

No. 871,412.

PATENTED NOV. 19, 1907.

C. L. JOHNSTON.  
SHEET DELIVERY APPARATUS.

APPLICATION FILED JAN. 10, 1906.

3 SHEETS—SHEET 1.

Fig. 1.

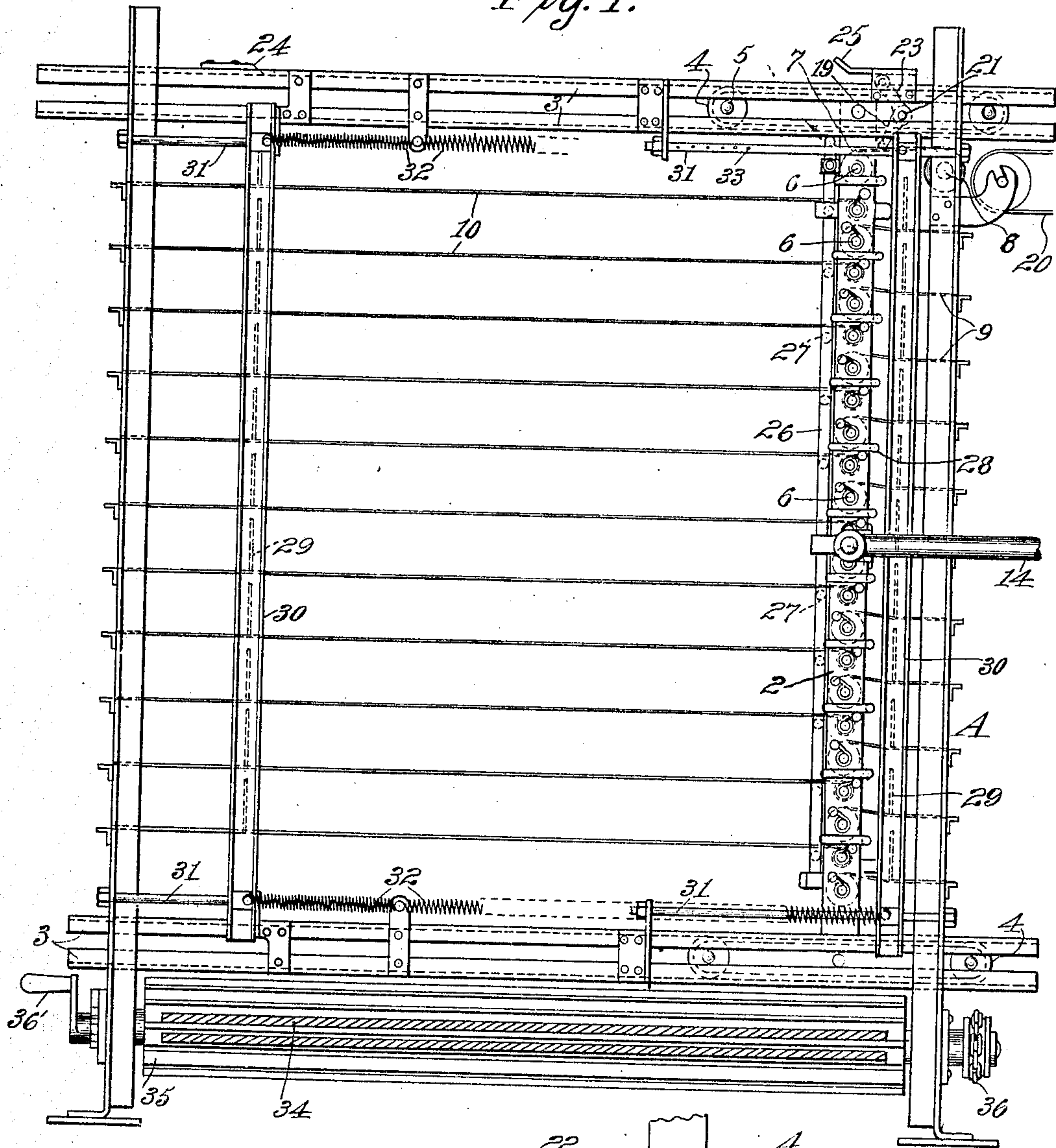
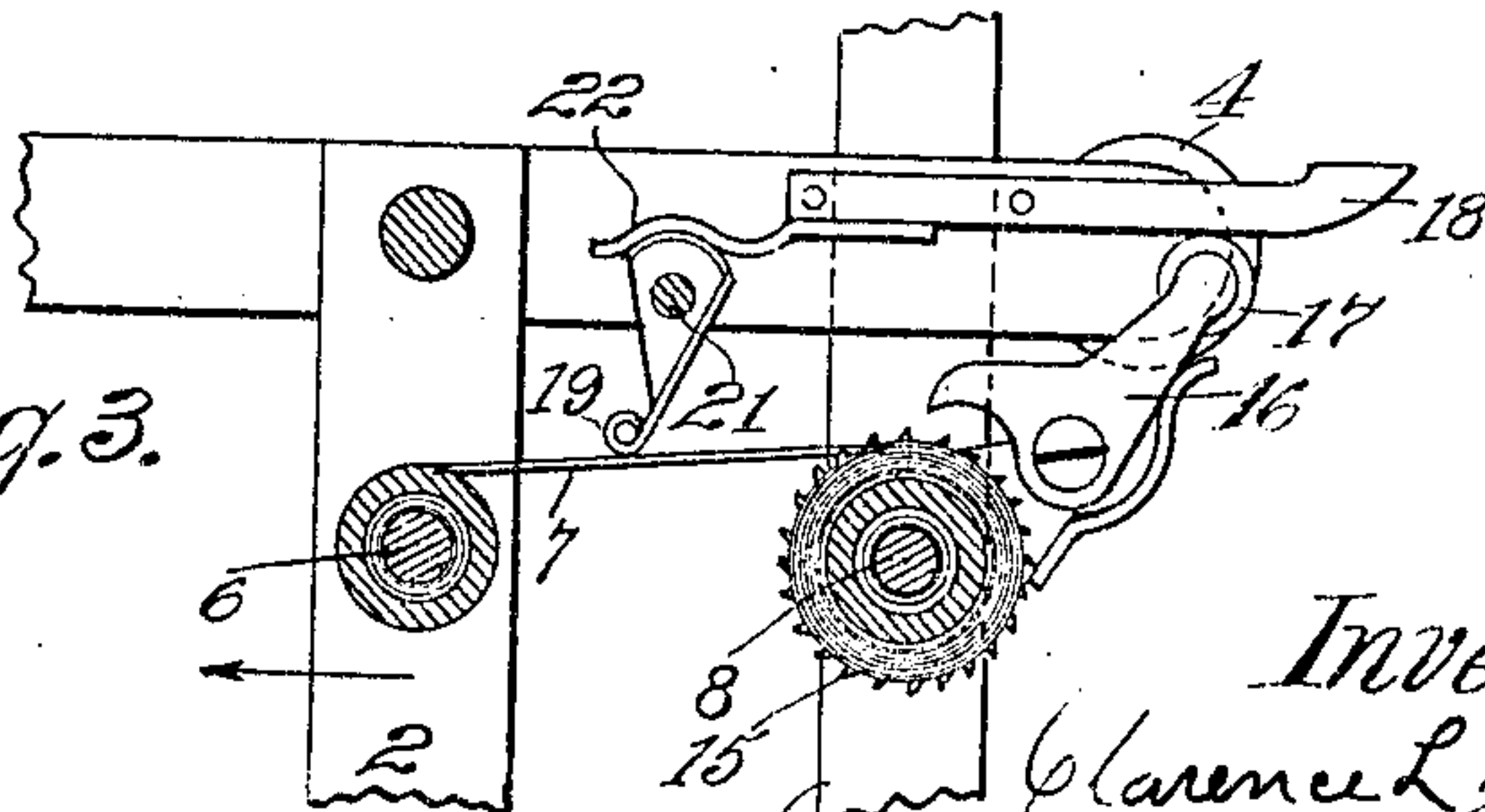


Fig. 3.



