



No. 631,950.

Patented Aug. 29, 1899.

W. CARTER.

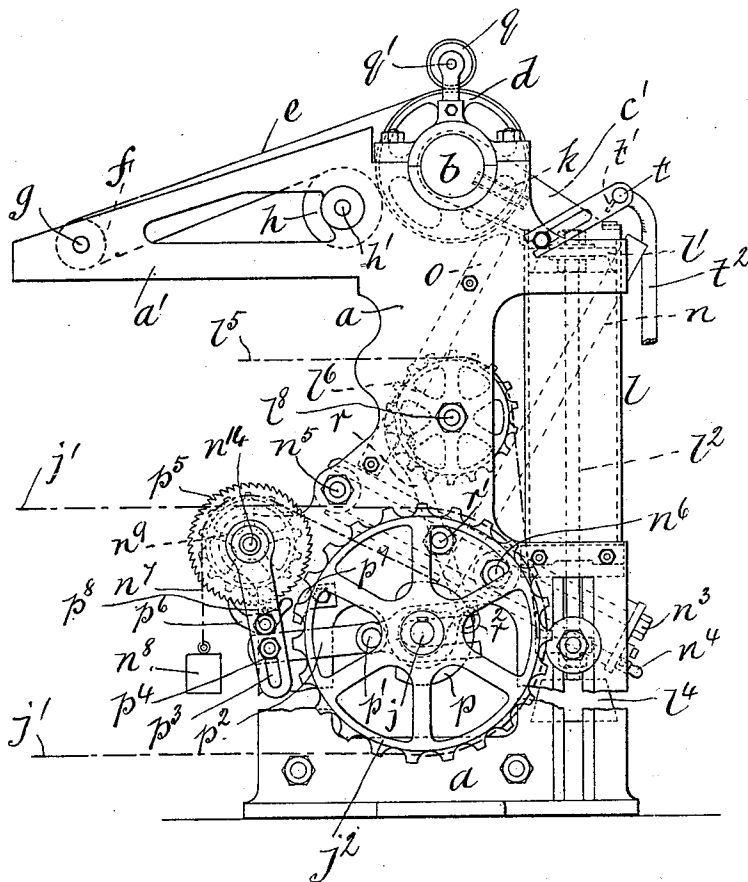
APPARATUS FOR FEEDING SHEETS OF PAPER TO PRINTING OR OTHER MACHINES.

(Application filed Jan. 5, 1899.)

(No Model.)

5 Sheets—Sheet 2.

Fig. 2.



WITNESSES:  
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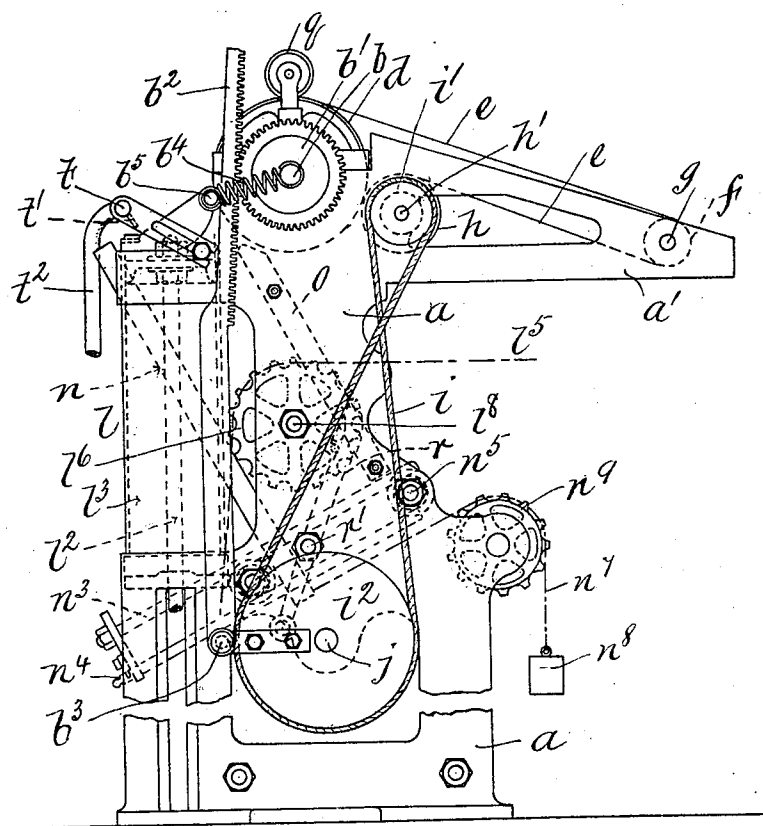
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(Application filed Jan. 5, 1899.)

(No Model.)

