Jan. 14, 1936. F. V. TOPPIN 2,027,797

PRINTING PRESS AND METHOD OF PRINTING

Filed Dec. 12, 1932 5 Sheets-Sheet 1

Fig. 1.

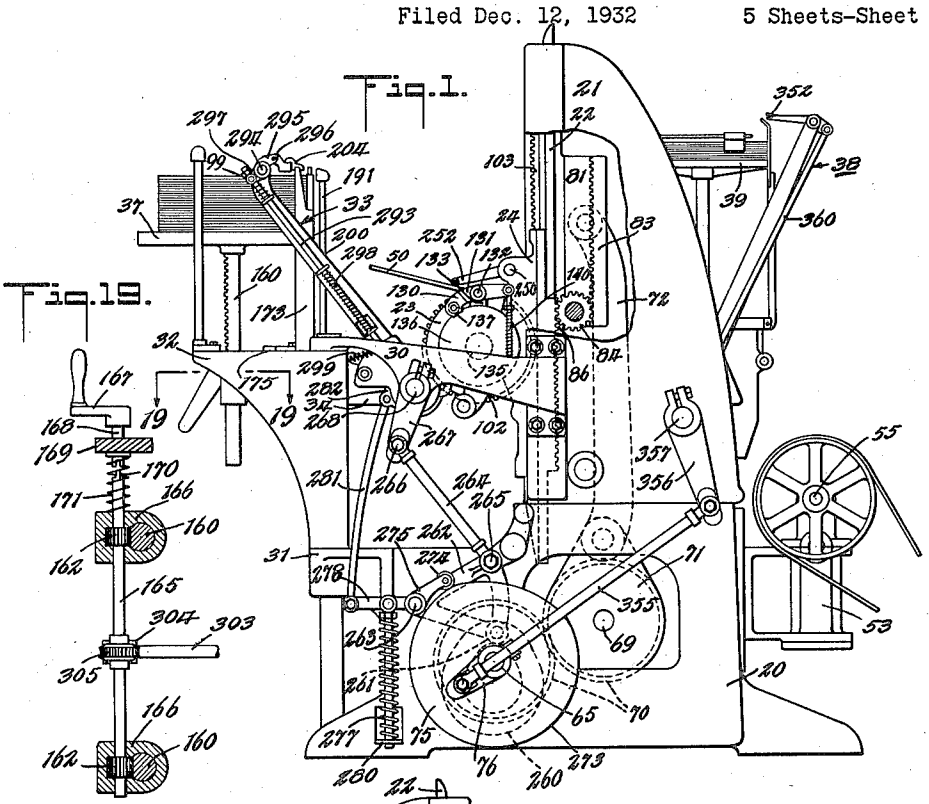


Fig. 1a.

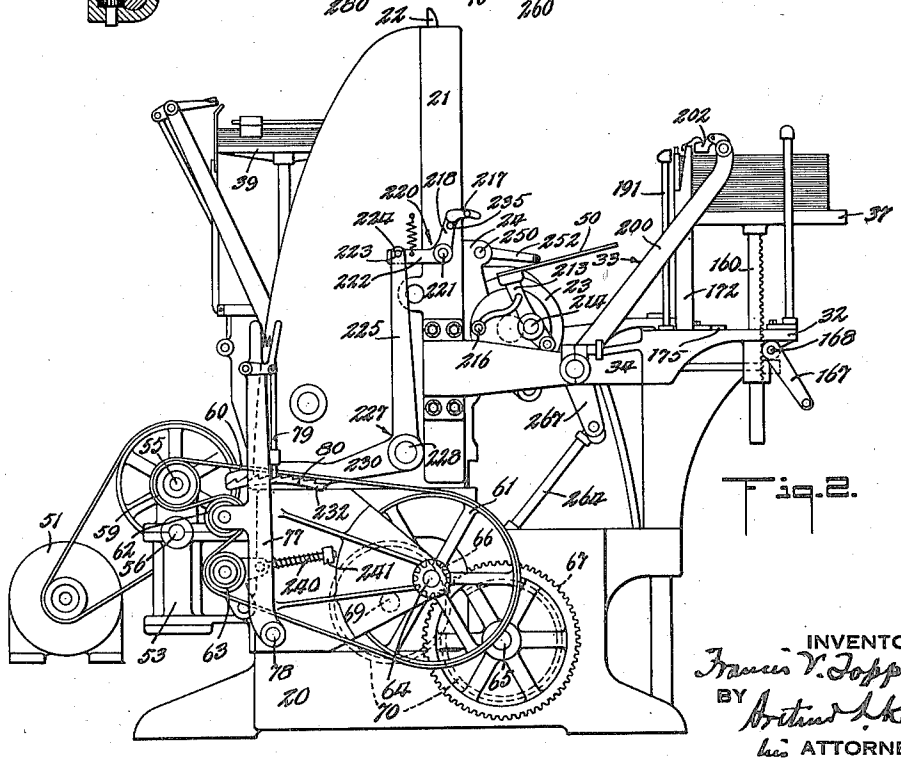


Fig. 2.

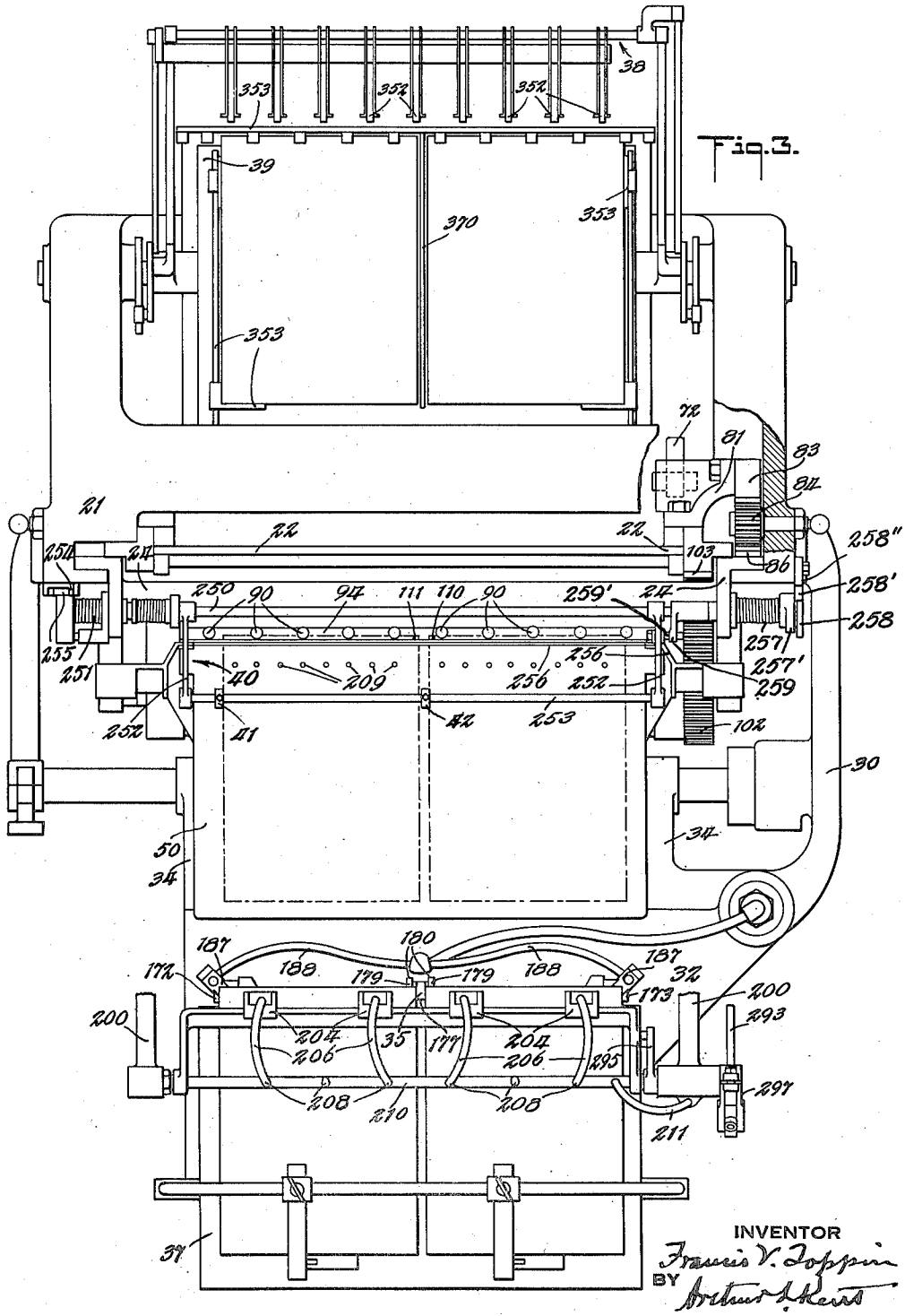
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Jan. 14, 1936. F. V. TOPPIN 2,027,797

PRINTING PRESS AND METHOD OF PRINTING

Filed Dec. 12, 1932 5 Sheets-Sheet 2

Fig. 3.