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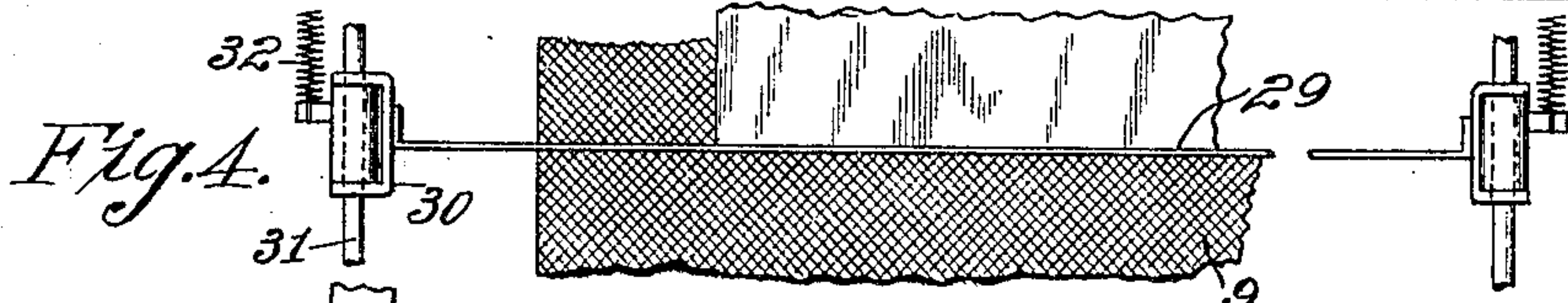
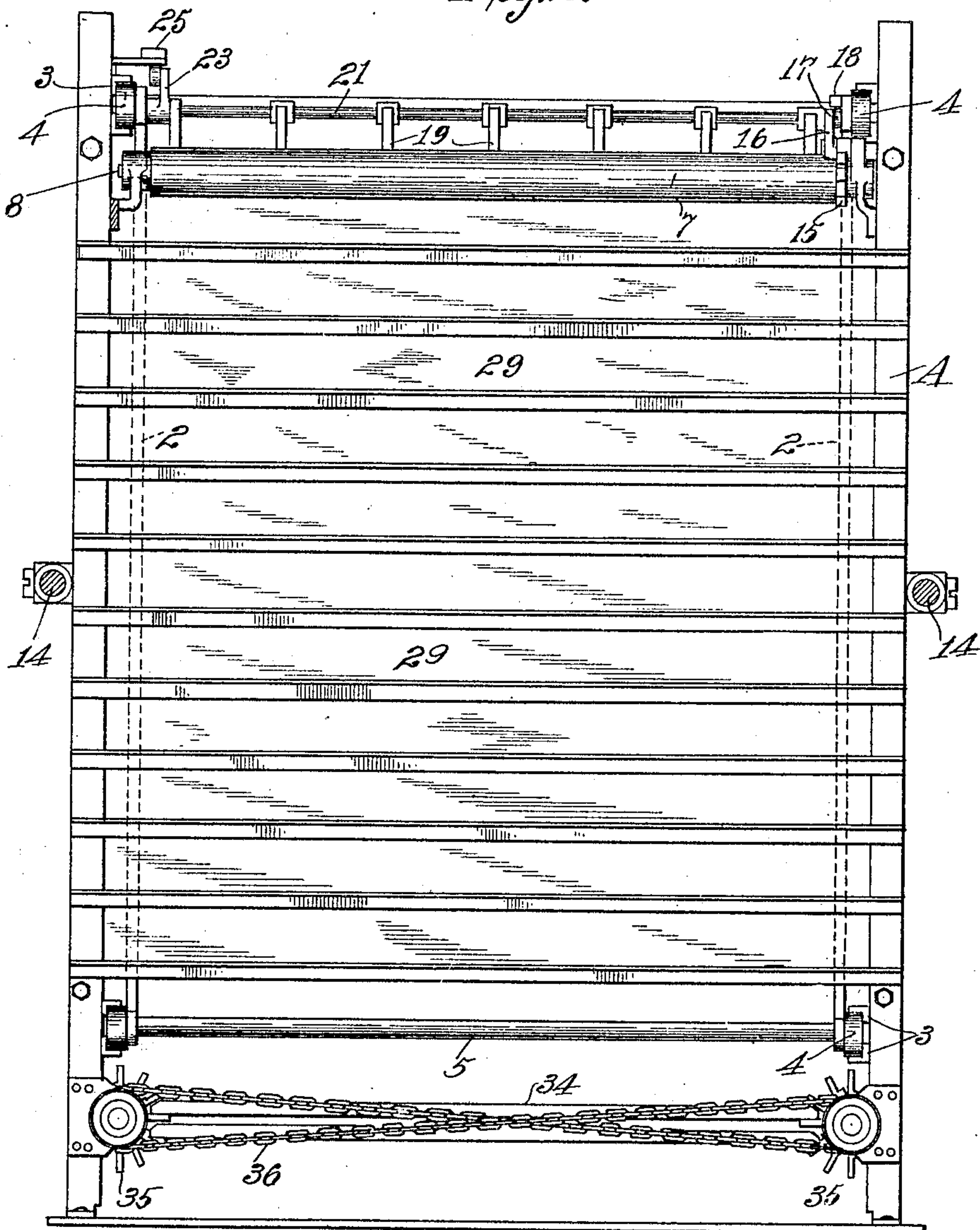
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3 SHEETS—SHEET 2.

Fig. 2.



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Fig. 5. 9 by Geo. H. Strong atty



