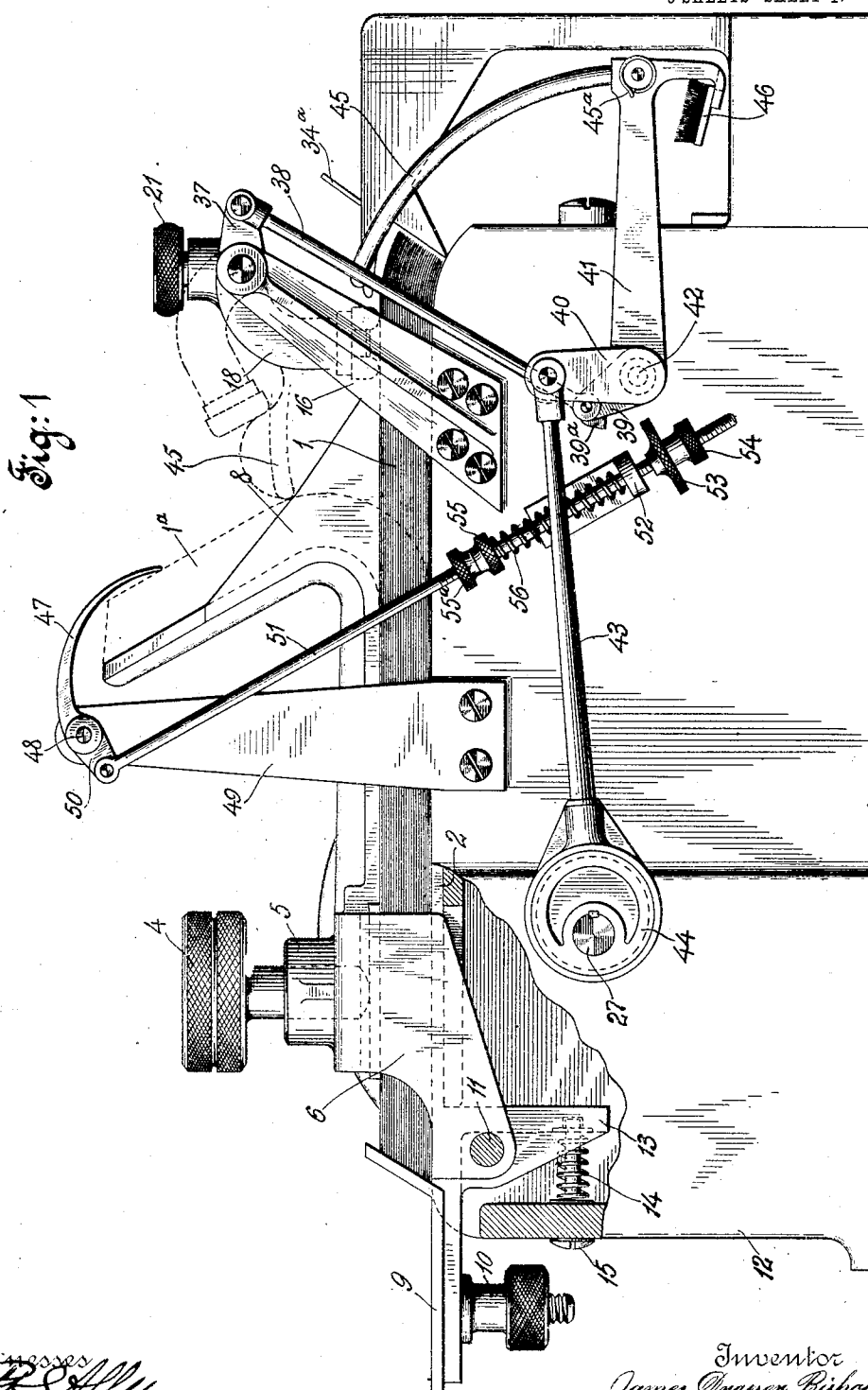


J. D. BISHOP.
MACHINE FOR COUNTING SHEETS, NOTES, &c.
APPLICATION FILED FEB. 15, 1904.

5 SHEETS—SHEET 1.

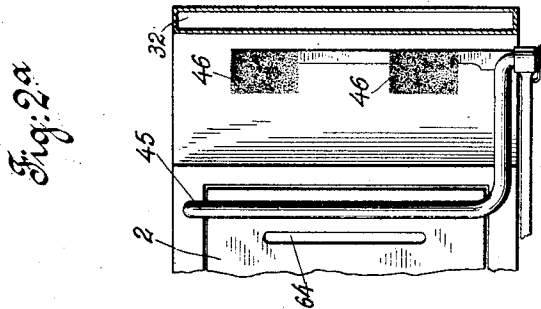
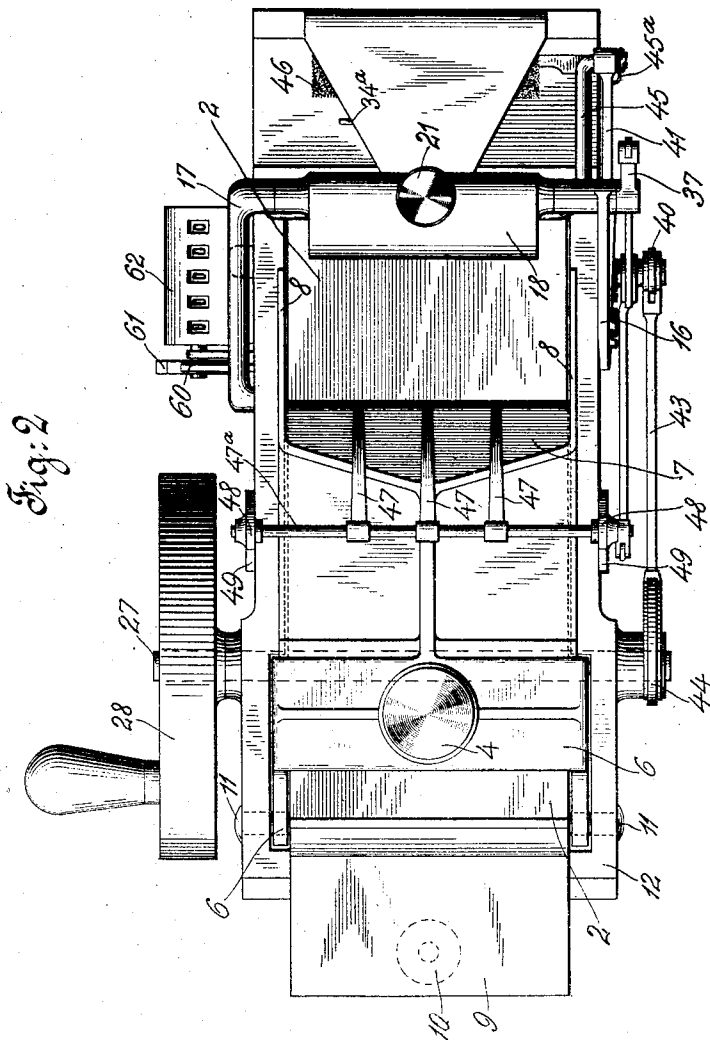


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5 SHEETS—SHEET 2.



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PATENTED JAN. 17, 1905.

