No. 759,212. PATENTED MAY 3. 1904

T. C. DEXTER.

SHEET CONVEYING MACHINE.

APPLICATION FILED NOV. 1, 1902.

NO MODEL. 6 SHEETS—SHEET 1.

FIG. 1.

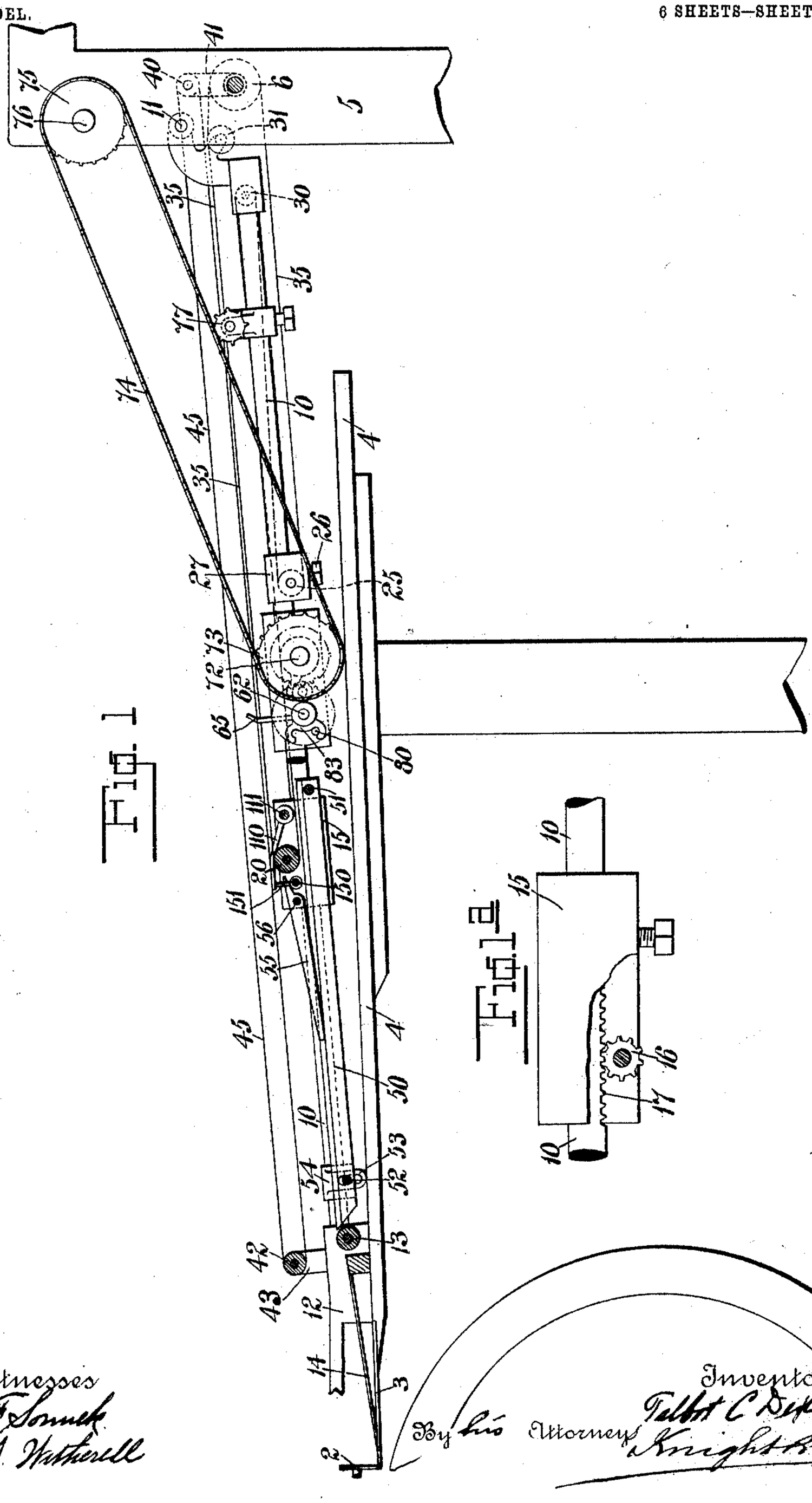

FIG. 2.

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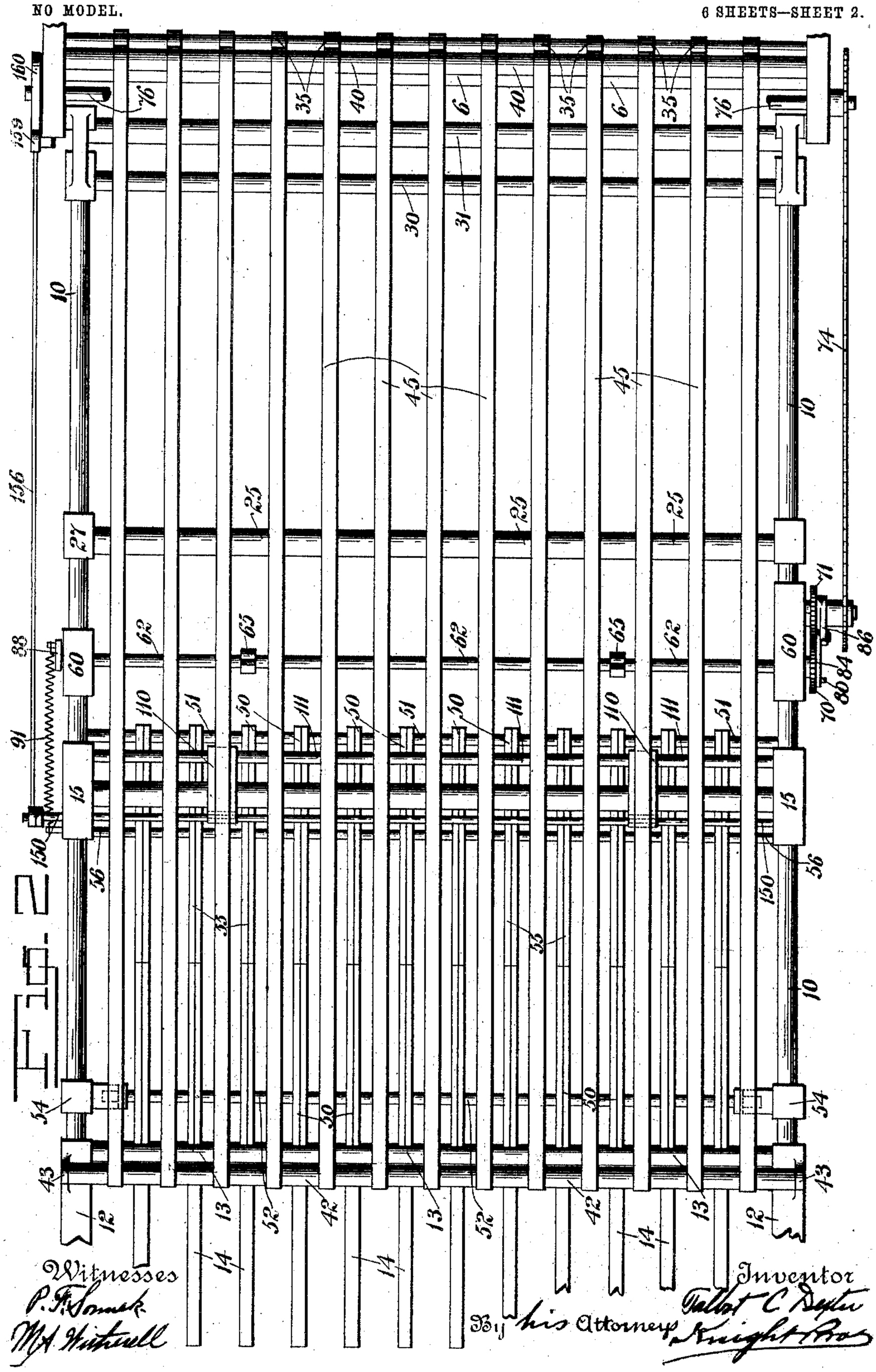
NO MODEL. 6 SHEETS—SHEET 2.



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SHEET CONVEYING MACHINE.

APPLICATION FILED NOV. 1, 1902.

NO MODEL. 6 SHEETS—SHEET 3.

Fig. 3.

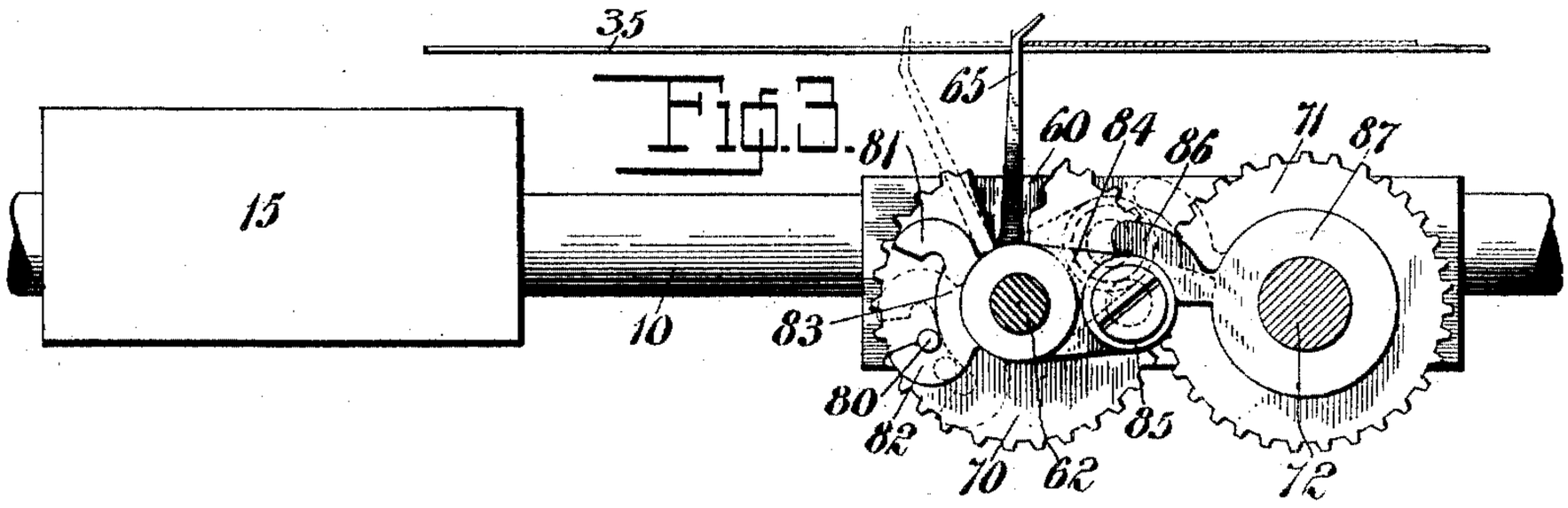


Fig. 4.