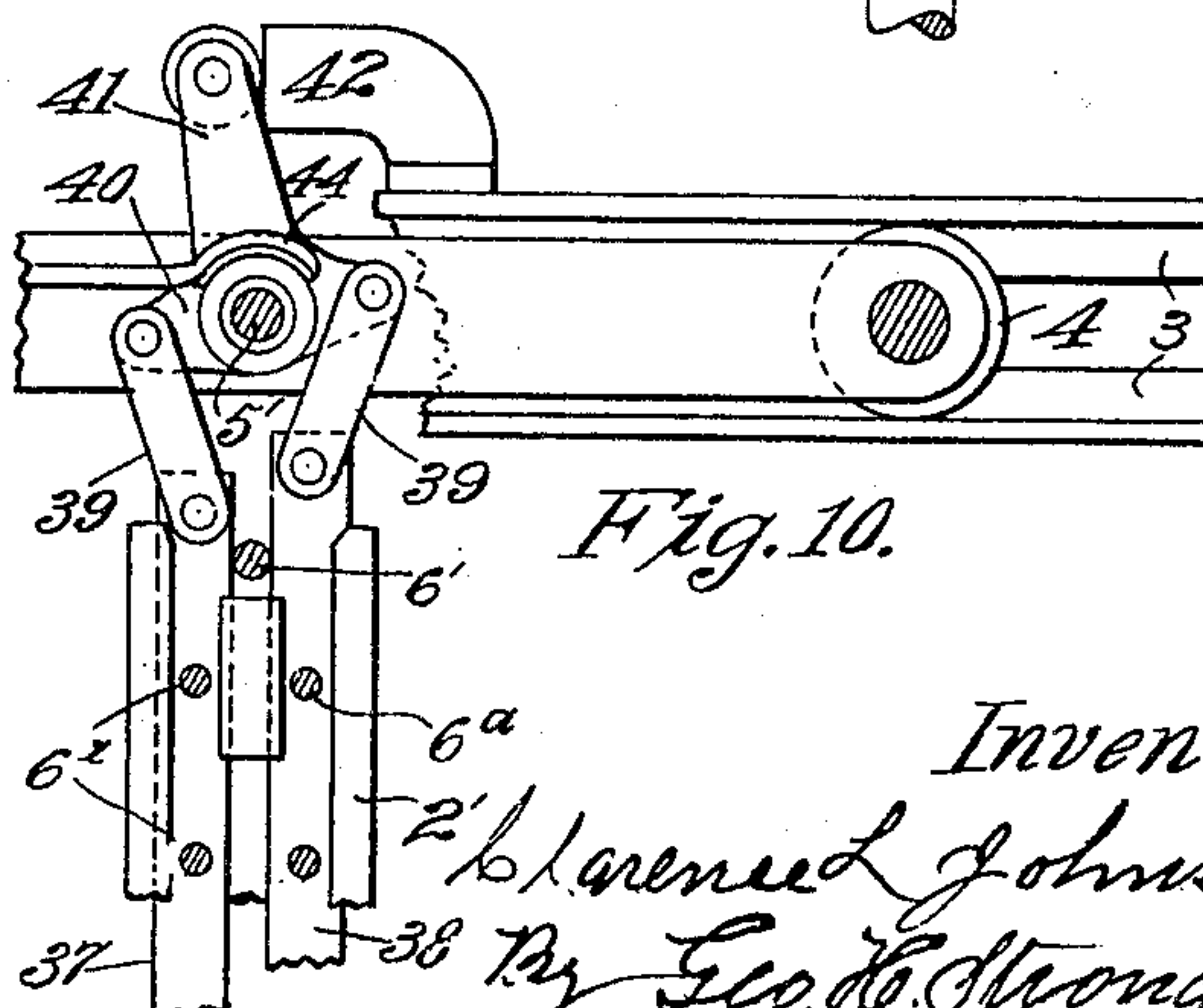
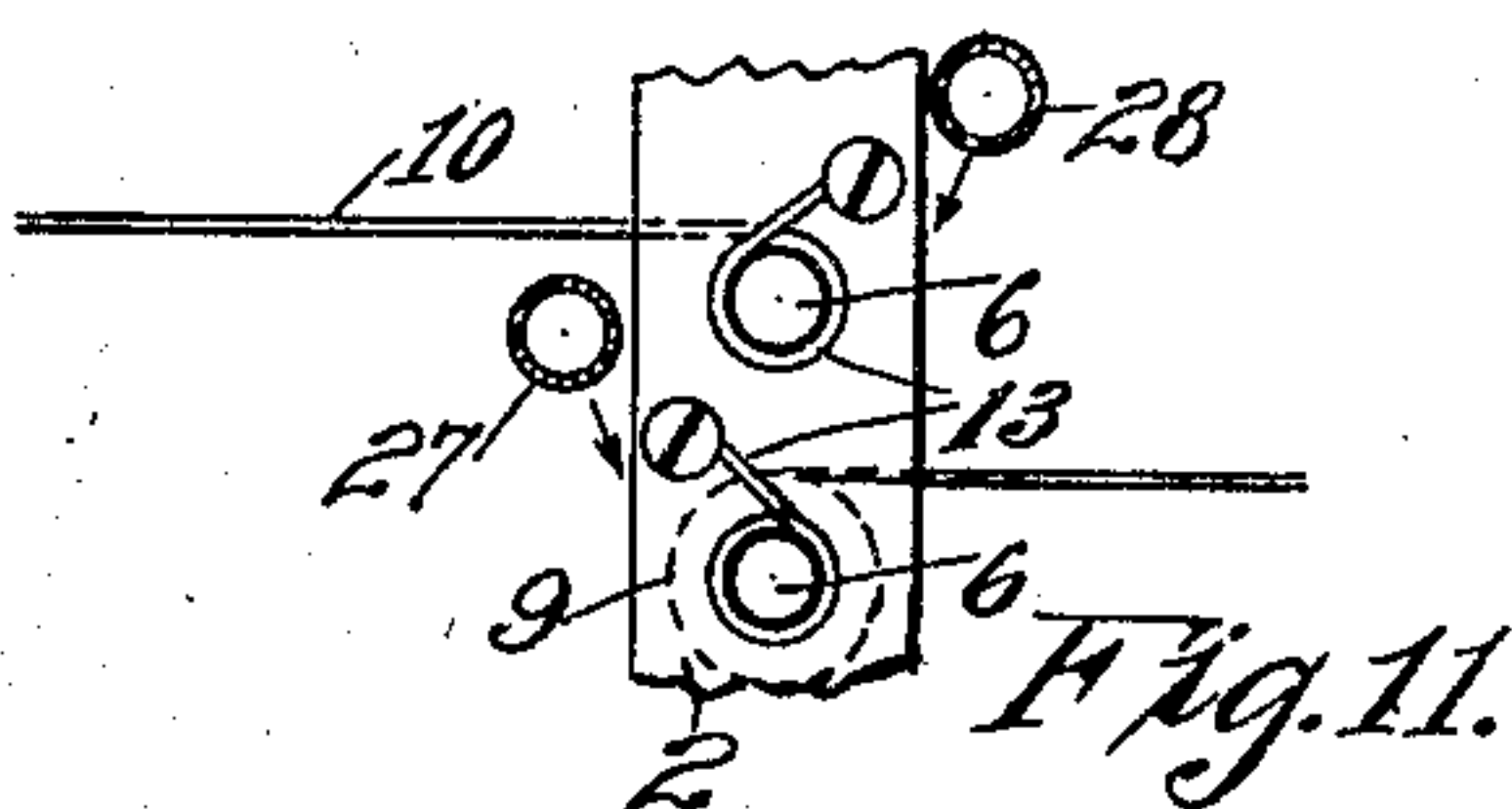
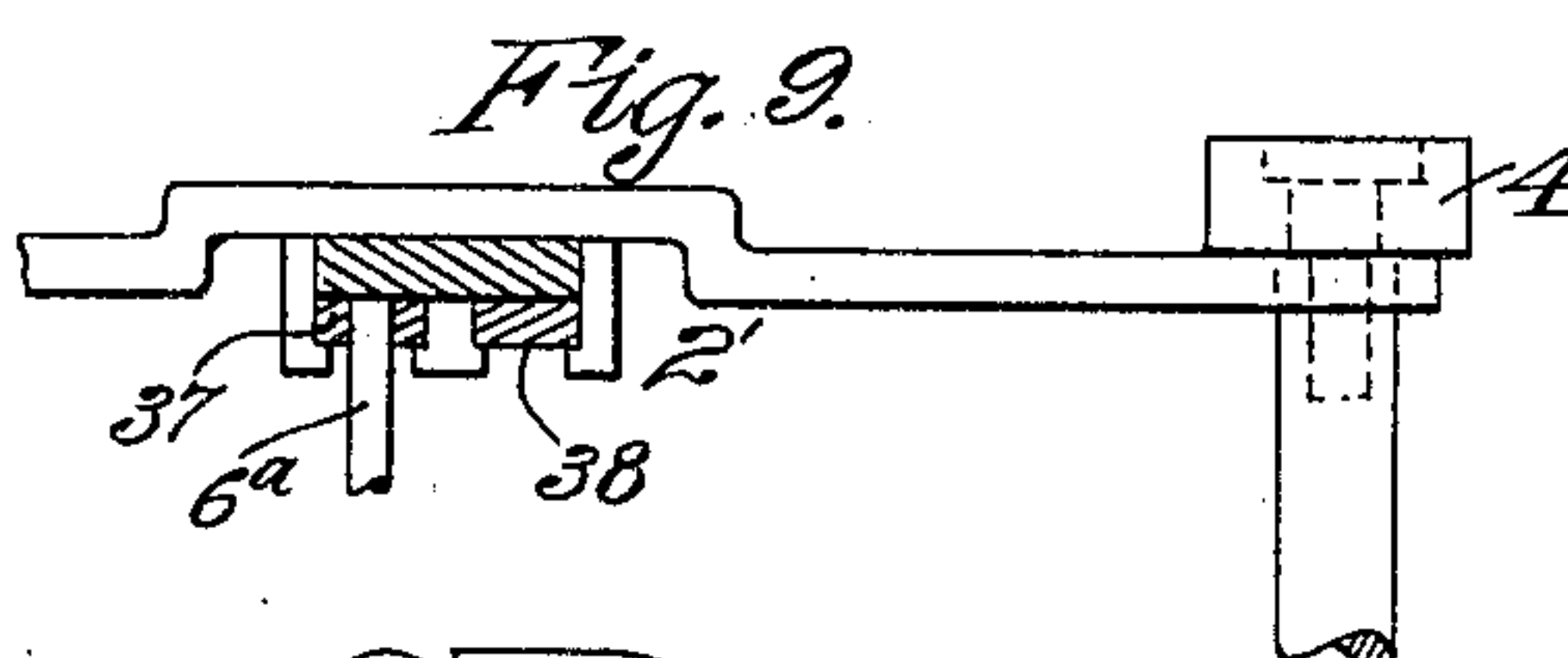
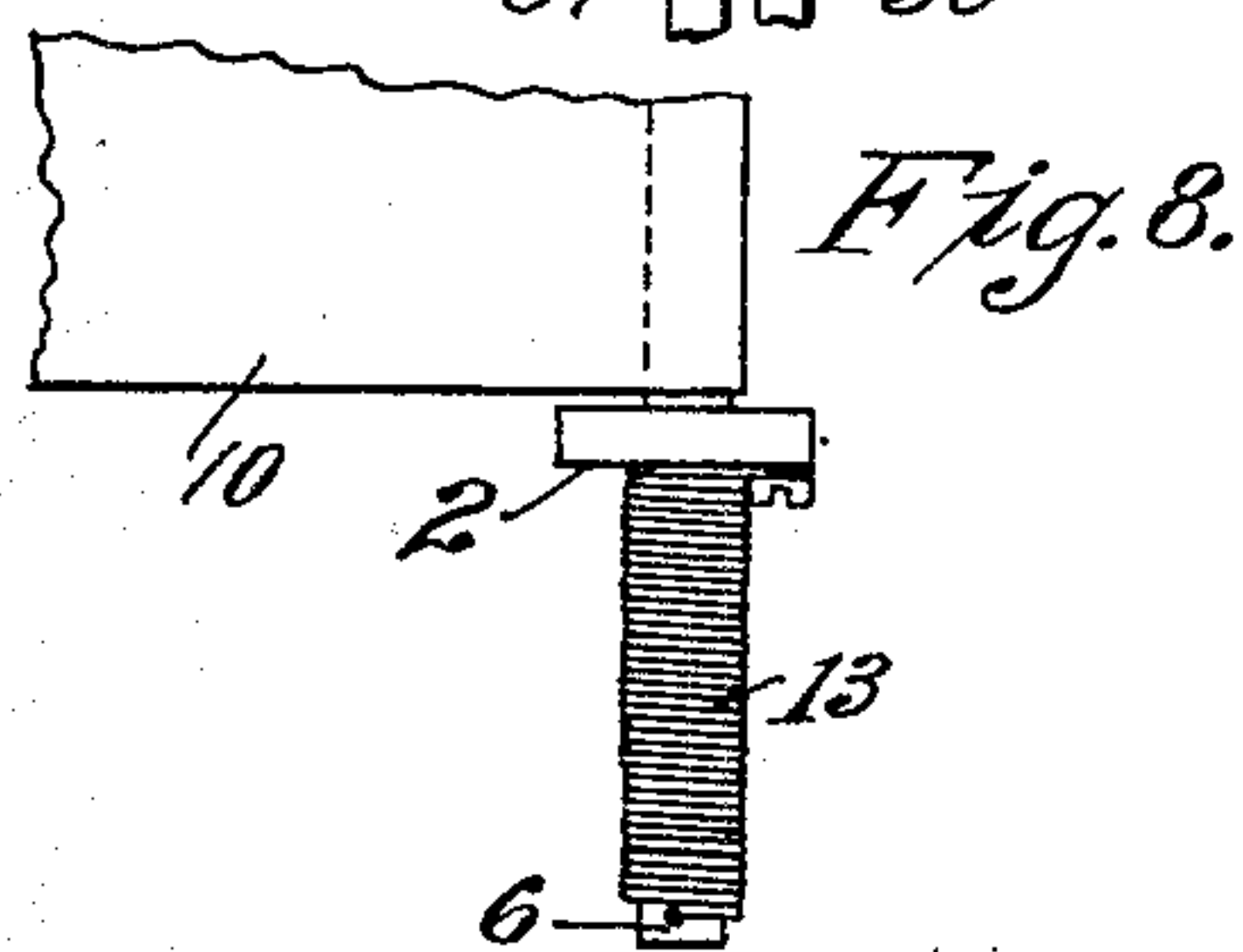
