

March 26, 1929.

C. E. CHRISTOPHEL

1,706,655

SHEET FEEDING DEVICE

Original Filed Aug. 14, 1924 7 Sheets-Sheet 1

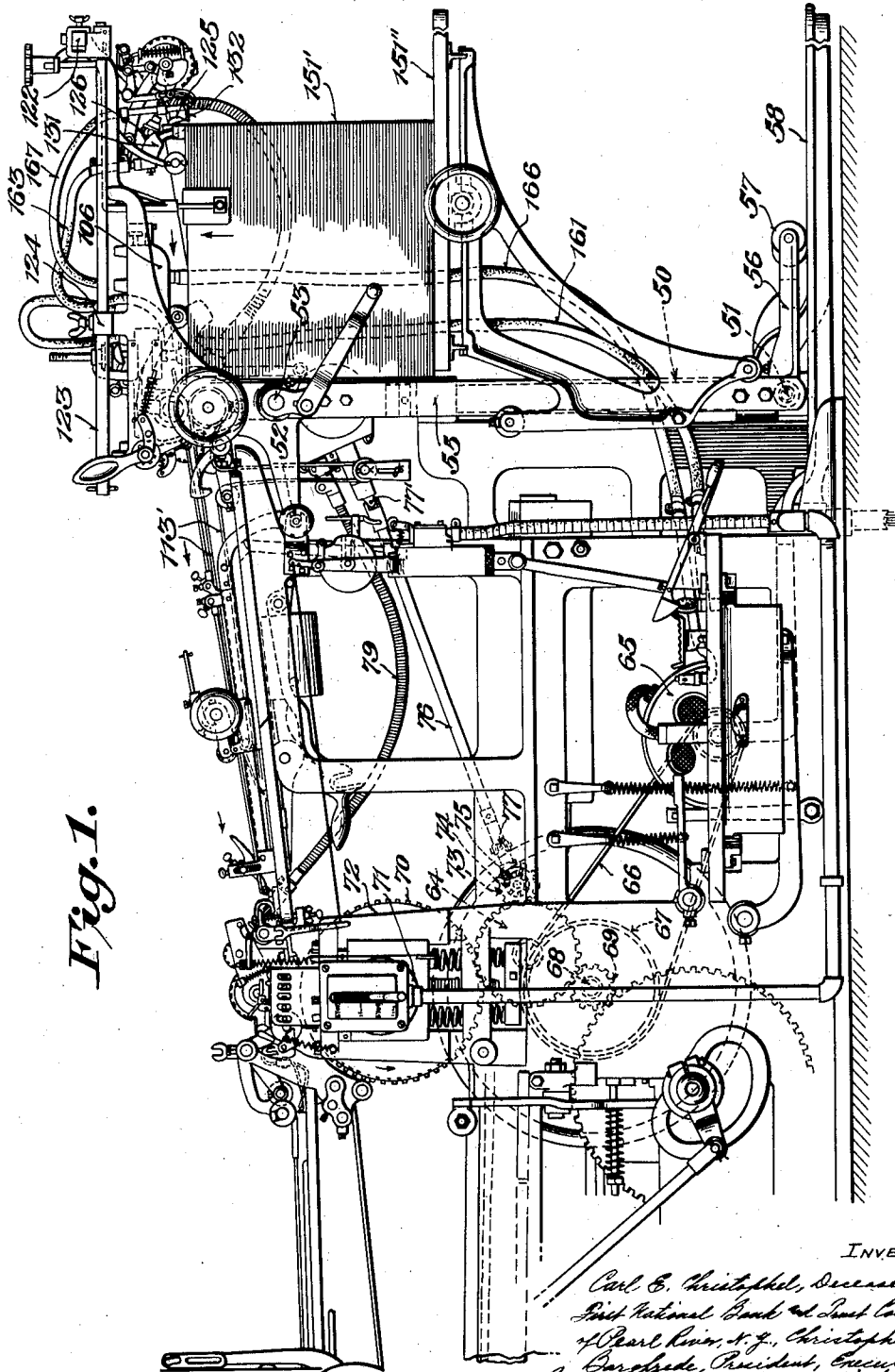


Fig. 1.

