(No Model.) 8 Sheets—Sheet 1.

E. T. CLEATHERO.

PAPER FEEDING MACHINE.

No. 570,000. Patented Oct. 27, 1896.

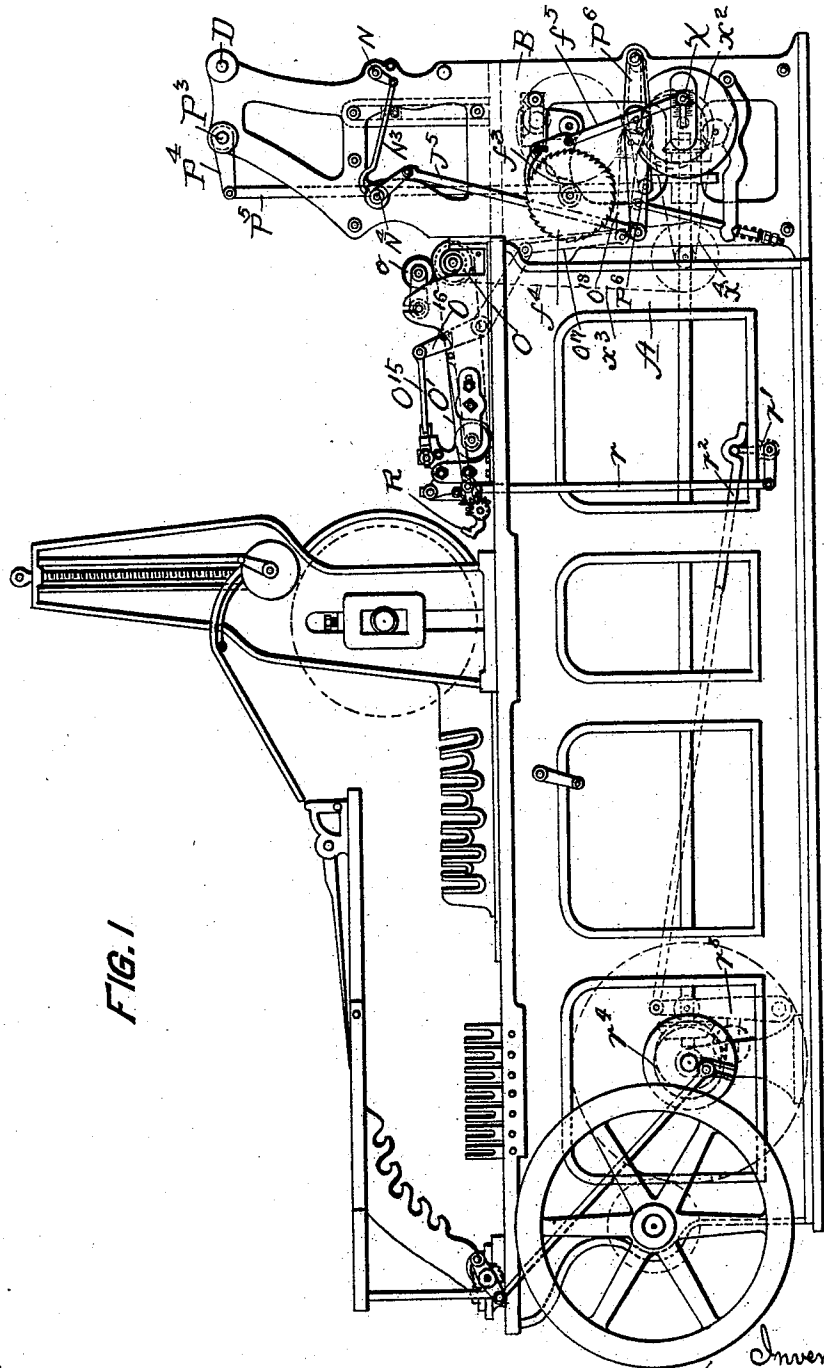

FIG. 1

Witnesses
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(No Model.) 8 Sheets—Sheet 2.

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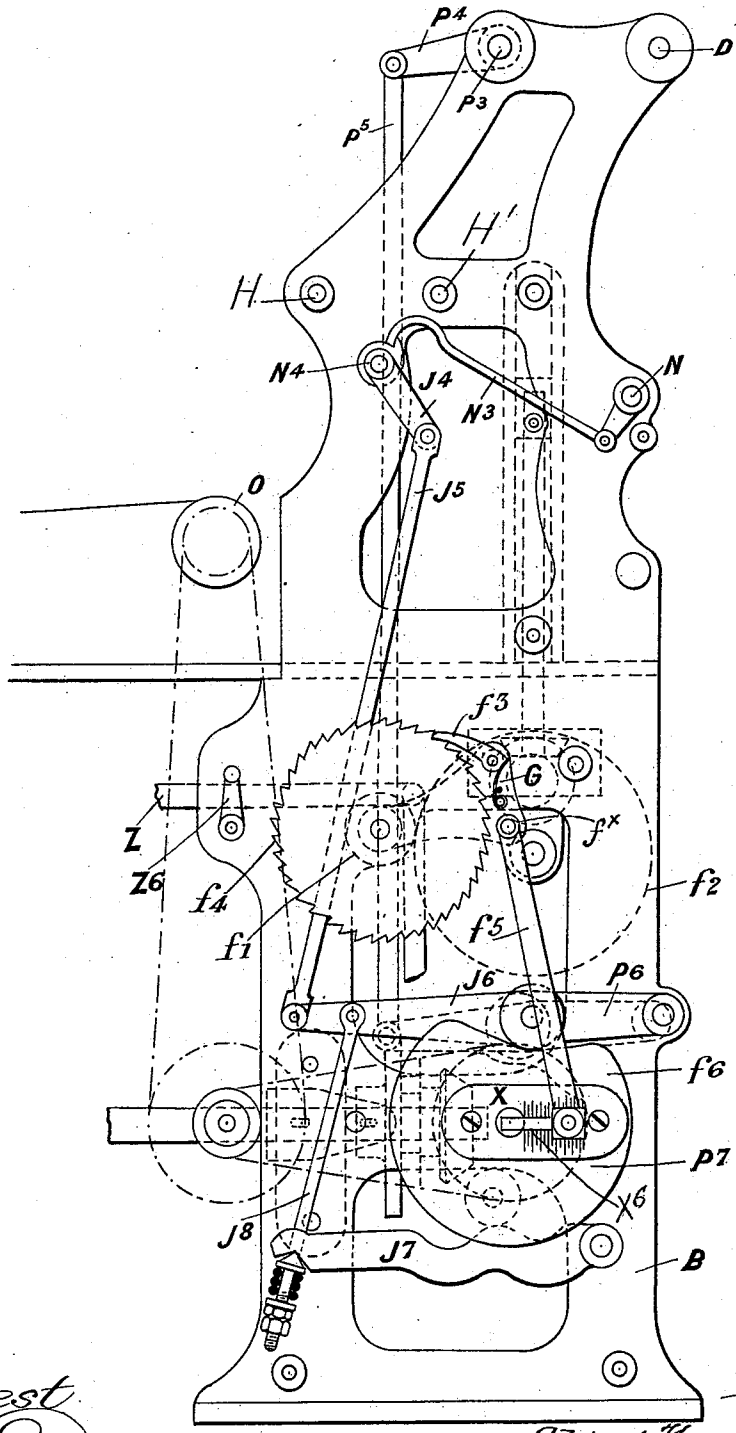

FIG. 2.