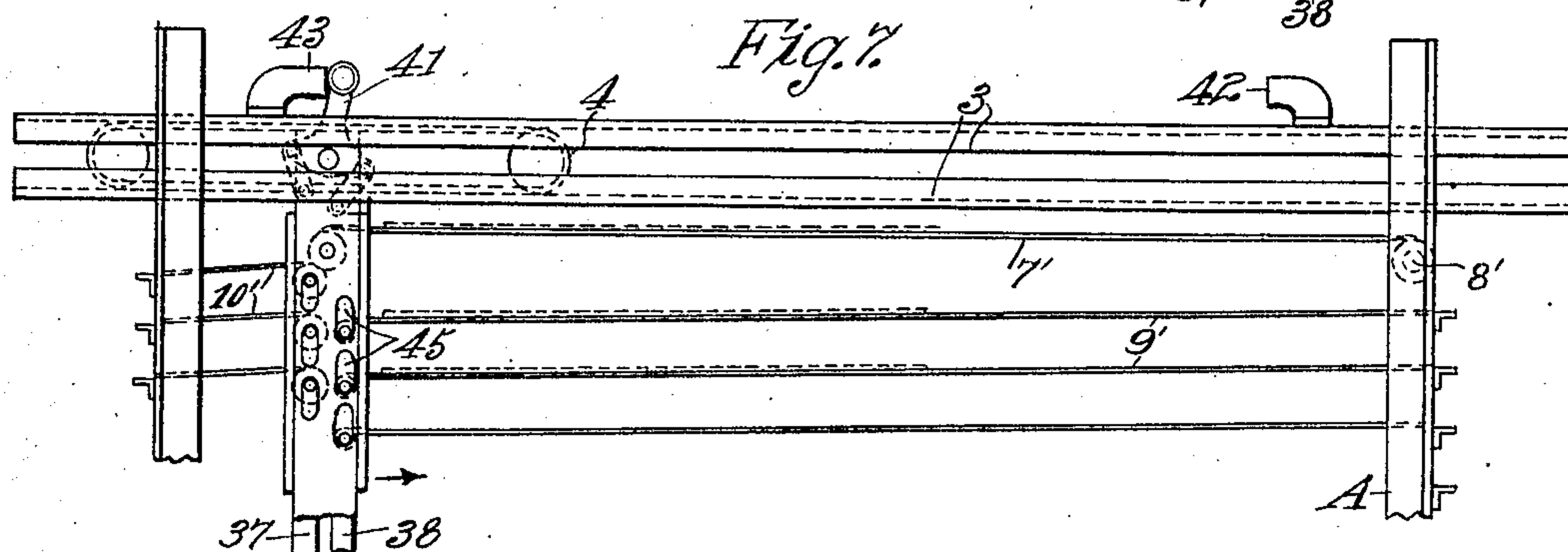
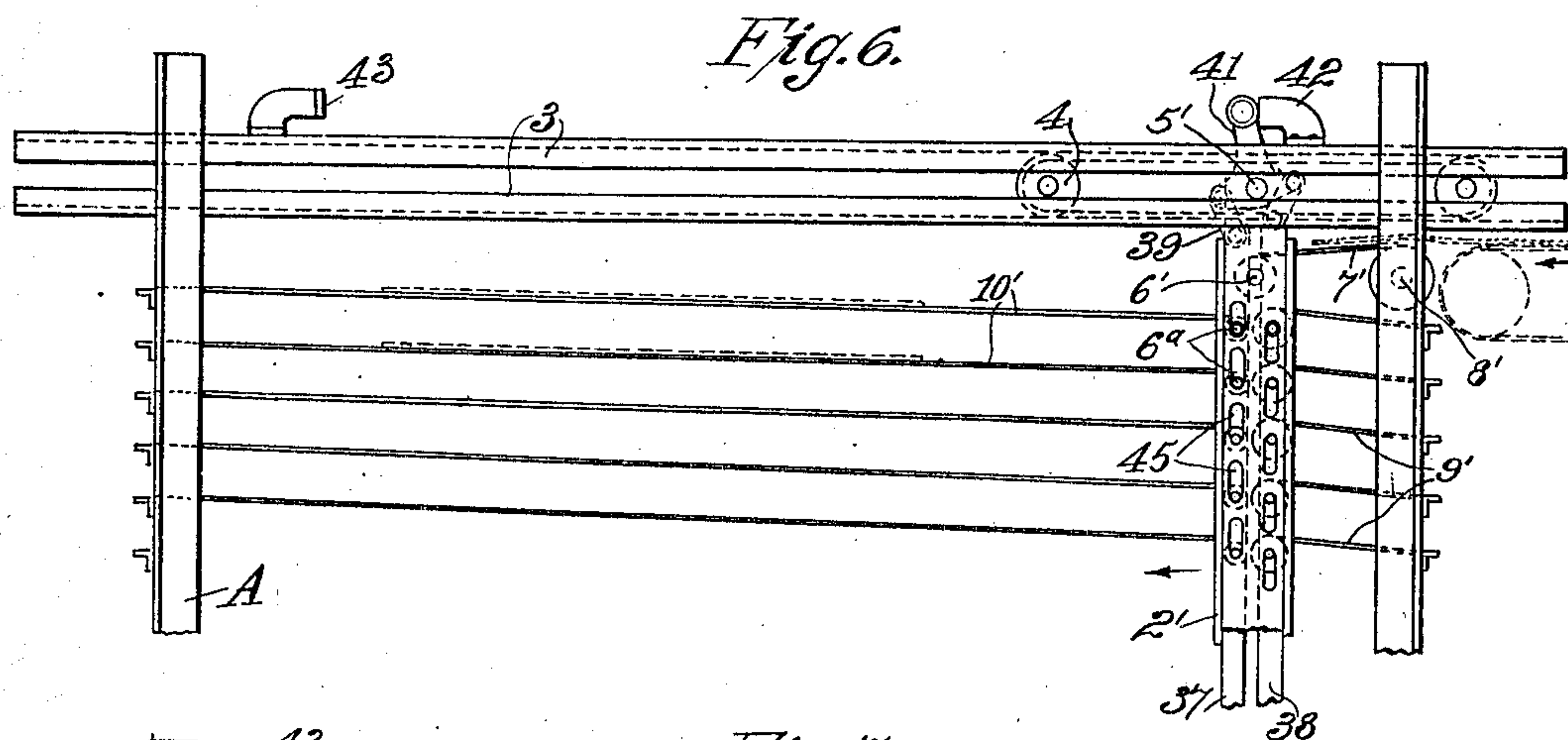
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3 SHEETS—SHEET 3.



