No. 649,957. Patented May 22, 1900.

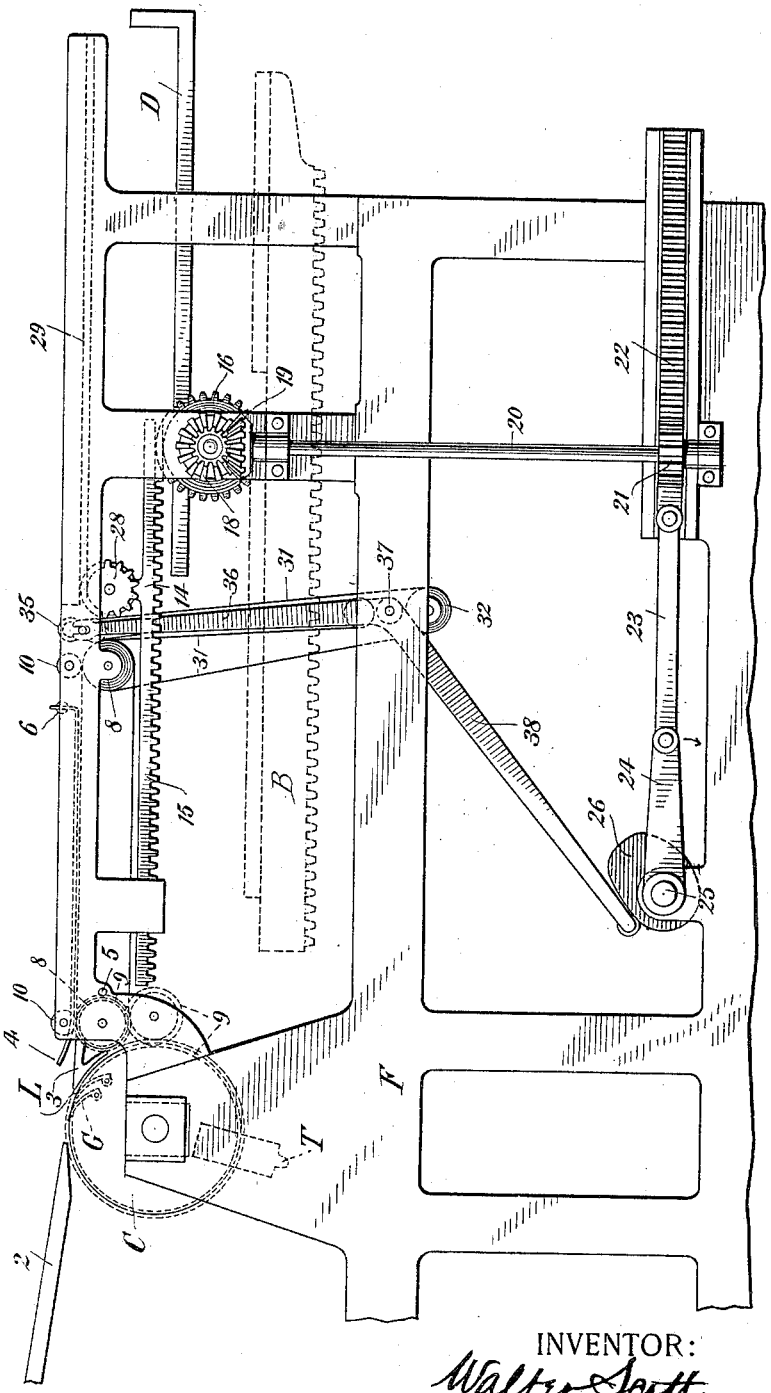
W. SCOTT.

SHEET DELIVERY MECHANISM.

(Application filed Mar. 10, 1897.)

(No Model.) 6 Sheets—Sheet 1.

Fig. 1.



WITNESSES:

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Frank Ryall

INVENTOR:

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By his Attorney

Richard W. Barkley.

No. 649,957. Patented May 22, 1900.

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SHEET DELIVERY MECHANISM.

(Application filed Mar. 10, 1897.)

(No Model.) 6 Sheets—Sheet 2.