Attest
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(No Model.) 8 Sheets—Sheet 3.

E. T. CLEATHERO.

PAPER FEEDING MACHINE.

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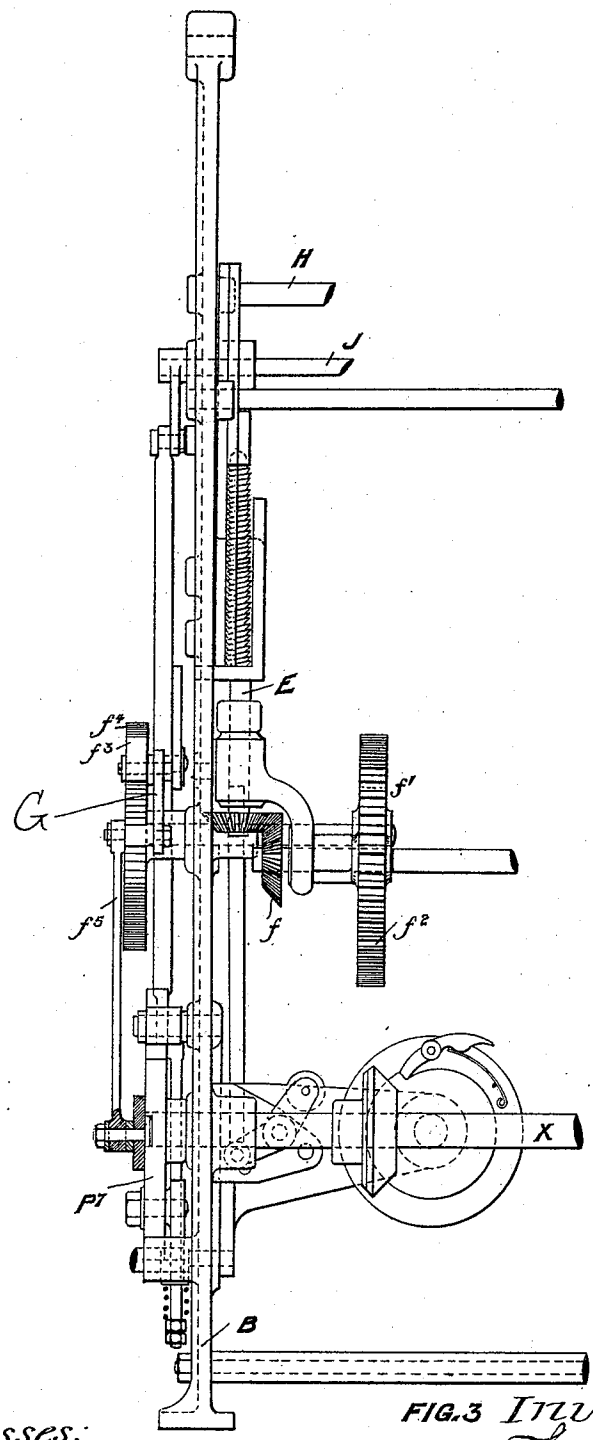

FIG. 3

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(No Model.) 8 Sheets—Sheet 4.

E. T. CLEATHERO.

PAPER FEEDING MACHINE.

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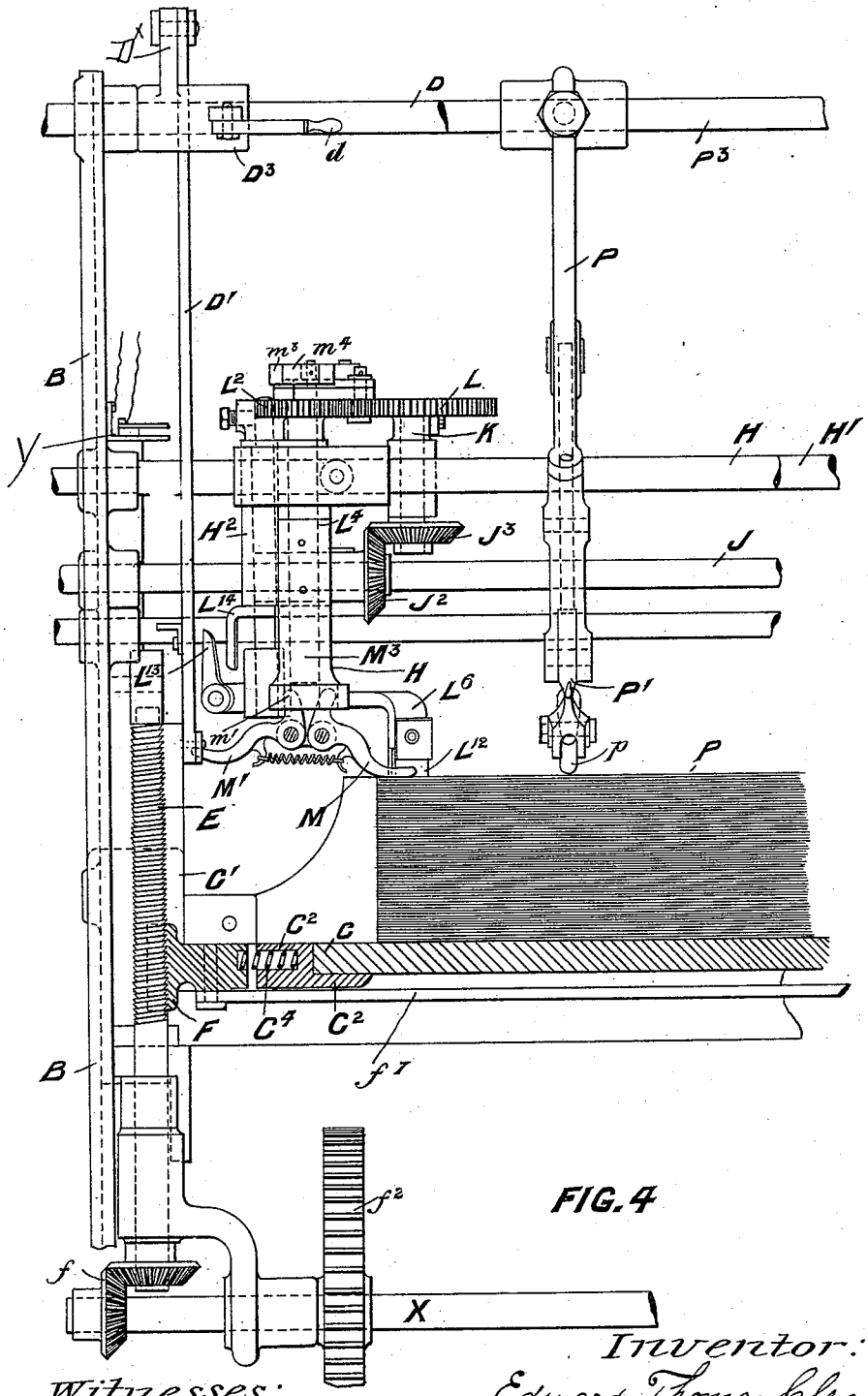

FIG. 4

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(No Model.) 8 Sheets—Sheet 5.

