

(No Model.)

3 Sheets—Sheet 1.

R. CUNDALL.

PAPER FOLDING MACHINERY.

No. 371,877.

Patented Oct. 18, 1887.

Fig. 1.

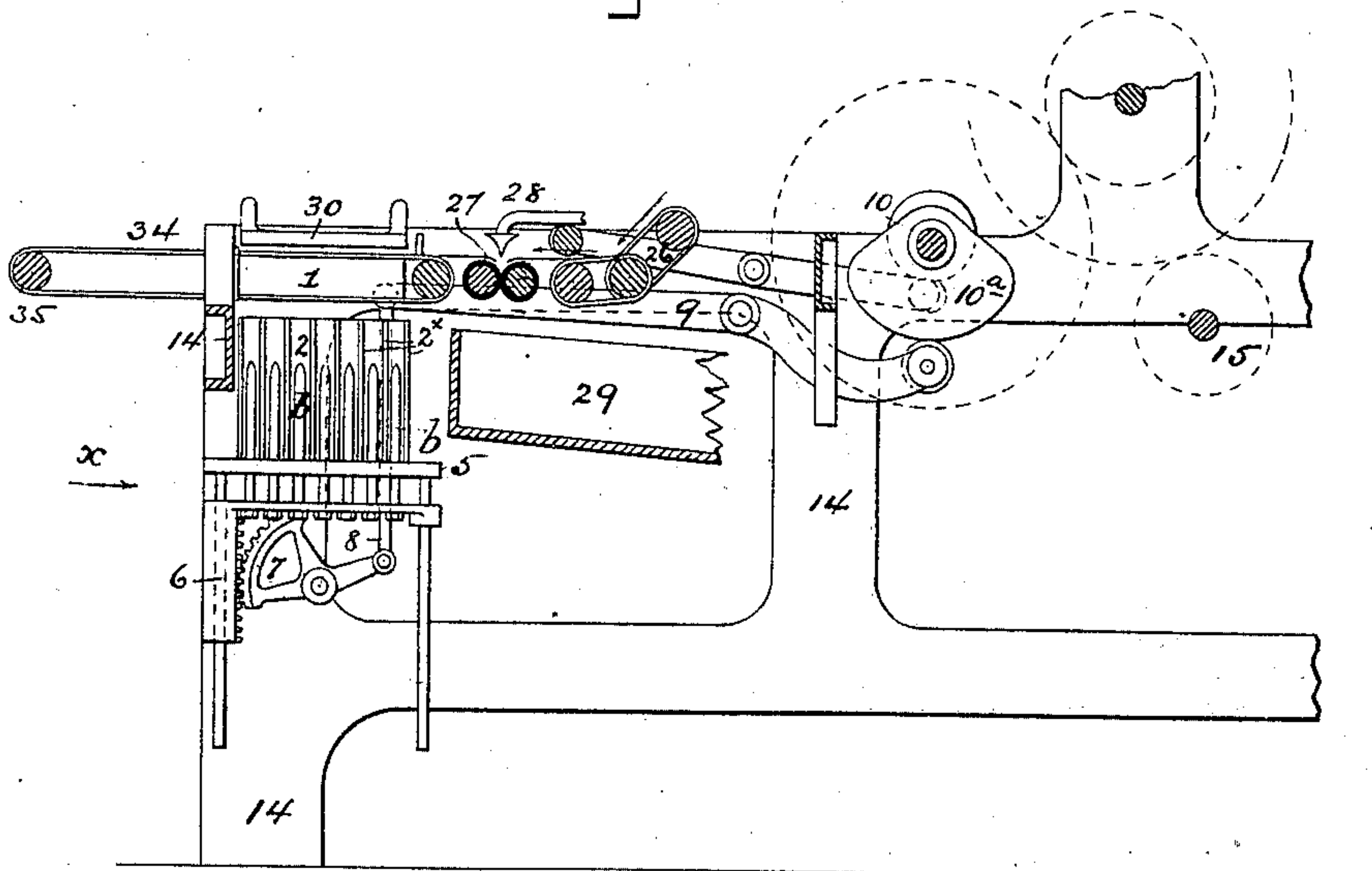


Fig. 2.

