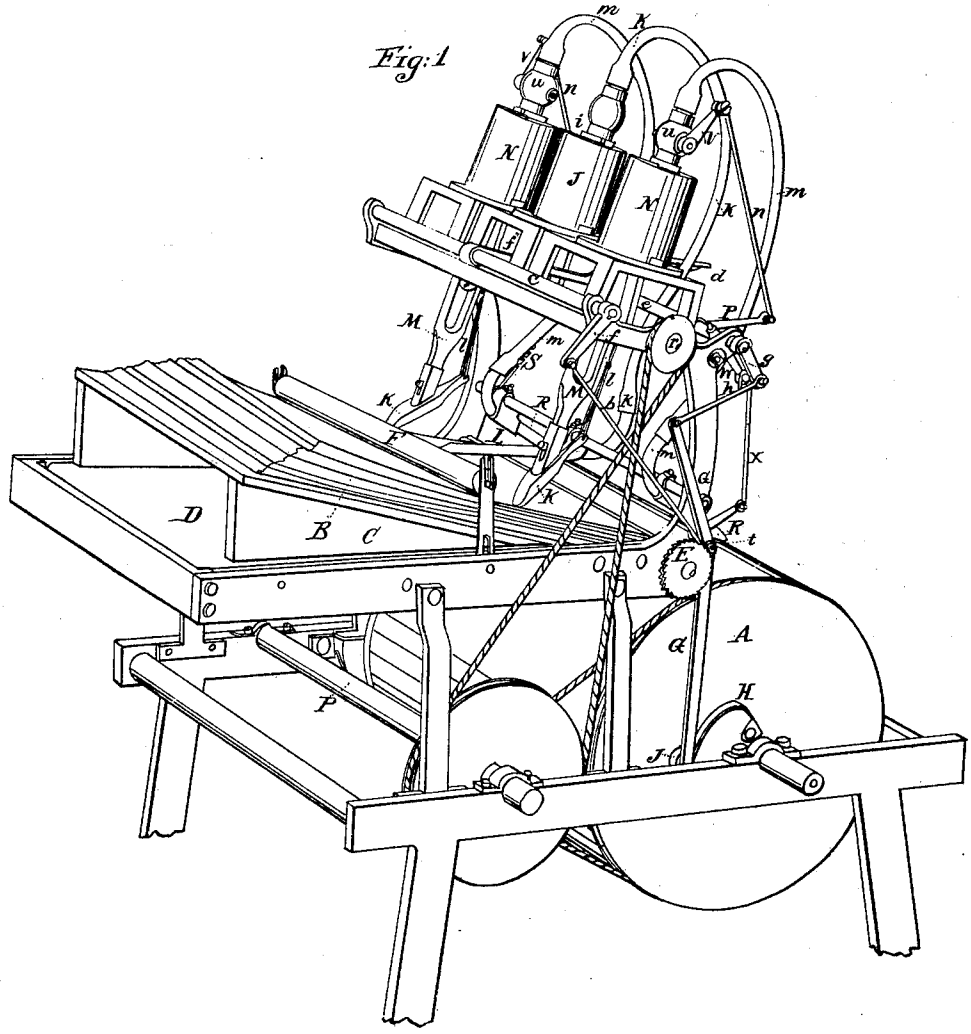
3 Sheets—Sheet 1.

W. BULLOCK.

AUTOMATIC PAPER FEEDER.

No. 21,591. Patented Sept. 21, 1858.