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PRINTING PRESS AND METHOD OF PRINTING

Filed Dec. 12, 1932 5 Sheets-Sheet 3

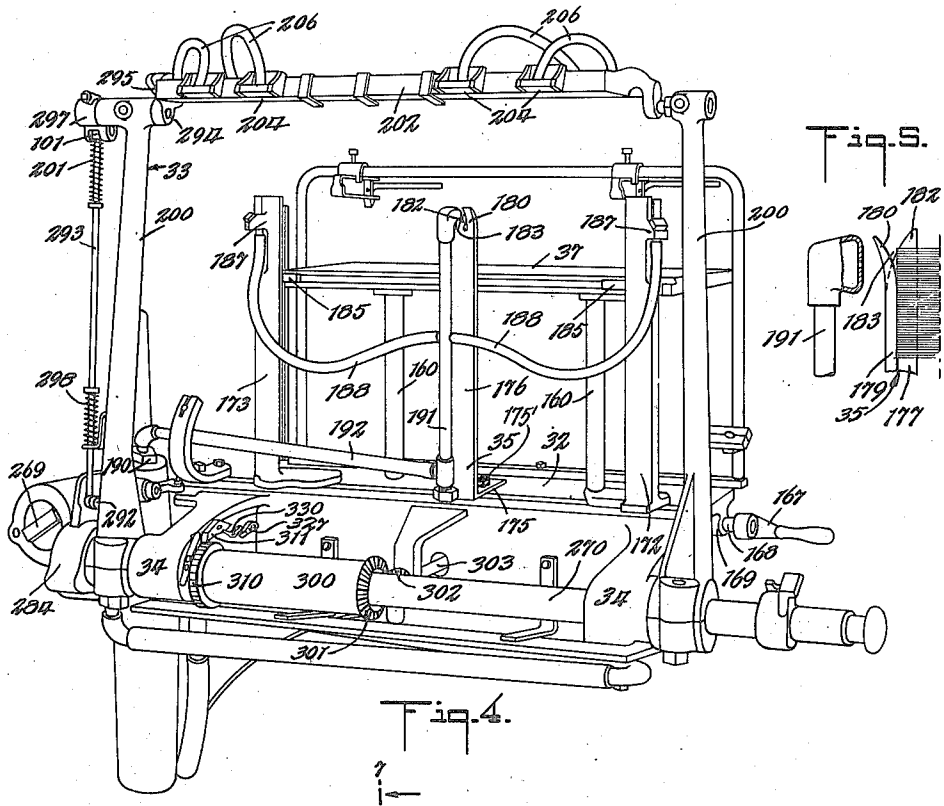


Fig. 4.

Fig. 5.

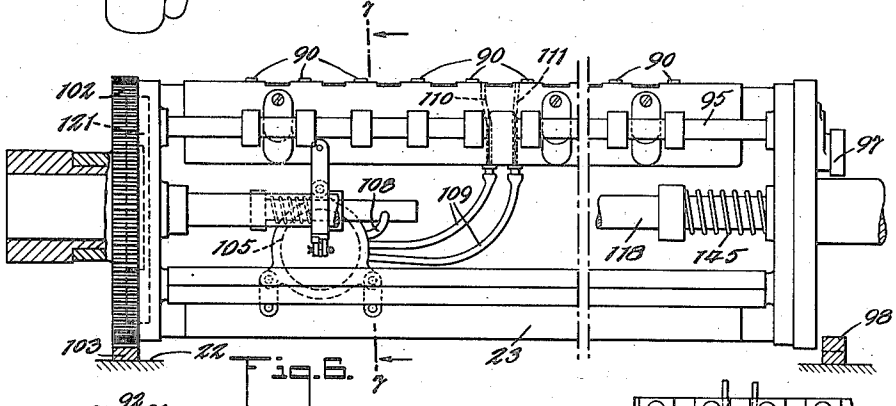


Fig. 6.

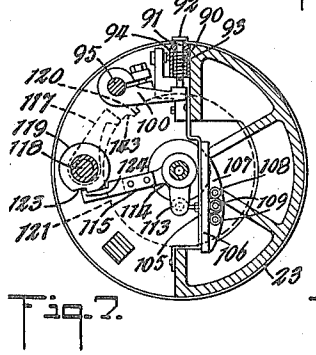


Fig. 7.

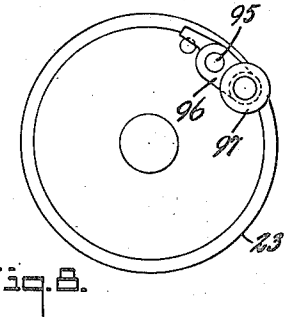


Fig. 8.

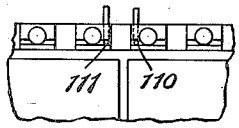


Fig. 9.

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PRINTING PRESS AND METHOD OF PRINTING

Filed Dec. 12, 1932 5 Sheets-Sheet 4

Fig.12.

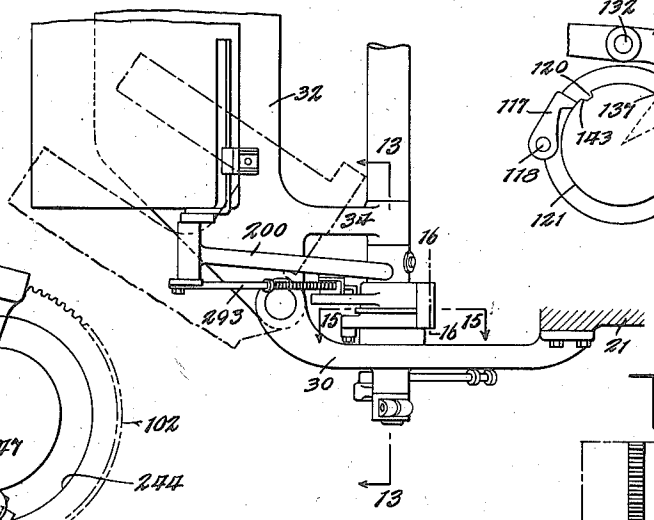


Fig.10.

Fig.20.

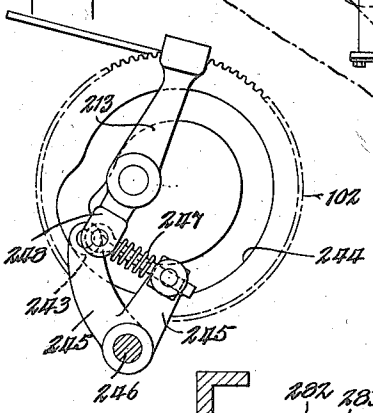


Fig.11.

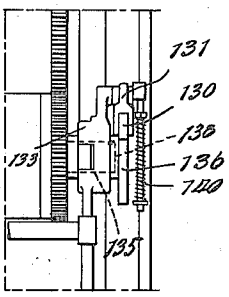
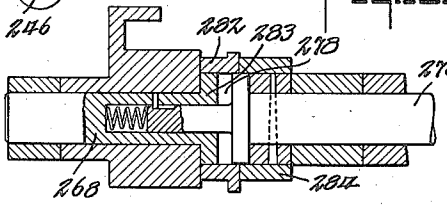


Fig.13.



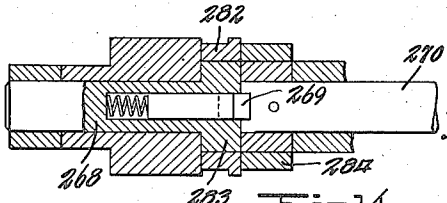


Fig.14.

Fig.15.

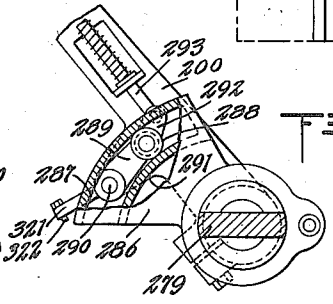


Fig.16.

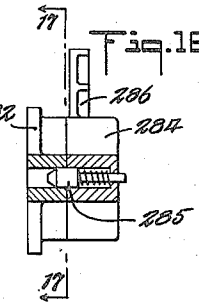
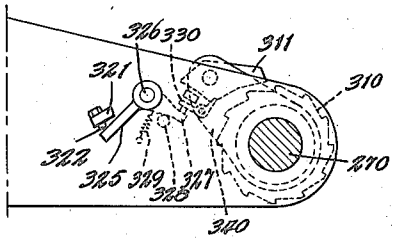


Fig.18.



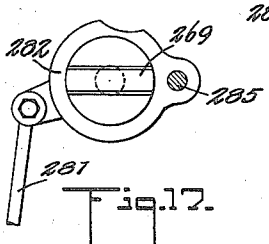


Fig.17.

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PRINTING PRESS AND METHOD OF PRINTING

Filed Dec. 12, 1932 5 Sheets-Sheet 5

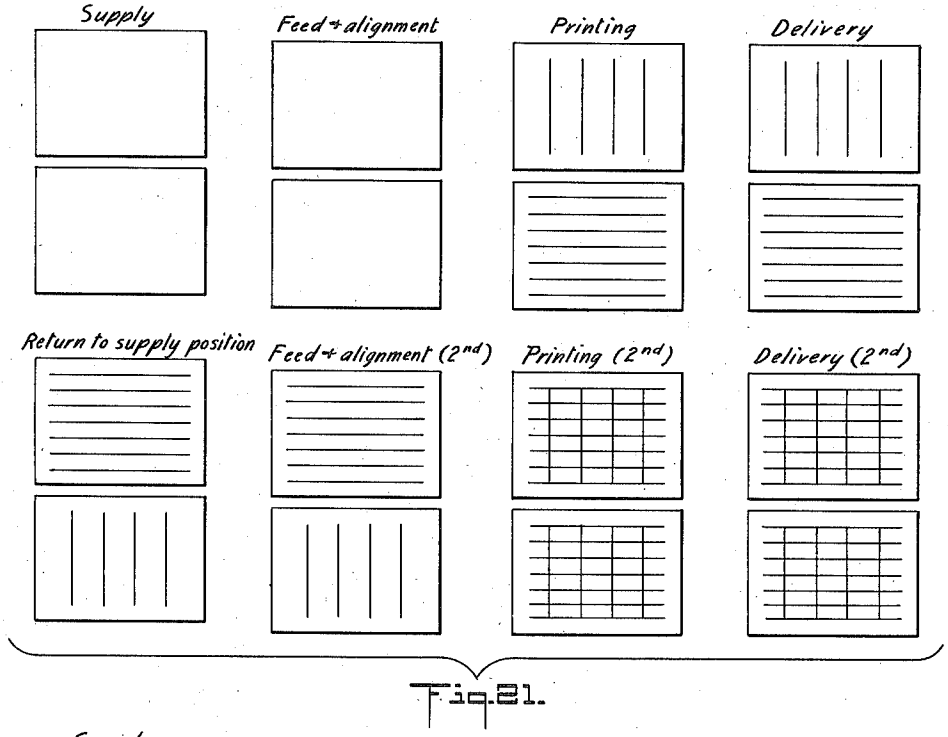


Fig. 21.