Fig. 3,

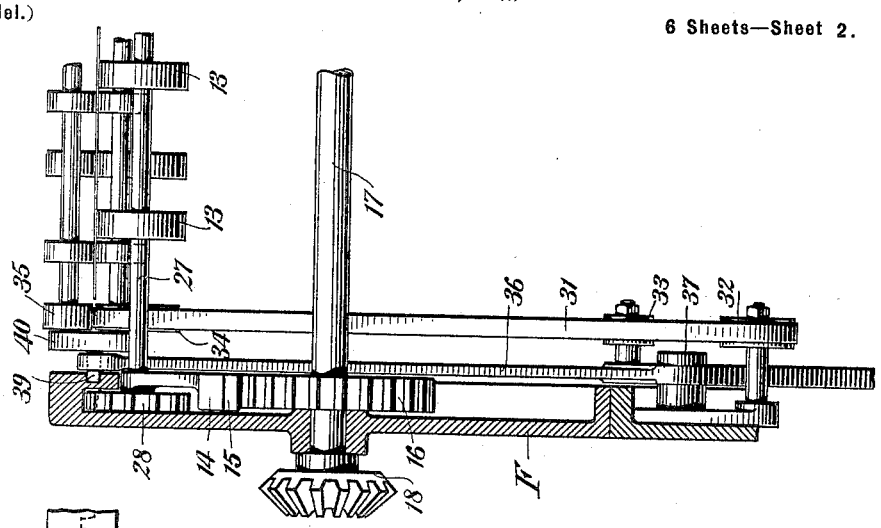
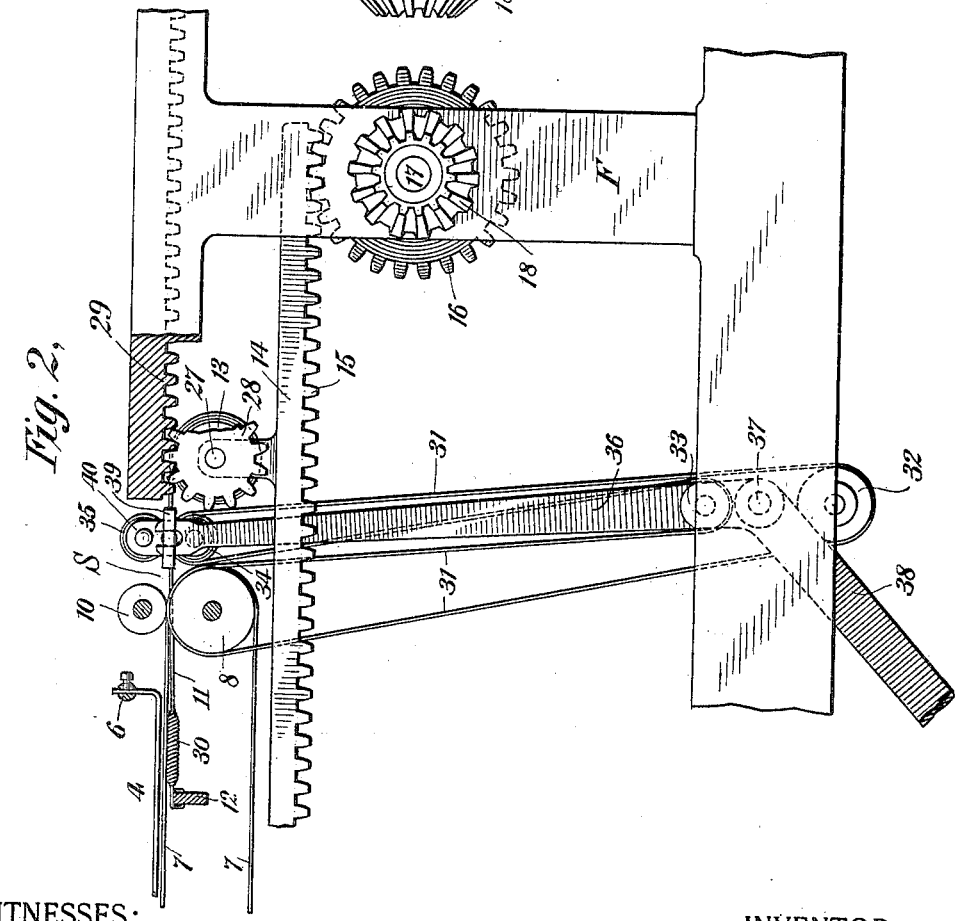


Fig. 2,



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SHEET DELIVERY MECHANISM.

(Application filed Mar. 10, 1897.)

(No Model.) 6 Sheets—Sheet 3.

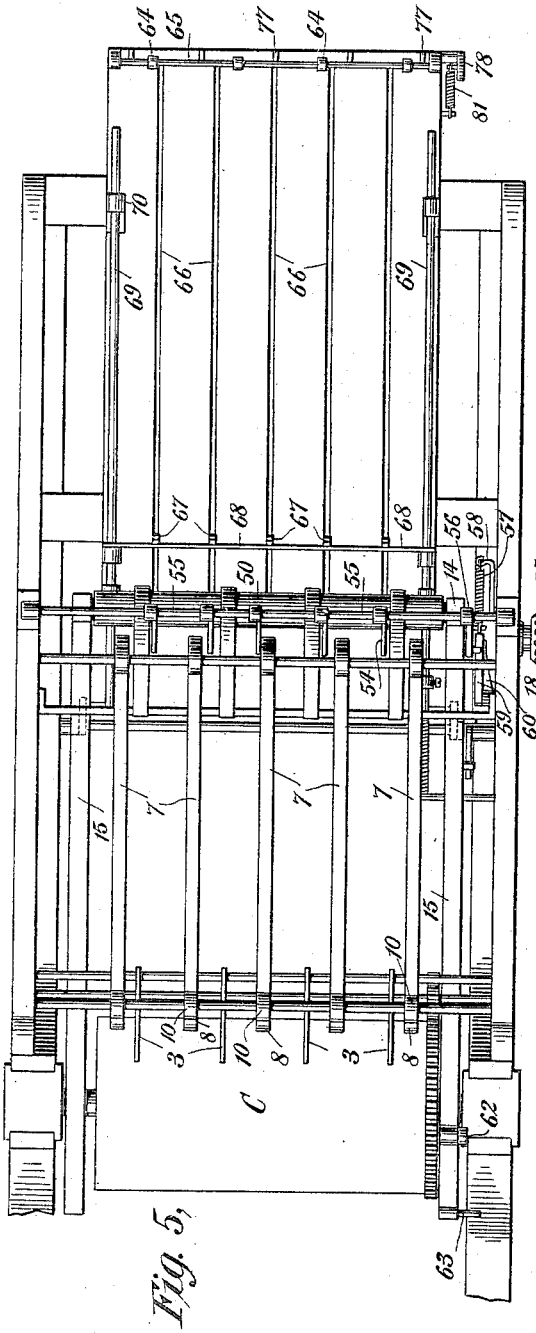

Fig. 5.