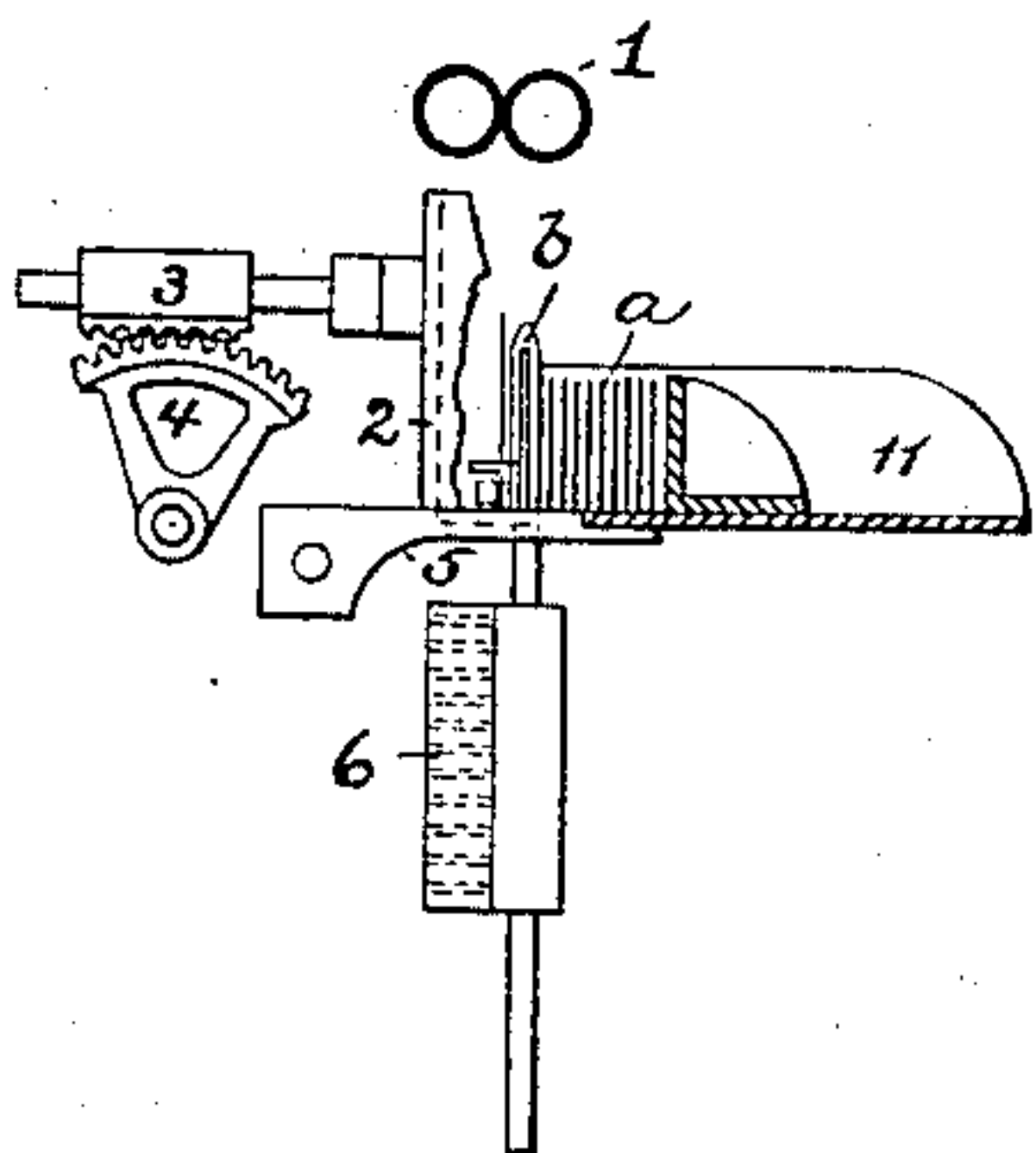


Fig. 3.