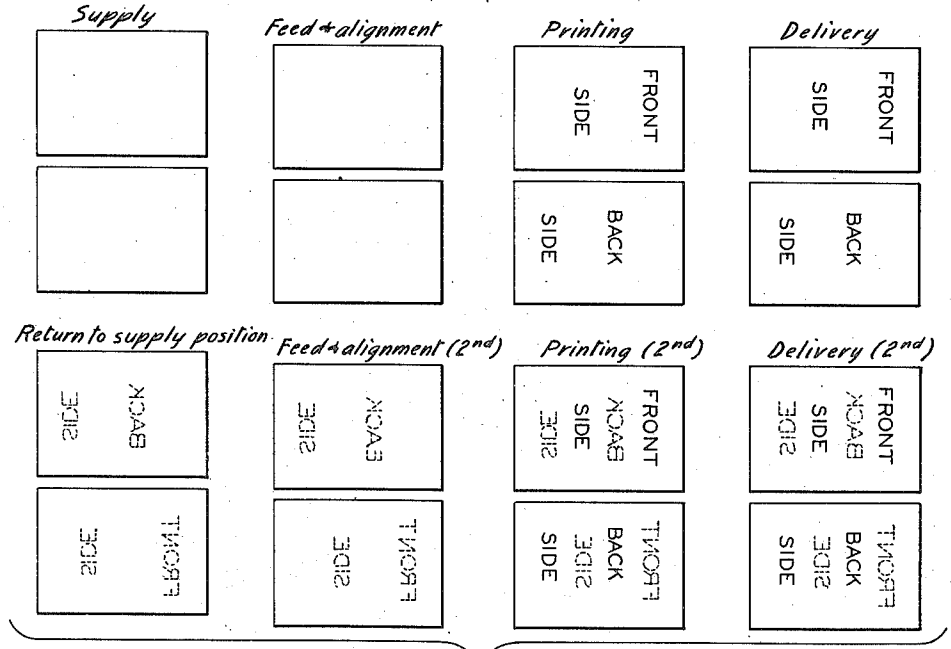


Fig. 22.

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UNITED STATES PATENT OFFICE

2,027,797

PRINTING PRESS AND METHOD OF PRINTING

Francis V. Toppin, Lyndhurst, N. J.

Application December 12, 1932, Serial No. 646,792

18 Claims. (Cl. 101—272)

This invention relates to printing presses, and, with regard to certain more specific features thereof, to plural sheet feeding and printing mechanism, whereby sheets are moved simultaneously from different stacks in rapid succession and impressed simultaneously against different forms set on a type bed. The invention includes a method of printing sheets in pairs, and more particularly a method of printing on opposed sides of sheets or by different impressions on the same side of each sheet.

Job-printing presses of present day construction are adapted, by the inclusion of a large type bed and a long cylinder roll, to the accommodation of sheets varying in size over a large range. Many of these presses comprise a stock supply table adapted to support a multiplicity of sheets arranged in a single stack for presentation to the sucker shoe bar of a feeder frame which periodically lifts successive top sheets from the stack and feeds them to a transfer table. The latter passes them to an impression cylinder which grips the sheets and presses them against a type form set up on the type bed. An air system is a component of such presses, and air pressures in the system are utilized for various purposes, such as periodically developing a suction at the sucker shoe for selecting successive top sheets of the stack and feeding them to a transfer table; blowing on the top sheets of the stack to slightly separate them so that only the uppermost sheet will be lifted by the sucker shoe; creating a partial vacuum in a stop-press mechanism which, when continued beyond a certain point in normal operation, stops the press; creating a partial vacuum in a mechanism controlling the rotation of the impression cylinder, which, when destroyed or prevented, stops the periodic rotation of the cylinder; and for other well known purposes.

Such presses have been constructed, and heretofore have been limited in commercial practice, to the feeding of single sheets in rapid succession from the stock supply table to the impression cylinder, and to the impressing and delivering of single sheets in rapid succession. A very large percentage of so-called "job printing" is on small sized sheets and the press is adjusted in its guiding and register mechanism to accommodate these sheets in single feed although ample type bed and impression cylinder dimensions exist for the simultaneous impression of several sheets of such small size.

It is necessary to obtain a very high precision in matters of registry in printing press work. The stack of sheets on the stock supply table must be kept in accurate and continuous register with the feeding, or front pick-up, mechanism, the sheet fed to the transfer table must be accurately positioned laterally of the press before the sheet is gripped by the impression cylinder in order that the sheet may properly align with the type forms on the type bed, and the successive printed sheets must accurately come into position to be gripped by the rear pick-up mechanism for delivery into a stack of printed sheets.

In addition to the register requirements above set forth, the stop-press and cylinder control features of printing presses impose demands of great exactitude in points of registry between the fed sheets and the transfer table, and also between the sheets and the impression cylinder.

Furthermore, when the sheets must be run through the press two or more times, as in case of printing on opposite sides, or as in case of printing on one side for cross rules and down rules, or as in multi-color work, registry in correct relation to previous registry is a necessary requirement of finished or high class work.

These problems of precise registry have limited the presses to the feeding of one sheet at a time through the press even though the size of the sheet be not more than a small fraction of the total handling and printing capacity of the press.

The present invention has for one of its objects to feed a plurality of sheets simultaneously from independent stacks and simultaneously impress said sheets on spaced forms on a single bed.

Another object of the invention is to guide and register independent stacks of sheets at a stock supply table in such a way that all of the forward corners of sheets in the independent stacks shall be controlled as to position relative to the feeding means and shall again be presented to the feeding means when the sheets are a second time fed through the machine.

Still another object is to provide a simple and inexpensive device which may be quickly and conveniently applied to standard printing presses to convert them to the simultaneous feeding of two sheets and the simultaneous impressing and delivering of the same.

As demonstrative of these economies, assume a printing order which calls for printing on opposite sides of a pre-ruled or pre-blocked card, i. e., a standard form on a card cut to size when supplied to the printer. The required printing may be with the type lines running in one direction between pre-rules on one side of the card, and with the type lines on the other side

of the card running at right angles to those on its opposite side. This order eliminates all thought of running a single sheet of double size through the press and cutting it in two after the printing, as the cards are uniform and pre-ruled and supplied to the printer in that condition.

On an order for ten thousand of such cards to be printed on opposite sides, the printer, according to usual procedure, would run ten thousand impressions for the face side, then run the cards through the press again with reverse side up making another ten thousand impressions on a different form, or a total of twenty thousand impressions. By the present improved method, the face and reverse forms are set side by side on the type bed, the ten thousand cards are divided into two stacks of five thousand each and are fed through the press in pairs. Each pair has one sheet face up and the other reverse up. Five thousand impressions print one side of the ten thousand cards, five thousand of them with the face printed and five thousand with the reverse printed. The stacks are then returned to the stock table, turned upside down and reversed as to bodily position so that continued operation of the press presents the unprinted side of sheets from each stack to the opposite form on the type bed. Five thousand more impressions complete the order, making a total of ten thousand impressions. In speaking of "impressions" the action of the impression cylinder relatively to the type bed is meant. One complete relative movement of these parts constitutes an "impression" as above referred to irrespective of the number of sheets printed by such action.

On the above described order, the present method effects a saving of ten thousand impressions.

Assuming that the order, instead of being accompanied by pre-cut cards, permitted the printer to select as stock a double sheet ruled on one side and plain on the other, with the option of simultaneously making two printings on each sheet and subsequently cutting the sheet into two cards. Then, to obtain the total of ten thousand cards, printed on both sides, by ten thousand impressions, the printer must set up two similar face compositions for one side of the double sheet, which, for example, may be the ruled side. He will then run five thousand impressions of the press, producing ten thousand face printings. Then he will set up two reverse compositions of like form and reverse his stack and run five thousand additional impressions. It will be noted that, although the impressions are held to a minimum, four separate compositions are required.

By the present method such composition work is halved inasmuch as only one face composition and one reverse composition are required and the press is held for such an order to a total of ten thousand impressions.

Assuming another order for ten thousand cards or sheets in which down rules and cross rules are specified, these rules cannot be made by ordinary composition so as to be effected by one impression. The practice has been to set up one form with either the cross rules or the down rules and make an impression, then substitute a form with the rules in the other direction and make a second impression. The alternative for this practice, is to prepare a plate which is expensive to the point of being prohibitive for small quantity orders. Another alternative is to set up two forms side by side on the bed, one form carrying the cross rules and the other form the down rules. Then a stack of five thousand double size sheets is fed to the press, impressions are made and the stack returned to the supply table where it is turned from its former position to present the cross ruled portion to the down ruled form and vice versa, in the subsequent printing. The sheets are subsequently cut in two. In following such a method a new edge of the double sheet becomes the forward registry or aligning edge when the stack is returned to the supply table. This carries all defects in the rectangular form of the paper directly into the printing, and proper angular relationship between the cross and down rules is not obtained.