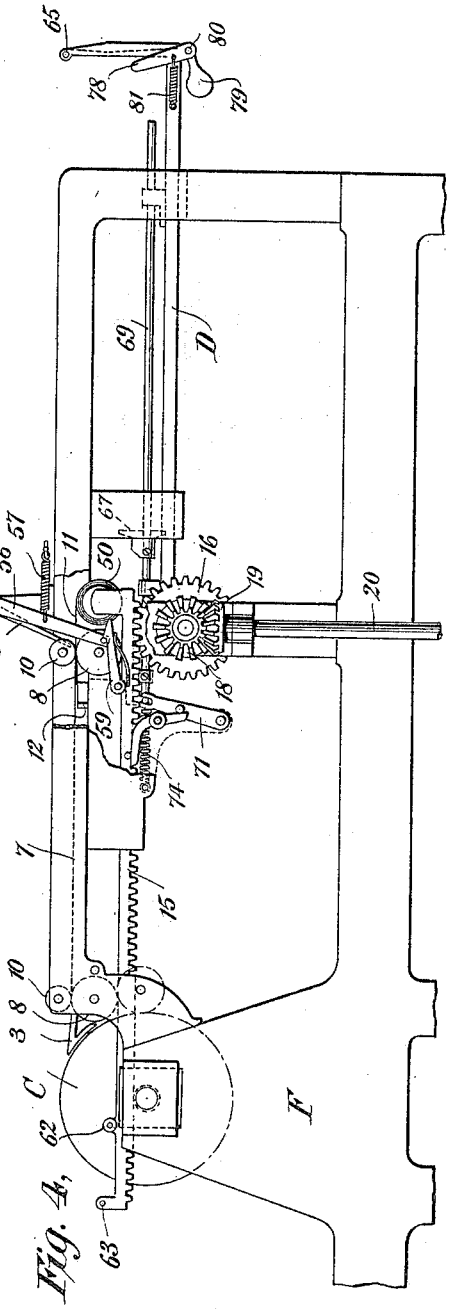

Fig. 4.

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SHEET DELIVERY MECHANISM.

(Application filed Mar. 10, 1897.)

(No Model.) 6 Sheets—Sheet 4.

Fig. 6.

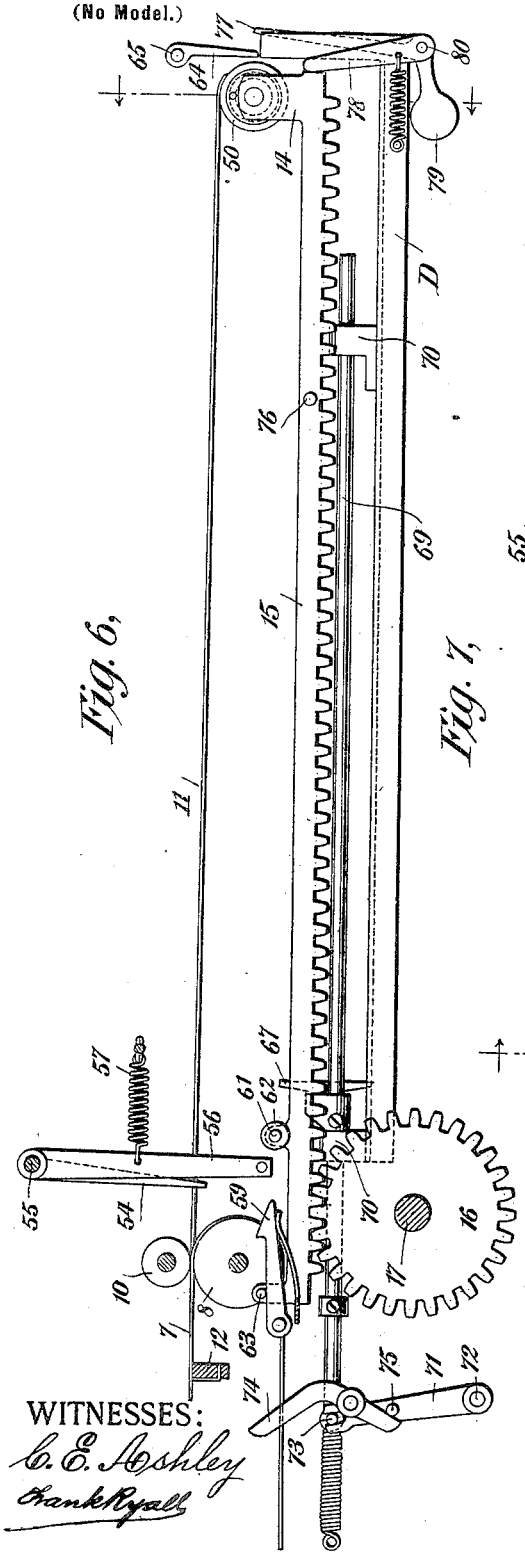
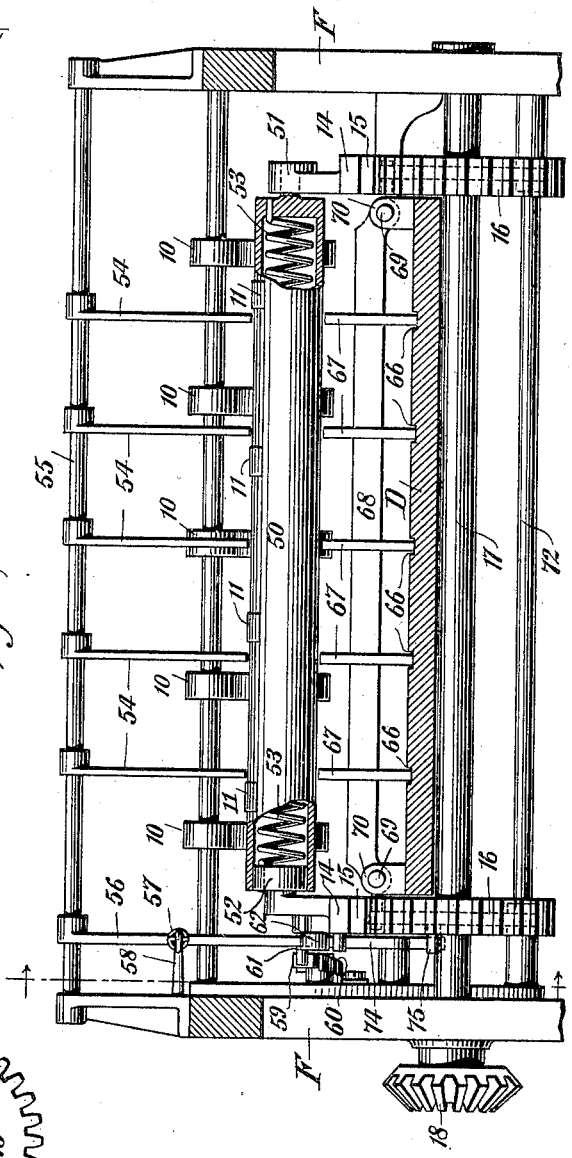