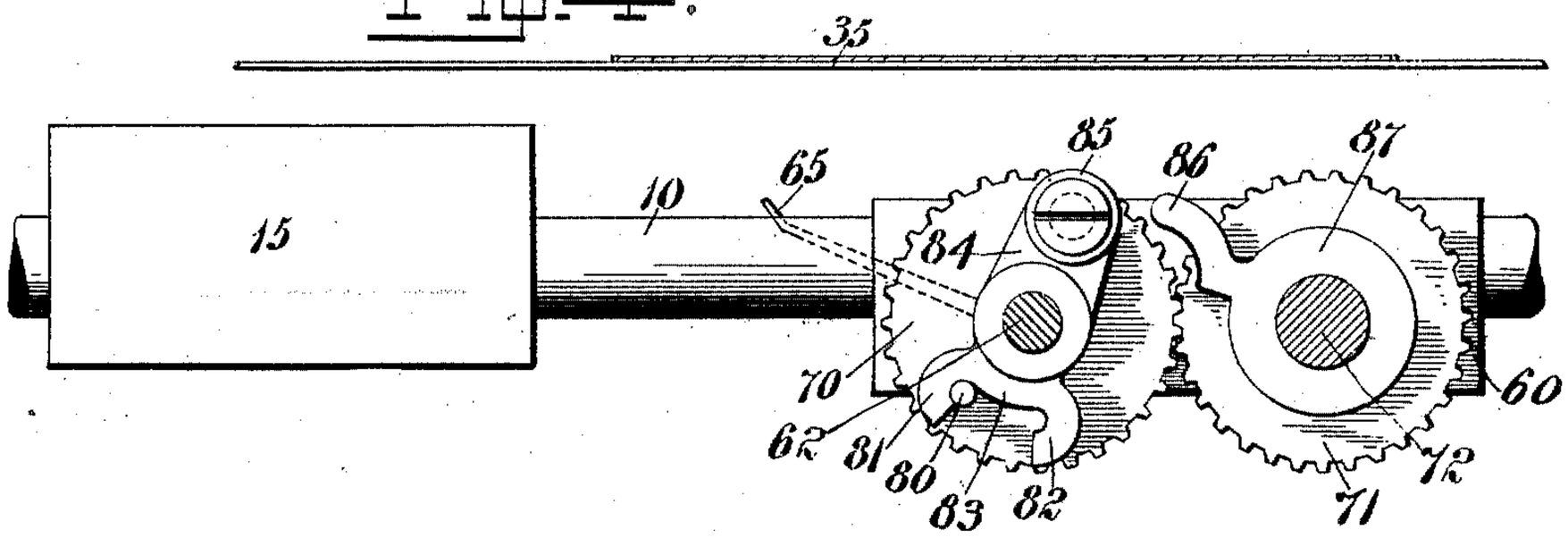
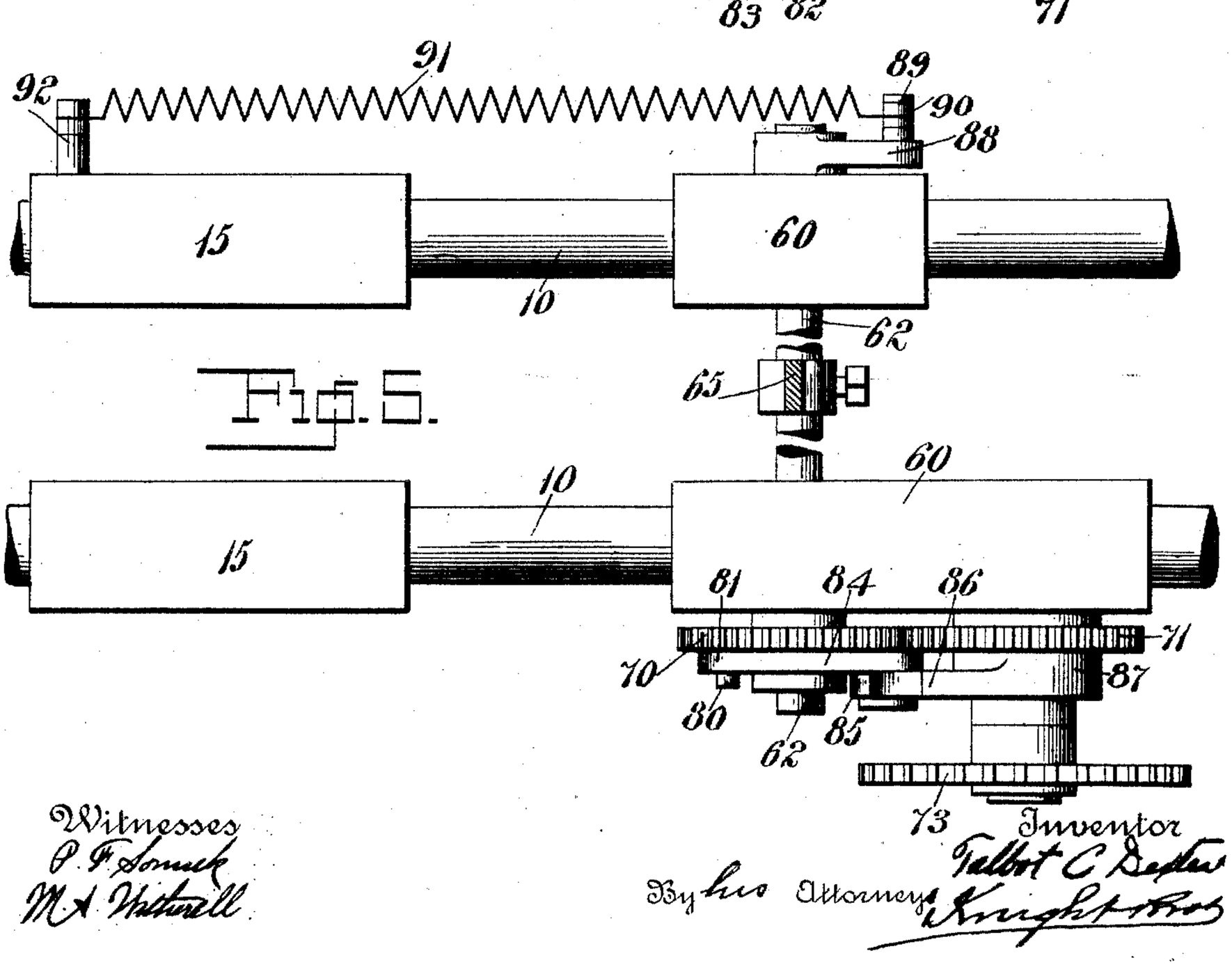


Fig. 5.



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NO MODEL. 6 SHEETS—SHEET 4.