By the present method the down rules may be set up in one form and the cross rules on another and the two forms arranged side by side. The ten thousand sheets or cards of the order are then arranged in two stacks of five thousand each and moved in pairs against the forms. The delivered sheets are removed in their respective stacks, returned to the supply table, and arranged so that each occupies the registry position formerly occupied by the other. The sheets are again moved in pairs from these stacks, using the same edges for registry as were formerly used, and impressed respectively against the forms bearing the rules in the other direction from those already printed, and the pairs of sheets are delivered a second time. Thus, by ten thousand impressions of the press and two compositions, and without the necessity of preparing special plates, the order is completed. A tremendous saving is effected over previously known methods, either in the number of impressions or the amount of composition work or in the avoidance of the heavy expense of special plates. The economies are substantial and of the highest importance in such a highly competitive field as job printing. Because of the use of the same edges in effecting the registrations for the second impressions, the quality of the work is exceptional.

The present invention has, therefore, as another of its objects to provide a method of printing which economically produces work of high quality.

Other objects will be in part obvious from the following description of the improved press and the improved method of printing, and in part pointed out particularly therein.

Although the invention, in so far as it involves a mechanism or combination or arrangement of parts, may be used in connection with printing presses of various types, it is shown in the particular embodiment illustrated by the drawings as embodied in a vertical press, specifically a vertical press of the Miehle type, and such press has been used herein with the additions and arrangements comprised by my invention to illustrate one manner of practicing the improved methods claimed herein as part of the present invention.

In the drawings:

Fig. 1 is a view in side elevation of a printing press embodying the invention;

Fig 2 is a view in elevation of the opposite side of the press shown in Fig. 1;

Fig. 3 is a top plan view of the press;

Fig. 4 is a view in perspective of the stock supply table and feeder mechanism;

Fig. 5 is a detail of the top of the plural feed bracket;

Fig. 6 is a view in elevation of the printing press cylinder;

Fig. 7 is a section taken on the line 7—7 of Fig. 6;

Fig. 8 is a view in end elevation of the cylinder;

Fig. 9 is a fragmentary view in plan of the cylinder showing the gripper pins and the cylinder control openings;

Fig. 10 is a detail showing the means for connecting the cylinder with its rotating mechanism and the means for holding the cylinder against rotation;

Fig. 11 is an elevational view of the cylinder control mechanism;

Fig. 12 is a fragmentary plan view of the press showing the pivotal mounting of the feeder frame;

Fig. 13 is a sectional view taken on the line 13—13 of Fig. 12;

Fig. 14 is a view in section through the same parts as in Fig. 13 but with the section plane at right angles to the line 13—13;

Fig. 15 is a view in section taken on the line 15—15 of Fig. 12 with parts broken away to show the interior construction;

Fig. 16 is a view in section taken on the line 16—16 of Fig. 12;

Fig. 17 is a view in section taken on the line 17—17 of Fig. 16;

Fig. 18 is a detail of the pawl and ratchet device for stepping up the stock supply table;

Fig. 19 is a detail of the hand operated mechanism for moving the stock supply table; the view is a section taken on the line 19—19 of Fig. 1;

Fig 20 is a view of the mechanism for rocking the transfer table;

Fig. 21 is a view illustrating the improved method of printing; and

Fig. 22 is a view illustrating another manner of carrying out the improved method of printing.

General features of the press

The present invention, relating to both the mechanism and the improved method, is exemplified herein by additions to, and modifications of, a Miehle vertical press of well known construction. Such presses comprise a base frame indicated at 20 on the accompanying drawings, supporting a way frame 21. A type bed 22 is mounted for vertical reciprocatory movement in the way frame and an impression cylinder 23 mounted on a cylinder frame 24 has a vertical reciprocatory movement in opposition to that of the type bed. In one direction of vertical reciprocation the impression cylinder is rotated to impress a sheet, gripped thereby, against a type form set up on the type bed.

A stock supply and feeder mechanism is arranged between a bracket arm 30 extending from the way frame 21 and a lower arm 31 extending from the base frame, between which arms a platform 32 is mounted for pivotal movement into and out of operative stock supply relationship with the above mentioned printing or impression mechanism. A feeder mechanism of suction type comprises a feeder frame 33 journaled in spaced arms 34 of the swinging platform 32.

According to the present invention the platform is provided with a separator and register bracket 35 (see Fig. 4) which, with certain side registers and guides, cooperates with a stock supply table 37 and certain blower devices, hereinafter described, to adapt the feeding mechanism to the simultaneous feeding of pairs of sheets from the supply table to the printing mechanism.

A delivery mechanism is supported between side walls of the way frame and includes a delivery or pick-up frame 38 which moves periodically to the impression cylinder, grips the printed matter and deposits it on a delivery table 39.

A lateral register mechanism comprises a lateral register frame 40 which, according to the present invention, carries a pair of adjustable dogs 41 and 42. The frame is moved in properly timed relation to the deposit of a pair of sheets on a transfer table 50, to present the dogs against one side edge of each fed sheet and move each sheet into a predetermined position with respect to the impression cylinder and the forms on the type bed.

The press is equipped with a stop device for interrupting the main transmission, and stopping the relative reciprocatory movements of the type bed and the cylinder when there is a failure of the sheet handling mechanism to correctly perform its functions. The press is further provided with a cylinder control device which prevents rotation of the cylinder if the sheets are not properly aligned with the type bed and gripped by the cylinder.

The press is driven by an electric motor 51 which provides the power for rotating the shafts to operate the mechanical agencies and which also drives an air pump 53 to develop various air pressures in an air system. Certain of these pressures are lower than atmospheric pressure whereby certain of the controls and the feeding device are operative by the development of partial vacuums, and other pressures are higher than atmospheric for effecting a blowing action on the sheets.

All of the above will be found more particularly described hereinafter under the various appropriate headings. The press shown in the accompanying drawings is in large part of well known construction in wide commercial use at the present time and for some years past. Inasmuch as the present invention relates to an improved method of printing, as well as to improvements in the supply, feed and delivery mechanism of a printing press, it is thought desirable to outline, at least, a complete press and its entire cycle of operation in order to convey a clear picture of the progressive steps of the method. However, it is not believed to be necessary or even desirable to extend this description to all of the minute details of construction or operation of many parts of the press which are already well known, as by so doing the text hereof would be unduly lengthened.

The main operating gear

The electric motor 51 is connected by a belt and pulleys to a driving shaft 55. Through suitable gearing the driving shaft is connected to the crank shaft 56 of the air pump 53 which is mounted on the base frame at the rear of the press. The pump is arranged in an air system which includes certain blowers and creates partial vacuums properly timed to the operation of the machine. The driving shaft 55 has at one end a pulley 59 from which through a belt 60 over a pulley 61, a belt-tightening pulley 62 and a spring-pressed idler pulley 63, it drives a fly wheel shaft 64. The shaft 64 is journaled in one side of the base frame and drives a cam shaft 65 through a pinion 66 and gear 67. The cam shaft drives a crank shaft 69 suitably journaled in the base frame, through gearing 70 shown by

the dotted lines in Fig. 2. Cranks 71 fixed on the shaft 69 at either end within the base frame actuate connecting rods 72, whereby rotation of the shaft is translated into vertical reciprocatory movement of the impression mechanism.

The cam shaft 65 is provided with a number of cams for operating the ink rollers, which need not be described for a clear understanding of this invention. Near the right hand end of the cam shaft there is a feeder operating cam 75 which governs the movement of the feeder frame 33 whereby sheets are picked up at the stock supply station and moved to the transfer table 50. The cam shaft 65 also has several valve actuating cams which control the air system. At its extreme right hand end the cam shaft is provided with a fixed crank arm 76 which is connected, as will hereinafter appear, with the delivery frame 38 the function of which is to pick up the sheets after impression and move them to a delivery station.

The transmission from the driving shaft 55 to the fly wheel shaft 64 through belt 60 is completed by pivotal movement of a hand operated lever arm 77 around a pivot stud 78 projecting from the base frame. Such movement swings the belt tightener pulley 62 to frictionally apply the belt over its various pulleys for driving engagement. When this effect is obtained, a spring pressed plunger 79 at the handle of lever arm 77 is released and engages a ratchet 80 on a portion of a stop-press mechanism which later will be more particularly described.

The impression devices

The connecting rods 72 actuated by the cranks 71 on shaft 69 are pivotally associated at their upper ends with brackets 81 which are substantially of right-angular cross-sectional form. One face of each bracket is bolted to the type bed 22 which is vertically slidable in the way frame 21. The other face of each bracket has secured to it a rack member 83 and these rack members are engaged with pinions 84 journaled in the side walls of the way frame. As the crank shaft is rotated continuously from the driving devices, the upper ends of the connecting rods, the brackets 81 and the rack member 83 are rectilinearly reciprocated thereby rotating the pinions 84 in one direction on the upstroke of the cranks and in the opposite direction on the downstroke. The pinions 84 at their sides opposite the rack members 83 are engaged by rack members 86 secured respectively to opposite sides of the cylinder frame 24 which journals the impression cylinder 23 and is slidably mounted in the way frame. Thus, movement of the type bed and its racks 83 causes a movement in the opposite direction of the impression cylinder.

The impression cylinder is adapted to receive sheets from the feeding mechanism and roll them against type set up in the type bed. To this end the cylinder is provided with a plurality of gripper pins 90 suitably spaced and aligned (see Figs. 3, 6 and 7). Each pin has a shank 91 and an enlarged substantially flat head 92. Springs 93 normally press the heads toward the cylinder against a gripper bar 94 therein. A rock shaft 95 extends through the cylinder and carries at one end an operating arm 96 provided with a cam roller 97 which is adapted to engage periodically and alternately with a cam 98 on the face of the type bed to rock the shaft 95. For each gripper pin there is an operating finger 100 fast on the rock shaft which is adapted to engage the lower end of the gripper pin and force it outwardly against the action of return springs 93, thereby lifting the heads of the pins and exposing the shanks thereof to the forward registration edge of the sheet or sheets to be impressed.