5 Sheets—Sheet 3.

Fig. 3.



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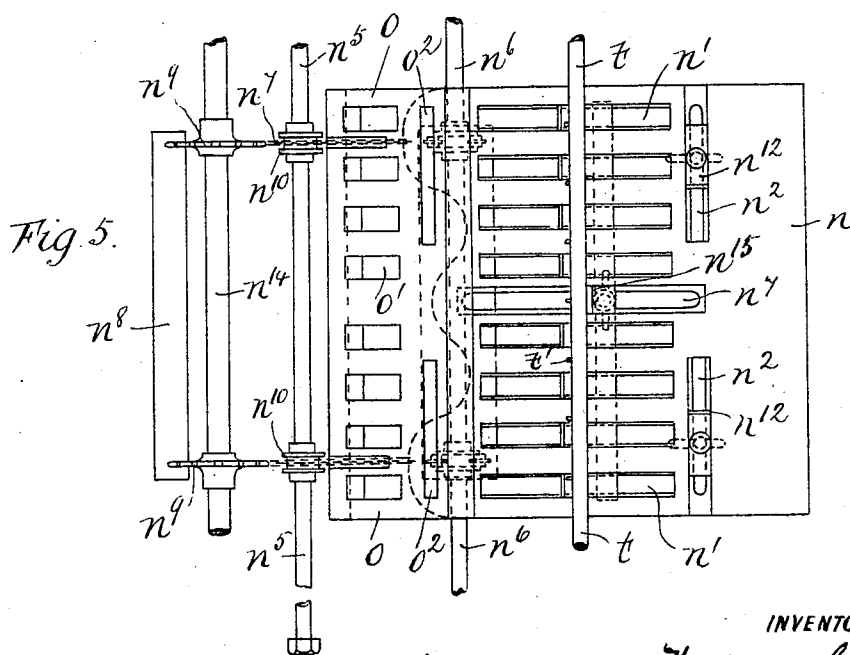
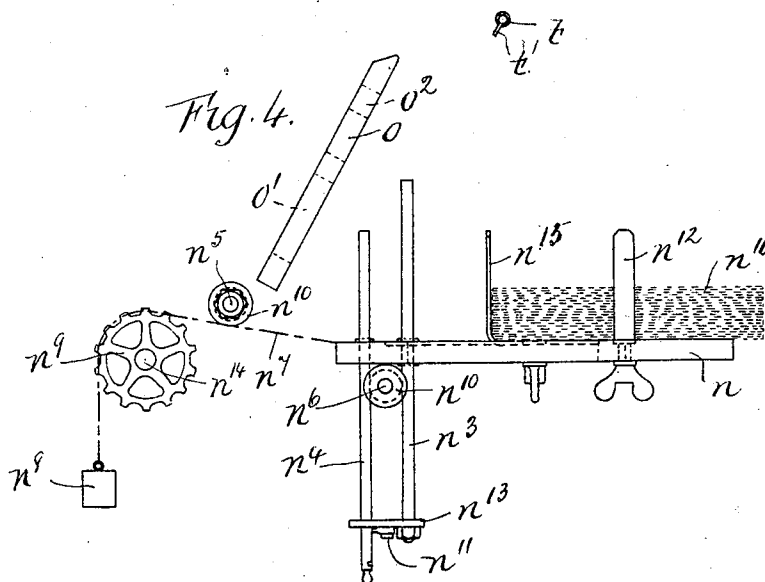
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APPARATUS FOR FEEDING SHEETS OF PAPER TO PRINTING OR OTHER MACHINES.

(Application filed Jan. 5, 1890.)

(No Model.)

**5 Sheets—Sheet 4.**



**WITNESSES:**

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APPARATUS FOR FEEDING SHEETS OF PAPER TO PRINTING OR OTHER MACHINES.

(Application filed Jan. 5, 1899.)

(No Model.)

5 Sheets—Sheet 5.

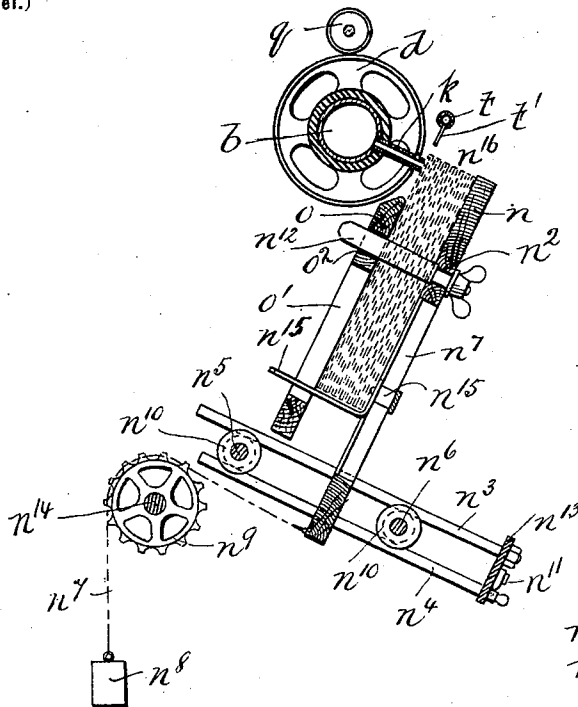


Fig. 6.

