

C. E. SAGE.

SHEET SEPARATING AND FEEDING MECHANISM.

APPLICATION FILED NOV. 1, 1901.

3 SHEETS—SHEET 1.

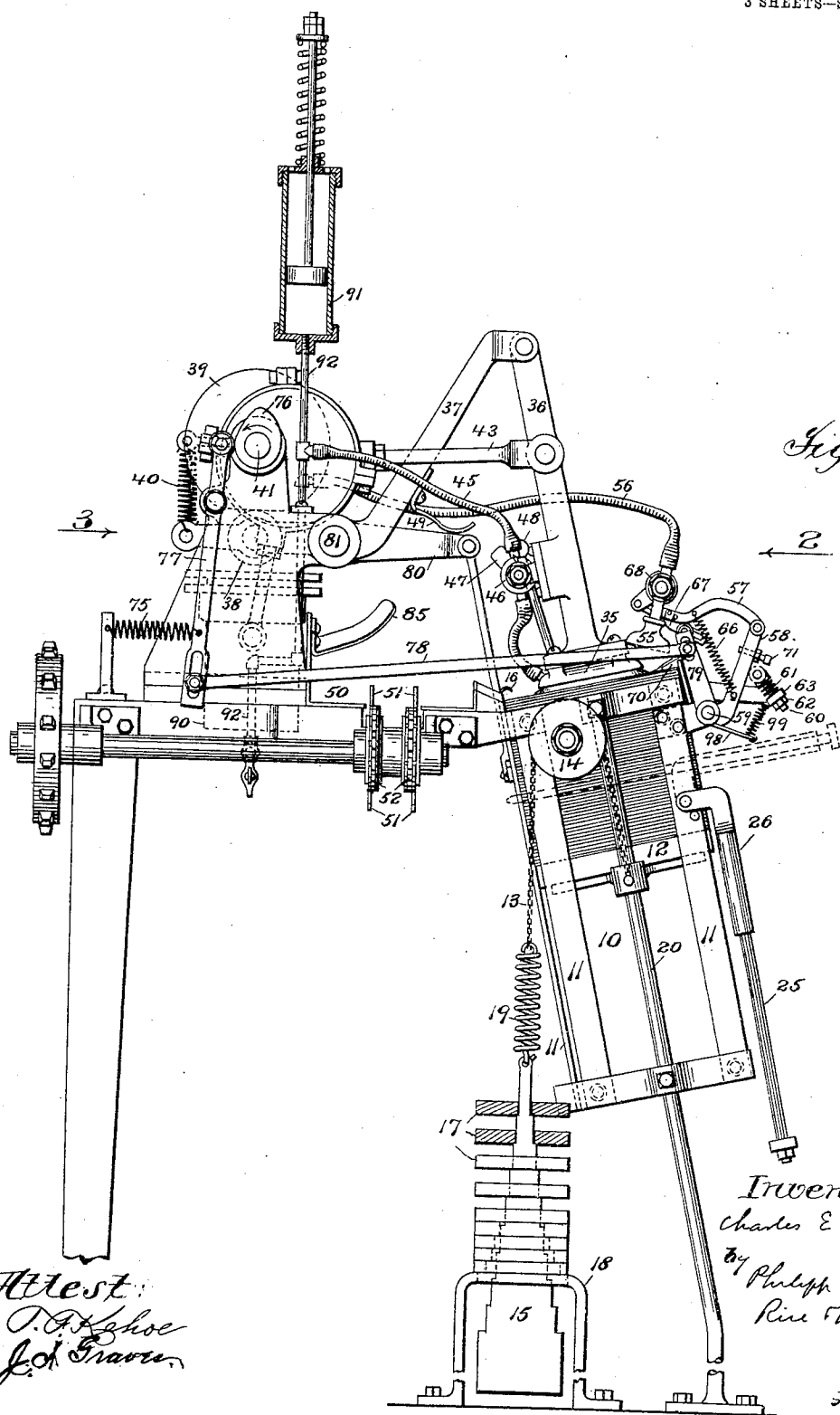


Fig. 1.