The operation of the press is timed so that the cam 98 on the type bed acts upon the roller 97 to lift the gripper pins when the cylinder is proceeding downwardly in the way frame, and again near the limit of the upward movement of the cylinder. At the end of the down movement of the cylinder, the roller 97 is freed allowing the springs 93 to retract the pins whereby the sheets are gripped for rotation with the cylinder on its upstroke. Lifting the gripper pins at the upper limit of cylinder movement allows the delivery frame grippers to engage the forward edges of the sheets and transfer the sheets to the delivery station.

The mechanism for rotating the impression cylinder during its upward travel in the way frame and for locking it against rotation during its downward travel is a well known construction such as is shown in the United States patent to Dudley & Stevens No. 1,567,360. It involves a spur gear 102 at one end of the cylinder which is meshed with a long rack 103 secured to the face of the type bed. This gear is adapted to be clutched and unclutched with the cylinder at the proper times. It is desirable, however, to avoid the clutching action under certain conditions, as where the paper sheets have not been properly fed or aligned, so that rotation of the cylinder will not be effected as it moves upwardly past the downward-y moving bed. To this end an air suction device is provided comprising a diaphragm 105 in a wall 106 of a chamber 107 in the cylinder (see Figs. 6 and 7). The chamber is closed except for an outlet 108 to a source of vacuum, provided by the air system previously mentioned, and two openings connected by flexible tubes 109 to two cylinder control openings 110 and 111 in the gripper bar 94 (see Fig. 9). The diaphragm controls an arm 113 of a bell crank lever 114 the other arm 115 of which controls in part the action of a pawl 117. This pawl is mounted upon a shaft 118 carried by the cylinder and is adapted to enter periodically a slot 120 in a disc 121 which is integral with the spur gear 102. Thus the cylinder is coupled at intervals to rotate with the gear as the latter is rotated by the rack on the type bed. The shaft 118 has a collar 119 notched at 123 to receive a pawl formation 124 of the end of arm 115 of the bell crank lever 114. When the parts are so engaged the pawl 117 is held retracted from the slot 120 in disc 121 and the cylinder and spur gear are uncoupled. The collar 119 is released, however, when the cylinder control openings 110 and 111 are covered as this creates a partial vacuum in the chamber 107 and operates the diaphragm to pivot the bell crank lever 114 and withdraw the pawl end 124.

Further control of cylinder movement is afforded by a device which locks the cylinder against rotation during its downward movement. This device is best shown in Figs. 1, 10 and 11, and comprises a dog 130 carried in one end of a lever arm 131 pivoted at 132 to a part of the journal casting 133 for one of the cylinder end trunnions 135. This casting is bolted to the cylinder frame. A disc 136 having a notch 137 in its periphery is fixed to an extension 138 of the end trunnion 135 and the rotative position of the cylinder as it reaches the upper limit of its bodily

movement is such as to present the notch 137 opposite the dog 130. A compression spring 140 acting upon the opposite end of lever arm 131 snaps the dog into position in the notch whereby the cylinder is held against rotation during its downward movement. The slotted disc 121, however, rotates during this downward movement, as the disc is integral with the spur gear 102 which is continuously in mesh with the rack 103 on the type bed. Therefore, the initial downward movement of the cylinder accompanied by rotation of the slotted disc, cams the pawl 117 out of rotatively locking engagement, due to the shape of one edge 143 of the slot and the shape of the engaging head of the pawl. At this point in the operation no sheet has been fed to the cylinder and the ports or openings 110 and 111 in the gripper bar are uncovered. A torsion spring 145 around the supporting shaft 118 of pawl 117 tends to force the pawl into the notch 120 of disc 121. As soon as the pawl 117 is cammed out of the slot in disc 121 the collar 119 is slightly rotated with its shaft thereby presenting its notch opposite the pawl end 124.

During further downward movement of the cylinder the locking dog 130 remains effective and the coupling pawl 117 is maintained out of coupling engagement with the disc 121 allowing the latter to make one complete rotation and again present, at the extreme downward limit of cylinder movement, the slot 120 opposite the head of the pawl. At this point the paper has been fed to cover the ports 110 and 111 and the diaphragm 105 is operated by the partial vacuum to cause release of the collar 119, whereupon the torsion spring 145 around shaft 118 rotates the shaft to re-enter the head of pawl 117 in the slot 120.

The cylinder then starts its upward or normal impression movement coupled to the spur gear which is in turn rotated by its engagement with the rack on the type bed. The gripper pins have closed on the fed paper and the vacuum is discontinued by a valve in the air system which is operated from the main cam shaft, allowing the diaphragm to return the pawl end 124 when the notch in collar 119 is again presented.

The cylinder control mechanism described is, as previously stated, well known. It has been used in successive single sheet printing for some time even with the two ports 110 and 111 in the gripper bar. Formerly, however, the use of a plurality of ports was only a safety measure or means for insuring proper operation of the vacuum creating and destroying device in connection with a single sheet registered therewith. In the present invention these ports are utilized in a different manner and to a somewhat different end. They are used in cooperation with the feeding means and lateral register means of the present invention so as to be effective controls on the cylinder action when two sheets are fed simultaneously to the cylinder. As will later appear, the sheets which are fed, according to the present invention, are spaced from each other and separately registered for association with the cylinder at the gripper pins. The present method in a preferred form is to align the separate sheets so that the forward inner corner of one sheet overlies one or more ports in the gripper bar and the forward inner corner of the other sheet overlies one or more other ports in the gripper bar. Thus, both sheets are brought into the control of the cylinder in such a way that if either of them fails of feed or correct register the impression cylinder will not rotate.

The stock supply, feeding devices, lateral register and stop press mechanism

The swinging platform 32 is adapted to be moved into a closed and locked position relatively to the way frame 21 for normal operation of the press. It is pivotally mounted as heretofore described, particularly in order to obtain access to the inking rollers and related mechanism. The stock supply table 37 is arranged above the platform and is supported for relative movement with the platform by a pair of rack bars 160 meshing with pinions 162 on a shaft 165 which is journaled in rack guide castings 166 bolted to the under side of the platform. The racks may be moved up and down to raise and lower the table by hand through the agency of a hand crank 167 on a short shaft 168 journaled in a side flange 169 of the platform and adapted for end engagement with the shaft 165 through a clutch 170 held normally disengaged by a spring 171. The supply table is also adapted for automatic elevation as will presently appear.

Mounted on the platform 32 and adapted to be fixed in different positions of lateral adjustment are two vertical register members 172 and 173. These are preferably of right angular cross section with the angles open toward each other so as to receive the corners of sheets positioned on the supply table.

According to the present invention the intermediate vertical separator and register member 35 is secured to the platform and preferably its cross section is T-shaped providing two oppositely disposed right angles for the registry of the inner forward corners of the sheets of two separate stacks positioned on the supply table with their outer forward corners in registry with the register members 172 and 173. This intermediate register is preferably in bracket form having a lower horizontal short leg 175 which may be bolted or otherwise suitably secured to the upper surface of the platform, (see Fig. 4 of the drawings wherein 175' designates a bolt for such purposes), and a long vertical leg 176 comprising a separator element 177, which corresponds to the stem of the T and serves to register the side edges of the inner forward corners of the sheets, and a lateral extension 179 on each side of the separator defining the bar of the T and serving as a register for the forward edges of sheets of separated stacks at their inner corners. At the top of the long leg 176 of the bracket the lateral extensions 179 define prongs 180 and the separator element runs into a point or reduced portion 182 thus providing openings 183 for a purpose which will presently appear. The three vertical members just described rise adjacent an edge of the stock supply table and, if desired, adjustable blocks 185 may be fitted slidably at that edge of the table to fit into the angles provided by the vertical registers or into other intermediate positions and prevent the forward margin of the stacked sheets from drooping over the edge of the table as might otherwise happen when thin stock would be used. It will be obvious from an inspection of Fig. 4 of the drawings that removal of the bolt 175' permits removal of the member 35 from the platform.

The side registers 172 and 173 have blower nozzles 187 near their tops which are connected by flexible tubes 188 to an air supply conduit 190 in the beforementioned air system. A hollow

post 191 is fixed on the platform 32 opposite the intermediate register 36. At its top it is provided with blower nozzles or perforations directed toward the aforesaid openings 183 between the prongs 180 and the point 182 of the separator element (see Fig. 5). A tube 192 connects the post 191 with the air system and the three blowers continuously supply air under light pressure directed edgewise of the sheets in the upper portion of each stack at each forward corner, thus keeping the first few sheets at the top of each stack agitated or "floated" to prevent the suction feeding mechanism from picking up more than one sheet at a time from each stack. As shown clearly in Fig. 5, the prongs 180 are pointed and directed away from the inner angle of the intermediate register and the blower air striking the separator as it runs to its point obviously is deflected through the openings 183 along the edges of the registered sheets.

The feeder frame 33 comprises two rocker arms 200, one at either side of the platform and pivotally mounted therein, and a suction shoe bar 202 pivotally mounted at its ends in the tops of the rocker arms. The bar carries a plurality of slidably adjustable suction shoes 204 connected by flexible tubes 206 to nipples 208 on a hollow rod 210 which communicates by a flexible tube 211 through one of the rocker arms 200 with a conduit in the air system. As the feeder frame is moved toward the paper stacks on the supply table a partial vacuum is created in the conduit and the rod 210, which causes the suction shoes 204, when dipped into contact with the top sheet of each stack, to pick up said top sheets. The feeder frame is then rocked toward the impression cylinder, the vacuum is destroyed by conventional valves and the selected sheets are dropped or deposited on the transfer table 50.

