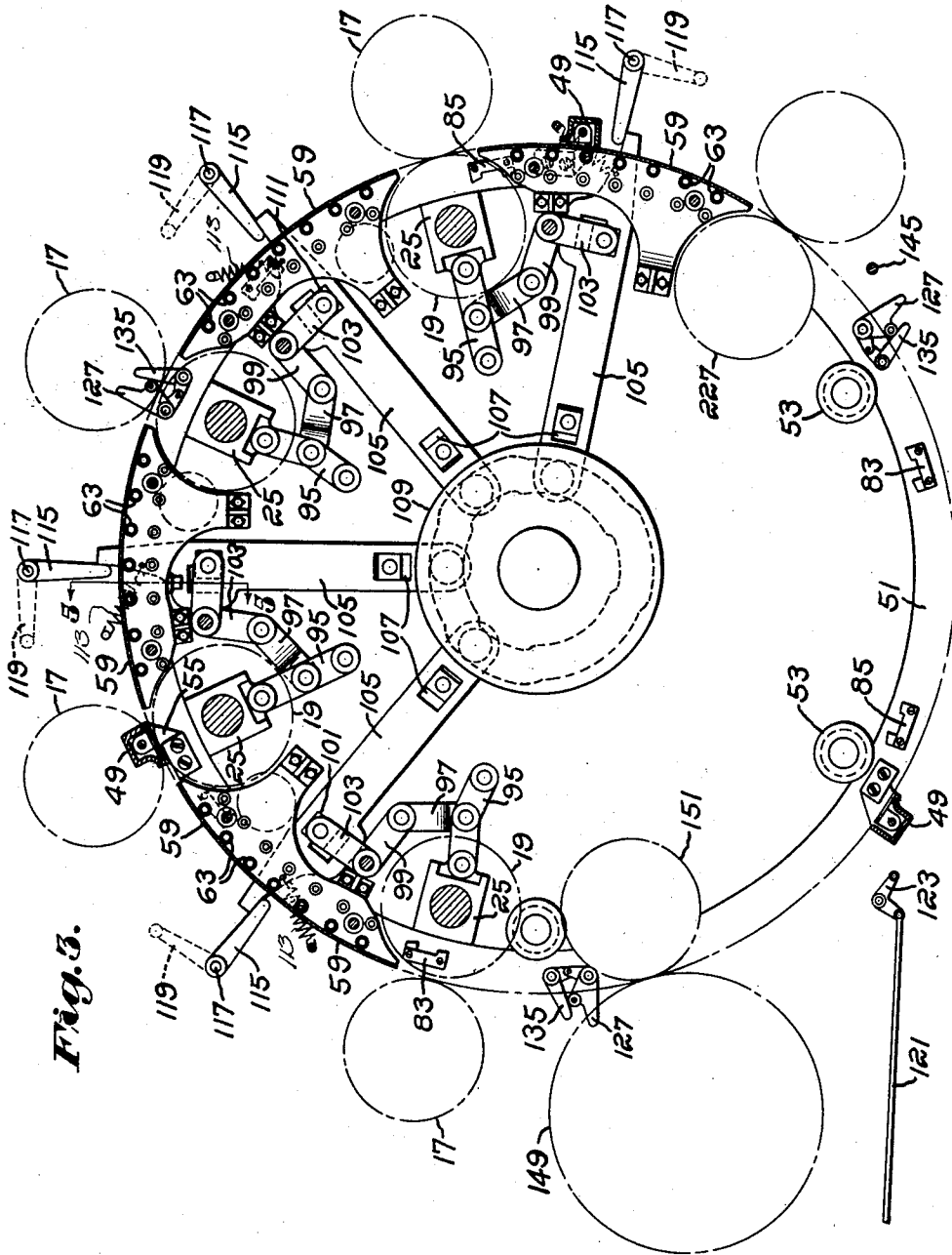


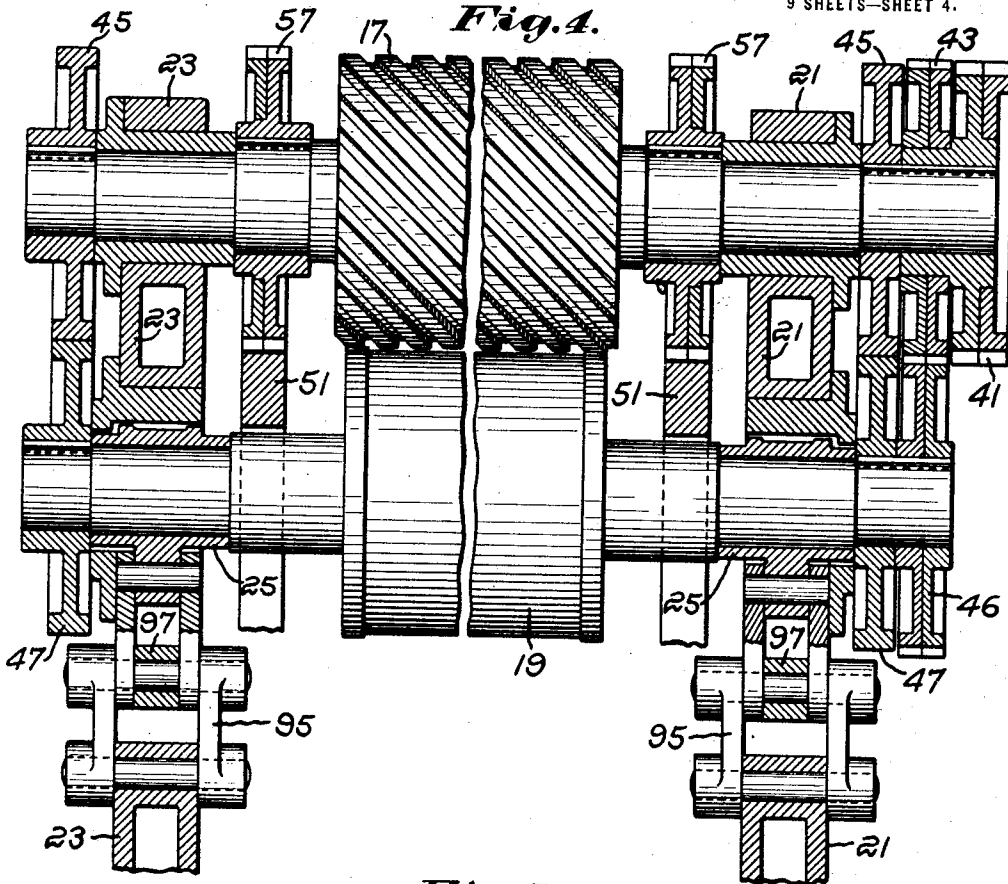
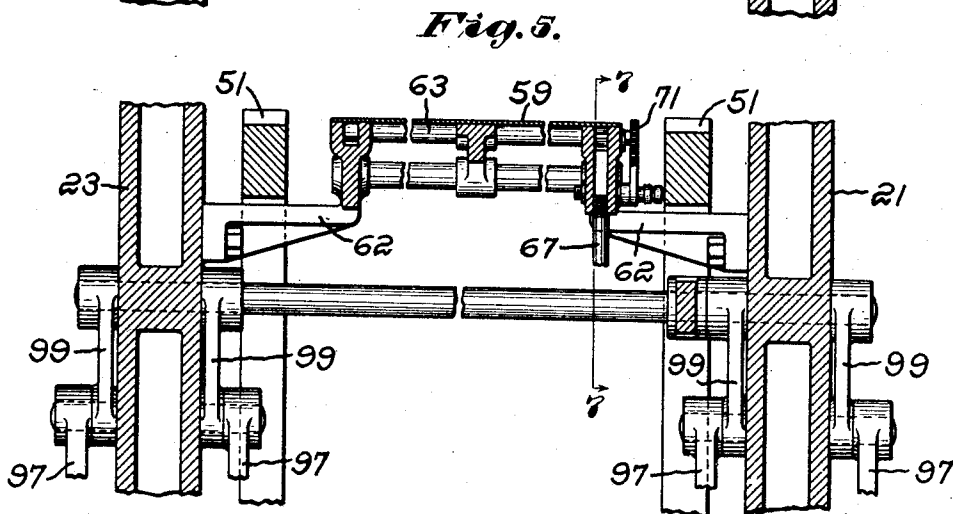
Fig. 3.

