F. A. BRENNER.

PNEUMATIC SEPARATOR.

APPLICATION FILED FEB. 3, 1908.

977,160.

Patented Nov. 29, 1910.

7 SHEETS—SHEET 1.

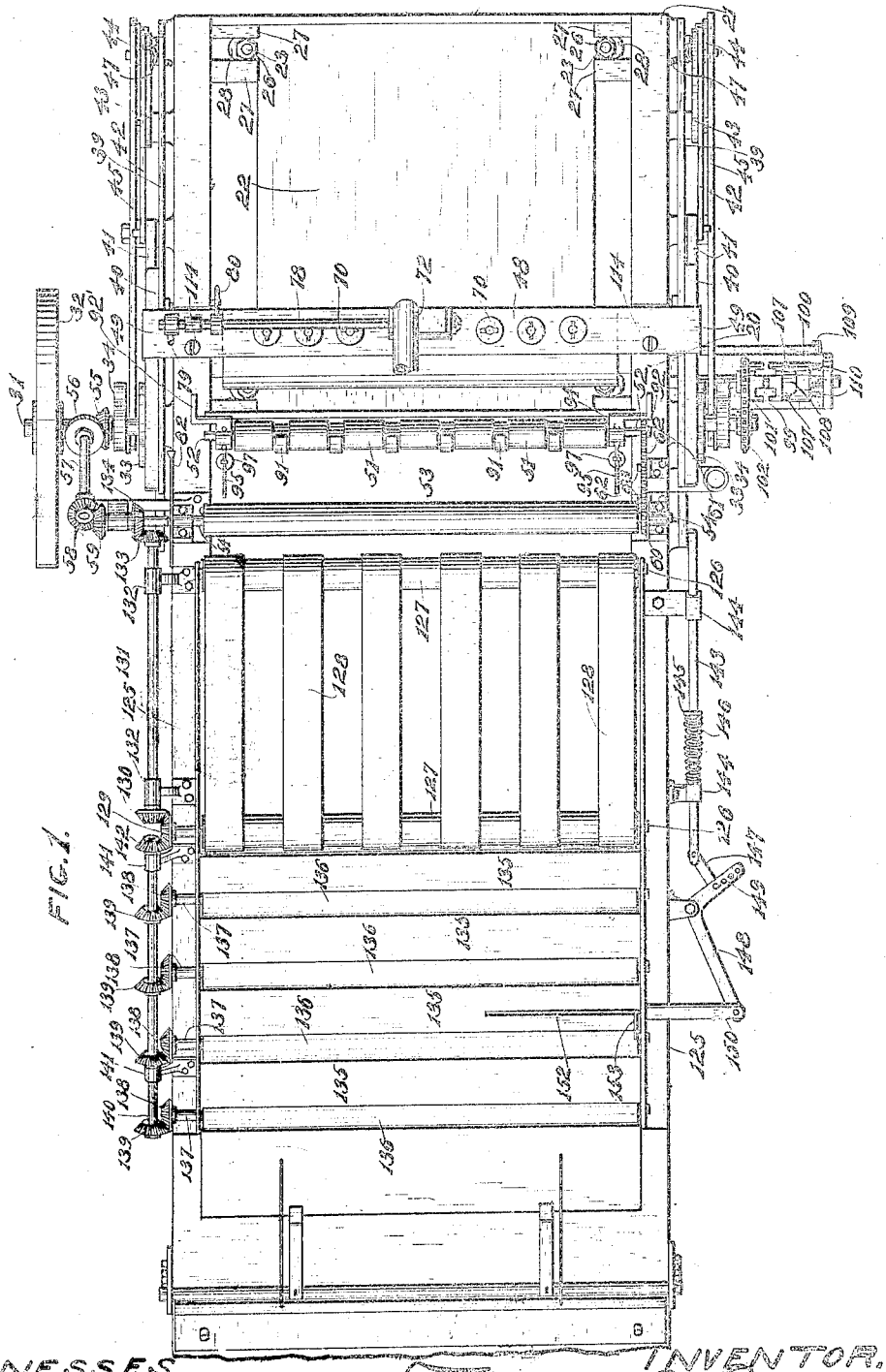

FIG. 1.

WITNESSES

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7 SHEETS—SHEET 2.

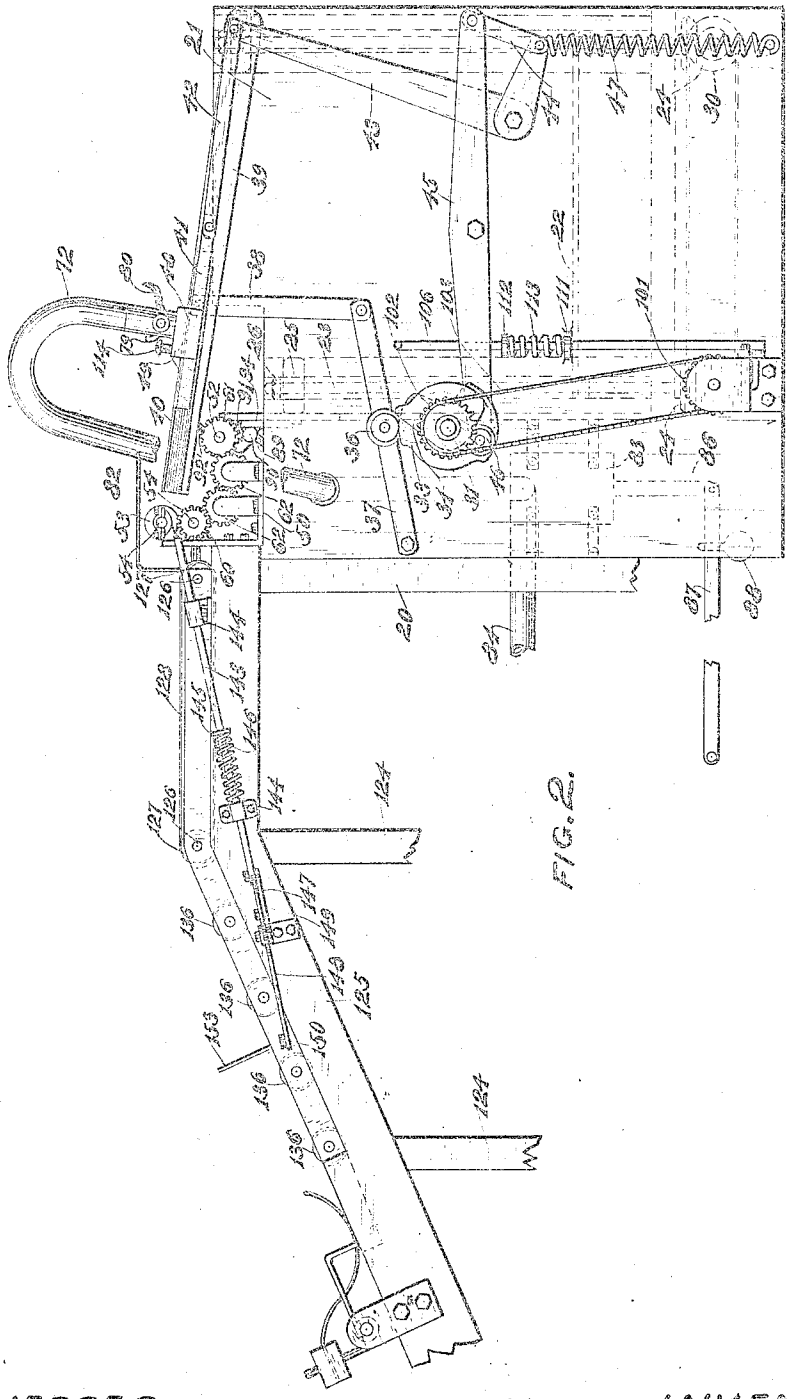

FIG. 2.

WITNESSES.

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7 SHEETS—SHEET 3.

FIG. 5.