The deposit of a pair of sheets simultaneously on the transfer table and the following action of a lateral register device which will be described presently, covers all of a plurality of laterally aligned ports or openings 209 along the top of the table and causes the air system, under control of a valve operated in a well known manner by a cam on the cam shaft, to develop at the proper time a partial vacuum within the table and within the end supports therefor provided by arms 213 pivotally mounted at 214 on the journal castings for the impression cylinder. At one end the impression cylinder has a spring retracted plunger 216 which is drawn outwardly against the spring action by the development of the partial vacuum. The plunger under such conditions extends sufficiently to travel in the path of a pivotally mounted latch 217 (see Fig. 2) on an arm 218 of a spring held bell crank lever 220 pivoted at 221 on the way frame 21. The other arm 222 of the lever is notched at 223 to receive a pin 224 at the top of an arm 225 of another bell crank lever 227 pivoted at 228 on the way frame. A lower arm 230 of lever 227 has a flange 232 provided with teeth forming the ratchet 80 and adapted to receive the spring pressed rod 79 and hold the belt 60 in frictional driving engagement with its pulleys.

If the pair of sheets on the transfer table properly feed to the cylinder grippers and are removed by the rotation of the cylinder on its upward stroke, the openings 209 are exposed, the vacuum broken, and the plunger 216 is at once retracted by its spring so as to avoid the latch 217. If, on the other hand, the sheets do not properly feed to the grippers and, therefore, are not removed by the rotation of the cylinder, the plunger will strike the latch 217 on its under side and rotate it on its pivot against a pin 235 on arm 218 of lever 220. This will depress the lower arm of lever 220, freeing the bell crank lever 227 from the notch 223, whereupon it drops by gravity or suitable spring means disengaging the teeth of ratchet 80 from the rod or plunger 79. A compression spring 240 bearing against the journal of idler pulley 63 and reacting against a lug 241 on the frame 20 forces the belt tightening pulley 62 and its lever 77 outwardly destroying the frictional driving engagement of the belt. Thus the press is safeguarded against continued operation under improper feed conditions.

Although the feeding device is reasonably certain to pick up a pair of sheets on each movement and feed them simultaneously to the transfer table, if it should happen that one of the pair failed to feed, the stop press mechanism will operate in the following manner. If only one sheet feeds to the transfer table, the openings 209 therein are not all covered. The desired vacuum will not be created and the plunger 216 will fail to project into the path of the stop press trip dog or latch 217. However, the cylinder control will operate to prevent rotation of the cylinder on its next upward movement owing to the fact that certain of the openings 110 and 111 in the gripper bar remain uncovered, and the transfer table will be returned upwardly with the single sheet thereon. At this time the feeder frame approaches with a pair of sheets and the uncovered openings 209 of the transfer table will be covered.

There will be two sheets superposed over certain of the openings and one sheet over the others. Where the superposed sheets are located, the top sheet overlaps the left hand margin of the lower sheet as the latter has previously been moved by the lateral register device. Therefore, when the top sheet is acted upon by the lateral register device, it moves both sheets owing to frictional contact thereof and the lower sheet has its inner forward corner displaced from position over the aperture in the gripper bar. Again the cylinder control prevents rotation of the cylinder due to one or more openings not being covered, the table is moved upwardly, this time with all the apertures covered, and the stop press mechanism operates as previously described.

As a pair of sheets are deposited on the transfer table by the breaking of the suction in the feeder frame, the forward edges project slightly beyond the forward edge of the table. The pivotally mounted arms 213 by which the table is supported at opposite ends are then given a short rocking movement by engagement of a cam roller 243 in a cam slot 244 cut in a face of the spur gear 102 (see Fig. 20). The cam roller is on the end of an arm 245 which is fixed on one end of a rock shaft 246 journaled in parts fixed to the cylinder frame. The arm 245 transmits movement through a stiff compression spring 247 to the lower end 248 of one of the arms 213 and at the opposite end of the rock shaft another arm fixed thereto connects through a similar spring with the other arm 213. As the spur gear 102 oscillates, the transfer table is rocked from a substantially horizontal position where the sheets are deposited, to a forward downwardly inclined position, thereby urging the deposited sheets against the shanks of the gripper pins which are in raised position at this point in the operation. Durng this movement the lateral register device is rendered effective on the left side edge of each sheet.

This lateral register device (see Fig. 3; also Figs. 1 and 2) comprises the lateral register frame 40 having a shaft 250 mounted in the cylinder frame 24 and slidable therein against the opposition of a spring 251. The shaft has spaced arms 252 fixed thereon, in the ends of which a rod 253 is secured. This rod carries a pair of adjustable dogs 41 and 42. The entire frame is given a lateral movement by a cam 254 fixed on a front face of the way frame 21, which engages a cam block 255 on an extension of the shaft 250. As the cylinder frame descends, the cam urges the frame 40 toward the right compressing the spring 251. The dogs 41 and 42 having been adjusted so that the limit of their right hand movement under the cam action corresponds with the desired lateral position of the left hand edge of each sheet relatively to the type forms on the bed, they advance respectively to the left hand edges of the pair of sheets as the latter are deposited on the table and urge the sheets laterally until the movement of the register frame reaches its limit under the cam action. During this operation the front edges of the sheets are aligned with the shanks of the gripper pins and at the end of the lateral registry operation a sheet guard 256 is caused to descend on the sheet and hold it lightly in registered position. The construction and operation of the sheet guard is well known in the art and need not be more particularly described.

The lateral register frame is held out of the path of the feeder frame by a torsion spring 257 and is lowered for registry purposes by a crank 257' having a cam roller 258 at its free end. The roller bears against the cam edge 258' of a plate 258'' bolted to the side of the frame. The torsion spring and cam control the angular movement of the crank 257', which has rotatively movable therewith another crank 259, engaging a pin 259' extending from one of the arms 252 of the register frame.

The sheets are then gripped by the gripper pin heads, the cylinder is rotated and the sheets are impressed against the type forms as hereinbefore described.

The stock supply and feeder mechanism involves automatic means for incrementally raising the stock supply table as the stack or stacks thereon is depleted. This mechanism is well known and has been used for some years in connection with the successive feeding of sheets from a single stack. It is dependent on the amount of dip which the suction shoe bar 202 is obliged to make to pick up the sheet or sheets to be fed. The dip of the suction shoe bar takes place at or near the limit of movement of the feeder frame toward the supply station. The means for operating the feeder frame and the stock supply table will now be described.

The feeder operating cam 75 has a cam race 260 shown in dotted lines in Fig. 1 engaging a cam roller 261 on a segmentally shaped frame 262 which is pivoted on the main frame 20 at 263. A link 264 has its lower end pivoted to the frame 262 at 265. The upper end of the link is pivotally connected at 266 with a crank arm 267 secured to a short shaft 268 journaled in the bracket arm 30 extending from the way frame 21. The short shaft 268 is connected through suitable clutch mechanism 269 with a long shaft 270 which journals in the arms 34 of the platform and to which the lower ends of feeder frame rocker arms 200 are fixed. Under normal conditions the two shafts are coupled and movement of the crank arm 267 rocks the feeder frame through a definite arc determined by the cam race 260.

The cam 75 has also a peripheral cam characteristic, its edge 273 acting upon a roller 274 of a bell crank lever 275 having a pivotal mounting on the pin 263 that pivots the frame 262. A compression spring 277 bearing against the extending arm 278 of the lever 275 and reacting against a lug 280 on the frame 20 holds the roller 274 against the cam edge 273. The outer end of arm 278 is pivotally connected to a rod 281 the upper end of which is pivoted to a collar 282 loosely mounted on an enlarged portion 283 of short shaft 268 and partially overlying the clutch mechanism 269 (see Figs. 13 to 17, inc.). Adjacent the collar 282 is another loosely mounted collar 284 adapted to rotate with collar 282 by reason of a spring pressed coupling pin 285 (see Fig. 16). The collar 284 has an integral bracket 286 provided with a cam groove 287 which receives a roller 288 on a small lever arm 289 fixed on a pin 290 which journals in a lug 291 on the adjacent feeder arm 200 (see Fig. 15). An extension 292 of the lever arm 289 is pivotally connected to a rod 293 which extends upwardly along the feeder arm. At the upper end of the feeder arm with which the aforesaid mechanism is associated, a short shaft 294 is journaled and projected beyond the journal at both sides thereof. On the inner side of the journal a small crank arm 295 is fixed to the shaft and the suction shoe bar is secured at the end thereof by a stud screw 296 (see Figs. 1 and 4). On the outer side of the journal formed by the top of the feeder arm another crank arm 297 is fixed on shaft 294 and the end of this arm is forked around a pivotally mounted block 101 through which the top of rod 293 is extended and provided with a collar 99. A spring 298 on the rod 293 between a suitable collar fixed on the rod and a bracket fixed on the feeder arm serves to urge the rod upwardly as cam groove 287 permits. This movement of the rod is transmitted through a spring 201 to the block 101 and the crank arm 297. The opposite end of the suction shoe bar 202 is suitably mounted to accommodate the movements effected at the one end. Thus the bar is caused to dip at the proper time by the action of the cam edge 273 on rod 281 and the movement of the cam groove 287 which allows the spring 298 to force the rod 293 upwardly until a plurality of suction shoes on the bar 202 come into suction engagement with the top sheet of each stack on the table, after which movement of the feeder frame transfers these sheets simultaneously to the transfer table. It will be obvious from an inspection of the shape of cam edge 273 that the dip of the suction shoe bar is for only a comparatively short interval and that the raising of the bar before or about the time that the feeder frame leaves its limit position assists the operation of the feed by tending to hurdle the sheets over the prongs 130 of the intermediate register and stack separator 35. A spring 299 returns the coupled collars 282 and 284 quickly to their starting positions after they have been acted upon by rod 281.