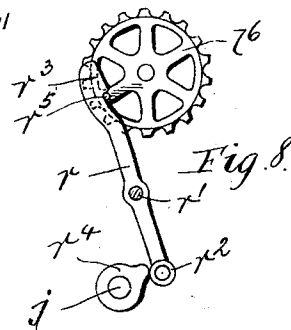


Fig. 8.

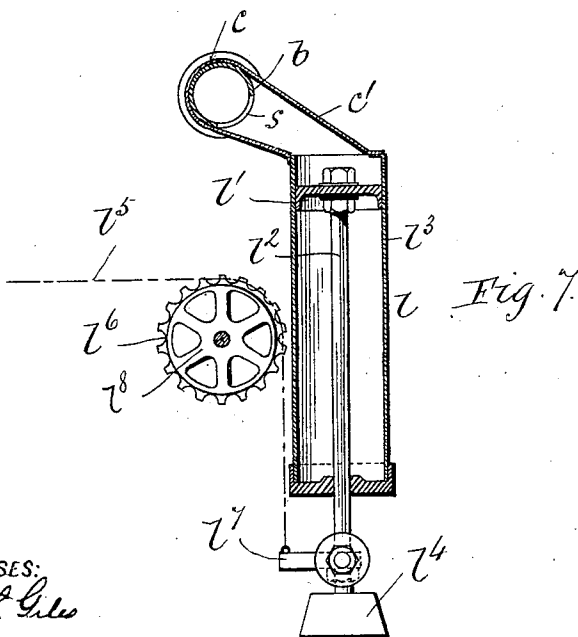


Fig. 7.

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# UNITED STATES PATENT OFFICE.

WILLIAM CARTER, OF GLASGOW, SCOTLAND.

APPARATUS FOR FEEDING SHEETS OF PAPER TO PRINTING OR OTHER MACHINES.

SPECIFICATION forming part of Letters Patent No. 631,950, dated August 29, 1899.

Application filed January 5, 1899. Serial No. 701,278. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM CARTER, lithographic printer, a subject of the Queen of Great Britain, residing at 62 Bothwell Circus, Glasgow, Scotland, have invented certain new and useful Improvements in Apparatus for Feeding Sheets of Paper to Printing or other Machines, (for which I have applied for a patent in England, No. 12,999, dated June 10, 1898,) of which the following is a specification.

This invention relates to an automatic feeder for printing and other machines to which sheets of paper require to be fed which is characterized, chiefly, by a movable holder which holds the sheets to be fed in an inclined position and automatically presents them at the proper times to a series of suction tentacles or nozzles in such a manner that said tentacles or nozzles can withdraw the sheets one at a time and deliver them, in the case of a printing-machine, by means of traveling tapes to the printing-cylinder.

The several features of novelty constituting the invention are pointed out in the claims.

In order that my said invention may be properly understood, I have hereunto appended, by way of illustration or example, five explanatory sheets of drawings which show the sheet-feeding mechanism constructed so that it can be readily fitted to, say, a Wharfedale printing-machine.

Figure 1 is a front elevation of the feeding mechanism. Fig. 2 is an elevation of one side of the mechanism. Fig. 3 is an elevation of the opposite side of the mechanism. Fig. 4 is a side view of the paper-holder when in the down or horizontal position. Fig. 5 is a view looking down on the mechanism, Fig. 4. Fig. 6 is a view of the paper-holder in the up or inclined position. Fig. 7 is a detail sectional view of one of the suction-pumps. Fig. 8 is a detail view of one of the levers *r* and its connections.

