No. 658,705. Patented Sept. 25, 1900.

T. C. DEXTER.

PAPER FEEDING MACHINE.

(Application filed June 24, 1898.)

(No Model.) 7 Sheets—Sheet 1.

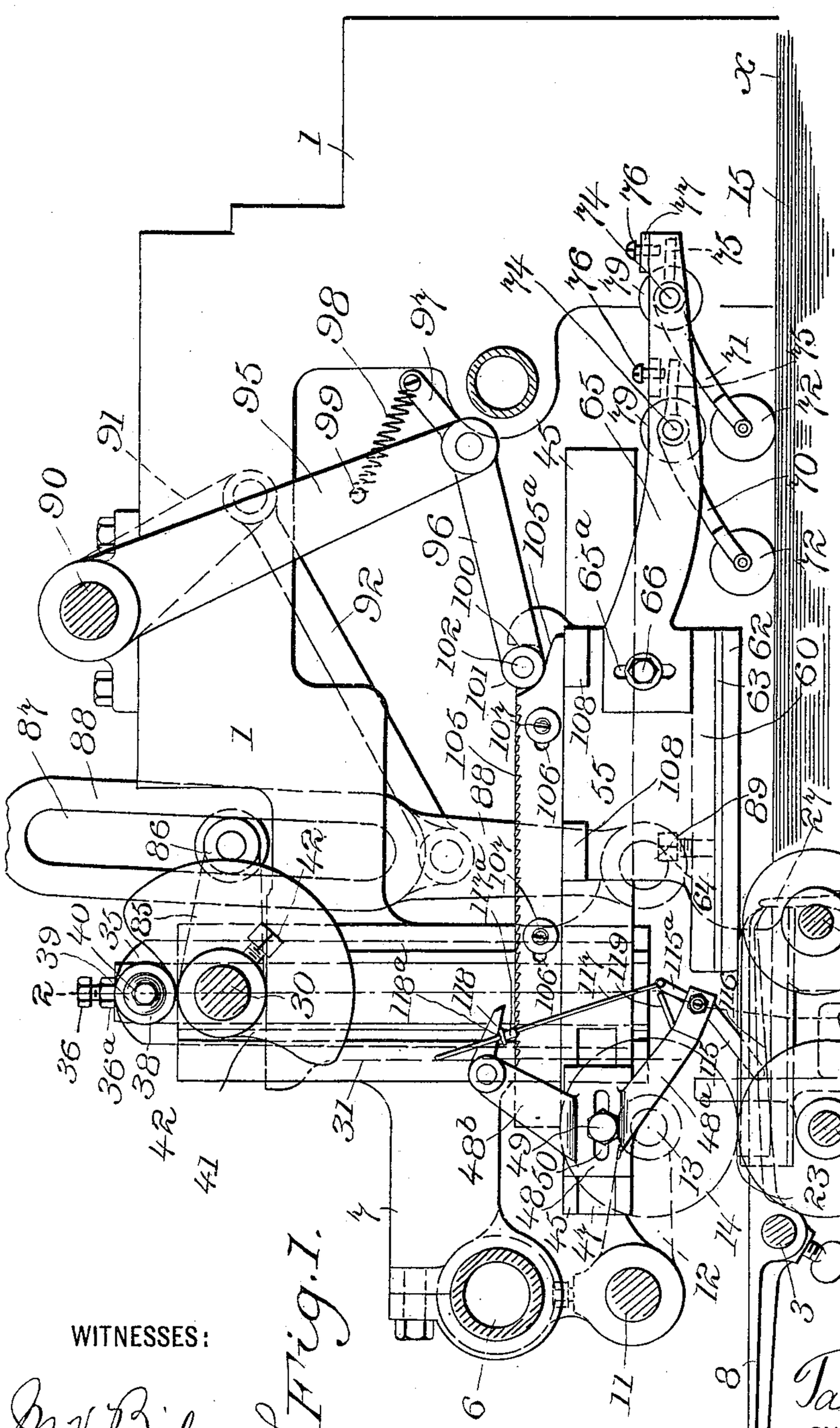

Fig. 1.

WITNESSES:

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Fig. 2.