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SHEET FEEDING DEVICE

Original Filed Aug. 14, 1924

7 Sheets-Sheet 2

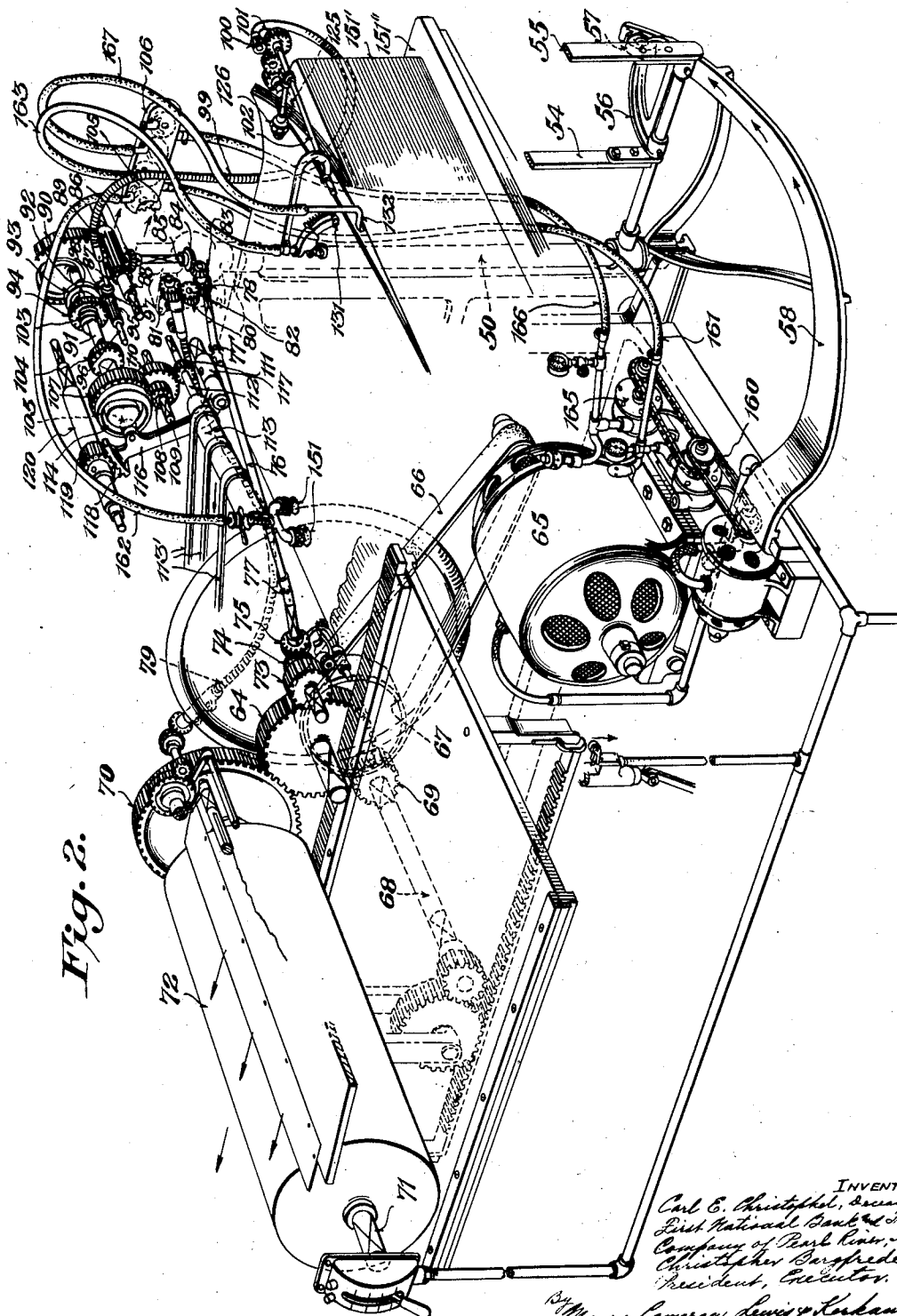


Fig. 2.

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SHEET FEEDING DEVICE

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7 Sheets-Sheet 3

Fig. 4.

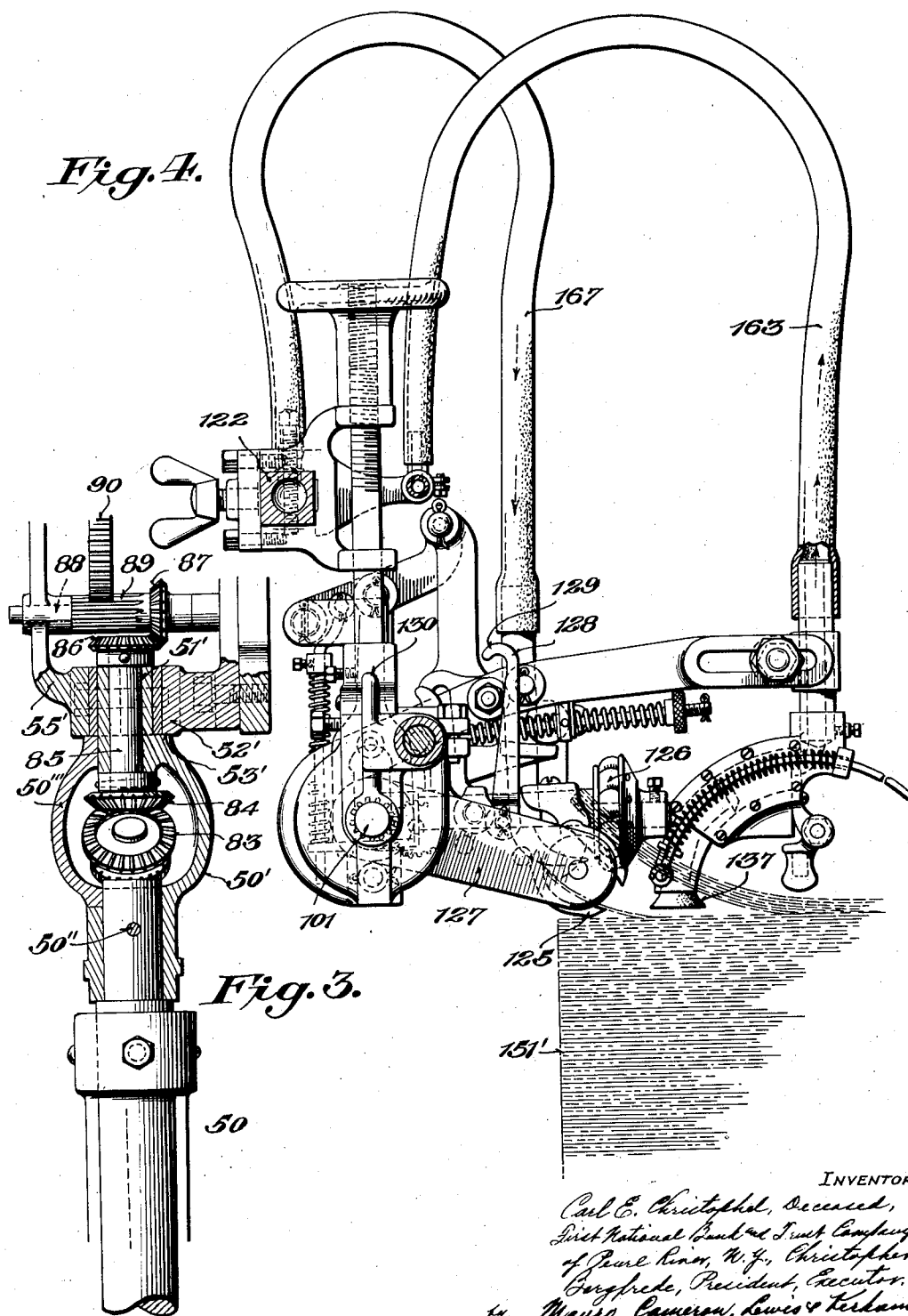


Fig. 3.