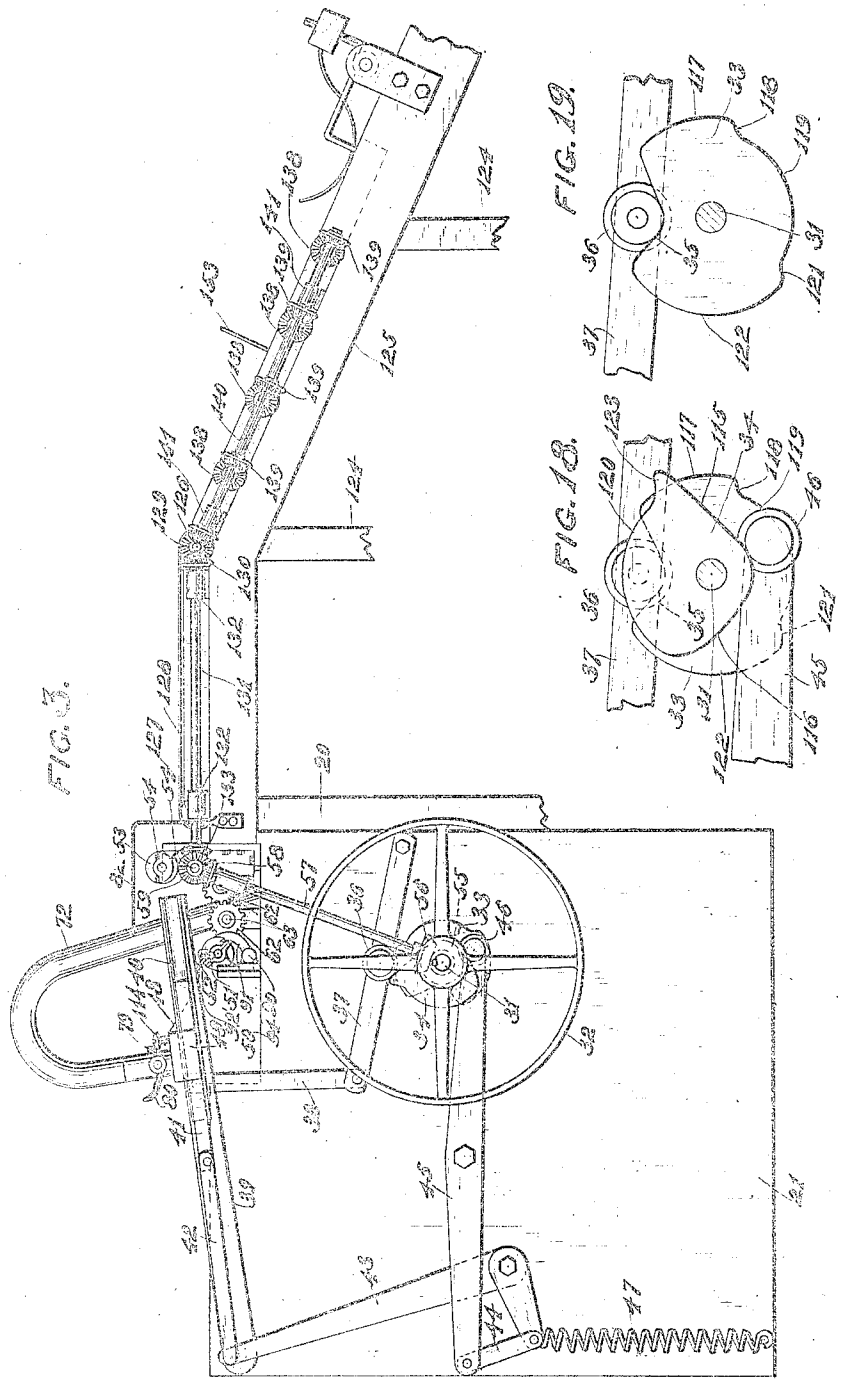

FIG. 19.

FIG. 18.

WITNESSES.

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7 SHEETS—SHEET 4.

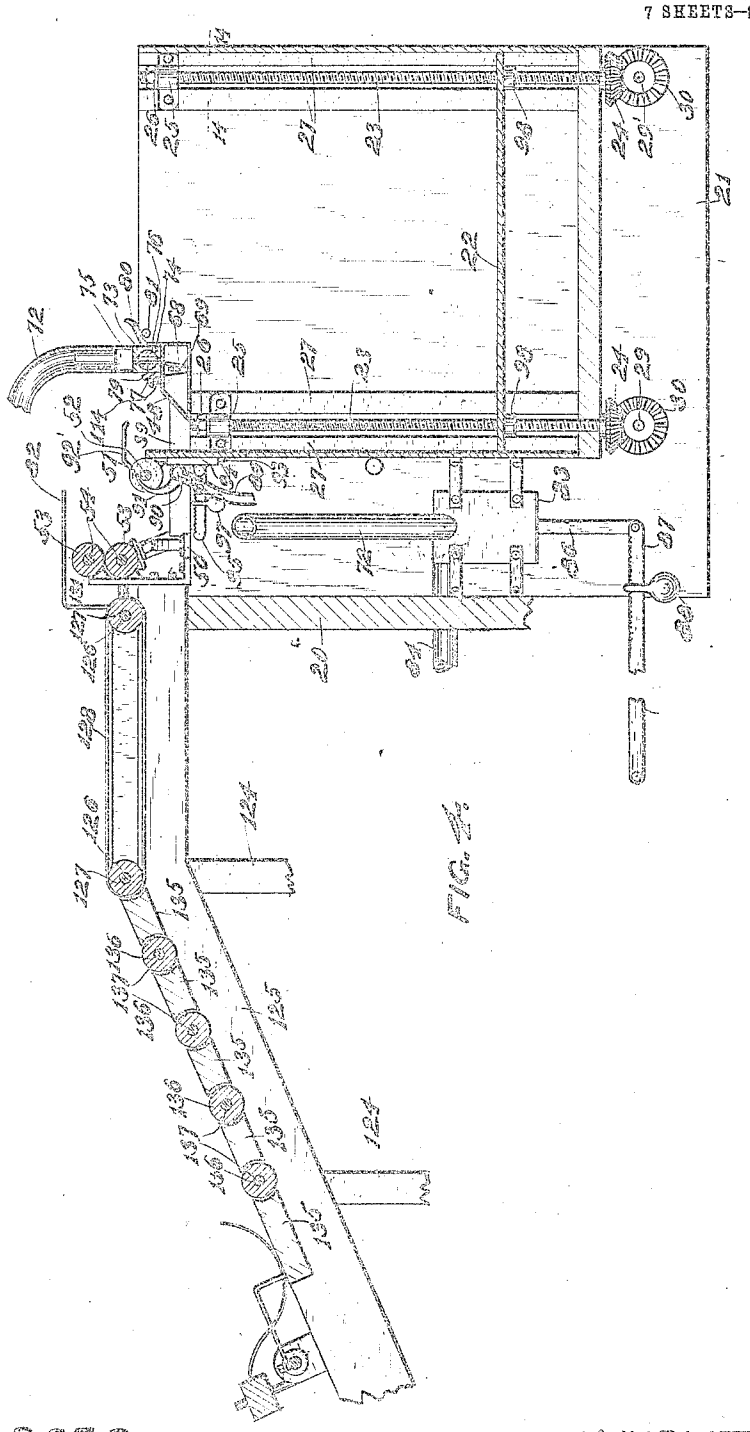

FIG. 4.

WITNESSES.

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APPLICATION FILED FEB. 8, 1908.

977,160.

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7 SHEETS—SHEET 5.

