T. E. BREEN.

PAPER FEEDING MACHINE.

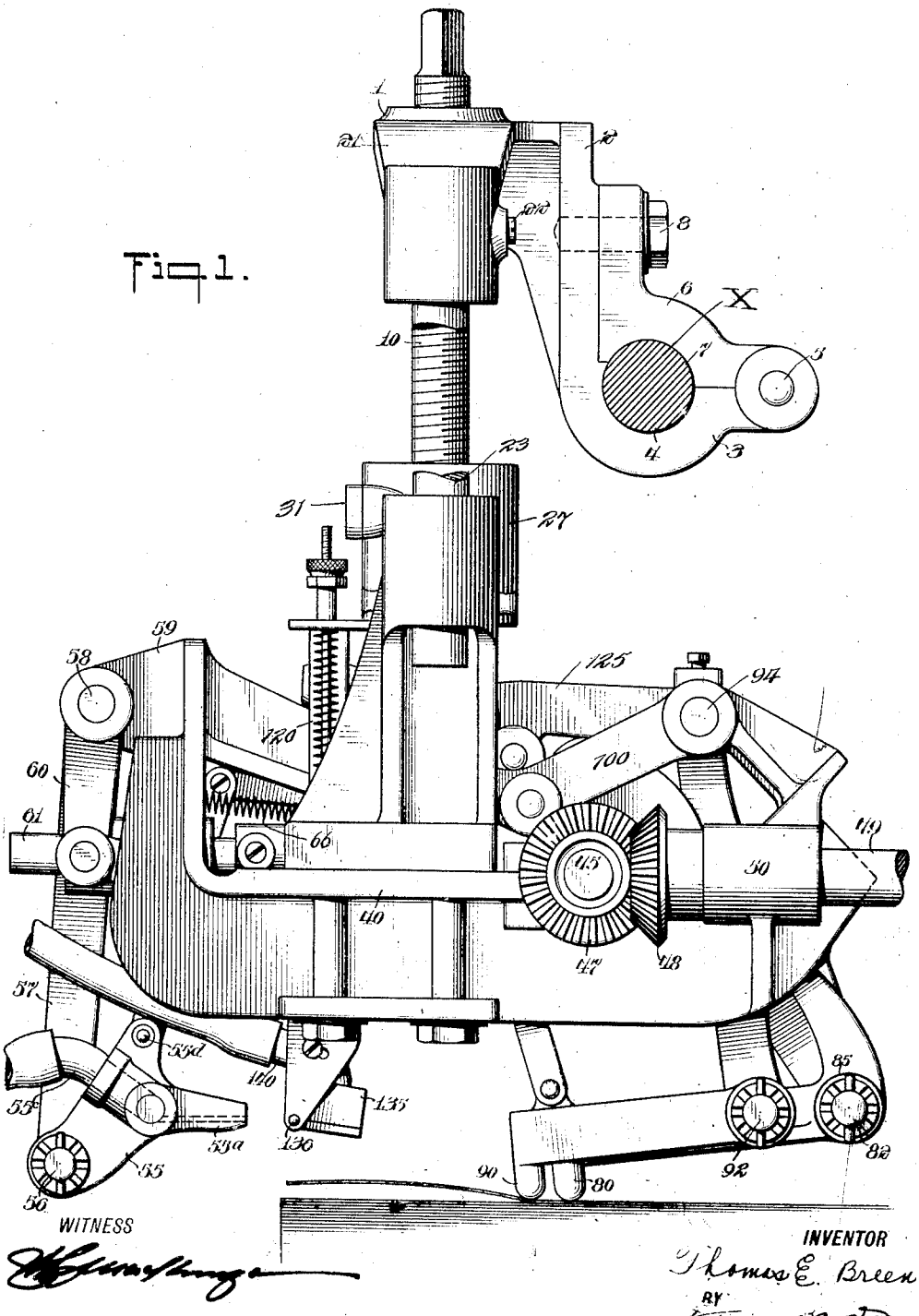
APPLICATION FILED OCT. 6, 1919.

1,382,951.

Patented June 28, 1921.

8 SHEETS—SHEET 1.

Fig. 1.



WITNESS

INVENTOR

Thomas E. Breen

BY

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8 SHEETS—SHEET 2.