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by Philip Sawyer
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Attest

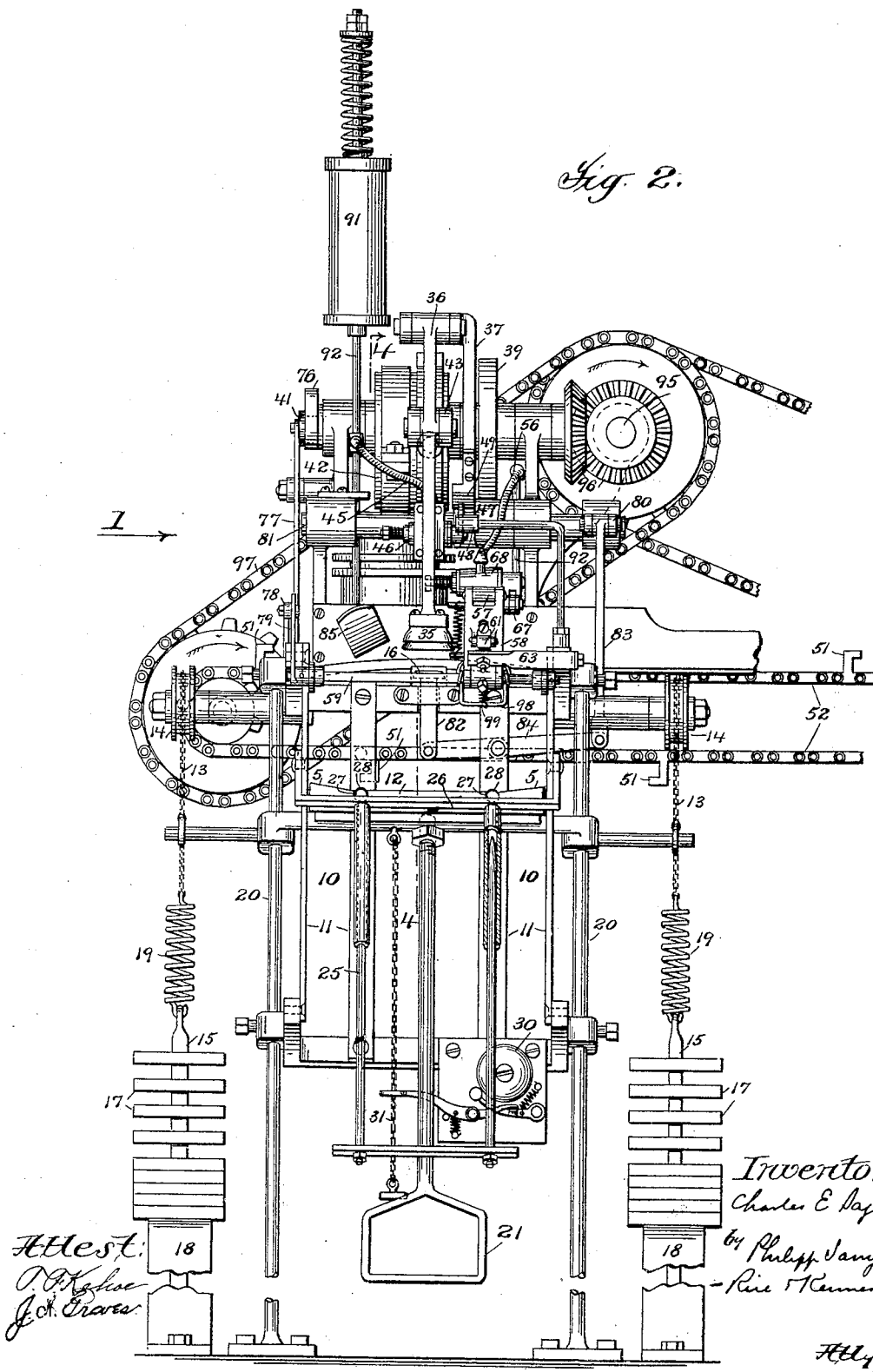
Attest:
D. A. Schoe
J. A. Traver

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3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