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9 SHEETS—SHEET 4.



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Patented Dec. 6, 1921.

9 SHEETS—SHEET 5.

Fig. 6.

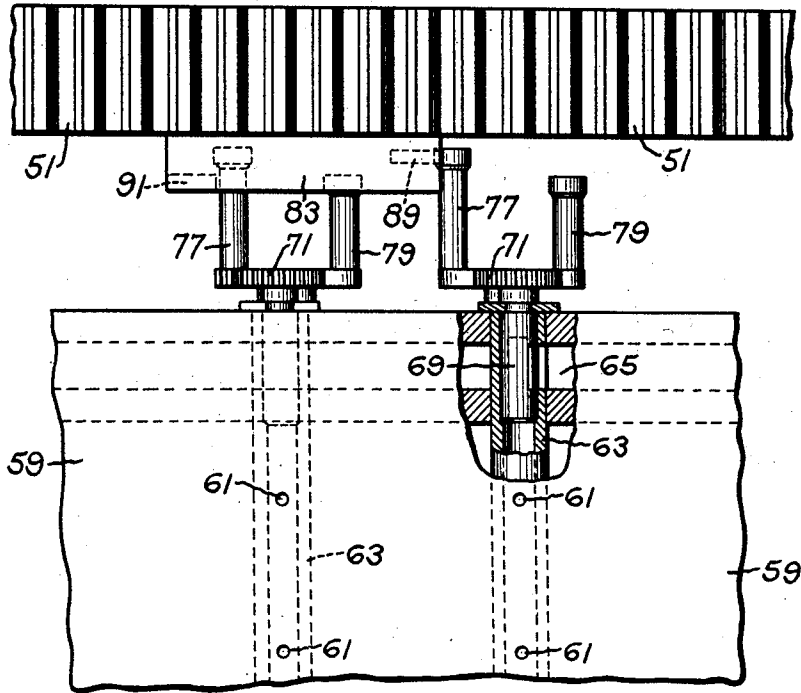


Fig. 7.

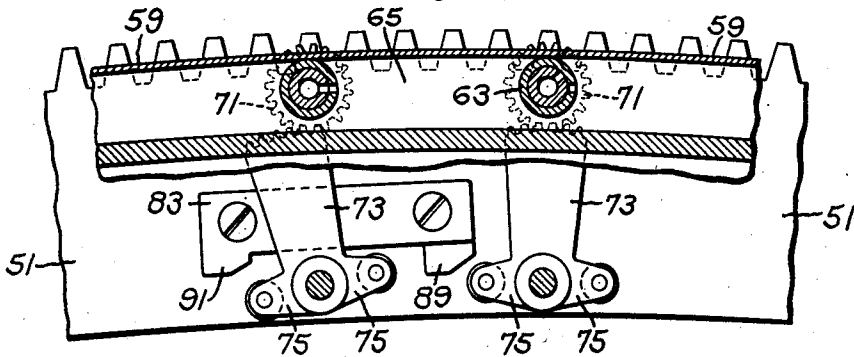
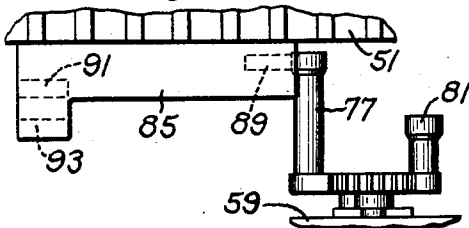


Fig. 8.



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PRINTING PRESS.

APPLICATION FILED APR. 19, 1919.

1,399,360.

Patented Dec. 6, 1921.

9 SHEETS—SHEET 6.

Fig. 9.

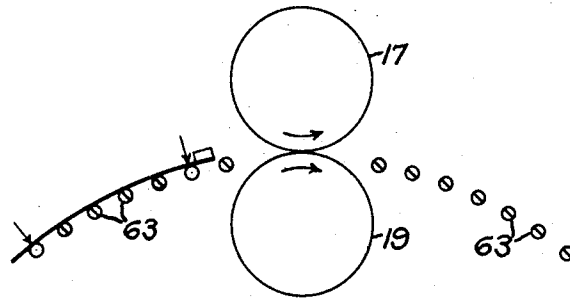


Fig. 10.

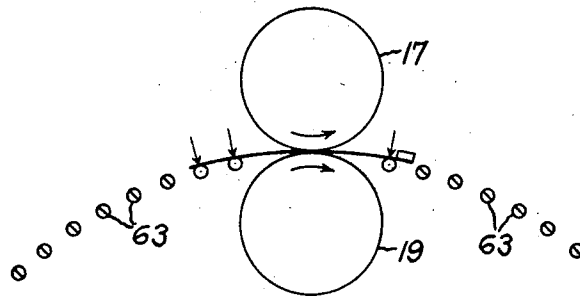
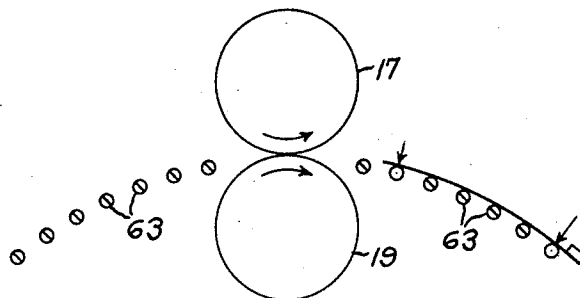


Fig. 11.



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Patented Dec. 6, 1921.
9 SHEETS—SHEET 7.

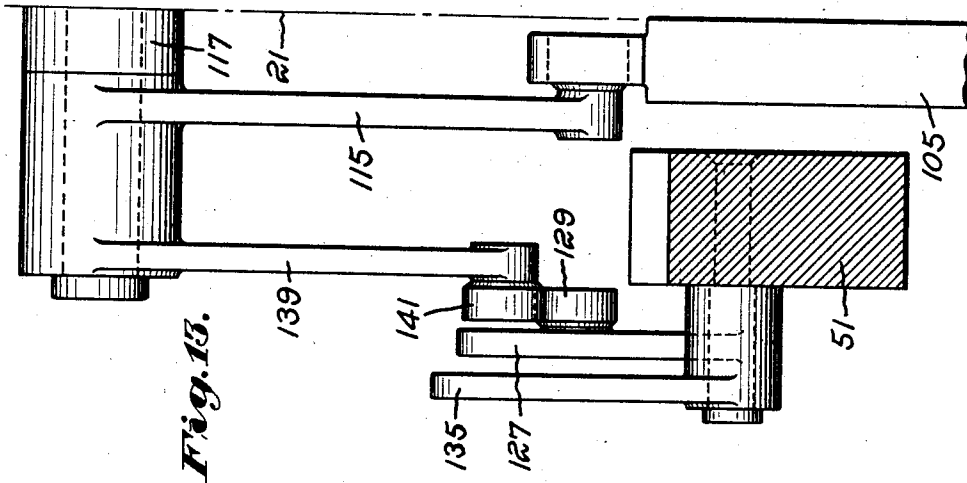


Fig. 13.