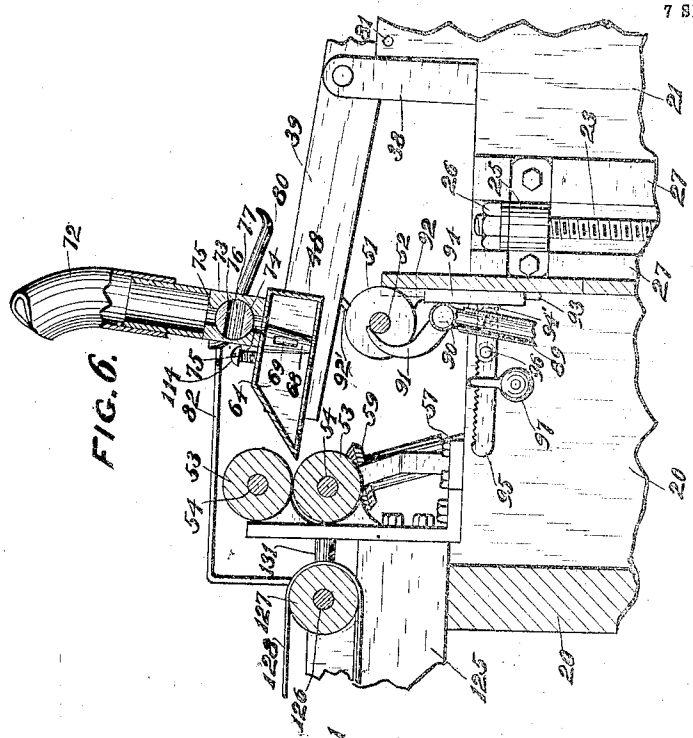

FIG. 6.

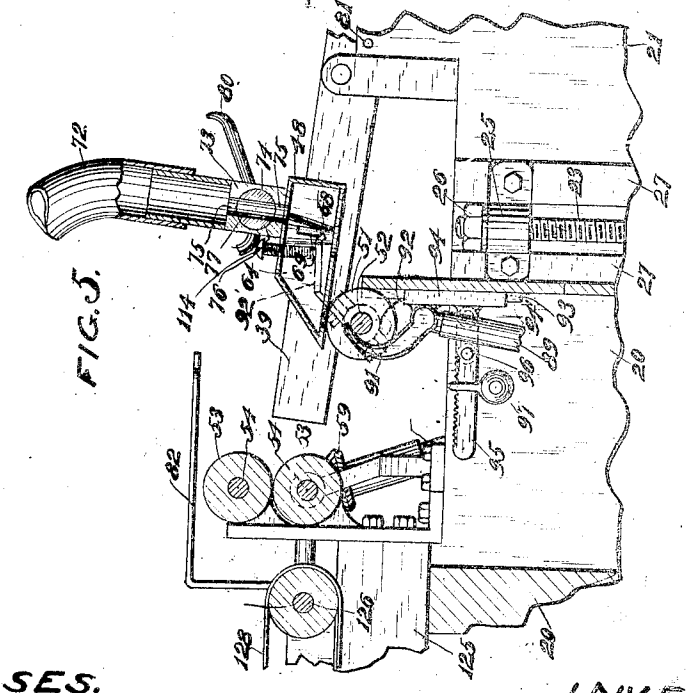

FIG. 5.

WITNESSES.

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APPLICATION FILED FEB. 6, 1908.

977,160.

Patented Nov. 29, 1910.

7 SHEETS—SHEET 6.

FIG. 7.

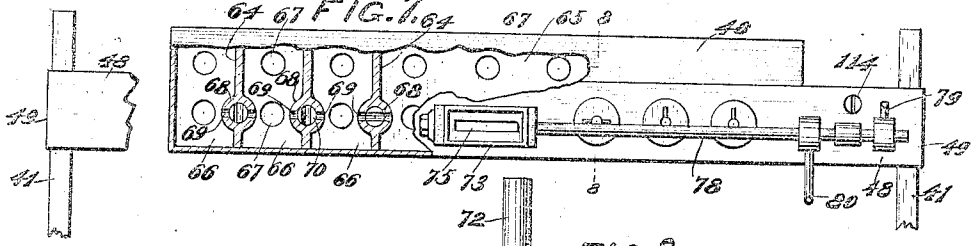


FIG. 8.

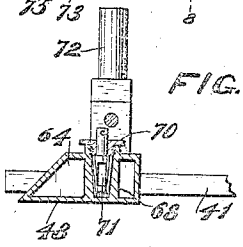


FIG. 9.

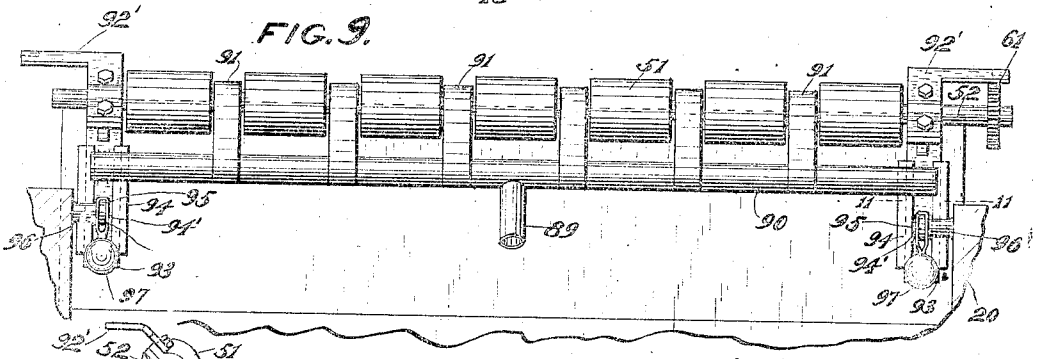


FIG. 10.

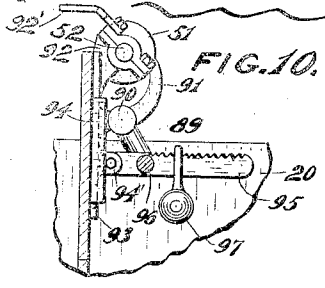


FIG. 11.

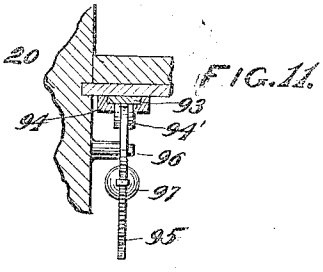
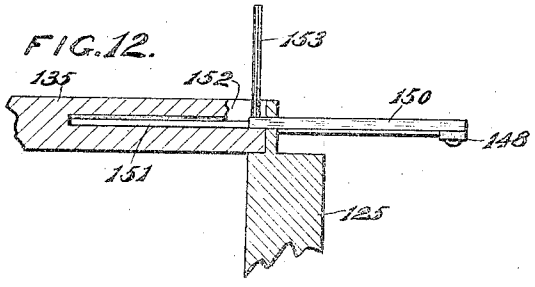


FIG. 12.



WITNESSES.

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7 SHEETS—SHEET 7.

FIG. 13.

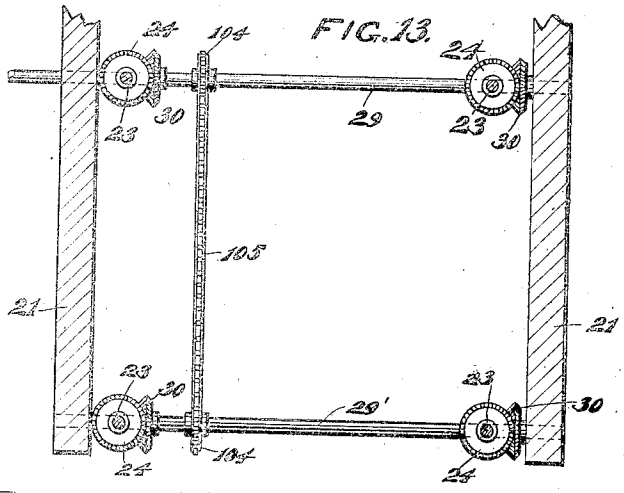


FIG. 14.

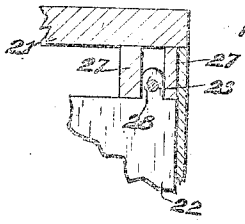


FIG. 15.

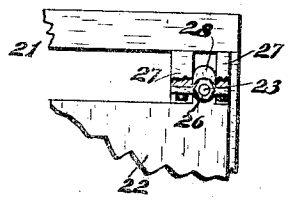


FIG. 16.