Witnesses:

Fred. E. Maynard.  
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*Inventor:*

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38 By Geo. H. Strong. All



# UNITED STATES PATENT OFFICE.

CLARENCE L. JOHNSTON, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF ONE-HALF TO  
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## SHEET-DELIVERY APPARATUS.

No. 871,412.

Specification of Letters Patent.

Patented Nov. 19, 1907.

Application filed January 10, 1906. Serial No. 295,390.

*To all whom it may concern:*

Be it known that I, CLARENCE L. JOHNSTON, a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Sheet-Delivery Apparatus, of which the following is a specification.

My invention relates to attachments for printing presses and especially to a sheet delivery and stacking apparatus primarily designed for preventing offset.

In all half-tone work where a fair color is carried, it is found necessary to put waste sheets between the printed sheets in order to stop offset; this however is very slow as well as expensive, since the waste sheets must not only be put in but must be taken out.

My invention comprehends broadly the use of a plurality of superposed reciprocating-carriers operating in a small compass and adapted to receive singly the freshly printed sheets and to pass them from one carrier to another successively with a suitable air space maintained between each sheet to allow the ink time to set into the sheets before stacking them; thus preventing the ink on one sheet from smearing the back of the next following one, or in other words, preventing offset.

Having reference to the accompanying drawings, Figure 1 is a side elevation in partial section of my apparatus. Fig. 2 is an end view of the same. Fig. 3 is a detail of the initial feeding curtain and paper check. Fig. 4 is a detail in plan view of the stop-plate for truing the edges of the paper. Fig. 5 is a view of the same from one end of the machine. Figs. 6 & 7 are side elevations representing a modification of my machine and the parts in different position. Fig. 8 is a detail of the spring-roller. Fig. 9 is a detail of a fragment of the curtain-roll carriage. Fig. 10 is a detail of the curtain roll shifting means employed in the modified form of the apparatus, shown in Figs. 6 and 7. Fig. 11 represents a pneumatic device for preventing the sheets from curling and traveling back onto the curtains, whence the sheets have just been delivered.

A represents a frame of any suitable size, shape or material supporting the essential features of the invention. The size of this frame will depend on the size of the largest

sheet to be handled and on the rapidity of the printing and on the length of time during which it is desired to suspend the sheets in air to allow the ink to set.

2 is a carriage reciprocal on suitable guides or track-ways 3. This carriage is of suitable design, and is here shown as comprising two vertical columns, each having cross-pieces at the ends with rollers 4 to run on the tracks 3: the two sides of the carriage being braced by suitable means as the rods 5 which extend across the machine.

The function of the carriage 2 is that of a traveling support for the several spring-rollers 6. The top roller 6 carries or is attached to a curtain 7 which is connected at its opposite end to a suitably supported, spring-counter roller 8 disposed at the front or feed-end of the apparatus, and is shown as journaled on frame A. Alternately of the succeeding rollers 6, carry or are attached to curtains 9 which have their outer ends connected to the same end of frame A as the roller 8 is located on; the intermediate rollers 6 are attached to curtains 10 which have their ends connected to the opposite end of the frame A. As the carriage moves to the left, the curtains 7 and 9 will unwind from their rollers and the curtains 10 are wound up on their rollers; the operation being reversed on the movement of the carriage to the right, all as is readily understood.

Any suitable form of spring-controlled roller may be employed. I prefer however to employ a construction such as is indicated in Fig. 8, wherein a plain rod is slipped through holes in the vertical bars of the carriage 2. A spring 13 is fastened at one end to the rod and at the other end to a fixed part of the carriage to produce the proper tension.

The advantage of this construction is that it is simple and cheap, leaves a spring always exposed so as to be easily gotten at, to permit a rapid repair or renewal in case the spring breaks. The carriage is reciprocated by any suitable means operating through the connecting rods 14 or otherwise.

The roller 8 of curtain 7 is provided with a stiffer spring than the spring on the roller 6 to which the other end of this curtain 7 is attached, so that when the two springs are free to act the tension of the spring of roller 8 will operate to unwind the roller 6. The roller 8 however is provided with a ratchet 15 which



is engageable by the spring-actuated dog 16. This dog 16 has a roller 17 which is normally interposed in the path of the cam 18 on the carriage 2. Normally with the carriage 2 moved to its point of nearest approach to roller 8, the roller 17 will be engaged by the cam 18 to release the dog from the ratchet 15 and allow the spring of roller 8 to act counter to the spring of its opposed roller 6; the consequence is that the curtain 7 will be unwound from its roller 6 and wound up on its roller 8. However, when the carriage moves away from roller 8 in the direction of the arrow of Fig. 3, the curtain 7 which remains attached to its roller 6 will be unwound from the roller 8; the cam 18 riding off of the roller 17 as the carriage moves away leaving the dog 16 free to ride over the ratchet 15. The moment, though, the carriage 2 reverses its direction of travel and starts again toward the roller 8, the dog 16 holds the ratchet 15 and roller 8 against the tension of the spring of the roller 8 and allows the roller 6 to act to wind up the curtain. This winding up of the curtain 7 on its roller 6 continues until the carriage has reached nearly its limit of travel toward roller 8 when the cam 18 engages the roller 17, trips the dog, and allows the stiff spring of roller 8 to quickly wind up the curtain 7 onto roller 8 and off of roller 6; this re-winding movement being further accelerated by increasing the diameter of the roller 8. Thus it will be seen that the curtain 7 is adapted to be alternately wound upon both of its rollers, and that its re-winding on roller 8 is very much quicker. It takes place during a very much shorter space of travel of carriage 2 than does the winding onto the roller 6. The purpose of this rapid re-winding is to re-set the curtain into position for the succeeding approaching sheet after having delivered the previous sheet onto the uppermost curtain 10. The printed sheets are delivered in any suitable manner, either by hand or direct from the printing cylinder or form onto the curtain 7 and against the adjustable stops 19 at a time when the curtain is wound off of its roller 6 and onto its roller 8. I have shown the tapes 20 as adapted to deliver the printed sheets onto the curtain. As the edge of a printed sheet is fed onto curtain 7 and up against the rockable stops 19, the carriage 2 moves away from roller 8 and in the unwinding of the curtain 7 carries the sheet along until the entire sheet is supported on the extended curtain 7.

The stops 19 are carried on the rock-shaft 21 journaled in the carriage 2 and are maintained in contact with the curtain when the carriage moves in one direction and out of contact with the curtain when the curtain moves in the opposite direction by appropriate means as the spring-brake 22. The rocking movements of the stops 19 are effect-

ed by the engagement of the arm 23 on the rock-shaft 21 alternately with the cams 24—25. When the sheet is being delivered onto the curtain, the stops 19 are thrown down to limit the forward independent movement of the sheet over the surface of the curtain and prevent its going too far before coming to rest on the curtain.

When the carriage has reached nearly the limit of its movement away from roller 8 the arm 23 encounters the cam 24 to raise the stops 19 and allow the paper to be delivered from the curtain 7 onto the top curtain or screen 10. In Figs. 1 & 2 the curtain or screens 9—10 are arranged alternately at different levels and the action and position of the several rollers 6 are such that as the curtain which is immediately supporting the sheet is wound up beneath the sheet, the latter drops onto the succeeding curtain or screen so that without any further horizontal movement of the paper after it is once delivered onto the curtain or screen 7, the sheet will drop down from one curtain to another until it falls onto the stack at the bottom.

The reciprocation of the carriage is timed relative to the speed of the press so that each sheet as it comes from the press will find the curtain 7 rolled up on roller 8 ready to receive it. The number of curtains or screens employed will depend on the length of time that it is desired to give each sheet to dry. Thus with a press printing at the rate of 1200 per hour, and with the use of 40 curtains, it allows one minute between each sheet; that is, each sheet will have one minute in the air before the next sheet is laid on top of it, which is more than ample time for the ink to set into the sheet.

There is sometimes a tendency of the edge of the sheet to curl and to roll back onto the curtain whence it has just come from, on the reversal of the movement of the carriage. I may employ the following means to overcome this difficulty: A vertical air pipe 26 is carried by the carriage, at one side, and connected by a hose or other suitable flexible connection with a source of air supply under pressure. From this pipe there extends a series of cross pipes 27 arranged beneath the curtains or screens 10 and having orifices as indicated in Fig. 11, through which a jet or jets of air are adapted to be discharged downwardly across the discharge end of the curtains 9. A similar set of pipes 28 connected with the vertical pipe 26 extends across the machine underneath the curtains 9 and are also suitably orificed and adapted to discharge a jet or jets of air downwardly across the delivery end of the curtains 10. These jets act on the sheets to press them down onto the receiving curtain beneath and effectively prevent any possibility of their riding back onto the curtain whence they have just



come from when the carriage reverses its movement. The air jets also operate to expedite the drying of the ink.

In order to maintain the proper position of the sheets on the several curtains or screen-carriers in the downward progress of the sheets and insure their piling up in a smooth, even stack, I provide the vertical stop-plates 29 at each end of the frame arranged between the several curtain carriers. These stop-plates may consist of thin metal strips and are secured at their ends to frame 30 which is slidable on the stationary horizontal guides 31. The stop-plates 29 at each end of the machine are normally pressed toward each other by means of the springs 32 connected with the frames 30. The movement of the frames 30 toward each other may be varied by suitable means as the pins 33 in the guides 31. This adjustment of the stop-plates is for the purpose of adapting the same machine to a variety of sizes of sheets.

Each stop-plate frame 30 is arranged in the path of the carriage 2 so that as the carriage approaches the end of its stroke in either direction, it engages one or the other of the frames 30 and carries that frame with its stop-plates along with it, as indicated for example, at the right of Fig. 1. When the carriage goes back in the opposite direction the stop-plates follow along with the carriage a little ways by reason of the tension of the springs 32; in so doing, they scrape the surface of their respective curtains to move or push up on the sheet or sheets that may have moved too far in one direction on the curtains. On striking the set of stops 33 the movement of that particular stop-plate-frame in unison with the carriage 2 is interrupted; leaving the adjacent edges of all the sheets on the curtains standing in the same vertical plane.