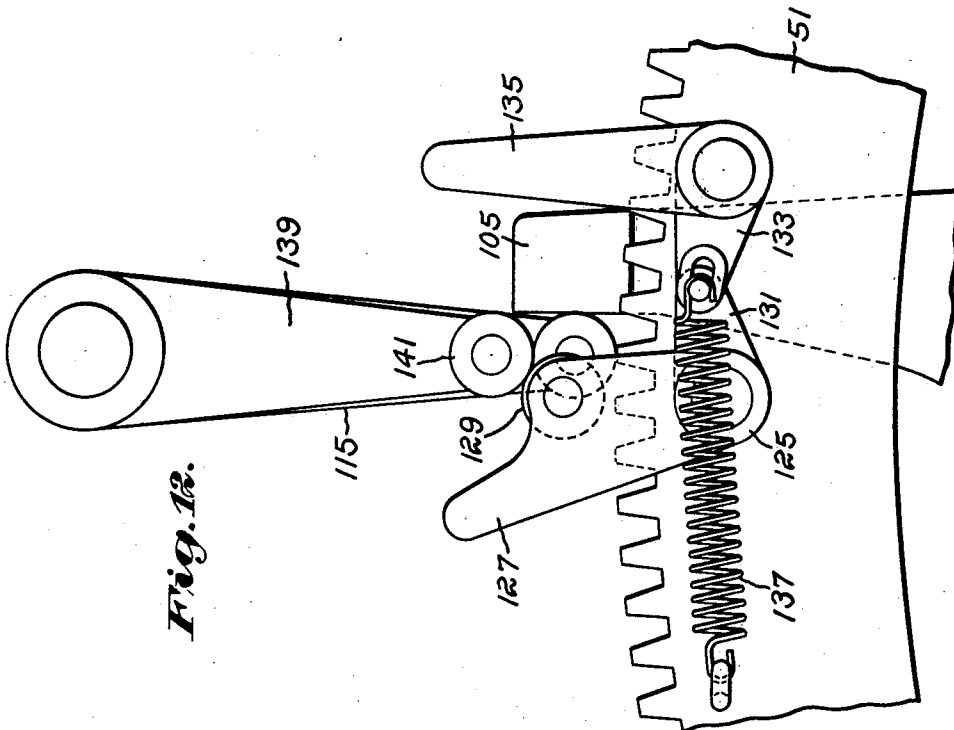


Fig. 12.

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 9 SHEETS—SHEET 8.

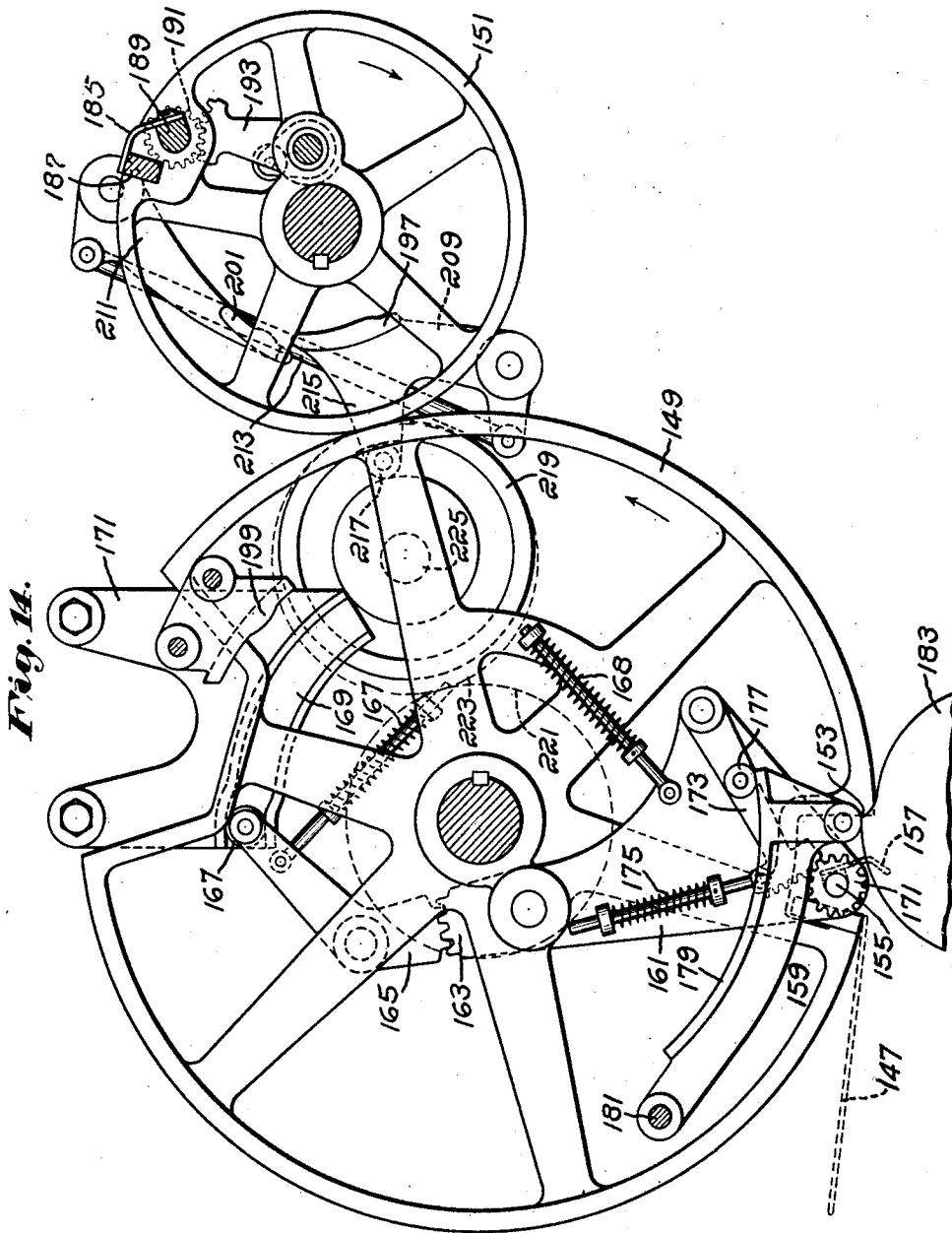


Fig. 14.

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Patented Dec. 6, 1921.
9 SHEETS—SHEET 9.

Fig. 15.

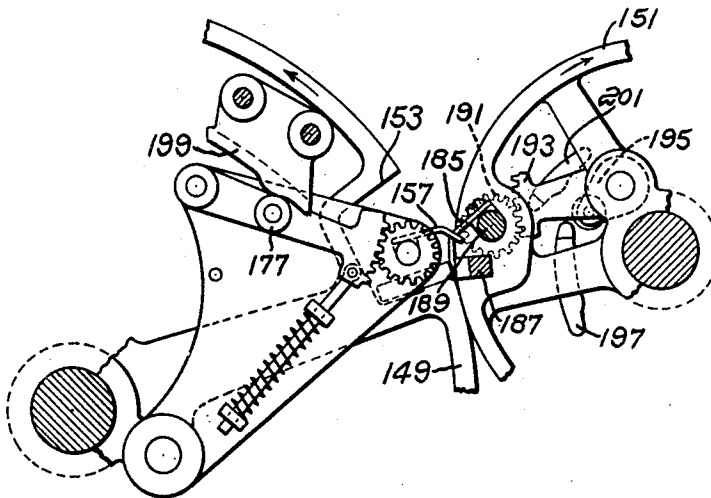
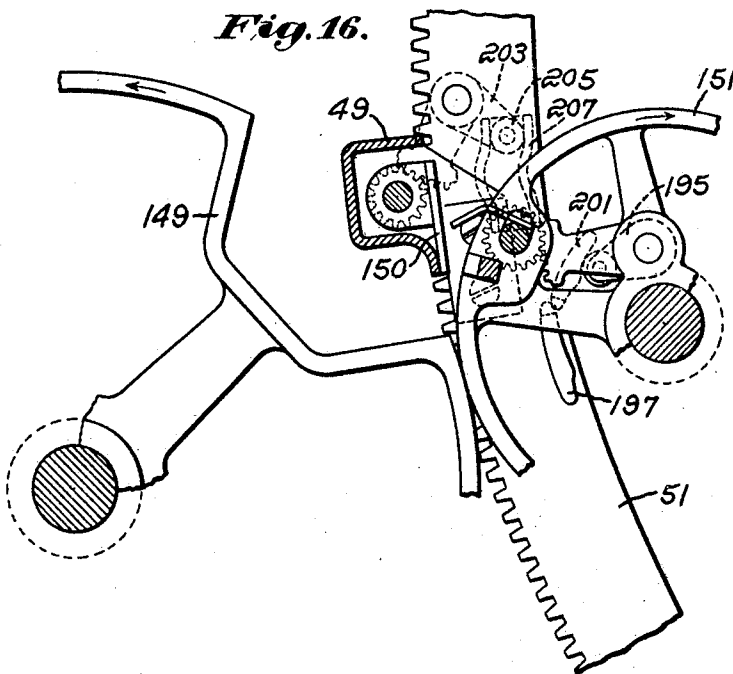


Fig. 16.