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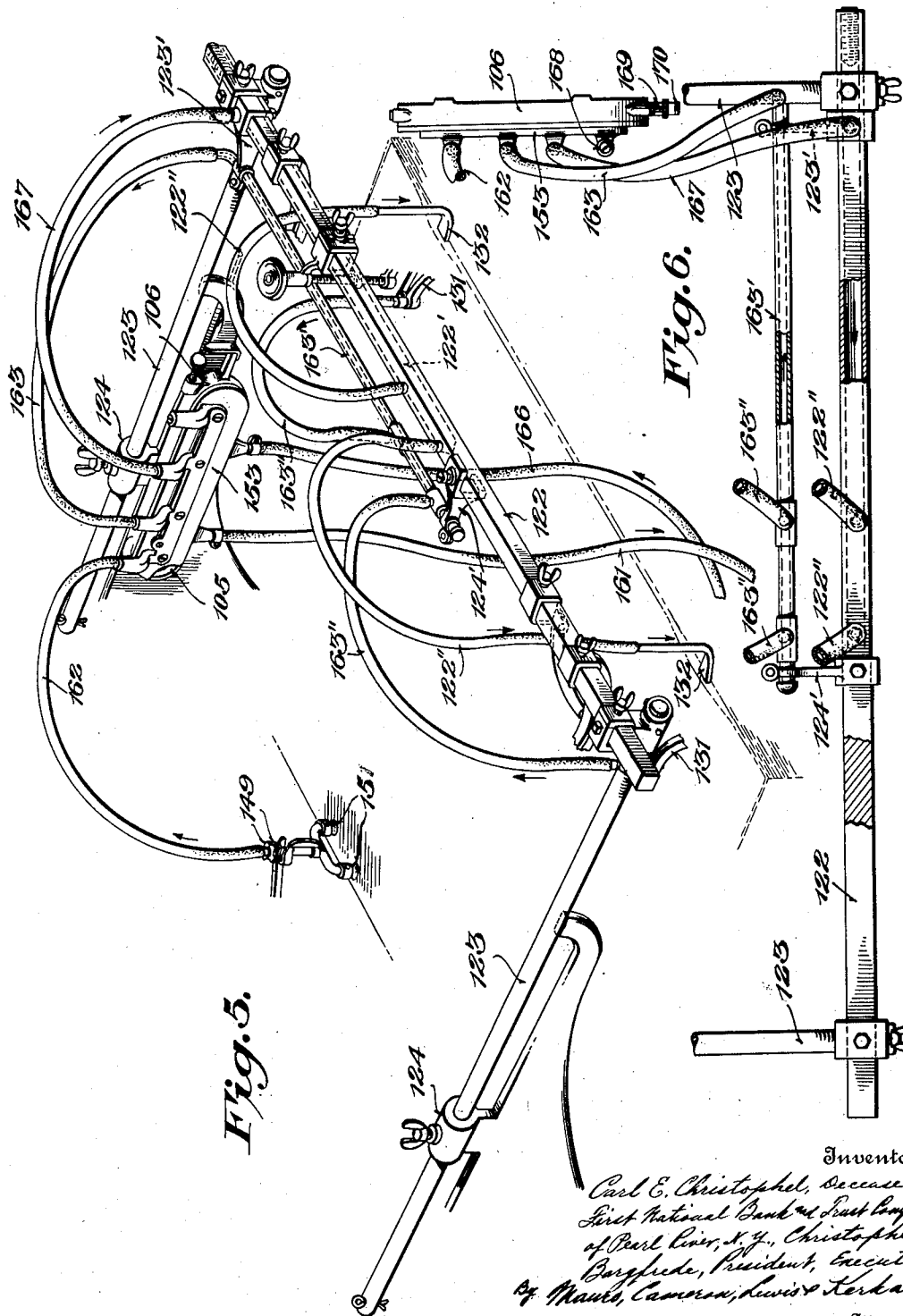
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SHEET FEEDING DEVICE

Original Filed Aug. 14, 1924

7 Sheets-Sheet 4



March 26, 1929.

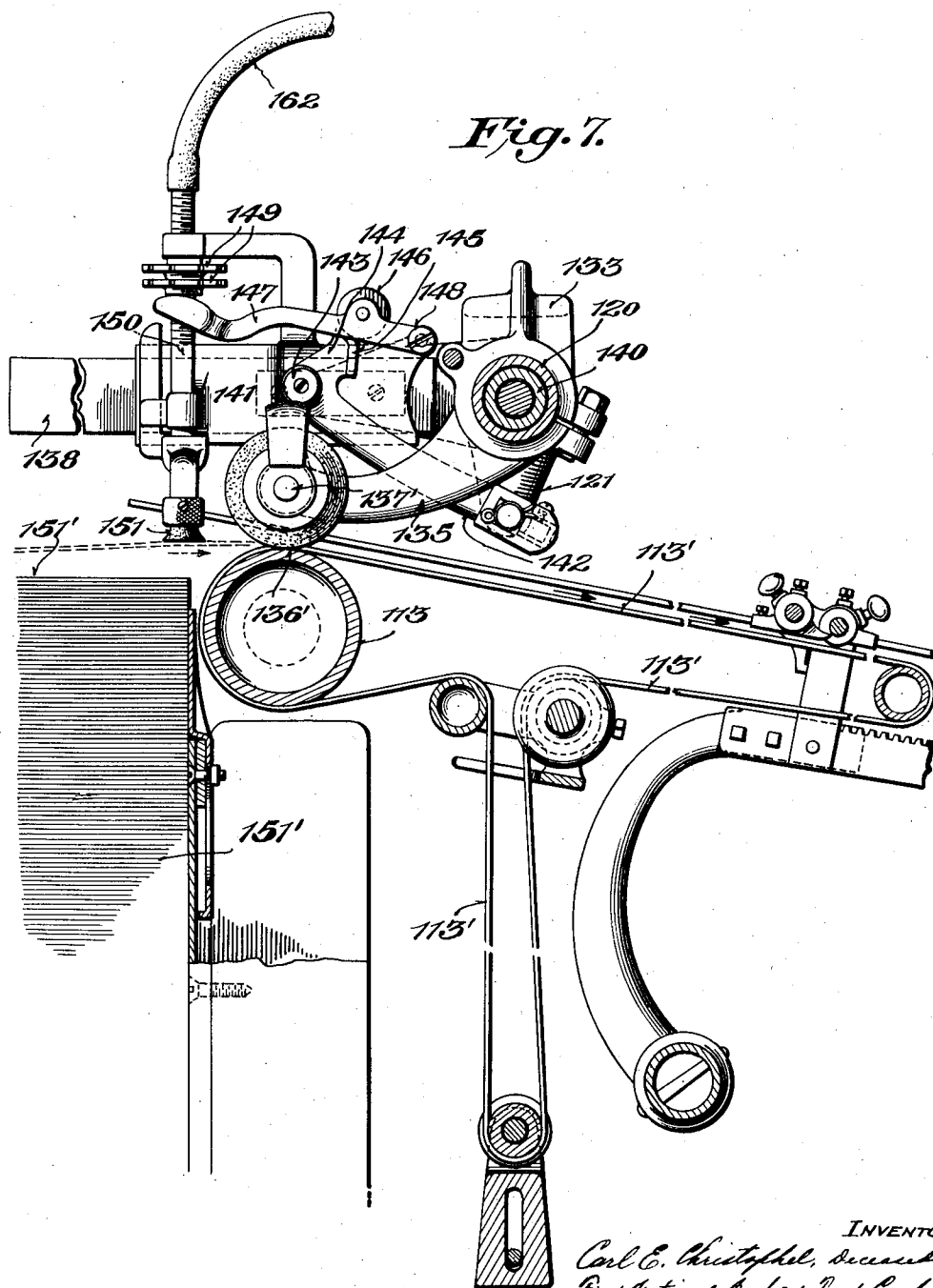
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1,706,655