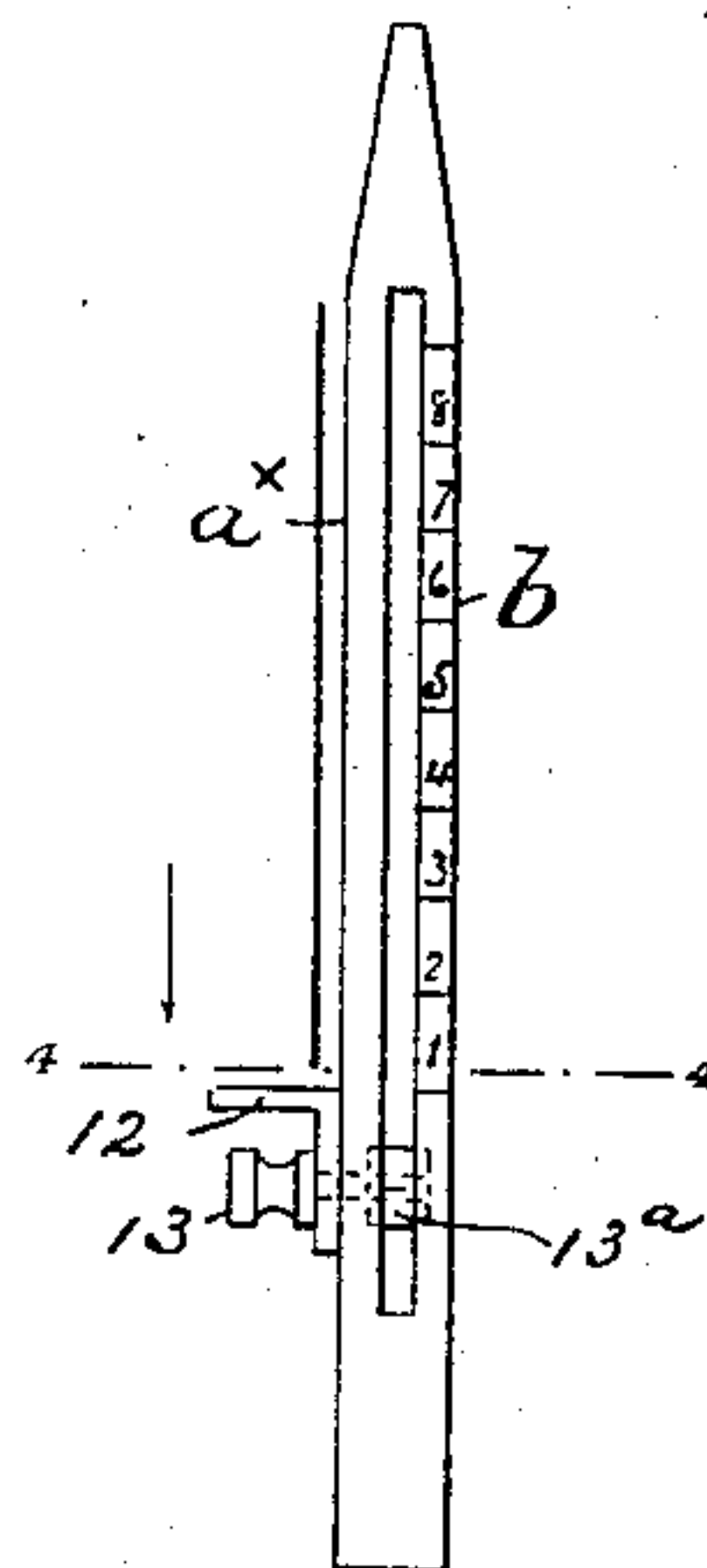
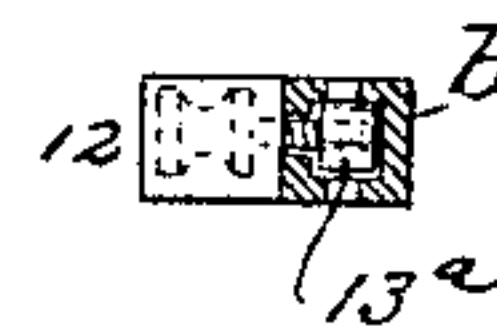


Fig. 4.