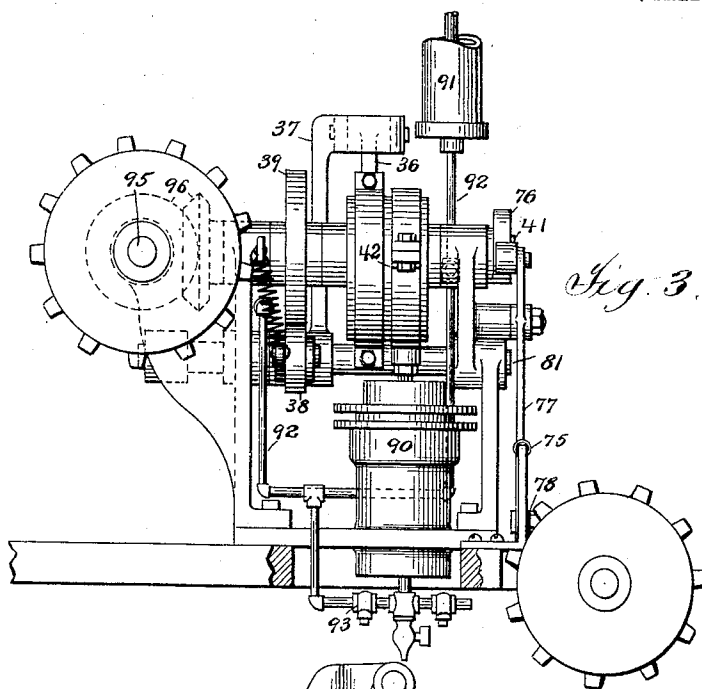


Fig. 3.

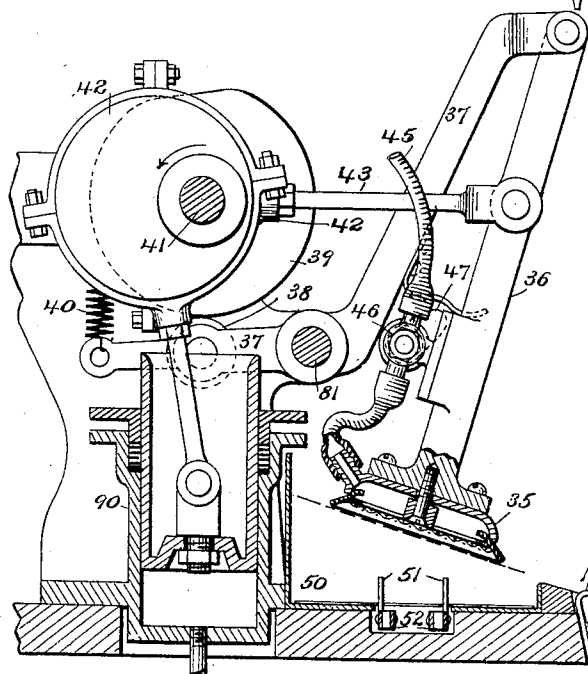
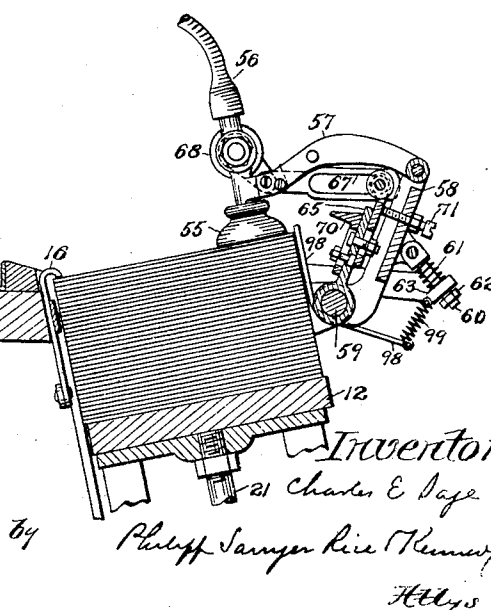


Fig. 4.



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UNITED STATES PATENT OFFICE.

CHARLES E. SAGE, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO THE
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SHEET SEPARATING AND FEEDING MECHANISM.

No. 805,158.

Specification of Letters Patent.

Patented Nov. 21, 1905.

Application filed November 1, 1901. Serial No. 80,789.

To all whom it may concern:

Be it known that I, CHARLES E. SAGE, a citizen of the United States, residing at Jersey City, county of Hudson, and State of New Jersey, have invented certain new and useful Improvements in Sheet Separating and Feeding Mechanism, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

10 The object of this invention is to provide an improved machine for transferring sheets successively from a pile which shall be rapid and sure in its operation and of such a nature as to insure the transferring of but a single sheet at a time.

15 As a full understanding of the invention can best be given by a description of a preferred construction embodying the various features thereof, such a description will now be given in connection with the accompanying drawings, showing such preferred construction.

20 In said drawings, Figure 1 is an end elevation of such a machine. Fig. 2 is a front elevation; Fig. 3, a partial rear elevation; Fig. 4, a section taken on line 4 of Fig. 2 and on an enlarged scale.