SHEET FEEDING DEVICE

Original Filed Aug. 14, 1924

7 Sheets-Sheet 5



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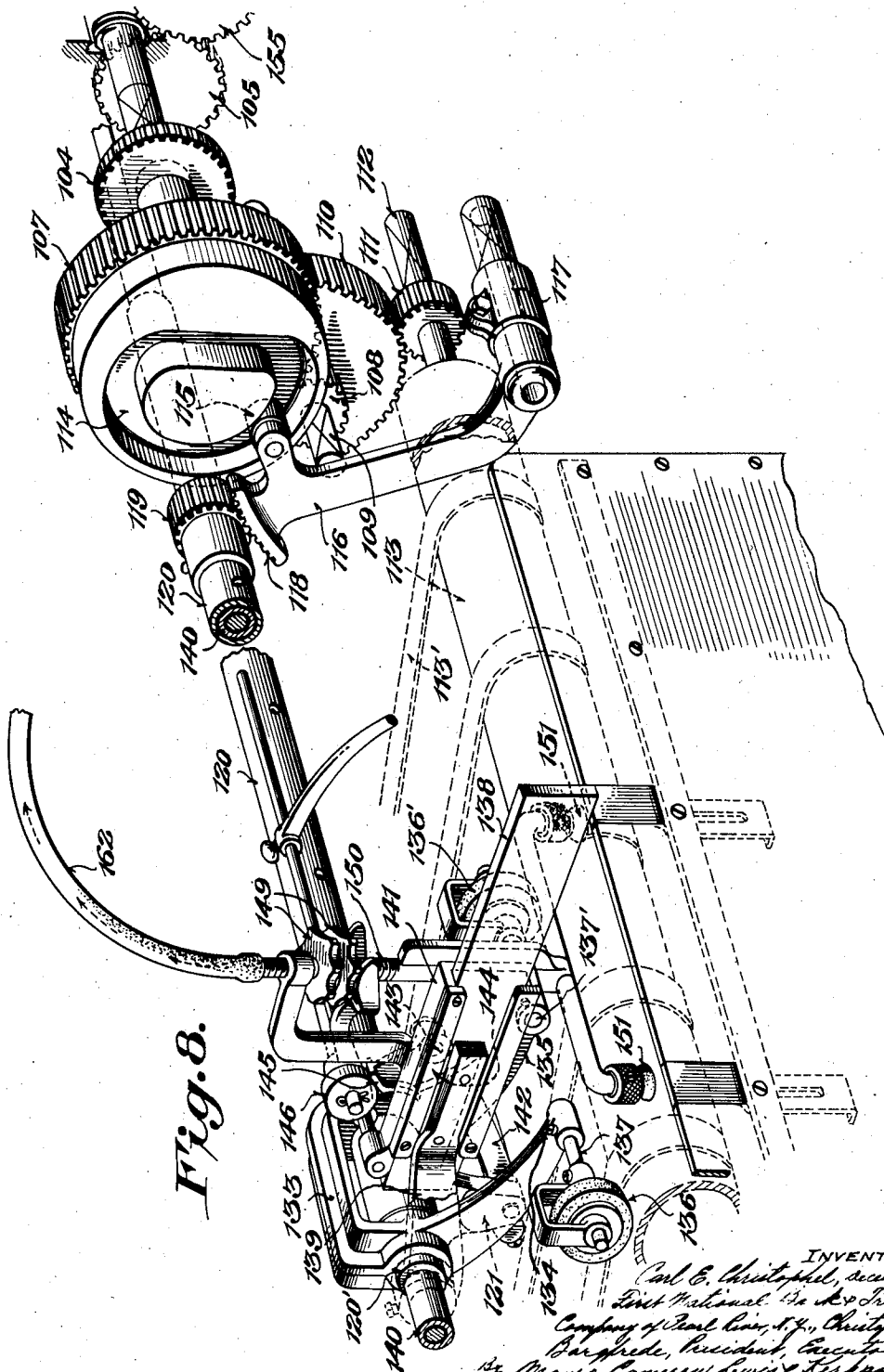
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SHEET FEEDING DEVICE

Original Filed Aug. 14, 1924

7 Sheets-Sheet 6



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March 26, 1929.

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1,706,655

SHEET FEEDING DEVICE

Original Filed Aug. 14, 1924

7 Sheets-Sheet 7

Fig. 9.