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PAPER FEEDING MACHINE.

No. 570,000. Patented Oct. 27, 1896.

FIG. 4a.

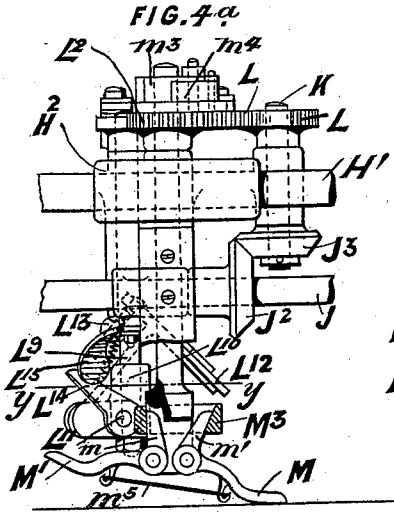


FIG. 4b.

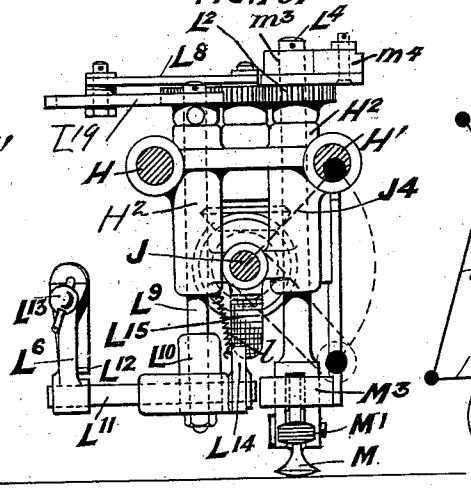


FIG. 4b'.

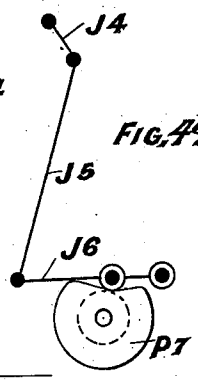


FIG. 4d.

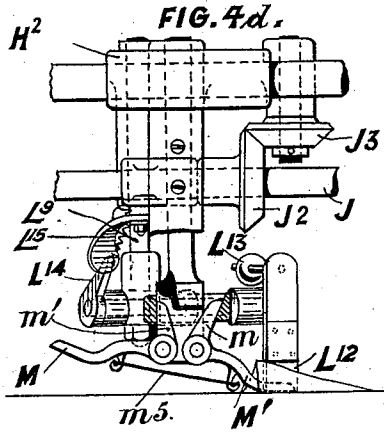


FIG. 4e.

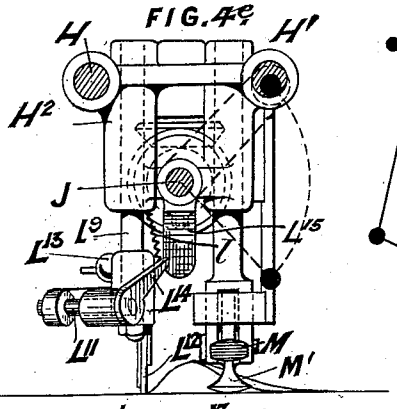


FIG. 4e'.

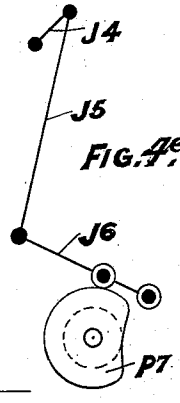


FIG. 4c.

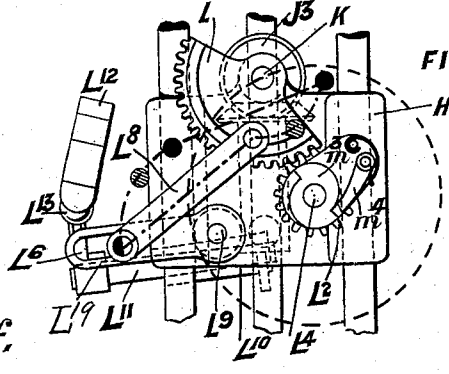
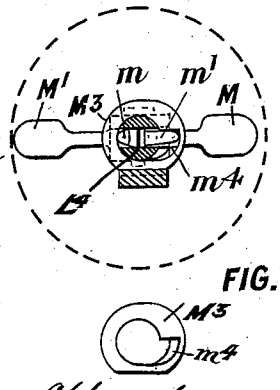


FIG. 4f.



