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C. B. STILWELL.

PAPER FEEDING MACHINE.

APPLICATION FILED APR. 18, 1902. RENEWED APR. 8. 1905.

19 SHEETS—SHEET 1.

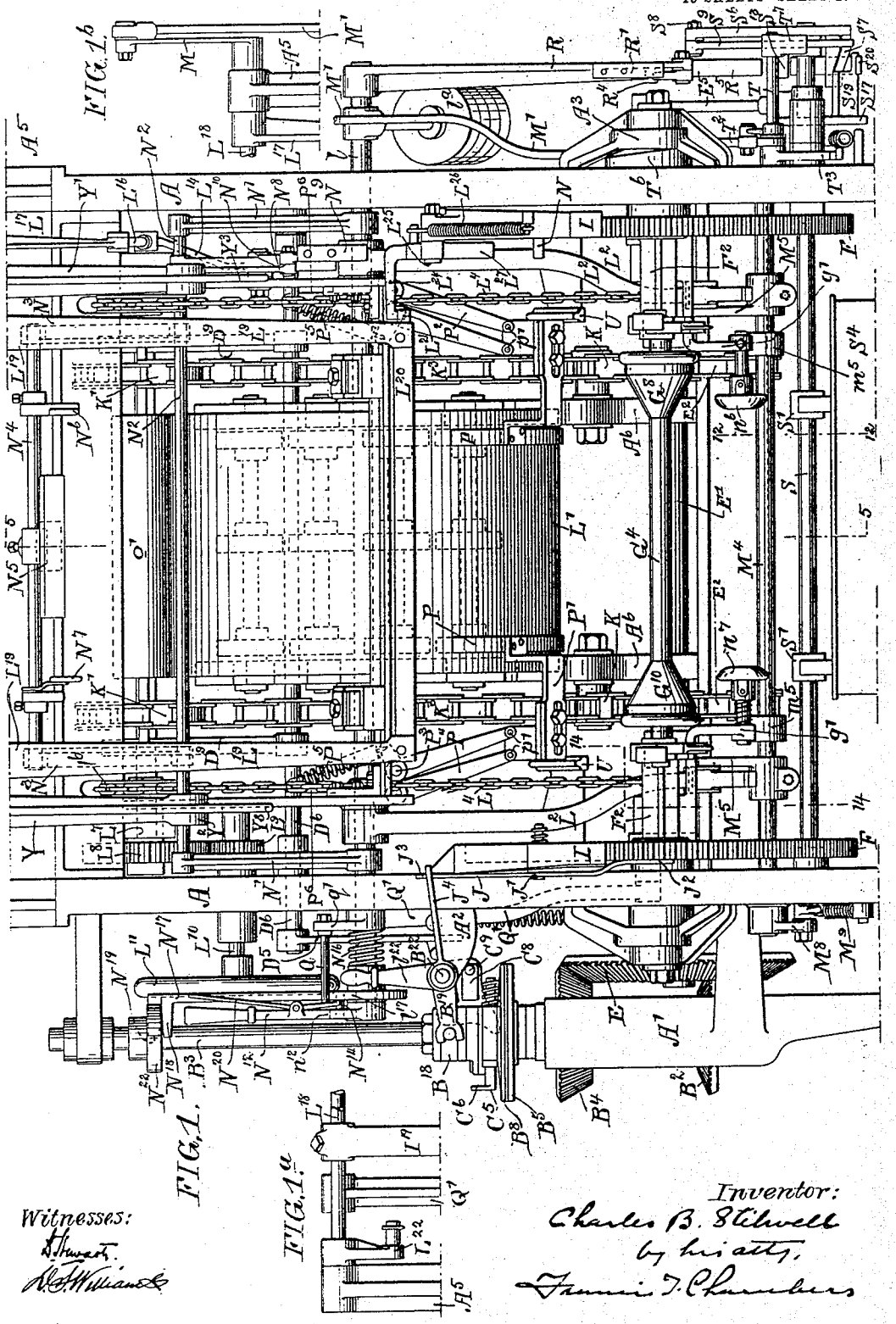


FIG. 1.

FIG. 1a.

FIG. 1b.

Witnesses:
D. Stewart.
A. H. Williamson

Inventor:
Charles B. Stilwell
by his atty.
Francis T. Chambers

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19 SHEETS—SHEET 2.

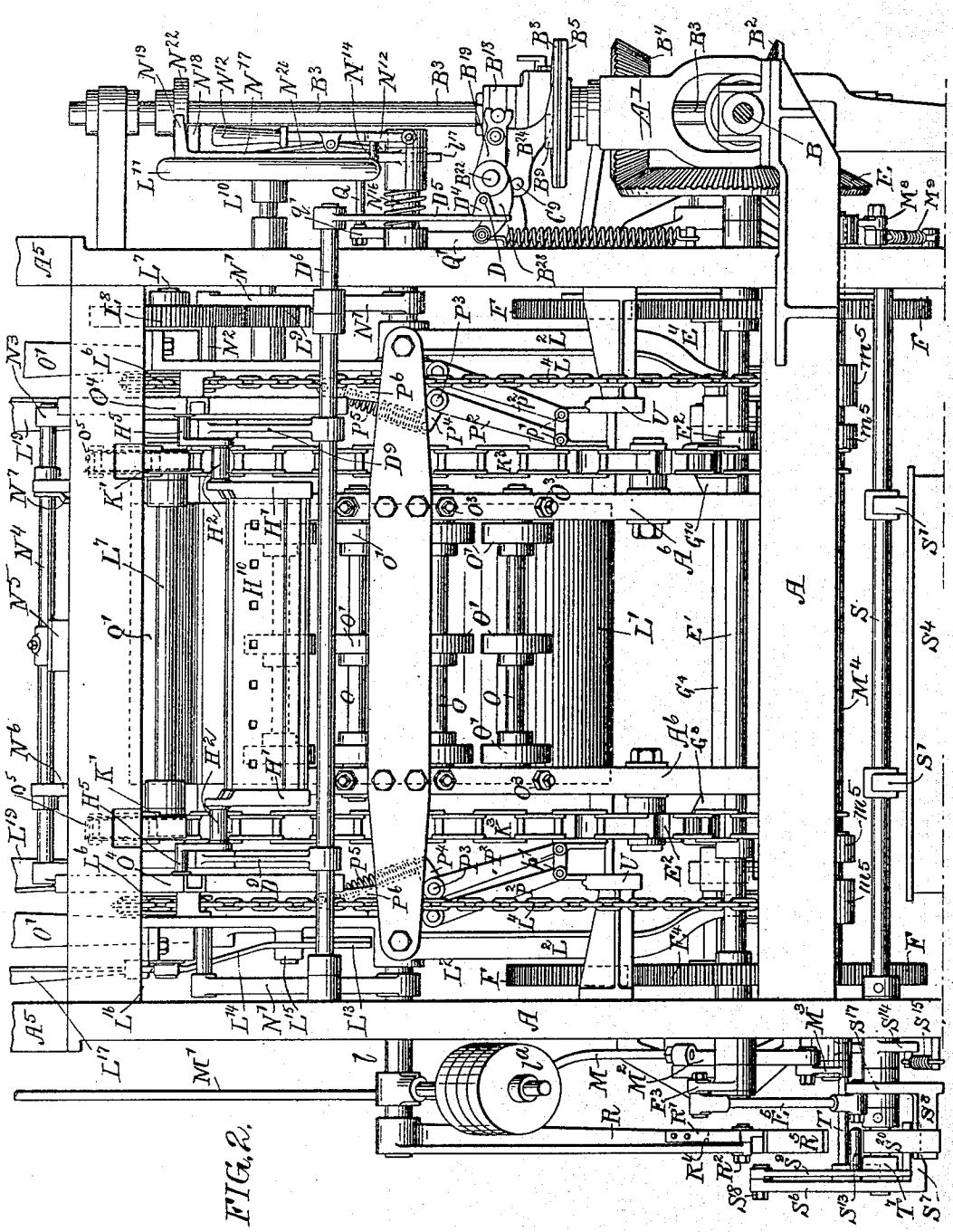


FIG. 2.

Witnesses:
A. Stewart
William Gassner

Inventor:
Charles B. Stilwell.
by his atty
Francis J. Chamberlain

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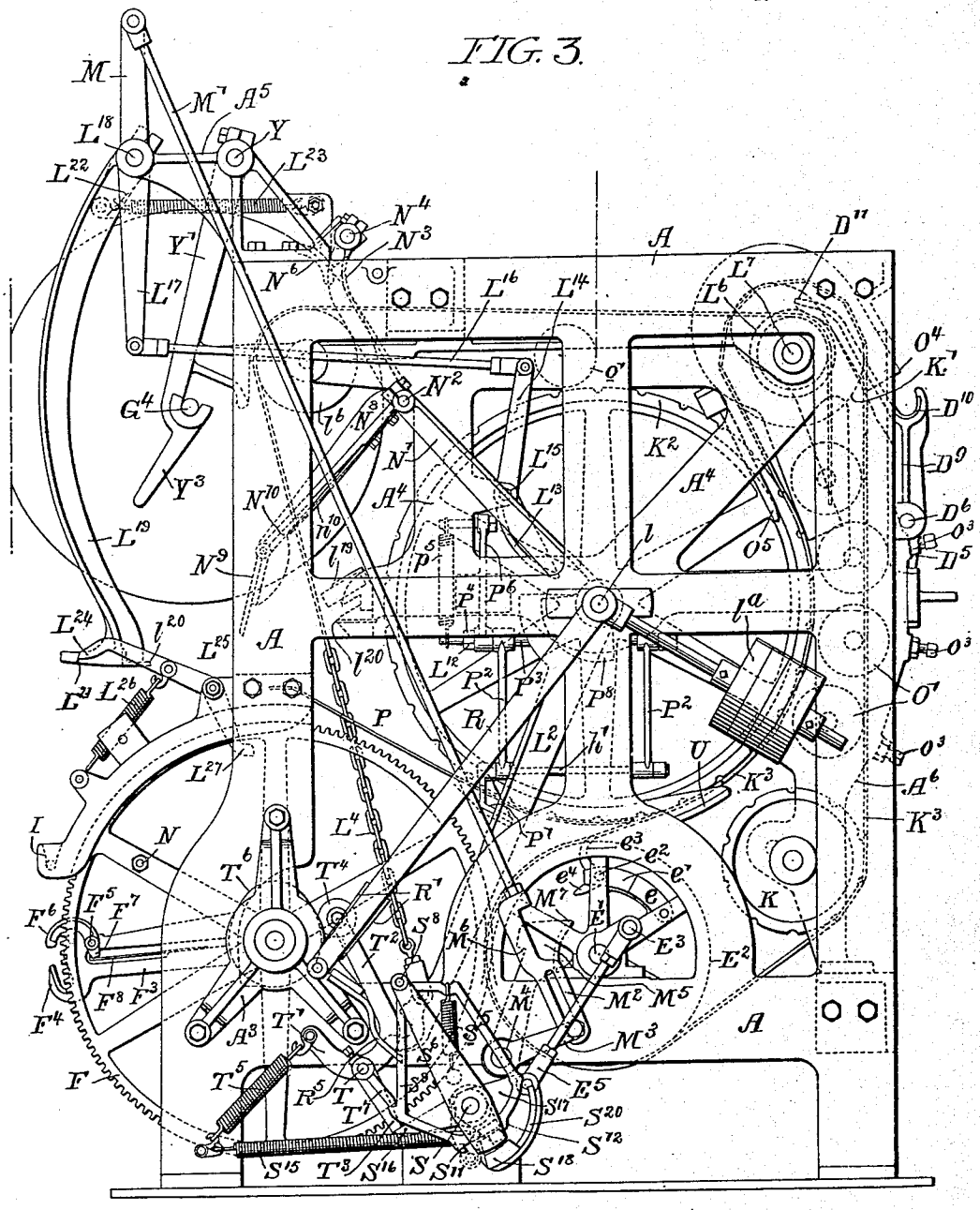
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19 SHEETS—SHEET 3.

FIG. 3.



WITNESSES:

INVENTOR:

Charles B. Stilwell

by his atty.

Francis D. Chamberlain

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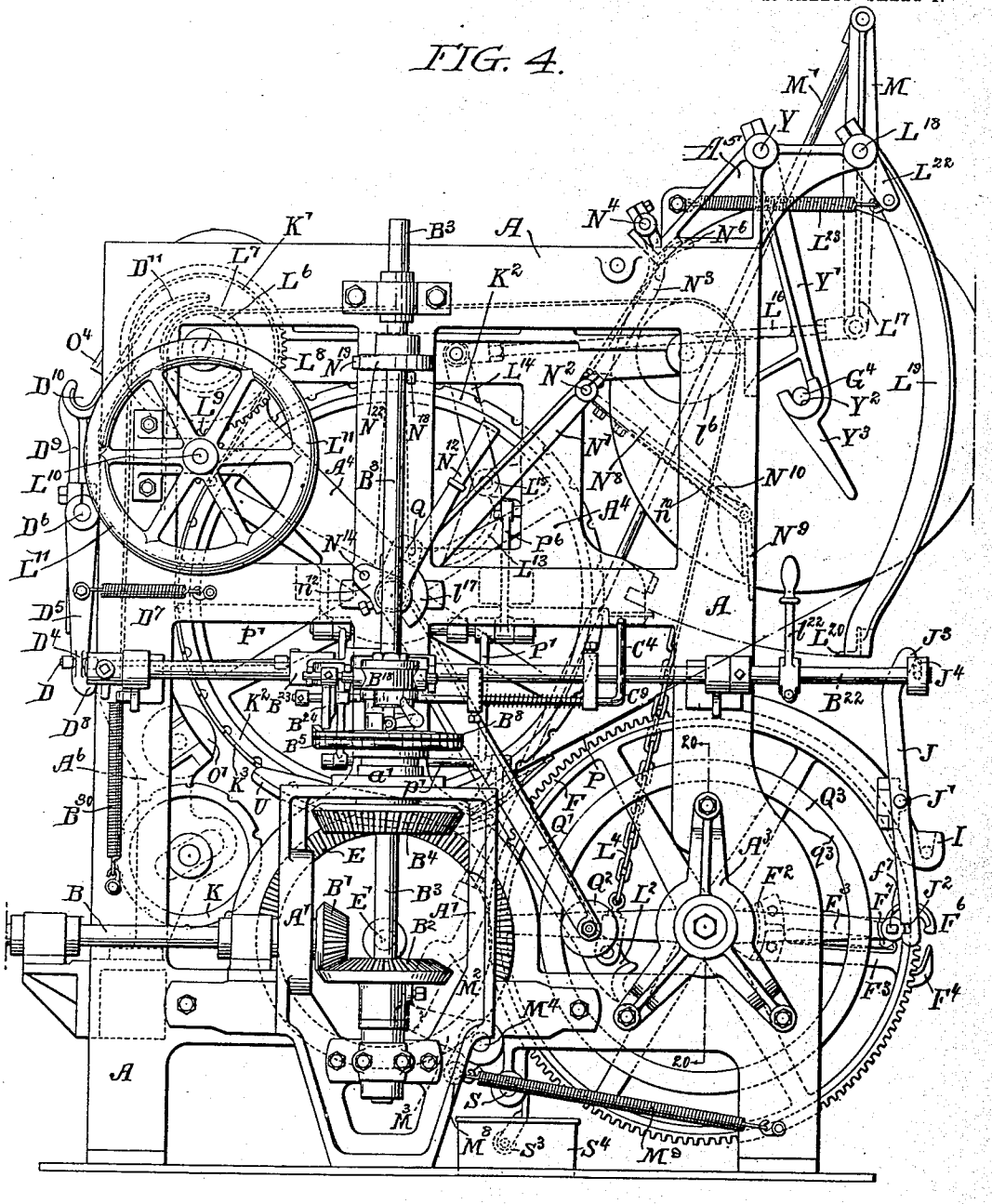
C. B. STILWELL.

PAPER FEEDING MACHINE.

APPLICATION FILED APR. 18, 1902. RENEWED APR. 8, 1905.

19 SHEETS—SHEET 4.

FIG. 4.



WITNESSES:

D. Stewart

A. G. Williams

INVENTOR:

Charles B. Stilwell

by his atty

Francis J. Chambers

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No. 808,883. PATENTED JAN. 2, 1906.