Fig: 1



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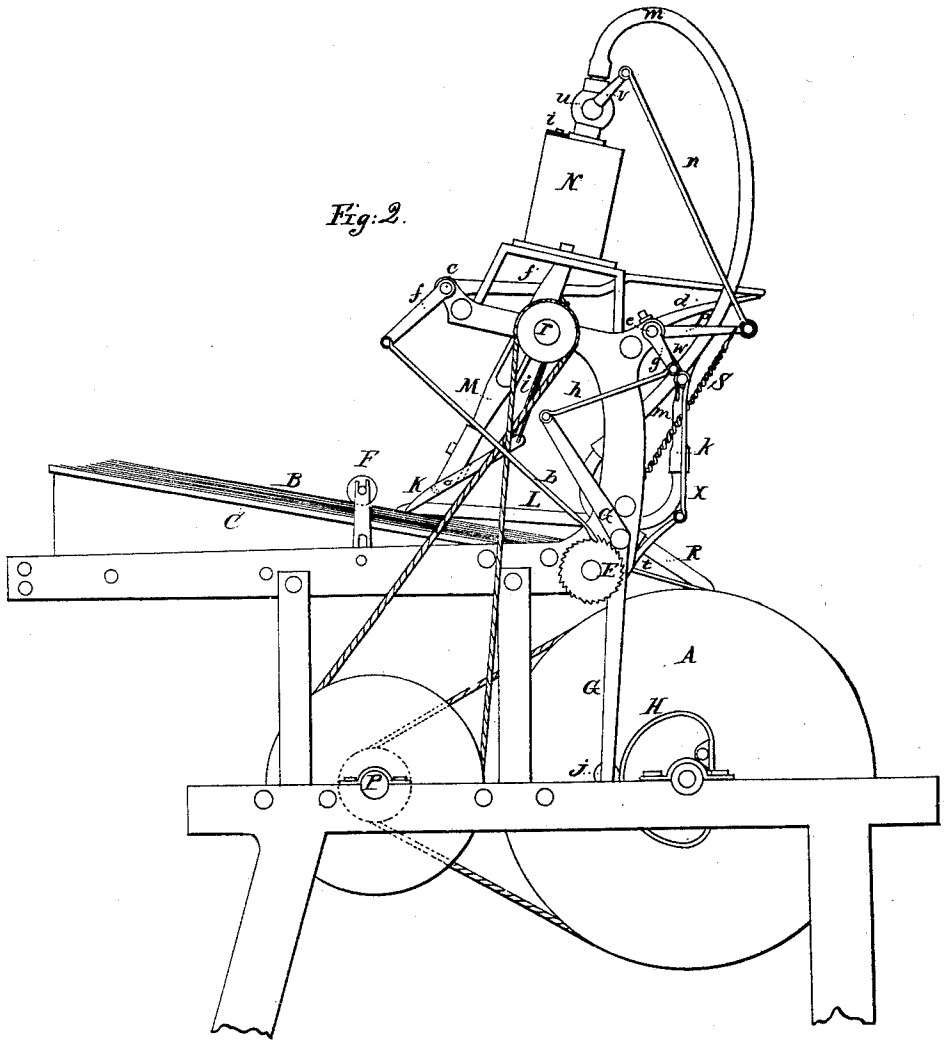
3 Sheets—Sheet 2.

W. BULLOCK.

AUTOMATIC PAPER FEEDER.

No. 21,591. Patented Sept. 21, 1858.

Fig: 2.



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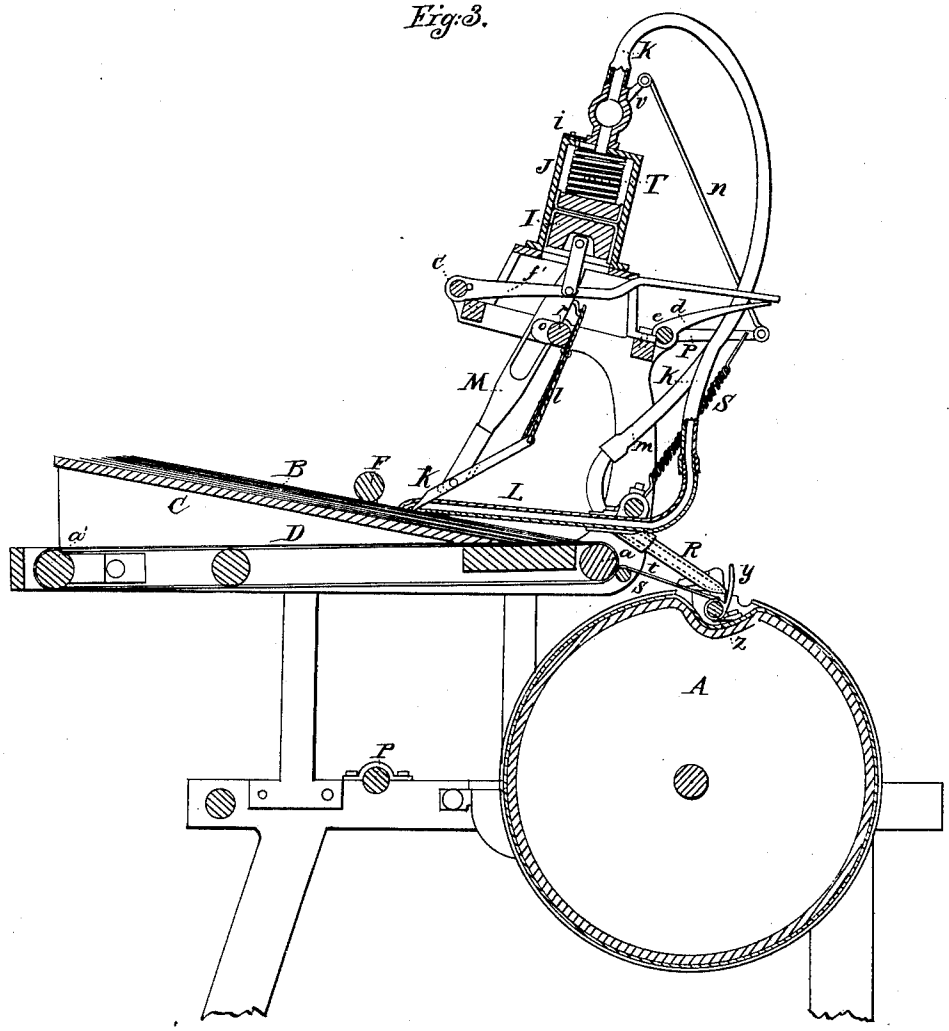
3 Sheets—Sheet 3.