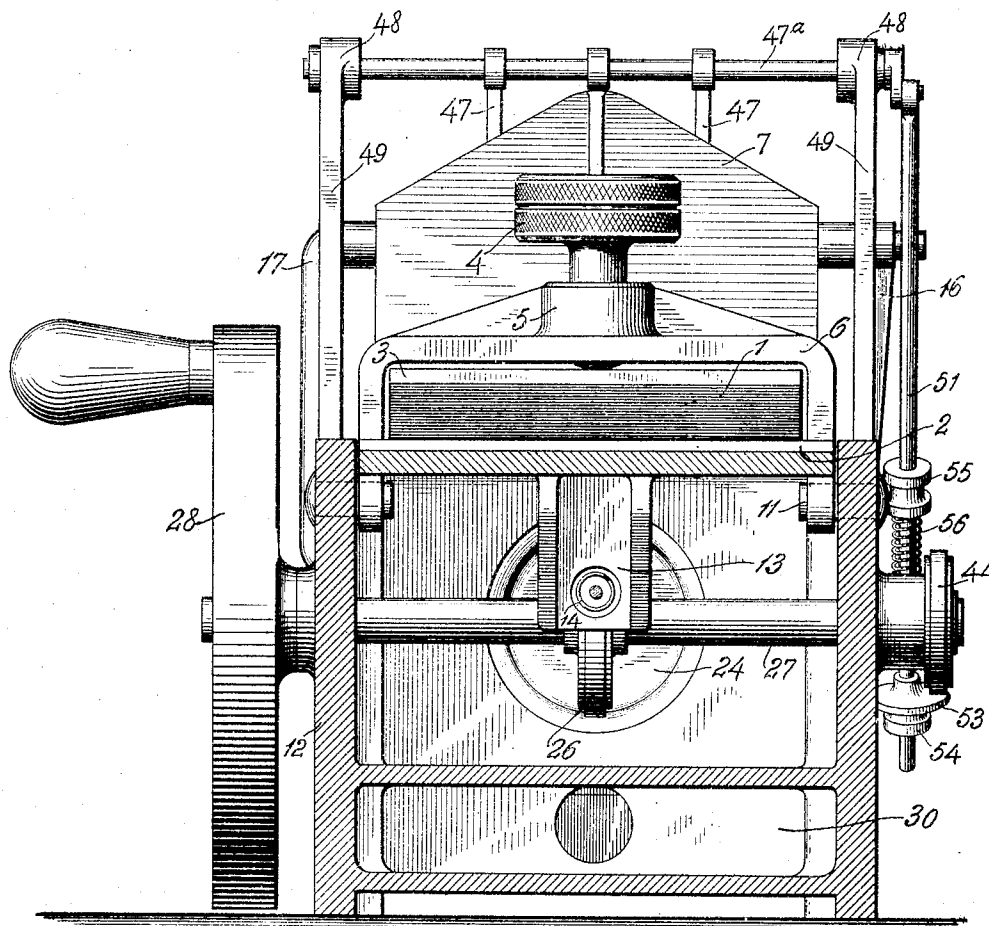
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MACHINE FOR COUNTING SHEETS, NOTES, &c.

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5 SHEETS—SHEET 3.