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UNITED STATES PATENT OFFICE.

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PRINTING-PRESS.

1,399,360.

Specification of Letters Patent.

Patented Dec. 6, 1921.

Application filed April 19, 1919. Serial No. 291,216.

To all whom it may concern:

Be it known that I, CHARLES A. MEISEL, a citizen of the United States, and a resident of Dorchester, county of Suffolk, State of Massachusetts, have invented an Improvement in Printing-Presses, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to printing presses and in its more specific aspects to presses wherein a plurality of impressions are made on a single sheet of paper, as in color work. As an illustrative embodiment of my invention, I here show a four-color, rotary press and shall describe the same in detail, reserving for the claims the statement of the novel principles exemplified thereby. The following specific description of an example of my invention may be taken in connection with the accompanying drawings wherein:

Figure 1 is a side elevation of the press as seen from the left, parts being omitted and left being understood as the left hand of a person facing in the direction in which paper passes through the press;

Fig. 2 is a side elevation as seen from the right;

Fig. 3 is a general diagram, the point of view being from the right;

Fig. 4 is a section on line 4—4 of Fig. 2 the gear 47 being omitted;

Fig. 5 is a section on line 5—5 of Fig. 3;

Fig. 6 is a fragmentary plan view illustrating the operation of the air boxes;

Fig. 7 is a section on line 7—7 of Fig. 5;

Fig. 8 is a detail of the valve-operating means for the air ducts adjacent a printing couple;

Figs. 9—11 are diagrams illustrating the operation of the air ducts;

Fig. 12 is a diagram, chiefly in side elevation, of the receiving cylinder and the transfer cylinder;

Fig. 13 is a fragmentary view of the same parts in another phase;

Fig. 14 is a fragmentary view, chiefly in side elevation, illustrating the transfer of paper from the transfer cylinder to the main gripper bar;

Fig. 15 is a detail of throw-off mechanism; and

Fig. 16 is another detail showing the parts as seen from the right of Fig. 15.

Referring to the illustrative embodiment of my invention illustrated in the accompanying drawings, I may utilize a series of printing couples, in number corresponding to the desired number of impressions, and I have herein (see Fig. 3) shown four such couples, each embodying a plate roll 17 and an impression roll 19. These couples are preferably ranged about a circle in such manner that the lines of contact between the rolls when they are in printing position correspond to the elements of an imaginary cylinder, the word elements being used in the geometrical sense. Preferably the rolls are confined to the upper half of the cylinder. The plate rolls 17 may be journaled in suitable frames 21 and 23 (see Figs. 1, 2 and 4) and the impression rolls 19 are journaled in suitable boxes 25 slidable in such frames. The frames 21 and 23 are also provided with suitable supporting surfaces 27 for inking mechanism of desired type, not shown.

For driving the rolls, I here illustrate a train of gearing best shown in Fig. 1 and comprising a shaft 29 adapted to be driven by any suitable form of motor or prime mover and having a pinion 31 meshing with a gear wheel 33 with which turns the pinion 35 meshing with the large gear wheel 37 the shaft of which may conveniently be substantially axial of the cylindrical surface about which the printing couples are disposed, this shaft being herein shown as journaled in the frame 21 and in an auxiliary support 39. The large gear 37 meshes with gear wheels 41 which, as shown in Fig. 4, are fast to the ends of the journals of plate rolls 17. The journals of these rolls also carry gear wheels 43 adapted to mesh with similar gears 46 on the journals of impression rolls 19 to drive the same. I may also provide the flat-faced wheels 45 and 47 at opposite ends of the journals of rolls 17 and 19, respectively, the faces of these wheels bearing on each other when the impression roll 19 is in the position shown in Fig. 4 and serving to hold the parts in proper relation to insure the required action of the gears.

Referring again to Fig. 3, the paper is carried through the printing couple by suitable gripper bars 49 which travel orbitally, herein through a circular path. The travel of the gripper bars may be effected in any desired manner but preferably, as herein shown, they are carried by a pair of rings 51 (see Fig. 4) supported internally by rolls 53 mounted on the frames. These rings may conveniently take the form of annular gears for the purpose presently to be described, and desirably the pitch circle of the gears is of substantially the same diameter as the circle about which the printing couples are ranged. The gripper bars 49 are supported by means of suitable brackets 55, as shown in Fig. 3, exteriorly of the gears in such manner that the paper is held substantially on the pitch line. The gears 51 correspond to the bases of the cylinder of which the lines of contact of each printing couple are elements and with the gripper bars form a sort of lantern wheel of which the gripper bars are the trundles.

To move the gripper bars orbitally to carry the paper through the printing couples in succession, the annular gears 51 may be revolved and herein, as best shown in Fig. 4, they take motion from gears 57 mounted on the journal of the plate cylinder 17 and turning with it.

To support the paper in its passage through the pairs and to control the handling thereof in the efficient manner hereafter more fully to be explained, supporting surfaces 59 (see Fig. 3) are provided between successive printing couples, these surfaces preferably taking the form of cylindrical segments and lying in the cylindrical path swept out by the gripper bars 49 as the gears 51 rotate. The lines of contact between the plate and impression rolls of the printing couples lie in this same cylindrical surface between successive supporting surfaces 59.

Herein the supporting surfaces 59 take the form of air boxes and have ducts 61 (Fig. 6) opening through the same to permit suction to be applied to the paper so that it may be pneumatically controlled in its passage through the pairs.

The construction of the air box chosen for purposes of illustration may be best understood from Figs. 5, 6 and 7. The supporting surface 59, from which open ducts 61, is formed of a suitable plate supported by the brackets 62 beneath which may extend the transverse pipes 63 having openings communicating with the ducts 61. The pipes 63 open to a lateral chamber or header 65 from which leads (Fig. 5) a pipe 67 through which air may be drawn by any suitable form of pump (not shown). The ends of the pipes within the header are provided with valves 69 (Fig. 6), conveniently of the

rotary plug form, permitting any pipe 63 to be put in communication with the header 65 and consequently with the source of suction.

For controlling the valves, each one may be provided with a pinion 71 with which meshes a sector gear 73 pivoted on the side of the air box and having a pair of arms 75 on which are mounted studs 77, 79 and 81, as the case may be, which studs may be engaged by suitable cams 83 or 85 (Figs. 6, 7 and 8) carried by the annular gears 51. As will clearly be understood from Fig. 7, if the left hand arm 75 carrying the stud 77 is depressed, as shown at the left hand side of Fig. 7, the sector will rotate the pinion in such a way as to open the valve and place pipe 63 in communication with header 65. If the stud 79 is then struck to depress the right hand arm 75, the sector 73 will return to the position shown at the right hand side of Fig. 7 and the valve will be closed, as there shown.

It will be understood that cams are suitably placed upon the annular gears 51 so as to provide for proper pneumatic control of the paper as it is carried through the press by the gripper bars 49. While the nature of this control may be varied, I preferably utilize two cams 83 and 85 for each gripper bar and control the sheet of paper in the manner diagrammatically illustrated in Figs. 9-11. In these figures the various pipes 63 are diagrammatically illustrated as circles, those having a diagonally placed diameter drawn therein representing pipes in which there is no suction operating through the ducts 61. The open-centered circles represent pipes through which air is being drawn and the arrows indicate that pressure is being exerted on the sheet.