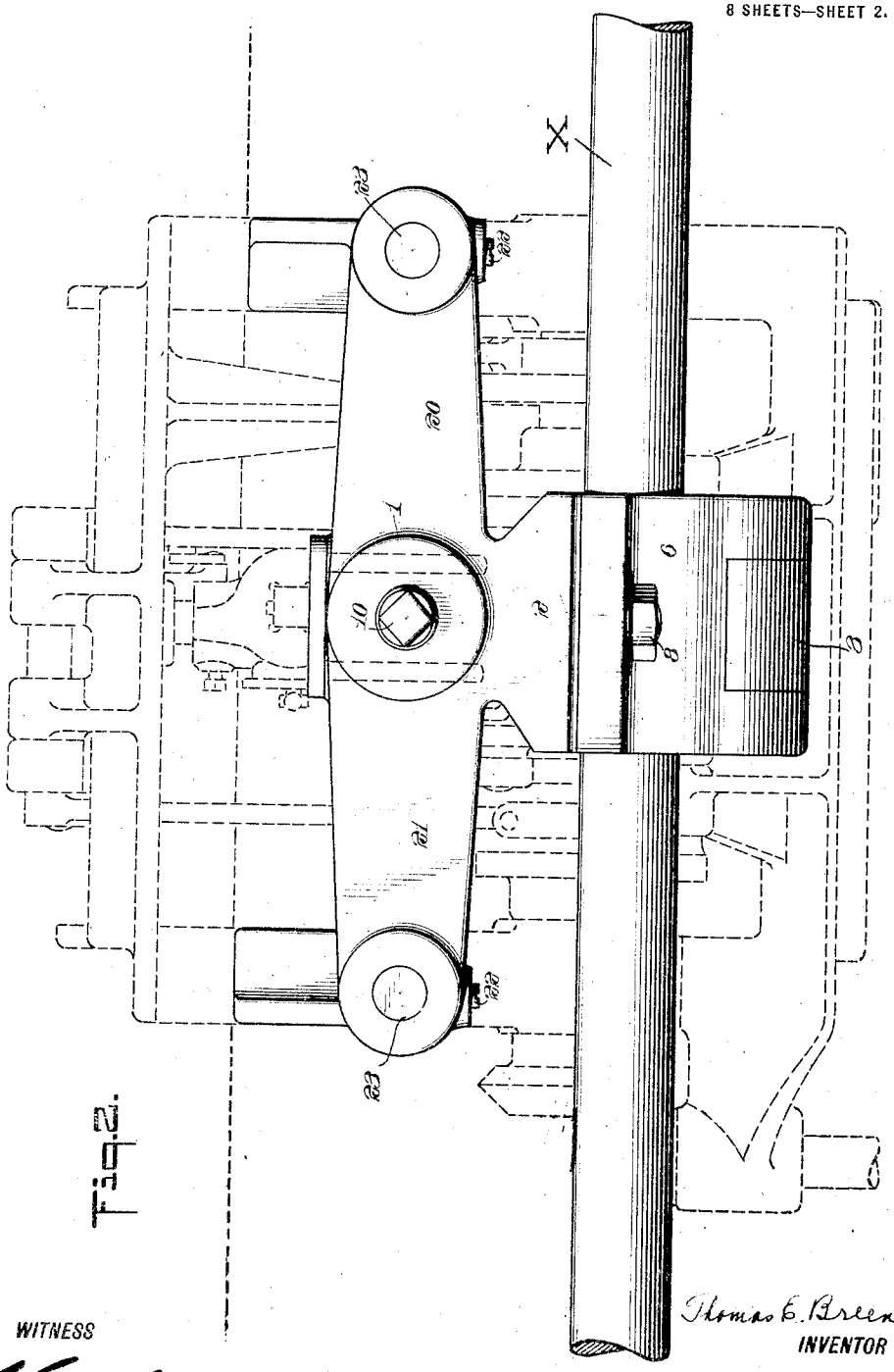


Fig. 2.

WITNESS

Thomas E. Breen
INVENTOR

BY Thompson & Thompson

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T. E. BREEN.

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8 SHEETS—SHEET 3.

Fig. 1a.

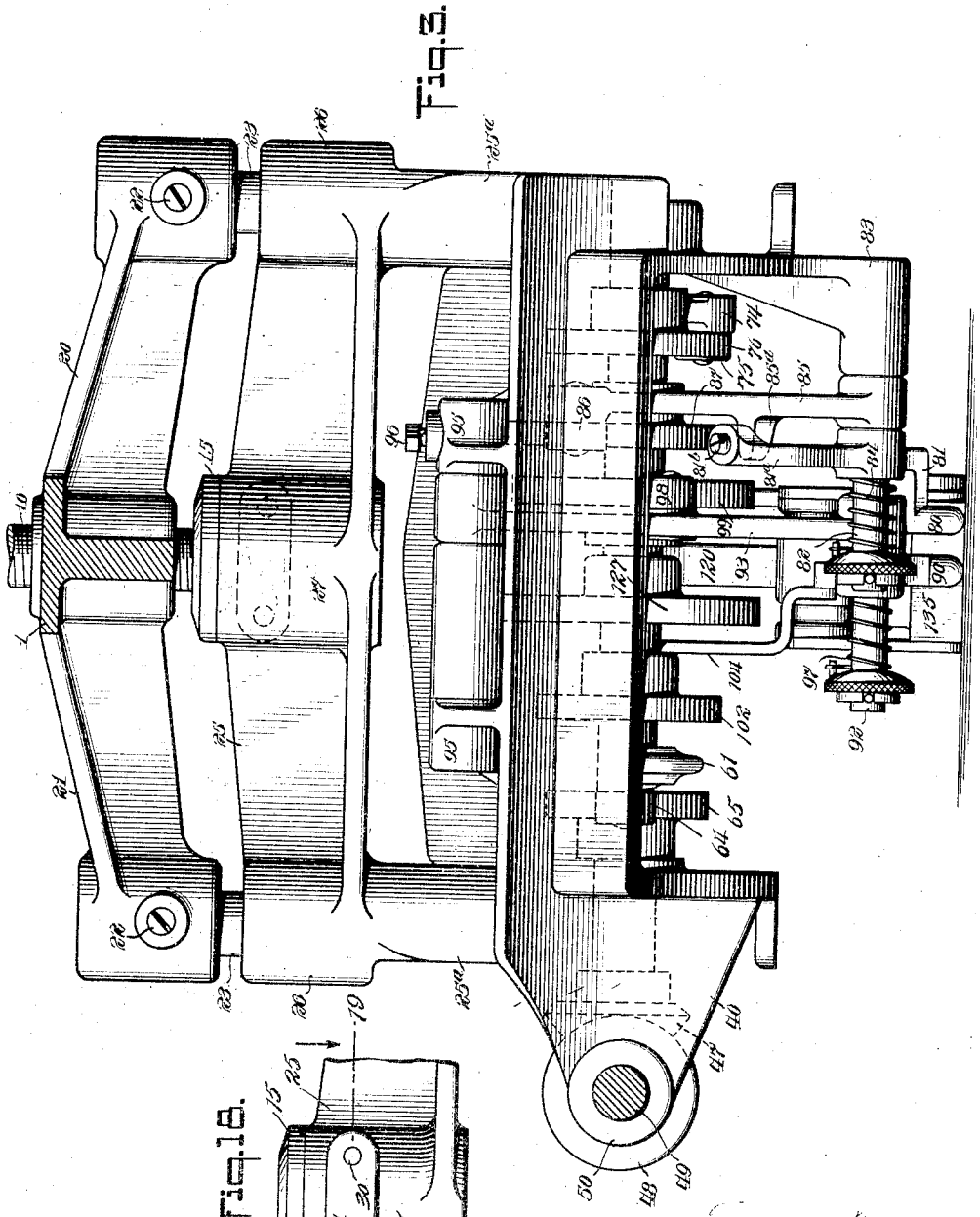


Fig. 1b.

WITNESS

Thomas E. Breen

INVENTOR

BY Fish & Richardson

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T. E. BREEN.

PAPER FEEDING MACHINE.

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1,382,951.

Patented June 28, 1921

9 SHEETS—SHEET 4.

Fig. 4.