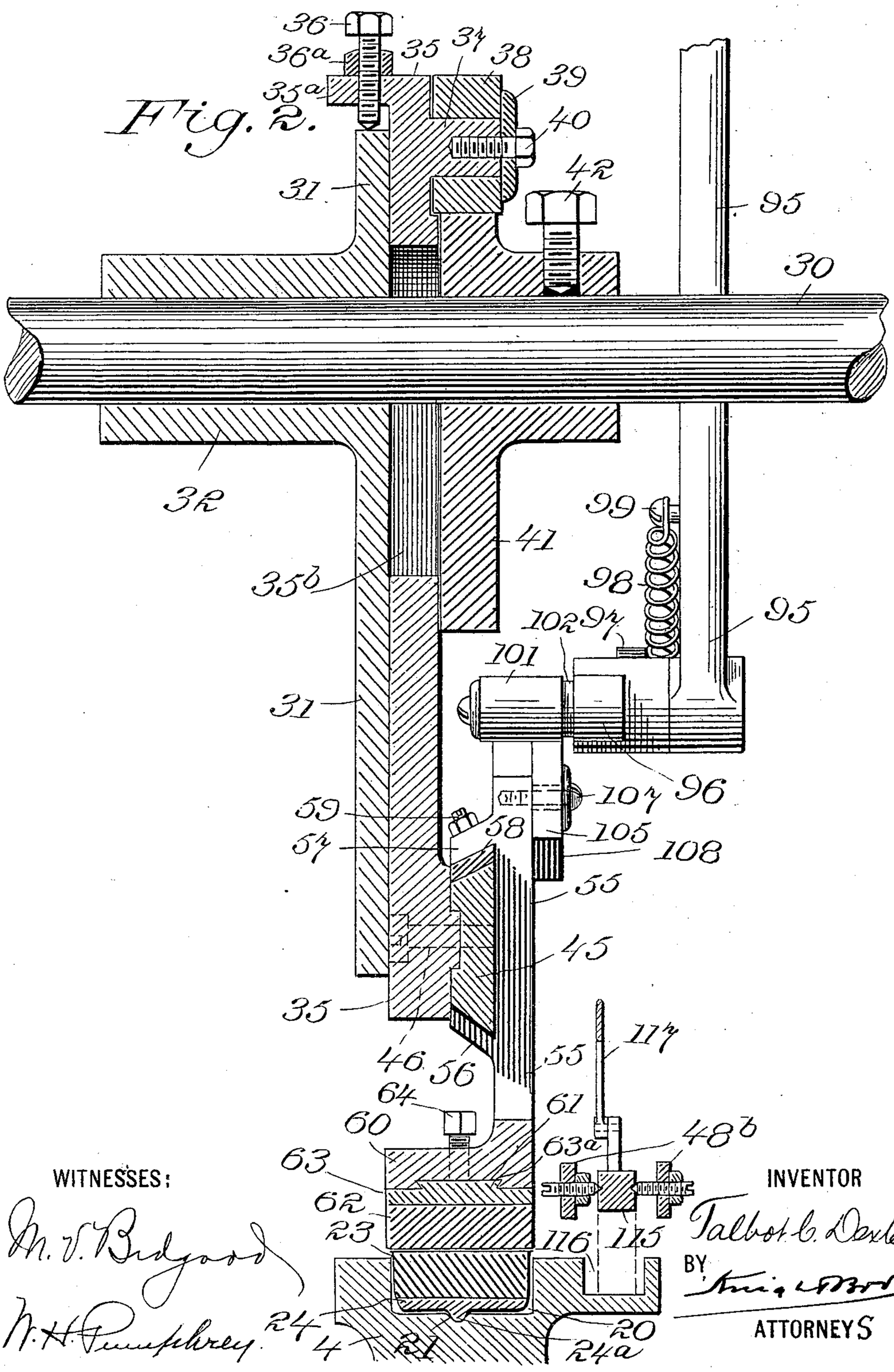

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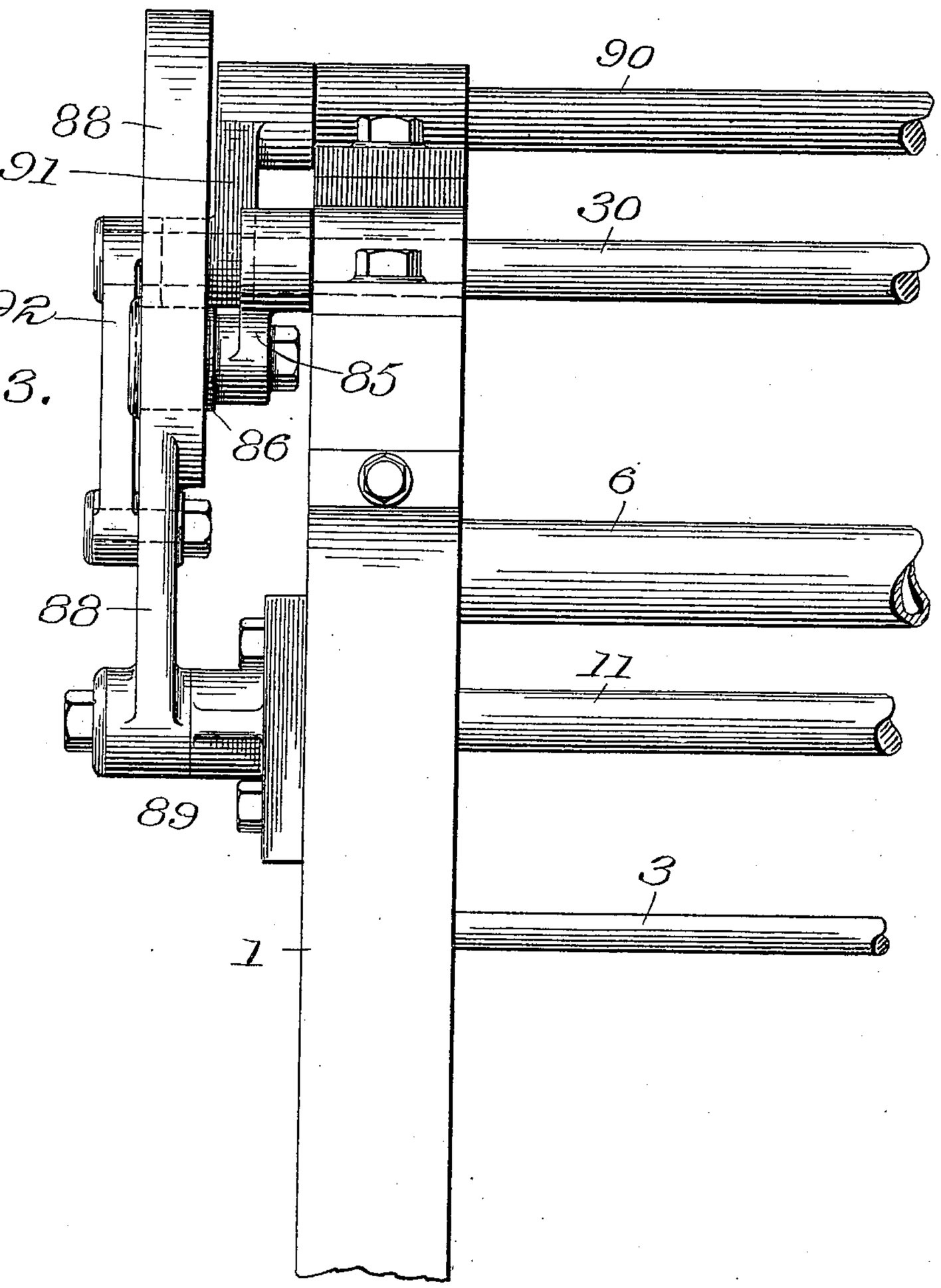
Fig. 3.



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T. C. DEXTER.

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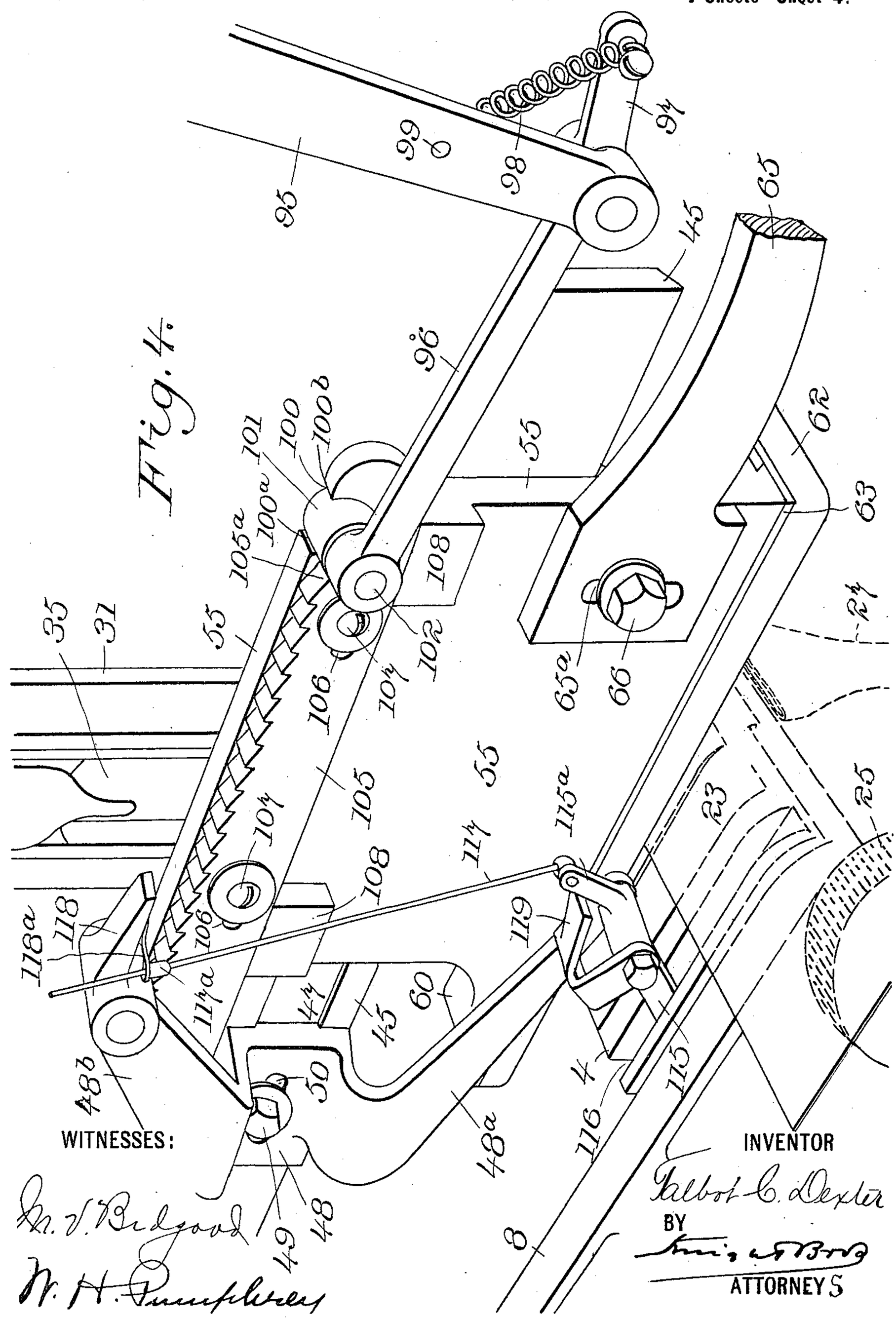
(No Model.) 7 Sheets—Sheet 4.

Fig. 4.



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PAPER FEEDING MACHINE.

(Application filed June 24, 1898.)

(No Model.) 7 Sheets—Sheet 5.

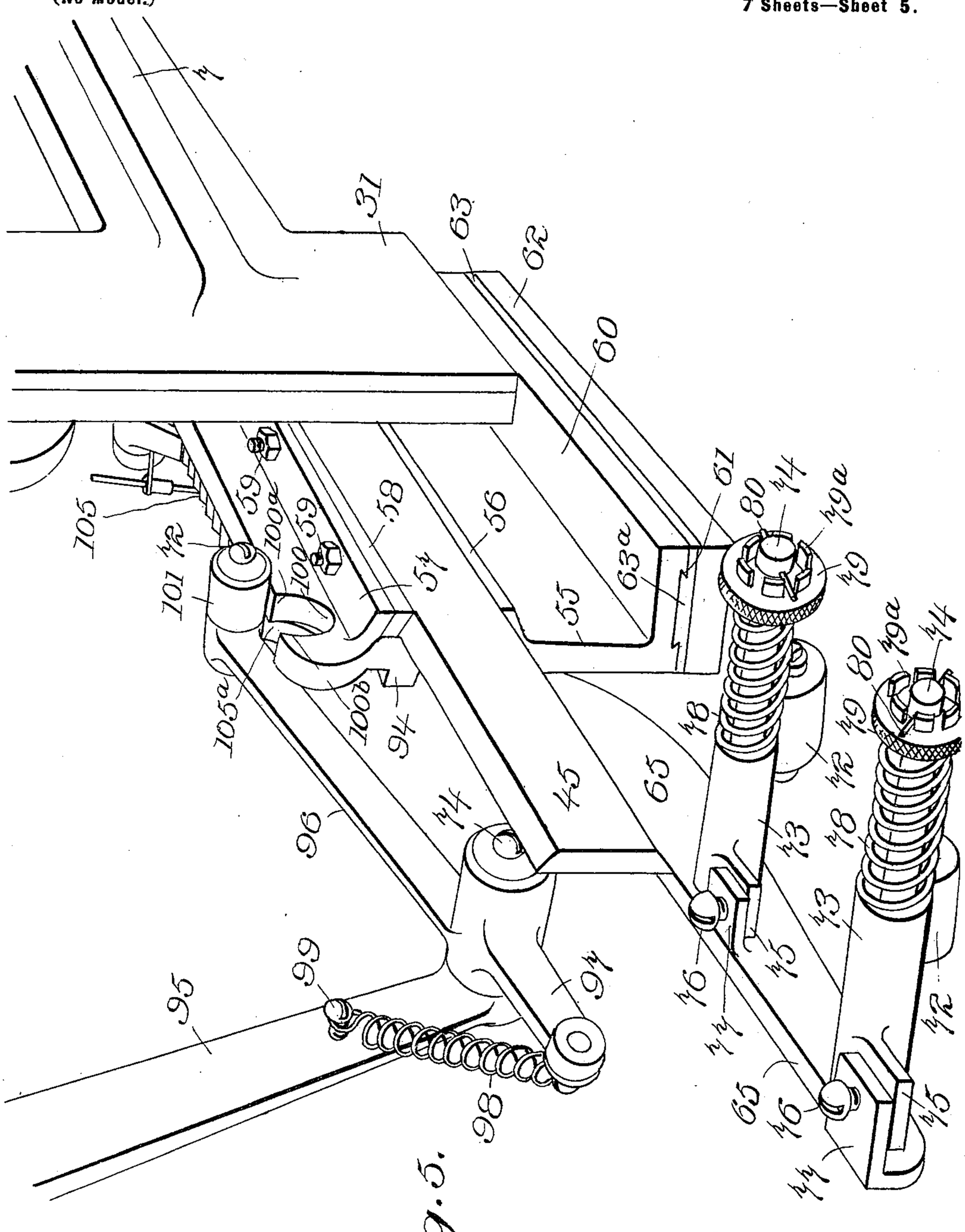

Fig. 5.