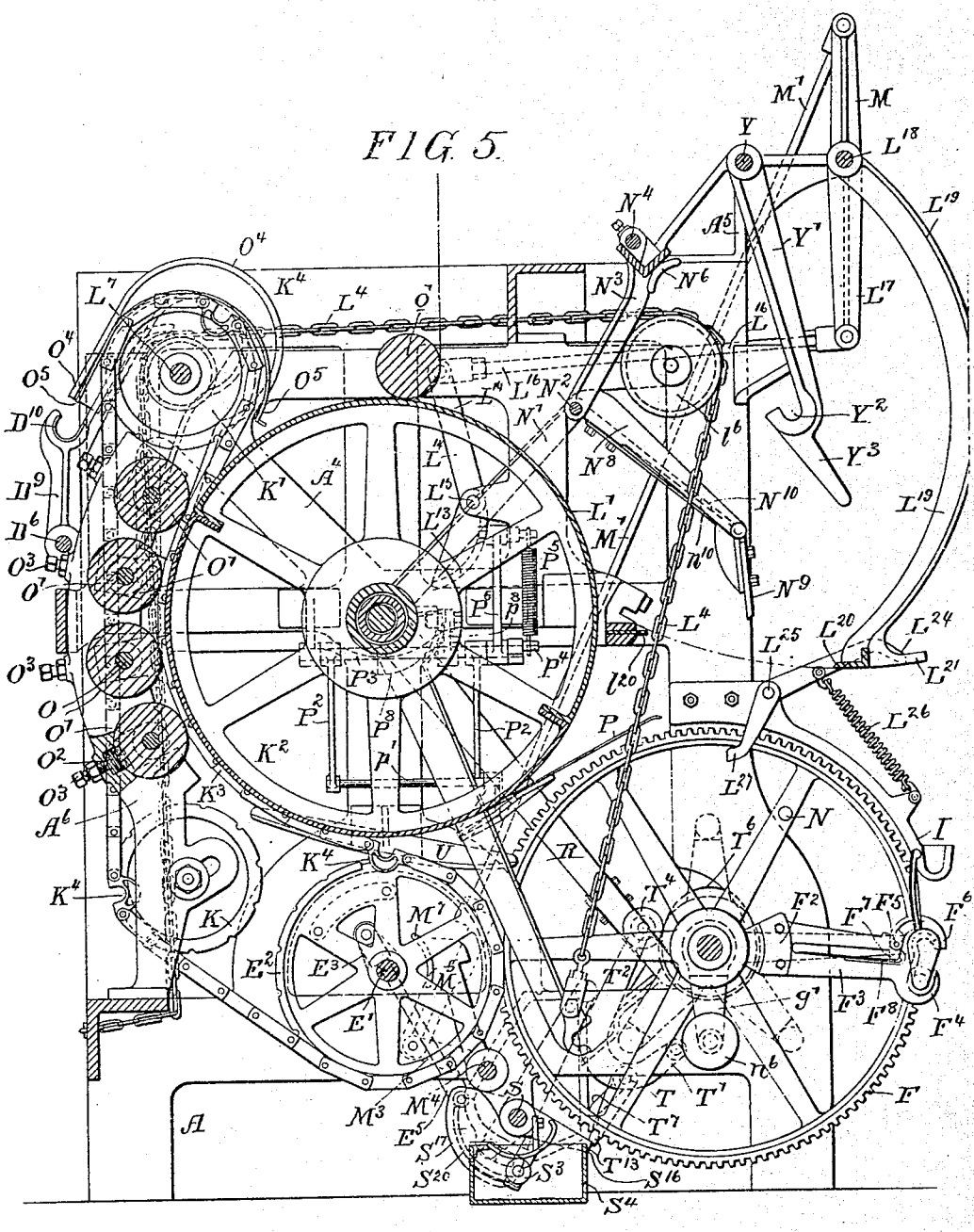
C. B. STILWELL.

PAPER FEEDING MACHINE.

APPLICATION FILED APR. 18, 1902. RENEWED APR. 8, 1905.

19 SHEETS—SHEET 5.

FIG. 5.



Witnesses:
J. Howard
H. C. Williams

Inventor:
Charles B. Stilwell
by his atty
Francis D. Chambers

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C. B. STILWELL.

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19 SHEETS—SHEET 6.

FIG. 6.

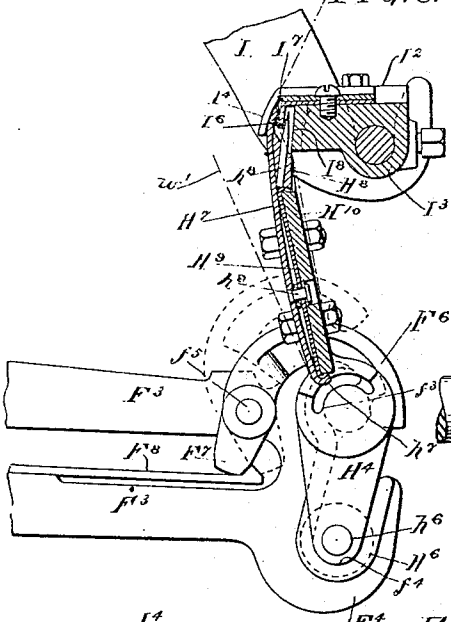


FIG. 7.

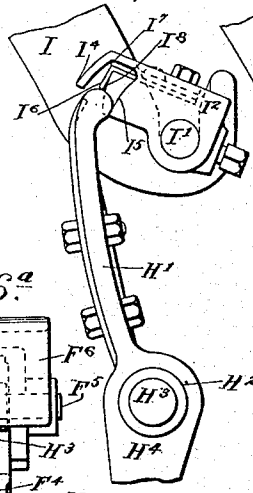


FIG. 8.

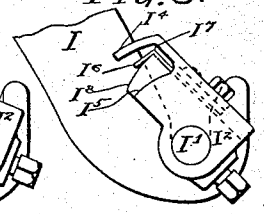


FIG. 6a.

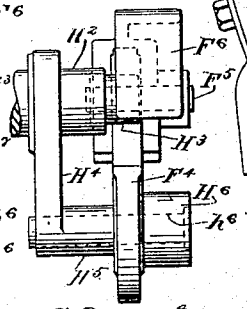


FIG. 9.

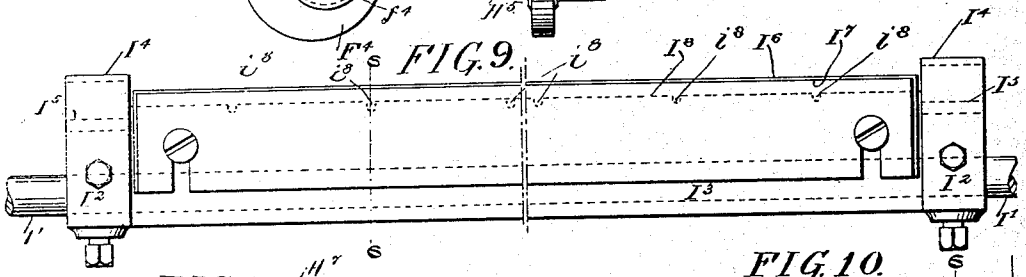


FIG. 11.

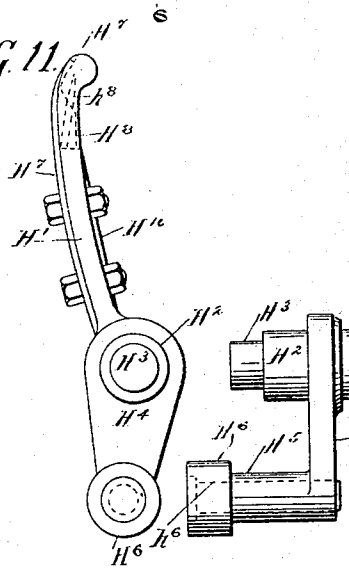
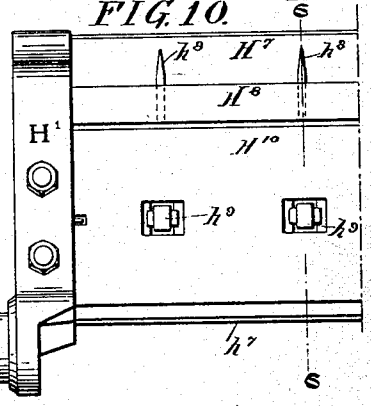


FIG. 10.



Witnesses:

J. Stewart

H. A. Williams

Inventor:

Charles B. Stilwell

by his atty.

Francis J. Chamberlain

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19 SHEETS--SHEET 7.

FIG. 12.

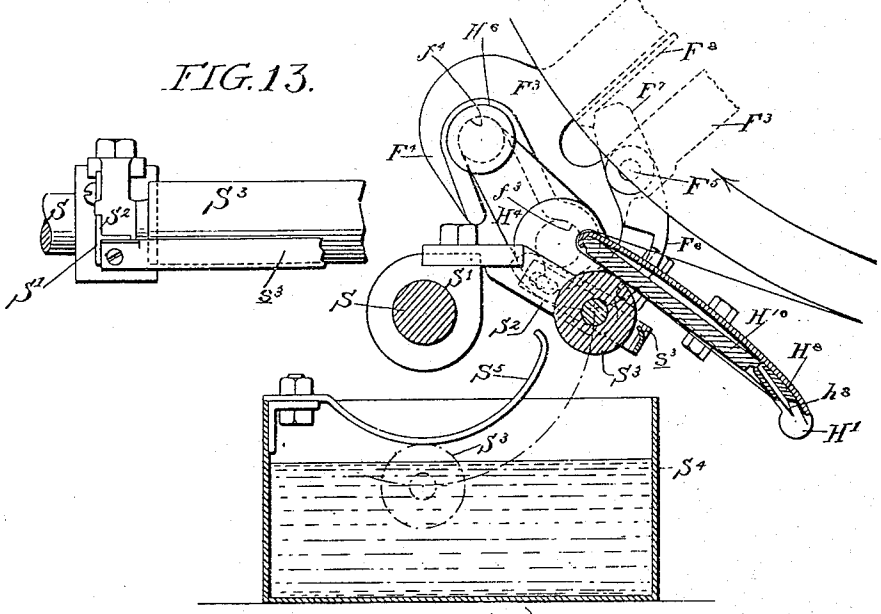
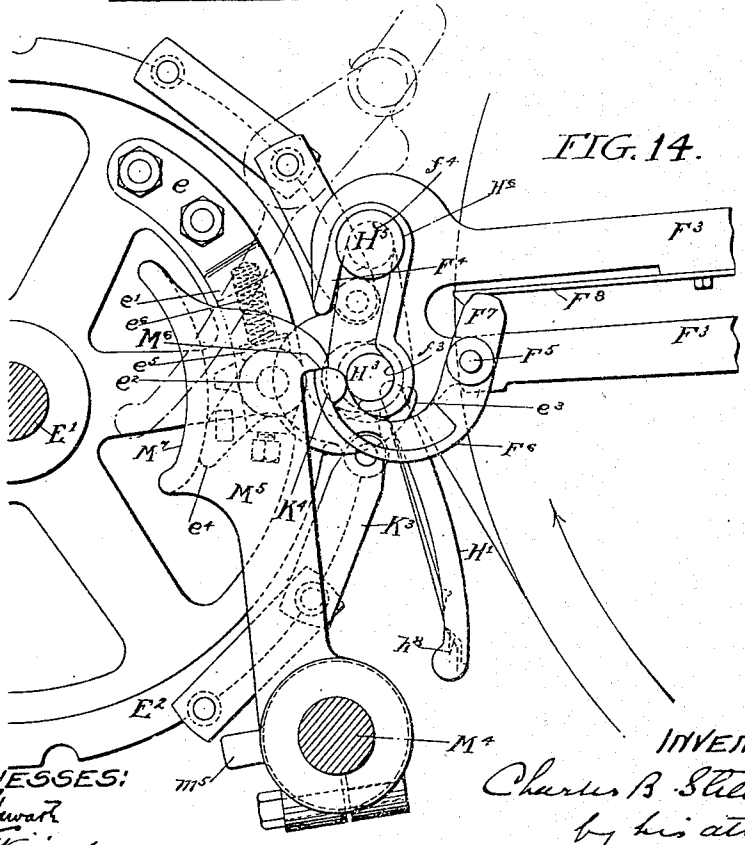


FIG. 13.

FIG. 14.



WITNESSES:

D. Stewart

W. S. Williams

INVENTOR:

Charles B. Stilwell

by his atty

Francis J. Chambers

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19 SHEETS—SHEET 8.

FIG. 15.

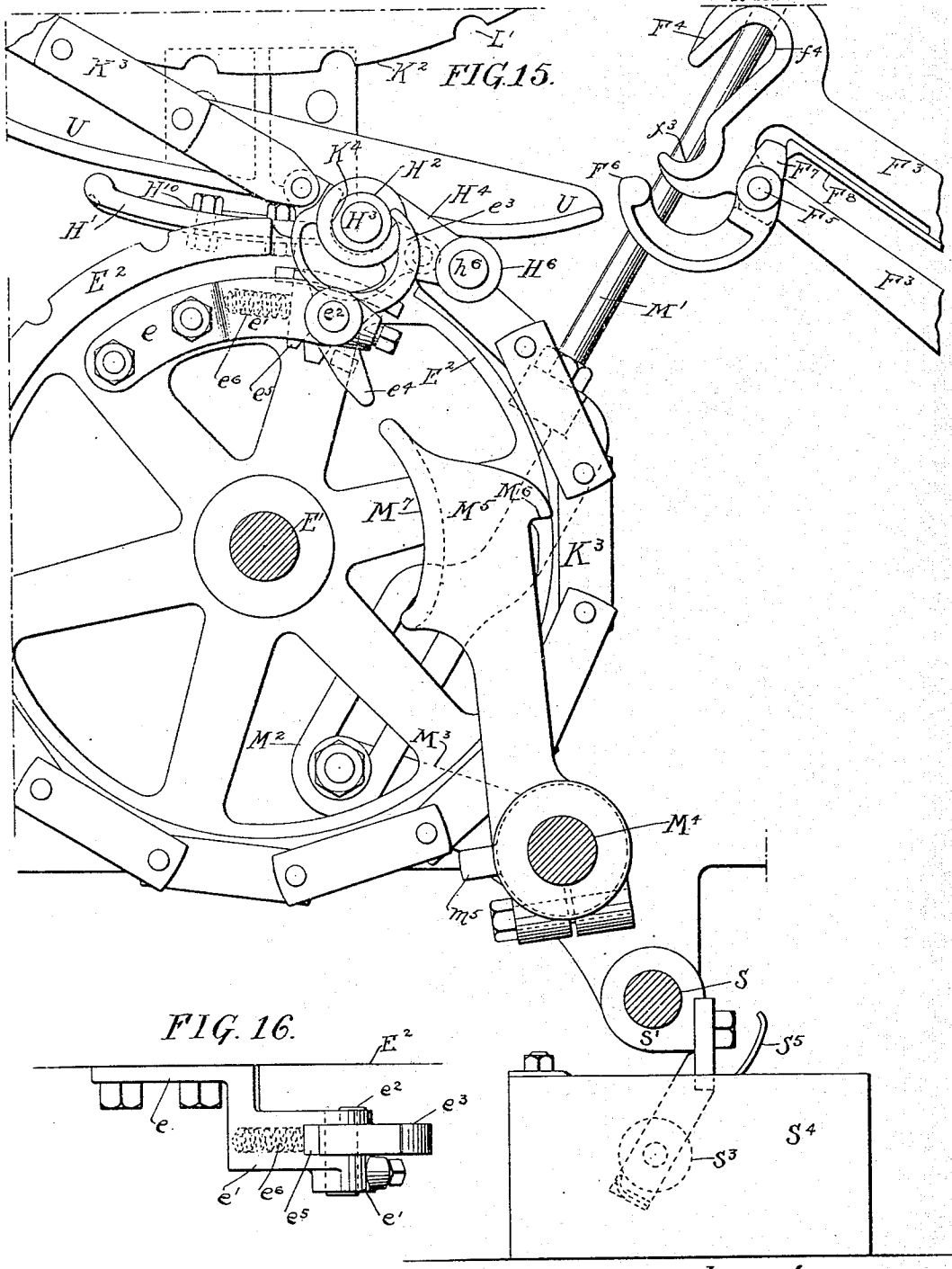


FIG. 16.

Witnesses:
L. Stewart
A. D. Williamson

Inventor:
Charles B. Stilwell
by his atty
Francis D. Chambers

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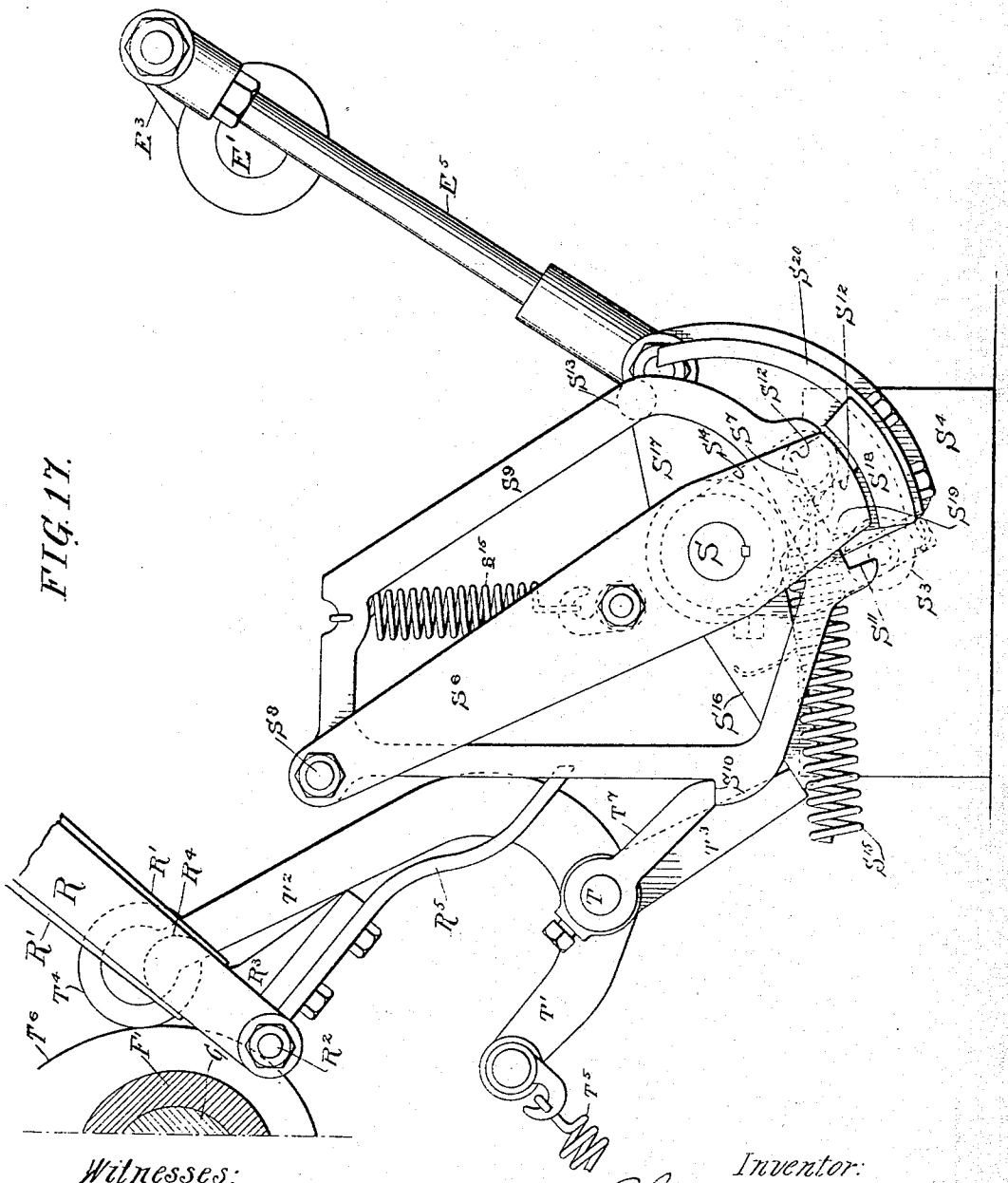
C. B. STILWELL.