Referring to the drawings, 10 represents a holder for supporting and guiding a pile of sheets. The invention has been made with the idea of feeding wrapper-sheets made up of a sheet of paper with a sheet of metal foil slightly shorter than the paper-sheet attached thereto; but it may of course be employed for feeding other sheets than such wrappers. The holder 30 10 comprises a guiding-frame 11 and a movable bottom or support 12, which is fed upward for maintaining the upper sheet of the pile in position to be engaged by the separating and transferring devices. For this purpose the support 12 is connected, by means of chains 13, passing over pulleys 14, with a weight-carrier 15, whereby the support is under a constant tension to move upward. This upward movement is normally limited by means of a stop 16, arranged, preferably, at the rear side of the holder and so as to project slightly over the pile of sheets and engage the upper sheet, as shown in Fig. 4.

50 The weight-carrier 15 carries a number of weights 17, which are supported on a series of shoulders formed on the carrier, and a suitable support 18 is provided, so that as the carrier moves downward it will be gradually relieved of the weights. The upward tension

on the support 12 will thus become gradually less as it moves upward and the weight of the pile of blanks diminishes. A spring 19 is preferably provided between the weight-carrier 15 and the chain 13 to form a yielding connection.

60 The support 12 is shown as mounted to slide on guide-rods 20, by which the guiding-frame 11 of the holder is supported, and it is preferably provided with a foot-treadle 21, connected thereto by means of a rod, as shown, for enabling the support to be drawn downward against the tension of the weights to receive a new supply of sheets.

70 The upper face of the support 12 is preferably slightly raised at each end, as shown at 5 in Fig. 2, so as to provide a slightly-concaved support for the sheets. The pile of sheets as it rests on the support so formed will thereby be caused to sag slightly toward the center, and this is found to aid considerably in the operation of separating the top sheet from the pile.

80 A pair of rods 25 are mounted to slide in a bracket 26, pivoted to the frame 11, so that when the supply of sheets is to be renewed the bracket 26 may be swung to the position indicated in dotted lines in Fig. 1 and the rods then pushed in beneath the remaining sheets, so as to support the same while the support 12 is drawn downward to receive a fresh supply of sheets. When the fresh supply of sheets has been placed on the support, it is allowed to rise under the tension of the weights to bring the new sheets beneath the sheets supported by the rods 25, and then the rods are drawn out and the rods and bracket allowed to drop to the position shown in full lines in Fig. 1. The support 12 is preferably formed with grooves 27 to permit the rods 25 to be projected beneath the sheets, and the rear guides 11 have openings 28 for receiving and supporting the inner ends of the rods.

90 I preferably provide an alarm device and means for actuating the same when the supply of sheets is to be renewed. Any suitable arrangement may be provided for this purpose. I have shown a bell 30, having a striker adapted to be tripped by the movement of the support 12 by means of a chain 31.

105 The bracket 26 is preferably so located that the rods 25 when in supporting position will be some distance below the top of the pile. The supply of sheets may thus be renewed

while there is a considerable number of sheets still left in the holder, and these sheets being under slight compression when the rods are projected beneath them the operation of the machine may continue without interruption during the short time required for replenishing the supply of sheets, since the expansion of the pile will be sufficient to maintain several successive top sheets in position for the proper operation of the transferring and separating devices.

The sheets are removed successively from the pile by means of a suction transferring device, comprising a suction-cup 35, carried by an arm 36, which is pivotally connected to and supported by a supporting-lever 37, pivoted to the frame and having a rearwardly-extending arm carrying an antifriction-roll 38, bearing on a cam-disk 39 and held in engagement therewith by a spring 40. The cam-disk 39 is fast on a shaft 41. The arm 36 is caused to swing forwardly and rearwardly by means of an eccentric 42 on the shaft 41, acting through pitman 43, pivoted to the arm 36 and connected to the eccentric-strap. The cam 39 is formed so as to rock the supporting-lever 37 to give the suction-cup a slight downward reciprocation as it nears its outer position over the pile of sheets in the holder, and the cam 39 and eccentric 42 are so timed that after the suction-cup has seized the top sheet in the holder it will have a slight outward movement as it begins to rise.

The suction-cup is connected, by means of a flexible tube 45, with the vacuum apparatus, which will be described hereinafter, and communication between the suction-cup and the vacuum apparatus is controlled by means of a three-way valve 46, mounted on the arm 36 near the suction-cup. This valve is operated by means of an arm 47, which as the suction-cup is moved into position to seize a sheet on the pile is engaged by a stop 48 (see Figs. 1 and 2) and thrown to move the valve so as to establish communication between the suction-cup and the vacuum apparatus and which as the cup comes to the position at which the sheet carried thereby is to be released engages a stop 49, which throws it in the opposite direction to move the valve so as to close communication between the suction-cup and the vacuum apparatus and open communication between the suction-cup and the atmosphere, and thereby effect the release of the sheet.