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No. 658,705. Patented Sept. 25, 1900.

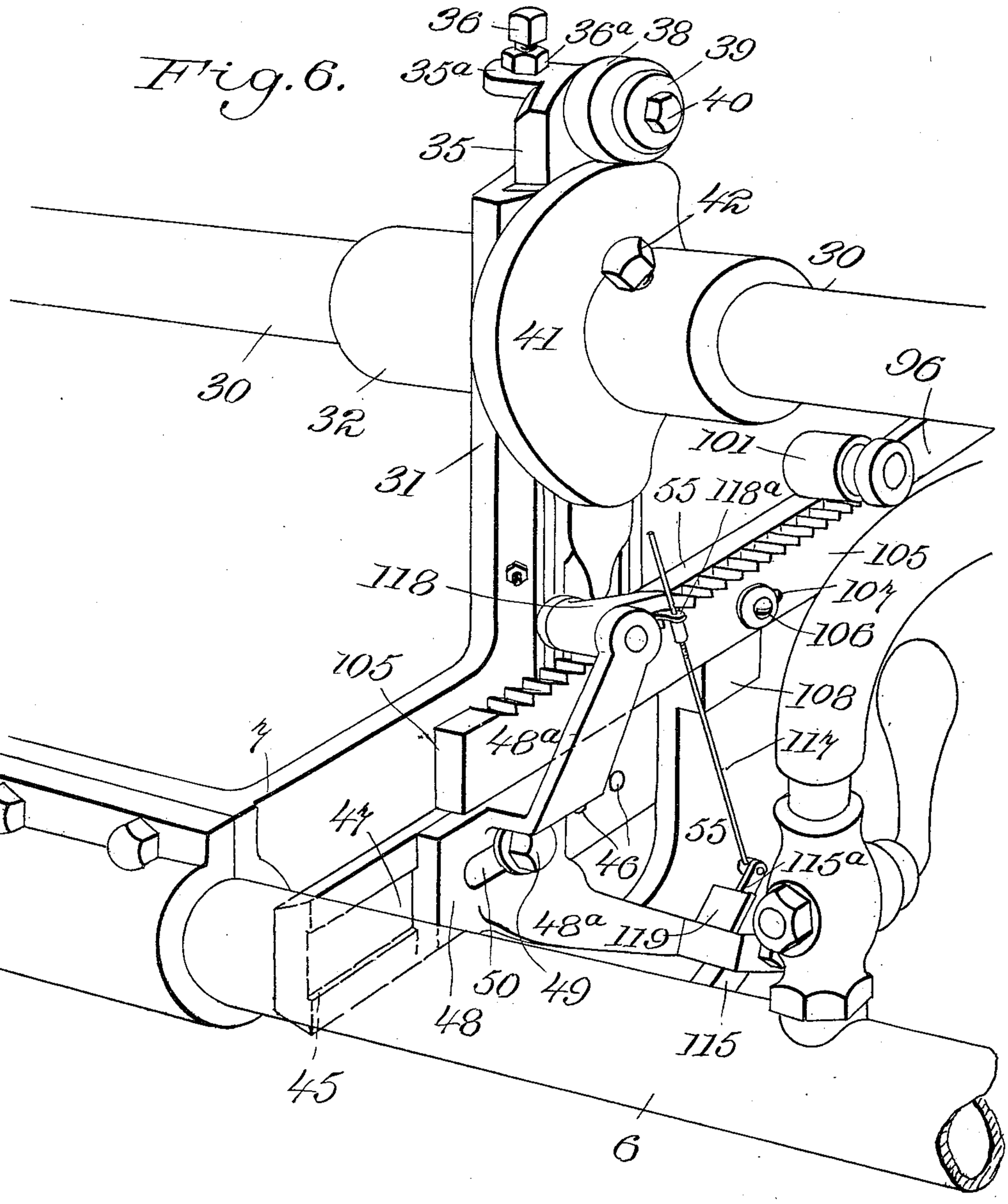
T. C. DEXTER.

PAPER FEEDING MACHINE.

(Application filed June 24, 1898.)

(No Model.) 7 Sheets—Sheet 6.

Fig. 6.



WITNESSES:

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PAPER FEEDING MACHINE.

(Application filed June 24, 1898.)

(No Model.) 7 Sheets—Sheet 7.

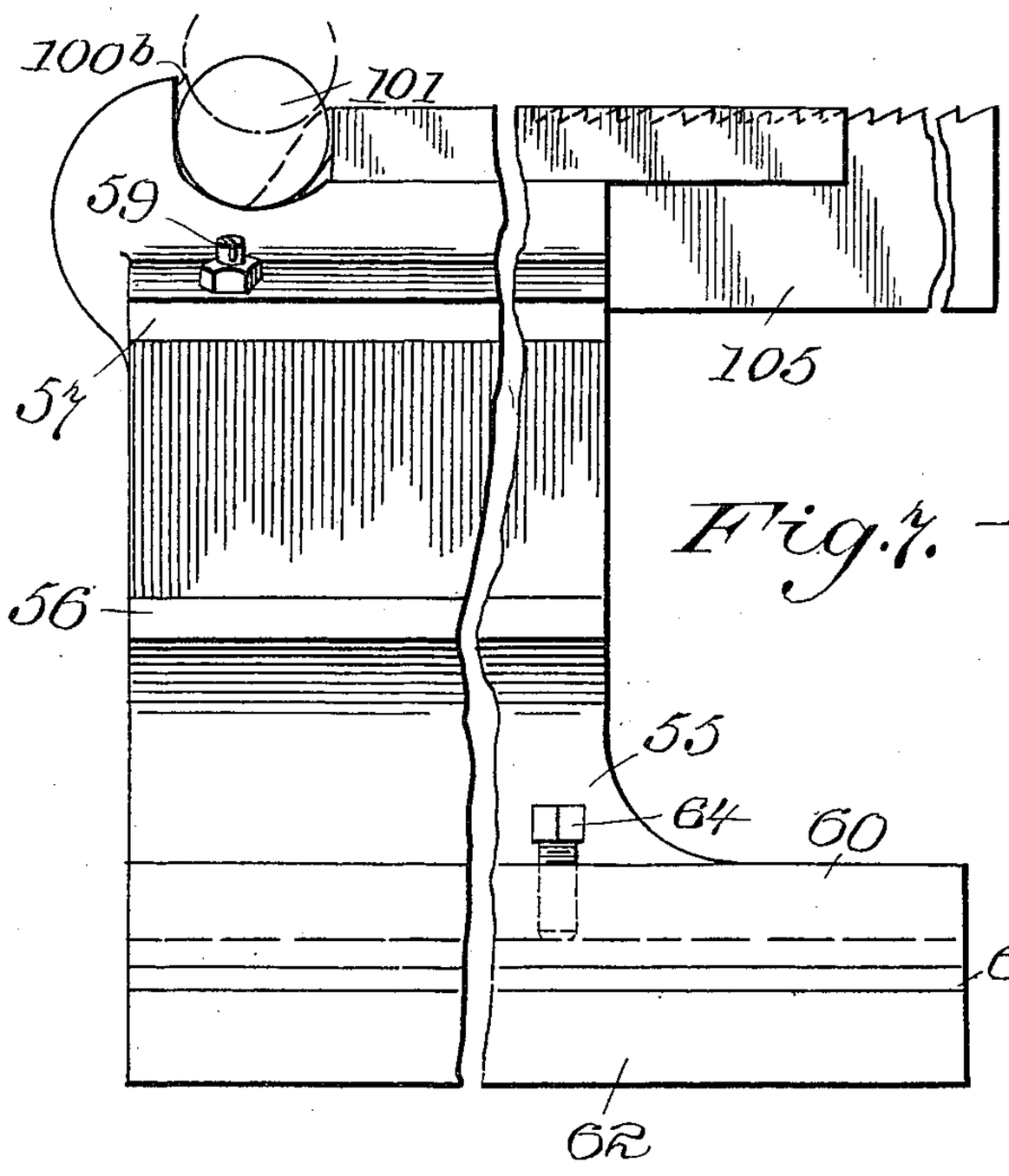


Fig. 7.