FIG. 4

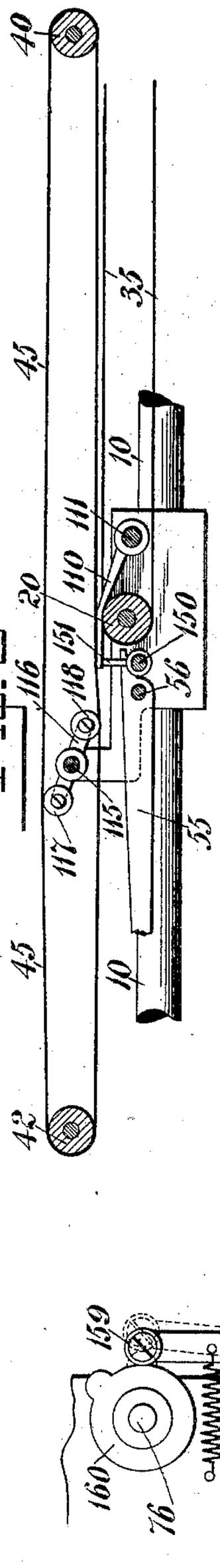


FIG. 5

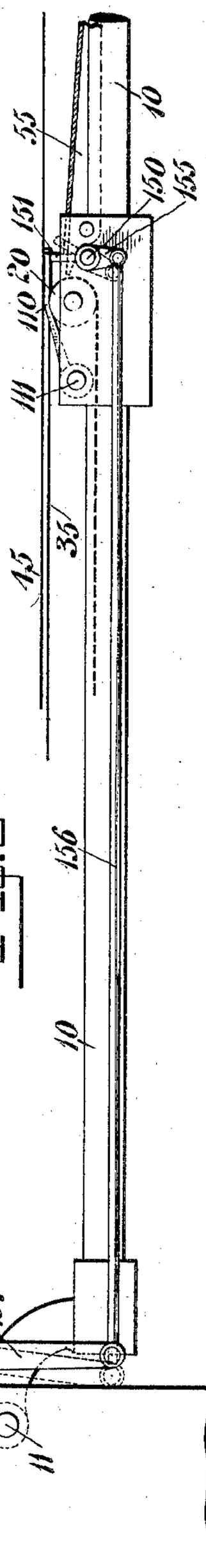


FIG. 7

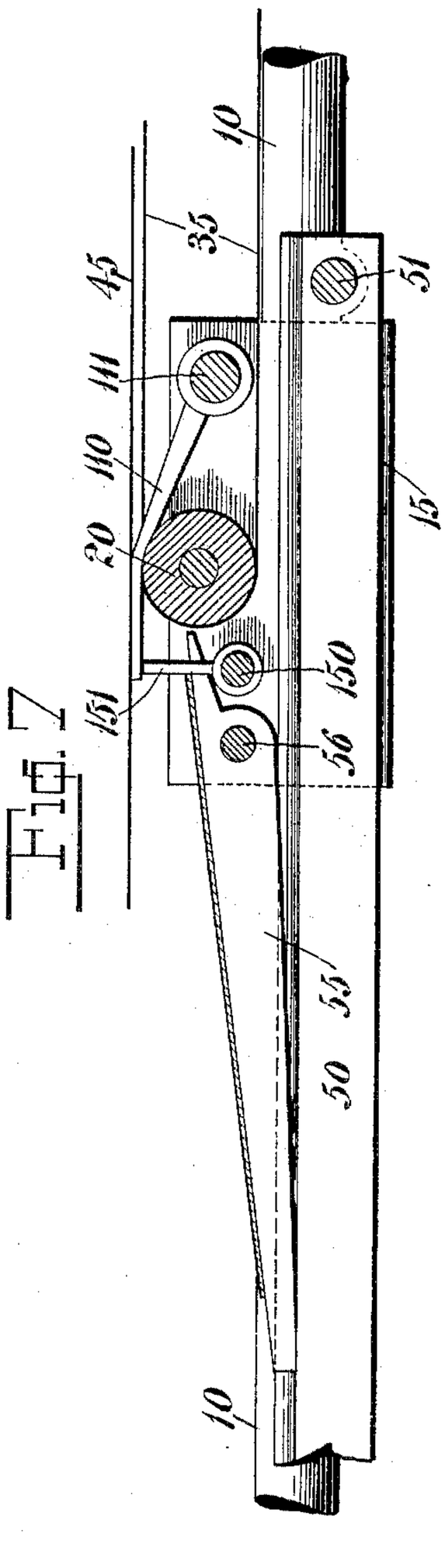
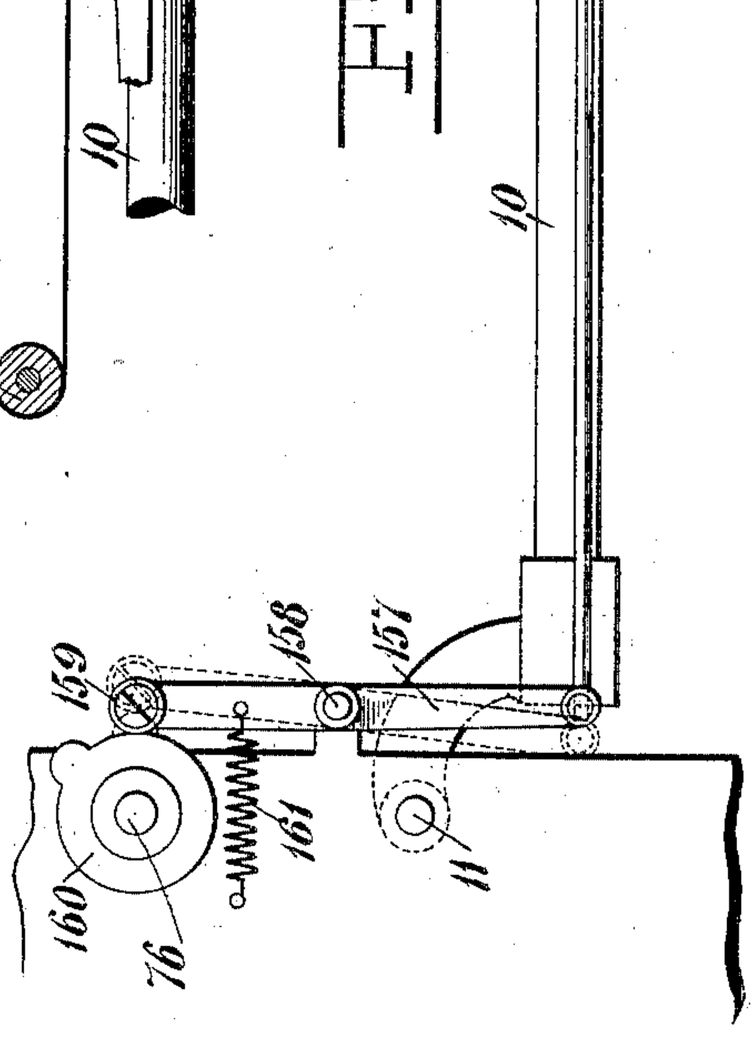


FIG. 6



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SHEET CONVEYING MACHINE.

APPLICATION FILED NOV. 1, 1902.

NO MODEL. 6 SHEETS—SHEET 5.

Fig. 9

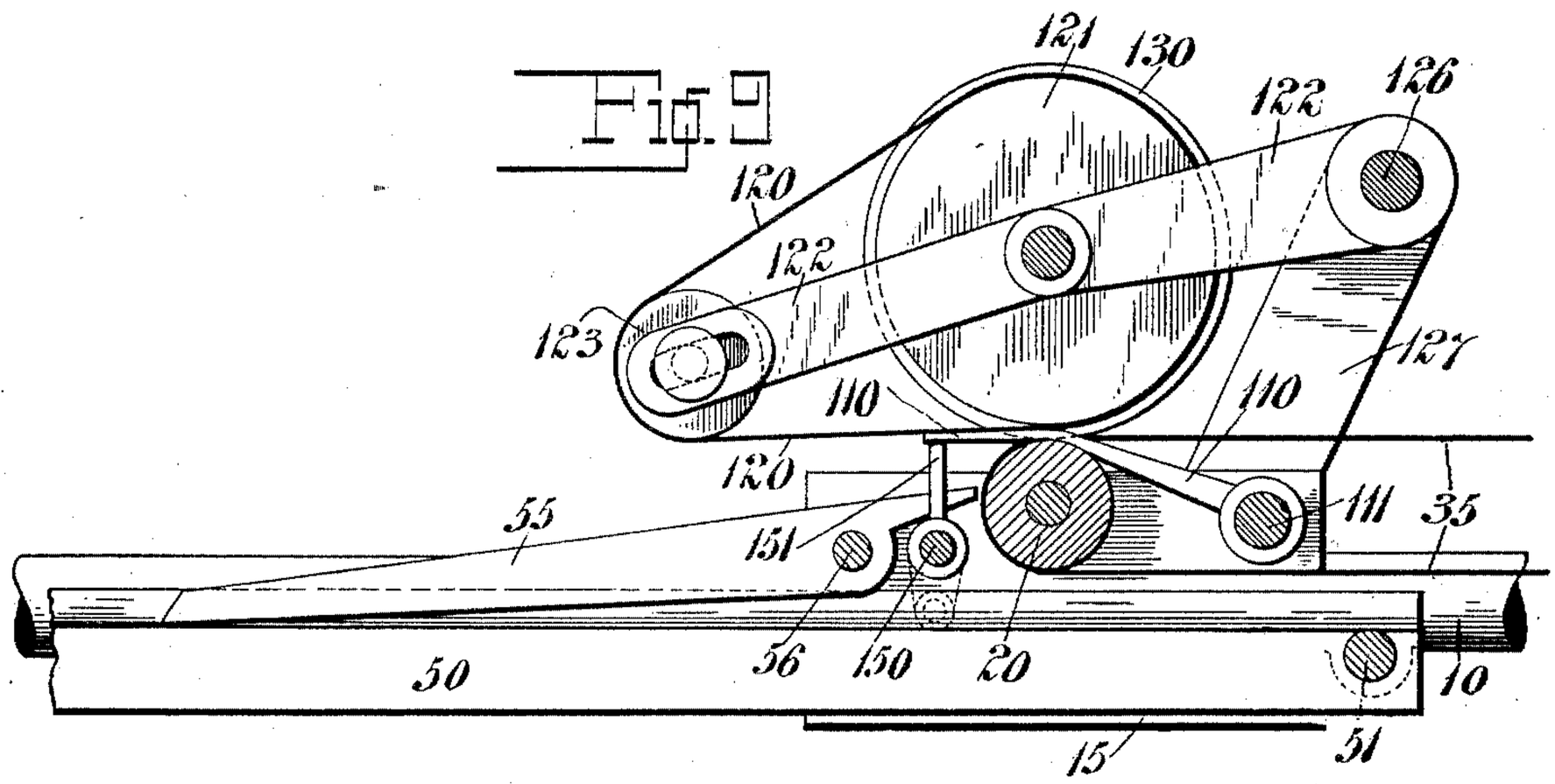
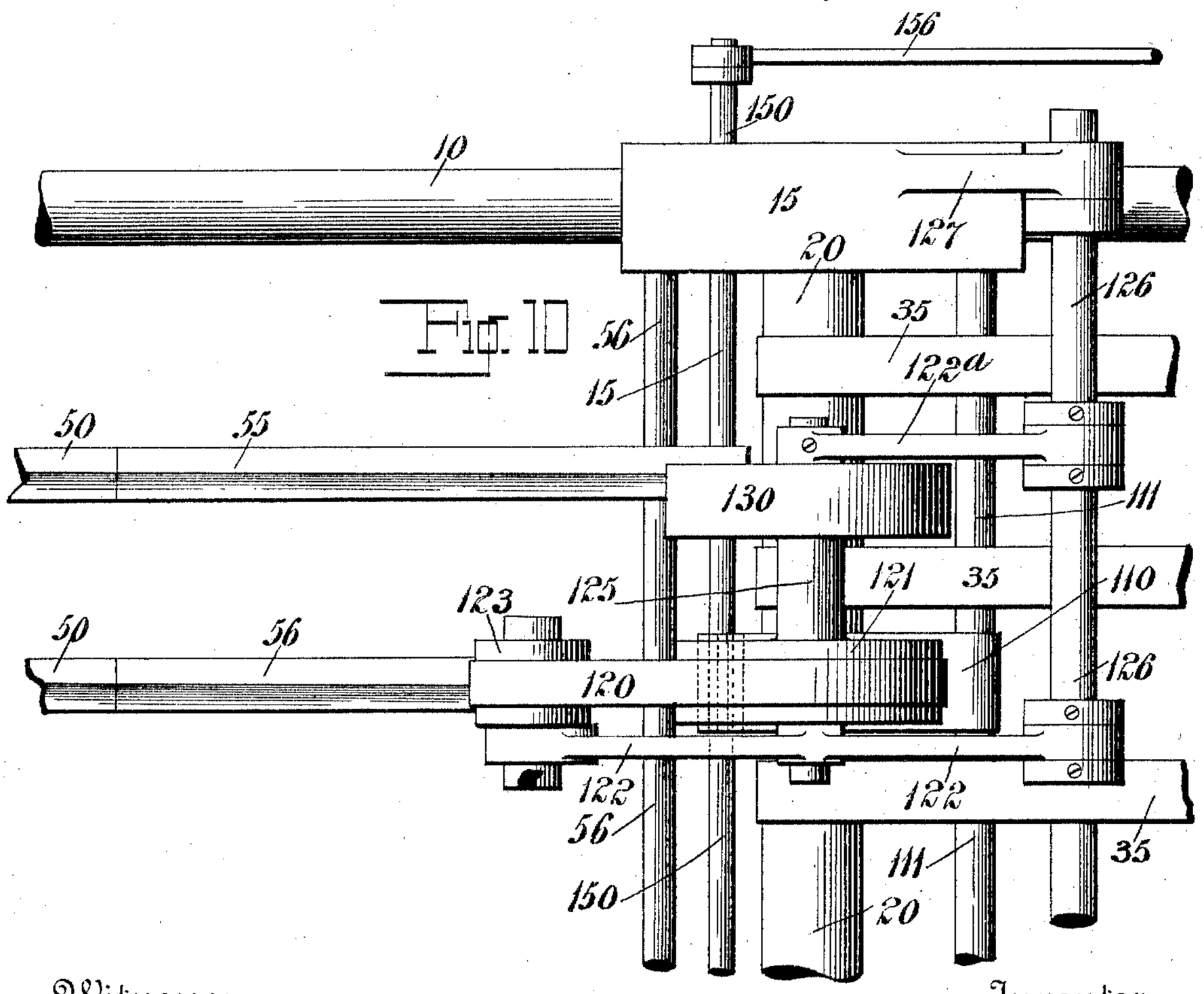