Fig. 3

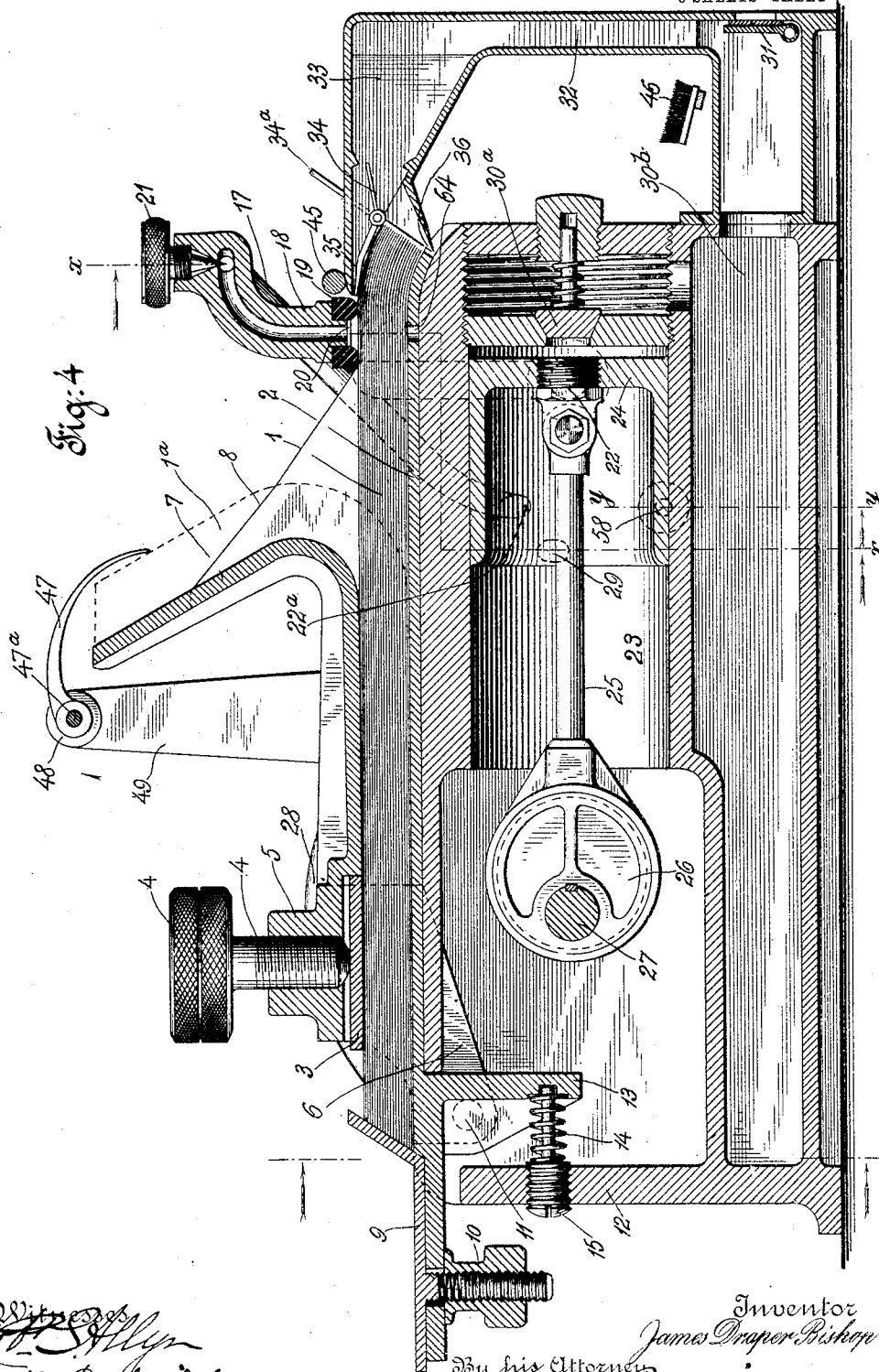


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APPLICATION FILED FEB. 15, 1904.

5 SHEETS—SHEET 4



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MACHINE FOR COUNTING SHEETS, NOTES, &c.

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5 SHEETS—SHEET 5.