All the sector gears 73 controlling the pipes are herein provided with long studs 77 on one arm, and the majority with studs 79 of intermediate length on the other arm. For controlling those pipes which are immediately adjacent to a printing couple on opposite sides of the same, however, I provide on the corresponding arm of the sector gear a short stud 81 (see Fig. 8), thus permitting a control for these valves different from that for the others.

Corresponding to each gripper bar, I may provide two cams 83 (Fig. 7) and 85 (Fig. 8). The cam 83 is secured to annular gear 51 adjacent the gripper bar and may be provided with a rise portion 89 at its forward end adapted to cooperate with the studs 77 on all the valve-operating sectors, and on its rear end with a rise 91 adapted to cooperate with the studs 79 on the majority of the sectors. Thus, as the gripper bar passes over the supporting surfaces 59, the cam rise 89 opens up a series of ducts 61 close to the front end of the paper and

as the gripper bar passes onward over the next series of ducts, this series is opened, and the one just opened is, with certain exceptions to be noted, closed by rise 91:

5 The cam 85 (Fig. 8) is provided with rises 89 and 91 for a like purpose and also with a rise portion 93 cooperating with the studs 81 controlling the series of ducts next adjacent to the printing couples on either
10 side. This cam is positioned adjacent the rear end of the sheet, so that as the rear end moves over the supporting surface 89 a series of ducts is always open to exert a suction to hold down that rear end, and
15 as the end passes free of them they are closed.

The leading cam 83, as the paper passes through the printing couple, operates to open the series of ducts on either side thereof, as illustrated in Fig. 10. Since the sectors controlling these ducts are formed as shown in Fig. 8 with short studs 81 instead of studs of intermediate length 89, the rise 91 of the cam does not operate to close the
25 same so that these series of ducts remains open, tensioning the paper between them as it is operated on by the printing couple, until the rear end of the sheet passes, bringing with it the cam 85 (Fig. 8). This
30 cam is provided with the rise 93 which closes the valves controlling these ducts.

Referring to Figs. 9, 10 and 11, it will thus be seen that the pneumatic control here illustrated provides for holding the
35 paper down at both ends of the sheet, at its rear end and immediately adjacent the gripper bar, as shown in all three figures. Furthermore, while the paper is passing through the couple it is held at opposite
40 sides of the couple, as illustrated in Fig. 10. At this time, as always, it is also held at its front end, herein (see Fig. 10) by the series of ducts immediately to the right of the printing couple, and at its rear end as
45 shown.

The construction illustrated and described exemplifies a construction wherein the paper is fed to a printing couple over a convex surface, and means are provided for exerting a drag on the rear end of the sheet which will tension it over this convex surface, thus holding it perfectly smooth and, if a series of impressions are to be made thereon as in the present instance, insuring
55 proper registration. The pneumatic control described and illustrated, furthermore holds the sheet perfectly smooth just where it is being operated on by the couple. It will furthermore be clear from the description
60 of the press already given that while the sheet of paper is fed with a smooth and steady motion, herein through a circular path permitting constant speed and a regular constant change of direction, the various
65 printing couples, such as may be used to

print different colors, are independent. Thus, provision is made for a proper make-up for each impression since each plate cylinder 17 cooperates with an impression cylinder 19 independently of the rest.

The impression roll 19 should, of course, be pressed against the plate cylinder 17 solely when paper is interposed between them, and it is for this purpose that the roll 19 is journaled in the boxes 25 (Fig. 3) mounted to slide substantially radially in the frames 21 and 23. For operating the roll, I may provide toggles 95 so arranged that when straightened, as shown in the second and fourth instances in Fig. 3, the impression roll 19 will be pressed upwardly against the plate roll 17 and when broken will be drawn inwardly out of contact therewith, as shown in the first and third instances. For operating the toggle there may be provided a link 97 worked by a bell crank 99 secured at one end to the link 97 and having at the other end a square box 101 received in a recess 103 in the substantially radially extending arm 105. The arm 105, which may be guided on the frame at 107, may be oscillated substantially radially by means of a suitably grooved cam 109 conveniently centrally located and carried by the shaft of the large gear 37. The recess 103 in the arm, which receives the box 101 secured to bell crank 99, is provided with a shoulder 111, marked on the upright arm in Fig. 3, which normally confines the box 101 in such manner that it moves radially with the arm, the arm being drawn to the left in Fig. 3 by a spring 113 normally to hold the shoulder in engagement with the box 101. Thus, in the usual operation of the press, as the arm 105 is oscillated by the cam the bell crank 99 will be rocked to break toggle 95 at the proper time to draw the impression roll 19 out of contact with the plate roll 17.

To permit the impression to be thrown out for an indefinite time, the levers 115 may be provided, pivoted at 117 in a side frame (see Figs. 12 and 13) and adapted to engage with the upwardly extending ends of the arms 105. As indicated in Fig. 3, the levers 115 may conveniently be rocked by means of the handles 119 on the outer side of the frame to throw arms 105 to the left against the pull of springs 113 and thus to disengage the square box 101 from the shoulder 111 and permit it to remain stationary in the larger portion of the recess 103 as the arm oscillates. The box 101 is thus not drawn downwardly with the arm from the position shown in the left hand example in Fig. 3, the toggle 95 is not straightened and the impression roll 19 is not brought up against the plate roll.

I may also, as herein shown, operate the arms 105 in such a way as to prevent the

impression roll from being thrown in in instances where the paper has been inaccurately fed to the press. For this purpose I may utilize any desired form of detector mechanism associated with the means for feeding the press, such mechanism not being here shown, and I arrange for this mechanism to operate a connecting rod 121 (shown in Fig. 3), which in turn swings the bell crank 123 counterclockwise from the position shown in that figure when a sheet is inaccurately fed. The bell crank 123 serves as a trip to position means for operating the throw-off mechanism, which means I will next describe, referring more particularly to Figs. 12 and 13.

Pivoted on the gear 51 is a lever 125 having a nose portion 127 adapted to cooperate with a cam roll on the bell crank lever 123 and carrying roll 129. The lever 125 is also provided with an arm 131 having a pin and slot connection with the arm 133 of another lever also pivoted on the annular gear 51 and having an outwardly extending arm or nose portion 135 for a purpose presently to be described. A spring 137 is provided, connected to the pin connecting the two levers 125 and 133, and acting to hold the two levers in position as they are moved over from one side to another of dead center.

In Fig. 3 the two levers 125 and 133 are shown in their normal position. In the ordinary course of operation of the press, the nose portion 127 of lever 125 passes freely over the arm of bell crank 123. If, however, the latter is rocked to throw an arm thereof upwardly, it makes contact with the nose portion 127, rocks the lever 125 counterclockwise and throws the connected arms of the two levers over to the other side of dead center to the position shown in Fig. 12, in which position they are held by spring 137. The hub of lever 115 (Fig. 13), which serves to operate the throw-off arm 105, may be provided with another crank arm 139 having a cam roll 141 adapted to cooperate with the cam roll 129 of lever 125. As will be readily understood from Fig. 12, when the lever 125 is in the normal position shown in Fig. 3, with the two arms 131 and 133 thrown to the other side of dead center, the roll 129 does not make contact with the roll 141 and the impression roll 19 is left to the normal automatic control of the oscillating arm 105. When, however, because of the improper feeding of a sheet the parts are positioned as shown in Fig. 12, the roll 129 will wipe over the roll 141, swinging crank arm 139 and consequently arm 115 to the right, viewing Fig. 12, thus moving arm 105 in the manner already described and acting to interrupt the action of the means which positioned the impression roll 19. Each impression cylinder in turn is thus drawn out or rather held out to prevent its action, this

compensating for the inaccurate feed of the paper in the first instance. As the trip passes, the spring 113 will again draw the arm 105 to the left, permitting the shoulder 111 to engage box 101 and the parts to resume their normal automatic operation. When the trip has passed the last printing couple, the outwardly extending arm 135 of lever 133 engages a fixed stop 145 which returns the parts to the position shown in Fig. 3.