Referring to the drawings, whereon the same reference-letters wherever repeated indicate the same parts, the feeding mechanism consists of a frame *a*, which carries in bearings at its upper end a hollow rock-shaft *b*, which works at each end in a sleeve *c* and which is provided with a series of loose tape-pulleys *d*, on whose peripheries a series of endless tapes

*e* (one for each wheel) run. These endless tapes *e* pass from the wheels *d* downward to and around wheels *f*, carried on a cross-shaft *g*, mounted in the forward extensions *a'* of the frame, and from the wheels *f* they pass back over the rotating guide-wheels *h* on the shaft *h'* to the pulleys *d*. The shaft *h'* is rotated by means of a crossed driving-cord *i*, which passes around the grooved pulley *i'* on the shaft *h'* and the driver-pulley *i''* on the main shaft *j*. The shaft *b* is rocked by means of rack-and-pinion mechanism, consisting of the pinion *b'* at the right-hand end of the shaft, whose teeth mesh with the teeth of the rack *b''*, (see Fig. 3,) whose lower end is pivoted at *b'''* to a bar bolted to the wheel *i''*. The rack is maintained in engagement with the pinion *b'* by means of the spring *b''''*, whose one end is secured on the reduced extension of the shaft *b*, while its other end is attached to a pin *b'''''*, hinged to the frame *a* at the back of the rack.

There is arranged on the hollow rock-shaft *b*, between the pulleys *d*, a series of suction nozzles or tentacles *k* for lifting the paper sheets by suction one at a time from the sheet-holder and delivering them to the tapes *e*. These nozzles or tentacles may for rough or uneven paper be provided with rubber or other mouthpieces. The sleeves *c* at the ends of the rock-shaft communicate by downward extensions *c'* with two suction-pumps *l* of any suitable and well-known construction. The pistons *l'* of these pumps have (see Fig. 7) depending piston-rods *l''*, which pass downward through the bottoms of the cylinders *l'''*. Each piston-rod is weighted at its lower end, as shown at *l''''*. In Fig. 1 only one piston-rod is shown complete, the right-hand one being broken away to show more clearly the mechanism behind it. The weights *l''''* cause the down or suction stroke of the piston of each cylinder, and as the weights can be varied the load can be regulated so as to suit the suction desired. The upstroke of the pistons is caused by means of chains *l'''''*, running over chain-wheels *l''''''*, carried on studs *l'''''''* and connected to the traveling carriage (not shown) of the printing-machine. As will be seen by dotted lines at Fig. 2 and also at Fig. 7, the lower end of each chain *l'''''* is attached to an arm *l''''''* on the piston-rod *l''* of each pump.

The main shaft  $j$  is driven from the driving-shaft of the printing-machine by means of an endless chain  $j'$ , which passes around the chain-wheel  $j^2$ , keyed to the shaft  $j$ .

5 The sheet-holder consists of a board or frame  $n$ , (see also Figs. 4, 5, and 6,) having a number of longitudinal slots  $n'$  and two cross-slots  $n^2$  in it and which is adjustably secured by means of guide-bars  $n^3 n^4$  at each  
10 side to two cross-shafts  $n^5 n^6$ . The bars  $n^3 n^4$ , which rest in grooved pulleys  $n^{10}$  on the shafts  $n^5 n^6$ , are connected together at their lower ends by a cross-board  $n^{13}$ , which has on it two latches  $n^{11}$ , engaging with nicks on the bars  
15  $n^4$ . The holder has also a central longitudinal slot  $n^7$ , and it is counterweighted by means of a weight  $n^8$ , attached by chains  $n^7$  to the bottom of the holder in such a manner, as shown, that the holder is normally held in its  
20 inclined position, so as to present the sheets of paper to be printed properly to the tentacles  $k$ , and it can be released from this normal position by means of suitable mechanism, as hereinafter described. The chains  $n^7$   
25 pass over the chain-wheels  $n^9$  on the revolvable shaft  $n^{14}$ .

$n^{16}$ , Figs. 4 and 6, indicates the sheets of paper to be printed, while  $n^{12}$  are gages which are adjustable within the slots  $n^2$ , and  $n^{15}$  is  
30 a gage-fork which is adjustable within the slot  $n^7$ . Each gage has a clamping thumb-screw, as shown. By means of these gages the paper sheets can be adjusted and held in the proper position on the board or holder.  
35 When the board is in the inclined position, Figs. 1 and 6, the paper sheets rest edgewise upon the gage-fork  $n^{15}$ . Whenever it is desired to place the sheets of paper upon the holder, the latter can be brought into the  
40 horizontal position, Figs. 4 and 5, against the action of the counterweight  $n^8$  by merely lifting the latches  $n^{11}$  (see Figs. 1, 4, and 6) out of engagement with the nicks  $n^{12}$  at the lower ends of the bottom bars  $n^4$  and then pulling  
45 out these bars to such an extent as to enable their inner ends to clear the back cross-shaft  $n^5$ , whereupon the holder, with its guide-bars, can be turned upon the front cross-shaft  $n^6$  as upon a hinge and brought to the position  
50 shown at Figs. 4 and 5.