Attest

Walter Maddox

James McShea

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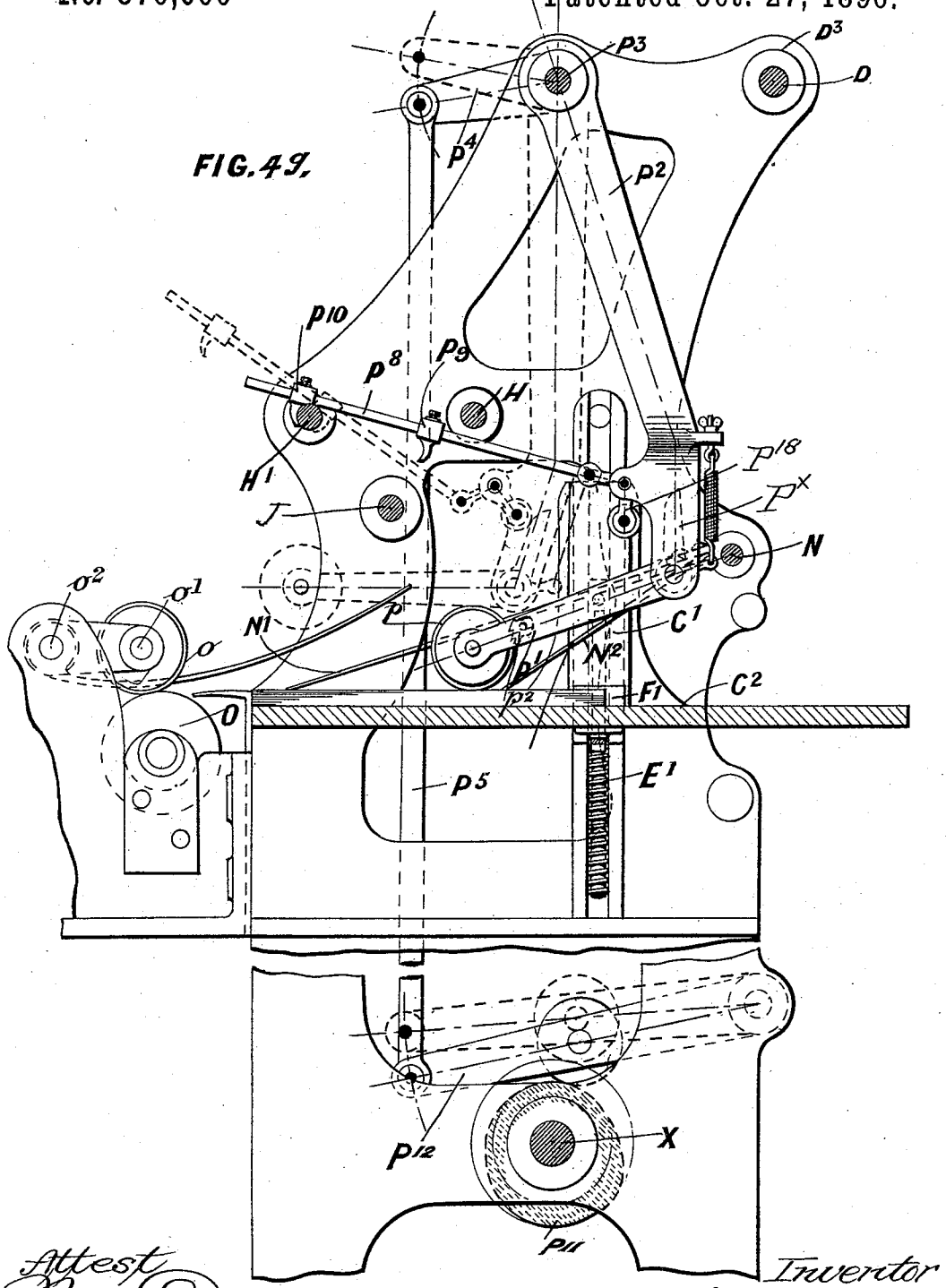
(No Model.) 8 Sheets—Sheet 6.

E. T. CLEATHERO.

PAPER FEEDING MACHINE.

No. 570,000 Patented Oct. 27, 1896.

FIG. 49.



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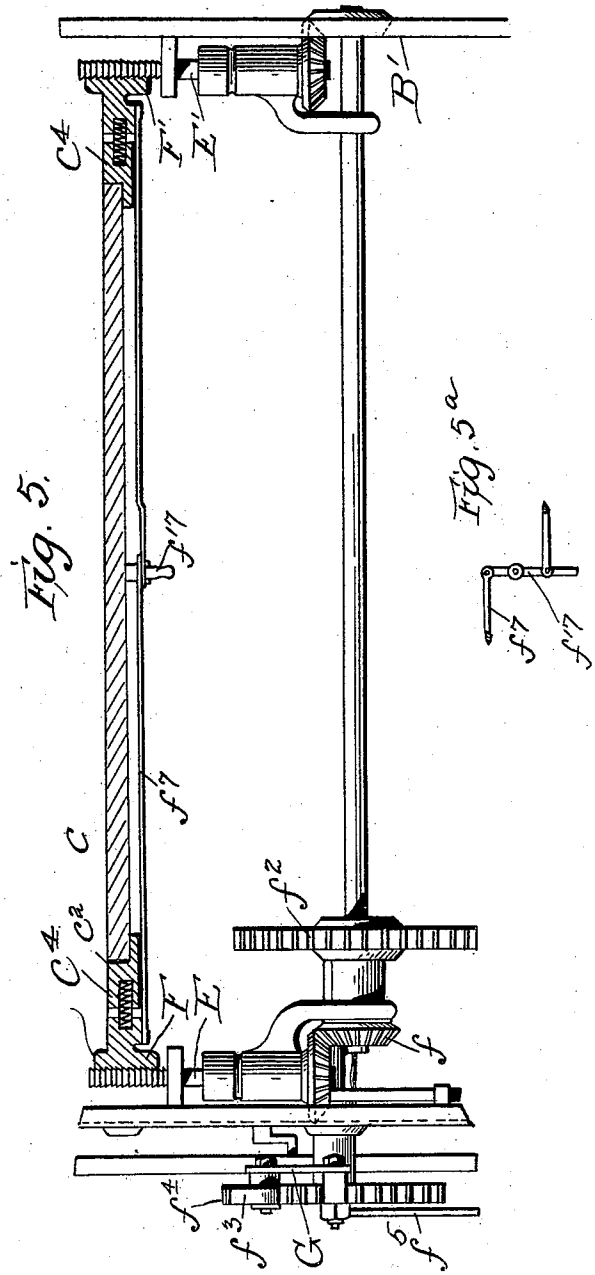
(No Model.) 8 Sheets—Sheet 7.

E. T. CLEATHERO.

PAPER FEEDING MACHINE.

No. 570,000. Patented Oct. 27, 1896.