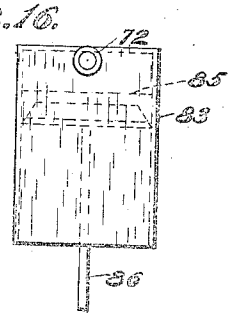
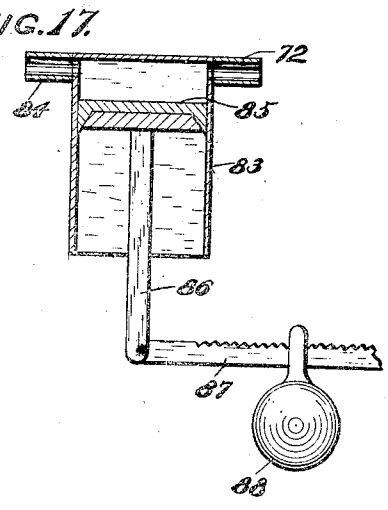


FIG. 17.



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UNITED STATES PATENT OFFICE.

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PNEUMATIC SEPARATOR.

977,160. Specification of Letters Patent. Patented Nov. 29, 1910.

Application filed February 8, 1908. Serial No. 414,874.

To all whom it may concern:

Be it known that I, FREDERICK A. BRENNER, residing in Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Pneumatic Separators, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

My invention has relation to improvements in pneumatic separators.

The primary object of the invention is to provide an improved construction whereby single sheets of paper are rapidly, accurately, and successively separated from a pile of sheets by pneumatic means, preparatory to each of said single sheets being fed to a printing press.

A further important object is to provide, in connection with a suction box, means for separating from the underside of said box all sheets of paper which may be sucked up by the box, with the exception of the single sheet which is in direct contact with the bottom of the suction box.

With the above, and numerous other incidental objects in view, the invention consists of the devices and parts, or the equivalents thereof, as hereinafter more fully pointed out.

In the accompanying drawings, Figure 1 is a plan view of the complete apparatus; Fig. 2 is an elevation of one side, parts being broken away; Fig. 3 is an elevation of the opposite side; Fig. 4 is a longitudinal sectional view; Fig. 5 is a fragmentary view parts being broken away, showing the suction device in the position which it occupies about midway of its rearward travel, and also showing the valve which regulates the suction pipe in its open position; Fig. 6 is a view similar to Fig. 5, but showing the suction box at the limit of its rearward travel, and the valve which regulates the suction pipe in its closed position; Fig. 7 is a plan view of the suction mechanism, parts broken away; Fig. 8 is a cross section on the line 8—8 of Fig. 7; Fig. 9 is a view looking downwardly upon the forward roller and upon the air blowing mechanism; Fig. 10 is an end view of Fig. 9, parts in section; Fig. 11 is a vertical section on the line 11—11 of Fig. 9; Fig. 12 is a detail view of the mechanism for straightening a sheet of paper, parts being in section; Fig. 13 is a detail view looking downwardly on the mechanism for raising the paper supporting table; Fig. 14 is a sectional view on the line 14—14 of Fig. 4; Fig. 15 is a fragmentary view looking down on one corner of the paper raising table, and one corner of the box for said table, parts being broken away; Fig. 16 is an elevation of the devices for governing the tripper mechanism of the printing press; Fig. 17 is a vertical sectional view through Fig. 16; Fig. 18 is a view of the two cams which are on opposite ends of the main drive shaft, showing the initial or normal position of said cams when the machine is not in operation; and, Fig. 19 is a view of the inner of said cams.

Referring to the drawings, the numeral 20 indicates a portion of the framework, the forward portion 21 thereof being in the form of a four sided box to accommodate the sheets of paper, the said sheets being supported on a platform or table 22 which is intermittently movable within the box on four vertical screw rods 23 arranged at the four corners of the box. The lower end of each of the screw rods extends through the bottom of the box, and carries a beveled gear 24, and the upper end of each rod passes through a bearing 25 and has a nut 26 turned on to its upper end against the bearing. At each corner of the box are two vertical strips 27—27 (see particularly Figs. 14 and 15) and between these strips extends from each corner of the table a tongue 28. The screw rods pass through the tongues 28, and hence said screw rods offer no obstruction to the sheets of paper lying on the table; or in other words, the screw rods are so disposed as not to interfere with the paper lying squarely on the table.

Beneath the box are two horizontal shafts 29—29′. Each of these shafts carries two beveled gears 30 which respectively mesh with the beveled gears 24 on the vertical screw rods 23.

The main driving shaft of the mechanism is indicated by the numeral 31. This shaft extends transversely across the frame 20 and through opposite sides of said frame. This shaft may be rotated in any desirable manner, and I show in the drawings a pulley 32 mounted on one of the extended ends thereof, said pulley adapted to have a belt (not shown) pass therearound, the said belt leading from any suitable source of power. Also on each outwardly projecting end of the shaft there are two cam mechanisms, the

two cams on one end being duplicates of the two cams on the opposite end. The inner one of each of these cams is indicated by the numeral 33, and the outer one by the numeral 34. Each inner cam is provided with a depression or recess 35. Adapted to act in conjunction with each inner cam is a roller 36 which is carried by an arm 37, said arm being pivoted at its rear end to the side of the frame. Articulating with the end of each arm 37 is an upright arm 38. These upright arms are pivotally connected to horizontal levers 39—39, said levers in turn being pivoted to opposite sides of the forward portion of the frame. Normally, each roller 36 is seated in the bottom of each depression 35, as shown in Fig. 19. The driving shaft, it will be understood, is rotated clockwise, or, in other words, in a direction toward the forward end of the machine. When the shaft starts to rotate, what may be termed the rear inclined walls of the depressions 35 will be caused to rotate along the rollers 36 which will of course have the effect of causing an uplifting of the arms 37 and consequent up movement of the upright arms 38. As arms 38 are connected to the horizontal levers 39, said levers are necessarily turned on their pivots so that the rear ends thereof are elevated or raised. Levers 39 on their outer sides are provided longitudinally with guides 40—40, and in these guides bars 41—41 are adapted to travel back and forth. The bars in question are reciprocated or moved longitudinally by means of pitmen 42—42, the forward ends of said pitmen being connected to the upper ends of the long arms of bell crank levers 43—43. To the short arms of the bell crank levers are pivoted links 44—44, and to the upper ends of these links are pivoted the forward ends of medially pivoted levers 45—45. The rear ends of levers 45 carry rollers 46—46 which rollers act in conjunction with the outer cams 34. Coiled springs 47—47 are connected at their upper ends to the short arms of the bell crank levers 43, and at their lower ends to the framework, and serve the function of pulling down the short arms of the bell crank levers 43, and also pulling down the links 44 and the medially pivoted levers 45, after said parts have been raised, and the proper time has arrived for returning said parts to normal position.

The numeral 48 indicates a suction box which extends transversely across the rear framework and is provided at opposite ends with projecting lugs 49—49 which extend outwardly in depressions 50—50 in the sides of the framework, and have their outer ends bent downwardly and secured to the longitudinally movable bars 41 so as to be moved back and forth, as said bars are actuated. The rearward and forward movement of the bars 41 and consequently the suction box is effected entirely by the outer cams 34, while, as previously explained, the up and down movement of the suction box is effected entirely by the inner cams 33.

Just to the rear of the normal forward position of the suction box is a roller 51, preferably made up of a series of collars mounted on a shaft 52 and spaced a distance apart (as most clearly shown in Fig. 9). To the rear of roller 52 are two rollers 53—53 mounted one above the other and mounted, respectively, on shafts 54—54.