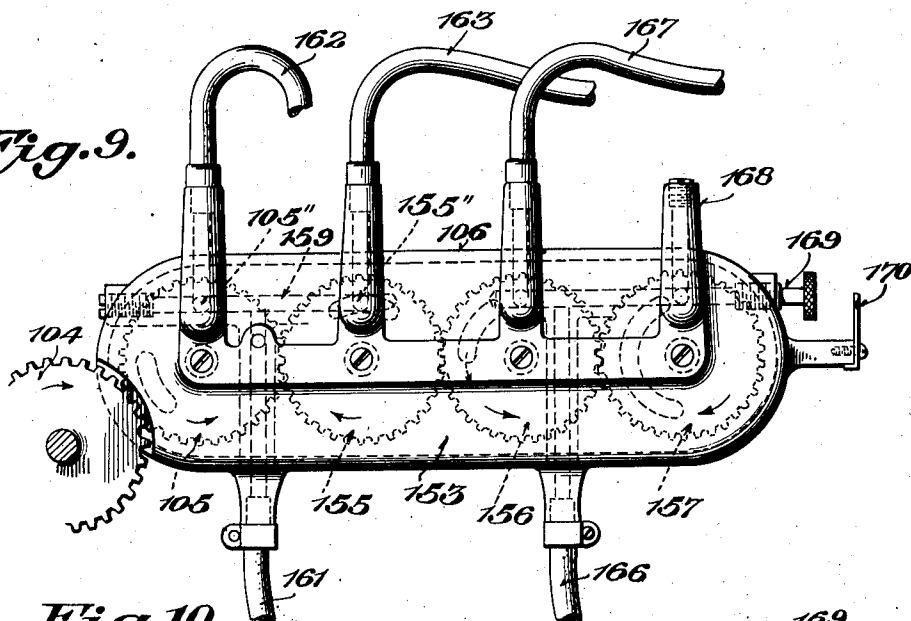


Fig. 10.

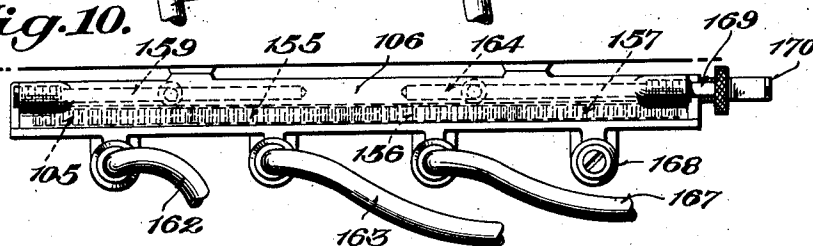
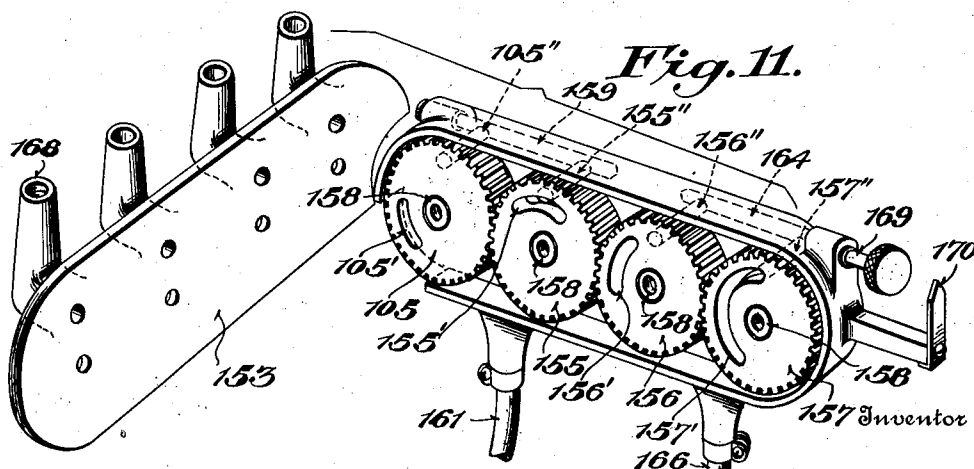


Fig. 11.



Carl E. Christophel, deceased,
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 Attorneys

UNITED STATES PATENT OFFICE.

CARL E. CHRISTOPHEL, DECEASED, LATE OF PEARL RIVER, NEW YORK, BY THE FIRST NATIONAL BANK AND TRUST COMPANY OF PEARL RIVER, NEW YORK, EXECUTOR; SAID CHRISTOPHEL ASSIGNOR TO DEXTER FOLDER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

SHEET-FEEDING DEVICE.

Original application filed August 14, 1924, Serial No. 732,046, and in Great Britain August 10, 1925. Divided and this application filed January 3, 1927. Serial No. 158,769.

The present invention is an improvement in feeders particularly adapted for use in association with printing presses, but adapted for use in any association where such a device is desirable.

The principal objects of this invention are to provide a feeder of simplified and durable construction which will rapidly and efficiently feed sheets of paper or other material to any desired instrumentality; which effectively separates the sheets and positively forwards them to the feed roller or other instrumentality to be fed; which eliminates the use of large and complicated devices for effecting the air and suction control of the sheet separating and forwarding mechanism; which employs a simplified and efficient air and suction control for the sheet separating and forwarding mechanism, that is "fool proof" and does not invite unnecessary adjustment; which includes a valve mechanism for controlling the air and suction, wherein there is preferably employed a plurality of valves rotated or driven from any suitable source and provided on their peripheries with gear teeth that intermesh and with ducts that register with ports in the valve casing; and which is an inexpensive and expeditious construction for separating and forwarding sheets to the devices to be fed.

This invention will be better understood by reference to the accompanying drawings illustrating one embodiment of the inventive idea, and wherein—

Fig. 1 is a side view of a printing press of the flat bed variety with which is associated a feeder embodying the present invention;

Fig. 2 is a perspective view with various parts omitted, illustrating the driving connections from the intermediate press gear to the front and rear ends of the feeder, and the means for supplying and controlling the air to the sheet separating and forwarding devices;

Fig. 3 is a detail showing the parts of the driving connections located at the pivot about which the feeder swings;

Fig. 4 is a side elevation of the sheet separating mechanism;

Figs. 5 and 6 are details of the air and suction connections to the sheet separating and forwarding mechanisms;

Fig. 7 is a side elevation, partly in section, of the sheet forwarding mechanism;

Fig. 8 is a perspective view of the forwarding mechanism and the means for operating the same;

Fig. 9 is an elevation of the air and suction control mechanism;

Fig. 10 is a plan view of the mechanism shown in Fig. 9; and

Fig. 11 is a perspective view showing the several valves and gears of the air and suction control mechanism, with the cover of the casing removed for purpose of clearer illustration.