W. BULLOCK.

AUTOMATIC PAPER FEEDER.

No. 21,591. Patented Sept. 21, 1858.

Fig. 3.



THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM BULLOCK, OF NEWARK, NEW JERSEY, ASSIGNOR TO GEO. W. TAYLOR, OF SAME PLACE.

AUTOMATIC PAPER-FEEDER FOR PRINTING-PRESSES.

Specification of Letters Patent No. 21,591, dated September 21, 1858.

To all whom it may concern:

Be it known that I, WILLIAM BULLOCK, of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Feeding Paper to Printing-Presses; and I do hereby declare that the following is a full, clear, and exact description of my said invention, reference being had to the accompanying drawings, in which—

Figure 1 represents a view in perspective of my automatic feeder connected with the cylinder of a printing press; Fig. 2 is a side elevation of the same, and Fig. 3 is a vertical longitudinal section of the machine through the central vacuum cylinder.

Various machines have heretofore been devised for the purpose of feeding sheets of paper to printing presses, but in these machines so far as my knowledge extends, the sheets have been operated upon by mechanism whose movement when in operation bears a definite relation to the movements of the press to which the apparatus has been applied. These machines have thus far proved defective in practice for the reason in my opinion that it has been necessary to lay the pile of paper upon them with very great accuracy to obtain a practically good register, and that sheets of paper of different qualities or dampened to a greater or less extent adhere to each other with greater or less force, and therefore require different amounts of movement or force in the feeding apparatus to feed them to the press.

My invention is designed to obviate the defects of preceding machines in these respects and it consists first, in operating the members of the machine which effect the feeding of the sheet of paper in such manner that the amount of movement developed by them in feeding successive sheets bears no fixed relation to that of the parts of the printing press proper, and that they have a sufficient capacity to feed a sheet of paper in less time than is allowed for that purpose by the movement of the press.

The second part of my invention consists in constructing and operating the feed mechanism in such manner that the amount of motion of the members which effect the movement of the sheet is regulated and controlled by the position of the sheet; so that when the sheet has been moved to its proper position the members aforesaid are no longer permitted to act upon it.

The third part of my invention consists in intermitting the operation of the feeding apparatus upon the paper while the sheet is being drawn into the press, although the members of the feeding apparatus still continue to move at a regular speed.

The fourth part of my invention consists in moving the pile of paper, so as to present the top sheet to the members which effect the feeding, by a mechanism whose operation upon the pile is controlled by the position of the pile so that when the pile occupies its proper position the mechanism is not permitted to act upon it. There are also various novel combinations of mechanical elements in my machine whose nature and operation will more fully hereinafter appear.