PAPER FEEDING MACHINE.

APPLICATION FILED APR. 18, 1902. RENEWED APR. 8, 1905.

19 SHEETS—SHEET 9.

FIG. 17.



Witnesses:
B. Stewart
A. F. Williamson

Inventor:
Charles B. Stilwell
by his atty.
Francis J. Chambers

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19 SHEETS—SHEET 10.

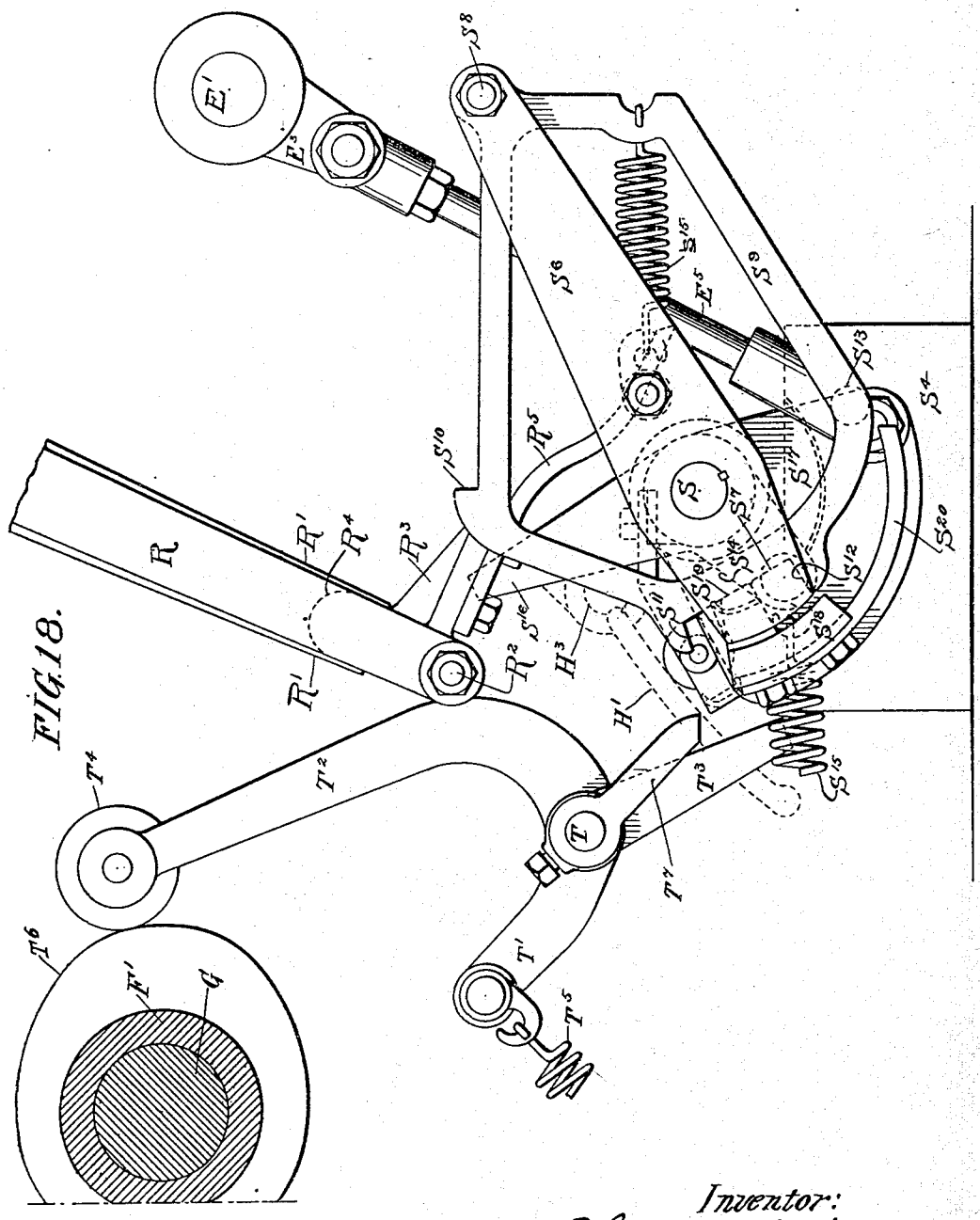


FIG. 18.

Witnesses:
H. Howard
A. C. Williamson

Inventor:
Charles B. Stilwell
by his atty
Francis J. C. Lumbers

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C. B. STILWELL.

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19 SHEETS—SHEET 11.

FIG. 20.

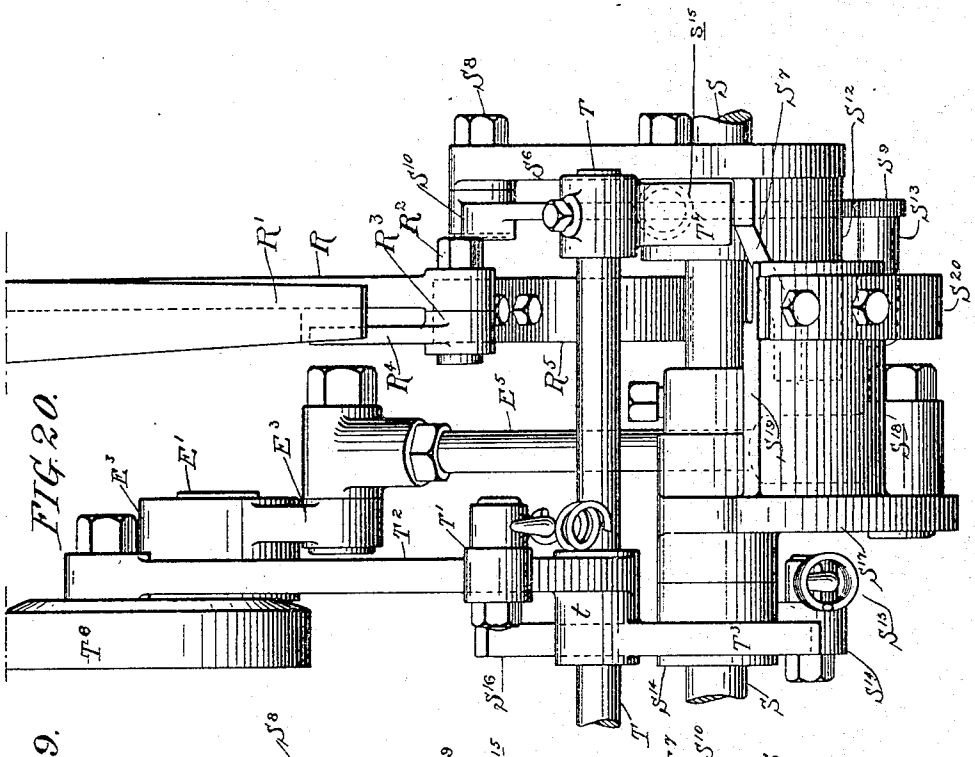


FIG. 19.

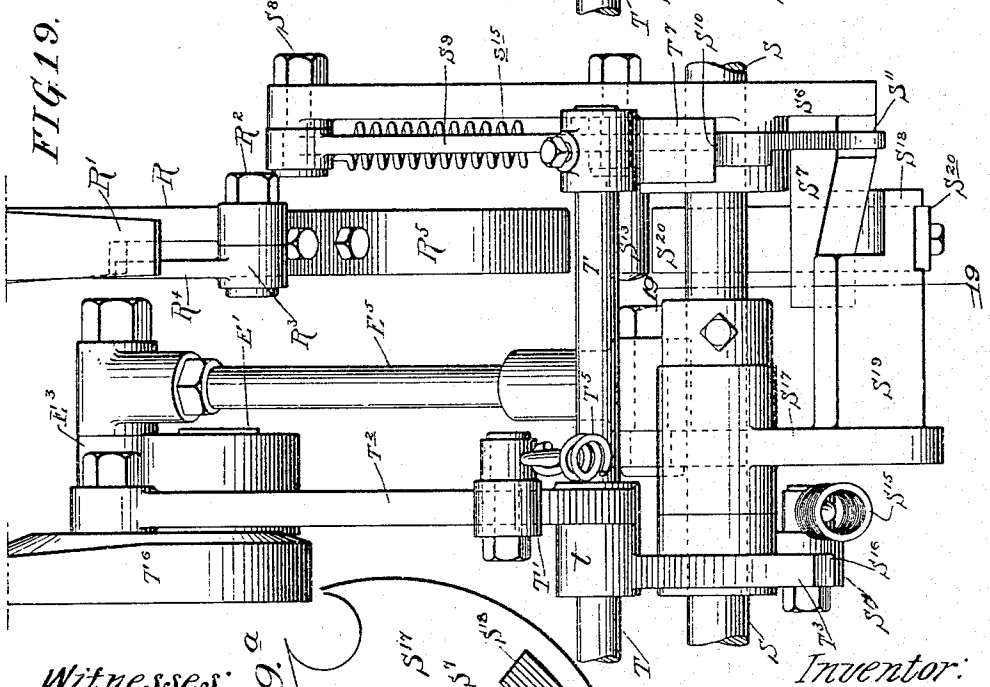
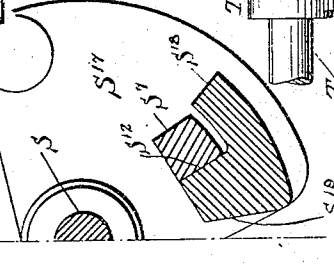


FIG. 19a



Witnesses:
S. Stewart
A. F. Williams

Inventor:
Charles B. Stilwell
by his atty
Francis D Chambers

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C. B. STILWELL.

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19 SHEETS—SHEET 12.

FIG. 21

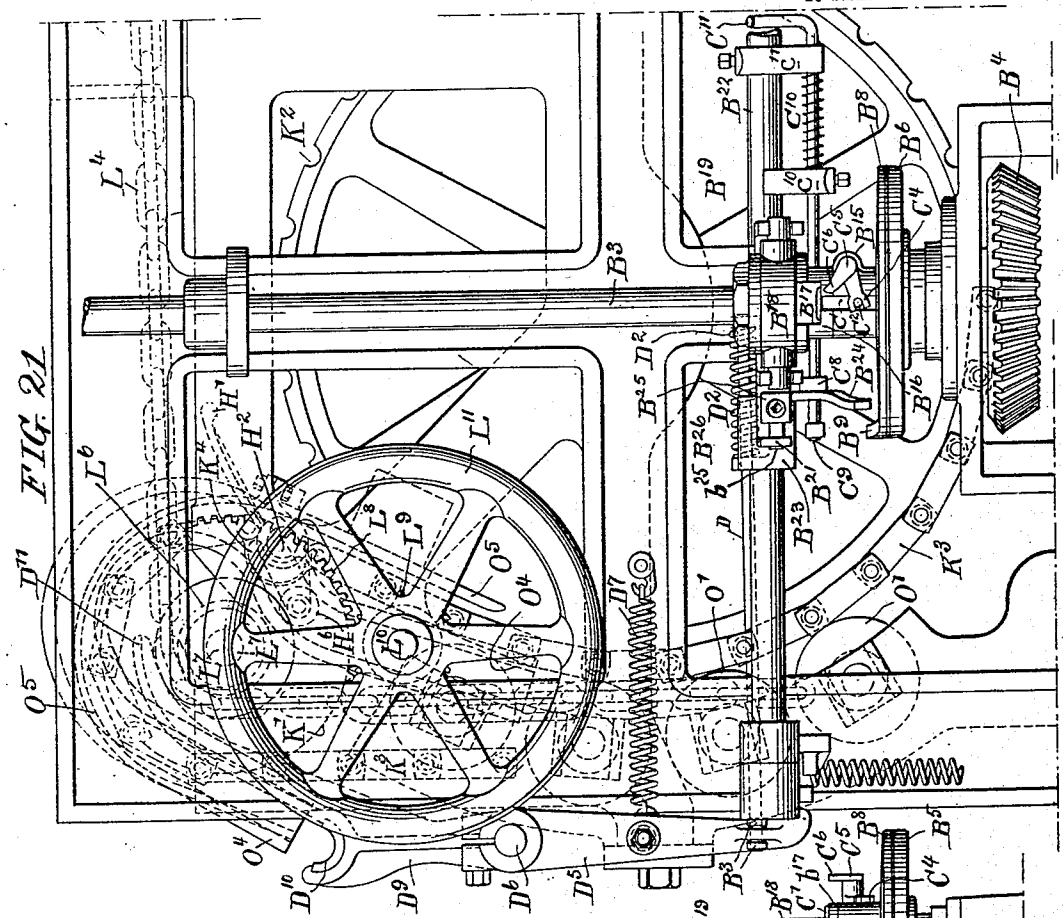
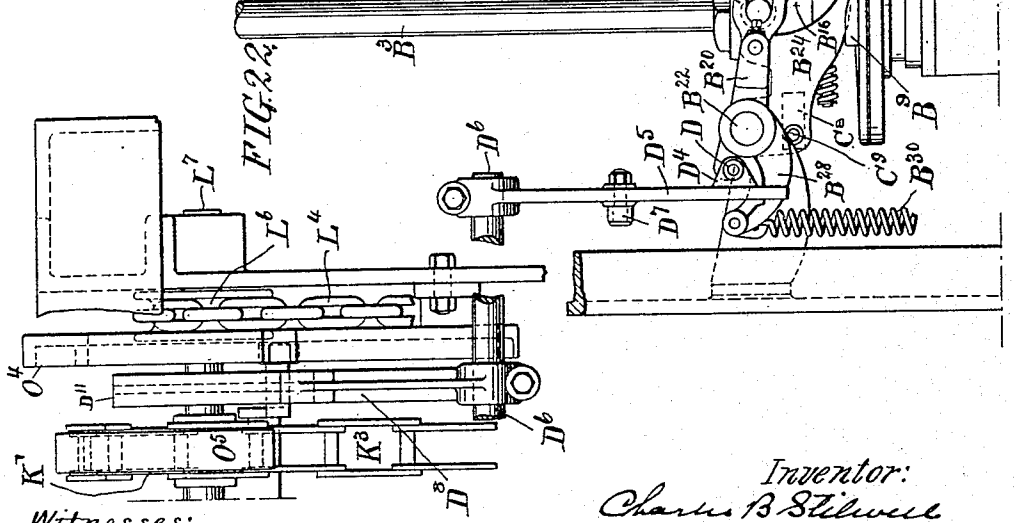


FIG. 22



Witnesses:

E. Stewart

D. S. Williamson

Inventor:

Charles B. Stilwell

by his atty

Francis D. Chambers

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C. B. STILWELL.

PAPER FEEDING MACHINE.

APPLICATION FILED APR. 18, 1902. RENEWED APR. 8, 1905.

19 SHEETS—SHEET 13.

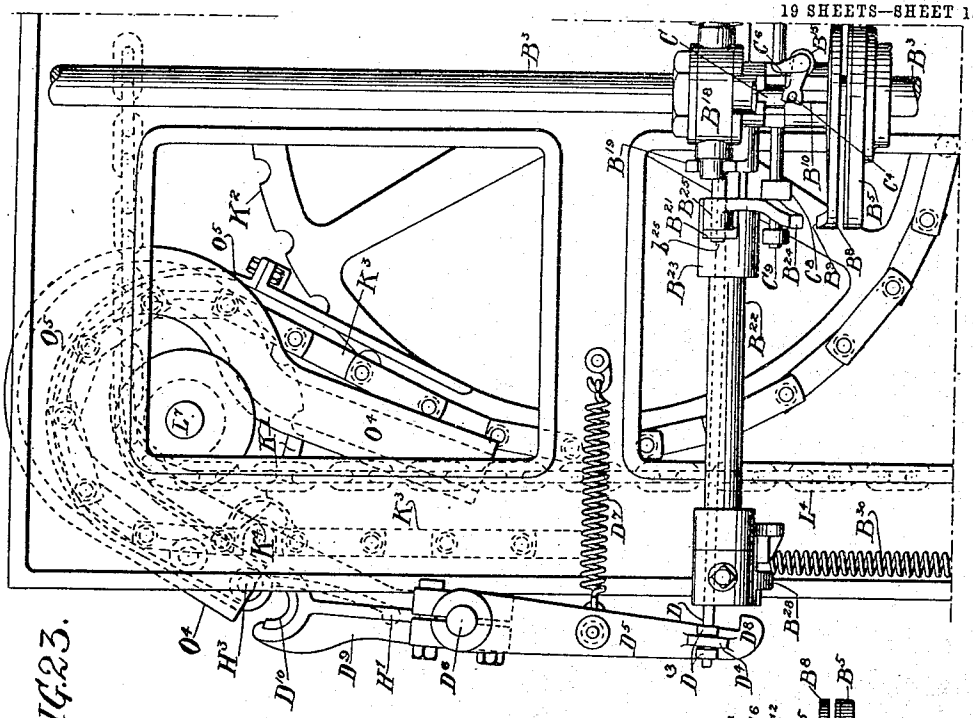


FIG. 23.