Attest
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C. F. Middleton

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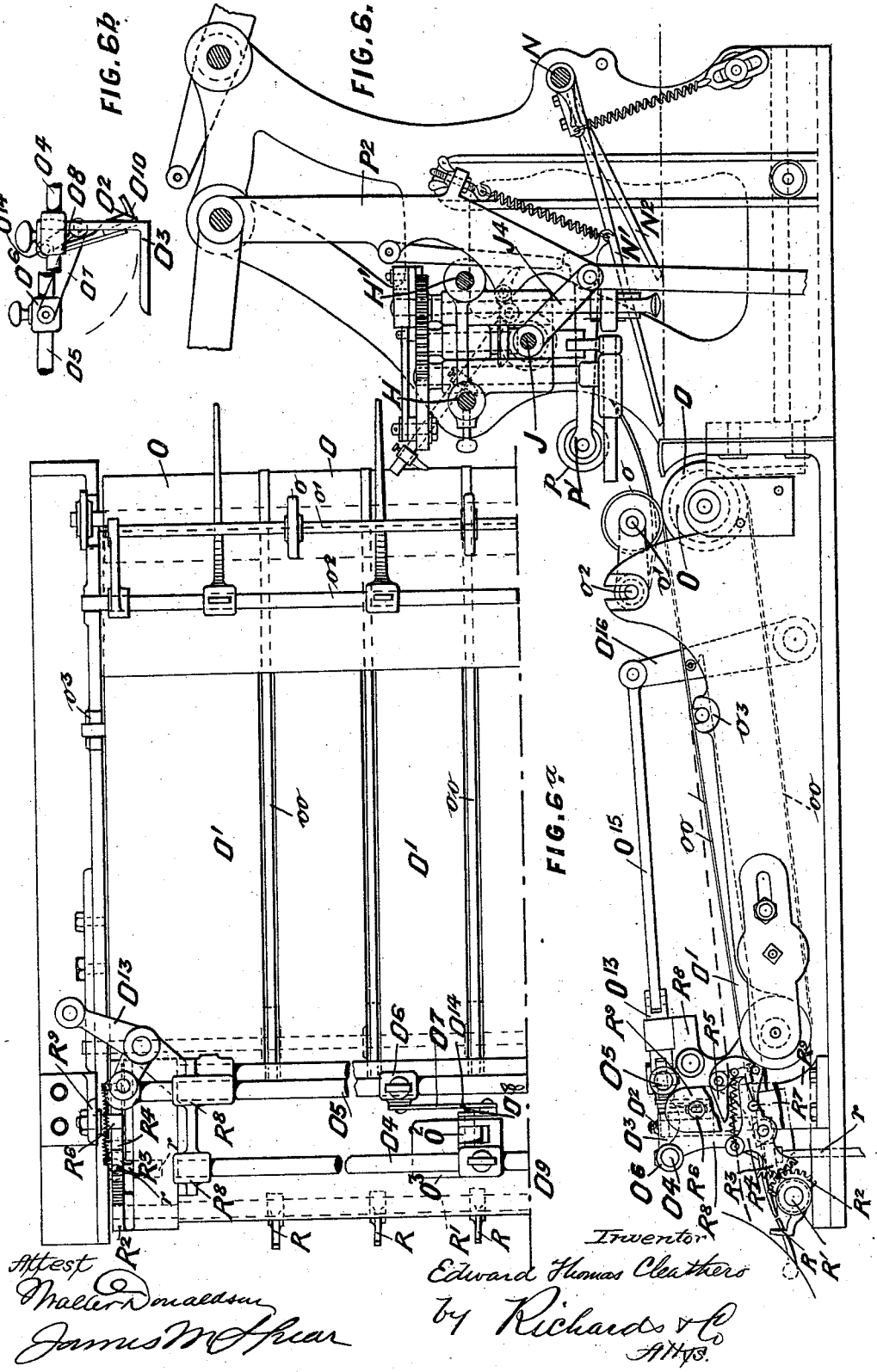
(No Model.)

8 Sheets—Sheet 8.

E. T. CLEATHERO.

PAPER FEEDING MACHINE.

No. 570,000. Patented Oct. 27, 1896.



Attest
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James McShear

Inventor
Edward Thomas Cleathero
by Richards & Co
Attys.

UNITED STATES PATENT OFFICE.

EDWARD THOMAS CLEATHERO, OF LONDON, ENGLAND, ASSIGNOR OF ONE-HALF TO EDMUND WILLIAM HORNSEY WALKER, OF SAME PLACE.

PAPER-FEEDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 570,000, dated October 27, 1896.

Application filed April 11, 1894. Serial No. 507,131. (No model.) Patented in England May 17, 1890, No. 7,738, and August 18, 1893, No. 15,678, and in Germany March 7, 1894, No. 82,920.

To all whom it may concern:

Be it known that I, EDWARD THOMAS CLEATHERO, engineer, of 16 Tollington Place, London, N., England, have invented certain new and useful Improvements in Feeding Apparatus for Printing, Ruling, and Folding Machines, of which the following is a specification.

The invention has been patented in England, No. 7,738, dated May 17, 1890, and No. 15,678, dated August 18, 1893, and in Germany, No. 82,920, dated March 7, 1894.

This invention has reference to the manner in which I construct and arrange apparatus and mechanism for attaching to ordinary printing, ruling, and folding machines for the purpose of causing an automatic and regular delivery or feeding of the paper which is to be operated upon.

In carrying my invention into effect I modify the method of driving my main motion-shaft to suit the particular type of the machine or the gearing or shafting of the machine to which my improvements are to be attached, and in the accompanying nine sheets of explanatory drawings I illustrate my feeding apparatus when attached to and working upon an ordinary Wharfedale type of printing-machine.

On Sheet 1, Figure 1 is a side elevation of the machine having the ordinary portions of the printing-machine shown somewhat in outline, the frames A being extended or arranged to receive my improved appliances. On Sheet 2, Fig. 2 is a detailed side elevation of one of the side frames B and the mechanism attached or connected therewith, which I secure to the ordinary side frame of the printing-machine. On Sheet 3, Fig. 3 is a detailed end elevation of the side frames B and its mechanism shown in side elevation at Fig. 2. On Sheet 4, Fig. 4 is a detailed end elevation of a portion of my feeding appliances, showing the pile of papers P in position upon the table C. On Sheet 5, Figs. 4^a, 4^b, and 4^c are front and side elevations and plan, respectively, of the carriage and gearing for actuating the fluffing-finger, showing the fluffing-finger in its raised or back position. Figs. 4^d and 4^e are front and side elevations corresponding to Figs. 4^a and 4^b, but having the fluffing-finger in its lowest position when fluffing has been effected. Figs. $4^{b'}$ and $4^{e'}$ are diagrammatic elevations showing the position of the cam P^7 and the crank-arm J^4, corresponding to the position of the fluffing-finger L^{12} in the elevations, Figs. 4^b and 4^e, respectively, while Fig. 4^f shows in detail sectional plan, taken upon the line $y\,y$ in Fig. 4^a, the feet M M'. On Sheet 6, Fig. 4^g is a detail sectional side elevation of the carrying-forward mechanism. Fig. 5 on Sheet 7 is a rear elevation of my side frames B B' with the adjusting means for the paper-table. Fig. 5^a is a detail view of the hand-lever and connecting-rods controlling the said adjusting means for the table. On Sheet 7, Fig. 6 is an enlarged side elevation of the feeding arrangement, showing the fluffing mechanism and front and side stop mechanism; and Fig. 6^a is a detail semiplan of the sloping board, showing the front and side stop mechanism, while Fig. 6^b is a detail side elevation of the side stop mechanism.

The sheets or the pile of papers P, I place upon my feed-board or feed-table C, which table I provide with an automatic rising motion for causing the top or uppermost sheet of paper to be kept at a constant height for delivery to the printing-cylinder; and I also arrange that the board C may be lowered and raised very rapidly by hand for enabling a fresh pile of paper to be readily introduced onto the board and for permitting that the adjustment or determination of the feeding-level for the top sheet shall be effected by hand before setting the automatic portion of my appliances in motion. When the supply of paper has almost been consumed and the table is at a corresponding elevated position, I cause an alarm to be given either by means of a trip-rod striking a gong or bell or by making a contact with an electric-bell bracket Y, Fig. 4, this latter arrangement being preferable, as it enables the alarm to be given during the whole time that the board remains empty, or until the attendant has lowered the table by hand for the introduction of a fresh supply.