Beside the various advantages which will appear to those skilled in the art in the construction of the press as described, floor space is saved by placing the couples in a circle, as described, and particularly by grouping them around a considerable arc of this circle, such as a semicircumference, as herein shown. In this instance the paper is carried around in a circular orbit and must be delivered to and carried away from this orbit in a direction cutting the circular orbit in the manner of a secant. The paper must thus be diverted from this path and delivered tangentially thereto to permit it to be taken by the gripper bars 49 and carried through the press. I shall next describe the particular feeding mechanism which I have chosen for purposes of illustration and shall here refer more particularly to Figs. 14, 15 and 16.

Any suitable feeding in mechanism may be utilized in connection with my press and I have not attempted to show the same herein, but the paper is delivered, conveniently against suitable gages, in a plane indicated at 147 in Fig. 14. Briefly to describe the action, it is carried by a receiving cylinder 149 and delivered tangentially to a circular orbit which corresponds to the pitch circle of the annular gears 51 and from thence is taken by a transfer cylinder 151 which also presents it tangentially but from the inner side of the circle in such manner that the gripper fingers 150 (Fig. 16) may close from within upon the same. The initial action of the receiving cylinder will best be understood from Fig. 14.

In the present instance the receiving cylinder 149 and also the transfer cylinder 151 are skeletonized cylinders consisting of a number of wheels having broad aligned rims supporting the paper in the manner of a cylinder. The cylinder 149 may be recessed at 153, as shown at the bottom of Fig. 14, to accommodate gripper shaft 155 on which are mounted the gripper fingers 157 adapted to close down on the part 159, disposed in one edge of the recess, and thus hold thereagainst the sheet of paper which is delivered down the plane 147 tangentially to the cylinder 149 and in overlying position to the element 159.

Preferably the gripper fingers 157 are arranged to swing through a limited arc less

than 180°. In their open position 157, however, it will be noted that they extend outwardly from the periphery of the cylinder 149 and in the counterclockwise rotation of the same would strike the paper on the plane 147 and tear it. I have therefore here shown the shaft 155 as carried by arms 161 eccentrically pivoted at the ends of the cylinder 149, one of which arms is provided with a segmental gear 163 meshing with a similar gear on lever 165 also pivoted to the cylinder and normally positioned by spring 167 with which cooperate springs 168 secured to arms 161. The lever 165, however, carries a cam roll 167 cooperating with a groove cam track 169 supported by a bracket 171 which is on the further frame viewing Fig. 14. It will be understood that if the eccentrically pivoted arm 161 is swung counterclockwise under the influence of springs 168, the shaft 155 carried thereby will be retracted within the circumference of the cylinder 159 and I arrange that it shall be in this retracted position as it approaches the feeding-in plane 147. Consequently, the gripper fingers 157 will not project beyond the cylinder in such manner as to tear the paper. As the gripper passes the end of the paper, however, the arms 161 are so swung as to lower the open gripper out in such a way as to receive the paper and permit the fingers 157 to be closed upon the same. The action of the cam 169 will be apparent from an inspection of Fig. 14 wherein the roll 167 has just passed into the rise portion to lower the grippers.

For operating the gripper fingers 157 the gripper rod 155 may be provided with a suitable pinion 171 with which meshes a sector gear 173 pivoted on the arm 161 and normally held by a spring 175 in such a position as to hold the gripper fingers 157 in open position. The sector 173 may carry a cam roll 177 adapted to run on a track 179 pivoted at 181 on the nearer frame. Since the effect of the eccentric swinging of the arm 161 is to move the cam roll 177 rearwardly, relative to the rotation of the roll 149, just at the time when it is desired to close the gripper fingers, I provide for positioning the track 179 and elevating it at the proper moment to permit it to act on the roll 177 and so actuate the gripper fingers, this being effected by means of a rotary cam 183 having a rise portion positioning the track.

The sheet of paper held by the gripper fingers 157 is then carried in a counterclockwise direction around the receiving cylinder 60 and is then taken by the transfer cylinder 151 in the manner best illustrated in Fig. 15, the sheet being taken by gripper fingers 185 closing inwardly against an abutment bar 187 presented at the surface of the cylinder 151.

As the cylinder 149 comes to proper position to deliver the paper to the transfer cylinder 151, the gripper fingers 157 and 185 come in substantial opposition, as shown in Fig. 15. It will be understood that the fingers 185 and 157 are staggered or out of line transversely of the machine so that they do not interfere. In Fig. 15 the position of the parts is that wherein the fingers 185 have closed upon the paper and the fingers 157 have released it. To understand fully the operation of the transfer, I shall first consider the parts as they would lie in a somewhat earlier phase of their rotation.

The gripper fingers 185 herein are carried by a rock shaft 189 adapted to be moved by a pinion 191 and a pivoted sector gear 193 meshing therewith, the sector gear being oscillated by an arm 195 having a cam roll adapted to cooperate with cam tracks presently to be described. The parts being in the position shown in Fig. 14, with the gripper fingers closed and the cylinder 151 rotating clockwise, the cam roll, as the parts approach the position of Fig. 15, will run over cam track 197, swinging the fingers open. At this time the fingers are opposite the recess 153 in the receiving cylinder, which permits this opening movement. Continued rotation of the receiving cylinder 149 then brings the edge of the paper held by gripper fingers 157 up between the abutment 187 and the open fingers 185. The parts then move to the position of Fig. 15 as the cam roll on arm 195 leaves the track 197, causing the gripper fingers 187 to close down on the sheet of paper. Immediately thereafter the cam roll 177 on the sector controlling gripper fingers 185 comes into cooperation with cam track 199 supported on the nearer frame, viewing Fig. 15, this causing the gripper fingers 157 to be opened and release the sheet of paper to fingers 185. The paper is then carried around the transfer cylinder and delivered by it to the main gripper fingers 150 in the manner best illustrated in Fig. 16.

To release the paper from gripper fingers 185, when it is to be transferred to fingers 150 and gripper bar 49, a cam 201 is provided on which the cam roll on arm 195 rides, throwing open the gripper fingers 185, as illustrated in Fig. 16. The gripper fingers 150 are operated by a pinion and sector gear in a manner similar to the rest, as will be clearly understood from Fig. 16, the sector being oscillated by arm 203 having a cam roll 205 adapted to run in a cam track 207 positioned on the nearer frame, viewing Fig. 16. As will be readily understood from that figure, the parts are so designed that the fingers 150 are thrown open so that the transfer cylinder will carry the edge of the paper in beneath them and they are then closed to grip the edge of the

paper which is thereafter released from the fingers 185 through the lifting thereof by means of cam track 201, as just described.

It will be understood that the transfer of the paper from cylinder 149 to transfer cylinder 151 and from cylinder 151 to the main gripper bars 49 takes place on alternate revolutions of the cylinder 151. I therefore provide means whereby the cam tracks 197 and 201 may cooperate in alternation with the cam roll of arm 195. For this purpose, as best shown in Fig. 14, these tracks are formed on a pair of levers 209 and 211, respectively, pivoted on the farther frame and connected by a link or connecting rod 213 in such manner that when one swings into the path of the cam roll the other swings away therefrom. The lever 209 is also provided with an extension 215 having a cam roll 217 running in the groove of a grooved cam 219. The groove of cam 219 is eccentric and on each revolution, which takes place on each two revolutions of the cylinder 151, swings the arm 209 to the right and positions track 197 in the path of the cam roll on arm 195. On the alternate phase of its movement, when lever 209 is swung to the left to bring the track 197 out of the path of the cam roll, the connecting rod 213 acts to swing arm 211, thus bringing the track 201 inwardly to act in its turn in the manner illustrated in Fig. 16.