The forward single roller 51 is intended to be rotated clockwise, or, in other words, in a direction toward the forward end of the machine, while the lower or active roller of the two rollers 53 is intended to be rotated in a direction toward the rear end of the machine, or in other words, anti-clockwise. These reverse rotations of the two rollers mentioned may be accomplished in any desirable manner, but I show in the drawings a convenient system of gearing for accomplishing this, and which will now be described. On the main shaft 31 is a beveled gear 55 which meshes with another gear wheel 56 carried at the lower end of an inclined shaft 57. The upper end of this inclined shaft carries a beveled gear 58 which meshes with a beveled gear 59 on one end of the shaft 54 of the lower roller 53. On the opposite end of this lower shaft 54 is a toothed wheel 60, which is connected up to a toothed wheel 61 on one end of the shaft 52 of the forward roller 51, by means of a system of gearing 62, consisting of two intermediate intermeshing toothed wheels carried on stubs or short axles 63. In view of the fact that the main shaft 31 rotates in a direction toward the forward end of the machine, or, in other words, clockwise the gearing between it and the lower of the shafts 54 causes the latter shaft to rotate in a direction toward the rear end of the machine, or, in other words, anti-clockwise, while the train of gearing between said lower roller 54 and the shaft 52 of roller 51 causes the latter roller to rotate in a direction toward the forward end of the machine, or, in other words, clockwise.

The suction box 48 hereinbefore referred to is most clearly shown in Figs. 5, 6, 7 and 8 of the drawings. It is of box like form, with the rear end preferably on an incline (Figs. 5 and 6). This box is divided up into a series of chambers or compartments by means of partitions 64, the central compartment being of greater length than the compartments on opposite sides thereof. The central compartment is indicated by the numeral 65, and the other compartments by the numeral 66. The bottom of the box is provided with a series of openings 67, a plurality of said openings leading to each compartment. Each partition 64 at one point

is enlarged to form a circular and downwardly tapering valve chamber 68, provided at diametrically opposite points of its wall, and in the direction of the length of the suction box, with openings 69—69. Fitted in each of these valve-chambers is an upright tapering hand operated valve 70, provided with a horizontal port or passage 71. Whenever one of these valves is turned so as to bring its port or passage 71 into registration with the openings 69, communication is established between two of the compartments so as to make both effective for suction purposes and this can be carried out throughout the entire series of compartments.

The suction through the suction box is created by means of a suction pipe 72 which enters the top of the box, preferably at a central point thereof. In the lower end of this pipe is a plug 73 which is formed with a valve chamber 74, said chamber having vertical ports 75—75 leading therefrom, the lower of said ports communicating with the central chamber or compartment of the suction box, and the upper of said ports communicating with the main portion of the suction pipe. Within the valve chamber 74 is disposed a valve 76 having a passage 77 therethrough. When this valve is turned so as to bring its passage 77 into alinement with the ports 75, it will be obvious that a clear passage is afforded from the suction box through the pipe 72. The open position of the valve is shown in Fig. 5, and the closed position thereof in Fig. 6. Valve 76 has projecting therefrom a valve rod 78. It is preferred that the rod be operated automatically to open and close the valve, and for this purpose I provide on said rod, near its outer extremity, a projecting finger 79, and farther inward on the rod another projecting finger 80. The latter finger, when the suction box is at the limit of its forward movement, is acted upon by an inwardly extending arm 81, which has the effect of turning the valve rod in a direction to bring the valve to the open position shown in Fig. 5. When, however, the suction box in its travel reaches the limit of its rearward movement, the finger 79 contacts with a forwardly projecting arm 82, and causes a turning of the valve rod in a direction to effect the closing of the valve (see Fig. 6). The suction pipe 72 extends upwardly from the suction box, and then bends downwardly and communicates with the interior of a chamber 83 through the upper end of one side of said chamber. From another side of this chamber leads a pipe section 84 which extends to and communicates with any suitable source of suction means. Within the chamber is a piston 85 provided with a depending piston stem 86 which extends downwardly through the open bottom of the chamber, and is pivotally connected at its lower end to a lever 87; pivoted to the frame work said lever provided with an upper serrated edge which forms a means for adjustably suspending a weight 88. The other end of a lever 87 connects with the tripper mechanism of the printing press (not shown), and is adapted to operate said tripper mechanism.

If it is supposed that there is a sheet of paper beneath the suction box, the holes or openings in the bottom of the box are closed thereby. A strong suction is thereby created upwardly from this sheet of paper in order to hold it to the bottom of the suction box, said suction being from the suction box, through the pipe 72, through the upper portion of the chamber 83, and through the pipe 84 to the suction means. The suction necessarily creates a vacuum in the upper portion of the chamber 83, and the air pressure beneath the piston 85 causes said piston to be held in the upper portion of the chamber, as shown in Fig. 17. On the other hand, if the suction box through any cause fails to draw up a sheet of paper, the openings through the bottom of said box are necessarily free or left uncovered, and as a consequence there are uninterrupted currents of air through the bottom of the suction box, through the suction pipe, through the chamber 83, and through pipe 84 to the suction means. When this uninterrupted draft occurs the vacuum above the piston no longer exists, and the action of the weight 88 will cause the piston stem 86 to descend, and consequently cause a turning of the lever 87 on its pivot. This turning of the lever 87 causes an action on the tripper mechanism of the printing press so as to throw off the impression cylinder without stopping the rotation of the same as well as the rotation of the form cylinder. The result is that when the mechanism misses feeding a sheet of paper, the impression cylinder is prevented from being brought against the backing for the paper on the form cylinder, and hence an impression of the type on said backing is prevented. If this were not provided for, the type would come in contact with the backing at a time when said backing did not have a sheet of paper thereagainst, and would result in the next sheet of paper fed along by the mechanism being smeared or soiled on the under side thereof by the printers' ink impressed on the paper backing.

In the operation of the suction box, it is of course apt to suck up a plurality of sheets of paper from the table, when it is only desired that one sheet of paper be fed through the mechanism at a time. It is for this reason that I provide for the forward roller 51 rotating clockwise, or, in other words, in a direction toward the forward end of the machine. This rotation of said roller has the effect, when the suction box is caused to

travel over said roller, of forcing back all of the sheets of paper which adhere to the suction box, with the exception of the single sheet held directly in contact with the bottom of said box. As an additional precaution, however, I provide for a number of jets of air being directed against the sheets of paper adhering to the bottom of the suction box. For this purpose I provide a flexible pipe 89 leading from any suitable source of air supply, said pipe communicating at its upper end with a short nipple depending from a transverse pipe 90. Pipe 90 has a series of curved and flat nozzles 91 projecting therefrom, there being one of said nozzles for each space between two of the adjacent collars forming the roller 51. The upper ends of these nozzles bend or curve into the spaces, and the currents of air issuing therefrom strike the sheets of paper and are designed to loosen and separate from the suction box all of the sheets with the exception of the sheet lying directly against the bottom of the suction box, and which is held to the suction box as against the action of the blasts of air, by reason of the suction exerted.

There is a point of travel of the suction box when it is directly over and bears upon the roller 51 (see Fig. 5). It is therefore desirable that there should be a slight yield of said roller downwardly in order to relieve friction, or to obviate such a close engagement between the suction box and the roller as would prevent said roller in its rotation forwardly from pushing back any surplus sheets which may adhere to the bottom of the suction box. As provision is thus made for the roller 51 moving downward slightly, provision must also be made for a corresponding movement of the pipe 90 and its nozzles 91. This is secured by providing bearings for the shaft 52 in the form of arms 92 projecting from slide bars 93 on opposite sides of the framework, said bars 93 being movable vertically in guides 94. The opposite ends of the pipe 90 are also secured to the slide bars 93. The bars 93 have ears 94′ projecting therefrom and to these ears are pivoted levers 95, said levers being pivoted between their ends to the framework on pivot pins 96. Adjustably suspended from the ends of the levers beyond the pivots thereof are weights 97. The upper edges of the levers are preferably serrated so that the weights may be conveniently held in adjusted position. From this construction, it will be obvious that as the suction box bears down on the top of the roller 51 a very slight down movement or yield of said roller is provided for, by reason of the bars 93 moving downwardly slightly in their guideways. As the bars thus move downwardly, the inner ends of the levers 95 are carried in the same direction, while, by reason of the provision of the pivots 96, the outer ends of the levers move upwardly against the contrary force exerted by the weights 97. The moment pressure of the suction box against roller 51 is removed, the weights 97 necessarily turn the outer ends of levers 95 downwardly, and raise the inner ends of said levers, thereby raising bars 93 and consequently restoring both the roller 51 and the pipe 90, together with the nozzles 91 of said pipe, to their normal raised position.