Fig:5

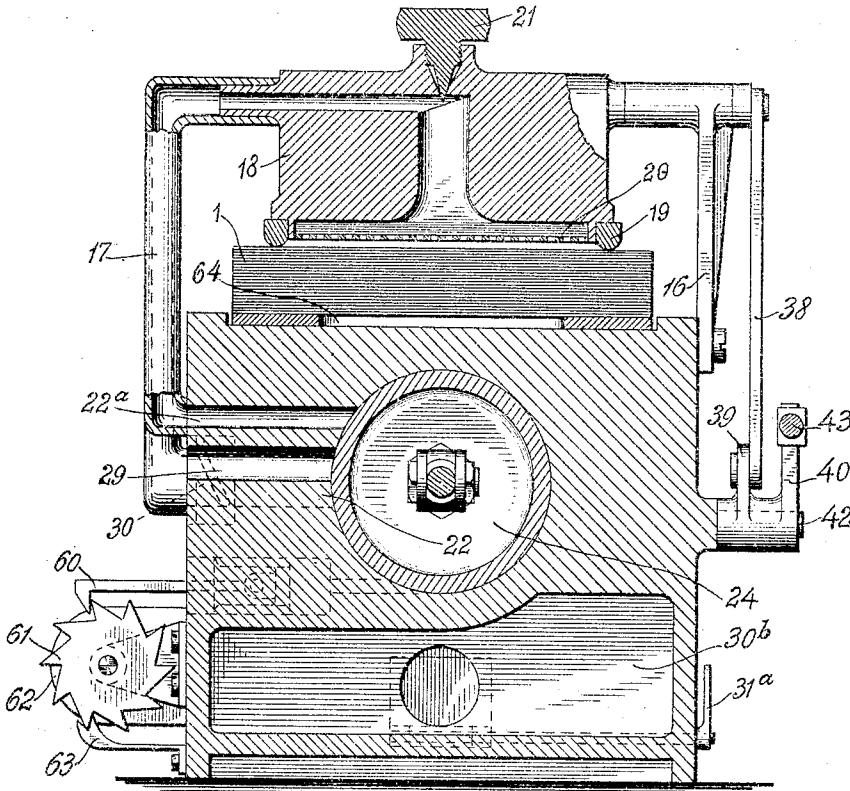


Fig:6

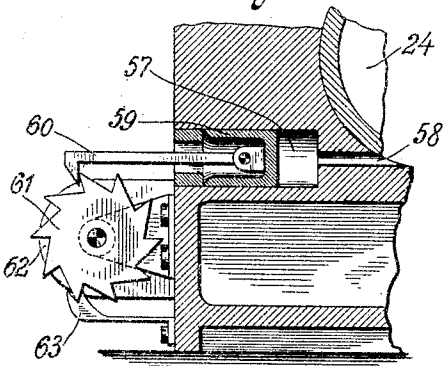
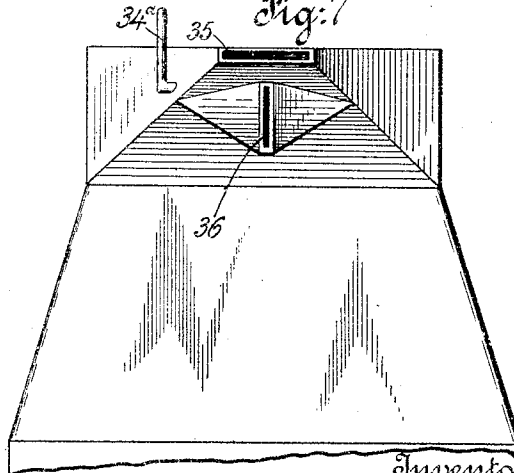


Fig:7



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UNITED STATES PATENT OFFICE.

JAMES DRAPER BISHOP, OF NEWARK, NEW JERSEY.

MACHINE FOR COUNTING SHEETS, NOTES, &c.

SPECIFICATION forming part of Letters Patent No. 780,262, dated January 17, 1905.

Application filed February 15, 1904. Serial No. 193,584.

To all whom it may concern:

Be it known that I, JAMES DRAPER BISHOP, a subject of the King of Great Britain, residing at Newark, in the county of Essex, State of New Jersey, have invented certain new and useful Improvements in Machines for Counting Sheets, Notes, &c., of which the following is a full, clear, and exact description.

My invention relates to machines for counting sheets of paper or similar material, bank-notes, stock-certificates, and similar matter of all kinds.

It has for its object to provide a means for mechanically counting such sheets with speed and accuracy; and it consists in a combination of elements and devices hereinafter described, and particularly pointed out in the claims.

The following is a description of a machine embodying my invention, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of the machine. Fig. 2 is a plan view. Fig. 2^a is a plan view of the right-hand end with certain parts removed. Fig. 3 is a left-hand end elevation. Fig. 4 is a longitudinal section with the parts shown in their normal positions when the piston is at the end of its right-hand or compressing stroke. Fig. 5 is a partial cross-section on the line X X, Fig. 4. Fig. 6 is a partial cross-section on the line Y Y, Fig. 4; and Fig. 7 is a view of a detail.

Referring more particularly to the drawings, 1 represents sheets to be counted, which in the present instance may be supposed to be bank-notes. These sheets are clamped to a table 2 by clamping-plate 3, with which engages the clamping-screw 4, passing through a screw-threaded orifice in the cross-bar 5, which is connected to the table by ears 6. This cross-bar 5 has a forwardly-projecting extension terminating in a backwardly-inclined support 7, to the sides of which are connected inclined guides 8.