To step up the stock supply table as the sheet stacks are depleted, a sleeve 300 mounted for rotary movement on the shaft 270 is provided with a beveled gear 301 at one end which meshes with a beveled pinion 302 on the end of a shaft 303 journaled in suitable brackets on the platform 32 (see Fig. 4). The shaft 303 has a worm 304

which is engaged with a worm wheel 305 fixed on the shaft 165 which has the spaced pinions 162 meshing with the rack bars 160 (see Fig. 19). Rotation of the sleeve 300, therefore, effects a movement of the stock supply table. It is only desired to move the table upwardly at intervals, after the stock thereon has been somewhat reduced. To effect this movement, a ratchet 310 is provided on the sleeve 300 and a pawl 311 is associated therewith and operated by mechanism which causes the pawl to function on the ratchet intermittently and at other times ride idly over the ratchet teeth. As previously stated, this operation is governed by the amount of dip of the suction bar which must increase as the stock is depleted. On an extension of the pin 290 which is journaled in lug 291 of the feeder arm (see Figs. 15 and 18), a short arm 321 is fixed, having at its free end an adjusting screw 322. The arm 321 by this mounting is moved in accordance with the rotative movement of the lever arm 289 and as the lever arm is moved a greater distance by the spring 298 acting upon rod 293 to dip the suction bar a greater distance as the stock is depleted, the arm 321 will be moved correspondingly further on each actuation until screw 322 strikes an arm 325 (Fig. 18). This arm is fixed on a short shaft 326 which is journaled in one of the arms 34 of the platform. At the other end of the shaft 326 a latch-operating arm 327 is fixed and normally held against a stop pin 328 on the platform arm by a spring 329.

The pawl 311 is held by a pivoted latch 330 so as not to operatively engage the ratchet wheel 310 on sleeve 300. In this condition the feeder frame may make several oscillations each time feeding a sheet from the top of each stack. Progressively the suction bar dips deeper for contact of the shoe with the top sheets. This causes the movement of the lever arm 289 and shaft 290 to be amplified, the shape of cam 287 being such as to allow for such amplified movement. Presently the movement is sufficient to cause the adjusting screw of the short arm 321 to contact with and move the arm 325 rotating the shaft 326 and the latch-operating arm 327. The arm 327 tips an end of the pivoted latch 330 releasing the pawl so that upon the next forward movement of the feeder frame the pawl, which is mounted with its latch on an arm 340, fixed to oscillate with shaft 270, engages the ratchet and thereby effects a partial rotation of the sleeve 300 which is translated as described into a slight elevation of the stock supply table. As the pawl rides back over the ratchet teeth the latch is restored by a gravity action. The elevation of the table decreases the amount of dip of the suction shoe bar and the pawl does not again function until the stock on the table has been again depleted a predetermined amount.

Owing to the construction and operation of the means which I have devised to register the inner corners of two separate stacks of sheets and to agitate the inner corners of the top sheets of each stack, the feeding devices are generally unfailing in the simultaneous selection of the top sheet of each stack upon successive operations. The depletion of the stacks is, therefore, entirely uniform, making it possible to rely upon the incremental feed mechanism just described.

The delivery mechanism

The devices for removing the printed sheets from the cylinder may be of the form shown and described in U. S. patent to Cheshire No. 1,567,177 or U. S. patent to Stevens No. 1,609,585, or of the form embodied in the press shown and described in U. S. patent to Dudley, or of other approved form. Such devices include a delivery table as indicated herein at 39 with means for automatically causing the table to descend as the printed stock accumulates, a delivery frame such as is indicated at 38 having a multiplicity of gripper jaws 352 spaced along the frame, and suitable confining walls or frame members 353 (see Fig. 3).

As shown herein a crank arm 76 drives a rod 355 which oscillates an arm 356 on a shaft 357. The delivery frame is rocked by this shaft and approaches the impression cylinder as the latter makes its upward or impression stroke. The gripper pins of the cylinder are caused to release the pair of sheets at about the time the gripper jaws 352 are opened by suitably timed actuation of a rod 360 and advance around the forward marginal areas of the sheets. The jaws then close on the sheets and the frame is moved to the delivery station where the jaws 352 are opened and the sheets dropped in separate stacks on the delivery table.

The confining walls or skeleton frame members 353 are adjustable to the desired positions and any desired jogging action may be introduced for the purpose of maintaining regularity of the stacks. It has been found advantageous in connection with the present invention to use, under certain conditions, a separating partition 370 (see Fig. 3) between the two stacks on the de-delivery table. Such a partition may be inserted between the front and rear walls or frame members and removably fixed to one or both of them. No contention is made of any novelty in the delivery mechanism except as, and to the extent that the step or steps of delivering and stacking in a plurality of stacks enter into the novel methods of printing herein claimed or unless said novelty shall exist in the introduction of the separating partition in combination with other elements by which the plural sheet feed is obtained.

The improved methods of printing

The improved methods which I have discovered will be understood by reference to Figs. 21 and 22 which schematically represent the steps taken in carrying out two typical printing orders. Other orders involving the reproduction of cuts or multicolor printing or printing sheets of different sizes or distinctive colors or other special problems may be carried out by these illustrated methods as hereinafter claimed.

Fig. 21 is directed to an order involving cross and down rules as previously referred to in this specification. A form provided with cross rules is set up at one side of the type bed and a form provided with down rules is set up at the opposite side, as represented under the legend "Printing", although the showing there is intended to represent the impressed sheets and not the forms. After setting the forms in the single bed, two stacks of sheets are arranged on the supply table as previously described. The two forward upper corners of each stack are kept constantly in agitation by the blowers and the feeding frame transfers the top sheet of each stack to the transfer table for alignment with the forms by the lateral register members and the gripper pins of the cylinder. The sheets are simultaneously impressed respectively against the different forms and delivered printed as shown under the legend

"Delivery". These operations are carried on until the supply stacks are exhausted and the sheets have been transferred to the delivery table in two printed stacks. The delivery stacks are then removed and returned to the supply table where the same forward corners of the stacks are registered but the position of the stacks is reversed so that the sheets formerly fed to the form having the cross rules will next be fed to the form having the down rules, and, correspondingly the sheets of the other stack will be advanced to the cross ruled form. The press is again set in operation and the sheets of each stack are delivered printed with both cross and down rules, it being understood that the desired type is originally set in each or either form. If the printing order is for a quantity of ten thousand the stacks are of five thousand each and with two runs through the press the number of operations is ten thousand as against twenty thousand otherwise required or as against the prohibitive expense of a specially prepared plate having the cross and down rules on one form.

Fig. 22 illustrates an order requiring different printing on opposite sides of each sheet. If the order is for a quantity of ten thousand the stacks are set up at the supply table each with five thousand sheets. The forms are set side by side in the bed, one form comprising the type for the face side of the sheet and the other form comprising the type for the reverse side of the sheet. Five thousand operations of the press print ten thousand sheets half of which are printed on the face and the other half on the reverse or back. The two delivery stacks are returned to the supply table and re-registered by their same forward corners but in this instance the stacks, in addition to being reversed as to position relative to the forms, are turned upon themselves, thereby presenting the unprinted sides of the sheets to the forms when subsequently fed through the press. Five thousand additional operations or a total of ten thousand complete the order as against twenty thousand otherwise required or as against the expense of four compositions instead of two when the sheets used would be of double size fed singly through the press and subsequently cut in half. It will be understood that where the sheets to be printed are standard forms or sizes supplied by the customer to the printer, even this alternative possibility of running a double sheet and later cutting it is not available to the printer. Under such conditions the printer formerly has been required to run twenty thousand operations of the press to complete the order.

For multi-color work, some modification of the inking mechanism will be necessary but such will be obvious to one skilled in the art and the user will be able to practice the methods herein described to great advantage in connection with multi-color orders.

The improved methods are of great importance in obtaining a high quality characteristic for the work. In both runs through the press the same edges of the sheets are registered with the forward registers for the two stacks which in turn causes these same edges to be the aligning edges with the gripper pins of the impression cylinder with the result that the sheets align perfectly with the forms for the second printing.

The plural feed devices make it possible to run stock of different quality or color simultaneously through the press; for example, an order for fifty thousand cards printed on one side, twenty-five thousand of the cards to be of one color stock and the other twenty-five thousand to be of a different color, and the printing to be different on the cards of each color. With a single sheet feed, fifty thousand impressions are necessary. It is impossible to operate with the two different forms on the type bed at the same time and feed a double sheet for subsequent cutting, as the stock for impression against the different forms is of different colors. By the present invention such an order is completed by twenty-five thousand impressions.

What is claimed is:

1. The method of printing, which consists of registering inner forward corners of two spaced stacks of sheets, simultaneously selecting a sheet from each registered stack, feeding said sheets and simultaneously impressing them respectively on two printing forms, repeating the selecting, feeding and impressing on successive registered sheets of the stacks, delivering the impressed sheets in two stacks, returning the stacks to register position in varied relation to their original register position so that the presentation of the sheets thereof to the printing forms is varied, and continuing the selecting, feeding, impressing and delivering of the sheets.