I carry the feed-table C from a cross-shaft

or stretcher-bar D by means of links D′, which I anchor to boss-brackets D^3, and I provide a handle or folding-lever *d* upon the boss D^3 for enabling the links D′ to be raised or lowered by hand when it is desired to alter the position of the board C, to which the links are attached by means of side slide-bars or guide-plates C′, formed upon the table-frame C.

It will be understood that there is another bracket D^3 and another link D′ at the opposite end of the machine from that shown in Fig. 4, and I have therefore referred to those parts in the plural number. The hand-lever *d*, Fig. 4, connects with the link D′ through the sleeve or boss D^3 on the shaft D, which sleeve has the arm $D^\times$, to which the link D′ is pivoted. By holding or working the handle the rising and falling of the table can be controlled.

To the side frames B B′, I mount or connect screws E E′, Figs. 4 and 5, having their teeth or screwed portions formed rack-shaped, as shown in Fig. 4, or as square threads, as shown at E′ in Fig. 4^s. These screws I set in motion at any desired speed by means of gearing *f* *f′* f^2, driven from a pawl f^3 and ratchet-wheel f^4, which has its movement communicated by the connecting-rod f^5, anchored in a slotted cam P^7. The cam-wheel P^7, I cause to receive its motion from a pitch chain and wheel, or by bevel or other gearing suitably connected to any revolving portion of the machine. The stroke of the connecting-rod I alter to suit the thickness of paper sheet which forms the pile, so as to insure that the rise of the table shall only be that necessary to keep the level of the top sheet of paper constant for delivery. I alter the stroke in one convenient manner by making a graduated scale upon the jaw or slot x^6, in which the connecting rod, pin, or block is carried, the graduations permitting of any desired thickness of paper sheet being fed or raised by the table a height at each stroke of the connecting-rod equal to the actual thickness of sheet that is to be removed at each operation of the machine from the pile upon the board. The ratchet-wheel f^4 I form with any desired number of teeth to suit the ratio of gearing-wheels employed in connection with my feed-motion shafts, and I cause the driving-pawl f^3, which I anchor to a rocking plate G, to engage with only one tooth at each vibration or to pass over any desired number of teeth in the wheel f^4 to suit the thickness of paper sheet upon the pile P. This rocking plate is pivoted on the rod f^5 at $f^\times$, Fig. 2.

I communicate the motion of the screws E E′ to half-nuts F F′, which I connect to the frame C^2, these nuts causing the table to rise when the screws E E′ rotate within them. To disengage the nuts in order to permit of rapid alteration or adjustment of the position of the board C, I connect levers f^7 to the nuts, which, upon being pulled by hand through the hand-lever f^{17}, Fig. 5, allow the weight of the table being carried by the manipulating folding hand-lever *d*, which is under control of the operator's hand. (Shown in Fig. 4.) For keeping the nuts in position upon their screws when in work for feeding the paper I place springs C^4 within and between the nuts and the frame C^2. The ratchet-wheel f^4 can be moved by hand in either direction for adjusting the height of the pile when the movement produced by the hand-levers *d* f^{17}, as before described, would be too great or insufficiently accurate. The lever *d* is pivoted to a lug integral with the boss D^3, and this boss is loosely mounted on the shaft D. When the lever *d* is not in use to turn the boss D^3, it is simply folded against the shaft D to be out of the way. These parts are duplicated at the other side of the machine.

I feed the sheet of paper in single sheets from the pile P by means of an improved corner-fluffing arrangement of mechanism and appliances which I employ and which I illustrate in Figs. 4, 4^a, 4^b, 4^c, 4^d, 4^e, 4^f, $4^{b'}$, $4^{c'}$, and 6. These front edge-fluffers raise up mechanically the two front side edges of the top sheet of paper in the pile P, and by so raising these edges allow the holding-down feet to be placed underneath the top sheet, which, while permitting the top sheet to be drawn over them, also keep down the remaining sheets of paper correctly in position upon the pile, so as to prevent more than one sheet of paper being fed forward at a time.

I carry my fluffing appliances and apparatus preferably upon a pair of stretcher bars or shafts H H′, running across from one side frame, B, to the other, B′. Upon these bars H H′, I mount a pair of sliding carriages H^2, one on each side of the paper sheet, only one of said carriages being shown. These carriages are so arranged that they may be free to move along and be held at any position upon the bars to suit the width of paper sheet forming the pile at any particular printing operation. From one side frame, B, to the other, B′, I carry a shaft J, within which I cut a long key-way or groove to enable bevel-wheels or other gearing-wheels J^2 to slide thereon; or I may make the shaft square, or of other section than round, for the same driving and sliding purposes. I give a vibratory motion to this shaft J by means of a crank J^4, anchored to a connecting-rod J^5 at one end, which receives its motion from a cam-roller lever J^6, working upon the cam P^7, and the motion of the shaft J is transmitted to the vertical spindle K, mounted upon the carriage H^2, by the bevel-wheels J^2 J^3. Upon the outer end of the vertical spindle K, I mount a segmental rack-wheel L, which gears into tooth-wheel L^2 to give a circular movement to the spindle L^4, carried upon the same frame or carriage H^2. The motion-spindle L^4 is revolved by means of the rack L and the wheel L^2, and this wheel L^2, I form with a pawl m^4 to give a circular motion in one direction only to the ratchet m^3 on the end of the spindle L^4. The toothed wheel L^2 is loose on the spindle L^4, while the

ratchet m^3 is fixed thereon. The wheel L^2, being loose, may oscillate with the segment-wheel, and it will thus carry the pawl back and forth, said pawl engaging the teeth in the ratchet successively and giving the same a forward movement only. To the face of the segmental rack L, I attach a connecting driving-link L^8, which gives a vibratory motion to a vertical spindle L^9 through a slotted arm L^{19}, said spindle having a sleeve or bush L^{10} on the end, which carries a horizontal bearing and its spindle L^{11}. Upon this spindle L^{11} I attach a bent fluffing-finger L^6, and I secure a piece of rubber or like material L^{12} upon the end of this bent finger-piece or arm L^6. As this horizontal carrying-shaft L^{11} is moved in a radial forward direction I cause it to descend upon reaching the front corner of the paper pile P, so that the rubber end is pressed onto the top sheet of the pile, and I provide an adjustable spring or an adjustable weight L^{13} in order that I may be enabled to vary the pressure to suit different surfaces or thicknesses or quality of paper, and as its forward motion continues the edge or corner of the sheet is "rucked up," and this rucking up permits of a foot M, also having a radial motion imparted to it, to pass between the top sheet, which is being raised at the corners, and the remainder of the pile of paper, thus holding the pile down until the top sheet is removed. I give the descending motion to the finger L^6, while it is being carried around by the link L^8, by means of a striker L^{14} and a striking-plate L^{15}. This striker I mount securely at the end of the carrying-shaft L^{11}, which is free to revolve in a boss-bearing L^{10}, fixed to the extremity of the shaft L^9, and as the carrying-shaft L^{11} travels forward in a radial direction as the striker L^{14} under the action of a spring l is maintained in close contact with the curved surface of the striking-plate, thereby causing it to move and with it the shaft upon which it is fixed, so as to bring the end L^{12} of the fluffer down on the surface of the paper. After the holding-down foot M has descended upon the pile the fluffing-finger L^6 has its return radial motion imparted to it by the segment L and its connecting-link L^8, the striking-finger L^{14} being then depressed by its contact with the cam or striking-plate L^{15}, and the fluffing-finger L^6 is thereby lifted from the surface of the loose or raised top sheet, thus permitting this sheet to be carried forward to the printing-cylinder.