Fig. 7.



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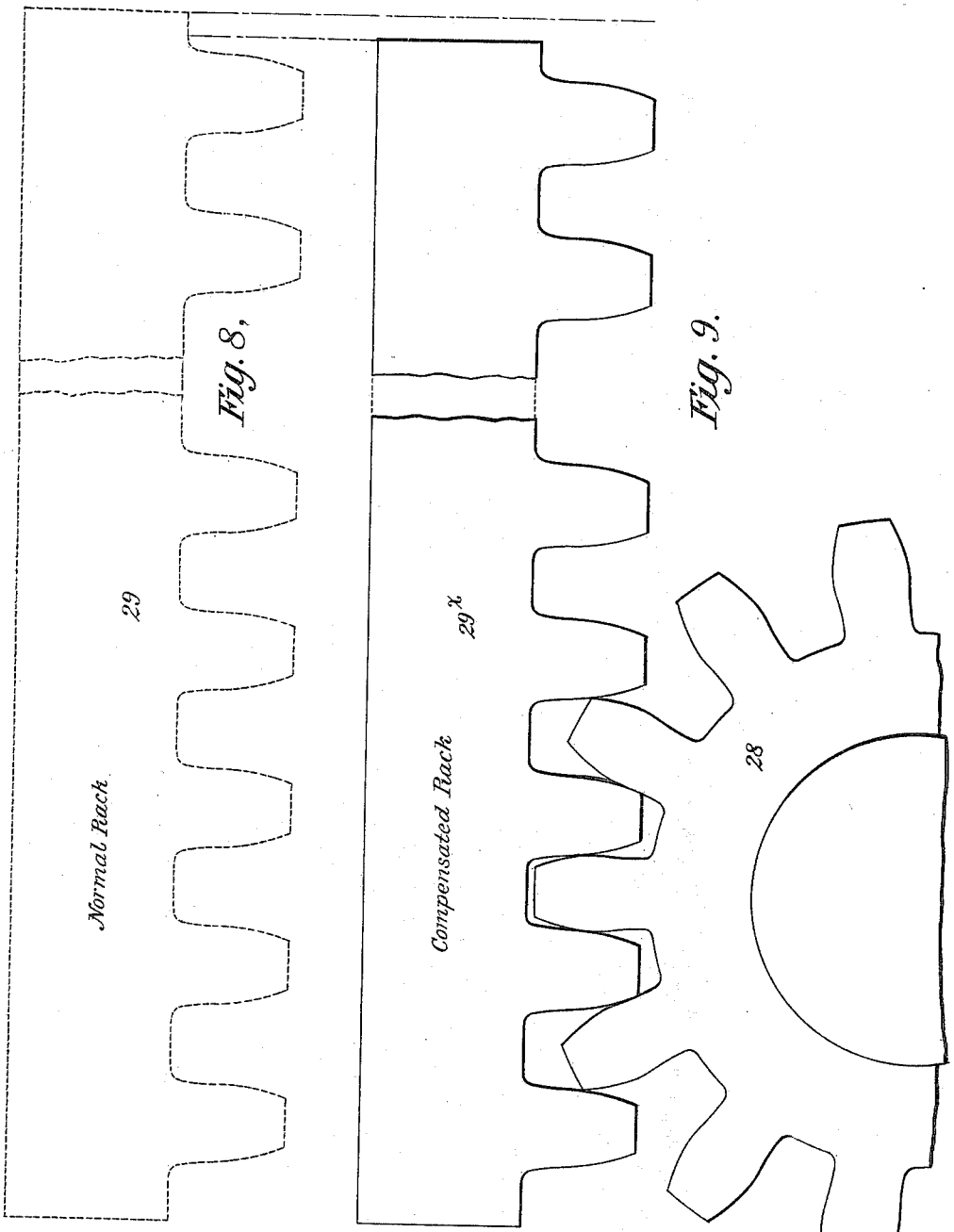
SHEET DELIVERY MECHANISM.

(Application filed Mar. 10, 1897.)

(No Model.) 6 Sheets—Sheet 5.



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No. 649,957. Patented May 22, 1900.

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SHEET DELIVERY MECHANISM.

(Application filed Mar. 10, 1897.)

(No Model.) 6 Sheets—Sheet 6.