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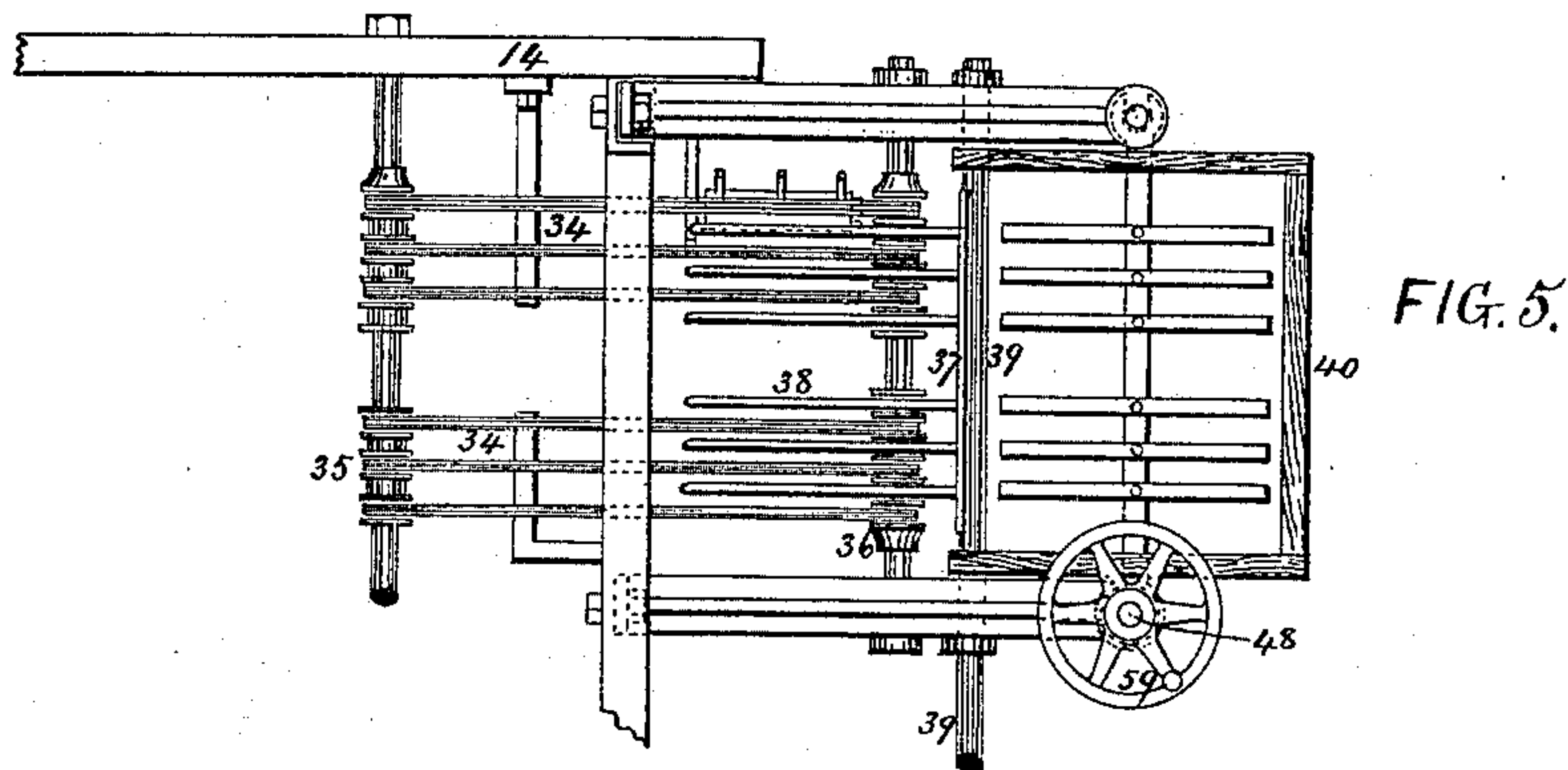
(No Model.)