The suction box acts to draw or suck up the paper upon the completion of its forward movement, the said box when it reaches the limit of its forward movement, moving downwardly in the depressions 50 of the frame, so that it is in close proximity to or bearing upon the uppermost sheet of the pile of paper on the table 22. It is, therefore, necessary that the table 22 have a vertical movement so that as the pile of paper is gradually reduced the table is gradually raised, whereby the limited down movement of the suction box will always bring it in close enough proximity to the top of the pile of paper as to permit the said box to suck up the paper. I have heretofore described the four screw rods 23 extending vertically in the box 21, and provided at their lower ends with the beveled gears 24 meshing with similar gears 30 on opposite ends of horizontal shafts 29—29. The screw rods run through nuts 98 which are rigid to the under sides of the four corner tongues 28 of the table. As the screw rods are turned by the intermeshing of the gears 24 and 30, it necessarily follows that the table must move vertically. However, it is also necessary that the two horizontal shafts 29—29′ should be rotated in order to convey rotation to the screw rods, and to secure this I project one end of one of the shafts 29 outwardly through the side of the frame, and mount on said extended end clutch mechanism consisting of the inner loose clutch member 99, and the outer clutch member 100, the latter being rotatable with the shaft but movable longitudinally thereon, as by being feathered thereto (see Fig. 1). The inner loose clutch member 99 is formed with a sprocket wheel 101 which is connected up to a sprocket wheel 102 on the main shaft 31 by means of a sprocket chain 103. The clutch member 99 is, however, continuously rotated but is normally loose on shaft 29. When, however, the feathered clutch member 100 is moved into engagement with said inner loose clutch member, the rotation of the latter is conveyed to the shaft 29. It is then necessary to transmit the rotation of this shaft 29 to the other shaft 29, and this is accomplished by mounting on the two shafts 29 sprocket wheels 104—104 connected by means of a sprocket chain 105. It is also important that the

movement of the table upwardly be intermittent, and it is for this reason that I provide the two clutch members referred to. I also provide means for automatically operating the feathered clutch member so as to throw it into engagement with the loose clutch member, and this mechanism consists of a vertical clutch operating rod 106 carried on the outer side of the box 21. The lower end of this rod is turned at an angle and forked, the arms of the fork being indicated by the numerals 107—107. These arms engage a groove 108 in the feathered clutch member. The clutch operating rod 106 is pivoted at its lower end on a pivot pin 109. It will be understood that the forked arms normally engage the groove of the feathered clutch so as to hold said clutch out of engagement with the loose clutch member (see Fig. 1). When, however, the clutch operating rod 106 is pushed downwardly and turned on its pivot, the forked arms are withdrawn from engagement with the groove 108, and coiled springs 110—110 then act on the feathered clutch member and force it inwardly into engagement with the loose clutch member. The clutch operating rod passes through a lug 111 projecting from the framework, and above the lug said arm carries a collar 112. Surrounding the rod between the lug and the collar is a coiled spring 113 which acts to return the rod to its normal position after having been depressed. The depressing of the rod 106 is intermittently accomplished by contact of the lever 37 with the upper end of said rod, which contact takes place every time the said lever turns downwardly on its pivot, and which occurs when the suction box is lowered.

For accurately spacing the suction box above the roller 51 the distance of the thickness of one sheet of paper, I provide screws 114 through the end ears on lugs 49 of the suction box for adjustably limiting the extent of the down movement of the suction box. The lower ends of said screws are adapted to contact with the top of the arms 92′ as clearly shown in Fig. 5. By turning these screws upwardly or downwardly the extent of the down movement or drop of the suction box upon reaching a position near the separating roller 51, can be readily limited.

In explanation of the operation of the mechanism thus far described, it will be stated that the main drive shaft is rotated clockwise, or, in other words, in a direction toward the forward end of the machine. This will cause the two sets of cams 33 and 34 to be carried around with the shaft in the same direction. At the very start of the operation, the suction box is at its farthest position forward, and is also extended downwardly in the depressions 50 to the limit permitted by the stop screws 114. Also at the start of the operation, the rollers 36 are in the depressions 35 of the cams 33, and the rollers 46 are bearing against the cams 34 at points slightly to the rear of the apex of the two inclined edges 115 and 116 of said cams 34. In the first operation of the cams, the rear walls of the depressions 35 of cams 33 act against the rollers 36 and thereby effect an uplifting of the levers 37, and through the links 38 a turning upwardly of the pivoted arms 39. This raises the suction box to the highest point of its up movement. Before the suction box started on its up movement it was resting on the top sheet of the pile of paper supported on the table 22. The suction from the source of suction supply and through the pipe 84, chamber 83, pipe 72 and the suction box necessarily caused said suction box, the moment it started upwardly, to carry therewith or suck up, one or more of the sheets of paper. The cams 34 on this initial movement are also turned so as to bring the rollers 46 from the initial point of contact, as shown in Fig. 18, that is, from the point where they were bearing against the portions of the edges 115 near the apex, to a position where they bear against the inclined edges 116 of the respective cams 34. After the cams 33 are turned sufficiently to bring the rollers out of the depressions 35, the rounded edges 117 of the cams 33 next engage the rollers 36. This, however, has no further uplifting effect on the arms 39 which control the uplifting of the suction box, and consequently there is no further up movement at this time of said suction box. While the curved edges 117 of cams 33 are bearing on rollers 36, the edges 116 of cams 34 are traveling over the rollers 46, and just before the rollers 36 leave the rounded edges 117 of cams 33, the inclined edges 116 acting on the rollers 46 start to force the suction box rearwardly by reason of the connection afforded by the levers 45, link 44, bell crank lever 43, pitmen 42 and bars 41, the ends of the suction box being connected to said bars as hereinbefore described. Just as this rearward travel of the suction box starts, the rounded edges 117 of the cams 33 leave the rollers 36, and said rollers descend slight inclines 118—118 onto other rounded edges 119—119 of said cams. This lowers the suction box until the screws 114 rest on top of the arms 92′ so that it will be just in the right position to pass over the top surface of the forward roller 51 and spaced the thickness of one sheet of paper above said roller. As the edges 116 still continue to act on rollers 46, the suction box continues to travel rearwardly until it lies squarely over roller 51. At this time, however, the edges 116 of cams 34 leave the rollers 44, and rounded edges 120—120 of

cams 34 act on said rollers 46. While these rounded edges are active, the suction box is held stationary over the roller 51, and this gives the blasts of air through the nozzles 91 full opportunity to act on the surplus sheets of paper adhering to the bottom of the suction box, and thereby separate said surplus sheets from the single sheet which is in direct contact with the bottom of said box, and which is held thereto by the suction action. This separating action is materially assisted by the particular direction of rotation of the rollers 51 toward the forward end of the machine, and which rotation of course acts to separate the surplus sheets and moves them back to a position to be further acted upon by the air blast. Before the rounded edges 120 leave the rollers 46, other short inclined edges 121—121 on the cams 33 act on rollers 36, and thereby act to elevate the suction box slightly, or to such an extent that it will easily clear the roller 51 on its continued movement rearwardly. Other rounded edges 122—122 act on the rollers 36, but said edges are so shaped as to effect no further raising of the suction box. Next, other short inclined edges 123—123 of cams 34 come into engagement with rollers 46, and act to move the suction box rearwardly to a point just slightly in advance of the two rollers 53—53. The short inclined edges 123—123 of the cams 34 now leave the rollers 46, and the inclined edges 115—115 are once more brought into engagement with rollers 46. The coiled springs 47 acting on the bell crank levers 40 and the links 44 cause a return forward movement of the suction box. The curved edges 122—122 of cams 33 next leave the rollers 36, and said rollers ride down what may be termed the forward inclined walls of the depressions 35, and consequently the suction box again lowers to its initial position.

In further explanation, it is to be stated that at the time the suction box completes its movement rearwardly, as previously explained, the sheet of paper carried by said suction box is brought to such position that its advancing edge is between the two rollers 53—53. At this time the finger 80 of valve rod 78 comes in contact with the forwardly projecting arm 82, and the valve 74 controlling the suction box is turned in a direction to shut off further flow of air through suction pipe 72, as per the position of said valve illustrated in Fig. 6. When the suction box completes its return forward movement, the projecting finger 79 of the valve rod 78 strikes the arm 81, and the valve 74 is again turned to an open position to permit suction to once more take place, as clearly shown in Fig. 5.