In the accompanying drawings the paper feeding apparatus is shown as used in connection with the cylinder, A, of a printing press; the other portions of the press being omitted to avoid unnecessary complexity in the drawings. The feeding apparatus is supported by a frame which extends above the upper surface of the cylinder A, and is suitably supported upon the frame of the press. The press cylinder is constructed in the usual manner, and is fitted with the usual finger shaft z, and fingers y, by which the edge of the paper presented to it is seized, and by the rotation of the cylinder drawn thereupon. The feed table C, upon which the pile of paper B is laid, is inclined; it is connected with an endless apron D that runs upon rollers a, a', and is otherwise suitably supported to sustain the weight of the paper. The shaft of one of the apron rollers a', has a ratchet wheel E secured to it which is operated by a finger b, whose office is to turn the ratchet wheel and the roller, and thus propel the feed table C with the paper lying thereon toward the cylinder A. The feed table is surmounted by a roller F, whose office is to press lightly upon the sheets and thus keep them in their proper position.

The finger b, which operates the ratchet wheel, depends from an arm f that is secured to the extremity of a rock shaft c. This finger rock shaft crosses the frame of the

feed apparatus, and is fitted at about its middle with a second arm f', by which the finger rock shaft can be rocked to cause the finger to move the ratchet wheel. The extremity of the finger rock shaft arm f', bears upon a toe d, which is secured to a second rock shaft e. This latter rock shaft also extends across the frame of the apparatus and is fitted at its extremity with an arm g, which is connected by a link h, with the upper extremity of a lever G. The lever G is pivoted to the frame and its lower extremity is furnished with a friction wheel j, that bears against the periphery of a cam H secured to the cylinder A; so that as the latter revolves, the lever G is caused to oscillate, and rock the rock shaft e, whose toe d acting upon the arm f', alternately raises and lowers the latter, and effects the rocking of the rock shaft c, by which the finger b, is caused to actuate the ratchet wheel E. Under the operation of the mechanism thus described alone, the finger would partially turn the ratchet wheel and its roller at each revolution of the press cylinder A, and would thus propel the feed table and the paper thereon forward faster than is necessary or desirable. In order therefore to control and regulate this action of the finger on its ratchet wheel, the arm f' of the finger rock shaft c is connected with the piston, I, of a single acting air cylinder, J, that is mounted in an inverted position upon the upper part of the frame of the apparatus. This piston is packed so as to move airtight in the barrel of the air cylinder, and as the link that connects the piston with the arm f' is inflexible, the piston is raised whenever this arm is raised by the toe d. The piston is surmounted by a coiled spring T which tends to depress it as often as the rocking toe, d, permits the arm f' to descend. By this movement of the piston air is alternately drawn into and expelled from the air cylinder J, and so long as the free passage of the air to and from the air cylinder is not prevented, the reciprocating movements or strokes of the piston will correspond in number with the oscillations of the rock shaft e, and the finger b will be moved in a corresponding degree. If however the admission of the air to the upper part of the air cylinder be shut off the piston can not redescend, because the pressure of the atmosphere upon its lower side holds it up against the force of the spring. Hence, under such a circumstance, the arm f' will no longer descend with the toe d, and the movement of the finger b, will be intermitted, although the toe d continues to vibrate, until air is again permitted to enter above the piston. The exclusion of air from the air cylinder thus stops the movement of the feed table, and its free admission permits the feed table to be moved forward; hence by controlling the admission of air to the cylinder the movement of the feed table is controlled in a corresponding manner.

In my apparatus the paper itself is made to control this admission of air to the air cylinder by the following arrangement. The head of the air cylinder J is closed, and is connected by a pipe k with a nozzle L, which extends over the inclined pile of paper B on the feed table, and is in such a position with respect to the other parts of the machine that when the pile of paper is in its proper position for being fed its upper sheet bears against the end of the nozzle, and, by preventing the free entrance of air through it to the air cylinder, stops the descent of the piston and the movement of the finger b and ratchet wheel E. When the nozzle is thus closed the feed table with the pile of paper thereon remains stationary until a sufficient number of sheets have been fed to the press to permit air to enter freely into the nozzle and thence into the cylinder; then the piston descends sufficiently to enable the finger b to move back the space of a ratchet tooth, and on moving forward to turn the ratchet wheel and propel the surface of the pile again toward the nozzle. When the paper is in contact with the nozzle the free exit of air from the air cylinder is prevented by the presence of the paper beneath the nozzle, hence it is necessary to provide a means for this air to escape while the piston is moved upward; this is effected by forming an orifice in the upper part of the air cylinder and closing it by a spring valve i which permits the imprisoned air to escape and prevents its reëntrance.