The sheets may be received from the suction-cup by any suitable feeding or carrying devices. As shown, they are dropped into a trough or way 50, through which they are advanced, by means of fingers 51 on endless chains 52, to the machine or apparatus to which they are to be successively fed.

In order to insure the transferring from the pile of but a single sheet at a time, an auxiliary pneumatic separating device is pro-

vided consisting of a small suction-cup 55, operated and supported in position to engage the uppermost sheet near the front edge thereof and raise the same slightly, and thereby admit air beneath the top sheet, and thus insure it and it alone being properly grasped by the suction-cup 35. This suction-cup 55 is connected with the suction apparatus by a flexible tube 56 and is carried by an arm 57, pivotally connected to a pivoted support 58, which is mounted on a shaft 59 and held in its normal position by means of a rod 60 and spring 61, the spring and a stop 62 on the rod 60 bearing on a bracket 63. The support 58 is thus normally held in the position shown in Fig. 1, but is capable of a slight forward movement against the tension of the spring 61 for a purpose to be pointed out.

Secured fast on the shaft 59 is an operating-arm 65, which carries an antifriction-roll in position to bear on the under side of the arm 57, which latter is properly formed as a cam, so that as the arm 65 moves forward the suction-cup 55 will be allowed to move downward under the tension of a spring 66 (see Fig. 1) until it is in position to grasp the uppermost sheet, and as the arm 65 moves rearward the suction-cup will be raised a short distance to the position shown in Fig. 1. The arm 65 also engages a slotted arm 67, by which is operated a three-way valve 68, which controls the passage leading to the suction-cup 55, and these parts are so arranged that as the suction-cup comes into position to grasp the sheet the valve will be moved to establish communication between the suction-cup and the vacuum apparatus, and as the suction-cup approaches its upper position this communication will be cut off and communication established between the suction-cup and the atmosphere for the release of the sheet. The arm 65 also carries a stop or finger 70, which as the arm moves rearward is projected beneath the edge of the sheet which has been raised by the suction-cup 55 and over the edge of the pile for the purpose of limiting the upward movement of the pile while the stop 16 is raised, as hereinafter described. As the arm 65 nears the limit of its forward movement it engages an adjustable stop 71 on the support 58 and gives the support 58 a slight forward movement against the pressure of the spring 61. Then as the arm 65 moves rearward again the spring 61 causes the support 58 to move rearward a distance corresponding to the forward movement which was given to it, its rearward movement being limited by the stop 62. The suction-cup 55 will thus be given a slight lateral rearward movement before beginning its upward movement. This is found to aid in separating the upper sheet from the succeeding sheets. The amount of the lateral movement of the suction-cup and its position with relation to the edge of the sheet may be adjusted by adjusting the stops

71 and 62. The antifriction-roll for engaging and operating the arm 57 and the stop 70 are shown as adjustable on the arm 65. The shaft 59 is rocked by means of a spring 75 and a cam 76 on the shaft 41, acting through a lever 77 and connecting-rod 78, connected to an arm 79 on the shaft 59.

The stop 16 is raised for releasing the successive top sheets by means of an arm 80, fast on the shaft 81, which carries the supporting-lever 37, this arm being connected to the slide 82, which carries the stop 16, by a connecting-rod 83 and cross-lever 84. The stop will thus be raised as the suction-cup 35 moves downward to grasp a sheet and will be returned to operative position as the suction-cup moves upward again.

A deflecting plate or arm 85 is preferably provided for engaging the edge of the sheet as the latter is carried laterally into position over the trough 50 by the suction-cup 35 to aid in detaching the sheet from the suction-cup and insuring its dropping flat into the trough.

The operation of the parts thus far described is, briefly, as follows: The suction-cup 55 having been moved down into position to seize the top sheet, the valve 68 will have been moved to connect the suction-cup with the vacuum apparatus. The suction-cup will then be moved first slightly to the rear and then upward to about the position shown in Fig. 1, lifting the edge of the top sheet away from the pile and releasing the sheet as it approaches its uppermost position. Meanwhile the transferring suction-cup 35 will have been moved forward and downward toward the top of the pile, and as it comes into position to seize the top sheet the valve 46 will be moved by engagement of the arm 47 with the stop 48 to establish communication between the suction-cup and the vacuum apparatus. The stop 16 having been meanwhile raised to release the top sheet and the finger 70 projected over the front edge of the pile to limit the upward movement thereof while the stop 16 is raised, the suction-cup 35 will seize the sheet and begin to rise, continuing its forward lateral movement for a short distance and then swinging rearwardly to carry the sheet over the trough 50, where it is dropped, the valve 46 being operated by engagement with the stop 49, as before explained. As the suction-cup 35 carries one sheet from the pile, the suction-cup 55 moves downward again into position to engage and separate the edge of the next sheet, the stop 70 having been meanwhile withdrawn and the stop 16 returned to its normal position for limiting the upward movement of the pile. As the sheets are successively dropped into the trough 50 they are advanced through the same by the fingers 51. The slight forward movement of the suction-cup 35 as it begins its upward movement after seizing the sheet serves to carry the sheet clear of the stop 16