Referring to the drawings, wherein like reference numerals indicate like parts throughout the several views, it is pointed out that the present application is a division of copending application, Serial No. 732,046, filed August 14, 1924, and that the invention is shown, for the purposes of illustration, in association with a printing press of the well known flat bed type. The mechanism is, however, adapted for various other uses and purposes.

Feeder mounting; Figs. 1, 2 and 3.

In the particular embodiment illustrated in the drawings, the feeder is mounted on a frame which is pivoted to one of the side frames of the printing press. This pivot is preferably in the form of a vertical stationary shaft 50, and the frame of the feeder comprises a plurality of transverse members 51, 52, 53 and 140, and vertical members 54 and 55, which latter are carried by the member 51 and connected to the member 53. The lowest transverse member 51 has a bracket 56 connected thereto in which is mounted a roller 57 that rides on a track 58 projecting from the rear frame of the press. The feeder is thus swung about the stationary vertical shaft 50 with little effort from its position in association with the press to a position as remote from the same as desired, so that easy access is had to the rear of the press for placing the forms on the bed of the press or for making corrections

and alterations to the form. The feeder frame is so constructed and arranged that it will stand at any desired place along the track to which it may be moved, and for this purpose, locking means may be provided for locking the feeder in association with the press when sheets are to be automatically fed from the pile to the impression cylinder. This locking means may be of any suitable construction, such as shown for example in copending application, Serial No. 732,046, above referred to.

Feeder drive; Figs. 1, 2 and 3.

The various parts of the sheet engaging, feeding, and control mechanism are preferably driven from the press or other device to be fed, and are always maintained in timed relation therewith, whether the feeder is in its feeding position with respect to the press, or whether it has been moved or swung away from the press, or whether the front end of the feeder board is raised or lowered. In the particular construction herein illustrated, the drive of the various parts of the feeder is effected from the intermediate gear 64 which is driven from any suitable source of power 65 by a belt 66, and a pulley 67 which is mounted on a shaft 68 carrying a pinion 69 that meshes with and drives the intermediate gear 64. This intermediate gear 64 meshes with and drives the cylinder gear 70 mounted on a shaft 71 on which the impression cylinder 72 is carried. The drive of the feeder is effected through a gear 73 that meshes with the intermediate gear 64. Gear 73 has compounded therewith a bevel gear 74 that meshes with a bevel gear 75 mounted on one end of a shaft 76 provided with two universal connections 77 and 77'. The other end of said shaft is provided with a gear 78 that drives the front end of the feeder through a Bowden wire 79 and gears 80 and 81, the gear 80 being an idler mounted on a stub shaft 82. Adjacent the gear 78 is a bevel gear 83 that meshes with a bevel gear 84 mounted on the lower end of a short vertical shaft 85 which projects through a gear casing 50' that is pinned to shaft 50 by a pin 50''. This gear casing 50' is provided with a suitable cover plate 50''' and also with an extended portion 51' (Fig. 3) that projects into a bracket 52' and which normally rests on a shoulder 53' on said casing. The bracket 52' is secured to the feeder frame, and bolted to the bracket 52' is a bracket 55' in which a short transverse shaft 88 and a cam shaft 91 have bearings.

The upper end of shaft 85 carries a miter gear 86 that meshes with a miter gear 87 mounted on the short transverse shaft 88. This shaft 88 carries an elongated pinion 89 with which meshes a large gear 90 mounted on the cam shaft 91 of the feeder. Shaft 91

has also mounted thereon a two-part clutch, one part 92 being keyed on the shaft 90 and the other part 93 being loose thereon, the gear 90 being compounded with the part 93. This clutch is adapted to be opened manually, or by the operation of calipering mechanism such as disclosed in copending application Serial No. 158,771, filed January 3, 1927. The drive of the mechanism at the rear end of the feeder is normally effected through the clutch 92, 93 by means of gear teeth 94 provided on the periphery of clutch part 92, which gear teeth mesh with an elongated pinion 95 mounted on a short stub shaft 96, with which pinion there is compounded a bevel gear 97 which meshes with a bevel gear 98 carried by one end of a Bowden wire 99. The other end of this Bowden wire carries a pinion 100 that meshes with a gear 101 carried by a shaft 102 on which is mounted the separator mechanism of the feeder, as hereinafter described.

The clutch member 92 is spring pressed toward the right by a spring 103 that tends normally to hold said member in clutched relation with its companion part 93. This spring encircles the cam shaft 91 and adjacent said spring and carried by the shaft 91 is a gear 104. This gear meshes with a gear 105 carried in a casing 106, which casing encloses the valves that control the distribution of air through the separator, forwarder and air blast, as hereinafter described. Adjacent gear 104 is a gear 107 that meshes with a pinion 108 carried by a stub shaft 109, which shaft also carries a gear 110 that meshes with a pinion 111 carried by a shaft 112. The shaft 112 carries a feed roller 113 around which the conveyor tapes 113' pass.

Compounded with gear 107 is an internal cam 114 in which engages a roller 115 carried by an arm 116 pivoted on a hollow bushing 117 carried by the frame of the machine. This arm is provided at its free end with a toothed sector 118 that meshes with a gear 119 mounted on a tube 120 to which is fixed a depending arm 121 through which is transmitted motion to the forwarding device, all as more fully hereinafter described.

It will therefore be seen that when the clutch 92, 93 is opened, either manually or automatically, all of the feeder mechanism including the separator, forwarder and the means for driving the air valves will be disconnected.

Sheet separating mechanism; Figs. 1, 2, 5 and 6.

The mechanism for separating successive sheets from the pile may be of any suitable or desired character so long as it will efficiently and surely separate the sheets in order that the same may be fed forward to the printing press or other instrumentality. It

is preferred, however, that the sheet separating mechanism disclosed in Patent No. 1,475,621, dated November 27, 1923, be employed. Dependent upon the size of the sheets to be fed, one or both of such mechanisms may be utilized. If two are employed they are preferably mounted one near each corner of the sheet pile, though, if desired, they may be moved closer together, as is preferably the case when cardboard is being fed. As here shown, the separating mechanism or mechanisms is or are mounted on a transverse rod or tube 122 which is carried by two longitudinally disposed rods 123, which rods are carried by the side frames of the feeder. These longitudinal rods may be adjusted lengthwise of the machine at 124, 124 so that the separating devices may be moved nearer to or farther away from the forwarding device.