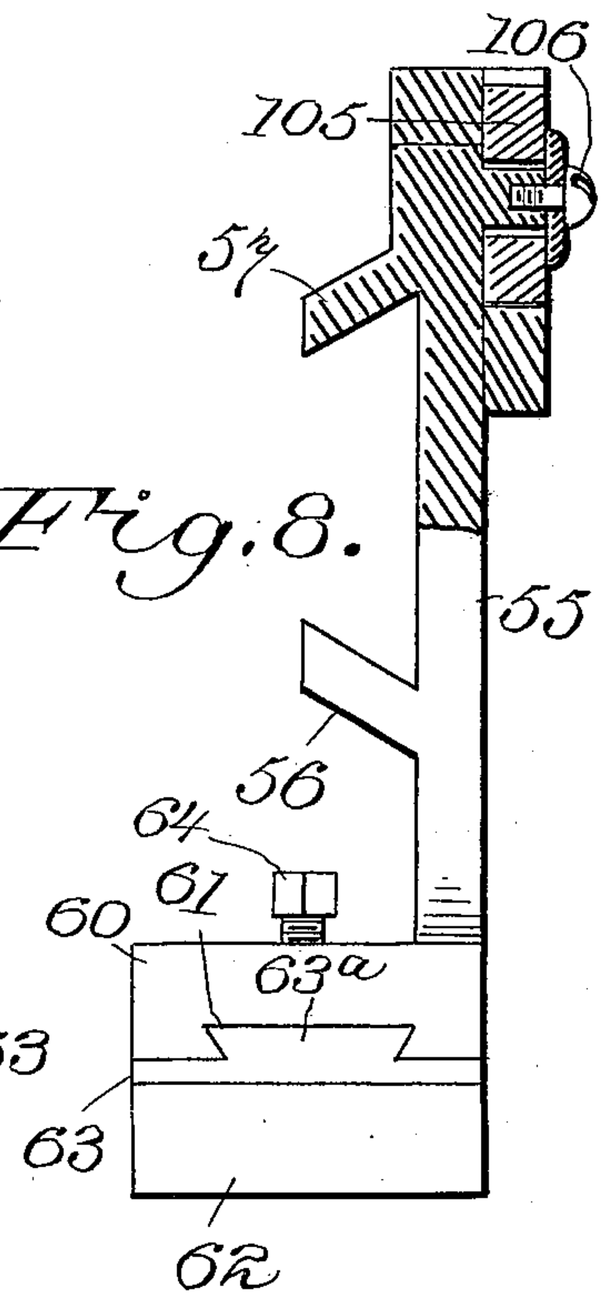
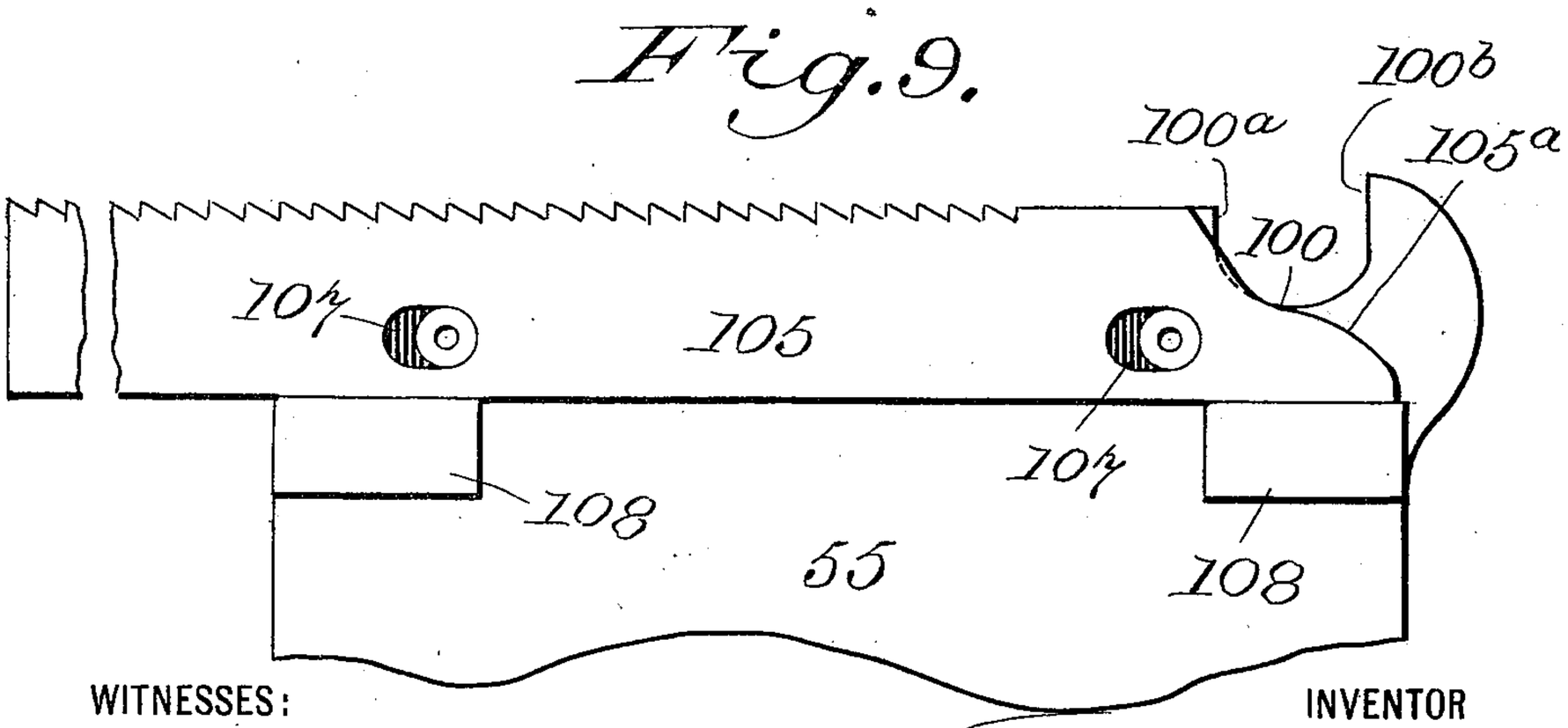


Fig. 8.

Fig. 9.



WITNESSES:

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M. H. Pennsylvania.

INVENTOR

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ATTORNEYS

UNITED STATES PATENT OFFICE.

TALBOT C. DEXTER, OF PEARL RIVER, NEW YORK.

PAPER-FEEDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 658,705, dated September 25, 1900.

Application filed June 24, 1898. Serial No. 684,347. (No model.)

To all whom it may concern:

Be it known that I, TALBOT C. DEXTER, a citizen of the United States, residing at Pearl River, in the county of Rockland and State of New York, have invented certain new and useful Improvements in Paper-Feeding Machines, of which the following is a specification.

The object of my invention is to simplify, cheapen, and improve the structure of that type of paper-feeding machine which is adapted to separate the successive sheets from an adjustably-supported pile and feed them forward to a paper-folder, ruling-machine, printing-press, or other machine which is to operate upon the sheets.

In an application filed by me June 12, 1896, serially numbered 595,373, I have described and claimed a paper-feeding machine in which the main feature of novelty consists of synchronously-operating feeding-off instruments and sheet-separating instruments. In another application filed by me December 28, 1897, serially numbered 617,263, I have described and claimed a paper-feeding machine in which the feeding-off instruments and sheet-separating instruments operate alternately or successively upon the sheets.

The main feature of the machine covered by my present application may be considered in the light of an improvement upon the machines of the above-named applications.

In my present application I employ feeding-off instruments and sheet-separating instruments mounted upon a common reciprocating carriage, so that the feeding-off instruments and sheet-separating instruments will move forward and back in unison, as in my above-named application serially numbered 595,373. In my present case, however, the lower stationary separator member is arranged in a slightly-higher horizontal plane than the normal working plane of the top of the pile of sheets, the feeding-off instruments being arranged to operate in the plane of the top of the pile of sheets and the separator instruments arranged to operate in the higher plane of the lower separator members. By reason of this arrangement the separator instruments will not engage the top sheet of the pile simultaneously with the feeding-off instruments, as in said application serially numbered 595,373, but will engage said sheet only after it has been fed forward to the separator-bed by the feeding-off instrument. In other words, the separator instruments engage the sheets alternately with or successively to the feeding-off instruments in a manner similar to that covered by my above-named application serially numbered 617,263, but said instruments are at the same time moved forward and back simultaneously. In addition to the alternate engagement of the feeding-off instruments and separating instruments with the sheets and their simultaneous forward-and-backward movement I provide means for elevating the feeder-carriage (supporting said instruments) at the limit of the forward stroke, holding the carriage elevated during its backward stroke and lowering it at the limit of the backward stroke in readiness for a new forward stroke, with the separating instruments and feeding-off instruments in their respective working planes. The preferred mechanism for elevating and lowering the feeder-carriage comprises a track-bar upon which the carriage reciprocates and a vertically-sliding supporting-bar having the track-bar rigidly secured to it and supported by a suitable rigid guide-frame in position to be moved up and down by a suitable cam on the main shaft.

A very important feature of the machine covered by my present application is its adaptability for use either with the separator instruments in combination with the feeding-off instruments, as above described, or with the feeding-off instruments alone as a simple automatically-controlled push-finger machine. This adaptability is obtained by removably securing the separator instruments in their supports, the specific structure of which arrangement is claimed in my present application. The importance of this structure will be clear when it is considered that in the machines as heretofore constructed any accident to the separating instruments when repairs are not at hand disables the whole machine, whereas with my machine should the separator instruments be torn or otherwise damaged, as they are liable to be, it is only necessary to remove the upper and lower separator members (an operation requiring but a few moments' delay) and con-

tinue the operation of the machine with the automatically-controlled feeding-off instruments. The upper separator members are not only removable, but are longitudinally adjustable and reversible. The forward ends of the upper separator members are always more liable to wear than the rear ends, and unless they are reversible they must be replaced by new ones when the forward ends become worn. By making said upper separator members reversible they can be used just twice as long. The simplest arrangement for making the upper separator members removable and reversible is to attach them to the feeder-carriage by dovetail joints, and for making them longitudinally adjustable any suitable securing device is provided for clamping them in any desired adjusted position upon the feeder-carriage.

Another feature of importance in my present application is the provision for the vertical adjustment of the feeding instruments with reference to the pile of sheets. The downward movement of the carriage supporting the upper separator member and feeding-off fingers is limited by an adjustable stop, thus making the operative lower position of the carriage vertically adjustable. The feeding-off fingers are journaled upon a rearward extension or bracket which is vertically adjustable upon the main part of the carriage, thereby making the feeding-off instruments vertically adjustable with reference to the carriage and movable separator member. Each feeding-off instrument is also provided with an independent adjustable stop to limit its downward movement upon the pile under the action of its spring. This adjustment is important in regulating the operation of the feed-fingers upon the pile of sheets, as the pile frequently has slight valleys and elevations in it which would prevent the proper operation of the feed-fingers if they were not properly adjusted to suit the particular pile of sheets before the feeding operation starts. With these several adjustments the proper relative operation of the feeding-off fingers and separators can be effected.