Fitted in connection with the holder  $n$  is a pinching-board  $o$ , which is bolted to the frame  $a$  in an inclined position corresponding to the inclined position of the holder. This board  
55  $o$  has longitudinal slots  $o'$ , (see Figs. 4, 5, and 6,) through which the gage-fork (or forks)  $n^{15}$  can pass freely, and also cross-slots  $o^2$ , through which the gages  $n^{12}$  can pass. It is necessary that at each downward movement of the suction  
60 nozzles or tentacles  $k$  and up to the time when said tentacles have taken a hold of the front sheet of paper the paper sheets should be held pressed against the pinching-board  $o$ , and this is done by means of the weight  $n^8$ ,  
65 which is sufficiently heavy to cause the holder to press the sheets of paper firmly against the pinching-board, and thereby compress or

pinch them. The result of this is that owing to the fact that the paper sheets project a few inches above the board  $o$ , as clearly shown at  
70 Fig. 6, the body only of the paper sheets is tightly pinched, while the upper ends of the sheets are free and, being free, open out slightly at their upper edges, thereby facilitating the removal of the sheets and lessening  
75 the likelihood of more than one sheet of paper being lifted at a time. It is also necessary when a sheet is just about to be removed by the suction-tentacles and during the action of removal that there should be no pinching  
80 pressure on the sheets, and this is accomplished by allowing the holder to recede slightly under the action of its own gravity at the proper time. This recession is allowed to take place once in each revolution of the  
85 main shaft  $j$  by means of a cam  $p$  on said shaft which acts upon a friction-roller  $p'$  on the lever  $p^2$ . One end of the lever  $p^2$  is forked, and the fork grasps with a sliding fit the shaft  $j$ , while its other end is adjustably  
90 secured by means of a slot-and-bolt arrangement  $p^3$  to the lower end of a lever  $p^4$ , whose upper end is secured on the shaft  $n^{14}$ . On this shaft is also keyed a ratchet-wheel  $p^5$ , with which a pawl  $p^6$ , pivotally secured to the  
95 lever  $p^4$ , can be made to engage, the pawl being normally held in engagement by a spring  $p^8$ . In conjunction with this mechanism there is a depending finger  $p^9$ , which is capable of disengaging the pawl  $p^6$  from the ratchet-  
100 wheel when the front arm of the pawl strikes against it. The finger  $p^9$  is bolted to the frame  $a$ . The arrangement is such that (the levers  $p^2$  and  $p^4$  being properly adjusted and connected together) each time a paper sheet  
105 is about to be lifted the cam  $p$  actuates the roller  $p'$  and lever  $p^2$ , so as to move the lever  $p^4$  and the pawl  $p^6$ , which is now in engagement with the ratchet-wheel, and thereby move the latter around a certain distance,  
110 thus relieving the weight from the chains and allowing the holder to move backward in its guide-bars  $n^3 n^4$  by gravity. The holder remains in this back position until the flattened face of the cam  $p$  bears against the  
115 roller  $p'$ , when the action of the weight at once rotates the chain-wheels  $n^9$  and pulls forward the holder, so as to again compress the sheets against the board ready for the next descent of the suction-tentacles. This  
120 action of the weight  $n^8$  and holder also compensates for each sheet withdrawn from the pile. At each upward movement of the tentacles a sheet is taken from the pile and delivered to the traveling tapes  $e$ , by means of  
125 which it is conducted to the printing-cylinder. The sheets retain their position in the holder by gravity. For the purpose of gripping the sheets as they are delivered by the suction-tentacles to the tapes small rubber-tired friction-wheels  $q$  on an overhead shaft  $q'$  are provided, as usual.  
130

It is necessary that the suction should not act gradually but as suddenly as possible

upon the paper sheet to be lifted and also with the maximum power or as near the maximum power as possible at the time the suction-tentacles come in contact with the sheet. To effect this, levers  $r$  are provided, said levers being fulcrumed upon the cross-shaft  $r'$ . There are two levers  $r$ , one at each side of the machine, and each lever at its lower end is provided with a friction-roller  $r^2$  and at its upper end with a catch  $r^3$ . (See detail view of the lever, Fig. 8.) Each chain-wheel  $l^6$  is provided with a lateral pin  $r^5$ , which can be engaged by the catch  $r^3$  of the lever  $r$  for the wheel. A cam  $r^4$  is made on each end of the shaft  $j$ , and these cams work against the rollers  $r^2$  and at the proper times actuate the levers, so as to free the catches  $r^3$  from engagement with the pins  $r^5$  of the chain-wheels  $l^6$ . With this arrangement when the carriage of the printing-machine is traveling forward (*i. e.*, away from the feeding mechanism) the wheels  $l^6$  are revolved so as to pull up the chains  $l^5$  and the piston-rods  $l^2$  of the suction-pumps. During this revolution of the wheels  $l^6$  their pins ride over the upper tapered ends of the catches  $r^3$ . When the carriage is on its backward movement, the weights of the piston-rods would actuate the chain-wheels, but they are prevented from doing so by the catches  $r^3$  until the proper time—*i. e.*, when sufficient slack chain has been given in advance of these wheels  $l^6$  by the continued backward movement of the carriage, at which time the cams  $r^4$  come into action and disengage the lever-catches  $r^3$  from the pins, whereupon the weights of the piston-rods are allowed to fall down by gravity, which they do suddenly, and thereby sharply actuate the pistons  $l^1$  of the pumps and produce a sudden suction at the mouths of the tentacles.