Fig. 10



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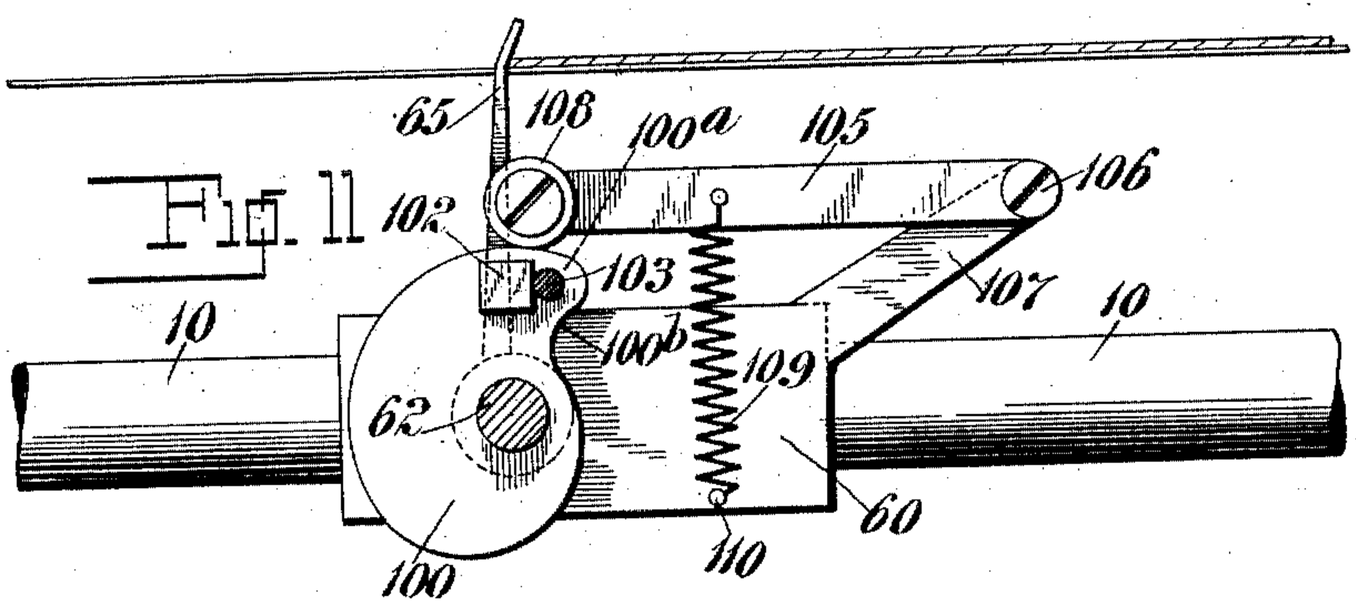
SHEET CONVEYING MACHINE.

APPLICATION FILED NOV. 1, 1902.

NO MODEL. 6 SHEETS—SHEET 6.

Fig. 11



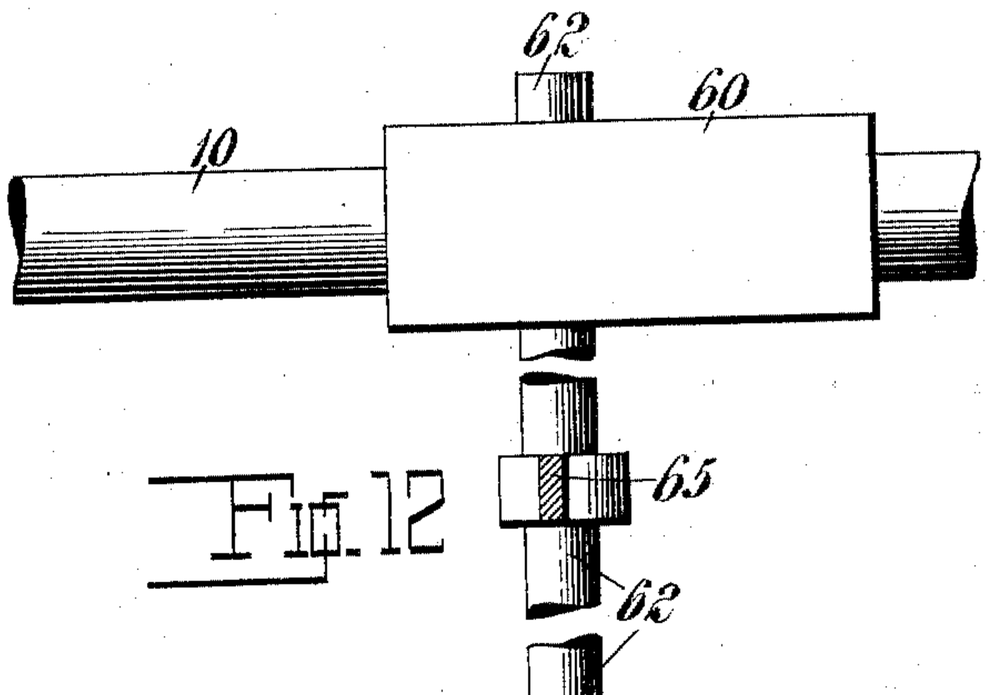
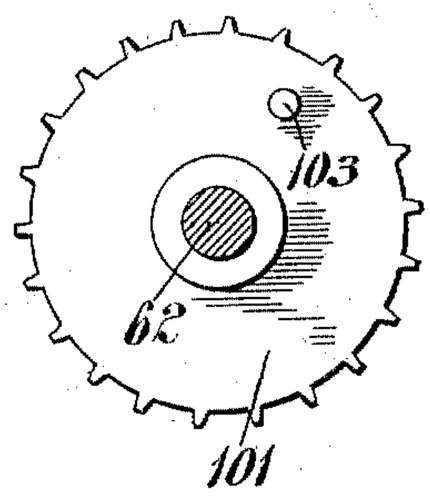
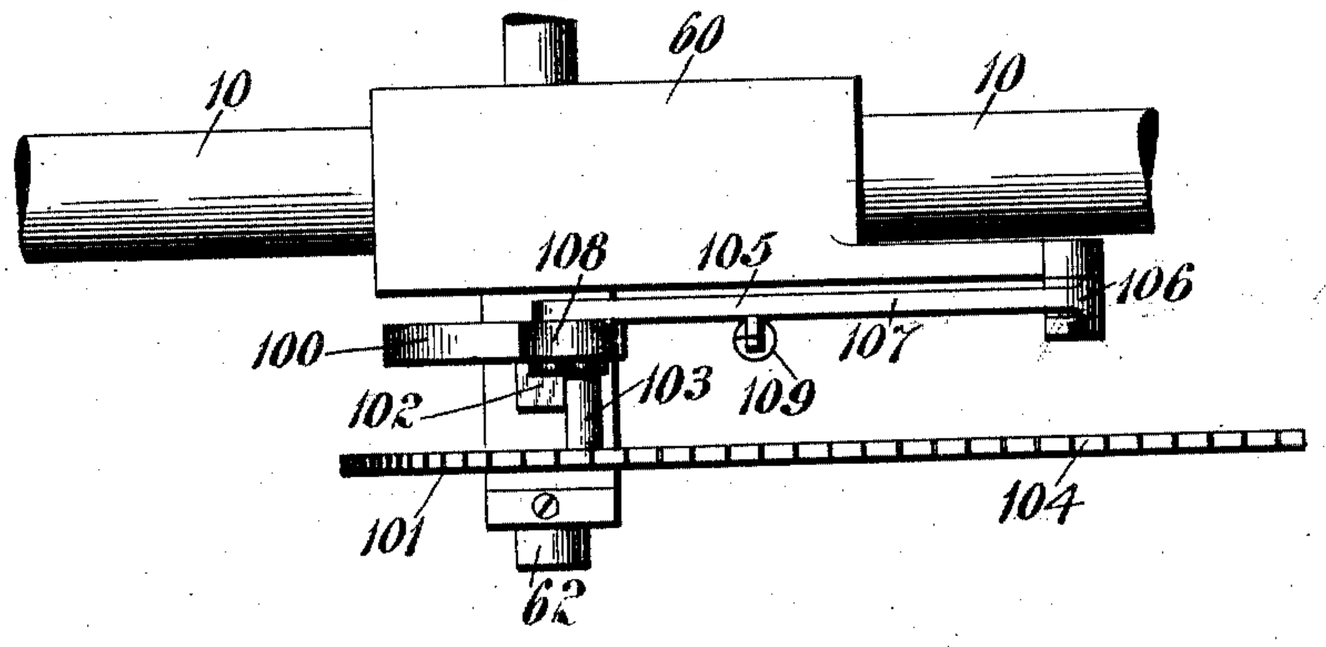