An important feature of my invention is the particular and specific arrangement of the suction box. It has been heretofore described that this box is divided into separate compartments or chambers by means of partitions 64, and that the central chamber is the longest chamber of the series. The length of this central chamber is about the average length of the sheet of paper to be fed to the printing press, and hence under ordinary conditions the valves 70 are closed so as to shut off communication between the different chambers, thereby permitting the suction to take place only through the central long chamber. If, however, sheets of greater length than the central chamber are to be fed to the press, then the valves 70 of the two chambers next adjacent to the central chamber are opened so as to allow for the suction also taking place not only through the central chamber, but also through said two other chambers. This may be carried out throughout any number of the chambers, depending upon the size of the sheets. If extremely long sheets are to be fed, that is, sheets as long, or approximately as long, as the suction box, all of the chambers are of course placed in communication with each other by opening all the valves 70.

The rear portion of the mechanism is mounted on a fra work which extends from the printing press, and is of any desirable form, consisting preferably of uprights 124, and the parallel side beams 125—125 supported by the uprights, the said beams for the greater portions of their lengths extending on a downward slant toward the printing press, and their forward ends which connect with the frame 20 being on a horizontal plane. The frame just described forms a support for the bed of the feeding table of the mechanism, which will now be described. Journaled in suitable bearings extending upwardly from the horizontal portions of the side beams are shafts 126—126, said shafts having rollers 127—127 fast thereon. Around these rollers run a series of endless belts 128 which are necessarily disposed in the direction of the length of the feeding table. The rear one of the rollers 126 is the actively rotated roller, the rotation thereof being secured by extending one of the ends of the shaft 126 of said roller and mounting on said extended end a beveled gear 129. This beveled gear meshes with a similar gear 130 on the rear end of a longitudinal shaft 131, said shaft being mounted in bearings 132—132 extending laterally from one of the side beams 125. The forward end of this longitudinal shaft also carries a beveled gear 133 which is in mesh with and derives its rotation from a beveled gear 134 mounted on shaft 54 of the lower of the rollers 53. It is obvious that when said shaft 54 is rotated, rotation is necessarily imparted to the rear roller 127 and

consequently the upper surfaces of the belts 128 are caused to move in a direction toward the printing press.

In advance of the longitudinal belts 128 a series of transverse slats 135 extend from one side beam 125 to the other. These slats are spaced a distance apart, and in the spaces between the slats are arranged transverse rollers 136. Corresponding ends of the shafts 137 of these rollers carry beveled pinions 138 which mesh with similar pinions 139 mounted on a longitudinal shaft 140, said shaft having its bearings in boxes 141 projecting laterally from one of the side beams. The forward end of this longitudinal shaft carries another beveled pinion 142 which meshes with the beveled pinion 129 on the end of the shaft 126 of the rear one of the rollers 127.

From the above described construction of the feeding table, it will be seen that after each sheet of paper passes between the rolls 53—53 it is taken up by the longitudinally arranged endless belts 128, and after being carried along by these belts each sheet passes on to the rollers 136, and is caused to travel over said rollers and finally into position to receive the impact of the impression cylinder of the printing press.

In the travel of the sheets of paper successively over the feeding table, if no means were provided to guard against it, the sheets might work into positions other than a straight alinement with the feeding table. To guard against this contingency I provide a mechanism which, in the event of the sheets being thrown out of straight alinement, will automatically cause said sheets to be straightened out, or to be so alined as to be properly fed to the printing press. Referring to this mechanism, the numeral 143 indicates a push rod, which is longitudinally movable in guides 144—144 projecting laterally from one of the side beams 125. On this push rod 143 is a collar 145, and encircling the push rod between said collar and the rear bearing 144 is a coiled spring 146. To the rear end of push rod 143 is pivoted a link 147. The rear end of this link is pivotally connected to the short arm of a bell crank lever 148. This short arm of the bell crank lever is provided with a series of perforations 149, and these perforations, in connection with a pivot pin, will enable the link to be connected to the bell crank lever at different points, so as to regulate the throw of said bell crank lever. The rear end of the long arm of the bell crank lever is pivotally connected to a slide 150 which extends inwardly into a recess 151 formed in one of the slats 135. A slot 152 extends downwardly from the top of this slat 135 and communicates with the recess 151. The slide 150 has a finger 153, which extends upwardly from said slide through the slot 152. The forward end of the push bar 143 is in line to be struck by one of the longitudinal movable bars 41, when said bar 41 reaches the limit of its rearward movement. This extreme rearward movement of said bar 41 occurs at the same time, of course, that the suction box reaches its extreme rearward movement. The contact referred to takes place at the time refered to, and the push rod 143 is pushed rearwardly. This movement of the push rod, through the intermediary of the link 147 causes a turning of the bell crank lever 148 on its pivot so as to throw the long arm of said bell crank lever inwardly, and consequently throw the slide 150 in the same direction. This will necessarily cause an in movement of the slide, and this in movement of the slide will carry with it the forwardly extending finger 153. The extent of the in movement of the slide is regulated by the particular point of connection between the short arm of the bell crank lever and the link 147, as regulated by the perforations 149. The in movement of the slide and finger is also so regulated as to be timed with the movement of the successive sheets of paper. The result is that if a sheet of paper in its movement along the feeding table in an inclined or diagonal position when it reaches the point where the slide is located, the upwardly extending finger 153 of said slide will act on one of the lateral edges of the sheet, and force said sheet into a straight position or alinement along the feeding table.

After each sheet of paper passes over the last or the rearmost roller 136 it will then be carried to such a point as to be in position to receive the impression of the impression cylinder of the printing press.

I desire it understood that wherever in the specification and claims the direction of rotation of the roller and the main shaft, or other rotatable parts, is described as being toward a particular end of the machine, I thereby intend to indicate that the upper surfaces of said rotatable parts move or rotate in the direction described.

What I claim as my invention is:

1. In pneumatic separators, a suction box having a flat bottom, and subdivided by a series of partitions into separate compartments or chambers, each compartment or chamber having a plurality of openings provided in the bottom of the box, and said partitions provided with valve-controlled openings, whereby when one or more of the valves are turned to an open position, the adjacent chambers are thrown into communication with each other, a suction pipe leading from one of the chambers and communicating with a suction creating means, and a valve adapted when adjusted to an open position to permit the suction means to create

a suction from the box and through the suction pipe, and, when closed, to shut off or stop the suction.

2. In pneumatic separators, a suction box subdivided by a series of partitions into separate compartments or chambers, the central chamber being of greater length than the other chambers, and the bottom of the box provided with openings leading to the different chambers, and said partitions provided with valve-controlled openings, whereby when one or more of the valves are turned to an open position the adjacent chambers are thrown into communication with each other, a suction pipe leading from the central long chamber and communicating with a suction creating means, and a valve adapted when adjusted to an open position to permit the suction means to create a suction from the box and through the suction pipe, and when closed, to shut off or stop the suction.

3. In pneumatic separators, the combination of a forwardly and backwardly reciprocating suction box provided with bottom openings, a suction pipe leading from the suction box, a chamber with which said suction pipe connects, a piston in said chamber, a connection between the piston and the tripper mechanism of the printing press, and adapted, when operated, to stop or check the impression cylinder of the printing press, a pipe section leading from the chamber and to a suction creating means, a valve for regulating the suction pipe which leads from the suction box, said valve adapted, when adjusted to an open position, to permit the suction means to create a suction from the box, through the suction pipe, through the chamber in the space above the piston of said chamber, and through the pipe section leading to the suction creating means, and said valve, when closed, adapted to shut off or stop the suction.