In order to sharply put on and cut off the suction from the pumps, the hollow rock-shaft  $b$  is, as shown at Fig. 7, made with a cut-out part at each end, where it works in the sleeves, so as to form ports  $s$ , which at each partial revolution communicate with the suction-cylinders. By having these ports in the ends of the hollow shaft said shaft as it turns practically acts as an automatic valve for opening and cutting off communication with the cylinders.

In order to move effectually separate the paper sheets in the holder from each other at their upper ends, so as to facilitate their removal one by one, a blowing device is used, which consists of a blowpipe  $t$ , held in adjustable brackets at each side of the frame. This pipe is provided with a series of nozzles  $t'$  at its under side, which are, as shown, directed downward, so as to deliver a series of air-jets against the upper edges of the paper sheets. The air-blast in this pipe  $t$  is created by means of a bellows (not shown) which may be of any ordinary and suitable construction, such as a concertina-bellows or the like, and be located under the machine and be com-

pressed and expanded at the proper times by means of a jointed lever or such like operated by the machine. The pipe  $t^2$  leads from the bellows to the blowpipe  $t$ . The bellows 70 is arranged so as to cause a blast upon the paper sheets just before and during the time each sheet is being lifted by the tentacles. The whole arrangement is such that at each downward movement of the tentacles  $k$  a sudden suction is produced in them, whereby the sheets in the holder are lifted one at a time and delivered at the succeeding upward movement of the tentacles to the endless bands  $e$ , by which they are carried to the printing-cylinder. 80

The parts of the apparatus may obviously be arranged so as to suit other classes of machines besides Wharfedale printing-machines. 85

Having now fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In mechanism for feeding paper sheets, the combination with the suction-cylinder, of an inclined sheet-holder arranged to hold the sheets tangential to said suction-cylinder and in contact therewith, a pinch-board coacting with said holder, means for causing the holder to compress the sheets against the pinch-board, and means for operating the holder to relieve the compression on the sheets at the time of operation of the suction-cylinder, substantially as described. 95

2. In mechanism for feeding paper sheets the combination of a frame, inclined guides fitted in the frame, an inclined sheet-holder carried by the guides, a suction device for removing the sheets from the holder, automatically-acting means for causing the holder to move forward upon the guides and present the sheets to the suction device and means for rendering said automatic means inoperative at certain times so that the holder can, at such times, automatically recede from the suction device, substantially as described. 110

3. In mechanism for feeding paper sheets the combination of a frame, inclined guides fitted in the frame, an inclined sheet-holder carried by the guides, a suction device for removing the sheets from the holder, chain and weight mechanism for causing the holder to move forward upon the guides and present the sheets to the suction device and means for slackening the chains at certain times in order that the holder may at such times automatically recede from the suction device, substantially as described. 120

4. In mechanism for feeding paper sheets the combination of a frame, inclined guides fitted in the frame, an inclined sheet-holder carried by the guides, a suction device for removing the sheets from the holder, chain and weight mechanism for causing the holder to move forward upon the guides and present the sheets to the suction device and ratchet mechanism operated by a rotating cam for 130



slackening the chains at certain times in order that the holder may, at such times, automatically recede from the suction device, substantially as described.

- 5 5. In mechanism for feeding paper sheets the combination of a frame, inclined guides fitted in the frame, an inclined sheet-holder carried by the guides, a suction-roller for removing the sheets from the holder, endless  
10 feeding-tapes passing around the suction-roller, automatically-acting means for causing the holder to move forward upon the guides and present the sheets to the suction-roller which latter catches the front sheet and  
15 delivers it direct onto the feeding-tapes and means for rendering the said automatically-acting means inoperative just when the sheet is about to be removed so that the holder can of its own weight slide backward upon the  
20 guides and withdraw the remainder of the sheets from the suction device, substantially as set forth.

6. In pneumatic mechanism for feeding paper sheets, the combination with the suction-cylinder, of an inclined sheet-holder arranged  
25 to hold the sheets tangential to said suction-cylinder, a pinch-board coacting with said holder, means for causing the holder to compress the sheets against the pinch-board, and  
30 means for operating the holder to relieve the compression on the sheets at the time of operation of the suction-cylinder, substantially as described.