Fig. 12

Fig. 13





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No. 759,212. Patented May 3, 1904.

UNITED STATES PATENT OFFICE.

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

SHEET-CONVEYING MACHINE.

SPECIFICATION forming part of Letters Patent No. 759,212, dated May 3, 1904.

Application filed November 1, 1902. Serial No. 129,679. (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 Sheet-Conveying Machines, of which the following is a specification.

The present invention relates to improvements in sheet-feeding mechanisms for conveying successive sheets of paper from an automatic paper-feeding machine to a printing-press, folding-machine, ruling-machine, or other machine designed to operate upon sheets of paper.

The main difficulties encountered with mechanical feeding mechanisms for feeding sheets automatically to printing-presses and other machines are, first, the tendency of the machines to so crowd the sheets against the front gages that they will be buckled against the gages and be forced out of register when the gages are lifted and the grippers take the sheet; second, the chance of failing to feed the sheets sufficiently far to reach the front gages, which danger is increased by the effort to prevent the crowding of the sheets and by the variations in the position of the successive sheets upon the sheet-conveying tapes; third, the difficulty in sufficiently squaring the sheets upon the conveying-tapes to insure the registry of the sheets at both sides at the front gages, and, fourth, the danger of destroying the registry at the front gages by the action of the side registering mechanism.

To positively insure the registry of the sheets at the front gages, sheet-conveying mechanisms have been constructed to force the sheets a little farther than necessary, causing the crowding of the sheets against the gages. These conveying mechanisms are usually arranged to act upon the sheets a little to the rear of the gages, with the result that the crowding of the sheets is confined to a space of, say, from twelve to fifteen inches of its leading edge. This crowding causes a buckle in the forward portion of the sheet between the front gages and the feeding devices, and since the buckle extends over such a small portion of the length of the sheet it will be clear that the springy tendency of the sheet to flatten out will force the leading edge of the sheet forwardly out of register the instant the front gages are elevated and before the grippers can clamp the sheet upon the impression-cylinder.

To square the successive sheets upon the sheet-conveying tapes, it has been proposed to provide intermediate gages with operating mechanisms for intermittently lowering them across the path of the sheets to momentarily arrest the sheets upon the tapes and allow the action of the tapes to square the sheets. Such devices are objectionable because of the shock and strain upon the sheets, such strain being sufficient when feeding light grades of paper to injure the leading edge of the sheet and sometimes to destroy the sheets.

The object of my present invention is to produce an improved construction of sheet conveying or feeding mechanism which will avoid the objectionable crowding of the sheets against the front gages and will at the same time insure every sheet reaching proper registered position without subjecting the sheet to any injury or objectionable strain.

To this end my invention consists of three important features.

In the first place, I employ, in combination with the usual sheet-carrying tapes for feeding the sheets from the automatic feeding machine to the press, a rotating series of gage-fingers which are constructed and arranged to rotate slowly in the same direction as the carrying portion of the tapes and to intermittently intersect the path of the sheets just prior to the arrival of the leading edge of each sheet, so as to partially intercept the sheets and cause them to slow down slightly upon the carrying-tapes. This slowing down of the sheets will straighten them upon the tapes, and since the gage-fingers are traveling in the same direction as the tapes, although at a slower rate of speed, the shock and strain upon the sheet will be reduced to a minimum. The operating mechanism is so constructed that immediately after the straightening of a sheet the rotating gage-fingers will be given a rapid forward impulse to move them out of the path of the sheets and allow the tapes to convey the sheets forward without further

interruption. These rotating gages may be variously constructed, as hereinafter explained.

The second feature of importance in my present invention is the provision of means operating upon the rear edge of the sheet for moving the leading edge of the successive sheets positively and uniformly into engagement with the front gages. This device comprises a series of feeding-tapes operating above the sheet in combination with two or more plates or fingers, which are arranged approximately parallel with the tapes and are adjustable toward and away from the front gages and adapted to press the sheet upwardly into frictional engagement with the upper tapes. These fingers will cause the upper tapes to have a positive feeding action upon the sheets until the rear edge of the sheet drops from the forward ends of the fingers into the depression just beyond the delivery tape-roller of the lower or main feeding-tapes. These upper feeding-tapes may be the usual tapes running the entire length of the sheet-conveying mechanism for holding the sheets in proper frictional engagement with the lower tapes or they may be a supplemental or additional series of short tapes arranged just above and a little beyond the delivery tape-roller of the lower feeding-tapes. This action of the upper tapes and coöperating fingers causes the successive sheets to be fed positively against the front gages from their rear edges in a manner very similar to the action of the hand-feeder.

The third feature of importance in my present invention consists of a series of upwardly-projecting plates or fingers arranged parallel with and just beyond the delivery tape-roller of the under feeding-tapes in position to engage the rear edge of the sheet after it has been released from the upper feeding-tapes and coöperating feed-fingers for further insuring the proper register of the sheet. These fingers are preferably arranged upon a rock-shaft having means for intermittently moving it to cause the fingers to move toward the gages. These fingers may be moved forward and backward quickly to give the sheet a forward registering impulse and held normally in position to retain the sheet in longitudinal registered position or they may be held stationary in proper position to crowd the sheet slightly against the front gages while the side registering mechanism is operating. In this latter arrangement of the devices the crowding of the sheet is not objectionable, first, because it is very slight, and, second, because the slight tendency of the sheet to buckle is distributed throughout the entire length of the sheet, and the pressure of the leading edge of the sheet upon the front gages will be so slight that it will not force the sheet out of registered position when the front gages are lifted. When these upwardly-projecting registering plates or fingers are stationary, they will be arranged immediately beneath the forward ends of the fingers which coöperate with the upper feeding-tapes for the purpose of engaging the rear edge of the sheet and holding it in registered position. Whether said upwardly-projecting fingers are movable or stationary they form guides for the rear edge of the sheet for holding it in registered position longitudinally while the side registering mechanism operates, the sheet being moved laterally between the front and rear guides, which prevent its uneven movement. This structure is particularly important in view of the fact that the side registering-gripper frequently has to buckle the sheet at one side near its forward edge on its inward stroke. Such side registering-grippers frequently destroy the longitudinal register of sheets; but with the addition of my improvement the sheets are held in longitudinal registered position while the side registering-gripper operates.

The intermittently-operating rotating gages for squaring or straightening the traveling sheets upon the conveyer-tapes are mounted upon an adjustable carriage to enable the operator to accurately place the gages to suit the size of sheets to be fed, and the operating mechanism of said rotating gages is properly timed with relation to the sheet-carrying tapes to cause them to meet the leading edge of each sheet as it passes forward.

The feeding devices and end gages or fingers which operate upon the rear edge of the sheets are mounted upon the adjustable carriage, which supports the delivery tape-roller of the sheet-carrying tapes, so that all of said devices can be accurately adjusted toward or away from the front gages of the printing-press or other machine to accommodate the machine to sheets of any size. Rods or bars extend from the delivery tape-roller of the sheet-carrying tapes forwardly toward the gage end of the feed-board, said rods or bars being in a slightly lower plane than the carrying portion of said tapes to allow the rear edge of each sheet to drop sufficiently for the leading edge of the succeeding sheet to overlap it.