Another feature of importance of my present application is the arrangement and construction of the automatic tripping devices operated by the passing sheets and positively controlling the operation of the feeding-off and separating devices. Unlike the tripping devices described and claimed in my above-named applications the tripping devices in my present case control both the separating and feeding-off instruments, which are supported upon the common reciprocating carriage. Each of the automatic tripping devices consists of a trip-finger supported in the path of the sheets and mechanically connected with a pawl supported upon the carriage above a rack-bar, which is mounted upon the carriage loosely, so as to be capable of moving longitudinally with relation thereto. The rack-bar is arranged to disengage the operating-arm from the carriage for arresting the forward movement of the carriage and feeding and separating instruments. The carriage-operating mechanism comprises a rock-arm carrying a spring-pressed operating-arm which is normally held in engagement with a notch or shoulder upon the carriage, whereby the carriage is reciprocated. The improved crank mechanism for operating the feeder-carriages is of considerable importance. The two carriage-operating rock-arms are keyed to a common rock-shaft which receives its motion from a slotted rock-arm which is driven by a crank on the main shaft, the crank engaging the slot of the rock-arm and working up and down therein during its rotation for effecting a quick forward movement and a slow backward movement of the feeder-carriages. The forward movement of the carriages is accomplished with little more than one-third of the revolution of the crank, while the backward movement consumes the remaining two-thirds of the revolution of the crank. The advantage of this differential movement of the carriages is that more time is gained for calipering the sheet after it has been fed forward by the feeding-off devices and separating devices and before it has been engaged by the drop-rollers. Another advantage is the smooth even motion of the crank and rock-arm and the omission of the wear and tear of cam-motions which have usually been employed. The longitudinally-movable rack-bar on the carriage is formed with an inclined or cam end which is supported adjacent to the shoulder or notch of the carriage and the spring-pressed operating-arm is engaged by said cam end of the rack-bar, and when the pawl is tripped by the passage of a sheet the rack-bar is engaged and held thereby, allowing a slight relative movement between the rack-bar and carriage to lift the spring-pressed operating-arm out of engagement with the notch or shoulder. This results in the positive stopping of the carriage for arresting the forward movement of the feeding-off and separating instruments, the operating-arm being allowed to slide on the upper face of the carriage and move forward to the limit of its stroke. When the operating-arm moves backward, its spring will force it into engagement with the notch or shoulder of the carriage and cam end of the rack-bar and cause the rack-bar to be moved longitudinally on the carriage into normal position in readiness for another forward stroke. The automatic tripping devices are adjustably mounted upon the carriage track-bars or some other parts of the supporting-frame in order that they will have a certain fixed relation to the carriages, but will be elevated and lowered with the carriage. The elevation of the tripping devices is desirable, because the tripping-arms, which are operated upon by the passing sheets, are moved out of engagement with the sheet when the carriage is elevated and the sheets are freer to move out

from the machine than they would be if the tripping-arms dragged constantly on the sheets, as in the old forms of machines.

I employ two sets of feeding-off and separating instruments arranged transversely of the machine, as in the old forms of my machines covered by my above-named applications, one feeding-off instrument and one upper separator member being mounted upon each of the two feeder-carriages. By this arrangement the sheets fed from the machine are squared at their forward edge just prior to being fed away by the drop-rollers or other delivery mechanism. With this arrangement it will be clear that when the separator members are removed, as above explained, the machine will then operate with the feeding-off fingers alone, and when so operating the feeding-off fingers will feed the sheet forward to the sheet-delivery mechanism without reference to the separator and the automatic tripping devices will control the operation of the carriages for regulating the feeding action of the feeding-off fingers for squaring the sheets in the same manner as when the separators are in use. At the forward edge of the pile I provide milled or knurled wheels or rollers, which are adapted to assist in the elevation of the forward edge of each sheet from the plane of the top of the pile to the higher plane of the stationary lower separator-beds. These milled or knurled wheels are positively operated by suitable gearing from the main operating-shaft.

Referring to the accompanying drawings, which form a part of this specification, Figure 1 is a longitudinal vertical sectional elevation of my improved feeding-machine. Fig. 2 is a transverse vertical sectional view of the same, taken on the line 2 2 of Fig. 1 and also showing the upper separator member in section. Fig. 3 is a detail sectional elevation illustrating part of the operating mechanism of the feeder-carriages. Fig. 4 is a front perspective view of one of the feeder-carriages, showing part of the operating mechanism, the separator, tripping mechanism, knurled wheels, and air-pipes. Fig. 5 is a front perspective view of one of the feeder-carriages, taken from the opposite side to that shown in Fig. 4 and showing one set of the feeding-off and separating instruments. Fig. 6 is a rear perspective view of one of the feeder-carriages, showing the carriage elevating and lowering mechanism and tripping mechanism. Fig. 7 is a detail side elevation of the carriage supporting the rack-bar and upper separating member, parts being broken away. Fig. 8 is an end view of the same, part being broken away. Fig. 9 is a detail elevation of the carriage and rack-bar, showing the opposite side from that illustrated in Fig. 7.

In the drawings I have shown only the essential parts of the improvements claimed as novel in my present application; but it must be understood that the structures illustrated and described are employed in combination with the other essential elements of a paper-feeding machine which is adapted to separate the successive sheets from a pile and feed them from the machine to the folder, printing-press, or other machine which is to act upon the sheets. Such a machine is illustrated in Patents Nos. 623,769 and 623,770, granted to me April 25, 1899, and reference may be made to said patents for the details of a complete machine to which my present improvements may be applied.

The machine-frame may be of any suitable construction to properly support the mechanisms hereinafter described. I have shown only parts of the frame in the accompanying drawings, of which parts, 1 represents one of the side frames; 2, a front cross bar or frame; 3, a cross-rod; 4 and 5, brackets; 6, the transversely-extending air-pipe rigidly secured in the side frames, and 7 one of a pair of brackets rigidly clamped upon and supported by the air-pipe. The brackets 7 are adjustable upon the air-pipe 6 transversely of the machine and support the feeder-carriages and operating mechanisms, as hereinafter set forth.

Adjustably mounted upon rod 3 are the paper-supporting arms 8, of usual construction.

9 is one of a series of lower delivery-rollers keyed upon a constantly-rotating shaft 10, journaled in suitable bearings in the machine and driven by any suitable means. (Not shown.)

11 is a transversely-extending rock-shaft supporting rock-arms 12, in the free ends of which is journaled a transverse shaft 13, carrying drop-rollers 14. The parts 12, 13, and 14 are shown in Fig. 1 by dotted lines. The drop-rollers 14 operate in conjunction with lower rollers 9 for delivering the sheets from the machine. The lower rollers 9 are constantly driven by suitable gearing with the main shaft of the machine, and the drop-rollers 14 are intermittently lowered and elevated into and out of peripheral contact with the rollers 9 in a manner well understood, so that the forward edges of the sheets will be gripped between the upper and lower rollers and fed rapidly from the machine. The upper rollers are rotated by their engagement with the lower rollers or the sheet supported upon the lower rollers.

15 represents an adjustably-supported pile of sheets, x being the normal working height of the top of the pile. The supporting-table for the pile (not shown) may be of any known construction provided with automatic elevating mechanism for retaining the top of the pile at the proper level.

The upper face of each of the brackets 4 is formed with a socket 20, in which is removably supported the lower rubber retarding-block 23 of the separator. The rubber block 23 is attached to a metal or other rigid back 24, formed with a longitudinal rib 24^a, which

rests in a groove 21 in the bottom of socket 20, thereby allowing a slight rocking of the separator-block under the action of the upper separator member. The lower separator-blocks have their upper working faces in a plane slightly higher than the normal working plane of the top of the pile of sheets, as shown in Fig. 1.

25 represents one of a series of milled or knurled wheels or rollers keyed to a constantly-driven shaft 26 and supported thereby at the forward edge of the pile of sheets. The peripheries of the milled or knurled wheels or rollers are a little to the rear of the rear edge of the lower separator members and serve to elevate the forward edges of the sheets as they are pushed forward by the feeding-off devices to cause the sheets to pass to the separator pads or beds.

27 represents small air-jet pipes at the rear edges of the separator-beds to assist the sheets in passing freely to the separator-beds and preventing the forward edges of the sheets being jammed against the separator-beds. The jet-pipes 27 are connected with the main air-pipe 6 through a suitable rubber hose, such as 28. The connection is not shown. The air from jet-pipes 27 keeps the forward edge of the sheets pressed firmly up against the under surfaces of the upper separating members as the sheets are fed forward by the feeding-off devices. The arrangement and operation of air-pipes 27 are not claimed in my present application, except in combination with the knurled or milled wheels or rollers, but are claimed, broadly, in my pending application, filed December 14, 1897, Serial No. 661,818, for improvements in paper-feeding machines.

30 is the main operating-shaft of the machine, journaled in suitable bearings in the side frames and extending transversely across the machine above the feeding and separating devices. Each of the brackets 7, which are adjustably mounted upon the air-pipe 6, has formed integral with it an upwardly-extending guide-frame 31, which embraces the main shaft 30 and is provided with a bearing 32, through which the shaft 30 extends. One face of the guide-frame 31 is formed with a vertical channel, in which is supported the vertically-reciprocating slide-bar 35, formed with an elongated slot 35^b, through which the shaft 30 passes.

35^a is a lug formed at the upper end of the slide 35, and 36 is a set-screw passing through a threaded opening in the lug 35^a and engaging the upper edge of the guide-frame 31 above the shaft 30.