During the reverse movement of the fluffing-finger the holding-down foot on each side of the paper remains upon the pile of paper until another sheet is being fluffed or rucked up, when it continues its radial motion, and another foot M′, which is then upon the opposite side of the same vertical spindle L^4, travels around lifted up until it has passed under the edge of the top sheet, which is then being fluffed, when it descends upon and presses down the remainder of the pile. I give this rising motion to the feet by means of tail-pieces m m', which I form upon their ends, these tailpieces working within the box-like end of the plate M^3, which I secure to the carriage. Within this box I provide a cam-like path m^4, which has a recess at one side to permit of the tails m m', impelled by a spring m^5, falling into it and thus allowing the feet M M′ to descend and to press upon the paper. When the shaft L^4 continues its motion, the tailpiece m' is caused to travel the inclined path of the cam-recess and then to raise the foot M from the surface of the paper. To more particularly illustrate the driving mechanism for my fluffing appliances, I have shown diagrammatic views, Figs. $4^{b'}$ and $4^{e'}$, of the links and attachments from the main driving-shaft cam P^7 in their respective positions at the commencement and at the close of the fluffing operation, as shown by detail elevations and plan, Figs. 4^a, 4^b, and 4^c, and in Figs. 4^d and 4^e.

Fig. 4^f shows a detail plan of my holding-down feet M M′ in position with their spindle L^4 and the cam-like path in the box end M^3. In Figs. 4^a, 4^b, and 4^c the fluffing-finger L^6 is shown in its raised back position prior to commencing the actual fluffing. In these views the crank J^4 is shown in its lowest position, corresponding with the diagrammatic motion view in Fig. $4^{b'}$, while Figs. 4^d and 4^e show the fluffing-finger in its forward position after having rucked up the edge of the paper, and the holding-down foot M′, which was in its upper position in Figs. 4^a and 4^b, is shown in its lower position when it is pressing upon the paper, and the crank J^4 is shown in its corresponding upper position, the diagrammatic view, Fig. $4^{e'}$, giving corresponding positions for the crank J^4 and the cam P^7.

I employ one set of fluffing mechanism at each corner of the front edge of the paper, the position of each being adjusted by sliding the carriages along the shafts H H′ and J and fixing them by set-screws to suit the width of the sheets forming the pile, and in order to further regulate and fluff the paper edges regularly and uniformly I mount another cross-shaft N within and between the side frames B B′, and upon this shaft N, I secure projecting fingers N′ N^2, which hold the top sheet of the paper down upon the pile during the operation of fluffing. When this has been concluded, they are lifted off the paper by means of a rod N^3, worked from a cam N^4, fixed upon the vibrating shaft J, Fig. 2, so as to permit of the top sheet being carried forward.

I carry forward my loosened or raised sheet from the pile by means of tapes and a roll O and rubber-faced disks o, working upon a spindle o', mounted by arms upon a rod or spindle o^2, carried in bearings upon the frame, the sheet being removed from the pile by means of two or more rubber disks p, mounted upon the one end of projecting carriers P′, which have a rising-and-falling motion im-

parted to them to enable them to be raised from the surface of the paper on their forward stroke, the rollers being arranged to revolve in one direction only by means of a nipping-cam p^2, Fig. 4^x, and to be bearing upon the surface of the paper during the forward movement of the carriers P'. I connect the carrier P' to a swinging arm P^2, which I mount upon a cross-shaft P^3, and I give these arms their swinging to-and-fro movement by means of a crank P^4 and a rod P^5, which I connect at the lower end to a cam-operated lever P^{12}, the cam P^{11} being fixed on the main motion-shaft X. The swinging arm P^2, I provide with a rod or pawl P^8, which is pivoted to a bell-crank P^{18}, which I pivot to the arm P^2 above the carrier P' at one end. The middle part of this rod I make with a peculiarly-shaped adjustable tooth P^9, so that when the paper is carried forward to the tape-roll this tooth P^9 is forced against the shaft H' and by this being brought to rest while the arm or rod P^2 is still moving forward the carrier P' is raised by its tail end P$^\times$, Fig. 4^x, being thrust against by the rod p^8 until the holding-out roller upon the bell-crank presses forward the tail of carrier, thus preventing its falling onto the surface of the paper again until the return stroke or vibration of the swinging arm. The nipping-cam p^2 is so pivoted and its teeth are so formed that as the carrier P' moves toward the roller O the roller p will not turn, and the paper will thus be fed through contact therewith of the roller. In Fig. 4^x the swinging arm P^2 with its actuating-crank P^4 and cam P^{11} are shown in their extreme back position in full lines, while the corresponding parts are shown in dotted lines for the opposite or forward lifted position. The rod or arm P^8 also has an adjustable tooth P^{10}, so that as the arm P^2 swings back to normal position the arm P' with the feed-roller will be depressed by reason of the tooth P^{10} striking upon the shaft H'. The arm P' with its roller will be held up during the return of the arm P^2 and until the tooth P^{10} engages shaft H', owing to the fact that the tail end $p^\times$ of the arm P' remains in contact with the bell-crank P^{18}, which is shown in dotted lines, Fig. 4^x, in such a position as will resist the force of the spring action on the arm P'. The tail end $p^\times$ and the bell-crank P^{18} are, in other words, acting substantially on the dead-center with the bell-cranks pivot. The roller p carries the paper sheet forward, delivering it onto the ordinary tape-roll O, and it is then carried by the tapes $o\,o$ down a rocking sloping board O', which is at its lowest position, leaving the tapes projecting above its surface while the sheet is being carried forward to the front stops R. (Shown in Figs. 6 and 6^a.) Upon reaching the front stops a rubber tooth O^2 descends on the paper and draws it to the side stop O^3 by the movement of a vibrating spindle O^{14}, on which it is secured. This spindle is journaled in the side stop O^3, which in turn is carried by the cross-shaft O^4, held in the brackets R^8, the vibrating movement of the rubber tooth O^2 being caused by the reciprocating action of the shaft O^5, driven from the bell-crank lever O^{13}, connected to the link O^{15}, which is in turn actuated by the bell-crank lever O^{16}, attached by a link O^{17} to the cam-roller lever O^{18}, driven from the main-shaft cam X^2. The side stop O^3 is carried upon a shaft O^4, fixed above the sloping board across the width of the machine, and has a set-screw upon it to fix it in any required position. I mount the shaft O^5 parallel with the shaft O^4, within the same brackets R^8, and I cause this shaft O^5 to slide longitudinally, and upon it I mount a boss O^6 with a crank-rod O^7 for giving motion to a crank O^8 on the side stop-spindle O^{14}, upon which spindle I secure the rubber tooth O^2 and its arm O^{10}. When the paper has been drawn to the side stops O^3, the rubber tooth passes off the paper by the reverse movement of the reciprocating shaft and leaves the sheet as it is being gripped by the ordinary grippers on the impression-cylinder.