In addition to the above-recited main features my present invention includes many details of construction, and in order that the same may be fully understood I will first describe the same with reference to the accompanying drawings, and afterward point out the novelty more particularly in the annexed claims.

In said drawings, Figure 1 is a detail side elevation of my improved sheet feeding or conveying mechanism, part of the same being in section. Fig. 1[a] is a detail longitudinal sectional view of one of the adjusting devices for the carriage which supports the delivery tape-roller and other devices. Fig. 2 is a plan

view of the mechanism shown in Fig. 1. Fig. 3 is a detail longitudinal sectional elevation of the rotating gages for straightening sheets upon the conveyer-tapes. Fig. 4 is a similar view showing the parts in a different position. Fig. 5 is a detail plan view of the same mechanism. Fig. 6 is a detail longitudinal sectional view of the feed devices which operate upon the rear edge of the sheet and the movable rear registering gages or fingers and the operating mechanism for the latter. Fig. 7 is a similar view showing stationary rear registering-fingers. Fig. 8 is a similar view showing an arrangement of idler-pulleys for holding the upper tapes in operative relation to the feed-fingers. Fig. 9 is a detail longitudinal sectional view of a slight modification of the feed devices which operate upon the rear edge of the sheets. Fig. 10 is a plan view of the same. Fig. 11 is a detail side elevation of a modified form of the rotating gages for straightening sheets upon the conveyer-tapes. Fig. 12 is a detail plan view of the same. Fig. 13 is a detail of the sprocket-wheel of the modification shown in Figs. 11 and 12.

1 represents the impression-cylinder, 2 the front gage, 3 the under guides, and 4 the feed-board, of a printing-press.

5 represents part of the frame of an automatic paper-feeding machine.

6 is the feeding-machine tape-roller driven by a part of the feeding-machine in a manner well understood.

10 represents the side bars of the frame which supports the sheet-conveying mechanism which carries the successive sheets from the feeding-machine to the printing-press or other machine. These bars 10 are pivotally mounted upon the feeding-machine frame at 11 and carry upon their forward ends the side brackets 12, upon which are mounted the side registering mechanism (not shown) and the press-controlling devices, which are partly indicated but not described in detail, since they do not form any part of my present invention. These side brackets 12 rest upon the feed-board 4 and also carry the metal plates or bars 14, which form an incline leading from the delivery feed-roller 13 to the gage end of the feed-board.

15 indicates one of a pair of adjustable brackets or carriages, which are mounted to slide on the side bars 10 of the conveyer-frame for adjusting them toward and away from the front gages of the printing-press or other machine to which the sheets are to be fed. Each of these brackets or carriages 15 carries a pinion 16, which meshes with a series of rack-teeth 17, formed on the bars 10. By rotating the pinion 16 the position of the carriages 15 upon the supporting-bars can be adjusted.

20 is the delivery tape-roller of the series of endless sheet-carrying tapes. This roller 20 is freely journaled in the brackets or carriages 15 and extends from side to side of the machine.

25 indicates one of a second pair of adjustable brackets or carriages, mounted upon the bars 10 and adjustable longitudinally thereof. These brackets or carriages 25 are provided with set-screws 26 for securing them in the desired adjusted position. A tape-roller 27 is freely journaled in the brackets or carriages 25 and extends from side to side of the machine.

30 and 31 are tape-rollers suitably journaled in the supporting-frame for guiding the endless tapes. The endless tapes 35 pass from the feed tape-roller 6 over the guide tape-roller 31, thence forwardly to the delivery tape-roller 20, thence rearwardly to the guide tape-roller 30 and again forwardly to the adjustable tape-roller 27, and from there back to the tape-roller 6. By adjusting the carriages 15 and 25 the carrying portion of the endless tapes 35 may be extended or shortened toward or away from the front gages 2 of the press. This is for the purpose of adjusting the space between the delivery tape-roller 20 and the front gages to suit different sizes of sheets which are to be fed. The adjustment of these carriages also affords a convenient means for tightening or loosening the conveyer-tapes.

40 is a tape-roller journaled in the feeding-machine frame 5 and driven in any suitable manner, such as by means of a belt or tape 41, leading from the tape-roller 6. 42 is another tape-roller supported from bracket-arms 43, extending up from the side brackets 12, adjacent to the register end of the feed-board.

46 indicates the upper set of endless feed-tapes, which are supported upon the tape-rollers 40 and 42 and extend from end to end of the sheet-conveying machine parallel with the carrying portion of the conveyer-tapes 35. The purpose of tapes 45 is to insure the frictional engagement of the carrying-tapes 35 with the successive sheets.

Parallel sheet-supporting bars 50 are mounted at their opposite ends upon rods 51 and 52, extending between the side bars 10 of the conveyer-frame. These main sheet-supporting bars 50 are formed with upper angular faces and rest in a plane lower than the feeding plane of the sheet-carrying portion of the conveyer-tapes 35, as set forth in my application filed October 25, 1902, Serial No. 128,715. These bars 50 extend from a point adjacent to the delivery feed-roller 13 back to a point a little beyond the limit of rearward adjustment of the delivery tape-roller 20 of the sheet-conveying tapes. The forward supporting-rod 52 rests in the vertical slots 53, formed in the brackets 54, mounted on the side bars 10, and are adjustable vertically in said slots for raising and lowering the delivery ends of the rods for regulating the action of the delivery-roller 13 upon the sheets. The rod 52 is held in the desired adjusted position in slots

53 by any suitable means, such as clamp-nuts threaded upon the projecting ends of the rod. These feed supporting-bars 50 are adapted to receive the successive sheets from the conveying-tapes and support them during the final gaging operation.

A series of transfer-fingers 55, having angular upper faces corresponding to the upper faces of the bars 50 and formed with angular grooves in their under faces to enable them to fit snugly over and slide upon the bars 50, are pivotally mounted upon a rod 56, mounted in the carriages 15. These fingers 55 move forwardly and backwardly with the carriages 15. Located between the adjustable carriages 15 and 25 is a pair of adjustable brackets or carriages 60, which slide upon the side bars 10 and are held in the desired adjusted position by means of a rack-bar and pinion, such as 16 and 17, respectively, as shown in Fig. 1[a] and above described. A shaft 62 is freely journaled in the brackets or carriages 60 and extends from side to side of the machine. Adjustably mounted upon the shaft 62 are a series of gage-fingers 65, which during the rotation of the shaft 62 are projected above the carrying portion of conveyer-tapes 35, move in the same direction as the tapes for a part of a revolution, and then withdraw from their projected position in the manner and for the purpose which will presently be explained.

A gear-wheel 70 is freely journaled on one end of the shaft 62 and is driven by a similar gear 71, mounted upon a shaft 72, journaled in one of the brackets 60 and carrying at its outer end a sprocket-wheel 73, around which travels a sprocket-chain 74, driven by a sprocket-wheel 75, mounted upon one of the shafts of the feeding-machine—such, for instance, as the cam-shaft 76. Any suitable adjustable take-up device, such as indicated at 77, may be employed for tightening or loosening the sprocket-chain 74 to suit the adjusted positions of the carriages 60.

A sprocket-wheel 70 carries a pin 80, which rests between the oppositely-curved fingers 81 and 82 of a yoke 83, which is keyed or otherwise rigidly secured to the rotatable shaft 62. The pin 80 may move between the fingers 81 and 82 to allow relative movement between the sprocket-wheel 70 and shaft 62. The yoke 83 also carries an arm 84, which projects from shaft 62 directly opposite the fingers 81 and 82. This arm 84 carries an antifriction-roller 85, which is adapted to engage a curved finger 86, extending from a hub 87, secured to the short shaft 72, upon which are mounted the sprocket-wheel 73 and gear-wheel 71. The purpose of the curved finger 86 and arm 84, carrying antifriction-roller 85, is to prevent relative movement between shaft 62 and gage-fingers 65 and gear-wheel 70 during a certain part of a revolution of the shaft.

The shaft 62 carries upon its end opposite the gear-wheel 70 a crank-arm 88, carrying a crank-pin 89, supporting a collar 90, to which is connected one end of a long spring 91, connected at its opposite end with a pin 92, extending from one of the brackets or carriages 15. The purpose of the spring 91 acting upon crank 88 is to cause a forward quick movement of shaft 62, carrying gage-fingers 65, with relation to the gear-wheel 70 once during every revolution of the shaft, the pin 80 traveling during such quick movement from the finger 81 to the finger 82. As the shaft 72 rotates gear 71 will cause gear 70 to rotate in unison therewith, and the pin 80, engaging the curved finger 82, which is rigidly attached to shaft 62, will carry the shaft around with it. This rotation of shaft 62 moves the gage-fingers 65 up into gaging position with relation of the carrying portion of tapes 35 and forwardly with the tapes for a part of a revolution. As the fingers 65 are caused to project beyond the carrying portion of the tapes the roller 85 of arm 84 is moved into engagement with curved finger 86, which is rotating with the driving-gear 71. The spring 91 during this part of the operation is being expanded and will continue to expand until the crank-arm 88 passes its dead-center, when the spring will tend to contract. The continued rotation of the parts moves the gage-fingers forwardly in the same direction of travel as the movement of the carrying portion of the tapes, but at a slower rate of speed, until the diverting paths of the curved finger 86 and rock-arm 84 will free the antifriction-roller 85 from the finger 86. The spring 91 being then released will rapidly rotate shaft 62, disengaging finger 82 from pin 80 and throwing finger 81 into engagement with said pin, at the same time quickly withdrawing the gage-finger 65 beneath the carrying portion of the tapes. The shaft 62 will then continue to rotate under the action of spring 91 at the same rate of speed as gear-wheel 70, the pin 80 remaining in engagement with finger 81 to confine the shaft to that speed. The parts rotate in this relation until the spring 91 becomes ineffective by reason of the rock-arm 84, reaching its limited movement under control of the spring, when the shaft 62 will remain stationary and the gear 70 will continue to rotate alone until the pin 80 has passed from its engagement with finger 81 into engagement with finger 82. The pin 80 then picks up the finger 82 and again carries the shaft 62 forward.