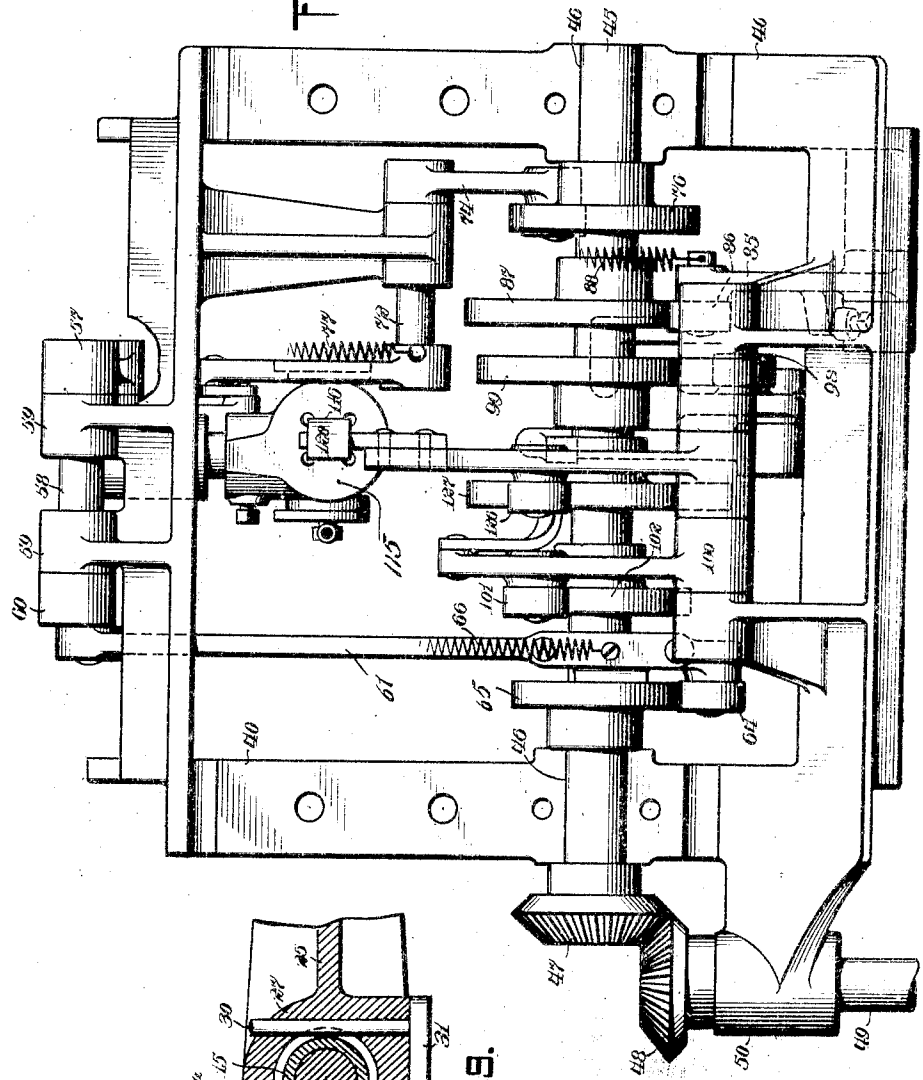
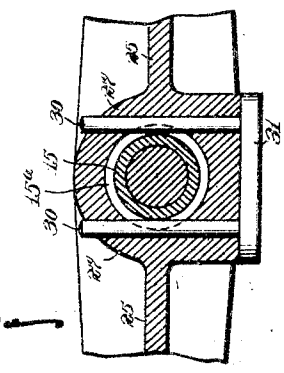


Fig. 19.



WITNESS



Thomas E. Breen
INVENTOR

BY Fenwick & West

HIS ATTORNEYS

T. E. BREEN.

PAPER FEEDING MACHINE.

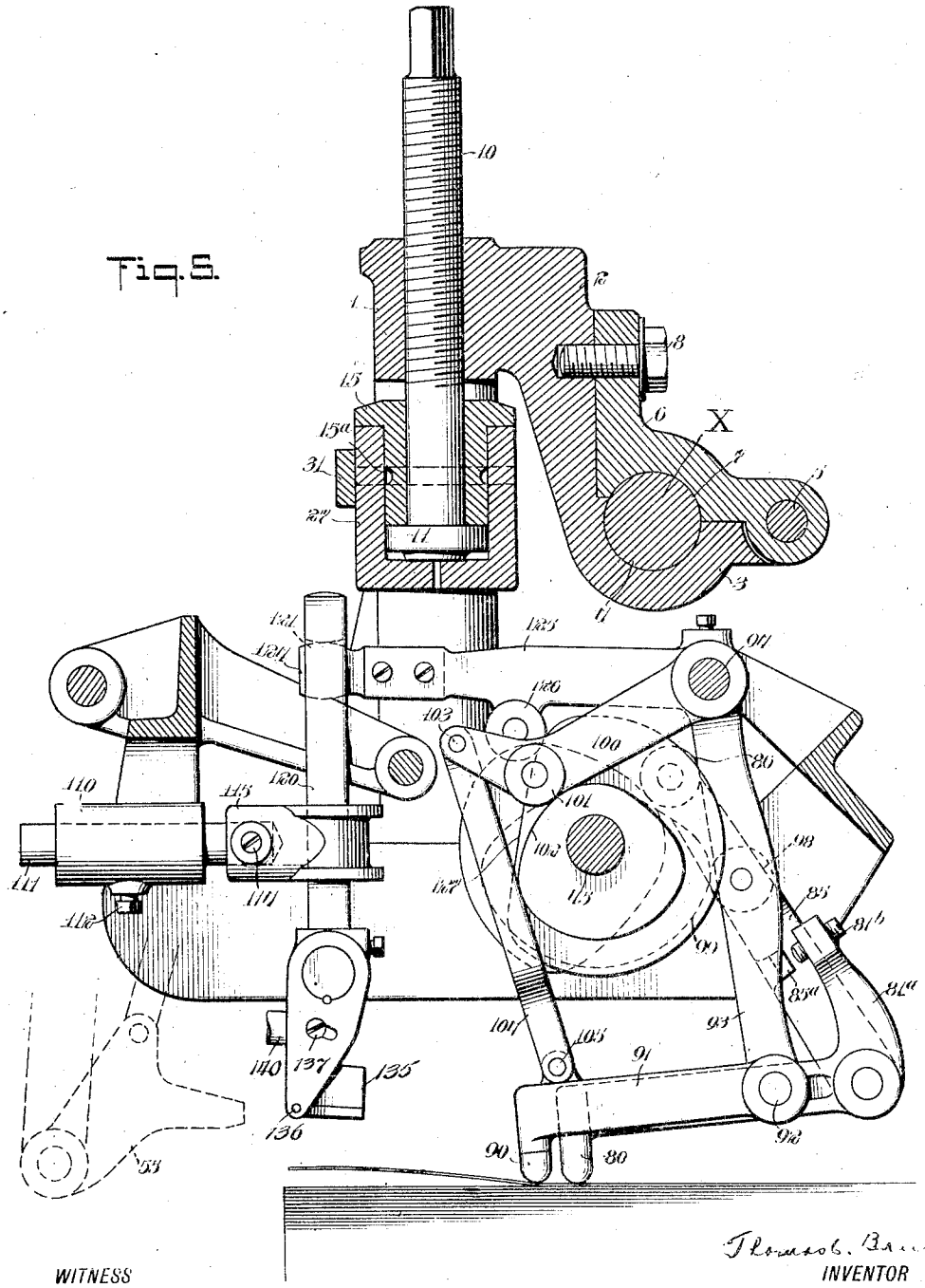
APPLICATION FILED OCT. 6, 1919.