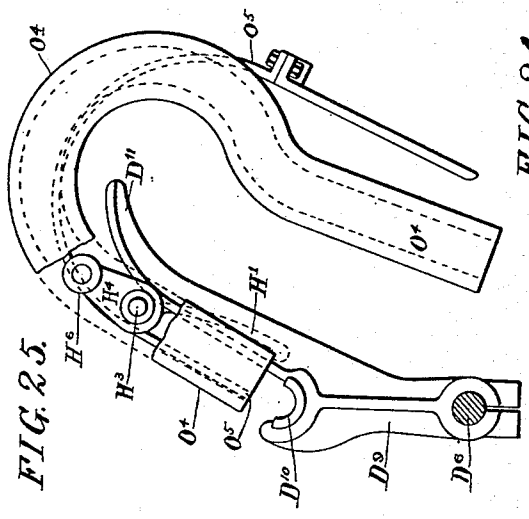


FIG. 25.

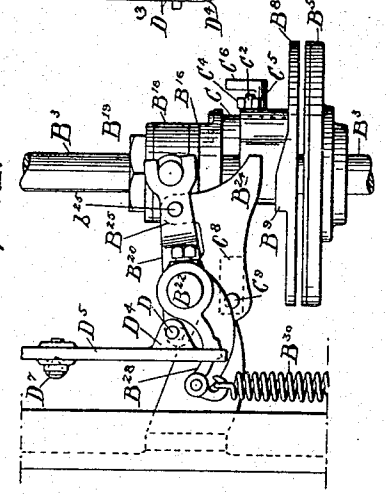


FIG. 24.

Witnesses:
H. Hewart
D. F. Williams

Inventor:
Charles B. Stilwell
by his atty
Francis D. Chambers

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C. B. STILWELL.

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APPLICATION FILED APR. 18, 1902. RENEWED APR. 8, 1905.

19 SHEETS—SHEET 14.

FIG. 26.

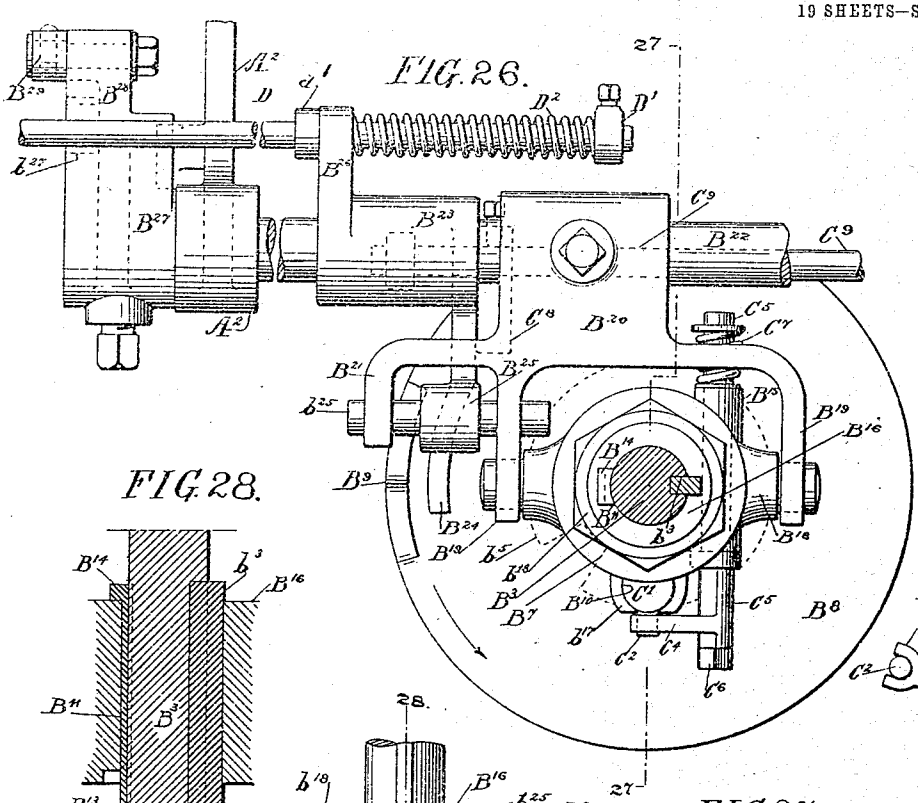


FIG. 28.

FIG. 29.

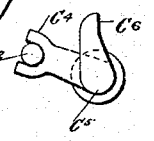


FIG. 27.

Witnesses:

A. Stewart

H. C. Williams

Inventor:

Charles B. Stilwell

by his atty

Francis J. Chambers

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C. B. STILWELL.

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19 SHEETS—SHEET 15.

FIG. 31.

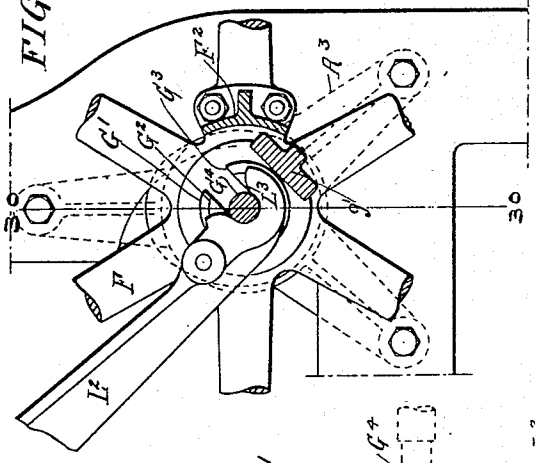


FIG. 30a.

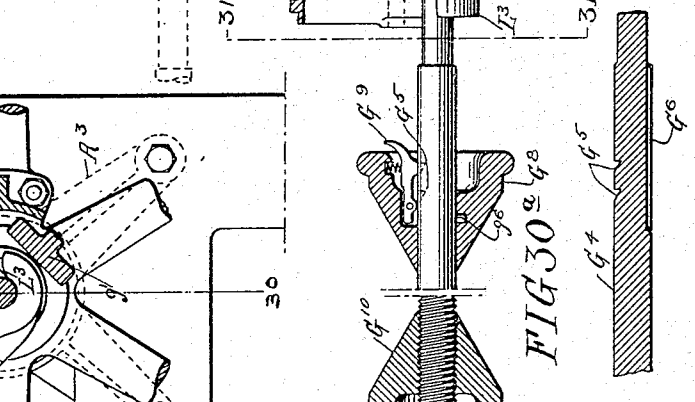


FIG. 30.

Witnesses:

H. Thurston

D. D. Williamson

Inventor:

Charles B. Stilwell.

by his atty

Francis D. Chambers

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C. B. STILWELL.

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APPLICATION FILED APR. 18, 1902. RENEWED APR. 8, 1905.

10 SHEETS—SHEET 16.

FIG. 32.

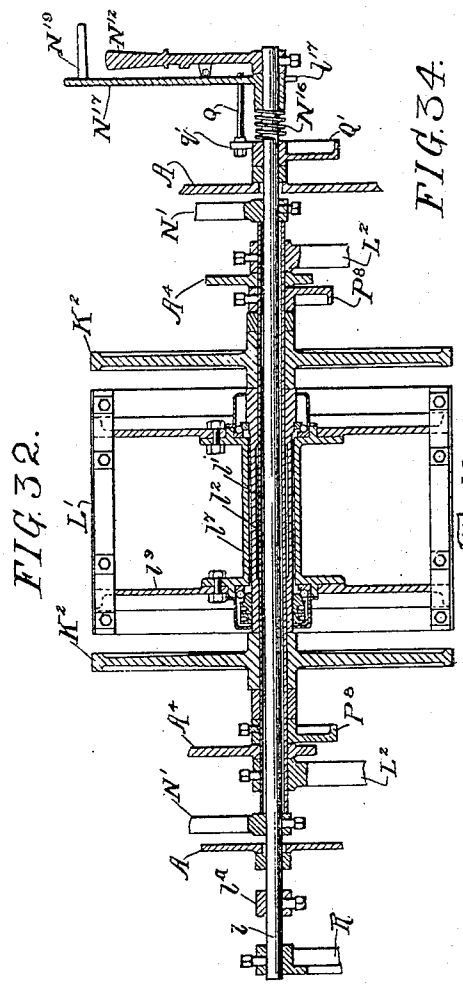


FIG. 34.

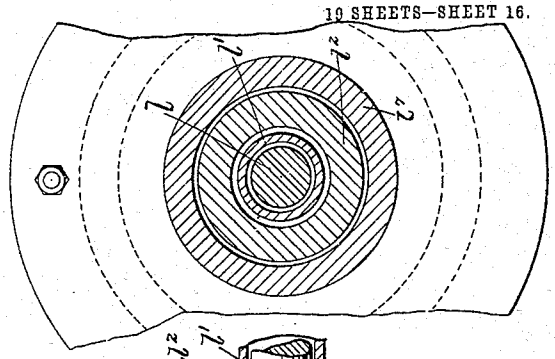
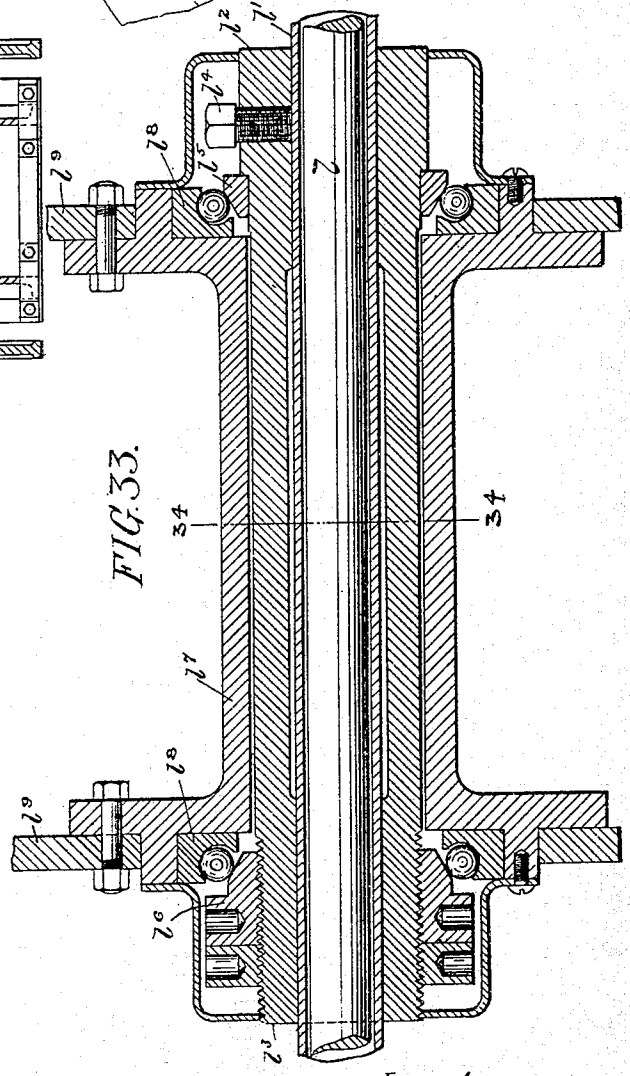


FIG. 33.



Witnesses:
H. Stewart
D. S. Williamson

Inventor:
Charles B. Stilwell
by his atty
Francis D. Chambers

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C. B. STILWELL.

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19 SHEETS—SHEET 17.

FIG. 36.

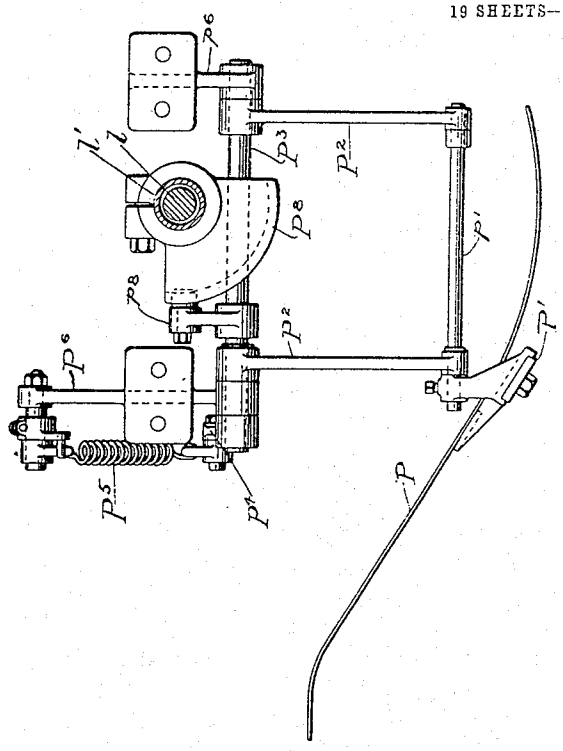
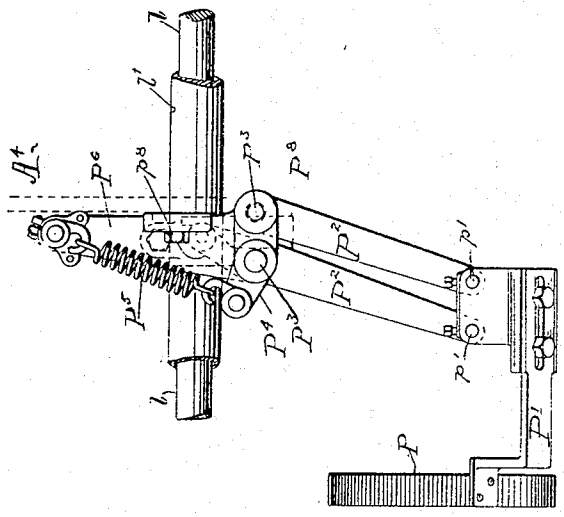


FIG. 35.



Witnesses:
F. Stewart
W. F. Williamson

Inventor:
Charles B. Stilwell
by his atty
Francis D. Chambers

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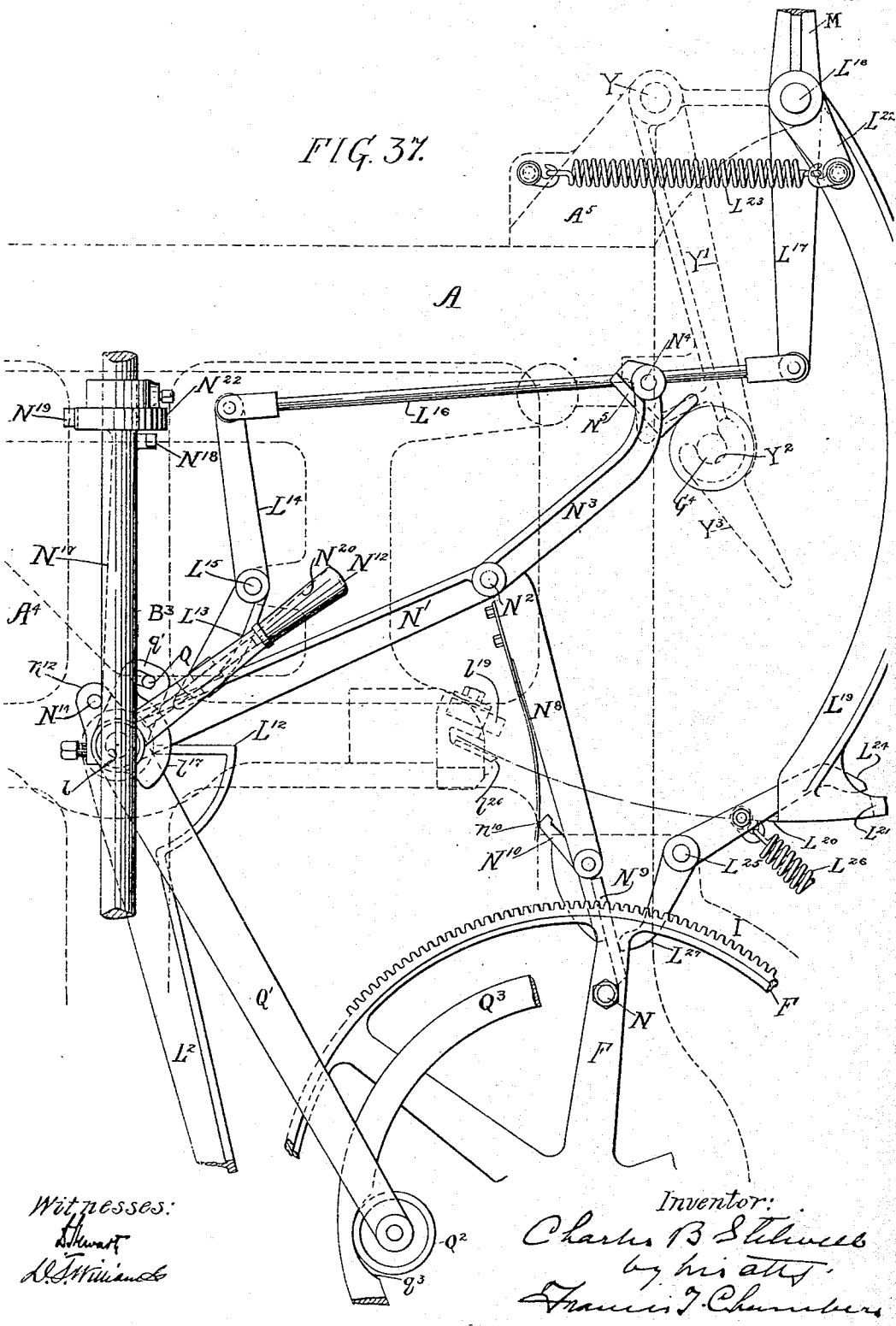
C. B. STILWELL.