The operating mechanisms of the sheet-conveying tapes and rotating gage-fingers are timed to cause the tapes to travel four times as fast as said gage-fingers, so that when the gage-fingers are projected across the path of the tapes just prior to the arrival of a sheet at their location they will intercept the sheet by engaging its leading edge and causing it to slow down to the speed of the rotating gages, the tapes slipping under the sheet and causing it to be squared or straightened out

upon the tapes by feeding up to the gages either side of the sheet which may need forward registering. Immediately following the squaring of the sheet the shaft 62 has imparted to it its rapid forward rotation for quickly moving the gages from in front of the sheet to allow it to again move forwardly with the carrying-tapes.

In Figs. 11, 12, and 13 I have shown a modification of this rotating gaging mechanism for straightening sheets in transit upon the carrying-tapes. In this modified mechanism the shaft 62, carrying gage-fingers 65, is journaled in the adjustable carriages 60, as in the preferred form just described. In place of the driving and controlling devices of the preferred form, however, I provide in this modified form a cam 100, rigidly secured to shaft 62 and formed with an extreme high portion 100^a, an extreme low portion 100^b, and a sprocket-wheel 101, loosely journaled on the projecting end of shaft 62. The cam 100 carries a boss or projection 102, which lies in the path of a pin 103 projecting from the inner face of the sprocket-wheel 101. The sprocket-wheel is driven by a sprocket-chain 104 in the same manner as explained in connection with the preferred form of the mechanism. A rock-arm 105 is journaled at 106 to a bracket-arm 107, projecting from one of the brackets or carriages 60. An antifriction-roller 108 is freely journaled in the end of rock-arm 105 and supported in peripheral engagement with the cam 100. A spring 109 connects the arm 105 with a pin 110 upon one of the brackets 60 for giving it a downward springy tendency. With this modified structure the normal rotation of shaft 62, carrying gage-finger 65, is caused by engagement of pin 103 of the rotating sprocket-wheel 101 with the boss or projection 102 of the cam 100, which is secured to the shaft. The cam 100 is so positioned upon the shaft 62 that the antifriction-roller 108 will tend to move from the extreme high portion 100^a to the extreme low portion 100^b just as the gage-fingers 65 have completed their gaging operation, so that when the parts reach this position the spring 109 will force arm 105 downwardly to cause cam 100, connected shaft 62, and gage-fingers 65 to move rapidly forward, withdrawing the fingers 65 from the path of the sheets and causing the boss or projection 102 to run away from the pin 103. When the antifriction-roller 108 has reached the extreme low portion of the cam 100, the cam and shaft will remain still until the rotation of sprocket-wheel 100 brings the pin 103 into engagement with projection 102, when the cam 100 and shaft 62 will again rotate forwardly for repeating the operation, the formation of the cam 100 being such that the arm 105 will again be moved upwardly to strain the spring 109 in readiness for the succeeding operation.

After the sheets have been straightened or squared on the conveying-tapes 35 by the mechanism just described they pass forwardly to the delivery tape-roller 20, the leading edge of the sheet falling from the tape-roller onto the transfer-fingers 55 and being led by them to the main sheet-supporting bars 50 and there transferred over the feed-roller 15 to the inclined plates or bars 14, when the leading edge of the sheet comes into contact with the front gages 2. For the purpose of positively and gently feeding the successive sheets into contact with the front gages, so as to insure the longitudinal register of the sheets without danger of injuring them and without any chance of the plunging forward of the sheet out of register when the front gages are raised, I provide a novel arrangement of feeding devices for operating upon the rear edge of the sheet. These devices will now be described.

110 is one of a pair or more of sheet-supporting plates or fingers which project upwardly and forwardly from a transverse supporting rod or bar 111, which is mounted in the adjustable carriages 15. These sheet-supporting fingers 110 have forward horizontal portions which project over the delivery tape-roller 20 and rest in contact with the under portion of the upper feed-tapes 45, their purpose being to lead the sheets from the carrying portion of the conveyer-tapes 35 upwardly into engagement with the upper tapes 45. These fingers effectively hold the sheets into frictional engagement with the tapes 45, so that when the rear edge of a sheet passes the delivery tape-roller 20 and is no longer propelled by the main conveyer-tapes 35 it will be entirely under the influence of the upper tapes 45. These tapes continue to feed the sheet forwardly by engagement with its rear edge until the rear edge of the sheet reaches the extreme forward end of the sheet-supporting fingers 110, when the rear edge of the sheet will drop upon the transfer-fingers 55. As the carriages 15 have previously been adjusted to support the extreme forward end of fingers 110 at exactly the proper distance from the front gages 2, it will be clear that the sheet will be accurately registered. The action of the upper feed-tapes 45, in combination with the sheet-supporting fingers 110, is very similar to the operation in feeding sheets by hand, in which case the feeder moves the sheets into register by taking them at their rear edges and sliding them forwardly into contact with the gages. Since two or more of the sheet-supporting fingers 110 are employed, it will be clear that should the sheet be slightly out of alinement with the tapes one side of the sheet will remain under the action of the upper feed-tapes longer than the other side, so that sheet will be straightened.

In Fig. 8 of the drawings I have shown an adjustable shaft 115 supporting arms 116, carrying idler tape-rollers 117 and 118 for holding the upper tapes 45 taut and for de-

pressing the lower portion of said tapes slightly to increase the feeding effect of the tapes upon the sheets as they pass from the sheet-supporting fingers 110.

In Fig. 9 I have shown a slight modification of this feed mechanism for operating upon the rear end of the sheets. In this modified form of the mechanism I do away with the usual upper feeding-tapes 45 and in place of them employ short auxiliary tapes 120, which are carried upon large tape-rollers 121, journaled in the rock-arms 122, and small tape-rollers 123, adjustably journaled in said arms 122. These large tape-rollers 121 are mounted upon short shafts 125, which are freely journaled in a pair of rock-arms 122 and 122ª, said rock-arms being mounted upon a shaft 126, supported in the upwardly-projecting bracket-arms 127, extending from the adjustable carriages 15. Each short shaft 125 also carries a frictional roller 130, which operates in peripheral contact with the delivery tape-roller 20 and is driven thereby to rotate the large tape-rollers 121 and drive the short tapes 120. The operation of this form of the mechanism is practically the same as in the preferred form. The friction-rollers 120 and tape-rollers 121 are held by gravity in their operative relation to the tape-roller 20 and sheet-supporting fingers 110.

150 is a bar or shaft supported in the adjustable carriages or brackets 15 and extending from side to side of the machine. This bar or shaft 150 carries two or more upwardly-projecting gage-fingers 151, which rest just below the sheet-supporting fingers 110 and preferably a little in rear of the forward ends of said fingers 110. The bar or shaft 150 may be an adjustably-mounted stationary shaft, as shown in Fig. 7 of the drawings, or it may be a rock-shaft, as shown in Fig. 6 of the drawings. When this shaft 150 is arranged to rock in its bearings, it is provided at one end with a downwardly-projecting rock-arm 155, connected, through a rod 156, with the lower end of a lever 157, journaled at 158 to the frame 5 of the feeding-machine and carrying in its upper end an antifriction-roller 159, which projects upon the periphery of a cam 160, mounted upon the feeding-machine cam-shaft 76. A spring 161 connects the lever 157 with the feeding-machine frame to hold the antifriction-roller 159 in engagement with the operating-cam.

The purpose of the upwardly-projecting gage-fingers 151 is to further insure the longitudinal register of the sheets and to form rear guides or gages for confining the sheets in longitudinal registered position during the operation of the side registering mechanism. When these gage-fingers 151 are arranged to be stationary, they will be so mounted as to be about the distance from the front gages to allow a sheet of paper to rest snugly between them and the front gages, although they may be arranged sufficiently close to the front gages to crowd the sheet slightly to further insure proper registering. If the sheet is slightly crowded between the rear gages 151 and the front gages 2, the slight buckling tendency of the sheet will not be sufficient to force the sheet forwardly out of register when the front gages are raised to allow the grippers of the impression-cylinder of the press to take the sheet.

When the gage-fingers 151 are arranged to rock, it will be observed that the shape of the cam 160 is such that the fingers will be given a quick forward impulse and returned to normal position, which will correspond with the position assumed by the fingers when they are stationary. This forward jogging of the sheet by fingers 151 is an additional precaution to insure the leading edge of the sheet being in proper engagement with the front gages. The rocking fingers remain in their vertical position after the jogging movement to act in the same manner as the stationary fingers. These rear gage-fingers 151 constitute an especially important feature when combined with the upper carrying-tapes 45 and the sheet-supporting fingers 110. The relative arrangement of these parts is preferably such that the upper tapes 45 and sheet-supporting fingers 110 will crowd the sheet forwardly from one-quarter of an inch to an inch to render it absolutely certain that the leading edge of the sheet will reach the front gages, the rear edge of the sheet falling below the fingers 110 and springing back slightly to the limit defined by the rear gage-fingers 151.