1,382,951.

Patented June 28, 1921.

8 SHEETS—SHEET 5.

Fig. 5.



WITNESS

INVENTOR

BY

HIS ATTORNEYS

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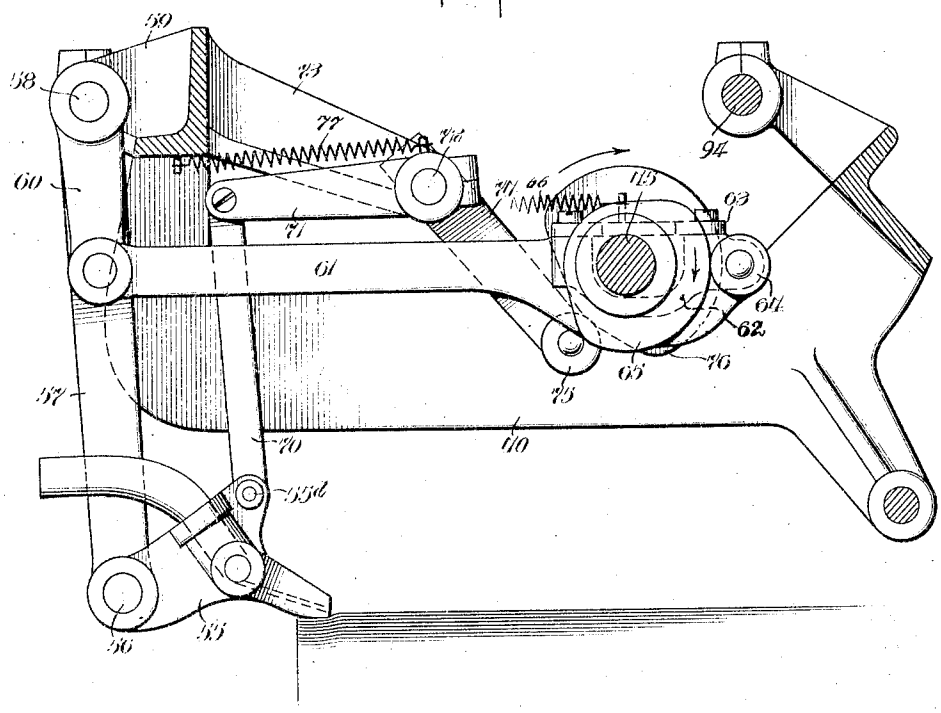
APPLICATION FILED OCT. 6, 1919.

1,382,951.

Patented June 28, 1921.

8 SHEETS—SHEET 6.

Fig. 6.



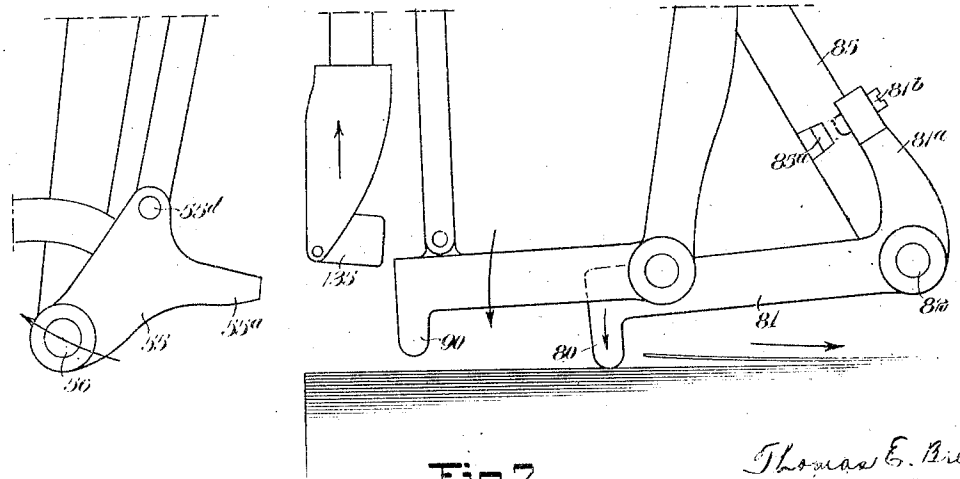


Fig. 7.

WITNESS

Thomas E. Breen
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BY Munn & Co

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T. E. BREEN.

PAPER FEEDING MACHINE.

APPLICATION FILED OCT. 6, 1919.

1,382,951.

Patented June 28, 1921.

8 SHEETS—SHEET 7.

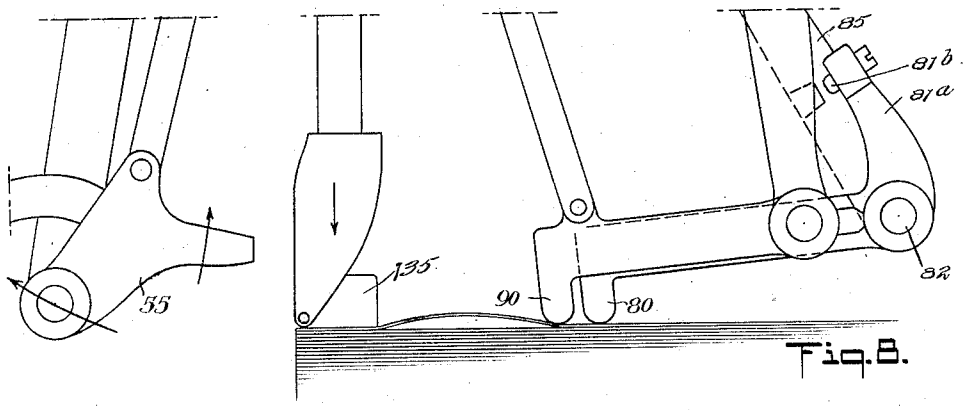


Fig. 8.

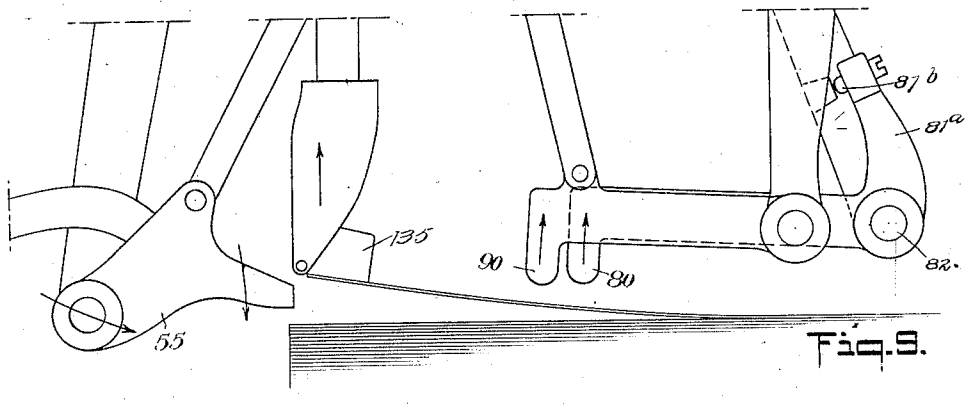


Fig. 9.