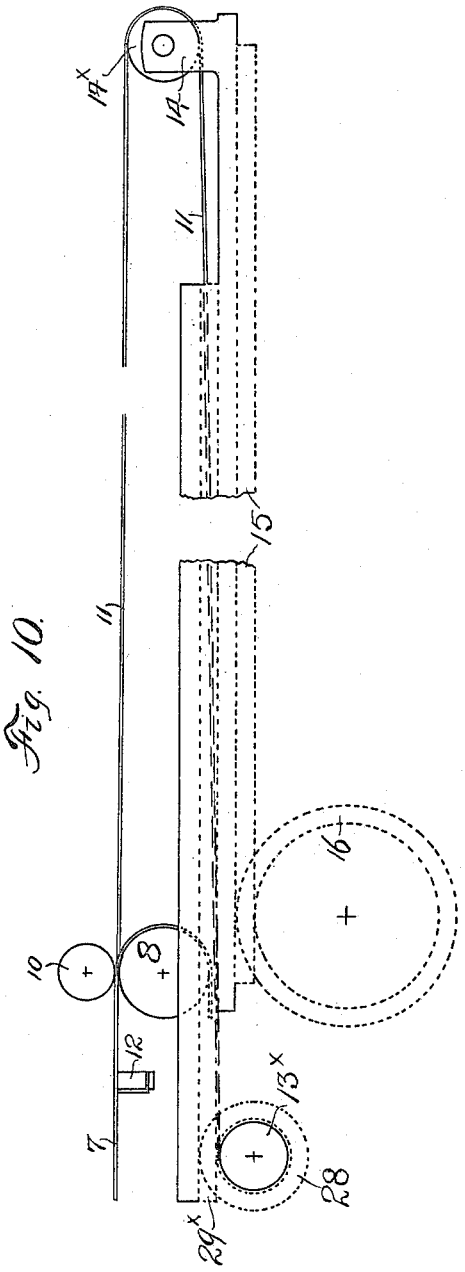

Fig. 10.

Witnesses
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Geo. C. Henning.

Inventor
Walter Scott
By his Attorney
Richard W. Barkley

UNITED STATES PATENT OFFICE.

WALTER SCOTT, OF PLAINFIELD, NEW JERSEY.

SHEET-DELIVERY MECHANISM.

SPECIFICATION forming part of Letters Patent No. 649,957, dated May 22, 1900.

Application filed March 10, 1897. Serial No. 626,906. (No model.)

To all whom it may concern:

Be it known that I, WALTER SCOTT, a citizen of the United States, and a resident of Plainfield, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Sheet-Delivery Mechanism, of which the following is a specification.

This invention relates to mechanism for delivering printed products upon flat receiving or delivery boards, the object of the invention being the improvement of the operation and the simplification of the mechanism.

In the practice of this invention I employ a sheet-forwarder, to which the sheets from the impression-cylinder are delivered, an extensible collapsible support, onto which the sheets are run from the forwarder, and an auxiliary feeder, which moves the sheets farther along on the support than they are placed by the forwarder. Concerning the forwarder it may be observed that it may be conveniently made of endless tapes running on rollers or pulleys and that it is preferred to have it act on both sides of the sheets. The extensible collapsible sheet-support is conveniently made of a set of discontinuous tapes or equivalent, which are connected directly or indirectly at one end to the frame of the machine and at the other end to an oscillating roller having also a motion of translation back and forth—that is, a bodily motion to and fro—which alternately winds and unwinds them. Of the auxiliary feeder I observe that it is preferably provided with a to-and-fro moving element or member, as to-and-fro moving rollers or pulleys, between which the sheets are fed or run by the forwarder to the support above referred to. I also remark that the details of the forwarder, the support, and the auxiliary feeder may be varied in many ways without departing from the combinations of which these are parts or elements. In one or two cases I will hereinafter indicate modifications of these parts that may be made without departing from the essentials of the invention herein claimed.

The invention also includes the combination of a roller or pulleys, to which one end of a discontinuous sheet-support is fast and which winds and unwinds the support, a pinion fast on or otherwise connected to the said roller to rotate the same, and a rack of greater pitch than the pinion, which meshes with the pinion, one of said rack-and-pinion roller elements having a bodily to-and-fro motion, while the other is fixed against what the books call a "motion of translation," the purpose of the combination being to compensate for the decreasing and increasing diameters of the roller plus the tapes (or equivalent) as these unwind and wind by the increasing and decreasing speeds of rotation of the roller, and thus keep the tapes taut or tightly stretched. It will be understood that if the pinion and roller have only a motion of rotation the rack will have a to-and-fro motion.

The invention also includes other combinations, as will hereinafter more fully appear, and the whole is pointed out more particularly in the claims concluding this specification.

The invention is illustrated in the accompanying drawings, (four sheets,) forming part of this specification, in which—

Figure 1 is a side elevation of part of a two-revolution stop-cylinder printing-press, showing the invention applied to and used in connection therewith. Fig. 2 is an enlarged side elevation of part of the delivery apparatus shown in Fig. 1. Fig. 3 is an end view of the parts shown in Fig. 2. Fig. 4 is a side elevation of part of a printing-press, showing a modification of the invention applied to and used in connection therewith. Fig. 5 is a plan view of the modification shown in Fig. 4. Fig. 6 is an enlarged side elevation, on the plane indicated in Fig. 7 by the line 6 6, of the delivery apparatus shown in Fig. 4; and Fig. 7 is an end view of the parts shown in Fig. 6. Fig. 8 is a diagrammatic view of a normal or usual form of rack adapted to coact with a pinion of given pitch. Fig. 9 is a like view of a rack whose teeth are brought closer together and which is adapted to coact with a pinion of the same pitch as that stated above in connection with Fig. 8, thus compensating for varying diameter of a tape winding and unwinding roller. Fig. 10 is a side view of a modification of certain parts of the mechanism shown in Fig. 6 with certain parts omitted.

Referring to Figs. 1, 2, and 3, the reference-letter F marks a suitable framework, in which

the working parts of the machine are mounted in appropriate manners. The letter C indicates the impression-cylinder, and the letter B the reciprocating bed or form-carrier. The cylinder is provided with suitable sheet-retainers, as the grippers G, and a set of lifting-fingers, as L. A cog or tooth T on the impression-cylinder forms part of a stopping and starting mechanism therefor, such as that shown in my Letters Patent granted on the 3d day of October, 1893, and bearing number 505,961. The sheets are fed to the cylinder in any suitable way, as from a feed-board.