The stop plates at the other end of the machine operate in a similar manner to true the opposite edges of the sheets. The sheets on leaving the last carrier are deposited one on top of another upon a removable board or tray 34, which is adapted to be supported by the grooved rollers 35 which are suitably connected as shown at 36 to turn in unison to lift up a board or tray when it is filled and to bring another board or tray into position ready to receive the sheet when the filled tray is removed. 36' is a crank for operating the rollers 35.

Some sort of supporting device as the longitudinally grooved rollers 35 is preferred, since it readily permits a stack of sheets to be removed and a fresh tray inserted without in any way interfering with the operations of the machine or changing the sizes of the stacks.

In Figs. 6—7 & 10, I have shown a modification of the invention in which I am enabled to employ double the number of cur-

tain supports in a machine of the same size as that shown in Figs. 1 & 2; or conversely to get the same number of curtain supports in a machine of half the size of that first described. In this construction I employ the same principle of a feed curtain 7' with its spring-rollers 6'—8', but the other rollers 6<sup>a</sup> to which the several curtains 10'—9' are attached, are journaled in vertical sliding bars 37—38 in the carriage 2'. The curtains 10' have their rollers supported in the slide bar 37 and the curtains 9' have their rollers journaled in the bar 38; and the two bars at each side of the machine are connected by respective links 39 with correspondingly rigid arms 40 on the rock-shaft 5'. The shaft 5' has a projecting arm 41 which is engageable alternately in the reciprocation of the carriage 2' with the stops 42—43. Suitable means as the spring-brake 44 may be employed to prevent the accidental rocking of the shaft 5'.

The ends of the roller rods 6<sup>a</sup> which carry the tension springs project out through slots 45 in one side of the carriage 2'. In operation of an apparatus of this form, the arm 41 encounters one of the stops as 42 in the manner indicated in Fig. 6 to rock the shaft 5' and correspondingly reciprocate the bars 37 downward and the bars 38 upward to bring the rollers of the curtains 9'—10' in such position that each curtain 10' will lie practically in a horizontal plane continuous with a corresponding curtain 9'. These curtains will remain in this relative position during the traverse of a carriage 2' toward the opposite end of the machine or until the arm 41 encounters a stop 43, as in Fig. 7. This encounter with stop 43 results in shifting the relative positions of the curtains 10'—9' so that each curtain 10' is now in line with the curtain 9' which was just previously in a plane above it. Thus it will be seen that the sheets will alternately be fed to the several curtains 10'—9'. The traverse of the carriage to the left will wind up the curtains 10' and unwind the curtains 9' so that the sheets on 10' are delivered over onto the curtains 9'. On the movement of the carriage to the right again after arm 41 has encountered stop 43, as in Fig. 7, the sheets which are now on the curtains 9' are gradually delivered over onto the successively lower curtains 10'.

It is possible that various modifications in my invention may be made without departing from the principle thereof, and I do not wish to be understood as limiting myself to my specific construction beyond what is required by a reasonable interpretation of my claims.

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

1. In a sheet delivery apparatus, the combination of a reciprocating carriage, two



curtains, each having a terminal supported by the carriage, one of said curtains having its other terminal secured to one side of and independent of the carriage and the other curtain having its corresponding terminal secured to the opposite side of and independent of the carriage, and mechanism to wind up one curtain and correspondingly unwind the other on the reciprocation of the carriage, said curtains arranged to deliver a sheet from the curtain which is being wound up onto the curtain which is being unwound and spring-pressed sheet-stops in the path of said winding and unwinding mechanism.

2. In a sheet delivery apparatus, the combination of two sets of curtains, a support for one terminal of each curtain of one set, a support for one terminal of each curtain of the other set, and means operative between said supports for winding up one set of curtains and correspondingly unwinding the other set, said winding mechanism operative to deliver a sheet alternately from a curtain of one set to a curtain of the other set and spring-pressed sheet-stops in the path of said winding and unwinding mechanism.

3. In a sheet delivery apparatus, the combination of two spring-controlled rollers, each having a curtain mounted thereon, a carriage for said rollers, supports for the free ends of the curtains and between which supports the carriage is reciprocal, said carriage and spring rollers operative to deliver a sheet from one of said curtains to the other means for maintaining a sheet flat on the curtains, and sheet-stop means in the path of the carriage.

4. In a sheet delivery apparatus, two rollers, a curtain having a terminal attached to one roller and a terminal attached to the other, and means for alternately winding the curtain off of one roller onto the other.

5. In a sheet delivery apparatus, two rollers, a curtain having one terminal attached to one roller, and the other terminal attached to the other roller, means for unwinding the curtain from one roller onto the other, and spring actuated means for re-winding the curtain onto the first roller and off of the second roller.

6. In a sheet delivery apparatus, two rollers, a curtain having one terminal attached to one roller and the other terminal attached to the other roller, means for alternately winding the curtain from one roller onto the other, and means for giving one roller an accelerated winding movement whereby the winding of the curtain onto that roller takes place more rapidly than the winding onto the other roller.

7. In a sheet delivery apparatus, two rollers, a curtain having one terminal attached to one roller and the other terminal attached to the other roller, means for alter-

nately winding the curtain from one roller onto the other, and means for giving one roller an accelerated winding movement.

8. A sheet delivery, comprising two spring-actuated rollers of different tension, a curtain having one terminal attached to one roller and the other terminal attached to the other roller, and means to actuate said rollers to wind the curtain alternately from one roller onto the other.

9. A sheet delivery comprising two-spring rollers of different tension, a curtain having one terminal attached to one roller and the other terminal to the other roller, means for permitting the weaker roller to wind up the curtain from the other roller, and means permitting the stronger roller to re-wind the curtain.

10. A sheet delivery comprising two rollers, a curtain having one terminal attached to one roller and the other terminal attached to the other, means for supporting one roller, means for supporting the other roller to permit it to move toward and from the first roller, and means for operating the rollers to wind the sheet alternately from one roller to the other roller.

11. A sheet delivery comprising two rollers having a relative movement toward and from each other, a curtain having one terminal attached to one roller and the other terminal attached to the other roller, and means for alternately winding the curtain from one roller to the other roller.

12. A sheet delivery comprising two spring rollers of different tension mounted to have a relative movement toward and from each other, a curtain having one terminal attached to one roller and the other terminal attached to the other roller, and means for alternately winding the curtain from one roller to the other.

13. A sheet delivery comprising two spring-rollers of different tension mounted to have a relative movement toward and from each other, a curtain having one terminal attached to one roller and the other terminal attached to the other roller, means permitting the weaker roller to wind the curtain from the stronger roller, and means to permit the re-winding of the curtain onto the stronger roller.

14. A sheet delivery comprising two spring-rollers of different tension mounted to have a relative movement toward and from each other, a curtain having one terminal secured to one roller and the other terminal secured to the other roller, means for unwinding the curtain on the separation of the rollers, means permitting the winding of the curtain onto the weaker roller as the rollers approach each other, and means permitting the stronger roller to act to re-wind the curtain during a portion of said movement of the rollers toward each other.



15. A sheet delivery comprising two spring-rollers of different tension, a curtain having one terminal attached to one roller and the other terminal attached to the other roller, supports for said rollers, one of said supports movable toward and from the other, mechanism in connection with the stronger roller to permit the curtain to be wound up on the weaker roller, and means to release said mechanism to permit said stronger roller to operate to re-wind the curtain.

16. A sheet delivery comprising two spring-rollers mounted to have a relative movement toward and from each other, a curtain having one terminal attached to one roller and the other terminal attached to the other roller, and means for successively winding the curtain onto each roller as the rollers approach each other.

17. A sheet delivery comprising two parallel-mounted, spring-rollers, a curtain having one terminal attached to one roller and the other terminal attached to the other roller, means for moving one roller toward or from the other, means for winding the curtain on one roller as the rollers approach each other, and means acting subsequent to the above mentioned winding means to re-wind the curtain onto the other roller, said rollers operative to wind at different rates of speed one from the other.

18. A sheet delivery comprising two parallel-mounted spring-rollers of different tension, a curtain having one terminal attached to one roller and the other terminal attached to the other roller, means for moving one roller alternately toward and from the other roller, and means permitting the successful winding of the curtain first onto the weaker roller and then onto the stronger roller during the approach of the rollers toward each other.

19. A sheet delivery comprising two parallel-mounted-spring-rollers of different tension, a curtain having one terminal attached to one roller and the other terminal attached to the other roller, a carriage for one roller movable toward and from the other roller, mechanism acting on the stronger roller to permit the curtain to wind onto the weaker roller, and trip means for releasing said mechanism to permit the re-winding of the curtain onto the stronger roller.

20. A sheet delivery comprising two parallel-mounted-spring-rollers of different tension, a curtain having one terminal attached to one roller and the other terminal attached to the other roller, a carriage for the weaker roller movable toward and from the stronger roller, and mechanism operating on the stronger roller to permit the successive winding of the curtain on each roller during the approach of the carriage toward the stronger roller.