2. In a printing press, in combination, an impression cylinder having cylinder-control spaced ports, a stock table, vertical register members at opposite sides of the stock table, an intermediate vertical register member comprising a single bracket providing registry for the inner forward corners of two spaced stacks of sheets on the stock table, a feeder adapted to select a sheet from each stack and move the sheets simultaneously toward the cylinder, lateral register means operative on each of the simultaneously moved sheets to align them in relation to said spaced ports so that in further operation one sheet overlies one port and the other sheet overlies another port and both sheets jointly cover all of said ports.

3. The method of printing, which consists of arranging two stacks of sheets side by side in spaced relation and controlling the positions of the stacks at the forward corners thereof, then simultaneously selecting a sheet from each stack, moving them forwardly and printing them, delivering the printed sheets, continuing the selecting, printing and delivering actions on successive pairs of sheets in the stacks until two stacks of sheets are delivered, removing the delivered stacks and re-controlling the same forward corners of the stacks in a different relative arrangement of the stacks, then further continuing the selecting, printing and delivering of two sheets at a time.

4. The method of printing a multiplicity of sheets, which consists of arranging the sheets in two stacks spaced side by side, controlling the inner forward corners of each stack so that each stack has the inner forward corners of its sheets in vertical alignment, simultaneously selecting a sheet from each stack and advancing them to be printed, simultaneously printing them side by side, delivering them side by side, periodically repeating the selecting, advancing, printing and delivering on successive sheets, then rearranging the stacks for further printing by reversing their original side by side relation, controlling the inner forward corners of the stacks as rearranged, and continuing the selecting, advancing, printing and delivering of the sheets in pairs.

5. The method of printing a multiplicity of sheets, which consists of arranging the sheets in two stacks side by side, controlling each stack

for registry purposes, creating a suction on the top sheet of each stack, withdrawing the top sheet of each stack from control and simultaneously advancing them to be printed, simultaneously printing them side by side, delivering the printed sheets side by side, continuing the suction creating, withdrawing, advancing, printing and delivering steps in relation to successive top sheets of the stacks until two stacks of sheets are delivered, then rearranging the stacks under control by turning them upon themselves in relation to their original arrangement and reversing their side-to-side positions, and again withdrawing from control, advancing printing and delivering the sheets thereof in pairs.

6. The method of printing, which consists of arranging a multiplicity of sheets in two stacks spaced side by side, controlling the stacks in a predetermined position of registry and sheet alignment, creating a suction on and withdrawing from control simultaneously a sheet from each stack and advancing the sheets for printing, adjusting the sheets laterally to a register position, printing the sheets side by side and delivering the sheets side by side, continuing the steps of withdrawing the sheets in pairs, advancing them, laterally adjusting them, printing them and delivering them, until two stacks of printed sheets are obtained, then rearranging and controlling the stacks of printed sheets with their side-by-side relation reversed from the original position of the stacks and continuing the advancing, adjusting, printing and delivering steps to effect printing of each sheet with indicia printed on its companion sheet by the first printing operation.

7. In a printing press having differential air pressure control for certain of its movements, the combination with a flat type-bed, an impression cylinder relatively movable therewith having spaced air ports, a stock table, laterally adjustable side-register members for stock on said table, and means for transferring sheets from said table to said impression cylinder, of a bracket adapted to be detachably arranged in a fixed position between the said side registers, said bracket having a uniform-spacing member for a pair of stacks of sheets mounted on the stock table and having oppositely extending flanges to register forward edges of the stacked sheets at their inner corners, and a lateral register device adapted to engage corresponding side edges of a pair of sheets being transferred and laterally move them to a predetermined position of alignment relative to the type-bed and to cover respectively different air ports in the impression cylinder.

8. In a printing press, the combination of a flat type-bed, an impression cylinder movable relatively thereto, a stock table, a delivery table, laterally adjustable side-registers for stock stacked on said stock table, means for transferring stock from the stock table to the impression cylinder, means for transferring stock from the impression cylinder to the delivery table, and means for adapting the press to the feeding of two sheets at a time comprising a partition at the delivery table, a lateral register device having spaced members simultaneously operative on corresponding edges of the sheets and a bracket having an arm which is T-shaped in cross section adapted to be detachably mounted in a position adjacent the stock table between said laterally adjustable side-registers.

9. In a printing press, the combination of a flat type-bed, an impression cylinder movable relatively thereto, a stock table, a delivery table, laterally adjustable side-registers for stock stacked on said table, means for transferring stock from the stock table to the impression cylinder, means for transferring stock from the impression cylinder to the delivery table, and means for adapting the press to the feeding of two sheets at a time comprising a partition at the delivery table, a lateral register device having spaced members simultaneously operative on corresponding edges of the sheets and a bracket having an arm which is T-shaped in cross section adapted to be detachably mounted in a position adjacent the stock table between said laterally adjustable side-registers, said arm having its upper end formed with an opening in the bar of the T opposite the stem and the stem being inclined upwardly and rearwardly opposite said opening.

10. In a printing press having an impression cylinder with spaced air ports which must be covered to insure normal printing operation, a stock table, side-registers for stock, a plural feed adapter comprising a bracket detachably fixed adjacent said table and having an upstanding arm T-shaped in cross section adapted to receive the inner forward corners of two stacks of sheets mounted on the stock table, an air blower fixed adjacent the stock table, means for simultaneously transferring a sheet from each stack from the stock table to the impression cylinder, and means adapted to act on both transferred sheets to align them over the air ports in said cylinder.

11. In a printing press having an impression cylinder with spaced air ports which must be covered to insure normal printing operation, a stock table, side-registers for stock, a plural feed adapter comprising a bracket detachably fixed adjacent said table and having an upstanding arm T-shaped in cross section adapted to receive the inner forward corners of two stacks of sheets mounted on the stock table, an air blower fixed adjacent the stock table, means for simultaneously transferring a sheet from each stack from the stock table to the impression cylinder, and means adapted to act on both transferred sheets to align them over the air ports in said cylinder, the upstanding arm of said bracket having an opening in the bar of the T opposite the stem to admit air from said blower.

12. In a printing press having an impression cylinder with spaced air ports which must be covered to insure normal printing operation, a stock table, side-registers for stock, a plural feed adapter comprising a bracket detachably fixed adjacent said table and having an upstanding arm T-shaped in cross section adapted to receive the inner forward corners of two stacks of sheets mounted on the stock table, an air blower fixed adjacent the stock table, means for simultaneously transferring a sheet from each stack from the stock table to the impression cylinder, and means adapted to act on both transferred sheets to align them over the air ports in said cylinder, the upstanding arm of said bracket having an end opposite said air blower defining two spaced prongs in the bar portion of the T and an upwardly receding stem portion by which air from said blower is deflected.

13. In a printing press having a platform and an impression cylinder and having a certain operation dependent on feeding of sheet material to cover closely spaced air ports in the impression cylinder, a device for converting the press to plural feed operation, comprising a single

bracket adapted to be fixed relative to the press platform at a predetermined point and having an upstanding arm which in cross-section defines two opposed spaced channels for the registration and predeterminate spacing of the corners of two stacks of sheets so that as sheets from each stack are simultaneously transferred to the impression cylinder said air ports will be covered.

14. In a printing press, an attachment for converting the press to plural sheet feed, comprising a bracket having an arm adapted to be removably secured to the press platform and an upright arm of T-shape in cross-section the inner angles of which are adapted to serve as registration and spacing means for the corners of sheets, the upper end of said upright arm being centrally recessed to define spaced prongs with an upwardly extending central portion between them, allowing for the passage of blower air between the prongs and providing for its deflection to each side between the prongs and the extending central portion.

15. In a printing press, an attachment for converting the press to plural sheet feed, comprising a bracket having an arm adapted to be removably secured to the press platform and an upright arm of T-shape in cross-section the inner angles of which are adapted to serve as registration and spacing means for the corners of sheets, the upper end of said upright arm being centrally recessed to define spaced prongs with an upwardly receding central portion between them, allowing for the passage of blower air between the prongs and providing for its deflection to each side between the prongs and the receding central portion, and said prongs being shaped to pointed tips and directed away from the angle of sheet registration to provide for the passage of blower air.

16. In a printing press, an attachment, for use in converting the press to plural sheet feed, comprising a bracket having an arm adapted to be removably secured to the press platform and an upright arm of T-shape in cross-section the inner angles of which are adapted to serve as registration and constant spacing means for the corners of stacks of sheets, the upper end of said upright arm being centrally recessed to define spaced prongs with an upwardly extending central portion between them, allowing for the passage of blower air between the prongs and providing for its deflection to each side between the prongs and the receding central portion.

17. In a printing press, an attachment, for use in converting the press to plural sheet feed, comprising a bracket having an arm adapted to be removably secured to the press platform and an upright arm of T-shape in cross-section the inner angles of which are adapted to serve as registration and constant spacing means for the corners of stacks of sheets, the upper end of said upright arm being centrally recessed to define spaced prongs with an upwardly receding central portion between them, allowing for the passage of blower air between the prongs and providing for its deflection to each side between the prongs and the receding central portion, and said prongs being shaped to pointed tips and directed away from the angle of stack registration to provide for the passage of blower air laterally between the prongs and the forward edges of sheets in stacks registered by the bracket.

18. In a printing press, a platform, vertical register members for corners of stacked sheets, said register members being adapted to be fixed in different positions of lateral adjustment relative to said platform, a stock supply table mounted for movement up and down relative to said vertical register members, an air blower nozzle in fixed relation to said platform, and a single bracket forming a combined separator and register for two stacks of sheets mounted on said stock supply table, said bracket being detachably fixed relatively to said platform, being provided with angular faces to register inner forward corners of the two stacks of sheets in definitely spaced relation and having its upper part adjacent said air blower nozzle and centrally recessed to permit air from said nozzle to pass through it to the corners of upper sheets of the two stacks.

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