Upon the rear end of the table 2 is an adjustable guide or stop 9, clamped in position by the nut 10.

The table 2 is pivoted at 11 to the base or frame 12 and has a downwardly-projecting lug 13, with which a spring 14 engages. This spring 14 tends to elevate the right-hand end

of the table 2 for the purpose hereinafter described. The tension of the spring 14 can be adjusted by the screw 15 engaging with the base 12.

Supported on one side by a solid bracket 16, screwed to the base, and at the other side by a tubular bracket 17, surrounding its hollow trunnion, is a pneumatic or suction lifting device or lifter 18, whose mouth is surrounded by a gasket 19, preferably of rubber, and bears upon the sheets 1. Within the gasket 19 and at the mouth of the lifting device is a screen 20, which acts to prevent the sheets from being sucked up so far as to be injured. This lifting device is provided with a by-pass 21 for admitting more or less air, so as to regulate the force of the suction. The lifting device, through its hollow trunnion and tubular bracket 17, is connected at 22 and 22^a with the cylinder 23 within the base. Inside this cylinder is a piston 24, operated through the rod 25 from an eccentric 26, mounted on the shaft 27, to which is in turn connected the driving or crank wheel 28. The cylinder 23 is also provided with a port 29, opening to the atmosphere and so placed with reference to the opening 22^a in the cylinder that both of them are covered by the piston 24, except when it is near the end of its backward movement—that is, the movement toward the left when viewed as in Fig. 4—the port 22^a being slightly in advance of the port 29. This breaks the vacuum in the lifter and also enables the piston on its return or compressing stroke—that is, the movement toward the right when the machine is viewed as in Fig. 4—to send a puff of air through the passage 22^a, which aids in disengaging the sheet from the lifter and forcing it upward.