PAPER FEEDING MACHINE.

APPLICATION FILED APR. 18, 1902. RENEWED APR. 8, 1905.

19 SHEETS—SHEET 18.

FIG. 37.



Witnesses:
L. Stewart
D. T. Williams

Inventor:
Charles B. Stilwell
by his atty.
Francis J. Chambers

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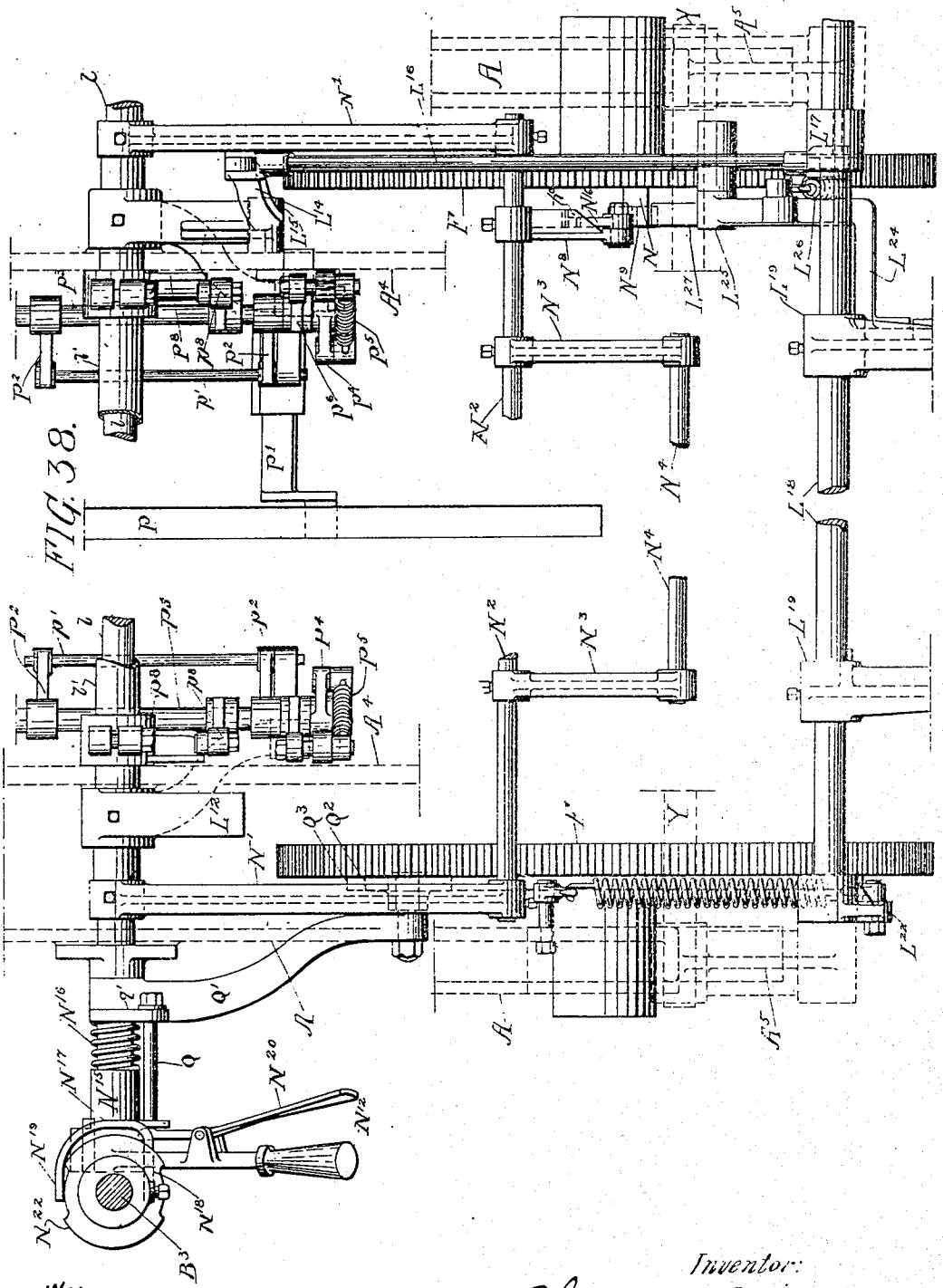
C. B. STILWELL.

PAPER FEEDING MACHINE.

APPLICATION FILED APR. 18, 1902. RENEWED APR. 8, 1905.

19 SHEETS—SHEET 19.

FIG. 38.



Witnesses:
J. Howard
H. T. Williams

Inventor:
Charles B. Stilwell
by his atty.
Francis J. Chamberlain

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UNITED STATES PATENT OFFICE.

CHARLES B. STILWELL, OF WAYNE, PENNSYLVANIA.

PAPER-FEEDING MACHINE.

No. 808,883. Specification of Letters Patent. Patented Jan. 2, 1906.

Application filed April 18, 1902. Renewed April 8, 1905. Serial No. 254,530.

To all whom it may concern:

Be it known that I, CHARLES B. STILWELL, a citizen of the United States of America, residing in Wayne, in the county of Delaware, in the State of Pennsylvania, have invented a certain new and useful Improvement in Paper-Feeding Machines, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to paper-feeding mechanism, and has for its object to provide a machine which will support two rolls of paper, one being drawn off for use and the other held in reserve until the first roll is practically exhausted, when its end is pasted to the end of the first roll, the web of the first roll cut off, practically at the pasted seam, and the feeding continued from the second roll without interruption.

My machine makes provision for the constant supply of fresh rolls of paper to be successively attached to and continue to feed indefinitely, and its various parts are devised for the purpose of making practicable and convenient the broad general operation indicated above.

My machine comprises, in the first place, bearings for a roll of paper in use and devices for guiding the paper from said roll through the machine in a definite path, the paper being drawn through these guideways by the paper-using machinery, which forms no part of my present invention, or machine and is not illustrated in the drawings.

My machine also comprises bearings for a roll of paper to be held in reserve and mechanism for giving to this reserve roll of paper a rotative movement on its bearings which will impart to its periphery substantially the same speed as that with which the web in use is moving through the machine, so that when the web of the reserve roll is attached to the web in use there will be no jerk or shock which will tend to tear the paper. In practice I attach the end of the web of the reserve roll to a bar-plate which I call a "stick, said stick normally rotating around the bearings for the reserve roll, but being capable of detachment from the rotating mechanism and simultaneous adjustment to carrier mechanism which will bring it in contact with the web of paper from the roll in use so glue being attached to the paper on the stick said paper will be glued fast to the web in use, the carrier mechanism being so constructed and combined with other devices that after it has performed its function in applying the paper on the stick to the web in use it will detach the stick from the paper and carry it to a non-operative position. In practice I find it advisable to impart the rotative movement to the reserve roll through the stick and the web of the paper from the reserve roll attached to the stick, and as the web of paper is incapable of withstanding sudden shocks I set the rotating mechanism in operation by means of a friction-clutch, connecting a conveyer-shaft with said mechanism and by means of which the motion to the power-shaft can be gradually communicated to the rotating mechanism, and a gradually accelerating speed thus given to the reserve roll of paper at the same time. It being important that the stick and reserve roll should have the proper determined speed at the time when the web of the reserve roll is attached to the web in use I find it advisable to employ, in addition to the friction-clutch, a positive clutch by means of which the power-shaft can be positively coupled to the rotating mechanism after said rotating mechanism has reached a proper speed of rotation. The operations which take place in applying the web of the reserve roll to the web in use are, in the first place, the cutting off of the web in use from its roll, in the second place the application of paste to the end of the reserve roll held upon the stick, and in the third place the detachment of the stick carrying the pasted end of the reserve roll from rotative mechanism and its attachment to the carriers which bring it in contact with the end of the web in use, and I bring all these devices into operation at practically the same time by means brought to operative position through the decreasing diameter of the roll of paper in use, so that when said roll has reached a determined diameter the paper being nearly exhausted, the cutter, paster, and the transferring device are automatically brought into operation, but as these operations should obviously have a definite relationship not only to the exhaustion of paper on the roll, but also to the movement of the rotating mechanism, I provide a cam or equivalent mechanism operated by said rotating mechanism and which also acts upon the devices for cutting off the web in use and applying the reserve roll to its end, so that these operations only take place in a definite relationship to the position of the rotating

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mechanism, and as it is often advisable that the position of the seam should be definitely located with respect to the mechanism which consumes the paper I, by preference, provide a second regulating-cam driven by the power-shaft and which also determines the cutting off, &c., of the paper with definite relationship to said movements of the power-shaft.

The above are the leading features of my invention in my new machine, which in its detail will be best understood as described in connection with the drawings forming part of this application, and in which—

Figure 1 is a rear elevation of the machine—that is to say, of that end of the machine at which the rolls of paper are supplied. Figs. 1[a] and 1[b] are views of the upper end of the machine not shown in Fig. 1 on account of lack of space. Fig. 2 is an elevation of the front of the machine. Fig. 3 is a side elevation of the machine viewed from the right-hand side of Fig. 1. Fig. 4 is a side elevation of the machine viewed from the left-hand side of Fig. 1. Fig. 5 is a cross-sectional side elevation of the machine, taken as on the line 5 5 of Fig. 1. Fig. 6 is a side elevation of the carrier-arms for the stick, showing the stick and the "loader" in cross-section, taken as on the line 6 6 of Fig. 9. Fig. 6[a] is an end elevation showing the manner in which the stick and its connected appliances are secured in the carrier-arms. Fig. 7 is an end elevation of the stick and loader, the loader being shown as in the act of coming into operation to fasten the paper on the stick. Fig. 8 is a similar end view of the loader thrown back out of operative position. Fig. 9 is a plan view of the loader; Fig. 10, a plan view of one end of the stick; Fig. 11, an end view of the stick. Fig. 12 is a view illustrating the mode in which I apply paste to the paper held on the stick, the view taken as on the line 12 12 of Fig. 1. Fig. 13 is a view of one end of the paste-roll. Fig. 14 is a sectional view taken as on the line 14 14 of Fig. 1, illustrating the devices acting to lift the stick from the carrier-arms and connect it with the feed-chain. Fig. 15 is a view similar to Fig. 14, illustrating the same parts in a condition consecutively following that of Fig. 14. Fig. 16 is a detail of a device shown in Figs. 14 and 15 as attached to the chain-wheel illustrated in those figures. Fig. 17 is a side elevation, of course on a much larger scale than the assembly views, showing the mechanism for operating the paste-roll, said mechanism being shown in its non-operative position. Fig. 18 is a view of the same parts shown in Fig. 17, but showing the mechanism in operative position. Fig. 19 is a side elevation of the paste-applying mechanism shown in Fig. 17 in the same position as it is shown in said Fig. 17; Fig. 19[a], a section on line 19 19 of Fig. 19. Fig. 20 is a similar side elevation showing the same parts in the position in which they are illustrated in Fig. 18. Fig. 21 is a view of the upper left-hand corner of the machine, as shown in Fig. 4, depicted on a larger scale. Fig. 22 is a front elevation of the clutch device shown in side elevation in Fig. 21 and of the feed mechanism for the stick, shown at the upper left-hand corner of Fig. 1, showing the connection between said devices. Fig. 23 is a view similar to Fig. 21, but showing the clutch and feed mechanism in a different position. Fig. 24 is a view similar to the lower part of Fig. 22, showing the same parts, but in alternative positions. Fig. 25 is a detached view of the guide mechanism for the stick, shown chiefly in dotted lines in Fig. 23. Fig. 26 is a plan view, on a much larger scale, showing the clutch-actuating mechanism. Fig. 27 is a cross-sectional view taken on the line 27 27 of Fig. 26. Fig. 28 is a cross-sectional view through the shaft and its immediate connections, taken on the line 28 28 of Fig. 27. Fig. 29 is a detail of one of the clutch-actuating devices. Fig. 30 is a longitudinal section through the supports for the paper-roll in its first position in the machine, the section being taken as on the line 30 30 of Fig. 31 looking toward the left. Fig. 30[a] shows a portion of the shaft G^4, taken on the section-line 30 30 of Fig. 31, said shaft being shown in full lines in Fig. 30. Fig. 31 is a cross-sectional view taken as on the line 31 31 of Fig. 30. Fig. 32 is a longitudinal sectional view taken as on the center line of the shaft *l*, but showing said shaft in full lines. Fig. 33 is an enlarged view of the central portion shown in Fig. 32. Fig. 34 is an end view of Fig. 33. Fig. 35 is a detached rear elevation of the paper-guide P and the mechanism by which it is retracted laterally when necessary in the operation of the machine. Fig. 36 is a side elevation of the same mechanism. Fig. 37 is a detached view, on an enlarged scale, showing the mechanism which regulates the mechanism of the paper-severing striker and which also, as will be explained, affects the operation of the paste-applying mechanism and of the mechanism which detaches the stick and the end of the new roll of paper from the carrier-arms and delivers it to the carrier-chains. Fig. 38 is a plan view, on an enlarged scale, of certain portions of the mechanism in my machine.

The rolls of paper upon which my machine operates are secured between the cones G^8 and G^{10} on the shaft G^4. (See Fig. 30.) As shown, the cone G^{10} is adjustable on a threaded portion G^7 of the shaft G^4, and the cone G^8 is made detachable, being secured to rotate with the shaft by the engagement of a pin g^6 with a slot G^6 (see Fig. 30[a]) and being retained in position on the shaft by the engagement of a spring-latch G^9 with a detent G^5. The roll from which the paper is being drawn for use is normally supported on the hook-arms Y′,

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pivoted to extensions A^5 of the frame at Y, (see Figs. 3, 4, and 5,) and the paper passes from the roll beneath the drum L′ and over the paper-guides P, following the circumference of the drum L′ until it passes under the small guide-roller, (indicated at o',) from which it is carried to the mechanism (not shown) which draws it from the roll for consumption. Such mechanism may be tube-forming mechanism for a paper-bag machine or any other mechanism which is adapted to draw a web of paper through it while consuming or operating upon it.

It will be seen from what I have described that my illustrated mechanism does not comprise any device which operates to draw the paper from the roll, the drum L′, as shown in Figs. 32 and 33, being preferably constructed with ball-bearings, so that it will rotate with the least possible friction and resistance. Thus the drum L′ is supported, as shown in Figs. 32 and 33, by webs l^9, secured to a central hub l', which, through appropriate bearings l^8, rests and turns on balls supported on bearings l^5 and l^6, the latter being adjustable on the threaded end l^3 of a tubular bearing-section l^2, which is secured, as by a set-screw l^4, to the tubular shaft l', through which runs the shaft l.

Passing now to the operative features of the mechanism illustrated in the drawings, I would state that said mechanism is driven by a shaft B, (see Figs. 2 and 4,) which shaft is driven by or moves with definite relationship to the tube-making or other mechanism of the consuming apparatus, (not shown in the drawings,) and which, as I have said, may be of any description. The shaft B has attached to its end a bevel-gear B′, which engages and drives the bevel-gear B^2, which is attached to the end of the vertical shaft B^3. This vertical shaft extends through a portion A′ of the frame through which also extends the sleeve-hub b^4, (see Fig. 27,) which has attached to its lower end a bevel gear-wheel B^4 (see Figs. 2 and 4) and to its upper end the clutch-disk B^5, which rests upon the portion a' of the framing A′ (see Figs. 4 and 27) and supports the annular friction-disk B^6, which has its central portion recessed, as shown at b^5, Fig. 27, with an inwardly-extending finger B^7, lying in said recess. The hub b^4 is not keyed to the shaft B^3, and therefore the gear-wheel B^4 is not directly driven by said shaft. They are engaged, however, at proper times by means of the clutch-disk B^8, (best shown in Figs. 26, 27, and 28,) the said disk being keyed to the shaft, the key being shown at b^3 and formed with a perforation B^{10}, extending through its face and through an extension of its hub, the hub extension being slotted. In this perforation moves vertically a pin C, having a flanged head C′, a laterally-extending pin C^2, which reaches out through the slot of the perforation B^{10}, and a terminal-engaging tooth C^3, which when the pin C is forced down through the perforation in the disk B^8 enters the recess b^5 and engages the inwardly-extending finger B^7. It will thus be seen that the clutch described can serve both as a friction-clutch through the contact of the disk B^8 with the annular friction-pad B^6 and also as a positively-locking clutch by the engagement of the tooth C of the pin C with the finger B^7. Passing for the present the description of the mechanism which acts upon the clutch and noting that in addition to the gear-wheel B^4 the only device driven by the shaft B^3 is a cam N^{22}, situated near its top, I will pass to a description of the mechanism operative through the bevel-gear B^4. This gear engages and drives the bevel-gear E, secured to the shaft E′, to which shaft are secured the chain-wheels E^2, (see Fig. 2 and Figs. 14 and 15,) also the gear-wheels E^4 E^4 (shown in Fig. 2) and the crank E^3, said crank actuating the connecting-rod E^5, the function of which will be hereinafter described. The gear-wheels E^4 engage and drive the gear-wheels F F, which (see Figs. 1, 3, 4, 30, and 31) are secured to the sleeve-hubs F′, journaled on the studs G G, (best shown in Fig. 30,) said studs in turn being secured to the spider-like supports A^3 A^3 on the opposite sides of the machine. The sleeve shown at the right-hand side of Figs. 1 and 30 has secured to it a cam T^6, the function of which will be hereinafter described, and the stud-shafts G G are formed with terminals cavities to receive the bearings G^2, said bearings and the wall of the cavities in the stud-shaft in which they set being slotted, as indicated at G^3 in Fig. 31, to enable the ends of the roller-supporting shaft G^4 to be inserted and withdrawn from it. Each stud-shaft is also, as shown in Fig. 30, provided with a terminal collar G′, slotted to correspond with the slots in the end of the shaft and bearings and utilized to hold the wheel-hubs F′ in position. As shown, these collars have arms g' (see Figs. 1 and 5) extending out from them. One of these arms supports the pad n^6, which is adjustable, but fixed in position when in use, and the other arm holds the elastically-supported pad n^7. These pads n^6 and n^7 press on the sides of the roll of paper and aid in holding it in fixed central position.