I have shown a two-revolution stop-cylinder press in Figs. 1, 2, and 3; but it is obvious that any suitable form of printing-press may be used for printing and delivering the sheets between the fixed guides 3 4, respectively, supported by the shafts 5 6 in the framework F. The sheets are moved away from the cylinder by the tapes 7, which run on the rollers 8, and the coacting rollers 10. The rollers or pulleys 8 are driven in a suitable manner, as by the train of pinions 9, connecting the roller with the cylinder C. From the last pair of rollers 8 10 the sheets are run upon the extensible collapsible support S. This support is shown in Figs. 1, 2, and 3 as formed of a series of discontinuous tapes 11 or the like, the bar 12, to which the tapes are fast at one end, and the roller or pulleys 13, to which the tapes are fast at the other end, the roller 13 being journaled in the movable frame 14. This supplemental frame 14 is suitably mounted and guided on the frame F, so that it is moved to and fro in the direction in which the sheets are run from the cylinder C. The frame 14 is provided with a double rack 15, which is in mesh with the double pinion 16, carried by the shaft 17, journaled in and extending across the frame F. At one end the shaft 17 is provided with the miter-gear 18, which is in mesh with a miter-gear 19, carried by the upright shaft 20 at one side of the machine. The shaft 20 is provided near its lower end with a spur-pinion 21, which is in mesh with the to-and-fro moving rack 22, which is suitably guided in the frame F. The rack 22 is moved back and forth by the link or pitman-rod 23 and the rotating crank 24, the pitman-rod being suitably pivoted to the two. The shaft 25, which carries the crank 24, is also provided with cams 26 for a purpose to be described, the shaft and cams making one turn to one reciprocation of the bed B.

The pulleys 13 above mentioned are carried by a shaft 27, which is suitably journaled in the frame 14, the shaft 27 being provided with a pinion 28. The frame F has a rack 29 fixed thereto, the rack preferably being of a "pitch" or number of teeth per given length along the pitch-line which is greater than that of the pinion 28, with which it meshes. This is illustrated diagrammatically in Figs. 8 and 9, where Fig. 8 shows what may be termed a "normal" or the "usual" rack for engagement with pinion 28, and Fig. 9 shows a compensated rack or one wherein the rack-teeth are brought nearer each other by a distance which is the quotient due to dividing the difference between the circumferences of the roller or pulleys 13 plus the tapes or apron at the time the tapes or apron are wholly or fully wound up and when they are fully unwound in the normal operation of the machine by the number of teeth in the rack. The amount of such reduction is only a small fraction of an inch, and the difference in pitch of the normal and compensated racks is not noticeable, except several teeth of each rack be considered. The effect of such compensation is to cause the tapes to fully wind and unwind while the pulleys 13 are moving a slightly-shorter distance than would be the case were a normal rack used—that is, the pulleys 13 are caused to rotate faster in the case of the compensated rack than they would in the case of a normal rack; or, to state it differently, for equal motions of translation the amount of tape unwound and wound in the case of the compensated rack is greater than in the case of the normal rack. The tapes 11 may be fastened to the bar 12 directly or, better, by means of the springs 30, which are fast to the tapes and to the bar. As the pulleys 13 are run out by the frame 14 the tapes 11 unwind from the pulleys at a constantly-decreasing rate of speed, which speed is greater than would be the case were the rack not compensated, as described, and which is due to the described difference in the pitches of the rack 29 and the pinion 28, thus compensating for the constantly-decreasing diameter of the pulleys plus the thickness of the tapes wound thereon. When the motion of the shaft 20 and the frame 14 is reversed, the pulleys have their motion reversed and they begin to wind up the tapes 11 from under the head of the sheet, which thereupon falls head first onto the delivery-board D.

An auxiliary sheet feeder or mover is employed to urge the sheets forward after they have passed the tapes 7 and the last rollers 8 and 10. The auxiliary shown in Figs. 1, 2, and 3 comprises the tapes 31, the pulleys 32 33 34 35, the arms 36, the axis 37, and the arm 38. The tapes 31 run on the pulleys 8 32 33 34, as shown, and the pulleys 35 are moved by the tapes, said pulleys 34 35 being in line with the pulleys 8 10 and receiving the sheets therefrom. The arms 36 are forked at their upper ends to receive the slides 40, which carry the rollers 34 35. The ends 39 of the slides 40 are guided in a suitable manner by the frame F, as by a slot, and are caused to move to and fro in right or straight lines. The arms 38 rest on the cams 26, above named, and, with the parts 32, 33, 34, 35, 36, 39, and 40, are moved to and fro by the cams. The parts being in the positions shown in Fig. 1, there is in the continued operation of the machine a sheet lying on the tapes 7 with its head near the pulleys 35, and the operation of the parts thus far described is as follows: A sheet is

fed to the cylinder C from the board 2, and as the bed B moves to the left this sheet first receives an impression from the form on the bed. As the crank-arm 24 moves away from the horizontal position (shown in Fig. 1) the rack 22 is drawn to the left, thus rotating the shafts 20 and 17 and causing the frame 14 to run outward or away from the cylinder C. The motion of the frame 14 causes the pinion 28 to be rotated by the rack 29, thus causing the tapes to be unwound as the frame 14 moves outward, at the same time the tapes 7 are feeding the sheet onto the tapes 11, being assisted in the operation by the tapes 31 and pulleys 35. Before the roller 13 reaches the end of its outward movement and reverses its direction of motion the arms 38 are moved by the cams 26 and the arms 36 are moved toward the delivery-board D and the rollers 34 35 continue to feed the sheet forward, and the arms 36 are moved backward just ahead of the returning roller 13. By this auxiliary feeder the sheets are moved along after they have passed beyond the control of the tapes 7, so that they will clear the support S and be delivered, the roller 13 rolling from under them as it reaches the position shown in Fig. 1.