and is also of advantage in serving to free the sheet completely from the next sheet of the pile, since the sheet is thus first given a movement toward the side at which the edge has been raised and air admitted between it and the next sheet.

Any suitable vacuum apparatus may be provided for exhausting the air from the suction-cups. The preferred construction shown comprises a vacuum-pump 90, operated by the eccentric 42, and an equalizing-cylinder 91, having a piston under spring tension to move it outward, and which cylinder is in communication, through a pipe 92 and check-valve 93, with the pump-cylinder. The flexible tubes 45 and 56 communicate with this equalizing-cylinder 91 as by communicating with the pipe 92. The vacuum-pump will thus be operated at each revolution of the shaft 41 and in time to correspond to the movements of the suction transferring-cup 35 and to reduce the vacuum in the system as this suction-cup seizes a sheet, and the piston of the equalizing-cylinder 91 will act to maintain the vacuum during the return stroke of the pump.

The cam-shaft 41 and the feed-chains 52 may be operated in any suitable manner. I have shown them as driven from a counter-shaft 95, the shaft 41 being driven through bevel-gears 96 and the feed-chains 52 through a sprocket-chain 97.

The forward movement of the suction-cup 55 has a tendency to gradually work the upper sheets of the pile outward, and to counteract this tendency I preferably provide a spring-guide 98, which bears against the edges of the sheets at the front side and near the top of the pile. This spring-guide is conveniently pivotally supported on the shaft 59 and urged against the sheets by the tension of a spring 99. This spring-guide is also preferably positioned so that if it is forced back against the tension of the spring 99 by the forward movement of the sheets it will be struck by the arm 65, and thereby positively returned to press the sheets back to proper position.

The parts controlling the operation of the suction-cup 55 are preferably so formed that the suction-cup will have a comparatively slow upward or separating movement and a quicker return movement, and as the suction-cup makes only one complete movement for each complete movement of the transferring suction-cup 35 and as it has only a very small movement compared to the movement of the suction-cup 35 its separating movement is very much slower than the transferring movement of the suction-cup 35, and its action is thus very certain.

It will be understood that I am not to be limited to the exact construction and arrangement of parts as in the preferred construction here shown and to which the foregoing de-

scription has been mainly confined, but that the invention includes changes and modifications thereof within the claims.

What I claim is—

5 1. The combination of a suction-transferrer for lifting and transferring sheets successively from a pile, and a suction device for lifting one edge of the sheet before it is seized by the transferrer and having a lifting move-
10 ment slower than the lifting movement of the transferrer, substantially as described.

2. The combination of a suction-transferrer for taking sheets successively from a pile, and a suction device for lifting one edge of the
15 sheet before it is seized by the transferrer having a lifting movement slower than the lifting movement of the transferrer and having a slight lateral movement before it begins its lifting movement, substantially as described.

20 3. The combination of a suction-transferrer for taking sheets successively from a pile, and a suction device for lifting one edge of the sheet before it is seized by the transferrer having a slight lateral movement before it
25 begins its lifting movement, substantially as described.

4. The combination of a transferrer for taking sheets successively from a pile by engagement with the upper surface of the sheet,
30 means for lifting one edge of the sheet from the remaining sheets of the pile before it is seized by the transferrer, and means for moving the transferrer after it has seized the sheet toward the side of the pile at which the edge
35 of the sheet is raised, substantially as described.

5. The combination of a suction-transferrer for taking sheets successively from a pile, means for lifting one edge of the sheet before
40 it is seized by the transferrer, and means for moving the transferrer after it has seized the sheet toward the side of the pile at which the edge of the sheet is raised, substantially as described.

45 6. The combination of a suction-transferrer for taking sheets successively from a pile, means for lifting one edge of the sheet before it is seized by the transferrer, means for moving the transferrer after it has seized the
50 sheet first toward the side of the pile at which the edge of the sheet was raised and then in the opposite direction, substantially as described.