30 is a valve in the passage leading to the opening 22, closing that passage when the piston moves forward, and 30^a is a check-valve permitting the air which is compressed ahead of the piston 24 to escape into the chamber 30^b. 31 is a valve which may be opened by the handle 31^a, so as to permit this compressed air to escape directly to the atmosphere. When the valve 31 is closed, the air is forced through the passage 32 to the chamber 33, where it can be guided by the valve 34 when adjusted by the handle 34^a, so as to escape through a hori-

zontal slit 35 and pass beneath any sheet which may have been raised by the lifting device 18, as hereinafter described, or be made to pass through the vertical slit 36, so as to blow
 5 against the ends of the sheets, and thereby loosen and separate them, making it more easy for the suction device to lift them one at a time in its oscillating movement, or the air can be permitted to pass through both slits, if
 10 desired. The slits are so narrow that the air escapes slowly, so that the discharge continues during the backward movement of the piston 24. The oscillating movement of the lifter is brought about by a crank-arm 37, connected to an extension on the lifter 18, which
 15 is in turn joined by a connecting-rod 38 to an arm 39, which is rigidly connected to arms 40 and 41 and with them journaled at 42 to a stud upon the base 12. The arm 40 is driven through an eccentric-rod 43 by the eccentric
 20 44, which is mounted upon the shaft 27, so that its maximum throw comes a trifle later than that of the eccentric 26. The arm 41 carries a pusher or sweep 45, which is yieldingly connected thereto through its projecting
 25 end and spring 45^a. It likewise carries brushes 46. The eccentric-rod 43 thus serves to give the lifting device 18 a reciprocating motion and to cause the sweep 45 to carry upward the sheet which has been lifted by the
 30 lifter. The brushes 46 strike against the ends of the sheets 1 and assist in loosening or separating them. As the sweep 45 lifts the sheet it bears against the inclined guides 8 and carries the sheet along until it comes beneath
 35 the fingers 47. These fingers are on the shaft 47^a, journaled at 48 in upwardly-projecting arms 49, attached to the frame 12. To the end of the shaft 47^a is connected a crank 50, to which is pivoted a rod 51, the lower end of
 40 which slides through a guide 52 and is provided with an adjusting-screw 53 and lock-nut 54. Between the projection 52 and an adjustable nut 55 and lock-nut 55^a, carried by the
 45 rod 51, is a compression-spring 56, which tends to throw the rod 51 upward and depress the ends of the fingers 47, so as to hold the notes. As the suction device 18 is lifted and the sweep 45 rises the projection 39^a, carried
 50 by the arm 39, engages with the adjusting-nut 53 and moves the rod 51 downward, thereby lifting the fingers 47, so that the notes can pass beneath them. When no notes have been counted, the fingers 47 rest against the inclined
 55 portion 7. As shown, they are in position to hold a lot of counted notes, as indicated in dotted lines at 1^a.

In order to count the movements of the piston 24 whenever a sheet is lifted by the suction device 18 and at the same time provide
 60 against making a record of the piston-stroke whenever the lifter fails to lift a sheet, I provide a pneumatic counter consisting of a cylinder 57, which is connected to the cylinder
 65 23 by the port 58, so as to be uncovered near

the end of the backward stroke of the piston. In this small cylinder 57 I provide a piston
 59, to which is pivoted a pawl 60, which acts upon a ratchet-wheel 61, operating the counter
 62. The ratchet-wheel is restrained from
 70 backward movement by the detent 63. In normal operation as soon as port 58 is uncovered by the piston 24 a vacuum is produced in the cylinder 57, drawing back the piston
 59 and detent 60 and revolving the ratchet-wheel 61, while on the return stroke of the
 75 piston 24 the air which has entered the port 29 is compressed, and thereby the piston 59 in the cylinder 57 is forced back to its original position ready to act for the next count.
 80 In case, however, the suction device 18 does not lift a sheet no vacuum is produced by the piston 24 on its backward stroke, and the piston 59 and the pawl 60 will of course not be actuated, and consequently the ratchet-wheel
 85 and counter will not be operated. It will be seen that the spring 14 will cause the table to follow up as the sheets are removed, so as to keep the sheets always in engagement with the mouth of the suction device 18. In order
 90 to provide against the production of a vacuum when all the sheets have been exhausted and the table 2 itself closes the mouth of the suction device 18, I provide an opening 64 in the
 95 table directly beneath the mouth of the suction device, so as to break the suction in that contingency.