7. In pneumatic mechanism for feeding paper sheets, the combination with the suction-cylinder, of an inclined sheet-holder arranged  
35 to hold the sheets tangential to said suction-cylinder, a pinch-board secured in the machine at the same angle of inclination as the sheet-holder and which is shorter than the  
40 sheet-holder, means for causing the holder to compress the sheets against the pinch-board with the exception of their upper ends which are free and which can consequently open  
45 out, and means for blowing upon the sheets when so opened out, substantially as described.

8. In pneumatic mechanism for feeding paper sheets, the combination with the suction-cylinder, of an inclined sheet-holder arranged  
50 to hold the sheets tangential to said suction-cylinder, a pinch-board secured in the machine at the same angle of inclination as the sheet-holder and which is shorter than the  
55 sheet-holder, means for causing the holder to compress the sheets against the pinch-board with the exception of their upper ends which are free and which can consequently open out and means for operating the holder so as  
60 to relieve the compression on the sheets at the time of operation of the suction-cylinder, substantially as set forth.

9. In mechanism for feeding paper sheets, the combination of a frame, a movable inclined sheet-holder fitted to the frame, means  
65 for moving the sheet-holder and means whereby the holder can be lowered down from the

inclined to the horizontal position, substantially as described.

10. In mechanism for feeding paper sheets  
70 the combination of a frame, an inclined sheet-holder fitted in the frame, inclined guide-bars carrying the holder, cross-shafts upon which the bars are fitted, and means for disengaging the bars from one of the shafts so that the  
75 holder may be turned down from the inclined to the horizontal position, substantially as described.

11. In mechanism for feeding paper sheets the combination of a frame, an inclined sheet-holder fitted in the frame, means for retaining  
80 the sheets on the holder in the inclined position and upon edge, suction means for withdrawing the sheets from the holder, pumps for producing the suction and pistons  
85 in the pumps which are actuated in one direction by chains attached to the traveling carriage of the machine and in the other direction by weights, substantially as set forth.

12. In mechanism for feeding paper sheets  
90 the combination of a frame, an inclined sheet-holder fitted in the frame, means for retaining the sheets on the holder in the inclined position and upon edge, suction means for withdrawing the sheets from the holder,  
95 pumps for producing the suction, pistons in the pumps which are actuated in one direction by chains attached to the traveling carriage of the machine and in the other direction by weights and means for insuring a sudden  
100 action of the weights, substantially as set forth.

13. In mechanism for feeding paper sheets the combination of a frame, an inclined sheet-holder fitted in the frame, means for retaining  
105 the sheets on the holder in the inclined position and upon edge, suction means consisting of a hollow rock-shaft provided with a series of nozzles for withdrawing the sheets from the holder, means for producing a suction  
110 in the hollow rock-shaft, means for regulating the suction produced, and means for operating the rock-shaft, substantially as set forth.

14. In mechanism for feeding paper sheets  
115 the combination of a frame, an inclined sheet-holder fitted in the frame, means for retaining the sheets on the holder in the inclined position and upon edge, suction means consisting of a hollow rock-shaft provided with  
120 a series of nozzles for withdrawing the sheets from the holder, means for producing a suction in the hollow rock-shaft consisting of two pumps arranged one at each side of the machine and actuated, alternately, in one  
125 direction by weights and in the other by the traveling carriage of the machine, means connecting the carriage with the pump piston-rods, and means for operating the rock-shaft, substantially as set forth.

15. In mechanism for feeding paper sheets  
130 the combination of a frame, an inclined sheet-holder fitted in the frame, means for retaining the sheets on the holder in the inclined

position and upon edge, suction means consisting of a hollow rock-shaft provided with a series of nozzles for withdrawing the sheets from the holder, means for producing a suction in the hollow rock-shaft, a pinion on the end of the rock-shaft, a rack gearing with the pinion, at its upper end and jointed, at its lower end, to a wheel on the main shaft of the machine, and a hinged pin-and-spring device for retaining the rack in gear with the pinion, and means for operating said main shaft, substantially as set forth.

16. In mechanism for feeding paper sheets the combination of a frame, an inclined sheet-holder fitted in the frame, means for retaining the sheets on the holder in the inclined position and upon edge, suction means consisting of a hollow rock-shaft provided with a series of nozzles for withdrawing the sheets from the holder, piston suction-pumps for producing a suction in the rock-shaft, ports in the rock-shaft sleeves on the rock-shaft, extensions connecting the sleeves with the pump-cylinders, piston-rods connected with the pistons of the pumps, adjustable weights on the piston-rods, arms on the piston-rods, chains connected to the arms and passing over chain-wheels to the traveling carriage of the printing or other machine to which the feeder is fitted, substantially as set forth.