F^2 F^2 (see Figs. 1, 4, 5, and 31) are arms projecting inwardly and opposite to each other from a point on the hub or spokes of the gear-wheel F, and from the ends of these arms F^2 extend the radial "stick-supporting" arms F^3 F^3. (Best shown in Figs. 3 and 4, 12, 14, and 15.) These arms are longitudinally slotted, as indicated, to save weight, and at their ends have the conformation well shown in Figs. 12, 14, and 15—that is to say, the arms F^3 have a permanent hook F^4 formed at one side, at the bottom of which is formed the socket f^4, and somewhat beyond

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the end of the hook they are formed with a second socket, (indicated at f^3.) Somewhat in from this socket pins F^5 are secured to the arms F^3 and hooks F^6 pivoted thereon and provided with extensions F^7, which are engaged by the springs, (indicated at F^8,) said springs acting to frictionally lock the hooks either in the position shown in Fig. 14 or in that shown in Fig. 15. It will be evident from what has been described that the gear-wheel B^4 when in operation drives the gears F and through them the stick-supporting arms F^3, which are rotated in the same direction as are the hands of a watch. Through the chain-wheels E^2, secured on the shaft E', the gear B^4 also actuates the endless chain, (indicated at K^3.) This chain passes up over the chain-wheels K^2, which are journaled on the sleeved shaft l' (see Figs. 32, 33, and 34) and which carry the chain on a path which coincides substantially with the face of the loosely-running drum L', already described. Leaving the chain-wheels K^2 the chain passes over chain-wheels K', which are journaled on the shaft L', (see Figs. 3, 5, 21, 22, and 25,) and thence passing downward the chain moves over the chain-wheels K to the driving-chain wheels E^2. It will be noticed that the chain K^3 is provided at equidistant intervals with socket-links, (indicated at K^4.)

Passing now to the mechanism driven by the crank-arm E^3 and the connecting-rod E^5 and which is best shown in Figs. 17, 18, 19, 19^a, and 20, the connecting-rod E^5 is coupled to a pin projecting out from the segment S^{17}, pivoted on the shaft S and having projecting outward from its face the flange S^{18}, near the upper end of which is secured the segmental plate, (indicated at S^{20},) the flange S^{18} being also formed with an inwardly-extending rib or flange, as indicated at S^{19}. At each revolution of the shaft E' the plate S^{17} moves from the position shown in Fig. 17 to that shown in Fig. 18, and back again.

Keyed to the shaft S is a lever S^6, provided on its shorter end with an inwardly-extending flange or finger, (indicated at S^7,) so placed as to abut against the flange S^{19} when the parts are in the position illustrated in Figs. 17 and 19. To the end of the longer arm of the lever S^6 is pivotally connected at S^8 the frame shown at S^9, said frame being also connected with the lever S^6 by a spring S^{15}. The frame S^9 is formed with an inwardly-extending pin S^{13}, and at its end opposite to that to which it is pivoted to the lever S^6 it is formed with outwardly-projecting fingers S^{11} S^{12}, between which passes the flange or fingers S^7 of the lever S^6, which flange or finger is considerably broader at its base where it passes between the fingers S^{11} S^{12} than it is at its end where it contacts with the flange S^{19}. The frame S^9 is also provided with a stop-lug, (indicated at S^{10}.) Also keyed or otherwise secured to the shaft S are the levers S^{14} and S^{16}, the lever S^{14} having attached to it the spring S^{15}, which tends to revolve the shaft S toward the right, and the lever S^{16} acting as a stop by coming in contact with the stop-lever T^3, as shown in Figs. 17 and 19. This stop-lever T^3 is secured to a sleeve t, which is journaled on the shaft T and to which sleeve is also secured the lever-arms, (indicated at T' and T^2) T^5 indicating a spring which tends to turn the sleeve toward the left, and the bent lever-arm T^2 carrying at its end a cam-roller T^4, which rests in contact with the cam T^6 on the hub F', already described.

T^7 indicates a fixed stop-finger secured to the shaft T and adapted to engage the stop-lug S^{10} on the frame S^9, as shown in Fig. 17.

R^5 is a finger which through mechanism to be hereinafter described comes under certain conditions into the position indicated in Figs. 18 and 20—that is to say, with its end shifted so far to the right that it projects under the pin S^{13} in the position said pin occupies in Fig. 17 and lying in the path of the segment S^{20}.

The shaft S has attached to it the collars S' S', (see Figs. 1 and 12,) which support the arms S^2, to the ends of which is journaled the paste-roller S^3 and which also support the scraper, (indicated at s^3.) In normal position the paste-roller is immersed in the paste-box S^4; but when the shaft S is rotated toward the left it moves by running along the plate S^5 and comes in contact with the paper on the stick, as shown in Fig. 12.

In normal operation the plate S^{17} moves between the positions shown in Figs. 17 and 18, and the stop-finger T^3 is at each rotation of the cam T^6 shifted from the position shown in Fig. 17 to that shown in Fig. 18, disengaging the stop-lever S^{16}. The stop-finger T^7, however, is not shifted by the cam T^6 and, remaining in engagement with the stop-lug S^{10}, prevents the frame S^9 and the lever S^6 from moving, so that the shaft S and the paste-rolls are not moved. When, however, the finger R^5 passes below the pin S^{13} and into the path of the end of the segment S^{20}, the upward movement of the said segment acts through the finger R^5 on the pin S^{13} and shifts the frame S^9 toward the right, thereby disengaging the lug S^{10} from the finger T^7, so that on the next downward movement of the segment S^{17} the lever S^6 will follow its movement, bringing the paste-roll up out of the paste-box and into contact with the paper on the stick, and it will readily be seen that after the paste is applied the next succeeding return movement of the plate S^{17} will restore the various parts to their normal non-operative position, as shown in Fig. 17, provided the cam T^6 leaves the stop-lever T^3 out of operation, which, as will be hereinafter described, is the case.

Passing now to a description of what I have

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referred to as the "stick," I will describe it next, because it is engaged by the hooks at the ends of the arms F^3 and moves with these hooks. The construction of this stick is best shown in Figs. 6, 6^a, 7, 10, and 11. H' H' indicate the end pieces of the stick, said end pieces connecting with a cross-plate H^9 and with outwardly-extending journals H^2 H^2, having terminal portions H^3 of smaller diameter and carrying the arms H^4, which support the pins H^5 and cam-rollers H^6. To the said pieces H' is secured the metal plate H^9, (see Fig. 6,) to the face of which is secured a rubber plate H^{10} and to the rear portions of which is secured, through the lugs h^9, (shown in Figs. 6 and 10,) the spring-plate H^7, which projects beyond the plate H^9 and has secured to the inside of its projecting end the head H^8, in which in turn are secured the projecting teeth, (indicated at h^8.) The stick is secured to the arms F^3, as shown in Figs. 6 and 6^a—that is to say, the laterally-projecting pins H^5 are inserted in the hooks F^4, the pin portion H^3 pressed up into the recess f^3, and the hook F^6 turned down over this pin portion H^3, locking the stick in position on the arms F^3, as shown in Fig. 6. The stick, however, is not placed in the supporting-hooks of the arms F^3 until after a roll of paper has been secured in the recess at the end of said shafts G G by engaging the ends of the roller-supporting shaft G^4 therewith, as shown in Figs. 30 and 31. The stick is then placed in the hooks as described, the said hooks being in the positions indicated in Figs. 3 and 4, and the end of the web of paper on the roll is then brought down under the lower end of the stick, up over its rubber face H^{10}, and over the end of the plate H^7, all as indicated by the dotted line w' in Fig. 6. It will be seen that in this position, as shown in Figs. 3 and 4, the hook-arms are immediately below the bearings I I, supported on the frame of the machine, and in these bearings I then place what I call the "loader," which is well illustrated in Figs. 6, 7, 8, and 9. The loader has projecting from its ends bearing-pins I' I', which are rested in the bearings I I and which support the body I^3 of the loader, the end pieces I^2 of which are formed with jaws I^4 I^5, which fit over the ends of the end pieces H' of the stick, as is well shown in Fig. 7. The body of the loader extends forward to a point not quite in contact with the pins h^8, as shown at I^8, being preferably slightly recessed, as indicated at i^8, Fig. 9, to clear these pins, and it is provided with a plate I^6, which projects downward on the other side of the pins h^8. A knife-blade I^7 is secured above the plate I^6, as shown. The stick being in the position indicated and the paper being drawn over it, as described, the loader is placed in the bearings in the position shown in Fig. 8 and then turned downward through the position shown in Fig. 7 to that shown in Fig. 6, this action forcing the paper over the pins h^8, and the operator then drawing the loose end of the paper against the knife I^7 severs it, after which the loader is removed and the end of the paper is securely fastened on the end of the stick, so that when the arms F^3 are revolved they carry with them the stick and the end of the paper, which in turn communicates motion to the roll of the paper, causing it to revolve with the stick, the revolving mechanism being such as to give to the outside of the standard roll of paper practically the same speed of movement that the web of paper being drawn from the upper roll over the drum L' has imparted to it.

I will next describe the mechanism of my machine which has to do with applying and withdrawing the clutch, by means of which the motion of the shaft B^3 is imparted to the gear-wheel B^4 and through it to the chain-wheel and revolving stick-holding-arms F^3. This part of the machanism is shown in Figs. 1, 2, and 4, also on a larger scale in Figs. 21, 22, 23, 24, and 25, and some of the details on a still larger scale in Figs. 26, 27, 28, and 29. I will first note that the hub of the clutch-disk B^8 has formed upon it a hollow bearing B^{15}, (shown in Figs. 21, 23, and 26,) which supports a rock-shaft C^5, held in place by the friction of a spring C^7, set between one end of the hub-bearing B^{15} and a collar c^5 on the end of the shaft. The shaft is provided with a forked arm C^4, which is engaged with the pin C^2, projecting out from the vertically-moving pin C, and the shaft also has an upwardly-projecting lever-arm C^6, by means of which it is operated, as will be described. The upper clutch-disk B^8, which, as already stated, is keyed to the shaft B^3, is connected to a sliding hub B^{16}, (see Fig. 27,) also keyed to the shaft B^3 through the medium of a rod B^{11}, (see Fig. 28,) which is securely fastened to the disk B^8 by its upwardly-extending lugs B^{12} and B^{13}, and which is also secured to the hub B^{16} by a shoulder B^{14}, which, however, permits the hub B^{16} a certain freedom of longitudinal movement to and from contact with the hub of the disk B^8. The hub B^{16} is formed with a recess B^{17} to give passage to the head C' of the pin C, said recess being formed with outwardly-extending fingers b^{17} to engage this pin, as shown in Figs. 26 and 27. Around the hub B^{16} is placed a trunnion-ring B^{18}, held in place by a screw-ring b^{18}, the trunnions of the ring being engaged by the forked lever-arms B^{19}, extending out from a plate or arm B^{20}, which is secured to the shaft B^{22}. The arm B^{20} also supports another lever-arm B^{21}, (best shown in Fig. 26,) which arm and the adjacent arm B^{19} support a pin b^{25}, which passes through an upwardly-extending lug B^{25} of a cam-lever B^{24}, which through its hub B^{23} is pivoted on the shaft B^{22} and free to move longitudinally along said shaft. The hub B^{23} also has extending from it a lever-

arm B^{26}, through which passes the rod D, having secured to it the collars D′ d', the arm B^{26} being normally held against the collar d' by the spring D^2, which abuts against the collar D′. Through a perforation in the cam-lever B^{24} extends a rod C^9, which supports a block C^8, the other end of the rod C^9 being supported on a bearing c^{11}, attached to the shaft B^{22}, (see Fig. 21,) the extreme end of the rod being turned up to form a handle, as indicated at C^{11}, and the rod being normally forced toward the left, as shown in Fig. 21, by the action of a spring C^{10}, abutted against the bearing c^{11} and against a bearing c^{10}, secured to the shaft C^9, as shown in Figs. 2, 22, and 24. The rock-shaft B^{22} has at one end a lever B^{28} attached to it, to which is connected a spring B^3, which tends to rock the shaft in the direction to raise the lever-arm B^{20}. When the lever-arm B^{28} is raised, a lug on its side is engaged by the hook D^8 on the end of a lever D^5, which is secured to the shaft D^6 and normally drawn in, in position to engage the lever-arm B^{28}, by a spring D^7. The lower part of the lever-arm D^5 has projecting from it a lug D^4, through which projects the end of the rod D already mentioned, collars D^3 securing the said rod and the lever-arm together. The shaft D^6 has also attached to it a lever-arm D^9, which extends upward, having a crotch D^{10}, situated immediately below the guideway O^4, to be described, a curved finger D^{11} extending up beyond the crotch in position to be acted upon by the stick, passing through the guideway, as will be described. The opposite end of the shaft B^{22} to that which has attached to it the lever B^{28} has projecting out from it a lever or pin, indicated at J^4, (best shown in Fig. 1,) which in turn rests against the bent end J^3 of a lever J, which, as shown in Fig. 4, is pivoted to the frame at J′ and has a notched downwardly-extending arm J^2, which when pressed in engages a lug f^7 on the stick-carrying arms F^3, said lug being, as shown, a projecting end of the pin, on which the hook F^6 turns. The notched lever has for its purpose the holding of the stick-carrying arms in correct position to register with the loading device, which I have already described. b^{22} is a hand-lever attached to the shaft B^{22} and by means of which it can be manually operated.

To describe now the operation of the clutch. It will be understood to begin that the clutch is disconnected and the stick-carrying arms F^3 held in rigid position by engagement with the notched lever J, the roll of paper is secured in the lower bearings concentric with the center upon which the stick-carrying arms move, and the end of the roll of paper is secured to the stick, as already described. The operator then takes hold of the lever b^{22} and rocks the shaft B^{22} downward from the position shown in Fig. 27 until the hub B^{16} rests against the top of the hub of the clutch-disk B^8 and presses said disk down upon the annular friction-body B^6 of the lower clutch member. By means of this frictional contact motion is gradually imparted to the lower clutch member and through the gear B^4 to the stick-carrying arms and through them and the stick to the roll of paper, the chain, heretofore described, being also set in operation at the same time. The first movement of the shaft B^{22} before making any engagement between the members of the clutch presses the pin J^4 against the curved arm J^3 of the notched lever and disengages said lever from the stick-carrying arms, which are thus enabled to move under the first light pressure applied to the clutch. In rocking the shaft B^{22} as described its arm B^{28} is moved up and engaged by the hook at the end of the lever D^5, the parts being held in the position shown in Fig. 22. After the moving parts of the machine have attained full speed through the action of the frictional part of the clutch the operator takes hold of the end C^{11} of the rod C^9 and draws it toward the right, as shown in Fig. 21, so that the block C^8 comes into the path of the arm C^6, attached to and revolving with the upper clutch member. This contact forces this arm downward, rocking the shaft C^5 and pressing down the arm C^4, which by its engagement with the pin C^2 forces down the locking-tooth C^3 into the cavity in the lower clutch member, so that it is engaged by the shoulder B^7 and the clutch members thus positively locked together, so that as long as this engagement persists the stick-carrying arms and other parts driven by the gear B^4 move with a fixed and positive velocity. The disengagement of the clutch is effected by the passage of the stick from the guide O^4 into the notched end of the lever D^9, this taking place, as will be described, after the paper attached to the stick has been applied to the end of the old roll of paper, and the stick in passing out of the guide into the notched levers forcing said levers in and the lever D^5 out, so that it disengages the arm B^{28} and permits the spring B^{30} to draw this arm down and rock the shaft B^{22} in the direction to move the hub B^{16} upward. This upward movement of the hub first draws up the pin C and locking-tooth C^3, the head C′ of the pin being engaged with the hub, as described, and afterward through the connecting-rod B^{11}. The hub also draws up the disk B^8 to the position shown in Fig. 27. As a further security that the clutch shall be disengaged as soon as the lever D^5 moves outward the said outward movement of the lever, acting on the attached rod D and acting through the arm B^{26} and hub B^{23}, draws the cam-lever B^{24} into position to be engaged by the cam B^9 on the disk of the upper clutch member B^8, such engagement forcing the cam-lever B^{24} up and through its engagement with

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the pin b^{25} forcing the lever B^{20} B^{19} up, thus positively insuring the elevation of the hub B^{16} and through it of the upper clutch member.

I will next describe the mechanism which detaches the stick with the attached end of the paper-roll from the stick-carrying arms F^3 and connects it with the endless chains K^3, so as to bring it into operation to attach the end of the new roll of paper to the rear end of the exhausted roll and finally detaches the stick from the chains and in doing so releases the clutch which connects the bevel-wheel B^4 with the driving-shaft B^5.