It will be understood that the registering mechanism is located at that side of the feed-table which is opposite the bell-crank lever O^{13}, and that Fig. 6^a, while showing the registering mechanism and its operating connection, omits to show the full width of the table, that side adjacent to the registering mechanism being omitted.

In order that the cylinder-grippers may effectually grip the paper, the front stops R are caused to fall away when the sloping board is raised by the usual action of the machine to the dotted upper position indicated in Fig. 6.

The front stops R, I fix on a shaft R' in the ordinary manner, this shaft being carried on bearings fixed to the front edge of the board. These front stops I hold in position in front of the board until the board has been lifted in the ordinary manner by the machine-lifting rod r, when I cause them to fall away by means of a toothed quadrant-wheel R^2, upon the stop-shaft R', which gears in another similar quadrant R^3, which is pivoted upon bearings at the front end of the table and carried thereby, and this quadrant has a finger R^4, held in position by a pawl R^5.

When the board lifts under the action of the lifting-rod r, the pawl R^5 strikes against a pin R^6, mounted upon the bracket R^9, and causes it to release the hold of the quadrant-finger and allows the front stops R to fall away. The bracket R^9 is fixed to the stationary side frame. When the board descends, the quadrant-finger R^4 comes into contact with a pin R^7, also mounted on the bracket R^9 on the under side, and lifts the front stops into position for receiving the paper, and the pawl engages with the finger again.

Fig. 6 shows the standard R^9 on the near

side of the feed-table broken away, and consequently the quadrant R^3 and finger R^4 at the opposite side of the table can be seen.

Referring to Fig. 1, it will be seen that the rod r is reciprocated vertically by a cam r^4, secured to the main counter-shaft, which operates cam-lever r^3, which reciprocates the rod r^2. This works the bell-crank r', secured to the vertical rod r.

The tape-rolls O are geared to or driven from the main shaft X, Fig. 1, of the apparatus by chains X^3 X^4 or by other suitable ordinary means.

The action of my improved feeding apparatus is as follows: The pile of paper P is laid on the feed-table C, and when the table has been raised by a hand-lever d or by turning the machine-pulleys slowly by hand until the top sheet of the pile reaches the automatic feeding apparatus the machine is then started and the top sheet of paper has its front opposite corners arched or fluffed up by means of the fluffing-fingers L^6, which travel over its surface, as hereinbefore described. Upon the corners being thus raised or fluffed a separating-foot M descends at each front corner upon the next or second sheet of the pile and presses upon the remaining sheets of the pile, while carrying-forward rollers p, mounted upon swinging arms P′ and P^2, are caused to take forward the loosened upper sheet and then deliver it to the tapes O, which convey it toward the ordinary grippers upon the impression-cylinder. The carrier-rollers p move off the surface of the paper when the sheet reaches the tape-rolls by the vibrating motion of the arms P′, upon which the rollers are mounted, and upon the sheet reaching the front stops R the side stop-fingers O^2 move down in a radial manner and draw the edge of the paper closely to the side stops O^3, thus insuring a perfect register. The paper sheet being thus in true position for delivering to the cylinder, the sloping board O′ is raised by the lifting-rod r, this action causing the front stops R to fall away clear of the front edge of the paper, thereby permitting the ordinary grippers upon the impression-cylinder to lay hold of the paper for carrying it around for taking the desired impression upon the sheet. As each sheet of paper is taken from the pile the feed-table C is automatically raised a distance adjusted by means of the index upon the cam P^7 to suit the thickness of the sheet taken off.

I do not limit the application of my improvements as hereinbefore described to any particular type of printing-machine, but I modify the method and the form of mounting and arranging my fluffing levers and appliances, together with the other improvements in the manner of feeding and gaging the paper, to suit any form of printing-machine.

I claim—

1. In combination, the frame, the vertically-movable feeding-table, the guide-blocks C′ moving in ways in the frame, the screws with means for operating the same, the half-nuts movable outwardly at the outer edges of the feed-table, means for operating the half-nuts extending below the table from side to side and connecting with the said half-nuts, the upper shaft D, the lifting means carried thereon, and the connection between the said lifting means and the guide-blocks of the table, substantially as described.

2. In combination in a paper-feeding device, the arm P having the feeding-roll, the swinging arm P^2 carrying the same pivotally, the rod P^8 arranged to move longitudinally for operating the arm P′, the cross-bar H′ and the two adjustable stops P^9 P^{10} on the rod P^8 to raise or depress the arm P′, substantially as described.

3. In combination, the paper-table, the spindles L^4 L^9, the oscillating fluffing-finger connected with the spindle L^9 to be operated thereby, the rotary feet M, M′ on the spindle L^4 and means including the cams for giving both the fluffing-finger and the feet their rising and falling movement, substantially as described.

4. In combination in a paper-feeding machine, the paper-table, the fluffing-finger, the spindle connected thereto for operating the same, and the pivoted holding-down feet M M′ having the arms m m' and the cam acting thereon to raise or depress the feet, substantially as described.

5. In combination in a paper-feeding apparatus, the feed-board, the stop O^3, the pivoted foot O^2, the reciprocating shaft O^5 connected to the pivoted foot, the link O^7 and arm O^8 forming said connection and means for reciprocating the shaft O^5, substantially as described.

6. In combination in a paper-feeding apparatus, the feed-board with means for giving the same a vertical movement, the front stops carried pivotally by the feed-board and means for raising and lowering the front stops comprising the stop-pins on the frame, and means to engage the same connected with the front stops, substantially as described.

7. In combination in a paper-feeding apparatus, the feed-board, the front stops, said board being movable vertically and means for raising and lowering the front stops as the board is operated comprising the rack R^2, the segment R^3 and controlling devices therefor, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

EDWARD THOMAS CLEATHERO.

Witnesses:

GEO. CROYDON MARKS,

WILLIAM G. EVANS.