4. In pneumatic separators, the combination of a forwardly and backwardly reciprocating suction box provided with bottom openings, a suction pipe leading from the suction box, a chamber with which said suction pipe connects, a piston in said chamber, said piston having a piston stem extending therefrom, a pivoted lever having a pivotal connection with the lower end of the piston stem and also connected with the tripper mechanism of the printing press, and adapted, when operated to stop or check the impression cylinder of the printing press, a pipe section leading from the chamber and to a suction creating means, a valve for regulating the suction pipe which leads from the suction box, said valve adapted, when adjusted to an open position, to permit the suction means to create a suction from the box, through the suction pipe, through the chamber in the space above the piston of said chamber, and through the pipe section leading to the suction creating means, and said valve, when closed, adapted to shut off or stop the suction.

5. In pneumatic separators, the combination of a forwardly and backwardly reciprocating suction box provided with bottom openings, means for creating suction from said suction box, a rotatable roller located to the rear of the normal forward position of the suction box, and air blowing mechanism to the rear of the roller and constructed to direct blasts of air over the roller and toward the suction box, and thereby serve to separate or disengage surplus sheets of paper from the bottom of the suction box.

6. In pneumatic separators, the combination of a forwardly and backwardly reciprocating suction box provided with bottom openings, means for creating suction from said suction box, a roller located to the rear of the normal forward position of the suction box, means for rotating said roller in a direction toward the forward end of the machine, and air blowing mechanism to the rear of the roller and constructed to direct blasts of air from the roller and toward the suction box, and thereby serve to separate or disengage surplus sheets of paper from the bottom of the suction box.

7. In pneumatic separators, the combination of a forwardly and backwardly reciprocating suction box provided with bottom openings, means for creating a suction from said suction box, a rotatable roller located to the rear of the normal forward position of the suction box, said roller provided with a series of annular recesses, an air pipe provided with a series of nozzles projecting into the recesses of the roller, and means for supplying air to said air pipe.

8. In pneumatic separators, the combination of a forwardly and backwardly reciprocating suction box provided with bottom openings, means for creating a suction from said box, a roller located to the rear of the normal forward position of the suction box and over which roller the suction box in its rearward travel is adapted to move and bear against, means for rotating said roller in a direction toward the front end of the machine, and means constructed to permit an up and down yielding motion of the roller, the down movement thereof occurring when the suction box bears thereon, and the up movement occurring when the suction box in its travel clears the roller.

9. In pneumatic separators, the combination of a forwardly and backwardly reciprocating suction box provided with bottom openings, means for creating a suction from said suction box, a roller located to the rear of the normal forward position of the suction box, said roller provided with a

series of grooves, and over which roller the suction box in its rearward travel is adapted to move and bear against, means for rotating the roller in a direction toward the forward end of the machine, an air pipe provided with a series of nozzles projecting into the grooves of the rollers, means for supplying air to said pipe, and means for permitting a simultaneous vertical movement of the roller and the air pipe, a vertical down movement occurring when the suction box bears on the roller, and a vertical up movement occurring when the suction box in its travel clears said roller.

10. In pneumatic separators, the combination of a forwardly and backwardly reciprocating suction box provided with bottom openings, means for creating a suction from said box, a roller located to the rear of the normal forward position of the suction box, said roller provided with a series of annular grooves, and over which roller the suction box in its travel is adapted to move and bear against, means for rotating the roller in a direction toward the forward end of the machine, guide ways, slides vertically movable in said guide ways, said slides provided with projecting arms forming bearings for the ends of the shaft of the roller, a transverse air pipe connected to the slides and having a series of nozzles projecting therefrom and into the grooves of the roller, means for supplying air to said pipe, levers pivoted between their ends to the frame work and at their outer ends to the slides, and weights adjustably mounted on the free arms of the levers.

11. In pneumatic separators, the combination of a frame, a suction box adapted to travel back and forth thereon, a roller located to the rear of the normal forward position of the suction box, means for causing said roller to rotate in a direction toward the front end of the machine, a main shaft, cams on said main shaft, devices connected to the suction box and operated by the cams, the formation of the cams being such that when the main shaft is rotated toward the front end of the frame the suction box through the cam formation and said connections is first elevated, then caused to travel rearwardly, then lowered to a position over and in contact with the roller, then raised and caused to continue its travel rearwardly, and other mechanism acting in conjunction with the cams to cause a return travel of the suction box toward the front end of the frame, and to cause a final lowering of the suction box to its initial position.

12. In pneumatic separators, the combination of a frame, a suction box adapted to travel back and forth thereon, a roller located to the rear of the normal forward position of the suction box, means for causing said roller to rotate in a direction toward the front end of the machine, a blowing mechanism constructed to direct blasts of air over said roller and toward the suction box, a main shaft, cams on said main shaft, devices connected to the suction box and operated by the cams, the formation of the cams being such that when the main shaft is rotated toward the front end of the frame, the suction box through the cam formation and said connections is first elevated, then caused to travel rearwardly, then lowered to a position over and in contact with the roller, then momentarily held stationary, then raised and caused to continue its travel rearwardly, and other mechanism acting in conjunction with the cams to cause a return travel of the suction box toward the front end of the frame, and to cause a final lowering of the suction box to its initial position.

13. In pneumatic separators, the combination of a frame, a main drive shaft having its bearings in the frame, cams mounted on the shaft, means for rotating the shaft toward the forward end of the frame, a suction box having bottom openings, means for creating a suction from said box, a roller to the rear of the normal forward position of the suction box, bars to which the ends of the suction box are connected, pivoted levers provided with guides in which the bars are adapted to travel, links connected to the pivoted levers, other levers to which the links are connected, rollers carried by said latter levers and adapted to bear on two of the cams, links pivotally connected to the movable bars, bell-crank levers pivotally connected to the links, springs connected to the bell-crank levers and to the frame work, medially pivoted levers having link connections at their forward ends with the short arms of the bell-crank levers, and having their rear ends carrying rollers adapted to bear respectively on the other two cams, the formation of the cams in conjunction with the aforementioned connections between the suction box and the rollers, being such that said suction box is first elevated, then caused to travel rearwardly, then lowered to a position over and in contact with the roller, then raised and caused to continue its travel rearwardly, and finally caused to travel in a reverse direction toward the front end of the frame, and to finally drop to its lower initial position.

14. In pneumatic separators, the combination of a frame, a main drive shaft having its bearings in the frame, cams mounted on the shaft, means for rotating the shaft toward the forward end of the frame, a suction box having bottom openings, means for creating a suction from said box, a roller to the rear of the normal forward position of the suction box, means for causing said roller to rotate in a direction toward the for-

ward end of the machine, a blowing mechanism constructed to direct blasts of air over said roller and toward the suction box, bars to which the ends of the suction box are connected, pivoted levers provided with guides in which the bars are adapted to travel, links connected to the pivoted levers, other levers to which the links are connected, rollers carried by said other levers and adapted to bear respectively on two of the cams, links pivotally connected to the movable bars, bell-crank levers pivotally connected to the links, springs connected to the bell-crank levers and to the frame work, medially pivoted levers having link connections at their forward ends to the short arms of the bell-crank levers and having their rear ends carrying rollers adapted to bear respectively on the other two cams, the formation of the cams in conjunction with the system of connections aforementioned between the suction box and the rollers being such that said suction box is first elevated, then caused to travel rearwardly, then lowered to a position over and in contact with the roller, then momentarily held stationary, then raised and caused to continue its travel rearwardly, and finally caused to travel in a reverse direction toward the front end of the frame, and to finally drop to its lower initial position.

15. In pneumatic separators, the combination of a forwardly and backwardly reciprocating suction box provided with bottom openings, means for exhausting the air from said box, a roller located to the rear of the normal forward position of said suction box, and means for spacing the suction box from the roller the thickness of a sheet of paper.

16. In pneumatic separators, the combination of a forwardly and backwardly reciprocating suction box provided with bottom openings, means for exhausting the air from said box, a roller located to the rear of the normal forward position of said suction box, and adjusting screws for spacing the suction box from the roller the thickness of a sheet of paper.

In testimony whereof, I affix my signature, in presence of two witnesses.

FREDERICK A. BRENNER.

Witnesses:

ANNA F. SCHMIDTBAUER,

C. H. KEENEY.