In the manipulation and operation of the machine the back-stop 9, which is held by the
 100 screw 10, is removed and the sheets 1 are slid under the clamp 3 and are moved forward until they abut against the vertical slot 36. The stop 9 is then secured in position and the clamp 3 screwed down. The machine is now
 105 ready for working by turning the crank or hand wheel 28, which creates the following movements: The piston 24 is first rapidly drawn back by the action of the eccentric 26. This produces a vacuum in front of the piston
 110 24, which, acting through the port 22, produces a suction at the mouth of the suction device 18, causing the uppermost sheet to adhere. The suction device is then tilted, as shown in dotted lines, Fig. 1, by the action
 115 of the eccentric 44 through the rods 43 and 38 and the crank-arm 37, lifting the end of the uppermost sheet. As soon as this sheet is lifted the sweep 45 passes beneath it, as shown in dotted lines, Fig. 1, and forces it up
 120 against the upturned portion 7, the sweep itself being guided in its action by the stationary guides 8. As the sweep approaches the uppermost limit of its throw the fingers
 125 47 are lifted by reason of the contact of the arm 39^a with the nut 53. The lifting of the sheet is assisted by the blast of air coming through the slit 35 from the chamber 33, and, as before referred to, when the sweep 45 is at its uppermost position the brushes 46 engage
 130 with the ends of the sheets, so as to slightly

separate them in preparation for the lifting of the next sheet. Whenever a sheet is lifted, a vacuum is created in the cylinder 57, which operates the pneumatic counting device, as above described. The vacuum is destroyed as the lifter nears the end of its upward throw. Upon the downward or return stroke of the suction device the rubber lips tend to smooth out the top note, and so prepare its surface for the action of the vacuum, and on the upward or starting stroke the friction of the rubber lips tends to start the sheet forward, and thereby mechanically assist the action of the vacuum. The lifter therefore acts by friction as well as by vacuum. As a matter of fact if the sheets were always of uniform thickness and stiffness the friction of the lifter might be so nicely adjusted as to lift the sheets without the aid of the vacuum; but as the machine ought to be able to act upon sheets of all thicknesses and stiffnesses the use of the vacuum is advisable. The machine shown in the drawings is intended to be operated by the production of a vacuum; but other means for the lifting of the sheets may be employed. In case no vacuum were used, other means would have to be provided for operating the counter.

It is to be noted that in the operation of this machine any sheets which are so imperfect as to be torn across the mouth of the suction device will be at once detected, since the suction device will have its vacuum broken, and so fail to lift the sheet. The sheets can then be turned aside, so as to be easily detected and removed.

My invention permits of many modifications, the broad idea being to provide a mechanical counting device for automatically accomplishing the ends referred to. As above described, it also contemplates the use of a vacuum for elevating the sheets, so as to count sheets of various thicknesses and stiffness. It may be varied in form and proportions and can easily be adapted to counting sheets of different shapes and sizes and to act upon various parts of the sheets to be counted—such, for instance, as upon the corners in case the sheets are very large.

Having described my invention, what I claim is—

1. In a counting-machine, the combination of a lifting device, a retaining device acting to retain the lifted sheets after they are disengaged from said lifter and means for operating the same, substantially as described.

2. In a counting-machine, the combination of a lifter, a lifting-sweep, a device acting to retain the lifted sheets after they have been disengaged from said lifter and sweep and means for operating the same, substantially as described.

3. In a counting-machine, the combination of a pneumatic lifter, a lifting-sweep, a retaining device acting to retain the lifted sheets

after they are disengaged by said lifter and sweep and means for operating the same, substantially as described.

4. In a counting-machine, the combination of a pneumatic friction-lifter, a sweep and a retaining device, and means for operating the same, substantially as described.

5. In a counting-machine, the combination of a lifter, a lifting-sweep, a support for the lifted sheets, a retaining device for retaining the sheets against said support when released by said sweep and lifter, substantially as described.