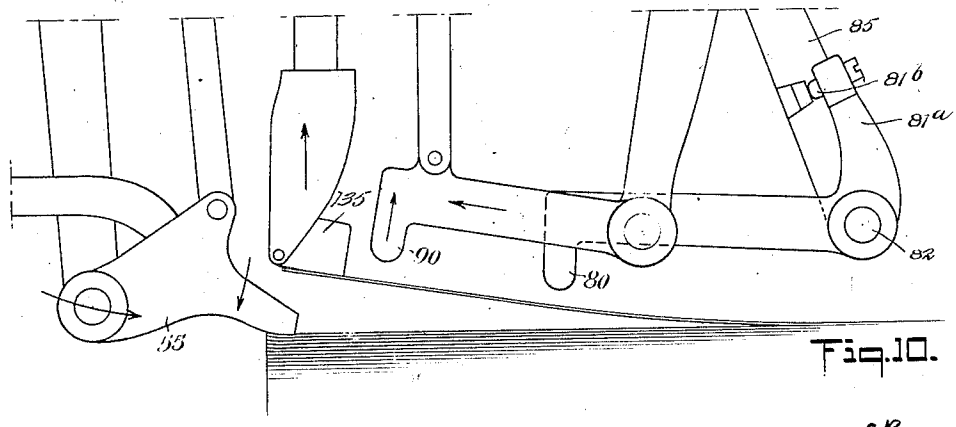


Fig. 10.

Thomas E. Breen
INVENTOR

WITNESS

BY Young & Young
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T. E. BREEN.

PAPER FEEDING MACHINE.

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1,382,951.

Patented June 28, 1921.

8 SHEETS—SHEET 8.

Fig. 11.

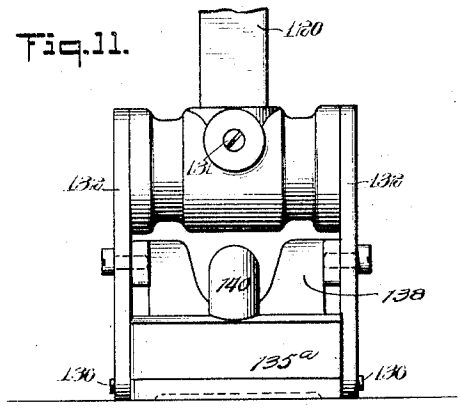


Fig. 12.

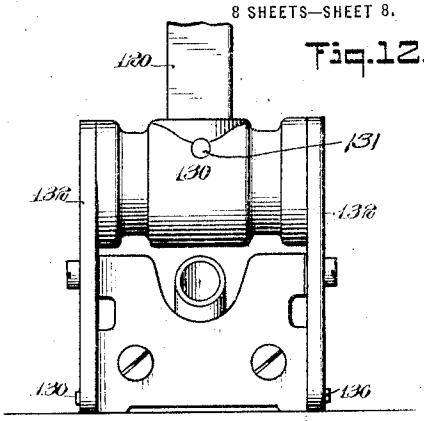


Fig. 13.

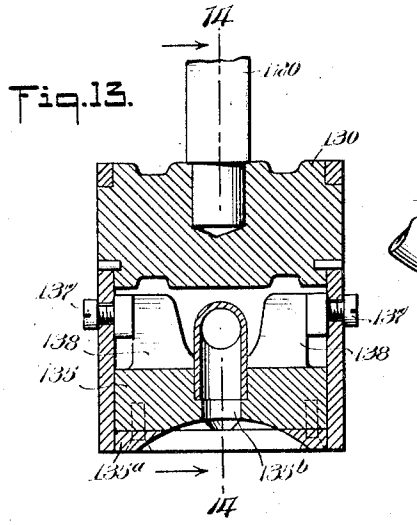


Fig. 14.

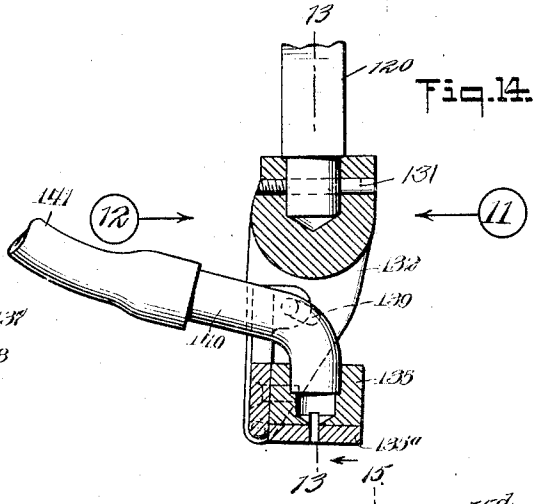
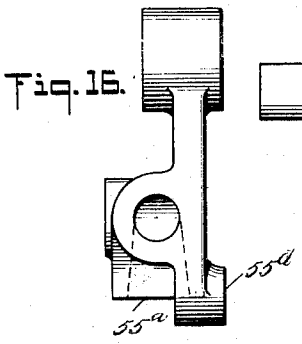


Fig. 16.



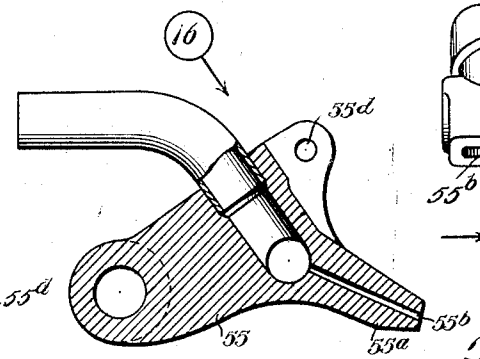


Fig. 17.

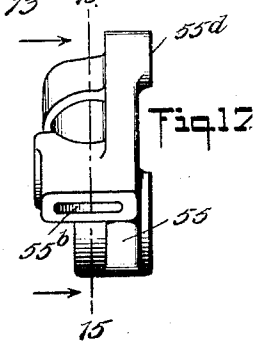
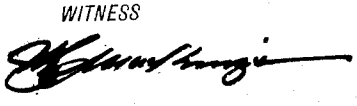


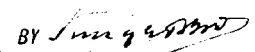
Fig. 15.