21. A sheet delivery comprising two parallel-mounted-spring-rollers of different tension, a curtain having one terminal attached to one roller and the other terminal attached to the other roller, a carriage for one roller movable toward and from the other roller, and means for winding the curtain successively onto each roller but at different rates of speed during the approach of the rollers toward each other.

22. A sheet delivery comprising two parallel-mounted-spring-rollers, a curtain having one terminal attached to one roller and the other terminal attached to the other roller, a carriage for one roller movable toward and from the other roller, a sheet-stop device engageable with the curtain during the receding movement of the carriage, means for disengaging said stop from the curtain during the return movement of the carriage, and means for successively winding the curtain onto each roller during said return movement of the carriage.

23. A sheet delivery comprising two parallel-mounted-spring-rollers of different tension, a curtain having one terminal attached to one roller and the other terminal attached to the other roller, a carriage for one roller movable toward and from the other roller, mechanism acting on the stronger roller to permit the curtain to wind onto the weaker roller, trip means for releasing said mechanism to permit the re-winding of the curtain onto the stronger roller, and a sheet-stop mechanism coöperating with the curtain and carried by the carriage.

24. A sheet delivery comprising two parallel-mounted-spring-rollers of different tension, a curtain having one terminal attached to one roller and the other terminal attached to the other roller, a carriage for the weaker roller movable toward and from the stronger roller, mechanism operating on the stronger roller to permit the successive winding of the curtain on each roller during the approach of the carriage toward the stronger roller, sheet-stop mechanism associated with the curtain, and means for operating said sheet-stop mechanism coördinately with the movements of the carriage.

25. In a sheet delivery apparatus, the combination of two-spaced supports, a curtain having one terminal attached to one of said supports, another curtain attached to the other of said supports, spring-rollers for each of said curtains, a carriage for said rollers reciprocal between said supports, said rollers arranged proximate to each other and operative to deliver a sheet from one curtain to the other, and sheet-stop mechanism capable of a limited movement in unison with the carriage.

26. In a sheet delivery apparatus, the combination of two opposed anchorages, two curtains each having a terminal attached to



a respective anchorage, and mechanism operative between the anchorages alternately to wind-up one curtain and unwind the other to deliver a sheet from one curtain to the other and spring-pressed sheet-stops in the path of said winding and unwinding mechanism.

27. In a sheet delivery apparatus, the combination of two opposed anchorages, a carriage operable there-between, two spring-actuated rollers mounted in juxtaposition with each other on the carriage, a curtain on each roller, each of said curtains having a terminal attached to a respective anchorage, and one of said curtains unwinding coördinately with the winding of the other curtain, and with the movement of the carriage, to transfer a sheet from one curtain to the other.

28. In a sheet delivery apparatus, the combination of two opposed anchorages, a carriage adapted to reciprocate therebetween, two series of spring-actuated rollers on the carriage, and curtains carried by the rollers, the curtains of one series having a terminal attached to one of the anchorages and the curtains of the other series having a terminal attached to the opposite anchorage said curtains of one series unwinding and the curtains of the other series winding coördinately therewith and during the reciprocation of said carriage to deliver a sheet alternately from a curtain of one series to a curtain of the other series.

29. In a sheet delivery apparatus, a series of superposed sheet supports comprising horizontal roller curtains, means to operate said curtains to pass a sheet successively from one curtain to another, and means to project a jet of air upon the sheet as it is received onto a curtain.

30. In a sheet delivery apparatus, a series of superposed sheet supports comprising horizontal roller curtains, means to operate said curtains to pass a sheet successively from one curtain to another, and spring-pressed stop means operable by the curtain-operating means, to limit the horizontal movement of the sheets.

31. In a sheet delivery apparatus, the combination of a series of superposed spring-actuated curtains, and means for operating said curtains to pass a sheet successively from one curtain to the other.

32. In a sheet delivery apparatus, the combination of two coöperating sets of spring-actuated curtains, and means for operating said curtains to deliver a sheet alternately from a curtain of one set to a curtain of the opposite set.

33. In a sheet delivery apparatus, the combination of two coöperating sets of curtains, a support for one terminal of each curtain of one set, another support for a corresponding terminal of the curtain of the other

set, a carriage reciprocal between said supports, respective spring-rollers for the curtains of each set of said curtains, said rollers arranged to deliver a sheet successively from a curtain of one set to a curtain of the other set on the reciprocation of the carriage, and sheet-stop mechanism in conjunction with the curtains of each set, said sheet-stop mechanism operative alternately on the reciprocation of the carriage.

34. In a sheet delivery apparatus, the combination of two opposed anchorages, a carriage reciprocal between said anchorages, two rollers mounted in juxtaposition with each other on the carriage, a curtain on each roller, each terminal connected with a respective anchorage, means for winding up one curtain and unwinding the other coördinately with the reciprocations of the carriage to transfer a sheet from one curtain to the other, and a sheet-stop appliance associated with each curtain and having a limited movement in unison with the carriage.

35. In a sheet delivery apparatus, the combination of two opposed anchorages, a carriage reciprocal between said anchorages, two rollers mounted in juxtaposition with each other on the carriage, a curtain on each roller, each terminal connected with a respective anchorage, means for winding up one curtain and unwinding the other coördinately with the reciprocations of the carriage to transfer a sheet from one curtain to the other, a spring-actuated frame arranged in the path of the carriage, and sheet-stop and truing mechanism carried by the frame.

36. In a sheet delivery, the combination of two opposed anchorages, a carriage reciprocal between said anchorages, two series of rollers on the carriages, curtains carried by said rollers, the curtains in one series attached to one anchorage and the curtains in the other series attached to the opposite anchorage, means for winding up one set of curtains and correspondingly unwinding the other set of curtains during the reciprocations of the carriage to deliver a sheet alternately from a curtain of one set to a curtain of the other set, and sheet stop and truing appliances associated with the several curtains and operative by the carriage.

37. In a sheet delivery apparatus, the combination of two opposed anchorages, a carriage reciprocal between said anchorages, two rollers mounted in juxtaposition with each other on the curtains, a curtain on each roller, each terminal connected with a respective anchorage, means for winding up one curtain and unwinding the other coördinately with the reciprocations of the carriage to transfer a sheet from one curtain to the other, and means for preventing the return of a sheet onto a curtain from whence it has just been delivered.

38. In a sheet delivery, the combination of



two opposed anchorages, a carriage reciprocal between said anchorages, two series of rollers on the carriage, curtains carried by said rollers, the curtains in one series attached to one anchorage and the curtains in the other series attached to the opposite anchorage, means for winding up one set of curtains and correspondingly unwinding the other set of curtains during the reciprocation of the carriage to deliver a sheet alternately from a curtain of one set to a curtain of the other set, and means for preventing the return of a sheet onto a curtain from whence it has previously been delivered.

39. In a sheet delivery, the combination of two opposed anchorages, a carriage reciprocal between said anchorages, two series of rollers on the carriage, curtains carried by said rollers, the curtains in one series attached to one anchorage and the curtains in the other series attached to the opposite anchorage, means for winding up one set of curtains and correspondingly unwinding the other set of curtains during the reciprocation of the carriage to deliver a sheet alternately from a curtain of one set to a curtain of the other set, and pneumatic means for maintaining the sheets straight on the curtains.

40. In a sheet delivery apparatus, the combination of two opposed anchorages, a carriage reciprocal between said anchorages, two rollers mounted in juxtaposition with each other on the carriage, a curtain on each roller, each terminal connected with a respective anchorage, means for winding up one curtain and unwinding the other coördinately with the reciprocations of the carriage to transfer a sheet from one curtain to the other, and means for maintaining the sheet flat on the curtains.

41. In a sheet delivery apparatus, the combination of two coöperating sets of spring-actuated curtains, means for operating said curtains to deliver a sheet alternately from a curtain of one set to a curtain of the opposite set, and means for preventing a sheet from returning onto a curtain from which it has previously been delivered.

42. In a sheet delivery apparatus, the combination of two coöperating sets of spring-actuated curtains, means for operating said curtains to deliver a sheet alternately from a curtain of one set to a curtain of the opposite set, and pneumatic appliances for preventing a sheet from returning onto a curtain from which it has been delivered.

43. In a sheet delivery apparatus, the combination of two opposed anchorages, a carriage reciprocal between said anchorages, two rollers mounted in juxtaposition with each other on the carriage, a curtain on each roller, each terminal connected with a respective anchorage, means for winding up one curtain and unwinding the other coördinately

with the reciprocations of the carriage to transfer a sheet from one curtain to the other, and pneumatic appliances on the carriage for preventing a sheet from returning onto the curtain whence it has just been delivered.

44. In a sheet delivery apparatus, the combination of two opposed anchorages, a carriage reciprocal between said anchorages, two series of rollers on the carriage, curtains carried by said rollers, the curtains in one series attached to one anchorage and the curtain in the other series attached to the opposite anchorage, means for winding up one set of curtains and correspondingly unwinding the other set of curtains during the reciprocation of the carriage to deliver a sheet alternately from a curtain of one set to a curtain of the other set, and pneumatic appliances on the carriage arranged to project a jet of air upon each sheet as it is delivered onto a curtain.