The modification shown in Figs. 4, 5, 6, and 7 lies chiefly in the auxiliary feeder. The parts that are common to the machines shown in these figures and in Figs. 1, 2, and 3 bear similar references and will not be further described. The tapes 11 are fast directly to the bar 12, which extends across the machine-frame, and are also fast to the barrel 50, which is suitably journaled at one end 51 in the frame 14, while at its other end the barrel fits over the stud or disk bearing 52 on the frame 14. A helical spring 53 within the barrel 50 is made fast at one end to the barrel 50 and at the other end to the stud 52, its tension being such that it tends to roll or wind up the tapes 11 on the barrel 50. The auxiliary feeder comprises the fingers 54, fast on a shaft 55, which is journaled in the framework F, an arm 56 on said shaft, a spring 57, fast to the arm 56 and to an arm 58 on the frame F, and devices for setting and releasing the parts just described. A trigger 59 is pivoted to the frame F and is pressed upwardly near the arm 56, as by a spring 60. The arm 56 is provided with a pin 61, with which the trigger 59 engages, as shown in Figs. 4 and 5. The trigger 59 is moved downward, thus releasing the arm 56, by the pin 63 on the rack 15, which pin presses on top of the trigger as the rack 15 reaches the end of its motion from the cylinder C. This happens shortly after the tails of the sheets are past the rollers 8 10. On the release of the arm 56 the spring 57 draws the arm 56 and the fingers 54 sharply away from the cylinder C, so that the fingers 54 strike the tails of the sheets forcibly and move the sheets along on the tapes 11 beyond the position of the roller 50 shown in Figs. 4 and 5, though of course the roller 50 at this time is in the position shown in Fig. 6. The arm 56 is moved toward the cylinder C by the roller 62, which is carried by the rack 15, and the pin 61 forces down the trigger 59 and engages therewith as the rack 15 moves toward the cylinder C. The arms 64 stop the sheets as the same are projected forward on or by the tapes 11. The arms 64 are carried by the shaft 65, which extends across the end of the machine.

In order to insure that the sheets shall lie evenly on the board D, the following mechanism may be employed: The board D is provided with a series of grooves or guides 66, extending along the same parallel to the direction in which the sheets are fed forward on the tapes 11. A series of upright packers 67 are guided by these grooves 66 as they are moved to and fro by the bar 68, to which they are attached, and the bars or rods 69, to which bar 68 is adjustably attached. The rods 69 are suitably guided on the frame F or board D, as by the lugs 70 on the board. The rods 69 are moved to and fro by the arms 71 of a rock-shaft 72, journaled in the frame F. The arms 71 are forked at their ends to engage with the pins 73 on the rods 69. Springs, fast to the frame F and to the rods 69, serve to draw the bars 69 toward the cylinder C. The rods 69 and attached parts are moved away from the cylinder C at the proper time by the lever 74, which is pivoted to the frame F in a convenient place and coacts with the pin or lug 75 on an arm 71 of the shaft 72, being itself operated by the pin 76 on the rack 15, as shown in Fig. 4. In order to prevent the sheets from being unevenly placed by the packers 67, there may be employed the rocking fingers 77, which are carried by a shaft 80 at the end of the board D. The shaft 80 is provided with an arm 78, which lies in the path of the rack 15 and is operated thereby to move the fingers 77 away from the cylinder C. As the rack 15 recedes toward the cylinder C the fingers 77 are drawn toward the cylinder C, as by a spring 81 or a weight 79, or both, and push the sheets that are displaced back into the stack lying on the board D.

While I have shown the rack 29 as fixed and the pinion 28 and roller 13 as having both a motion of translation and motion of rotation, it must be understood that this construction is capable of inversion in so far as that the rack 29 may be moved to and fro—*i. e.*, have a motion of translation—while the pinion 28 and roller 13 have only motion of rotation, the relative pitches differing, as above described. Thus in a case where one end of the tapes 11 are wound and unwound by a roller $13^{\times}$, journaled in the frame F and provided with a pinion 28, and the rack $29^{\times}$ (which is compensated, as hereinbefore described) is secured to one of the racks 15 and the tapes or apron H run about a roller (or pulleys) $14^{\times}$, which is journaled in arms 14 aforesaid, all as shown in Fig. 10, the same compensation as above described may be secured. It is obvious that many other changes may be made

without departing from the spirit of this invention.

In the form of the invention shown in Figs. 1, 2, and 3 the sheets lie at times on the parts of the tapes that are wound on the roller and are unwound therefrom, and I have shown such roller and its gear as the part or element which, in combination with a rack having its teeth brought closer together, as indicated in Fig. 9, to cause the roller to revolve faster than it otherwise would, compensates for the variations in the diameter of the roller plus the varying thickness of the tapes wound thereon and so keeps the support tightly stretched. In so far as this compensatory action is concerned it is of course immaterial whether the sheets ever actually lie upon or touch the parts of the tapes (or their equivalent, an apron) that are so wound and unwound. Thus the support may be connected (directly or indirectly) at one end with a roller or winder $13^{\times}$, (as by a cord or ligament which passes about an idler $14^{\times}$ and is fastened to the winder,) which is oscillated by a gear and a rack having a greater pitch than the gear, while the sheets are run upon the support which is extended while the sheets are so run and which is withdrawn from under the same at one end and so delivers them.

What I claim is—

1. In a sheet-delivery, the combination of the impression-cylinder, a sheet-forwarder to which the sheets from the cylinder are delivered, an extensible collapsible support onto which the forwarder runs the sheets, and an auxiliary sheet-feeder for moving the sheets farther along the said support, substantially as described.