It will be remembered that the arms F^3 are by the engagement of the clutch set in operation, carrying the stick with the attached end of the paper and imparting to the roll of paper the velocity with which the paper is being drawn from the roll in use. I have also described the mechanism by which paste or glue is applied to the paper passing over the face of the stick when the parts are in the position shown in Fig. 13, the operation of the pasting-roll being contingent on the described operation of the finger R^5, which I will here state comes into operation to apply the paste-roll to the paper, first, in a certain relation to the exhaustion of the roll of paper in the upper bearings, and, second, to the operation of the knife which cuts off the paper from the upper roll preliminary to the attachment of the paper from the lower roll, and, third, to the operation of the hook-lever M^5, which I am about to describe, and which also depends upon the same conditions with regard to the exhaustion of the paper and the operation of the cutter. Until the time when the enumerated conditions and devices exist and operate the reserve roll simply revolves idly on its bearings. I have already described the construction and operation in the machine of the chains K^3 with their socket-links K^4. These links occur at distances apart equal to the diameter of the circle through which the stick is carried by the revolving arms F^3, and the position of the chain-wheels E^2 are such that at each revolution of the stick-carrying arms the bearings H^2 H^2 of the stick enter one of the sockets K^4, as, for instance, is shown in Fig. 14. Each of the chain-wheels E^2 (see Figs. 14, 15, and 16) have attached to them a bracket e, supporting a pivot-pin e^2, upon which is journaled the hub of a hook-like lever e^3, having an inwardly-extending finger e^4. The bracket also supports a spring e^6, which acts through a friction-head e^5 on the sleeve of the hook-lever e^3, so that it turns against considerable frictional resistance, and will therefore remain in any position in which it is placed until shifted by some positively-acting device. The position of the hook-lever e^3 is such that it corresponds and is adapted to coact with the socket-links K^4 of the chain, as is well shown in Figs. 14 and 15. Secured to the shaft M^4 are two levers M^5, having hooks M^6, which lie in the plane of the jaws F^6 of the stick-carrying arms F^3. The shaft M^4 is a rock-shaft and is actuated through a lever M^3, which is connected with the slotted end M^2 of a connecting-rod M', which in turn is acted upon by mechanism controlled through the exhaustion of the paper on the roll in use and the operation of the cut-off, as will be hereinafter described. The normal non-operative position of the parts is with the hook-levers M^5 out of operative position—that is to say, so far retracted that they will not engage the jaws F^6. These levers M^5, in addition to the hooks M^6, are formed with laterally-projecting cam-surfaces, (indicated at M^7,) which lie in the plane of the fingers e^4 and are adapted to operate them and the hook-levers e^3 when the levers M^5 come into operation. The shaft M^4 is also provided with attached fingers m^5, which also lie in the plane of movement of the finger e^4 and act upon them when the shaft is shifted to bring the levers M^5 into operation. The mode of operation of both levers is well illustrated in Figs. 14 and 15, the hook being shifted to operative position at the same time that the paste or glue roll is brought into operation, the movement of the stick-carrying arms F^3 first bringing the stick into operation with the paste-roll, as shown in Fig. 12, and immediately afterward passing from the position shown in Fig. 12 to that shown in Fig. 14, when the hooks M^6 of the lever M^5 engage the jaws F^6 and force them down to the position shown in Fig. 15, so that they release their grip upon the stick. Just before this occurs the revolution of the chain-wheels E^2 brings the fingers m^5 into contact with the ends of the hook-levers e^3, forcing them open, and at the same time that the hook-levers F^6 are engaged by the jaws F^6 the fingers e^4 come in contact with the cam-surfaces M^7 and close the jaws e^3 over the bearings H^2 of the stick, said bearings being normally held in the socket-links of the chain at the same time that they are freed from the grip of the stick-carrying arms, so that in passing from the position shown in Fig. 14 to that shown in Fig. 15 the stick is detached from the stick-carrying arms and carried off from said arms by the chain-wheel. In passing with the chain first over the chain-wheels E^2 and then over the chain-wheels K^2, situated on either side of the drum L', the body or paper-carrying portion of the stick is guided by the engagement of the cam-wheel H^6, attached to the stick with the fixed cam U, which is well shown in Figs. 5 and 6, the face of the said body of the stick being directed against the drum L' and the pad H^{10} of the stick, over which the paper passes, being clamped against the body of the drum L', or rather against the paper passing over said drum, by the action

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of a series of pressing-rolls O′ O′ O′, (see Figs. 2 and 5,) which press against the back of the stick as it passes between them and the drum, the shafts O of the said rolls being supported in bearings which in turn are acted upon by springs O^2, (see Fig. 5,) the pressure of the spring being adjustable through set-screws O^3, and regulating the pressure on the stick. The stick having performed its function in applying the paper carried by it to the paper carried on the drum L′ is next to be withdrawn from the chain-wheels and detached from the paper, and this is accomplished by the guides O^4 and O^5, while (shown in Figs. 2, 5, 21, 22, 23, and 25) the bearings H^3 of the stick enter the lower portion of the guides O^4, which gradually carry it away from the face of the drum L′ and the guide O^5, engaging the cam-wheels H^6, the two guides so shifting the stick that the pull of the paper draws it off of the pins h^6 and the stick being carried around by the chain into the end of the guide O^4, which projects over the curved arms D^{11} of the levers D^9, pressing these levers inward and rocking the shaft D^6 in such manner as to turn the hook-lever D^5 outward, so that it releases its engagement with the lever B^{28} of the shaft B^{22} and also draws out the rod D, as already described, with the effect of disconnecting the clutch and stopping the motion of the parts driven by the clutch. The stick on issuing from the end of the guide O^4 is received in the socket ends D^{10} of the levers D^9, from which it is withdrawn by hand and used again, as described.

Passing next to a description of the device for severing the paper at the end of an exhausted roll and for setting in operation the described mechanism for pasting the paper on the stick and delivering the stick to the chain-wheels, I will note first that the cutting of the paper from the roll supported on the hook-levers Y′ is effected by a striker L^{20}, supported on lever-arms L^{19} L^{19}, secured to the shaft L^{18}, one of said arms supporting a stop-shoulder L^{21}, which in normal non-operative position is engaged by the end of a lever L^{24}, pivoted on a rock-shaft L^{25}, from which rock-shaft depends another lever, (indicated at L^{27},) a spring L^{26} normally holding the lever L^{24} in position to engage the stop L^{21}, as shown in Figs. 3, 5, and 37. A spring L^{23}, acting on a lever L^{22}, also secured to the shaft L^{18}, tends to draw the lever-arms L^{19} inward. Also attached to the shaft L^{18} is the downwardly-depending lever-arm L^{17}, which connects by rod L^{16} with a lever-arm L^{14}, attached to the rock-shaft L^{15}, to which is also attached the cam-wiper L^{13}. The levers L^{19} extend down on either side of the roll of paper, the striker L^{20} lying below the roll, and when disengaged from the stop-lever L^{24} it is drawn inward by the influence of the spring L^{23} and passing between the knife l^{20} and the bar l^{19} and cutting off the paper against the knife.

Considering next the mechanism which operates to release the striker-arm N′ N′ (see Figs. 1, 3, 4, 5, 22, 37, and 38) are levers attached to the shaft l and having secured to their ends the transverse shaft, (indicated at N^2,) to which shaft in turn are secured the lever extensions N^3, which support the short transverse shaft N^4, to the middle of which shaft is attached a pad N^5, which rests against the surface of the roll of paper supported on the levers Y′. The shaft N^4 also supports the guide-plates N^6 and N^7, one of which, N^7, is supported on a spring-arm, as shown in Fig. 1. These guide-plates rest on each edge of the paper-roll and assist in steadying and holding it in central position. Also attached to the transverse shaft N^2 is the downwardly-extending arm N^8, having pivoted at its end a finger N^9 with a rear extension N^{10}, which lies between springs n^{10} n^{10}, secured to the arm N^8 and which normally act to hold the finger N^9 in the position shown, for instance, in Fig. 3. As the diameter of the roll of paper on the hook-arms Y and Y′ decreases the levers N′ move downward, carrying with them the arm N^8, which finally reaches a position in which the finger N^9 lies immediately in front of the lever-arm L^{27}, as shown in Fig. 37, and slightly above the path of a pin N, secured to one of the spokes of the gear-wheel F, and on the happening of other contingencies to be described the lever-arms N′ and their arm N^8 move still farther downward, so that the finger N^9 is engaged by the pin N and forced into contact with the lever L^{27}, as shown in Fig. 37, turning the rock-shaft L^{25} and lifting the stop-lever L^{24}, so as to free the striker, which immediately operates, as before described, to cut off the paper. The weight of the levers N′ and attached parts is partially counterbalanced by the adjustable weight (indicated at l^a) attached to a lever extending out from the shaft l, as shown in Figs. 1, 2, and 3. In addition to the attached levers N′ and the counterweight-lever l^a the shaft l has journaled on it a hub from which extends a downwardly-reaching lever Q′, carrying a cam-roll Q^2 at its bottom, said hub also supporting an upwardly-extending slotted arm q', in which is adjustably secured an outwardly-extending pin, (indicated at Q,) and in addition the shaft has attached to it the hand-lever N^{12} and the downwardly-extending lever-arm R, which lever-arm has pivoted at its end R^2 the finger R^5 and the attached finger R^4, which lies between the springs R′ R′, secured to the lever R, the finger R^5 operating, as has been fully described and as illustrated in Figs. 17, 18, 19, and 20, to set in action the paste-roll. The cam-roll Q^2 on the lever Q′ rests in contact with the annular cam Q^3, having a depressed portion q^3, said cam being attached to the spokes of one of the gear-wheels F. The lever Q′ has a slotted extension q', in which is adjustably secured the outwardly-extending

pin Q, which (see Figs. 32 and 37) rests against the side of the upwardly-extending lever N^{17}, the hub of which is journaled on the shaft l and free to slide on said shaft, being normally held in contact with the hub of the hand-lever N^{12} by a spring N^{16}. To the upper end of the lever N^{17} is secured the cam-contacting finger N^{19}, which is adapted to rest against the cam N^{22} when the lever is inclined in this direction, and also another arm N^{18}, which extends out so as to engage the shaft B^3 and prevent the lever being thrown too far in the opposite direction. When the cam-roller Q^2 rests on the circular portion of the cam Q^3, the attached arm q' is moved over to a position in which its pin Q presses against the upwardly-extending arm N^{17} and pushes its cam-contacting arm N^{19} away from cam N^{22}, so that as long as this contact is maintained the lever N^{17} is not able to follow the cam, but is held in fixed position. When the cam-roll falls into the depressed portion q^3, the pin Q moves out of contact with the lever N^{17}, as shown in Fig. 37, enabling the finger N^{19} to come in contact with the cam N^{22} and to follow its outline. As the roll of paper on the hook-levers Y' runs out the levers N' move downward, rocking the shaft l downward until the pin N^{14} on the lug n^{12} of the hand-lever comes in contact with the side of the upwardly-extending lever N^{17}, which lever arrests the further downward rotation of the shaft l and the parts connected therewith until such time as the cam N^{22} permits the lever N^{17} to move in the direction which permits a further downward rocking of the shaft. In this position the finger N^9 on the arm N^8 lies just above the pin N on the wheel F, and the finger R^5 has moved down to a position where it is just cleared by the segment S^{20} on the paste-applying apparatus; but the further motion can only occur, as above explained, when the cam-roller Q^2 is in the recess q^3 of the cam Q^3. Consequently the further rocking motion of the shaft l, which results in the freeing of the striker and of the operation of the paste-roll, can only take place by the conjoint operation of the cams Q^3 and N^{22}, and in this way I make the situation of the pasted seam on the paper bear any desired relationship to devices connected with the mechanism which consumes the paper. For instance, I thus so regulate the position of the pasted seam that it will not at any time be operated upon by severing mechanism which separates the paper into blanks, or so that it will or will not come into registry with any particular portion of the consuming mechanism, whatever it may be. The grip-lever N^{20}, pivoted on hand-lever N^{12}, rests against lever N^{17}, as shown in Fig. 38, and when actuated pushes said lever N^{17} inward, compressing spring N^{16} until the finger N^{19} clears cam N^{22}, whereupon the shaft l can rock down to its lowermost position without regard to said cam and dependent only on the position of cam-recess q^3.

From what has already been said it will be clearly understood how the striker, which cuts the paper off the old roll, and the paste-applying devices are simultaneously actuated by the final downward rocking of the shaft and its attachments permitted by the cams Q^3 and N^{22}. The operation of the hook-lever M^5 to disengage the stick from the arms F^3 and engage them with the carrying-chains occurs simultaneously with the operation of the striker and pasting-roll and is directly affected by the motion of the arms carrying the striker, which arms, as already described, are secured to the shaft L^{18}, to which shaft again is secured the upwardly-extending lever M, which by means of the connecting-rod M' and its slotted lower extremity acts upon the lever M^3, which is secured to and actuates the rock-shaft M^4 and through it the hook-levers M^5. Thus the cutting off of the paper necessarily brings the hook-levers into operation to perform their described functions. The slot in the end M^2 of the rod M' is to permit a downward motion of this rod without affecting the rock-shaft M^4.

I have heretofore mentioned the paper-guides P, over which the paper from the rolls supported on the hook-levers Y' passes on its way to the drum L'. These guide-plates P and their attached mechanism are best shown in detail in the drawings, Figs. 35 and 36. The plates P, a proper outline for which is indicated in Fig. 36, are supported on arms P', to which are pivoted at p' p' the parallel levers P^2 P^2, which again are secured to the pivoted rock-shafts P^3 P^3, supported on brackets P^6 p^6, secured to the frame. To one of the shafts P^3 is attached a lever-arm P^4, which is connected by a spring P^5 with an upwardly-extending standard on the bracket P^6, as shown in Fig. 35, the action of the spring being to hold the guide-plates P in their normal operative position beneath the web of paper. One of the shafts P^3 has also attached to it a lever p^8, carrying a cam-roller, which by the action of the springs P^5 is held in contact with the faces of one of the cams P^8 on the sleeve l'. The effect of this construction is that when the shaft l' is rocked toward the right the cams P^8, acting through the mechanism described, will cause the guide-plates P to move laterally outward until they lie outside of the edges of the paper, and this construction is rendered necessary by the fact that after the roll of paper resting on the hook-levers Y' is exhausted and the paper is being drawn from the roll resting in the bearings at the ends of the studs G, as shown in Figs. 30 and 31, it is necessary to lift the roll of paper into the upper position, so as to enable a fresh roll of paper to be inserted in the machine. This is

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accomplished through the lifting-levers L^2, which levers are secured to the tubular rock-shaft l', to which shaft, as already stated, the cams P^8 are also secured, the upper end of one of the levers L^2 being formed with a projecting shoulder L^{12}, which is when the lever L^2 is raised adapted to come into contact with the wiper-lever L^{13}. The ends of the levers L^2 are formed with hooks L^3, which are adapted to engage the roll-shaft G^4 when supported in the bearings of the studs G, as shown in Figs. 30 and 31, and to the ends of the levers L^2 are connected the chains L^4, which pass up over the chain-wheels, (indicated at l^6 L^6.) The chain-wheel L^6 is secured on a shaft L^7, to which is also secured a gear-wheel L^8, which (see Fig. 4) is engaged by a small gear-wheel L^9 on a shaft L^{10}, to which is also secured the hand-wheel L^{11}. When, therefore, it is desired to raise the roll of paper, the hand-wheel L^{11} is turned, drawing up the chains L^4 and the hook-levers L^2 until they engage the shaft of the paper-roll and lift it out of the bearings and up toward the hook-levers Y'. As the levers L^2 move upward they rock the shaft l', causing the cams L^8, secured to said shaft, to act upon the levers p^8, as described, thereby shifting the guides P P outwardly, so that the roll of paper can move upward between them without coming in contact with them. The upward movement of the hook-levers L^2 also brings the shoulder L^{12} in contact with the wiper-lever L^{13}, rocking the shaft L^{15}, and through the lever L^{14} connecting rod L^{16} and lever L^{17}, rocking the shaft L^{18} toward the left, thereby throwing the striker-arms L^{19} backward to a point which enables the striker to clear the roll of paper on its way upward. The ends of the shaft G^4 on which the paper is supported come finally in contact with the arms Y^3 of the hook-levers Y', pushing them backward to permit the shaft to pass upward until it attains the proper height, when the weight of the hooked levers Y' brings them again forward and their sockets Y^2 beneath the ends of the shaft G^4, which is thereafter supported on the hooked levers, the lifting hook-levers being permitted to return to their normal position, with of course the corresponding return of the guide-plates P and the striker to their normal positions.