6. In a counting-machine, the combination of a moving table for the sheets to be counted, a lifter acting upon said sheets, a lifting-sweep, and a retaining device for holding the sheets counted, substantially as described.

7. In a pneumatic counting-machine, the combination of a moving table, a pneumatic lifter engaging the sheets to be counted, said table having an orifice to break the vacuum when the sheets are exhausted, substantially as described.

8. In a pneumatic counting-machine, the combination of a moving table, means for clamping the sheets thereon, a pneumatic lifter engaging with said sheets, a sweep cooperating with said lifter and retaining devices for holding the sheets counted, substantially as described.

9. In a pneumatic counting-machine, the combination of a clamping-table for holding the sheets to be counted, a pneumatic lifter, an air-pump for creating a vacuum for operating said pneumatic lifter and means for assisting and retaining the counted sheets after the same are disengaged from the lifter, substantially as described.

10. In a pneumatic counting-machine, the combination of a lifting device, a suction-cylinder, a piston working therein, and producing a vacuum for said lifting device, a pneumatic register consisting of a cylinder opening into said suction-cylinder, a piston therein and a detent connected to said piston and an integrating mechanism actuated by said detent, substantially as described.

11. In a counting device the combination of a lifter and a pneumatic blast assisting in raising the sheets when once lifted and disengaged from the lifter and means for producing a blast through the lifter when near the end of its upward throw, substantially as described.

12. In a mechanical counting-machine, the combination of a lifting device, a sweep passing beneath the sheets when lifted, guides for said sweep and a retaining device to retain the sheets after they are disengaged from said sweep and lifter, substantially as described.

13. In a mechanical counting-machine, the combination of a lifting device, a sweep passing beneath a sheet when lifted, a support and means for retaining the ends of counted sheets against said support, substantially as described.

14. In a counting device, the combination of a movable table on which the sheets to be counted are placed, a lifter, and means for holding said table against the lifter as the sheets are counted, a sweep passing beneath a sheet when lifted and means for retaining said sheet when disengaged from said lifter and sweep, substantially as described.

15. In a counting-machine, the combination of a pneumatic lifting device, a cylinder and a piston for causing a vacuum therein, and connections between the forward end of said cylinder and said lifting device, also ports connecting said cylinder with said lifting device and with the atmosphere respectively so located as to be uncovered at the end of the rear stroke of the piston, substantially as described.

16. In a pneumatic counting-machine, the combination of a cylinder containing a vacuum-producing piston, a second cylinder connected to said first cylinder at a distance corresponding to an intermediate throw of said piston, a piston in said second cylinder, a registering-train, and means connected to said second piston for actuating said registering-train, substantially as described.

17. In a pneumatic counting-machine, the combination of a moving table, a clamp for holding sheets thereon, a reciprocating lifter, a sweep passing beneath a sheet when lifted, and retaining devices engaging the sheets after disengagement from said lifter and sweep, together with means for operating the same, substantially as described.

18. In a counting-machine, the combination of a table, sheets to be counted thereon, and means for producing an air-blast directly against the ends of said sheets before the sheets are lifted, and means for producing a blast through the lifter when near the end of its upward throw, substantially as described.

19. In a counting-machine, the combination of a table, sheets to be lifted resting thereon, a lifting device engaging and lifting an end of the uppermost of said sheets, and means for producing an air-blast directed beneath the sheet lifted and elevating said sheet after it is disengaged from said lifter and means for retaining said sheet when so elevated, substantially as described.

20. In a counting-machine, the combination of a pneumatic lifting device having a sweeping movement, a rubbing gasket surrounding the mouth of the same, so that frictional as well as pneumatic action takes place, substantially as described.

21. In a counting-machine, the combination of a pneumatic lifting device having an upward movement and means for producing a blast of air through said lifting device when near the end of its upward throw, substantially as described.

22. In a counting-machine, a table, means for clamping to the table the sheets to be counted, means for lifting one end of the uppermost sheet, and a reciprocating brush engaging and disengaging the ends of said sheets to assist in separating them, substantially as described.

23. In a counting-machine, the combination of a supporting-table, means for clamping thereon sheets to be counted, a pneumatic lifting device engaging one end of the uppermost of said sheets, means for actuating said lifting device, and means for registering the movement of said lifting device only when engaged in lifting a sheet, substantially as described.

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