36^a is a clamping-nut upon the set-screw 36 for clamping said screw in any desired adjusted position. The screw 36 limits the downward movement of the slide 35 in the guideway of the frame 31, and by it the operative position of the carriage with relation to the pile can be regulated.

37 is an integral boss projecting from one face of the slide 35, and 38 is an antifriction-roller journaled upon the boss 37 and confined by a washer 39 and set-screw 40.

41 is a cam secured to the shaft 30 by set-screw 42. The cam 41 is located in close proximity to the face of the slide 35 and is in constant engagement with the antifriction-roller 38 for the purpose of raising and lowering the slide 35.

45 is a horizontal track-bar secured to the lower end of the vertically-reciprocating slide 35 by means of bolts 46. The horizontal track-bar 45 is of dovetailed cross-section and is formed in one face with a channel 47, in which fits a longitudinally-adjustable bracket 48, secured by means of a set-screw or bolt 49, passing through a longitudinal slot 50 of the bracket and threaded into a suitable opening in the track-bar. The bracket 48 supports the tripping-finger and pawl of the automatic tripping device, as hereinafter explained.

55 is one of a pair of longitudinally-reciprocating and vertically-movable feeder-carriages. The carriage 55 comprises a plate or bar formed on one face with horizontal flanges 56 and 57, which form between them a dovetailed groove, in which the horizontal track-bar 45 engages for supporting the carriage in its horizontal reciprocation. The carriage can be adjusted vertically with relation to the pile by the screw 36 above referred to.

58 is a wear-strip inserted between the track-bar 45 and the upper flange 57, said wear-strip being confined by screw-bolts 59. At the lower edge of the carriage is formed a horizontal plate or flange 60, in the lower face of which is formed a dovetailed groove 61.

62 is the oblong pad or block of rubber secured to the backing-plate 63, formed with the dovetailed tongue or rib 63^a, which is adapted to be slid longitudinally into engagement with the dovetailed groove 61 of the flange 60 of the carriage. The rubber pad or block 62 upon its metal backing constitutes the upper movable member of the sheet-separating device.

64 is a thumb-screw or set-screw threaded in a suitable opening extending through the wall of the flange 60 of the carriage and engaging the upper face of the dovetailed tongue or rib 63^a for the purpose of clamping the upper separator member in any longitudinally-adjusted position with relation to the carriage and feeding-off fingers supported therefrom.

65 is a bracket-arm secured to and extending rearwardly from the carriage 55. The bracket-arm 65 is formed at its forward end with a vertical slot 65^a, through which passes a tap-bolt 66, which is seated in a suitable threaded opening in one face of the carriage 55. By reason of the said bolt 66 and slot 65^a it will be observed that the bracket-arm 65 (carrying the feeding-off instruments) may be vertically adjusted with relation to the

feeder-carriage and separator carried thereby, the bracket-arm 65 forming practically a continuation of the carriage.

70 and 71 are the feeding-off instruments or fingers, each of which carries in its forward bifurcated end a rigidly-clamped block or roll of rubber 72 and is formed with a journal-sleeve 73, journaled upon a bolt 74, which projects from one face of the bracket-arm 65. Extending rearwardly from each of the journal-sleeves 73 is a heel 75, which is normally engaged by an adjusting-screw 76, passing through a flange 77, formed integral with the bracket-arm 65. Mounted upon each of the pivot-bolts 74 is a spiral spring 78, one end of which engages the journal-sleeve of the feeder-finger, while the other end engages an adjustable collar 79, formed with slotted flanges 79ª.

80 is a pin passing through a suitable opening in the end of bolt 74 and engaging the slots in flange 79ª. By pressing the collar 79 inwardly against the tendency of the spring 78 said collar may be rotated in either direction upon the bolt to increase or diminish the tension of the spring upon the feeder-finger in a manner well understood. In this way the pressure of the feeder-fingers upon the paper can be regulated. By adjusting the screws 76 the downward movement of the feeder-fingers under the action of their springs can be limited. Both of the feeding-off fingers or instruments are constructed alike.

It will be observed that when the carriage 55 reciprocates forward and back the upper separating member 62 and feeding-off fingers 70 and 71 will be moved in unison with the carriage.

I will now describe the mechanism for operating the carriage.

Keyed to the outer end of the main rotating shaft 30 is a crank-arm 85, carrying at its free end an antifriction-roller 86, which engages in an elongaged slot 87 of the slotted rock-arm 88. The rock-arm 88 is journaled outside one of the side frames of the machine upon a journal 89.

90 is a rock-shaft journaled in suitable bearings in the side frames of the machine and extending across the machine.

91 is a rock-arm keyed to the shaft 90, and 92 is a link journaled at one end to the rock-arm 91 and at its other end to the rock-arm 88. Depending from and keyed to the rock-shaft 90 is a long carriage-operating rock-arm 95, having journaled to its lower end an arm 96, formed with a heel 97, engaged by the spiral spring 98, which is connected at its other end to a pin 99, projecting from one face of rock-arm 95. The spring 98 keeps the forward end of the pivoted arm 96 pressed downwardly into engagement with a notch or recess 100, formed in the upper end of the carriage 55. The walls of the recess 100 form the forward shoulder 100ª and the rear shoulder 100ᵇ, with which an antifriction-roll 101 engages for moving the carriage forward and back. The roll 101, which is shown particularly in Figs. 2 and 6, is elongated for the purpose which will presently appear. The roll 101 is journaled freely upon a pin 102, mounted in the forward end of the spring-actuated operating-arm 96, the spring 98 holding the roll 101 normally in engagement with the notch 100.

105 is a rack-bar formed with elongated slots 106, through which pass screws 107 for confining the rack-bar in position upon one face of the carriage 55.

108 are blocks or flanges formed integral with one face of the carriage 55 for assisting in supporting the rack-bar 105. The rack-bar 105 is adapted to move longitudinally upon the carriage within certain limits for the purpose presently to be explained. The upper serrated or toothed edge of the rack-bar 105 is approximately on a level with the upper edge of the carriage 55. The rear end of the rack-bar is formed with an incline or cam 105ª, which rests normally just below the antifriction-roll 101 of the operating-arm 96. The rack-bar forms one of the essential elements of the automatic tripping devices which control the feeding operation of the carriage. I will now proceed to describe the other parts of this automatic controlling mechanism.

The longitudinally-adjustable bracket 48, which is mounted upon the rack-bar 45, has a downwardly-extending arm 48ª and an upwardly-extending arm 48ᵇ. Journaled in the bifurcated lower end of the downwardly-extending arm 48ª is pivotally mounted a tripping-finger 115, which rests normally in a longitudinal slot 116, formed in the bed of the lower separator member above described. The trip-finger 115 is formed with a heel 115ª, to which is pivoted the lower end of the upwardly-projecting rod 117. Journaled upon the upper end of the bracket-arm 48ᵇ is a pawl 118, which is supported by the bracket-arm 48ᵇ, just above the rack-bar 105. The pawl 118 has projecting from one side an ear 118ª, through which the rod 117 extends. 117ª is a collar adjustably secured to the rod 117 below the ear 118ª. From this construction it will be observed that when the tripping-finger 115 is in its lowest position in the groove 116 the heel 115ª will hold the rod 117 in its uppermost position and the collar 117ª, engaging the ear 118ª, will hold the pawl 118 disengaged from the rack-bar 105. Should the tripping-finger 115 be elevated from its groove by the passage of a sheet, it will be clear that the support for the pawl 118 will be removed and the pawl will drop into engagement with the rack-bar.

119 is a finger projecting from bracket-arm 48ª in position to engage heel 115ª and limit the downward movement of trip-finger 115 in its groove 116. By adjusting the bracket 48 longitudinally upon the track-bar 45 it will be observed that the automatic controlling

mechanism can be tripped sooner or later by the sheet passing from the machine. This adjustment is necessary in regulating the relative operation of the several devices in the machine.

I do not claim, broadly, in my present application the trip having a "loose-joint" mechanical connection, as above described, but have covered this structure in my pending application, filed December 14, 1897, Serial No. 661,818. I do, however, claim such structure as part of novel combinations hereinafter recited in the claims.

As above stated, my improvements are preferably employed as parts of the machine which is illustrated and described in one of my above-named patents, in which two sets of feeding-off devices and two sets of separating devices are arranged transversely of the machine. I have described but one set of each of these devices; but it will be clear that both sets are substantial duplicates, and from the above description, taken in connection with the patents above referred to, the structure and arrangement of my improved machine will be fully understood. It will of course be clear that two rock-arms 95, which operate arms 96, must be provided one for each feeder-carriage and two slides 35, carrying track-bars 45, with their operating rotary cams upon the main shaft 30. The other mechanisms described, with the exception of the rock-arm 88 and crank 86, are also duplicated, said rock-arm 88 serving to impart the rocking motion to shaft 90 for the operation of both carriages.