7. The combination of a transferrer for
55 taking sheets successively from a pile by engagement with the upper surface of the sheet, a suction device for lifting one edge of the sheet before it is seized by the transferrer having a lateral movement away from the side of
60 the pile and a lifting movement, and means for moving the transferrer after it has seized the sheet toward the side of the pile at which the edge of the sheet is lifted, substantially as described.

65 8. The combination of means for feeding a

pile of sheets upward, a stop for limiting the upward movement of the pile, a suction-transferrer for taking sheets successively from the pile, means for lifting one edge of the sheet before it is seized by the transferrer, and
70 means for moving the transferrer after it has seized the sheet laterally to carry the sheet clear of the stop, substantially as described.

9. The combination of means for feeding a pile of sheets upward, a stop for limiting the
75 upward movement of the pile, a suction-transferrer for taking sheets successively from the pile, means for lifting the edge of the sheet opposite the stop before it is seized by the transferrer, and means for moving the trans-
80 ferrer after it has seized the sheet first toward the side of the pile at which the edge of the sheet has been raised and then in the opposite direction, substantially as described.

10. The combination of means for feeding a
85 pile of sheets upward, a stop for limiting the upward movement of the pile, a suction-transferrer for taking sheets successively from the pile, means for lifting the edge of the sheet opposite the stop before it is seized by the
90 transferrer, and means for moving the transferrer after it has seized the sheet toward the side of the pile at which the edge of the sheet has been raised, substantially as described.

11. The combination of means for feeding a
95 pile of sheets upward, a stop for limiting the upward movement of the pile, a suction-transferrer for taking sheets successively from the pile, a suction device for lifting the edge of the sheet opposite said stop before it is seized
100 by the transferrer, a second stop arranged to enter beneath the lifted edge of the sheet and over the edge of the pile, means for raising the first-mentioned stop to release the top sheet, and means for moving the transferrer
105 after it has seized the sheet first toward the side of the pile at which the edge of the sheet is raised and then in the opposite direction, substantially as described.

12. The combination of means for feeding a
110 pile of sheets upward, a stop for limiting the upward movement of the pile, a transferrer for taking sheets successively from the pile, means for lifting the edge of the sheet opposite to said stop before it is seized by the
115 transferrer, a second stop arranged to enter beneath the lifted edge of the sheet and over the edge of the pile, and means for raising the first-mentioned stop to release the top sheet, substantially as described.

13. The combination of means for feeding a
120 pile of sheets upward, a stop for limiting the upward movement of the pile, a suction-transferrer for taking sheets successively from the pile, means for lifting the edge of the sheet
125 opposite to said stop before it is seized by the transferrer, a second stop arranged to enter beneath the lifted edge of the sheet and over the edge of the pile, means for raising the first-mentioned stop to release the top sheet, 130

and means for moving the transferrer after it has seized the sheet toward the side of the pile at which the edge of the sheet is raised, substantially as described.

14. The combination of means for feeding a pile of sheets upward, a stop for limiting the upward movement of the pile, a suction-transferrer for taking sheets successively from the pile having a movement to carry the sheet clear of the stop, means for raising the stop to release the sheet, and means for limiting the upward movement of the pile while the stop is raised, substantially as described.

15. The combination of means for feeding a pile of sheets upward, a stop for limiting the upward movement of the pile, a transferrer for taking sheets successively from the pile having a movement to carry the sheet clear of the stop, means for raising the stop to release the sheet, and means for limiting the upward movement of the pile when the stop is raised, substantially as described.

16. The combination of means for feeding a pile of sheets upward, a stop for limiting the upward movement of the pile, a transferring device for taking sheets successively from the pile, a suction device for lifting the edge of the sheet opposite to said stop before it is seized by the transferring device, said suction device having a lateral inward movement and an upward lifting movement, a second stop adapted to enter beneath the raised edge of the sheet and over the edge of the pile, and means for moving the first stop to release the top sheet, substantially as described.

17. The combination of means for feeding a pile of sheets upward, a stop for limiting the upward movement of the pile, a transferring device for taking sheets successively from the pile, a suction device for lifting the edge of the sheet opposite said stop before it is seized by the transferring device, an actuating-arm 65 for giving said suction device its lifting movement, and a second stop carried by said arm adapted to enter beneath the raised edge of the sheet and over the edge of the pile, substantially as described.

18. The combination in a sheet separating and feeding mechanism, of the suction-cup 55 for raising the edge of the top sheet carried by a pivoted cam-arm 57, a member engaging said cam-arm to control the lifting movement of the suction-cup, a valve for controlling the suction-cup, and a lost-motion connection between said valve and the cam-arm-engaging member, substantially as described.