As disclosed in said Patent No. 1,475,621 there is preferably employed a rotary platen 125 which is driven through suitable gearing from shaft 101. Cooperating with this rotary platen is the sheet straightening means in the form of a combing wheel 126 which is also suitably rotated. The gearing that drives the platen 125 from the shaft 101 is carried in a casing 127 to which one end of an arm 128 is connected. The other end of said arm is provided with a hook 129 that is adapted to be hooked over bracket 130 so that when desired, the platen 125 and the combing wheel 126 may be held in an elevated position out of operative engagement with the sheet pile. This is desirable when thicker cardboard is being fed or when the separation is being effected solely by means of the collapsible sucker 131. After the topmost sheet is separated from the pile, either by the action of the collapsible sucker 131, or by the cooperative action of the platen 125 and sheet straightening means 126, air is preferably introduced beneath the topmost sheet through the hollow foot clamp 132 to complete the separation of said topmost sheet.

Sheet forwarder; Figs. 7 and 8.

After the sheet is separated from the pile, it is seized along its forward edge by the forwarding device which moves the sheet from the pile onto the conveyor 113'. Preferably, there is employed a forwarder of the general type disclosed in application, Serial No. 599,359, filed November 6, 1922, wherein there is disclosed a suction mechanism which, by suitable connections, is lowered into engagement with the top sheet of the pile then elevated and then reciprocated along a track bar to deposit the sheet on the feed roller and associated conveyor. While in the present construction it is preferable to continue to employ the track bar and the suction mechanism that is lowered and

raised, there has been eliminated the drop rollers that are normally elevated and lowered into engagement with the sheet and has been substituted rollers that during the normal operation of the feeder rest upon and are rotated by the feed roller. These rollers have also been embodied as part of the forwarder construction. A housing 133 is loosely mounted on tube 120 and is provided with arms 134 and 135 in which are carried rollers 136 and 136' that rest upon and are rotated by the feed roller 113, said rollers 136 and 136' being adjustably mounted upon transverse pins 137 and 137' carried by said arms 134 and 135 respectively. The rollers 136 and 136' may be swung away from the feed roller 113 for the purpose of removing a sheet or for any other reason. A horizontal track 138 is carried by a bracket 139 keyed or otherwise secured on the transverse member 140 adjacent the end 120' of tube 120. This transverse member 140 preferably consists of a tube that is fixedly mounted in the side frames of the feeder and projects through the tube 120. The track 138 is preferably fixedly secured so that it has no vertical movement, though in some embodiments it may be found desirable to mount track 138 on the housing 133 so that it may move with the same.

A carriage 141 is reciprocated along track 138 through arm 121 which is fixedly secured to the tube 120 and positioned on said tube between arms 134 and 135. The lower end of said arm 121 is connected to the link 142, which latter is secured to said carriage at 143. An arm 144 integrally connected to the link 142 is provided with a cam surface 145 that engages a roller 146 carried by an arm 147 pivoted at 148 on the carriage 141. The free end of arm 147 engages adjusting nuts 149, 149 carried on a tube 150 that carries the sucker mouths 151, 151. Through the connections described it will be understood that as the tube 120 is oscillated back and forth from the cam 114 as heretofore described, the carriage 141 will be reciprocated along track 138 and simultaneously the sucker mouths 151, 151 will be elevated and depressed. The particular sequence of operation is that, after the sheet is separated, the sucker mouths 151, 151 are first lowered into engagement with the uppermost sheet, then elevated and raised, then the carriage is moved forwardly toward the feed roller 113, the sheet being introduced between said feed roller and the cooperating rollers 136 and 136'. Thereafter, the carriage is reciprocated back toward the sheet pile, the sucker mouths 151, 151 are then lowered into engagement with the top sheet of the pile, and the sequence of operations is repeated. The sheet pile, indicated at 151', is carried on the support 151'' of a pile elevating mechanism such as disclosed, for example,

in copending application, Serial No. 732,046, above referred to.

Air control for the sheet separator and sheet forwarder; Figs. 1, 2, and 4 to 11.

The topmost sheet of the pile is first seized by the suction member 131 of the separator, after which a blast of air passes through the foot clamp 132 to float the sheet, and thereafter suction is applied at the forwarder through suction mouths 151, 151 to move the sheet into engagement with the feed roller 113 and the conveyor 113' associated therewith. In reverse order, the suction at the separator 131 is first cut off, then the air through the foot clamp 132 is next cut off, and lastly the suction on the forwarder 151, 151.

It is highly important that the air control be effected by a simple and efficient mechanism in order that the rapid and accurate separation and forwarding of the sheets shall be effected and in order that the proper sequence of operations shall be maintained. Heretofore, the air controls have been for the most part cam operated, and these have been a prolific source of difficulty, inasmuch as adjustments of the timing were frequently made both by skilled and unskilled operators. The present air control is so arranged and enclosed as to discourage tampering and so adjusted at the factory as to require little, if any, attention in the subsequent operation of the feeder. In the present embodiment, a much simplified control has been provided in the form of a rotary valve mechanism, here shown as a plurality of valves which are provided on their peripheries with gear teeth, so that the various members are operated one from the other, and are always, during the operation of the device, in intermeshed relation, thus controlling, by fixed gearing, the proper sequence of operation and the proper and exact control of the air and suction to the various parts.

As herein shown, the casing 106 is mounted on the side frame of the machine adjacent the gear 104 carried by the cam shaft 91, which casing is adapted to be closed by a cover 153. This casing carries a plurality of rotary valve members 105, 155, 156 and 157. While four of such members are herein shown, a larger or smaller member may be employed if desired, said rotary valve members being mounted on transverse shafts 158, 158. The member 105, as heretofore stated, meshes with gear 104 on cam shaft 91 and is driven thereby, this member 105 in turn meshing with a driving member 155, which latter in turn drives the member 156, and so on. The member 105 is provided with a duct 105', member 155 with a duct 156', and member 157 with a duct 157'. The ducts

105' and 155' are adapted to register with orifices 105'' and 155'' respectively, and these two orifices in turn are connected with a channel 159 provided in the casing 106. This channel 159 is connected to a suction pump 160 through a tube 161 which connects with the lower end of the casing 106. As the members 105 and 155 rotate, bringing their ducts into register with the said orifices, suction will be applied through tube 162 to the forwarder 151, 151 and through tube 163 to the collapsible sucker 131 at the separator. The duct 156' in valve member 156 is adapted to register with orifice 156'' associated with channel 164 which is connected to a blower 165 through a tube 166. So long as the duct 156' is in register with the orifices 156'' the blast will pass through a tube 167 to the hollow foot clamp 132.