The fingers 110 and 151, being mounted upon the adjustable brackets or carriages 15, can readily be adjusted toward and away from the front gages 2 to suit any size of sheet which it is desired to print. It will be clear that when a sheet is in registered position it will rest upon the plates or bars 14, the bars 50, and the fingers 55, with its front edge in engagement with the gages 2 and its rear edge in engagement with the gages 151.

I desire to claim broadly in my present application the combination of the moving gage-fingers with the sheet-carrying tapes so constructed and arranged that the gage-fingers will be intermittently projected across the path of the sheets upon the tapes and moved forwardly with the tapes at a slower rate of speed than the tapes, so as to slow down or partially arrest the movement of the sheets for straightening them upon the tapes, and then be withdrawn from the path of sheets upon the tapes at a faster rate of speed than the tapes. These gage-fingers are preferably mounted to rotate and are provided with operating mechanism which is adapted to move the fingers slowly in the direction of travel of the tapes while the sheet is being

gaged and move the fingers very rapidly for withdrawing them from the path of the sheets immediately after the gaging of the sheets.

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

1. In a sheet-conveyer, the combination of a series of sheet-carrying tapes, with gage-fingers movable into and out of operative relation with the tapes, and operating means adapted to cause said gage-fingers to project across the path of sheets upon the tapes, then move forwardly with the tapes at a slower rate of speed than the tapes, and finally be rapidly withdrawn from the path of sheets upon the tapes at a faster rate of speed than the tapes, substantially as set forth.

2. In a sheet-conveyer, the combination of a series of sheet-carrying tapes, with rotating gage-fingers arranged to intermittently project across the path of sheets upon the tapes, and operating means adapted to rotate said gage-fingers at a slower rate of speed than the feed-tapes for partially arresting sheets upon the tapes, and then rotate said fingers rapidly for removing them quickly from the path of the sheets, substantially as set forth.

3. In a sheet-conveyer, the combination of a series of sheet-carrying tapes, and their operating means, with rotating gage-fingers arranged to intermittently project across and be withdrawn from the path of sheets upon the tapes, operating means adapted to rotate said gage-fingers at a slower rate of speed than the feed-tapes during part of a revolution for partially arresting and straightening sheets upon the tapes, and auxiliary means for rotating said gage-fingers at a faster rate of speed during another part of a revolution for rapidly withdrawing the gages from the path of sheets upon the tapes, substantially as set forth.

4. In a sheet-conveyer, the combination of a series of sheet-carrying tapes, with rotating gage-fingers arranged to intermittently project across and be withdrawn from the path of sheets upon the tapes, operating means adapted to rotate said gage-fingers, and auxiliary means adapted to rotate said gage-fingers and cause them to run ahead of the operating means, substantially as set forth.

5. In a sheet-conveying mechanism, the combination of sheet-carrying tapes, with rotatable gage-fingers constructed and arranged to intermittently project across and be withdrawn from the path of the tapes, and operating means for moving said gage-fingers, means constructed and arranged to engage said gage-fingers in a forward direction and independently of the operating means, and auxiliary means adapted to move the gage-fingers ahead of the operating means, substantially as set forth.

6. In a sheet-conveyer, the combination of a series of sheet-carrying tapes, with a series of gage-fingers constructed and arranged to intermittently project across the path of the tapes and move forwardly with the tapes, a rotary shaft upon which the gage-fingers are mounted, a driving member loosely mounted upon said shaft, a driven member fixed upon said shaft, means of engagement between the driving and driven members, and means for rotating said shaft independently of the driving member, substantially as set forth.

7. In a sheet-conveyer, the combination of a series of sheet-carrying tapes, with rotatable gage-fingers movable into and out of operative relation with the tapes, a shaft upon which said gage-fingers are mounted, a driven member secured to said shaft, a driving member loose on said shaft, means of engagement between the driving and driven members, and auxiliary spring-actuated means for moving said gage-fingers independently of the driving member, substantially as set forth.

8. In a sheet-conveyer, the combination of a series of sheet-carrying tapes, with rotatable gage-fingers movable into and out of operative relation with the tapes, a shaft upon which said gage-fingers are mounted, a driven member secured to said shaft, a driving member loose on said shaft, means of engagement between the driving and driven members, auxiliary spring-actuated means for moving said gage-fingers independently of the driving member, and means controlling the operation of the auxiliary spring-actuated means, substantially as set forth.

9. In a sheet-conveyer, the combination of a series of sheet-carrying tapes, with rotatable gage-fingers movable into and out of operative relation with the tapes, a shaft upon which said gage-fingers are mounted, means for rotating said shaft at a normal speed, and an independent spring device operating upon a member secured to said shaft and adapted to rotate said shaft independently to its normally operating driving means, substantially as set forth.

10. In a sheet-conveyer, the combination of a series of sheet-carrying tapes, with a rotatable shaft, supporting gage-fingers which are adapted to move into and out of operative relation with the tapes, a driven member secured to said shaft, a driving member loosely mounted upon said shaft and engaging the driven member, an auxiliary spring device operating upon a part connected with said shaft, and a rotating device adapted to intermittently engage a part connected with said shaft for controlling the action of said spring device, substantially as set forth.

11. In a sheet-conveyer, the combination of a series of sheet-carrying tapes, with a rotatable shaft supporting gage-fingers, a driven part secured to said shaft, a driving part loosely mounted with relation to said shaft and having means of engagement with the driven member, a rotating controlling-arm

adapted to periodically engage said driven part, and a spring device operating upon the shaft for driving it independently of the driving member, substantially as set forth.

12. In a sheet-conveyer, the combination of a series of sheet-carrying tapes, with a rotatable shaft supporting gage-fingers which rotate in operative relation with said tapes, a yoke-arm secured to said shaft, a driving-wheel loosely journaled upon said shaft and provided with a pin which projects between the arms of said yoke for allowing a limited relative movement between the shaft and driving-wheel, and an auxiliary driving device operating upon said shaft for rotating it a limited amount independently of the driving-wheel, substantially as set forth.

13. In a sheet-conveyer, the combination of a series of sheet-carrying tapes, with a rotatable shaft supporting gage-fingers which rotate in operative relation with said tapes, a yoke-arm secured to said shaft, a driving-wheel loosely journaled upon said shaft and provided with a pin which projects between the arms of said yoke for allowing a limited relative movement between the shaft and driving-wheel, an auxiliary driving device operating upon said shaft for rotating it a limited amount independently of the driving-wheel, and a rotating controlling-arm adapted to engage a part projecting from said shaft for controlling the operation of said auxiliary driving device, substantially as set forth.

14. In a sheet-conveyer, the combination of a series of sheet-carrying tapes with a rotary shaft supporting gage-fingers, driving means loosely mounted upon said shaft, means of engagement between said driving means and said shaft, constructed to allow a limited relative movement between them, an arm secured to and projecting from said shaft, a parallel shaft carrying a rotating controlling-arm which is adapted to periodically engage the arm of the gage-shaft, and an auxiliary driving device operating upon said gage-shaft, substantially as set forth.

15. In a sheet-conveyer, the combination of a series of sheet-carrying tapes, with a rotary shaft supporting gage-fingers which rotate in operative relation with the tapes, a main driving device having means of engagement with said shaft and constructed to allow a limited relative movement between it and said shaft, a crank-arm secured to said gage-shaft, a spring device connected with said crank-arm and adapted to rotate the gage-shaft a limited amount independently of the main driving device, and a rotating controlling-arm adapted to periodically engage a part upon the gage-shaft for controlling the action of said spring device, substantially as set forth.

16. In a sheet-conveyer, the combination of a series of sheet-carrying tapes, with a rotatable shaft carrying gage-fingers which rotate in operative relation to the tapes, oppositely-curved fingers 81, 82, secured to said gage-shaft, driving-wheel 70 loosely journaled upon said shaft and carrying a pin 80 which operates between the fingers 81, 82, a wheel 71 mounted upon a shaft 72 and driving the wheel 70, means for rotating said shaft 72, a controlling-arm 86 mounted upon shaft 72, an arm 84 mounted upon the gage-shaft and adapted to be periodically engaged by the controlling-arm 86, and an auxiliary driving device arranged to operate upon the gage-shaft for rotating it a limited amount independently of the main driving-wheel 70, substantially as set forth.

17. In a sheet-conveyer, the combination of suitable registering-gages, a series of sheet-carrying tapes, a series of upper feed-tapes, and a series of plates or fingers arranged adjacent to the delivery-roller of the lower tapes and adapted to press sheets upwardly into engagement with the upper tapes, and means for adjusting said fingers toward and away from the gages, substantially as set forth.

18. In a sheet-conveyer, the combination of a series of sheet-carrying tapes, the receiving and delivery tape-rollers supporting said tapes, suitable registering-gages, and a series of upper feed-tapes, with a series of plates or fingers arranged adjacent to the delivery-roller of the lower tapes and adapted to press sheets upwardly into engagement with the upper tapes, and means for adjusting said delivery-roller and said plates or fingers with relation to the gages, substantially as set forth.

19. In a sheet-conveyer, the combination of suitable front gages, with a series of upper feed-tapes, a series of plates or fingers arranged to press sheets upwardly into engagement with the said tapes, and a series of plates or fingers adapted to engage the rear edge of the sheet for holding the sheet into engagement with said front gages, substantially as set forth.

20. In a sheet-conveyer, the combination of suitable sheet-carrying tapes and their receiving and delivery tape-rollers, with suitable front gages, upper feed-tapes, plates or fingers arranged adjacent to the delivery-roller of the lower tapes and adapted to press sheets upwardly into engagement with the upper tapes, and a series of gage-fingers arranged beneath said sheet-supporting fingers adjacent to the said delivery tape-roller, and adapted to hold the sheets into engagement with said front gages, substantially as set forth.

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