2. In a sheet-delivery, the combination of the impression-cylinder, a set of tapes to which the sheets from the cylinder are delivered, an extensible collapsible support onto which the tapes run the sheets, and an auxiliary sheet-feeder for moving the sheets farther along the said support substantially as described.

3. In a sheet-delivery, the combination of the impression-cylinder, a set of tapes to which the sheets from the cylinder are delivered, a flexible support connected at one end to the frame of the machine, a to-and-fro movable roller to which the other end of the support is attached and which winds and unwinds the support, and an auxiliary sheet-feeder for moving the sheets farther along the support, substantially as described.

4. In a sheet-delivery, the combination of the impression-cylinder, a set of tapes to which the sheets from the cylinder are delivered, a flexible support connected at one end to the frame of the machine and onto which the tapes run the sheets, a to-and-fro movable roller to which the other end of the support is attached and which winds and unwinds the support, and a to-and-fro movable auxiliary sheet-feeder for moving the sheets farther along the support, substantially as described.

5. In a sheet-delivery, the combination of the impression-cylinder, a sheet-forwarder to which the sheets from the cylinder are delivered, a flexible support connected at one end to the frame of the machine, a to-and-fro movable roller to which the other end of the support is attached and which winds and unwinds the support, and an auxiliary sheet-feeder for moving the sheets farther along the support substantially as described.

6. In a sheet-delivery, the combination of the impression-cylinder, a sheet-forwarder to which the sheets from the cylinder are delivered, a flexible support connected at one end to the frame of the machine, a to-and-fro movable roller to which the other end of the support is attached and winds and unwinds the support, and an auxiliary sheet-feeder having a to-and-fro moving element for moving the sheets farther along the support, substantially as described.

7. In a sheet-delivery, the combination of the impression-cylinder, the set of tapes 7 to which the sheets are delivered from the cylinder, the tapes 11 connected at one end to the frame of the machine, the roller to which the tapes 11 are attached, a movable frame in which the said roller is journaled, means for rotating the roller, the swinging arms 36, the rollers or pulleys 34, 35, moved to and fro by said arms, and mechanism for swinging the arms 36 to and fro, and the tapes running on the roller 34, substantially as described.

8. The combination of the impression-cylinder, the set of tapes 7 to which the sheets are delivered from the cylinder, the extensible collapsible support to which the sheets are delivered by the tapes 7, the swinging arms 36, the roller or pulleys 34, 35, moved to and fro by said arms, the tapes running on the roller or pulleys 34, and means for swinging the arms 36 to and fro, substantially as described.

9. The combination of the impression-cylinder, the sheet-forwarder to which the sheets from the cylinder are delivered, the extensible collapsible sheet-support onto which the said forwarder runs the sheets, the rollers or pulleys 34, 35, between which the sheets pass from the forwarder to the support, and mechanism for moving said rollers 34, 35, to and fro bodily and for rotating the same, substantially as described.

10. The combination of the impression-cylinder, the sheet-forwarder to which the sheets from the cylinder are delivered, the extensible collapsible sheet-support onto which the said forwarder runs the sheets, the rollers or pulleys 34, 35, between which the sheets pass from the forwarder to the support, the slides for carrying said rollers, and means for reciprocating said slides and for rotating said rollers, substantially as described.

11. The combination of the impression-cylinder, the sheet-forwarder to which the sheets from the cylinder are delivered, the extensible collapsible sheet-support onto which the said forwarder runs the sheets, the rollers or

pulleys 34, 35, between which the sheets pass from the forwarder to the support, the slides for carrying said rollers, the pivoted arms for reciprocating said slides, and mechanism for operating said arms and for rotating said rollers 34, 35, substantially as described.

12. The combination of the impression-cylinder, the sheet-forwarder to which the sheets from the cylinder are delivered, the extensible collapsible sheet-support onto which the said forwarder runs the sheets, the rollers or pulleys 34, 35, between which the sheets pass from the forwarder to the support, the tapes passing over the roller 34, and mechanism for moving said rollers 34, 35, to and fro bodily and for moving said tapes, substantially as described.

13. The combination of the impression-cylinder, the sheet-forwarder to which the sheets from the cylinder are delivered, the extensible collapsible sheet-support onto which the said forwarder runs the sheets, the rollers or pulleys 34, 35, between which the sheets pass from the forwarder to the support, the slides for carrying said rollers, the tapes passing over the roller 34, and means for moving said slides to and fro and for moving said tapes, substantially as described.

14. The combination of the impression-cylinder, the sheet-forwarder to which the sheets from the cylinder are delivered, the extensible collapsible sheet-support onto which the said forwarder runs the sheets, the rollers or pulleys 34, 35, between which the sheets pass from the forwarder to the support, the slides for carrying said rollers the pivoted arms for reciprocating said slides, the tapes passing over the roller 34, and devices for moving said arms and said tapes, substantially as described.

15. In a sheet-delivery employing an extensible collapsible sheet-support, the combination of a discontinuous sheet-support, a roller (or pulleys) to which one end of the support is connected, a toothed gear connected with and rotating the roller, and a rack of greater pitch than said gear and meshing therewith, one of said rack and gear-roller elements having a to-and-fro motion of translation while the other of said elements is fixed against motion of translation, substantially as described.

16. In a sheet-delivery employing an extensible collapsible sheet-support, the combination of a discontinuous sheet-support, a to-and-fro moving roller (or pulleys) to which one end of said support is connected, a toothed gear connected with and rotating the roller, and a fixed rack of greater pitch than the said gear and meshing with said gear, whereby the roller is rotated as it moves to and fro, substantially as described.

Signed at New York city, in the county of New York and State of New York, this 16th day of February, A. D. 1897.

WALTER SCOTT.

Witnesses:
WILLIS B. DOWD,
RICHARD W. BARKLEY.