WITNESS





INVENTOR

BY 

HIS ATTORNEYS

UNITED STATES PATENT OFFICE.

THOMAS E. BREEN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO DEXTER FOLDER COMPANY, OF PEARL RIVER, NEW YORK, A CORPORATION OF NEW YORK.

PAPER-FEEDING MACHINE.

1,382,951. Specification of Letters Patent. Patented June 28, 1921.

Application filed October 6, 1919. Serial No. 328,794.

To all whom it may concern:

Be it known that I, THOMAS E. BREEN, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Paper-Feeding Machines, of which the following is a full and clear specification.

The present invention relates to an improved separator for paper feeding machines to take the place of the sheet buckling devices or other forms of preliminary separators that commonly operate upon the opposite corners of the rear edge of a pile of sheets to separate the top sheet from the pile preparatory to winding the sheets for the action of the feeding-off devices.

In pile feeders as now commonly used it is customary to employ these preliminary separating devices at the two rear corners of the pile of sheets, such a duplication of the separators being considered necessary, particularly when operating upon large sheets of paper. I have found that an effective preliminary separation of the top sheet of a pile can be accomplished with a single one of my improved separating mechanisms arranged to operate in the middle of the rear edge of the pile. The result is due to the peculiar effectiveness of the improved separating mechanism.

The improved sheet separator comprises a pile holding foot adapted to periodically move into and out of engagement with the rear edge of a pile of sheets, an auxiliary pile engaging foot normally engaging the top of the pile a short distance in front of the main foot, a simple combing finger movable into and out of engagement with the top of the pile and rubbing the pile inwardly from the rear edge toward the auxiliary holding foot to comb or slightly disturb the top sheet of the pile, and a suction lifting member arranged to engage the top sheet between the main and auxiliary holding feet immediately after the action of the combing finger and raise the slightly disturbed top sheet away from the pile sufficiently to permit the introduction of air blasts beneath the top sheet.

The action of the simple combing finger operating forwardly from the rear edge has the effect of slightly shifting the top sheet forwardly in the center and drawing inwardly the rear corners of the top sheet so that the entire rear portion of the top sheet is displaced slightly upon the pile and readily yields to the lifting action of the suction member. At the completion of the preliminary separation, the top sheet resting upon a film of air, is fed from the pile by any suitable delivery devices.

In order that the invention may be fully understood it will first be described with reference to the accompanying drawings and afterward pointed out more particularly in the annexed claims.

Figure 1 is a side elevation of the improved sheet separating mechanism.

Fig. 2 is a detail plan view of the same illustrating the main support for the mechanism and indicating the operating parts by dotted lines.

Fig. 3 is a front elevation of the improved mechanism.

Fig. 4 is a plan view of the main operative parts of the mechanism, the upper supporting bracket and frame parts being removed to better illustrate the mechanism.

Fig. 5 is a vertical, central, longitudinal, sectional view of the mechanism showing particularly the suction lifting device and the comber and auxiliary holding down foot.

Fig. 6 is a similar view illustrating the operation of the main holding down foot and omitting other parts of the mechanism for the sake of clearness.

Figs. 7, 8, 9 and 10 are detail, outline views of the essential parts of the mechanism showing their successive positions in the operation of separating a sheet from the pile.

Figs. 11 and 12 are detail views of opposite sides of the suction sheet lifting member looking respectively in the directions of the arrows 11 and 12 of Fig. 14.

Figs. 13 and 14 are vertical, sectional views of the same taken respectively upon the section lines 13—13 of Fig. 14 and 14—14 of Fig. 13.

Fig. 15 is a vertical, longitudinal, sectional view of the main holding down foot taken on the line 15—15 of view 17.

Fig. 16 is a detail rear view of the same looking in the direction of arrow 16 of Fig. 15.

Fig. 17 is a front view of the main holding down foot.

Figs. 18 and 19 are detail views illustrating the locking device for securing together the two parts of the supporting frame.

It will be understood that the improved sheet separator forming the subject of the present application is designed to be used as part of an automatic paper feeding machine, in which a pile of sheets is supported upon an automatically adjustable table in proper position for the operation of the devices which act upon the top of the pile for separating and feeding-off the successive sheets to any form of machine designed to operate thereon.

In this well-known type of automatic paper feeding machine it is common to provide an adjustable frame overhanging the pile of sheets to support the separators in proper relation to the pile. Such overhanging frame usually includes a transverse bar such as indicated at X in the accompanying drawings, which bar can be adjusted vertically, forwardly and backwardly with relation to the pile. This bar is the only part of the well-known mechanism which it is thought necessary to illustrate in the drawings of the present application.

For convenience of manufacture and manipulation, the improved sheet separating mechanism is arranged upon a suitable supporting frame, which is detachably secured to an adjustable yoke engaged and supported by a main adjusting screw carried in a bracket that is detachably and adjustably mounted upon a supporting bar such as bar X of the well-known frame of an automatic feeder. This mechanism will now be described in detail.

1 is an internally threaded head formed integral with a bracket arm 2 having an angularly disposed end 3, in which is formed a semi-circular recess 4 fitting a supporting bar such as X. Pivoted to the bracket at 5 is an angular hasp member 6 having a semi-circular recess 7 fitting over the upper portion of bar X and resting snugly against a vertical face of the bracket 2 in which position it is securely fastened by means of a set bolt 8 passing freely through an opening in member 6 and threaded into the bracket. By this means the bracketed head is adjustably and securely mounted upon the supporting frame above a pile of sheets.

Operating in the threaded head 1 is a heavy vertical adjusting screw 10 by which the improved feeding mechanism is supported. The lower end of the adjusting screw 10 is freely journaled in a flanged bearing collar 15, which is detachably mounted in a yoke frame in the manner presently to be described. The lower end of the adjusting screw 10 is formed with a flanged bearing head 11 supporting the collar 15 upon the screw, the screw being free to rotate in the collar.

The head 1 has formed with it the oppositely extending yoke arms 20 and 21, formed in their ends with vertical sockets in which are secured by means of set screws 22, the downwardly projecting guide rods 23.