I will now briefly describe the operation of my improved machine. The carriages supporting the upper separating instruments and the feeding-off instruments are moved forward and back by the engagement of the antifriction-roll 101 of operating-arm 96 with shoulders 100^a and 100^b of the feeder-carriages. By reason of the peculiar arrangement of the crank 85 and slotted rock-arm 88 it will be observed that the forward movement of the carriages will consume scarcely more than one-third of the revolution of the crank 85, while the backward movement of the carriages will take up the remaining two-thirds of the revolution of the crank. This differential forward and backward movement of the carriages is due to the fact that the end of the crank-arm operates in the slot of the main operating rock-arm and is nearest the journal of the rock-arm during the forward movement of the carriages for producing a quick movement and farthest from the journal during the rearward movement of the carriages for producing a slow movement. The feeding-off instruments 70 71 feed the top sheet from the pile toward the lower separator-beds, the knurled or milled wheels 25 serving to elevate the forward edge of the sheet on the separator-beds and the air-blast pipes serving to force the forward edge of the sheet firmly against the lower surface of the upper separator members. As soon as the forward edge of the sheet reaches the rear edge of the lower separator members the upper separator members effectively engage it for feeding it forward over the separator-beds and separating it from any chance underlying sheets. It will therefore be observed that although the feeding-off instruments and separating instruments are mounted upon the same reciprocating carriage, which moves them forward and back simultaneously, said feeding-off and separating instruments also engage the sheet successively or alternately. I claim this feature to be broadly new in my present application and have above distinguished it from the essential features of my above-named patents. The moment the forward edge of the sheet, under the action of the feeding-off and separating members, reaches the tripping-fingers 115 each of said tripping-fingers will be independently moved on its pivot out of its groove 116 and allow the pawls 118 to drop into engagement with the rack-bars 105. This will positively arrest the movement of the rack-bars 105, while the carriages continue to move for a very short space after the rack-bars are engaged. It will therefore be observed that the rear incline or cam ends 105^a of the rack-bars will immediately engage the antifriction-rollers 101 and lift them positively out of the grooves 100, allowing the the antifriction-rollers 101 to roll upon the upper faces or edges of the carriages to the limit of the forward stroke of the operating-arms 96. By this arrangement the forward feeding motion of the feeding-off and separating devices is positively arrested, and as each set of such devices is independently tripped the sheet will be automatically squared before leaving the machine in a manner well understood. Shortly after the feeding operation has been arrested, as just explained, the cams 41 will elevate the slides 35, carrying with them the track-bars 45 and the feeder-carriages and feeding-off and separating instruments which are supported thereupon, the springs 98 yielding sufficiently to allow the upward movement of the carriages. The tripping-fingers and pawls being supported by the brackets, which are also mounted upon track-bars 45, these parts will be elevated at the same time, the tripping-fingers being lifted out of engagement with the sheet, so as to avoid dragging upon the sheet during its final passage from the machine. The slides 35 and all of the parts supported thereby, as just explained, are held in elevated position until after the sheet has been fed from the machine and the feeding-off and separating devices have been returned to their rear position in readiness for another forward feeding-stroke. When the operating-arms 96 reach the limit of their forward movement, they start back slowly under the operation of the crank and slotted rock-arm, which transmit motion to the rock-shaft 90

and rock-arms 95, the rolls 101 rolling upon the upper edges of the carriages until they again reach the recesses 100, when the springs 98 (which are under greater tension by reason of the elevated position of the carriages) will force the rolls 101 down into the recesses 100, against the incline or cam ends 105^a of the rack-bars, the spring-pressure being sufficient to cause the rack-bars to move longitudinally upon the carriages back to their normal position. As soon as the rolls 101 are again in engagement with the recesses 100 the carriages will be moved backward, with the rock-arms, to their rearmost position in preparation for a new forward stroke. As the rearward stroke of the carriages is completed the cams 41 lower the track-bars supporting the carriages and other operating parts in readiness for a new forward stroke, when the operation is repeated.

The air-pipe 6 above described is for the purpose of supplying air to the small-air jet pipes 27 above referred to and also for the purpose of blowing air between the sheets by the interposition of the usual blast-pipes employed for this purpose.

By removing the lower separator-beds from their receiving-sockets and sliding the upper separator instruments from the dovetailed grooves in the lower face of the carriages the machine will be in readiness for operation as a simple push-finger machine, and it will be clear that with the separating members removed the push-fingers will be tripped in their operation for squaring the sheet in a manner well understood, the same as if the separators were in use. My feeding-machine without the separators forms a very complete and effective machine of the push-finger type, and I consider the machine in this form very important.

Should the upper separator members become torn or worn at their forward edges, as they are very liable to, it is simply necessary to slide them out of engagement with the carriage and reverse them and insert them in reversed position. The machine can then be operated as effectively as if a new separator member had been supplied.

The feature of the longitudinal adjustment of the upper separator members in the carriages is of great importance in that it enables me to accurately arrange the relative position of said separator members to the other parts of the machine. It also enables me to cut off any worn or torn part at the end of the separator-pad and adjust the shortened pad to the proper relative position to operate as before.

The crank movement for operating the carriages is quite important for two reasons. In the first place a smooth even movement is provided and the wear and tear incident to cam movements is avoided. In the second place a varied or differential movement of the carriages is provided. By reason of the sliding of the end of the crank in the slot of the rock-arm it will be observed that the forward movement of the carriages will be rapid, while the rearward movement will be relatively slow. This is important, as it gives more time for the calipering of the sheet after the sheet is properly squared by the feeding-off and separating members and before it is delivered from the machine by the drop-rollers. In other forms of machines where the feeder-carriages moved forwardly and backwardly at the same speed considerable trouble was encountered, because sufficient time was not allowed to properly caliper the sheet or attend to such registering as may be required.

The knurled or milled wheels are important in elevating the forward edge of the sheet from the plane of the top of the pile of sheets to the separator-beds and are an important feature. The small air-jet pipes are also important in combination with the knurled wheels for causing the forward edge of the sheet to firmly adhere to the upper separator members when they come into engagement with the sheet upon the separator-beds after the sheet has been elevated by the knurled wheels.

It will be observed that the carriage-operating mechanism enables me to positively arrest the movement of the carriage without interfering with the stroke of the operating-arm, the arrest of the movement of the carriage being accomplished by disengaging the operating-arm from the carriage and not by resisting the forward movement of the carriage.

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

1. In a paper-feeding machine, the combination of a support for a pile of sheets, with suitable feeding-off instruments and sheet-separating instruments, the feeding-off and separating instruments being moved simultaneously forward and backward over the pile and arranged to successively or alternately engage the sheet for feeding it from the machine and separating it from any chance underlying sheet, substantially as set forth.

2. In a paper-feeding machine, the combination of a support for a pile of sheets, suitable feeding-off instruments, suitable separating instruments, and a carriage adapted to reciprocate above the pile of sheets and supporting the feeding-off and separating instruments, said feeding-off and separating instruments being arranged to successively or alternately engage the sheets of paper, substantially as and for the purpose set forth.

3. In a paper-feeding machine, the combination of a support for a pile of sheets, with suitable feeding-off and sheet-separating instruments which engage the sheet alternately or successively for feeding it from the machine and separating it from any chance underlying sheet, and means for simultaneously elevating the feeding-off and separating instruments at

the end of their forward stroke and lowering said instruments at the end of their rearward stroke, substantially as set forth.

4. In a paper-feeding machine, the combination of a support for a pile of sheets, a feeder-carriage supported above the pile of sheets and adapted to reciprocate thereover, suitable feeding-off instruments and sheet-separating instruments mounted upon the carriage and adapted to engage the sheet alternately or successively, and means for elevating and lowering the carriage and feeding-off and separating instruments, substantially as and for the purpose set forth.

5. In a paper-feeding machine, the combination of a support for a pile of sheets, with a vertically-movable slide, means for elevating and lowering said slide, a track-bar rigidly secured to said slide, a feeder-carriage reciprocating upon said track-bar, suitable feeding-off and sheet-separating instruments mounted upon the carriage and adapted to engage a sheet alternately or successively, and means for operating said feeder-carriage, substantially as set forth.

6. In a paper-feeding machine, the combination of a support for a pile of sheets, a vertically-movable slide, a horizontal track-bar mounted upon said slide, suitable cam mechanism for elevating and lowering the slide, a feeder-carriage mounted upon the track-bar, operating mechanism for the feeder-carriage, suitable feeding-off and sheet-separating instruments mounted upon the carriage and adapted to successively or alternately engage a sheet, and automatic tripping mechanism operated by a passing sheet adapted to arrest the operation of the feeding-off and separating instruments, substantially as set forth.

7. In a paper-feeding machine, the combination of a support for a pile of sheets, a stationary separating bed or member arranged in a horizontal plane slightly higher than the normal plane of the top pile of sheets, a feeder-carriage operating above the pile of sheets and stationary separating member, suitable feeding-off instruments mounted upon the carriage and engaging the sheet upon the pile, and a movable sheet-separating member also mounted upon the carriage and engaging the sheet upon the lower stationary separator member, whereby the feeding-off and movable separating members will alternately or successively engage a sheet and will be moved forward and backward simultaneously, substantially as set forth.

8. In a paper-feeding machine, the combination of a support for a pile of sheets, a stationary separating bed or member arranged in a horizontal plane slightly higher than the normal plane of the top pile of sheets, a feeder-carriage operating above the pile of sheets and stationary separating member, suitable feeding-off instruments mounted upon the carriage and engaging the sheet upon the pile, a movable sheet-separating member also mounted upon the carriage and engaging the sheet upon the lower stationary separator member, and suitable means for elevating the forward edge of the sheet from the plane of the top of the pile to the plane of the lower separator member, substantially as set forth.

9. In a paper-feeding machine, the combination of a support for a pile of sheets, a lower stationary separator member, suitable feeding-off devices, an upper movable separating member operating over the lower stationary separator member, knurled or milled wheels or rollers arranged at the forward edge of the pile and adapted to assist the feed of sheets from the pile to the lower separator member, substantially as set forth.

10. In a paper-feeding machine, the combination of a support for a pile of sheets, a lower stationary separator member, suitable feeding-off devices operating upon the pile of sheets, an upper movable sheet-separating member operating over the lower stationary separator member, knurled or milled wheels or rollers at the forward edge of the pile, and air-jet pipes located at the rear edge of the stationary separator member and adapted to force the forward edge of the sheet up against the lower surface of the upper movable separating member, substantially as set forth.