In Fig. 2 wherein there is shown only a single sheet separating mechanism 131 and 132, the connections 163 and 167 are shown as extending directly from the casing 106 to said devices 131 and 132. When, however, two separating mechanisms are employed, it is preferred to connect the suction tube 163 to a pipe 163' (Figs. 5 and 6) from which pipe are leads 163'', 163'', to the two collapsible suckers 131, 131. Also, it is preferred to connect the air tube 167 to bar 122 which is provided with a recess 122', from which recess extend leads 122'', 122'', to the hollow foot clamps 132, 132. The pipe 163' is carried by brackets 123', 124', that are carried by the hollow bar 122. The suckers 131 and the foot clamps 132, 132, are longitudinally adjustable along the bar 122.

An additional orifice 157'' is associated with the channel 164 and a blast would pass through the nipple 168 and through a suitable tube to any desired point where air might be required. A stem 169 is screw threaded into the end of casing 106 and operates to obturate the duct 157'' when the valve 157 is not in use. A stop 170 is provided to prevent the stem 169 from being screwed outwardly so far that it may become disconnected.

The size of the ducts in the several rotary valves and relative arrangements are determined by the particular sequence of operations that are to be performed. The valves may be removed from their shafts and replaced at any desired angular adjustment to insure that the suction and blast are being applied respectively at the proper time; and after this adjustment is once made it will be appreciated that the relation will be fixedly and accurately maintained by reason of the intermesh of the several rotary valve elements. As indicated above, one or more rotary valves may be employed. Further, the ducts might be provided in the casing and the ports in the rotary valve mechanism.

While one expression of the inventive idea has been heretofore described and illustrated, it is to be understood that the invention is not limited thereto, and that the invention may be embodied in various mechanical expressions within the limits of the appended claims.

What is claimed is:—

1. In a sheet feeding device, the combination of sheet engaging mechanism, a source of air and suction, air and suction connections to said mechanism, and a rotary valve mechanism controlling said connections.

2. In a device of the character described, sheet separating and forwarding mechanism, air and suction connections to said mechanism, and a plurality of rotary valves geared together controlling said connections.

3. In a device of the character described, a driven shaft, sheet engaging mechanism, air and suction connections to said mechanism, and a plurality of rotary valves geared together and driven from said shaft for controlling said connections.

4. In a device of the character described, sheet engaging mechanism, air and suction connections to said mechanism, and a plurality of intermeshing rotary valves controlling said connections.

5. In a device of the character described, sheet separating and forwarding mechanism, air and suction connections to said mechanism including a casing, a rotating valve mechanism mounted in said casing, one of said last named parts being provided with elongated ducts and the other with ports adapted to register with said ducts during a predetermined period.

6. In a device of the character described, sheet engaging mechanism, air and suction connections to said mechanism including a stationary casing provided with ports, a plurality of rotating valves mounted in said casing, each of which is provided with an elongated duct adapted to register with one of said ports during a predetermined period and each of which is adapted to be removed and angularly adjusted to vary the period of registration with its associated port.

7. In a device of the character described, the combination of a casing, sheet engaging mechanism, a source of suction and air pressure connected to said casing, connections between said casing and said mechanism, and a rotary valve mechanism mounted in said casing and controlling the suction and air through said connections to said mechanism.

8. In a device of the character described, the combination of a casing, sheet engaging mechanism, a source of suction and air connected to said casing, connections between said casing and said mechanism including a suction tube and an air tube, connections

between said casing and said tubes and connections between said tubes and said mechanism and valve mechanism mounted in said casing and controlling the suction and air through said connections to said mechanism.

9. In a device of the character described, the combination of a casing, sheet engaging mechanism, a source of suction and air connected to said casing, connections between said casing and said mechanism including a stationary suction tube and a stationary air tube, one of said tubes being carried by the other, connections between said casing and said tubes and connections between said tubes and said mechanism, and a valve mechanism mounted in said casing and controlling the suction and air through said connections to said mechanism, said mechanism being adjustable along one of said tubes.

10. In combination, sheet separating mechanism embodying a rotating member, a shaft, a train of gears connecting said shaft and member, a casing on which said gears and said member are carried and arranged to be moved manually therewith to an elevated inoperative position, and means for holding said casing and member in said elevated inoperative position.

11. In combination, sheet separating mechanism embodying a rotating member, a shaft, a train of gears connecting said shaft and member, a pivoted casing on which said gears and said member are carried and arranged to be swung manually therewith to an elevated inoperative position, and a hook carried by said casing and adapted to engage a fixed part of the separating mechanism to hold said casing and member in said inoperative position.

12. In a sheet feeding device, the combination of means operating on the sheets, a plurality of conduits connected with said means, and a plurality of rotary valves geared together and connected with said conduits.

13. In a sheet feeding device, the combination of means operating on the sheets and having a plurality of connections to be controlled, and a plurality of rotary valves geared together and controlling said connections.

14. In a sheet feeding device, the combination of sheet engaging means, a source of suction, suction connections between said source and said means, and a rotary multiple valve mechanism controlling said connections.

15. In a sheet feeding device, the combination of sheet separating means having a plurality of connections to be controlled, and a rotary, multiple valve mechanism for controlling said connections.

16. In a sheet feeding device, the combination of means operating on the sheets and

having a plurality of connections to be controlled, a source of suction, suction connections between said source and said means, and a plurality of rotary valves geared together and controlling said connections.

17. In a sheet feeding device, the combination of means operating on the sheets, an air pump and a suction pump, means connecting said pumps with the first named means and comprising an air conduit and a suction conduit, and a rotary, multiple valve

mechanism for controlling the suction and air in said conduits.

In testimony whereof said executor, by its president, has signed this specification.

FIRST NATIONAL BANK AND TRUST

COMPANY OF PEARL RIVER, NEW YORK,

Executor of the Estate of Carl E. Christophel, Deceased.

By CHRISTOPHER BARGFREDE,

President.