The central yoke frame 25 is formed in its opposite ends with vertical guide sockets 26 fitting and sliding upon guide rods 23 and a central hollow head 27, formed with a cylindrical pocket in which rests the bearing collar 15 and the head 11 on lower end of adjusting screw 10. The bearing collar 15 is formed with an annular groove 15^a, and the head 27 is transversely perforated in the plane of said annular groove, to receive the locking pins 30 mounted in parallel relation upon a supporting and manipulating head 31 as shown particularly in Figs. 18 and 19 of the drawings. When the parts are assembled as shown, the coupled locking pins 31 are forced into the perforations in the head 27 and caused to engage the annular groove 15^a of collar 15 upon opposite sides so as to lock the collar 15 in the head 27 and thereby support the central yoke frame 25 and the mechanism hereinafter referred to from the screw 10. The guide rods 23 retain the supporting frames in their proper angular relation and the mechanism is adjusted vertically by the operating of the screw 10. By means of the locking pins 30 the central yoke frame 25 and all the mechanism carried thereby can be quickly detached from the upper supporting yoke 20. The intermediate yoke frame 25 is formed with downwardly extending legs 25^a, which are securely bolted to the sides of the main horizontal frame or casting 40. This main casting is an open frame of approximately rectangular shape having side and end members and suitable bracketed arms and bearings to accommodate the operative parts of the mechanism. These parts will be hereinafter referred to in connection with the mechanism supported by them.

45 is the main cam shaft of the sheet separating mechanism. This shaft 45, carrying the various cams for the operative parts presently to be explained, is suitably journaled at its ends in bearings 46 of the sides of frame 40. One end of shaft 45 carries a beveled gear 47, which meshes with and is driven by a similar gear 48 carried by shaft section 49 journaled in bracket bearing 50 and designed to be operated through the usual sectional shafting and flexible couplings well-known in this art.

55 is the main holding down foot pivotally mounted at its rear end upon bolt 56 carried in the lower end of a depending lever 57 secured at its upper end upon a rock shaft 58, journaled in the rearwardly presented bracket arms 59 of frame 40. The

foot member 55 has a pile engaging toe 55[a] at its forward end, which may be provided with an air blast channel indicated at 55[b] to receive blasts of air through the air pipe 55[c] suitably connected with an air blower. The provision of an air blast in the holding down foot is not essential to its proper operation since the required air blasts for assisting in the separation of the top sheet of a pile can be supplied by the ordinary air blast nozzles.

The rock shaft 58 carries a depending rock arm 60 pivoted at its lower end to a horizontal pitman 61, which is formed at its forward end with a guide yoke 62, embracing the cam shaft 45 and supported thereon by the removable plate cap 63. The guide yoke 62 carries a friction roller 64 operating in peripheral engagement with a cam 65 secured to cam shaft 45. A spring 66 connects the pitman 61 with a stationary point of the frame 40 to retain the roller 64 yieldingly in engagement with the controlling cam 65 to periodically impart a back and forth motion to the main holding down foot 55.

The foot 55 has pivoted to it at 55[d] the lower end of link 70 pivoted to a rock arm 71, carried by a short rock shaft 72, journaled in the bracket arm 73 of the machine frame. This rock shaft 72 carries a downwardly presented rock arm 74 in the lower end of which is journaled a roller 75 operating in peripheral engagement with a cam 76 mounted upon the cam shaft 45. The spring 77 connects the rock shaft 72 with a stationary point of the machine frame to yieldingly hold the roller 75 in engagement with its cam 76, to cause the main holding down foot 45 to be periodically moved downwardly into engagement with the rear edge of a pile of sheets.

The foot 55 is provided with the customary adjustable tension spring device acting between the foot 55 and the supporting pin 56 to assist in providing the proper tension upon the foot when it is thrown into engagement with the pile of sheets.

80 is the auxiliary pile engaging and holding foot mounted on the rear end of an arm 81, journaled upon pin 82 carried in the lower end of the bracket arm 83 of the machine frame 40. The adjustable tension spring 84 surrounds the pin 82 and engages the arm 81 to press the foot normally against the top of the pile of sheets. Arm 81 has formed integral with it an upwardly presented arm 81[a] carrying an adjustable screw tappet 81[b] adapted to be periodically engaged by a lug 85[a] formed upon a lever 85, journaled upon the pin 82 between bracket 83 and arm 81 and carrying at its upper end an anti-friction roller 86, which is intermittently engaged by cam 87 upon cam shaft 45 to raise the auxiliary foot 80 away from the pile of sheets during the time that the partially separated sheet is being fed-off from the pile. 88 is a spring acting upon lever 85.

90 is the combing finger mounted on the free end of an arm 91, journaled upon pin 92, carried in the lower end of lever 93, which is journaled at its upper end upon a shaft 94 fixed in bracket bearing 95 of the machine frame 40. A set screw 96 holds the shaft 94 against movement. A tension spring 97 arranged between the arm 91 and pin 92 imparts a normal spring pressure to the combing member 90. The lever 93 has journaled upon it, between its ends an anti-friction roller 98, which operates in peripheral engagement with a cam 99 carried by cam shaft 45. Journaled upon the stationary shaft 94 near the left hand bracket 95 of Figs. 3 and 4 is a rearwardly projecting lever 100, carrying an anti-friction roller 101, which operates upon the cam 102 on shaft 45. The free end of this lever 100 has pivoted to it at 103 a link 104, which is pivoted at its lower end 105 to the arm 91 of the comber. By the operation of cams 99 and 102 upon levers 93 and 100, the combing member 90 is given a rectilineal movement, that is forwardly in engagement with the top of the pile, then upwardly away from the pile, then rearwardly in raised position, and finally into engagement with the pile for its forward active strokes.

The machine frame 40 carries upon its rear end a socketed bracket 110, in which is adjustably mounted a rod 111 secured by a set screw 112. Upon the forward end of rod 111, is adjustably secured a guiding head 115, secured to the rod by means of set screw 114. This head 115 is formed with a vertical guide opening 118 (see Fig. 4), in which reciprocates a bar 120 of the suction separating device. This bar 120 is formed near its upper end with a slot 121 indicated in dotted lines in Fig. 5 in which engages the rear end 124 of a lever 125 freely journaled upon the fixed shaft section 94 and carrying between its ends an anti-friction roller 126, which operates in peripheral engagement with the cam 127 upon the cam shaft 45.

The bar 120 reciprocates vertically in the supporting and guiding head 115, and carries upon its lower end the suction sheet lifting device illustrated in detail in Figs. 11 to 14 of the drawings. This suction device comprises a body member 130 socketed to receive the lower reduced end of bar 120 and secured thereto by a set screw 131. Side plates 132 are secured to the member 130 and a suction head 135 is pivoted at its rear corners 136 in the lower ends of the side plates 132. The suction head rests between the side plates 132 and screws or pins 137 projecting from the brackets 138 of head 135 pass freely through the curved slots 139 in

side plates 132 to permit the suction head to move upon its pivots 136 within the limits of the pin and slot connection 137 and 139 so as to automatically adjust the suction face to the surface of the top sheet of the pile.