The feeding of the paper, sheet by sheet, from the pile to the position where the fingers of the cylinder grip its forward edge, is effected by automatic hands, K, K, which are moved alternately in the direction in which the sheet is to be moved and alternately in the opposite direction thereto. These hands are pivoted to the lower extremities of arms M, M, which depend from a pair of pistons similar to that of the air cylinder J and working in a pair of air cylinders, N, N, situated on either side of the air cylinder J. The arms are slotted to admit the cranks o of a crank shaft r, by whose revolution these arms are caused to vibrate to and fro in the direction in which the paper is to be fed. The crank shaft in its revolution permits the hands K, K, to bear upon the sheet when they are moved toward the cylinder A; as they approach the end of their stroke in this direction the cranks in their revolution bear against the upper ends of the slots in the arms, and, raising them, lift the hands from the sheet upon which they have been pressing. As the cranks then pass through the upper half of their revolution they carry the arms and their

hands backward over the sheets, and drop them again, to permit the hands to press upon the paper while the cranks are traversing the lower half of their revolution, and are moving the hands toward the press cylinder A. As before stated each hand is pivoted to its corresponding arm; that extremity of each hand which is nearest the cylinder is also connected with its respective arm by a spring *l* which causes the opposite, or what may be termed the finger end of the hand, to bear upon the sheet with a yielding pressure. The crankshaft *r*, which passes transversely across the frame of the apparatus, is fitted with a pulley to which in this instance motion is imparted from a counter shaft P by means of a cord, and the countershaft is driven in a corresponding manner from the cylinder A. The several pulleys upon the shafts are of such relative diameters that the crank shaft revolves many times faster than the cylinder A. Therefore, as but one sheet has to be fed for each revolution of the cylinder, the capacity of the hands for feeding the paper is very much greater than is actually required for the purpose; and if the hands were permitted to act upon the paper the whole time allowed by the revolution of the press cylinder, the paper would be pushed over the cylinder and out of the machine.

In order to control and regulate the action of the hands upon the paper a pair of nozzles R, R, are projected over the cylinder, their extremities being situated at the line to which the paper is to be fed. These nozzles are connected with the upper parts of the air cylinders N N by pipes *m* so that when the pistons descend under the actions of their respective springs the air enters through the nozzles R, R; and when these nozzles are closed, air can not enter the upper ends of the cylinders; in the latter case the pistons will be prevented from descending by the pressure of the atmosphere beneath them and will hold the arms and hands in the raised positions to which they have been lifted by the action of the cranks *o*. In order to guide the paper from the table to the nozzles a pair of flap guides *t*, are secured to a shaft, *s*, in such positions as to project immediately beneath the nozzles R, so as to direct the edge of the paper moved by the hands against the orifice of the nozzles. The guide shaft *s* is fitted with an arm by which it can be rocked so as to raise the extremities of the guides into close contact with the orifices of the nozzles, and thus limit the movement of the paper, or to permit them to fall by their weight and thus free the forward edge of the paper when the fingers of the press cylinder grip it. A slight recess is also cut in the end of each guide immediately beneath the orifice of its appropriate nozzle so as to permit the air to pass freely thereto. The operation of the controlling apparatus thus described is such that when the front edge of the paper arrives beneath the orifice of either nozzle it closes that orifice, prevents the admission of air to the air cylinder above, and thus stops the descent of the hand upon the paper, which is then permitted to remain stationary until the fingers of the cylinder seize it although the hand still continues to vibrate. If the front edge of the paper moves forward equally from end to end, both nozzles will be closed simultaneously, and both hands will cease to act upon the paper at the same time. If however the uniform movement of the sheets be prevented by any accidental cause or if the paper be unevenly piled upon the table so that its front edge moves diagonally forward, the hand appropriate to the nozzle at which the sheet arrives first will be first prevented from dropping, while the other hand still continues to act upon the paper. The sheet will then be turned upon the orifice of the nozzle as a center by the action of the hand still operating, until this hand is prevented from dropping by the arrival of the edge of the sheet at its appropriate nozzle.