To briefly recapitulate the operations of my machine, a roll of paper being in position on the hangers Y' the paper from it is led under the drum L' and guide-roll O' to the paper-using machinery, which draws the web from the roll. A reserve roll on a spindle G^4 is then placed in the bearings G^2, a stick H' placed in the hooks of the arms F^3, and the end of the web from the reserve roll secured to the stick—as, for instance, is described in connection with Figs. 6 to 8 of the drawings. The arms F^3 and the stick carried by them are then set in rotation first by the action of the friction-clutch B^6 B^8, which is thrown into engagement by moving the lever b^{22} and held in engagement by the engagement of the arm B^{28} with the hooked end of lever D^5. The clutch serves to communicate motion to all of the positively-actuated parts of the machine and by reason of its frictional character does so gradually and with increasing speed until the full speed is attained, when the operator by means of the rod C^9 throws into engagement the positively-engaging clutch-tooth C^3, whereupon the moving parts are positively driven and at a speed which gives to the periphery of the reserve roll and to the chain K^3 substantially the same rate of motion as that of the paper web in use. While the web is being drawn from the roll in use, the arms L^{19}, carrying the cutter for severing the web, are held back against the pressure of the spring tending to draw them toward the web by the stop-lever L^{24}, having the extension L^{27}, and the lever-arm M and its attached rod M' are also held in the position shown, for instance, in Fig. 3—to wit, the position in which the hook-lever M^5 is out of operation—and the striking-cutter and the lever are both set in operation by the spring L^{23}, when the stop-lever L^{24} releases the arms L^{19}, the cutter severing the web and the hook-lever acting to transfer the stick and the end of the new web to the carrier-chains K^3, which carry the end of the new web into contact with the end of the old web and secure them together, the end of the new web having glue applied to it immediately before it is transferred to the carrier-chains. The release of the cutter-striker and the bringing of the paper-roller into operation are effected by the coaction of the several devices described—viz., the arms N', which are supported by the pad N^5 on the roll in use—and move down as said roll is consumed, the arms being secured to the shaft l, to which is also secured the arm R, with its tongue R^5. The downward movement of the arms N' continues until the web is nearly run off of the roll and the tongue N^9 comes nearly, but not quite, to the position where it engages pin N, as shown in Fig. 37, the tongue R^5 being at the same time brought to the position where it nearly, but not quite, engages the segment S^{20}. (See Figs. 17 to 20.) At this point the further motion of the arms N' and R is arrested by the contact of the pin N^{14}, secured on an arm extending from shaft l, with the arm N^{17}, which when it moves toward the right (see Fig. 37) permits the shaft l to turn far enough to bring the tongues N^9 and R^5 into operation, the first releasing the striker, which cuts off the paper from the old roll, and the second bringing the paster device into operation to apply a line of paste to the end of the web from the reserve roll, which is secured to the stick, and the motion

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of the striker also brings into operation the hook-levers M^5, which release the stick from the arms F^3 and attach it to the carrier-chains, which in turn carry it into contact with the severed end of the old roll and after the webs are glued together carry off the stick and in doing so release the driving-clutch and bring the power-driven parts of the machine to a rest. The proper timing of the motion of the arm N^{17} is secured by its inter-engagement with the cam N^{22} and the cam Q^3, as described, the arm only moving to actuate the striker, &c., when said cams are in in a definite relation to each other. It only remains to indicate the operation of transferring the new roll to the position of the old roll in the hangers Y'. This is accomplished by the arms L^2, which are raised by the hand-wheel L^{11} through the chains L^4, the arms L^2 carrying the roll up until its spindle engages the hangers Y' and the turning of the arms L^2 acting through the shoulder L^{12}, the wiper L^{13}, and the connections from said wiper to restore the striker to its normal engagement with the stop L^{24}. The upward motion of the arms L^2, which are attached to the sleeve l', also effects the retraction of the guides P through the action of cams P^8, as described, and the lowering of the arms L^2 to their normal non-active position restores the guides to operative position and leaves the striker free to act when the new roll is in turn run out.

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

1. In a paper-feeding machine, means for supporting a roll of paper from which paper is being drawn for use and means for guiding the web drawn from said roll through a determined path in the machine in combination with means for supporting a supplemental roll of paper, means for imparting to, said supplemental roll a rotary motion which will cause its periphery to move with approximately the speed of the web in use, and means for attaching the end of the web on the supplementary roll to the web in use without arresting the motion of either web.

2. In a paper-feeding machine, means for supporting a roll of paper from which paper is being drawn for use and means for guiding the web drawn from said roll through a determined path in the machine in combination with means for supporting a supplemental roll of paper, means for imparting to said supplemental roll a rotary motion which will cause its periphery to move with approximately the speed of the web in use, means for attaching the end of the web on the supplementary roll to the web in use without arresting the motion of either web, and means for shifting the supplemental roll to the supports for first roll.

3. In a paper-feeding machine, means for supporting a roll of paper from which paper is being drawn for use and means for guiding the web drawn from said roll through a determined path in the machine in combination with means for supporting a supplemental roll of paper, means for imparting to said supplemental roll a rotary motion which will cause its periphery to move with approximately the speed of the web in use, means for attaching the end of the web on the supplementary roll to the web in use without arresting the motion of either web and means actuated by the contracting diameter of the roll in use for setting in operation said means for attaching the web of the supplementary roll.

4. In a paper-feeding machine, means for supporting a roll of paper from which paper is being drawn for use and means for guiding the web drawn from said roll through a determined path in the machine in combination with means for supporting a supplemental roll of paper, means for imparting to said supplemental roll a rotary motion which will cause its periphery to move with approximately the speed of the web in use, means for severing the web in use from the roll, means for applying glue to the end of the web of the supplementary roll and means for carrying the pasted end into contact with the severed end of the first web to connect the webs together.

5. In a paper-feeding machine, means for supporting a roll of paper from which paper is being drawn for use and means for guiding the web drawn from said roll through a determined path in the machine in combination with means for supporting a supplemental roll of paper, means for imparting to said supplemental roll a rotary motion which will cause its periphery to move with approximately the speed of the web in use, means for severing the web in use from the roll, means for applying glue to the end of the web of the supplementary roll and means for carrying the pasted end into contact with the severed end of the first web to connect the webs together and means actuated by the receding diameter of the roll in use for setting in operation said cutting, pasting and web-connecting devices.

6. In a paper-feeding machine, having means for supporting a paper-roll in use and for guiding the web of paper from said roll through the machine, the combination of a support for a supplemental paper-roll with revoluble arms adapted to carry a "stick" or device on which the end of the paper on the supplemental roll is attached, a carrier movable in close relationship with the guides for the web in use and with the revolving arms aforesaid, said carrier being adapted to receive the "stick" from the arms and bring it and the paper end attached to it in contact with the web from the first roll, means for shifting the "stick" from the arms to the

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carrier when desired, means for applying glue to the paper end on the "stick" before it is brought in contact with the first web and means for arresting and starting the motion of the carrier.

7. In a paper-feeding machine having means for supporting a paper-roll in use and for guiding the web of paper from said roll through the machine, the combination of a support for a supplemental paper-roll with revoluble arms adapted to carry a "stick" or device on which the end of the paper on the supplemental roll is attached, a carrier movable in close relationship with the guides for the web in use and with the revolving arms aforesaid, said carrier being adapted to receive the "stick" from the arms and bring it and the paper end attached to it in contact with the web from the first roll, means for shifting the stick from the arms to the carrier when desired, means for applying glue to the paper end on the "stick" before it is brought in contact with the first web, a constantly-moving motor device, mechanism for actuating the carrier devices aforesaid and clutch mechanism for connecting and disconnecting said mechanism with the motor device.

8. In a paper-feeding machine having means for supporting a paper-roll and for guiding the web of paper from said roll through the machine, the combination of a support for a supplemental paper-roll with revoluble arms adapted to carry a "stick" or device to which the end of the paper on the supplemental roll is attached, a carrier movable in close relationship with the guides for the web in use and with the revolving arms aforesaid said carrier being adapted to receive the "stick" from the arms and bring it and the paper end attached to it in contact with the web from the first roll, means for shifting the "stick" from the arms to the carrier when desired, means for applying glue to the paper end on the stick before it is brought in contact with the first web, a constantly-moving motor device, mechanism for actuating the carrier devices aforesaid, a friction-clutch and a positive clutch both acting to engage the carrier mechanism and couple it to the motor device and means for engaging first the friction-clutch and afterward the positive clutch.

9. In a paper-feeding machine having means for supporting a paper-roll and for guiding the web of paper from said roll through the machine, the combination of a support for a supplemental paper-roll with revoluble arms adapted to carry a "stick" or device to which the end of the paper on the supplemental roll is attached, a carrier movable in close relationship with the guides for the web in use and with the revolving arms aforesaid said carrier being adapted to receive the "stick" from the arms and bring it and the paper end attached to it in contact with the web from the first roll, means for shifting the "stick" from the arms to the carrier when desired, means for applying glue to the paper end on the stick before it is brought in contact with the first web, a constantly-moving motor device, mechanism for actuating the carrier devices aforesaid, a friction-clutch and a positive clutch both acting to engage the carrier mechanism and couple it to the motor device, means for engaging first the friction-clutch and afterward the positive clutch and means actuated by the movement of the "stick" to release both clutches after the paper on the "stick" is attached to the web in use.

10. In a paper-feeding machine, the combination with the rotatable carrier-arms F^3 and the carrier-chains K^3 of mechanism for actuating said carriers, a positively-moving motor device, clutch mechanism for coupling said motor to the carrier-driving mechanism, a rock-shaft B^{22} for moving the clutch mechanism, means tending to shift the shaft B^{22} to a position to release the clutches, a catch acting to hold the shaft in clutch-engaging position, a paper-holding "stick" adapted to be engaged and moved successively by the carrier-arms and the carrier-chains and means for releasing the catch holding the clutch-shaft B^{22} in operative position arranged to be actuated by the "stick" when moving with the chains K^3.

11. In a paper-feeding machine, the combination with the rotatable carrier-arms F^3 and the carrier-chains K^3 of mechanism for actuating said carriers, a positively-moving motor device, a friction-clutch B^6 B^8 for coupling said motor and the carrier-driving mechanism, a clutch-locking tooth C^3 movably secured to one clutch member and adapted in one position to positively lock the clutch members together, a rock-shaft B^{22} coupled to the movable friction-clutch member so as to move it to and from operative position and coupled to the locking-tooth so as to move it from but not to operative position, means tending to move the rock-shaft to release the clutch devices, a catch adapted to hold it in operative position, a tooth-actuating lever C^4 C^6 pivoted on the movable friction-clutch member, a manually-operative block C^8 arranged to engage and operate said lever to engage the clutch-tooth and a paper-holding "stick" adapted to be engaged and moved successively by the carrier arms and chains and to act on the rock-shaft catch to release it when moved by the carrier-chains.

12. In a paper-feeding machine, the combination of the revoluble carrier-arms F^3 having fixed and movable jaws H^6 F^6 for holding the "stick" with the carrier-chains K^3 having "stick-holding" sockets K^4 adapted to register with the movable jaws F^6, sprocket-wheels E^2 over which chains K^3 pass, pivoted

jaws e^3 secured to said wheels and the hook-lever M^5 having a hook M^6 adapted to engage and open jaw F^6 and a cam M^7 adapted to engage and move the jaw e^3 so as to move the stick from the arms F^3 to the sockets in chains K^3.

13. In a paper-feeding machine having a support for a paper-roll in use and a guide-drum L′ over which the web from said roll passes, a support for a supplemental roll of paper, in combination with carrier-arms F^3 revoluble around said support and having fixed and movable "stick-holding" jaws H^6 F^6, a carrier-chain K^3 having sockets K^4 adapted to register with the movable jaws of the arms F^3 as the arms and chain revolve, sprocket-wheels supporting and guiding the chain carriers so that they move practically parallel with the guide-drum for a part of their length, means for releasing the "stick" from the arms F^3 and engaging it with the sockets of the chain carrier and means for pressing the "stick" against the guide-drum as it is carried over it.

14. In a paper-feeding machine having a support for a paper-roll in use and a guide-drum L′ over which the web from said roll passes, a support for a supplemental roll of paper, in combination with a "stick" adapted to hold the end of the supplemental roll of paper, said "stick" having the trunnion-shafts H^2 and crank-arms H^4 H^5 extending from said shafts, carrier-arms F^3 revoluble around said support and having fixed and movable "stick-holding" jaws H^6 F^6 adapted to engage the crank-arm H^5 and the ends of shafts H^2 of the "stick," a carrier-chain K^3 having sockets K^4 adapted to register with the movable jaws of the arms F^3 as the arms and chain revolve and engage the stud-shafts H^2, sprocket-wheels supporting and guiding the chain carriers so that they move practically parallel with the guide-drum for a part of their length, means for releasing the "stick" from the arms F^3 and engaging it with the sockets of the chain carrier and cams U acting to engage the crank-arms of the stick and press it against the guide-cylinder.

15. In a paper-feeding machine the combination of the guide-drum L′, the carrier-chains K^3 and the rolls O′ held against the drum by elastic pressure and adapted to press the stick against said drum.

16. In a paper-feeding machine the combination with the guide-drum L′ and carriers K^3 K^3 of the "stick," guides O^4 and O^5 arranged to withdraw the "stick" from the drum and release the paper as specified.

17. In a paper-feeding machine the combination with a constantly-acting motor and a clutch device whereby its motion is communicated to the moving parts of the machine, a latch holding the clutch in operative position, carriers K^3 constituting one of the parts actuated through the clutch, a "stick" adapted to hold the end of a web of paper and to be moved by the carriers, a guide O^4 arranged to gradually withdraw the "stick" from the carriers and a lever D^{11} arranged to be acted on by the "stick" moving through guide O^4 and to act to release the clutch-latch.

18. In a paper-feeding machine having a positively-driven shaft and moving parts driven by said shaft through a clutch, the combination with mechanism for pasting the end of a reserve roll of paper to a web in use, of mechanism for operating said pasting and applying devices comprising a cam, as N^{22}, directly connected to the positively-driven shaft and a cam q^3 connected with the driven mechanism whereby said devices are prevented from operating except in a definite relation to the motion of the driving-shaft, as well as to the movements of the driven mechanism.

19. In a paper-feeding machine having bearings for rolls of paper in use and in reserve and means for rotating the reserve roll with a speed corresponding to that of the web drawn from the roll in use, a paper-severing device adapted to act on the web in use in combination with mechanism for attaching the web of the reserve roll to the severed end of the web in use and moving toward the bearings thereof as the roll contracts and mechanism actuated by said moving part as it approaches the line of the roll-bearings for setting in operation the severing and paper-attaching devices.

20. In a paper-feeding machine having bearings for rolls of paper in use and in reserve and means for rotating the reserve roll with a speed corresponding to that of the web drawn from the roll in use, a cutter L^{20} supported on pivoted arms L^{19}, means tending to draw the cutter in across the web of paper, a stop-lever holding said cutter in non-operative position, means for attaching the end of the reserve roll of paper to the web in use and mechanism for releasing the cutter from the stop-lever and for setting in operation the mechanism operating to attach the paper of the reserve roll to the web in use said mechanism consisting in part of devices supported on the roll in use and moving toward operative position as the said roll contracts and in part of a device operated by the means acting to rotate the reserve roll whereby the cutting and attaching devices operate in a fixed rotation to the position of the rotating devices.

21. In a paper-feeding machine having bearings for rolls of paper in use and in reserve and means for rotating the reserve roll with a speed corresponding to that of the web drawn from the roll in use, a cutter L^{20} supported on pivoted arms L^{19}, means for attaching the end of the reserve roll to the web

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in use, a cutter L^{20} secured on pivoted arms, means tending to draw said cutter toward the web in use, a stop-lever acting to hold the cutter out of operation, means connecting the cutter and the paper-attaching mechanism whereby they act simultaneously, a device for acting on the stop-lever and releasing the cutter supported on the roll in use and moving toward operative position as the roll contracts and a coacting device operated by the revolving mechanism of the reserve roll whereby the cutter is released in a fixed relation to the position of said revolving mechanism.

22. In a paper-feeding machine having bearings for rolls of paper in use and in reserve and means for rotating the reserve roll with a speed corresponding to that of the web drawn from the roll in use, gluing mechanism for applying glue to the end of the web of the reserve roll, mechanism for applying the glued end of the reserve web to the web in use, cutter L^{20} secured on pivoted arms, means tending to draw said cutter toward the web in use, a stop-lever acting to hold the cutter out of operation, means connecting the cutter and the paper gluing and attaching mechanism whereby they act simultaneously, a device for acting on the stop-lever and releasing the cutter supported on the roll in use and moving toward operative position as the roll contracts and a coacting device actuated by the revolving mechanism of the reserve roll whereby the cutter is released the glue applied and the webs attached in a fixed relation to the position of said revolving mechanism.

23. In a paper-feeding machine having bearings for a roll of paper in use and a roll in reserve the combination with means for revolving the roll in reserve, means for cutting off the web from the roll in use and for securing the end of the reserve roll to the end of the web in use, of a rock-shaft *l*, a lever secured thereto and having its free end supported on the roll in use so as to move down as said roll contracts and mechanism supported by and moving with the rock-shafts for setting in operation the cutter and the attaching devices when the roll in use is reduced to a determined diameter.

24. In a paper-feeding machine having bearings for a roll of paper in use and a roll in reserve, the combination with means for revolving the roll in reserve, means for cutting off the web from the roll in use and for securing the end of the reserve roll to the end of the web in use, of a rock-shaft *l*, a lever secured thereto and having its free end supported on the roll in use so as to move down as said roll contracts, mechanism supported by and moving with the rock-shaft for setting in operation the cutter and the attaching devices when the roll in use is reduced to a determined diameter, a cam moving in fixed relationship with the roll-revolving mechanism and means controlled by said cam for assisting the final operative movements of the devices acting on the cutter and applying devices until they can operate in a determined relationship to the revolving devices.

25. In a paper-feeding machine having bearings for rolls of paper in use and in reserve and means for transferring the reserve roll to the bearings for the roll in use, the combination of guide-plates for the web in use situated between the bearings for the two rolls and means for shifting said guide-plates out of the path traveled by the reserve roll on its way to the bearings for the roll in use actuated by the transferring mechanism.

26. In a paper-feeding machine having bearings for rolls of paper in use and in reserve and means for transferring the reserve roll to the bearings for the roll in use, the combination of a cutter L^{20} for cutting off the web from the roll in use, a stop-lever for holding the cutter out of operation and means operated by the transferring devices for shifting the cutter out of the path of the moving roll and engaging it with said stop-lever.

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