17. In mechanism for feeding paper sheets the combination of a frame, an inclined sheet-holder fitted in the frame, means for retaining the sheets on the holder in the inclined position and upon edge, suction means consisting of a hollow rock-shaft provided with a series of nozzles for withdrawing the sheets from the holder, piston suction-pumps for producing a suction in the rock-shaft, ports in the rock-shaft sleeves on the rock-shaft, extensions connecting the sleeves with the pump-cylinders, piston-rods connected with the pistons of the pumps, adjustable weights on the piston-rods, arms on the piston-rods, chains connected to the arms and passing over chain-wheels to the traveling carriage of the printing or other machine to which the feeder is fitted, pins on the chain-wheels, levers  $r$  fulcrumed on a shaft  $r'$  and provided with catches  $r^3$  at one end and rollers  $r^2$  at the other end, cams  $r^4$  for operating the levers and means for operating the cams  $r^4$ , substantially as set forth.

18. In mechanism for feeding paper sheets the combination of a frame, an inclined sheet-holder fitted in the frame, means for retaining the sheets on the holder in the inclined position and upon edge, suction means consisting of a hollow rock-shaft provided with a series of nozzles for withdrawing the sheets from the holder, a series of pulleys on the rock-shaft, endless tapes passing over the pulleys and over pulleys on the frame of the machine, means for operating the tapes, means for producing a suction in the hollow rock-

shaft, and means for operating the rock-shaft, substantially as set forth.

19. The holder  $n$  made with a series of slots  $n'$ , a slot  $n^7$  cross-slots  $n^2$ , adjustable gages  $n^{12}$  fitted in the slots  $n^2$  and a fork-gage  $n^{15}$  fitted in the slot  $n^7$ , substantially as set forth.

20. The holder  $n$  made with a series of slots  $n'$ , a slot  $n^7$ , cross-slots  $n^2$ , adjustable gages  $n^{12}$  fitted in the slots  $n^2$ , a fork-gage  $n^{15}$  fitted in the slot  $n^7$ , a pinching-board combined with the holder and slots  $o'$   $o^2$ , in the pinching-board, substantially as set forth.

21. In combination, the holder, the guide-bars, and the supports upon which said guides are mounted to have a sliding and a rocking motion, substantially as described.

22. The combination of the holder  $n$ , the guide-bars  $n^3$ ,  $n^4$ , for the holder, shafts  $n^5$ ,  $n^6$ , for supporting the guide-bars, rollers  $n^{10}$  on these shafts, a board  $n^{13}$  connecting the guide-bars and means for locking the bars  $n^4$  to the board, substantially as set forth.

23. The combination of the holder  $n$ , the guide-bars  $n^3$ ,  $n^4$ , for the holder, shafts  $n^5$ ,  $n^6$ , for supporting the guide-bars, rollers  $n^{10}$  on these shafts, a board  $n^{13}$  connecting the guide-bars and latches  $n^{11}$  for locking the bars  $n^4$  to or disengaging them from the board  $n^{13}$ , substantially as set forth.

24. The combination of the holder  $n$ , the guide-bars  $n^3$ ,  $n^4$ , for the holder, supports for holding the guide-bars in an inclined position, a weight connected to the holder for the purpose of drawing it forward, and mechanism for checking the action of the weight when necessary, substantially as set forth.

25. The combination of the holder  $n$ , the guide-bars  $n^3$ ,  $n^4$  for the holder, supports for the guide-bars, chains connected to the holder and passing over chain-wheels, a cross-shaft carrying the chain-wheels, and a weight connected to the chains for the purpose of drawing the holder forward, substantially as described.

26. The combination of the holder  $n$ , the guide-bars  $n^3$ ,  $n^4$ , for the holder supports for holding the guide-bars in an inclined position, a weight connected to the holder by chains, chain-wheels over which the chains pass, a shaft carrying the chain-wheels, a ratchet-wheel on the shaft, a lever  $p^4$  on the shaft, a pawl  $p^6$  on the lever, a spring  $p^8$  forcing the pawl into engagement with said ratchet-wheel, the finger  $p^9$ , a lever  $p^2$  jointed to the lever  $p^4$ , a roller  $p'$  on the lever  $p^2$ , a cam  $p$  which acts on the roller, and means for operating the cam, substantially as set forth.

Signed at Glasgow, in the county of Glasgow, Scotland, this 16th day of December, 1898.

WILLIAM CARTER.

Witnesses:

H. D. FITZPATRICK,  
THOMAS GRACE.