The suction face of the head 135 is preferably formed by a removable plate 135[a] having one or more suction openings or slots through which it communicates with the interior suction cavity 135[b] from which a short elbow pipe 140 leads for connection with the flexible air tube 141, which is designed to communicate with a suction pump of any suitable construction. While the suction head 135 may have its sheet engaging face formed in any approved way, I have found very satisfactory results with the use of the removable plates referred to. I have designed a series of these face plates for the suction head, which differ from each other in the area of the suction openings through them, thus providing means for readily adapting the mechanism to the separation of various grades of paper sheets.

The operation of the improved machine will be clear from the following brief description. When the mechanism has been adjusted to the proper position above the rear edge of a pile of sheets midway between the sides, the machine is set into operation and assuming the parts start in the position shown in Fig. 7 of the drawings with the main holding foot 55 and the suction head 135, and the combing foot 90 elevated from the pile, and the auxiliary holding foot 80 in engagement with the pile, the combing member 90 will move downwardly into engagement with the top sheet and while engaging said sheet will move forwardly toward the auxiliary holding foot 80, thereby rubbing or combing the top of the pile from the rear edge toward the front and causing a disturbance of the top sheet of the pile, particularly in the middle zone of the sheet, but extending in some degree throughout the entire rear edge of the top sheet. In the middle zone of the sheet, its rear edge is raised and flexed somewhat in the form shown in Figs. 1 and 5. At the same time said rear edge is advanced somewhat as indicated. As the combing member 90 completes its forward combing stroke, the suction head 135 is lowered into engagement with the rear edge of the slightly disturbed top sheet and presses it down on to the pile as shown in Fig. 8, a buckled portion of the top sheet being thus separated from the pile. The suction head taking hold of the rear edge of the top sheet then starts to move upwardly away from the pile and at the same time the auxiliary holding foot 80 and the combing member 90 move upwardly away from the pile while the main holding foot 55 moves inwardly and downwardly, these changes in position being indicated in Fig. 9. Immediately after the main holding foot 55 comes into firm engagement with the rear edge of the pile beneath the raised rear edge of the top sheet, the combing member 90 moves rearwardly in raised position ready to again descend upon the pile for its succeeding stroke. The auxiliary holding foot still remains in holding position as the suction head 135 is about to drop the rear edge of the sheet. This position of the mechanism is shown in Fig. 10. As the sheet is released, with the mechanism in position shown in Fig. 10, any suitable feeding-off device comes into action to feed the sheet from the pile and deliver it to the machine which is to operate upon it. Referring to Fig. 4, it will be understood from the foregoing description that the separator is mounted centrally of the rear edge of the pile, an auxiliary holding foot being operated to engage the pile in advance of said rear edge (see Fig. 7) after which the combing member 90 drops to the pile near the rear edge thereof and moves toward the auxiliary holding foot to displace the rear edge of the top sheet with respect to the pile as shown in Figs. 1 and 5. Immediately, the suction head drops to the pile as shown in Fig. 8 and by depressing the rear edge of the top sheet, forms a loop or bulge therein between the suction head and the combing member. The rear edge of the top sheet having been disturbed with respect to the pile, is lifted by the upward movement of the suction head and a blast of air is projected under said top sheet from the air channel in the main holding foot (see Fig. 9). At the same time, the auxiliary holding foot and combing member are raised and the top sheet withdrawn from the pile by the feeding off mechanism. During this operation, the main holding foot clamps down the rear edge of the pile while the combing member in its elevated position, returns to its initial position in readiness to begin a new cycle.

If it is desired to remove the supporting mechanism from the machine for repair or extensive adjustment, it will be understood that this can be accomplished by disconnecting the driving shaft 49 and removing the locking pins 30, which will permit the main frame 40 and the central frame 25 to be detached from the other parts of the supporting frame.

I claim:

1. In a machine of the character described, a holding foot movable into and out of engagement with a pile of sheets at a distance from the rear edge of said pile, a sheet engaging instrumentality movable into engagement with said pile and forwardly over said pile toward said holding foot, a sheet gripping instrumentality movable into engagement with the displaced rear edge of said top sheet, and means for raising said

foot and said instrumentality for separating the top sheet from the pile.

2. In a machine of the character described, a holding foot movable into and out of engagement with a pile of sheets, a sheet engaging instrumentality movable into engagement with said pile and over said pile toward said holding foot, a sheet gripping instrumentality movable into engagement with a displaced portion of said top sheet, means for raising said foot and said instrumentalities for separating the top sheet from the pile, and a second pile holding foot movable into engagement with the pile beneath said top sheet, the last mentioned pile holding foot being provided with air blast channels for introducing a blanket of air beneath said top sheet.

3. In a sheet feeding machine, a main pile holding foot for clamping the edge of all but the top sheet of a pile, an auxiliary holding foot for engaging the pile at a distance in front of said main holding foot, a sheet combing member movable forwardly toward said auxiliary holding foot, for separating portions of the top sheet from the pile, and a suction head movable into gripping engagement with the rear edge of said top sheet.

4. In a sheet feeding machine, a main pile holding foot for clamping the edge of all but the top sheet of a pile, an auxiliary holding foot for engaging the pile at a distance in front of said main holding foot, a sheet combing member, for separating portions of the top sheet from the pile, and a suction head movable into gripping engagement with the rear edge of said top sheet, said combing member being disposed between said suction head and said auxiliary holding foot.

5. In a machine of the character described, a sheet holding foot, a combing member slidably engaging the top sheet as it moves toward said foot, and a sheet engaging suction device disposed in the rear of said sheet holding foot and combing member for engaging the rear edge of the top sheet, said suction device comprising a vertically reciprocable body member and a suction head oscillatably connected to said body member.

6. In a paper feeding machine, the combination of a supporting frame; an adjusting screw mounted in said frame, a suitable sheet separating mechanism and detachable means connecting said separating mechanism with said adjusting screw.

7. The combination of a supporting frame, a vertical adjusting screw threaded in said frame and formed with a head at its lower end, a bearing collar mounted upon said screw in engagement with said head, a separating mechanism, a frame in which said mechanism is mounted, and a key detachably locking said separator frame upon said bearing collar.

8. The combination of a supporting frame, a vertical adjusting screw threaded in said frame and formed with a head at its lower end, a bearing collar mounted upon said screw in engagement with said head, a separating mechanism, a frame in which said mechanism is mounted, and a key detachably locking said separator frame upon said bearing collar, said separator frame having a bearing socket to receive said collar, perforations intersecting said socket and detachable pins mounted in said perforations and engaging the recesses of said bearing collar.

9. The combination of the main and auxiliary pile engaging members, means for moving said members into and out of engagement with the pile, a suction sheet lifting device adapted to move into and out of engagement with the pile adjacent to the main pile engaging member and a sheet combing member adapted to engage the top of the pile adjacent to the main pile engaging member and comb toward the auxiliary pile engaging member.

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