The mechanism which delivers the paper to the gripper bars 49, which has just been described, may be driven by suitable spur gearing. A number of the gear wheels do not appear on the drawings as they are obscured by other parts, but as the elements in themselves are of usual form and the manner of their action simple to understand, I have not considered it necessary to multiply the drawings by specific views. The shaft of the receiving cylinder 149 may have a gear wheel meshing with the annular gear 51, the speed ratio being substantially one to three to provide for delivering sheets to three gripper bars, as disclosed in the present embodiment. The shafts of the receiving cylinder 149 and the transfer cylinder 151 may also be connected by a pair of gears, the speed ratio being two to one. In Fig. 14 I indicate at 221 the pitch circle of a gear fast on the shaft of the receiving cylinder 149 and meshing with a gear of which the pitch circle is shown at 223 and which drives the cam 219, the gear 223 and cam 219 revolving on a stud 225. The gear 221 may also form part of a suitable train driving the shaft of cam 183. Pitch circles of the gears of the train are shown in Fig. 2.

To deliver the sheets from the bars after they have been carried through the various printing couples by the gripper bars 49, I may provide a transfer cylinder 227 (Fig.

2) operating in a manner similar to the transfer cylinder 151. The paper is received from a gripper bar 49 by suitable grippers on the transfer cylinder 227, carried around this cylinder and delivered to grippers on a carrier chain 229.

Having thus described in detail the illustrative embodiment of my invention shown in the particular drawings and the various specific mechanisms utilized therein as desirable forms, the principles exemplified thereby which I claim as new and desire to secure by Letters Patent I shall express in the following claims:—

1. In a press, in combination with means to revolve a sheet over a cylindrical surface, a series of printing rolls substantially tangent to the surface, intermediate supporting devices in the form of cylindrical segments having provision for pneumatic control of the paper, and means controlling the air supply in correlation with the travel of the sheet.

2. In a press, in combination with means to revolve a sheet over a cylindrical surface, a series of printing rolls substantially tangent to the surface, intermediate supporting devices in the form of cylindrical segments having air ducts opening therethrough, and means selectively to exert suction through the ducts.

3. In a press, in combination, a pair of rings, means to revolve the same, paper-holding means carried by said rings and moved thereby through a cylindrical path, a series of printing rolls substantially tangent to the cylinder, intermediate supporting devices in the form of cylindrical segments, air ducts opening therethrough, valves controlling the ducts and means on a ring controlling the valves.

4. In a press, in combination, a pair of rings, means to revolve the same, paper-holding means carried by said rings and moved thereby through a cylindrical path, a series of printing rolls substantially tangent to the cylinder, intermediate supporting devices in the form of cylindrical segments, air ducts opening therethrough, and valve means for exhausting air through said ducts in correlation with the passage of the paper through the press.

5. In a press, one or more printing couples the contact lines of which correspond to the elements of a cylinder, supporting surfaces in the form of segments of the cylinder, air ducts opening through said surfaces, valves controlling said ducts, means to carry a sheet around the cylinder and means associated with said carrying means for operating the valves in coordination with the travel of the sheet.

6. In a press, one or more printing couples the contact lines of which correspond to the elements of a cylinder, supporting surfaces

in the form of segments of the cylinder, air ducts opening through said surfaces, valves controlling said ducts, sheet-carrying means comprising a pair of rings at the bases of the cylinder and a gripper bar extending between them, and means carried by said rings for operating the valves.

7. In a press, a printing couple, a convex supporting surface leading thereto, means to carry a sheet over said surface to the couple and means to maintain a drag on the rear end of the sheet while leaving the body of the sheet free to be tensioned over said surface.

8. In a press, a printing couple, a convex supporting surface leading thereto, means to carry a sheet over said surface to the couple and means to maintain a pneumatic pressure on the rear end of the sheet while leaving the body of the sheet free thereby holding it tensioned over the convex surface.

9. In a press, a printing couple and supporting surfaces on either side thereof, air ducts opening through said surface, means to carry a sheet over said surfaces and means to control the air pressure in said ducts whereby to maintain suction on the sheet on limited areas thereof, said areas lying on both sides of the couple as the sheet passes the couple and also on the rear end of the paper when free of the couple.

10. In a press, a printing couple and supporting surfaces on either side thereof collectively disposed on a convex arc passing through the contact line of the couple, a carrier movable to draw a sheet over said surfaces and means to apply pneumatic pressure to limited areas of the sheet on opposite sides of the couple.

11. In a press, a printing couple and supporting surfaces on either side thereof collectively disposed on a convex arc passing through the the contact line of the couple, a carrier movable to draw a sheet over said surfaces and means to maintain a drag on the rear end of the sheet while leaving the body of the sheet free to be tensioned over said surfaces.

12. In a multicolor press, a series of printing couples the contact lines of which correspond to elements of a cylinder, supporting surfaces in the form of cylindrical segments, means to carry a sheet over said surfaces and through the couples and means to maintain a drag on the rear end of the sheet while leaving the body of the sheet free to be tensioned over said surfaces.

13. In a press, in combination with a series of printing couples, supporting surfaces therebetween having air ducts opening therethrough, means to carry a sheet over said surfaces and between the couples and means controlling the ducts constantly to provide suction to limited areas adjacent both ends of the sheet.

14. In a press, in combination with a series of printing couples, supporting surfaces therebetween having air ducts opening therethrough, means to carry a sheet over said surfaces and between the couples and means controlling the ducts constantly to provide suction to limited areas adjacent both ends of the sheet and on opposite sides of a printing couple when the same is printing.

15. In a press, in combination with a series of printing couples ranged around a cylinder, intermediate supporting surfaces in the form of cylindrical segments having air ducts opening therethrough, means to carry a sheet over said surfaces and between the couples and means controlling the ducts to provide suction on limited areas, said areas located adjacent the ends of the sheet, tensioning the sheet over the surface.

16. In a press, in combination with a series of printing couples ranged around a cylinder, intermediate supporting surfaces in the form of cylindrical segments having air ducts opening therethrough, means to carry a sheet over said surfaces and between the couples and means controlling the ducts to provide suction on limited areas, said areas located adjacent the ends of the sheet, tensioning the sheet over the surface, and also on opposite sides of a printing couple when the sheet is printing.

17. In a press, in combination with a printing couple, sheet-supporting surfaces on either side thereof having air ducts opening therethrough, means to carry a sheet over said surfaces through the couple and means controlling the ducts to maintain suction on the sheet at opposite sides of the couple during printing.

18. A press comprising, in combination, a printing couple, a fixed supporting surface leading to the contact line thereof, means to draw a sheet over the surface and through the couple, a row of air ducts opening to the sheet path closely adjacent the intake side of the couple and means to exhaust air through said ducts governed to operate only while the sheet overlies the same.

19. In a press a series of printing couples the contact lines of which correspond to the elements of a cylinder, supporting surfaces in the form of segments of the cylinder between the couples, rows of air ducts opening to the surface of the cylinder, each closely adjacent the intake side of a couple, means to draw a sheet forward around the cylinder and means to exhaust air through said ducts governed to operate only while the sheet overlies the same.

20. In a press, in combination with suitable imprinting means, a supporting surface for the paper operated upon, pipes beneath said surface, ducts opening from said pipes through the surface, a header receiving the

ends of said pipes, an exhaust port for said header, valves in the pipes, and means to operate the valves in correlation with the passage of paper.

21. In a press, in combination with suitable imprinting means, a supporting surface for the paper operated upon, pipes beneath said surface, ducts opening from said pipes through the surface, a header receiving the ends of said pipes, an exhaust port for said header, valves in the pipes, means to carry the paper over said surface and means associated with said carrying means for operating the valves.

22. In a press, in combination with suitable imprinting means, a supporting surface for the paper operated upon, pipes beneath said surface, ducts opening from said pipes through the surface, a header receiving the ends of said pipes, an exhaust port for said header, rotary valves in said pipes providing communication between the same and the header, pinions on the valves, sectors meshing with the pinions, means to carry the paper over said surface and means associated with said carrying means for rocking the sectors.

23. In a press, in combination, a pair of endless carrier members, paper-holding means carried and orbitally moved thereby, a series of printing rolls substantially tangent to the orbit, intermediate supporting surfaces having air ducts opening there-through, valves controlling air flow through the ducts and means associated with said members for operating the valves.