19. The combination of the suction-cup 55 carried by a pivoted cam-arm 57, pivoted support 58 by which the arm 57 is carried, means for holding the support 58 in its normal position under yielding tension, a reciprocating actuating member having a part engaging the cam-arm 57 to control the lifting movement of the suction-cup 55 and adapted to move the support 58 against the yielding tension as it

nears the end of its movement in one direction whereby the suction-cup will be given a slight lateral reciprocation while in its slow or sheet-seizing position, substantially as described.

20. The combination of the suction-cup 55 carried by the pivoted cam-arm 57, pivoted support 58 by which the arm 57 is carried, means for holding the support 58 in its normal position under yielding tension, pivoted actuating-arm 65 having a part to engage the cam-arm 57 to control the lifting movement of the suction-cup and adapted to engage the bracket 58 as it nears the end of its forward movement to move the bracket against the yielding tension, a valve for controlling the suction of the suction-cup, valve-operating connections between the valve and the arm 65, and a stop 70 carried by the arm 65, substantially as described.

21. The combination of a suction-transferrer for taking sheets successively from a pile having a lateral movement after it has seized the sheet, a spring-guide bearing against the edges of the sheets near the top of the pile and at the side toward which the suction-transferrer makes said lateral movement, and means for positively returning said guide to normal position, substantially as described.

22. The combination of a support for feeding a pile of sheets upward, a stop for limiting the upward movement of the pile, a transferring device for taking sheets successively from the pile, and a sheet-supporting device comprising a pivoted bracket 26 and rods 25 sliding therein for supporting the pile of sheets to permit the main support to be lowered for receiving a fresh supply of sheets, said secondary supporting device being located at a distance below the top of the pile so that the elasticity of the remaining sheets will maintain successive top sheets in position for the proper action of the transferring device during the time required for replenishing the supply of sheets, substantially as described.

23. The combination of a support under tension to feed a pile of sheets upward, a stop for limiting the upward movement of the sheets, a transferring device for taking sheets successively from the pile, and an auxiliary support for supporting the sheets to permit the main support to be lowered to receive a fresh supply of sheets, said auxiliary support being located at a distance below the top of the pile so that the elasticity of the remaining sheets will maintain successive top sheets in position for the proper action of the transferring device during the time required for replenishing the supply of sheets, substantially as described.

24. The combination in a sheet separating and feeding mechanism, of a holder for the sheets having a support for feeding the pile of sheets upward, a weight-carrier connected to the support for raising the support as the

weight-carrier moves downward, a series of weights, and a weight-support for supporting the weights independently of the carrier, the weight-carrier being formed with a series of shoulders for engaging and lifting successive weights as the carrier moves upward, substantially as described.

25. The combination of means for feeding a pile of sheets upward including a support for the sheets having opposite sides raised so that the sheets shall be bent slightly upward toward the corresponding edges, and a suction-transferrer for taking sheets successively from the pile having a movement toward and from the top of the pile and a lateral movement longitudinally of the raised sides of the support, substantially as described.

26. The combination of means for feeding a pile of sheets upward including a support for the sheets having opposite sides raised so that the sheets shall be bent slightly upward toward the corresponding edges, a suction-transferrer for taking sheets successively from the pile, and a suction device for lifting one edge of the sheet before it is seized by the transferrer, said suction device being arranged to engage the sheet between the raised edges thereof, and the transferrer having a movement toward and from the top of the pile and a lateral movement longitudinally of the raised sides of the support and toward the side of the pile at which the edge of the sheet is raised, substantially as described.

27. The combination of a support for a pile of sheets having opposite sides raised so that

the sheets shall be bent slightly upward toward the corresponding edges, and a suction-transferrer for taking sheets successively from the pile having a movement toward and from the top of the pile and a lateral movement longitudinally of the raised sides of the support, substantially as described.

28. The combination with sheet separating and feeding devices including two suction members operating successively on the sheet, of a vacuum-pump, and an equalizing device having a moving suction member in communication with the vacuum-pump and with the suction members for maintaining the vacuum during the intervals between the effective movements of the pump, substantially as described.

29. The combination with sheet separating and feeding devices including two suction members operating successively on the sheet, of a vacuum-pump operated in time with the operative movement of one of the suction members, and an equalizing device having a moving suction member in communication with the vacuum-pump and with the suction members for maintaining the vacuum during the intervals between the effective movements of the pump, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES E. SAGE.

Witnesses:

A. L. KENT,
T. F. KEHOE.