45. In a sheet delivery apparatus, the combination of two opposed anchorages, a carriage reciprocal between said anchorages, two rollers mounted in juxtaposition with each other on the carriage, a curtain on each roller, each terminal connected with a respective anchorage, means for winding up one curtain and unwinding the other coördinately with the reciprocations of the carriage to transfer a sheet from one curtain to the other, and pneumatic appliances on the carriage operative to project a jet or jets of air upon a sheet as it is received onto a curtain.

46. A sheet drying mechanism having in combination means for alternately supporting a sheet in a horizontal position and for giving said sheet a step by step vertical movement, and means arranged to project a jet of air upon the sheet.

47. In sheet drying mechanism, means for supporting a plurality of superposed sheets in stationary horizontal position with a suitable air-space between each sheet, means arranged to project a jet of air upon the sheet, and means for giving the several sheets a step by step vertical movement to pass the sheets successively from one support to another.

48. The combination with means for supporting a sheet in horizontal position, of a carriage movable relative to the sheet, and air blast means supported by the carriage and arranged to direct a current or currents of air downwardly upon said sheet.

49. The combination with means for supporting a sheet horizontally and for giving said sheet a step by step vertical movement, of a pair of parallel longitudinally grooved rollers arranged beneath said sheet supporting means, a removable shelf fitting corresponding grooves in said rollers, and means for rotating said rollers in unison to raise or lower said shelf.



50. In a sheet delivery apparatus, the combination of two opposed anchorages, a carriage reciprocal between said anchorages, two series of spring rollers on the carriage, curtains carried by said rollers, the curtains in one series attached to one anchorage, and the curtains in the other series attached to the opposite anchorage, and means for raising the rollers of one series and correspondingly lowering the rollers in the other series.

51. In a sheet delivery apparatus, the combination of two opposed anchorages, a carriage reciprocal between said anchorages, two series of spring-rollers on the carriage, curtains carried by said rollers, the curtains in one series attached to one anchorage and the curtains in the other series attached to the opposite anchorage, shiftable supports on the carriage for the ends of said rollers, and means for shifting said supports to raise one set of rollers and correspondingly lower the other set of rollers coördinately with the reciprocations of the carriage.

52. In a sheet delivery, the combination of two opposed anchorages, a carriage reciprocal between said anchorages, two series of spring rollers on the carriage, curtains carried by said rollers, the curtains in one series attached to one anchorage and the curtains in the other series attached to the opposite anchorage, sliding supports on the carriage for said rollers, a rocker member connected with said supports, and means for actuating said rocker-member on the reciprocation of the carriage to lift one set of rollers and correspondingly depress the other set of rollers.

53. A sheet delivery mechanism having in combination rolling and unrolling sheet-carriers one of said carriers in its rolling delivering the sheet to the other carrier, and means for rolling and unrolling said carriers and means for raising and lowering alternately the adjacent ends of the sheet carriers.

54. In a delivery mechanism the combination with means for conveying sheets from a printing press or the like, of a series of expansible and contractible sheet supports arranged to receive the sheets from the conveyer, means for operating the sheet supports so that the sheets are received at one end of the series are kept separated and are discharged at the other end thereof, and means for receiving the sheets as they are discharged and means for raising and lowering alternately the adjacent ends of the sheet supports.

55. In a delivery mechanism the combination with means for conveying sheets from a printing press or the like, of a series of expansible and contractible sheet supports arranged to receive the sheets from the conveyer and to support a number of them each separately, means whereby the support at one end of the series is expanded to receive a sheet, the intermediate supports caused to

transfer the sheet from one end of the series to the other end thereof, and the support at the latter end of the series contracted to discharge the sheet, and means for receiving the sheet as it is discharged and means for raising and lowering alternately the adjacent ends of the sheet supports.

56. In a sheet drier and delivery mechanism, the combination of a series of expansible and contractible sheet supports, means for expanding and contracting the supports to cause them to receive sheets at one end of the series, transfer them from one end of the series to the other end thereof, and to discharge the sheets at the latter end thereof and means for raising and lowering alternately the adjacent ends of the sheet supports.

57. In a sheet drier and delivery mechanism, the combination of a series of expansible and contractible sheet supports, and means for expanding and contracting the sheet supports so that the sheets received at one end of the series are transferred without movement in their planes to the other end thereof and discharged and means for raising and lowering alternately the adjacent ends of the sheet supports.

58. In a delivery mechanism, the combination with means for conveying sheets from a printing press or the like, of a series of flexible sheet supports arranged to receive the sheets from the conveyer, means for operating the sheet supports so that the sheets received at one end of the series are transferred in a direction at right angles to their planes and without movement in those planes to the other end of the series and discharged, and means for receiving the sheets as they are discharged and means for raising and lowering alternately the adjacent ends of the sheet supports.

59. In a sheet drier and delivery mechanism, the combination of a series of flexible sheet supports, a series of rollers each of said supports being fixed at one end and connected to a roller at the other end, and means for operating the rollers so that the sheets received at one end of the series are discharged at the other end thereof and means for raising and lowering alternately the adjacent ends of the sheet supports.

60. In a sheet drier and delivery mechanism, the combination of a series of flexible sheet supports, a series of rollers each of said supports being fixed at one end and connected to a roller at the other end, and means for operating the rollers so that the sheets received at one end of the series are transferred from one support to another and discharged at the other end thereof and means for raising and lowering alternately the adjacent ends of the sheet supports.

61. In a sheet manipulating machine, a pair of flexible sheet supports, a series of



rollers one support being fixed at one end to one part of the machine and connected at the other end to a roller, and the other support being fixed at one end to an opposite part of the machine and connected at the other end to a second roller, a carriage in which said rollers are mounted, and means for reciprocating said carriage and means for raising and lowering alternately the adjacent ends of the sheet supports.

62. A sheet delivery mechanism comprising a pair of oppositely arranged rolling and unrolling sheet carriers, one of said carriers in its rolling delivering the sheet to the other carrier, and means rolling and unrolling said carriers and means for raising and lowering alternately the adjacent ends of the sheet carriers.

63. In a delivery mechanism, the combination with means for conveying sheets from a printing press or the like, of two series of oppositely arranged sheet supports, means for operating the sheet supports so that the sheets received at one end of one series are without movement in their planes alternately transferred from one series to the other and advanced from one support to another throughout each series and finally discharged, and means for receiving the sheets as they are discharged and means for raising and lowering alternately the adjacent ends of the sheet supports.

64. In combination, two series of oppositely arranged expansible and contractible sheet supports, and means for alternately expanding and contracting said sheet supports so that the sheets received at one end of one series are alternately transferred from one series to the other and advanced from one support to another throughout each series and finally discharged and pneumatic appliances for maintaining a sheet flat onto the supports.

65. In a sheet manipulating machine, two series of oppositely arranged flexible sheet supports, two sets of rollers the supports forming one series being fixed at one end to one part of the machine and connected at the other end to a set of rollers; and the supports forming the other series being fixed at one end to an opposite part of the machine and connected at the other end to a second set of rollers, a carriage in which both sets of rollers are mounted, and means for reciprocating said carriage and pneumatic appliances for maintaining a sheet flat onto the supports.

66. In a delivery mechanism the combination with means for conveying sheets from a printing press or the like, two sets of rollers, of two series of oppositely arranged flexible sheet supports, the supports forming one series being fixed at one end to one end of the machine and connected at the other end to a set of rollers, and the supports forming the other series being fixed at one end to the opposite end of the machine and connected at the other end to a second set of rollers, a carriage in which both said sets of rollers are mounted adjacent to each other with the rollers of each set opposite the spaces between the rollers of the other set, and means for reciprocating said carriage and pneumatic appliances for maintaining a sheet flat onto the supports, substantially as described.

67. In a delivery mechanism the combination with means for conveying sheets from a printing press or the like and a pair of rollers, of a pair of oppositely arranged flexible sheet supports, one support being fixed at one end to one end of the machine and connected at the other end to a roller, and the other support being fixed at one end to the opposite end of the machine and connected at the other end to a second roller, a carriage in which said rollers are mounted, and means for reciprocating said carriage, whereby the sheets received by one support are transferred to the other support and discharged and pneumatic appliances for maintaining a sheet flat onto the supports.

68. In a delivery mechanism, the combination with means for conveying sheets from a printing press or the like, of a series of sheet supports arranged to receive the sheets from the conveyer, means for operating the sheet supports so that the sheets as received at one end of the series are kept separated and transferred in a direction at right angles to their planes and without movement in those planes to the other ends and discharged, a table for receiving the sheets as they are discharged, and means for maintaining a predetermined relation between the sheets during their passage through the machine and pneumatic appliances for maintaining a sheet flat onto the supports.

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

CLARENCE L. JOHNSTON.

Witnesses:

S. H. NOURSE,

GEO. H. STRONG.