11. In a paper-feeding machine, the combination of a support for a pile of sheets, suitable feeding-off instruments, a stationary separator-bed, a feeder-carriage, and a removable upper separator member detachably secured to the feeder-carriage by means of a dovetailed cam-groove, substantially as set forth.

12. In a paper-feeding machine, the combination of a support for a pile of sheets, with suitable feeding-off instruments and suitable sheet-separating instruments adapted to engage a sheet successively or alternately with relation to the feeding-off devices and an automatic tripping device operated by a passing sheet and adapted to simultaneously arrest the operation of the feeding-off devices and sheet-separating devices, substantially as set forth.

13. In a paper-feeding machine, the combination of a support for a pile of sheets, a vertically-movable slide, a horizontal track-bar mounted upon said slide, suitable cam mechanism for elevating and lowering the slide, a reciprocating feeder-carriage mounted upon the track-bar and carrying sheet-feeding instruments, and operating mechanism for the feeder-carriage, substantially as set forth.

14. In a paper-feeding machine the combination of a support for a pile of sheets, a vertically-movable slide, a horizontal track-bar mounted upon said slide, suitable cam mechanism for elevating and lowering the slide, a reciprocating feeder-carriage mounted upon the track-bar and carrying sheet-feeding instruments, operating mechanism for the feeder-carriage, and automatic tripping mechanism operated by a passing sheet adapted

to arrest the operation of the feeder-carriage, substantially as set forth.

15. In a paper-feeding machine, the combination of a support for a pile of sheets, with suitable feeding-off instruments, suitable sheet-separating instruments, means for reciprocating said feeding-off and sheet-separating instruments simultaneously, suitable automatic tripping devices operated by a passing sheet and adapted to arrest the operation of the feeding-off and sheet-separating devices, and means for lowering and elevating the feeding-off devices, sheet-separating devices and tripping devices simultaneously, substantially as set forth.

16. In a paper-feeding machine, the combination of a support for a pile of sheets, the vertically-movable slide or frame having means for operating it, a feeder-carriage supported by said vertically-movable slide or frame, suitable feeding-off and sheet-separating instruments mounted upon the carriage, means for operating the carriage, and a suitable automatic tripping device operated by a passing sheet for arresting the operation of the feeding-off and separating instruments, said tripping device being mounted upon the vertically-movable slide or frame whereby it will be raised and lowered with the feeder-carriage, substantially as set forth.

17. In a paper-feeding machine, the combination of a support for a pile of sheets, suitable sheet-feeding devices, means for operating the sheet-feeding devices, and means for positively disengaging the operating means from the sheet-feeding devices for causing the arrest of the operation of said feeding devices, substantially as set forth.

18. In a paper-feeding machine, the combination of a support for a pile of sheets, a suitable feeder-carriage adapted to reciprocate above the pile of sheets, feeding instruments mounted upon the carriage and engaging the pile of sheets, an operating-arm engaging the carriage, an automatic device controlled by the sheets fed off and adapted to disengage the operating-arm from the feeder-carriage, whereby the movement of the feeder-carriage will be arrested without interfering with the stroke of the operating-arm, substantially as set forth.

19. In a paper-feeding machine, the combination of a support for a pile of sheets, a reciprocating feeder-carriage formed with a shoulder, an operating-arm engaging said shoulder, and means operated by a sheet fed off for automatically moving said operating-arm out of engagement with the shoulder on the carriage to thereby arrest the feeding operation, substantially as set forth.

20. In a paper-feeding machine, the combination of a support for a pile of sheets, a reciprocating feeder-carriage, supporting a feeding instrument, an operating-arm engaging the carriage, and a cam movably mounted upon the carriage and controlled by a sheet fed off for positively disengaging the operating-arm from the carriage to arrest the feeding operation, substantially as set forth.

21. In a paper-feeding machine, the combination of a support for a pile of sheets, a reciprocating feeder-carriage having a shoulder, an operating-arm engaging the shoulder upon the carriage, a cam longitudinally movable upon the carriage adapted to engage the arm and lift it out of engagement with the shoulder of the carriage, and means operated by a passing sheet for operating said cam, substantially as set forth.

22. In a paper-feeding machine, the combination of a support for a pile of sheets, a reciprocating feeder-carriage supporting a feeding instrument, an operating-arm engaging the carriage, a rack-bar longitudinally movable upon the carriage and formed with a cam end which is adapted to engage the operating-arm, a pawl supported above the rack-bar, and a tripping device actuated by a passing sheet and adapted to move the pawl into engagement with the rack-bar for causing the disengagement of the operating-arm from the carriage and arresting the feeding operation, substantially as set forth.

23. In a paper-feeding machine, the combination of a support for a pile of sheets, a reciprocating feeder-carriage, an operating-arm engaging the carriage, a vertically-movable slide or frame supporting the carriage, a bracket mounted upon said vertically-movable slide or frame, a tripping device comprising a sheet-operated tripping-finger and a pawl controlled thereby mounted upon said bracket, and a rack-bar mounted upon the carriage and formed with an incline or cam end which is adapted to disengage the operating-arm from the carriage when the pawl is tripped, substantially as set forth.

24. In a paper-feeding machine, the combination of a support for a pile of sheets, a sheet-feeding carriage, an operating-arm engaging the carriage for reciprocating it, a rack-bar carried by and longitudinally movable upon the carriage, a pawl adapted to be tripped by a passing sheet to engage the rack-bar, and cause it to move on the carriage, said rack-bar being adapted by its movement to disengage the operating-arm from the carriage to arrest the movement of the carriage, substantially as set forth.

25. In a paper-feeding machine, the combination of a support for a pile of sheets, a feeder-carriage carrying a feeding instrument, a spring-pressed operating-arm engaging the feeder-carriage for reciprocating it, and a suitable automatic tripping device operated by a passing sheet and adapted to disengage the spring-pressed operating-arm from the carriage, substantially as set forth.

26. In a paper-feeding machine, the combination of a support for a pile of sheets, a feeder-carriage supporting a feeding instrument, a spring-pressed operating-arm engag-

ing the carriage, a longitudinally-movable rack-bar formed with an incline or cam end and mounted upon the carriage adjacent to the operating-arm, and automatic sheet-operated tripping devices adapted to engage the rack-bar to cause it to disengage the operating-arm from the carriage, substantially as set forth.

27. In a paper-feeding machine, the combination of a support for a pile of sheets, a feeder-carriage supporting a feeding instrument, a suitably-operated rock-arm, an operating-arm journaled upon the rock-arm and engaging the carriage, a spring tending to force the operating-arm into engagement with the carriage, and a suitable cam controlled by a passing sheet and adapted to disengage the operating-arm from the carriage, substantially as set forth.

28. In a paper-feeding machine, the combination of a support for a pile of sheets, a reciprocating feeder-carriage supporting a feeding instrument, a slotted rock-arm, a rotary crank mounted upon a suitable shaft and engaging the slot of the rock-arm, and means for transmitting the differential forward and backward rocking motion of the rock-arm to the feeder-carriage, whereby the forward feeding motion of the carriage will be rapid and the backward motion relatively slow, substantially as set forth.

29. In a paper-feeding machine, the combination of a support for a pile of sheets, a reciprocating feeding-carriage supporting a feeding instrument, a slotted rock-arm journaled upon the frame of the machine, a rotary crank mounted upon a suitable shaft and engaging the slot of the rock-arm, a rock-shaft supporting an auxiliary rock-arm, an operating-arm mounted upon the auxiliary rock-arm and engaging the carriage, and a suitable connection between the slotted rock-arm and the rock-shaft, substantially as set forth.

30. In a paper-feeding machine, the combination of a support for a pile of sheets, a reciprocating feeder-carriage, a bracket-arm vertically adjustable upon the feeder-carriage, suitable feeding-off instruments mounted upon the bracket-arm, a sheet-separating instrument mounted upon the main part of the carriage, and a stationary lower separator member, whereby the feeding-off instruments can be adjusted vertically with relation to the separator instruments, substantially as set forth.

31. In a paper-feeding machine, the combination of a support for a pile of sheets, a reciprocating feeder-carriage, an operating-arm carrying an antifriction-roller which engages the carriage, suitable feeding instruments mounted upon the carriage, and means operated by a passing sheet for disengaging the antifriction-roller from the carriage whereby the movement of the carriage will be arrested and the antifriction-roller will roll upon the carriage to the limit of the stroke of the operating-arm, substantially as set forth.

32. In a paper-feeding machine, the combination of a support for a pile of sheets, a feeder-carriage carrying a feeding instrument, a spring-pressed operating-arm carrying a freely-journaled antifriction-roller which engages the carriage for operating it, a longitudinally-movable cam mounted upon the carriage and adapted to engage the antifriction-roller for disengaging it from the carriage, and means controlled by a passing sheet for causing a relative movement of the cam upon the carriage, substantially as set forth.

33. In a paper-feeding machine, the combination of a support for a pile of sheets, a feeder-carriage supporting a feeding instrument, means for moving said feeder-carriage vertically at the forward and backward limits of its stroke, and a spring-pressed operating-arm engaging the carriage for operating it, substantially as set forth.

34. In a paper-feeding machine, the combination of a support for a pile of sheets, a reciprocating feeder-carriage, an operating-arm engaging the carriage, a longitudinally-movable rack-bar mounted upon the carriage and adapted to disengage the operating-arm therefrom, a track bar or frame upon which the carriage reciprocates, a bracket adjustably mounted upon the track bar or frame and adapted to be adjusted longitudinally of the track-bar, and a sheet-actuated tripping device mounted upon said adjustable bracket and adapted to actuate the rack-bar upon the carriage for disengaging the operating-arm and arresting the movement of the carriage, substantially as set forth.

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