24. A press comprising, in combination, means to revolve a gripper bar through a cylindrical path, printing couples comprising rolls having lines of contact corresponding to elements of the upper half of the cylinder and fixed segmental cylindric supporting surfaces between the couples directly over which said gripper bars move and providing supports beneath the sheets advanced thereby on which they rest under gravity.

25. A press comprising, in combination, means to revolve a gripper bar through a cylindrical path, printing couples comprising rolls having contacting surfaces corresponding to elements of the upper half of the cylinder, a receiving device below the horizontal diameter of the cylinder and a transfer means to receive paper from said device and deliver it to the gripper bar.

26. A press comprising, in combination, means to revolve a gripper bar through a cylindrical path, printing couples comprising rolls having contacting surfaces corresponding to elements of the upper half of the cylinder, a delivery device below the horizontal diameter of the cylinder and a transfer means to receive paper from the gripper bar and deliver it to said device.

27. A press comprising, in combination, means to revolve a gripper bar through a cylindrical path, printing couples comprising rolls having contacting surfaces corresponding to elements of the upper half of the cylinder, fixed cylindrical segments between the printing couples directly within the path of the gripper bar, a receiving device below the horizontal diameter of the cylinder and a transfer means to receive paper from said device and deliver it to the gripper bar.

28. A press comprising, in combination, means to revolve a gripper bar through a cylindrical path, printing couples comprising rolls having contacting surfaces corresponding to elements of the upper half of the cylinder, fixed cylindrical segments between the printing couples directly within the path of the gripper bar, a delivery device below the horizontal diameter of the cylinder and a transfer means to receive paper from the gripper bar and deliver it to said device.

29. In a press, a printing couple, a cylindric sheet-supporting surface leading thereto, a gripper bar having gripper fingers, means to revolve the same exteriorly directly over said surface, a cylinder substantially tangent to the path of the sheet interiorly and having gripper fingers staggered with respect to the fingers of the bar and means for driving the cylinder at the same surface speed as the bar.

30. In a press a printing couple, a cylindric sheet-supporting surface leading thereto, a gripper bar having gripper fingers, means to revolve the same exteriorly directly over said surface, a delivery device having a portion substantially tangent to the path of the sheet exteriorly and being cut away to pass the bar and having gripper fingers and a transfer cylinder substantially tangent to the path of the sheet interiorly and having gripper fingers to receive the sheet from the delivery device and to release it to the bar and means for driving said device and cylinder at the same surface speed as the bar.

31. A press comprising, in combination, means to revolve a gripper bar to carry paper through a cylindrical path, printing couples comprising rolls having contacting surfaces corresponding to elements of the upper part of the cylinder, a transfer cylinder disposed interiorly at the lower part of the cylindrical path substantially tangent to said path having means for releasing a sheet to the gripper bar and means exterior to the path for delivering sheets to the transfer cylinder.

32. A press comprising in combination one or more printing couples, an orbitally movable carrier having a gripper bar to advance a sheet for printing, a sheet-supporting surface over which said bar moves to hold the sheet substantially coincident there-

with, a transfer cylinder disposed interiorly of the orbit substantially tangent thereto, having the same surface speed as the carrier and means for feeding sheets to the transfer cylinder.

33. In a press one or more printing couples ranged about a cylindric sheet path, sheet-supporting surfaces along said path, a gripper mechanism directly exterior to said path to advance a sheet substantially coincident with said surfaces and including a bar closely adjacent said surfaces and fingers closing from inward thereagainst.

34. In a press one or more printing couples ranged about a cylindric sheet path, sheet-supporting surfaces along said path, a gripper mechanism directly exterior to said path to advance a sheet substantially coincident with said surfaces and including a bar closely adjacent said surfaces and fingers closing from inward thereagainst, in combination with a sheet handling cylinder disposed interiorly substantially tangent to said path and having gripper fingers staggered with respect to those above referred to.

35. A press comprising in combination one or more printing couples, an orbitally movable carrier having a gripper bar to advance a sheet for printing, a sheet-supporting surface over which said bar moves to hold the sheet substantially coincident therewith and gripper fingers swinging from inward thereagainst.

36. A press comprising in combination one or more printing couples, an orbitally movable carrier having a gripper bar to advance a sheet for printing, a sheet-supporting surface over which said bar moves to hold the sheet substantially coincident therewith and gripper fingers swinging from inward thereagainst, in combination with a sheet handling cylinder disposed interiorly substantially tangent to the orbit and having gripper fingers staggered with respect to those just referred to.

37. A press comprising in combination one or more printing couples, an orbitally movable carrier having a gripper bar to advance a sheet for printing, a sheet-supporting surface over which said bar moves to hold the sheet substantially coincident therewith, a transfer cylinder disposed interiorly of the orbit substantially tangent thereto, having the same surface speed as the carrier, an opposed delivery device exterior of the orbit and substantially tangent to the same and to said cylinder and having the same surface speed as the carrier, said device being arranged to pass the gripper bar without bodily movement thereof and having means to take sheets from gages, the transfer cylinder receiving such sheets from the delivery device and releasing them to the gripper bar.

38. In a press one or more printing

couples, cylindric surfaces for supporting the sheet in its passage through the couples, means for advancing the sheet comprising an annular carrier having a gripper bar revolving directly over said surface exteriorly thereof and adapted to hold a sheet substantially coincident with said surface for advance in a circular path and inner and outer revolving carriers substantially tangent to said path having grippers for successively handling a sheet in cooperation with the grippers of the carrier.

39. In a press one or more printing couples, an annular carrier having peripherally located gripper means for advancing sheets in a circular path for the printing operation and cooperating sheet transferring means comprising fixedly positioned interiorly and exteriorly located revolving devices having grippers operating in succession with said gripper means.

40. In a press, a series of rotary printing couples disposed about a circle and each including a roll shiftable substantially radially, means to carry paper around the circle and throw-off means comprising a cam, substantially radial arms oscillated thereby having shoulders, means normally engaging a shoulder to transmit motion from the cam to cause shifting of a roll and means to disengage said means from the shoulder.

41. In a press, a series of rotary printing couples disposed about a circle and each including a roll shiftable substantially radially, a toggle for shifting each roll, means to carry paper around the circle and throw-off means comprising a cam, substantially radial arms oscillated thereby having shoulders, levers for operating the toggles each normally engaging the shoulder of an arm, and means to disengage said levers from the shoulders.

42. In a press, a series of rotary printing couples disposed about a circle and each including a roll shiftable substantially radially, a lever for shifting each roll having a square box, substantially radially oscillating arms having recesses loosely receiving a box and extensions fitting the box, and yieldable means normally drawing said arm to position the box in the extension.

43. In a press, a series of rotary printing couples disposed about a circle and each including a roll shiftable substantially radially, a toggle for shifting each roll, a lever for operating the toggle having a square box, substantially radially oscillating arms having recesses loosely receiving a box and extensions fitting the box, and yieldable means normally drawing said arm to position the box in the extension.

44. In a press, a series of rotary printing couples disposed about a circle and each including a roll shiftable substantially radially, means to carry paper around the

circle and throw-off means comprising a cam, substantially radial arms oscillated thereby having shoulders, means normally engaging a shoulder to transmit motion from the cam
5 to cause shifting of a roll, and a shiftable trip moving with the paper-carrying means and adapted to be positioned by suitable detector mechanism for moving said arm to release
10 said motion-transmitting means from the shoulders.

45. A press of the class described comprising a series of rotary printing couples ranged about a circle, a pair of rings having a connecting gripper bar movable about
15 said circle, throw-off means having operating portions adjacent the path of the rings, a shiftable trip carried by said rings hav-

ing a part for moving said operating portions and a portion for contact with suitable detector mechanism. 20

46. A press of the class described comprising a series of rotary printing couples ranged about a circle, a pair of rings having a connecting gripper bar movable about
25 said circle, throw-off means having operating portions adjacent the path of the rings, a shiftable trip carried by said rings for operating said throw-off means, and fixed and positionable abutments at opposite ends
30 of the series of couples for shifting the trip.

In testimony whereof, I have signed my name to this specification.

CHARLES A. MEISEL.