In the operation of the machine it is necessary that the sheet should not be sucked into the orifice of the nozzles and should not be touched by the hands while it is being drawn upon the cylinder by the fingers. Both of these objects are obtained by fitting stop cocks *u* into the pipes leading to the air cylinders N N. These stop cocks are operated by arms *v v* which are connected by rods *n* with a pair of arms *p* projecting from the rock shaft *e* previously mentioned. This shaft is caused to rock in one direction to close the stop cocks by the action of a spring S, which is connected with one of the arms *p*, and the shaft is rocked in the opposite direction to open the cocks by means of the cam H. The cam H is set in such a position with respect to the finger shaft, *z*, of the press cylinder that it permits the spring S to close the stop cocks, thus preventing the suction of the sheets into the orifices of the nozzles R, and at the same time preventing the entrance of air into the cylinders N N, as soon as the fingers *y* are in the position to grip the forward edge of the sheet; and it permits the stock cocks to be kept closed until the sheet has been entirely drawn upon the cylinder, thus preventing the hands from dropping. When however the hinder edge of the sheet has passed the nozzles R, the cam acting upon the lever G, opens the stop cocks and permits the hands to act freely upon the next sheet. As the rock shaft *e*, which operates the cocks, moves just when the front edge of the paper should be released by the guides *t*, its motion is made use of to effect the dropping of the

guides by securing an arm *w* to it, and connecting this arm by a rod *x*, with an arm secured to the guide shaft *s*. The air cylinders N, N, are fitted with orifices and spring valves to permit the air imprisoned in the cylinders to escape, in the same manner as described in reference to the central air cylinder J.

When the printing press to which this feeding apparatus is attached is to be put in operation, the paper, previously dampened in the usual manner, is laid upon the feed table B, and the latter is moved forward by turning the ratchet wheel E by hand until the uppermost sheet closes the orifice of the nozzle L. The press is then put to work and the several parts of the feeding apparatus operate as hereinbefore described. The hands operating upon the pile of paper propel the sheets forward toward the press cylinder, the uppermost sheet being moved directly by the action of the hands upon it, while the sheets beneath are moved in a less degree by the contact with those above them, so that when the uppermost sheet arrives at the proper position to be gripped by the fingers of the press the next sheet is a short distance behind it, the third a less distance behind the second, and so on progressively to the pile. As the press cylinder revolves its fingers seize the uppermost sheet, and as fast as one sheet is drawn into the press the next one is moved by the hands to be drawn upon the press cylinder at the succeeding revolution thereof.

The various parts of the feeding apparatus thus described may be modified in various ways without affecting my invention, so long as its distinctive peculiarities are retained; my invention may also be applied to platen printing presses, to ruling and calender machines, and to other purposes; and in such cases may require modification to adapt it to the work to be performed, a greater number of fingers may be employed if found advisable. Fingers may also be added to operate at right angles to those hereinbefore mentioned, for the purpose of giving a side register to the sheets.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is—

1. Operating the hands or their equivalents which effect the feeding of the sheet of paper in manner substantially as herein set forth so that they have a greater capacity for moving the sheet than is necessary for the purpose.

2. I also claim controlling the operation of the hands or their equivalents upon the sheets of paper by mechanism whose operation is dependent upon the position of the sheet being fed, so that the length of time during which the hands or their equivalents are permitted to act upon each sheet of paper does not bear any fixed relation to the movements of the other parts of the printing press.

3. I also claim intermitting the operation of the hands or their equivalents upon the paper while the latter is being drawn into the press by mechanism acting substantially as herein set forth.

4. I also claim effecting the progressive movement of the pile of paper by mechanism whose operation is dependent upon the position of the pile substantially as herein set forth.

5. I also claim the combination of the flap guides and nozzles or their equivalents for stopping the movement of the forward edge of the sheet and for releasing the same in the manner hereinbefore described.

6. I also claim moving sheets of paper by automatic rubbing hands or their equivalents constructed substantially as herein set forth.

7. I also claim operating the stop cocks of the air cylinder and the flap guides by a cam or its equivalent whose movement is coincident with or bears a fixed relation to the movement of the fingers which draw the paper into the press.

In testimony whereof I have hereunto subscribed my name.

WM. BULLOCK.

Witnesses:

MICHAEL HARDY,

WILLIAM L. BENNEM.