3 Sheets—Sheet 2.

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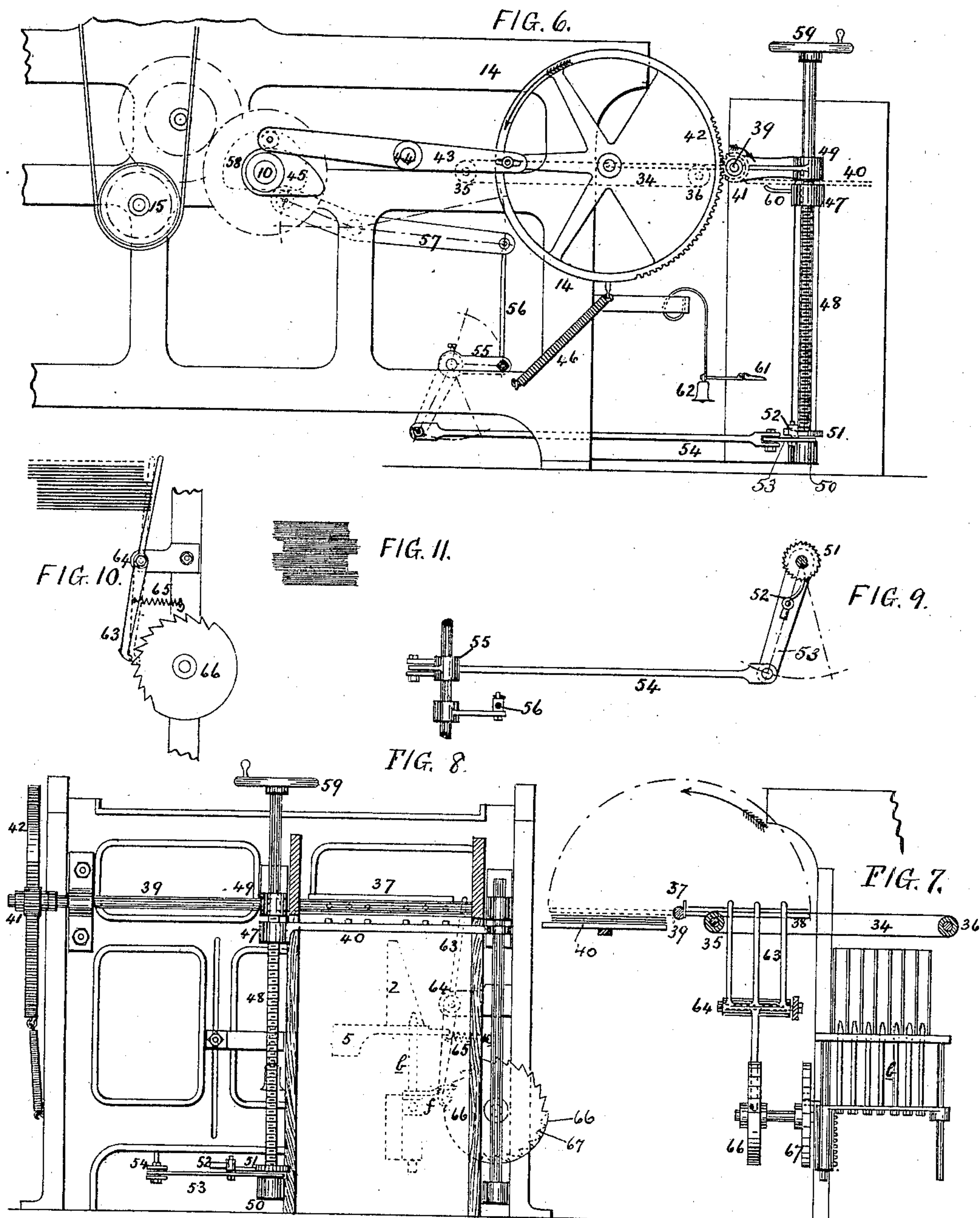
(No Model.)

3 Sheets—Sheet 3.

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No. 371,877.

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UNITED STATES PATENT OFFICE.

ROBERT CUNDALL, OF SHIPLEY, NEAR BRADFORD, COUNTY OF YORK,
ENGLAND.

PAPER-FOLDING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 371,877, dated October 18, 1887.

Application filed August 9, 1886. Serial No. 210,472. (No model.) Patented in England October 4, 1881, No. 4,303, September 25, 1883, No. 4,569, March 14, 1884, No. 4,854, and March 16, 1886, No. 3,667.

To all whom it may concern:

Be it known that I, ROBERT CUNDALL, a subject of the Queen of England, and a resident of Shipley, near Bradford, in the county of York, England, have invented certain new and useful Improvements in Paper-Folding Machinery, (for which patents have been granted to me in England, No. 4,303, dated October 4, 1881; No. 4,569, dated September 25, 1883; No. 4,854, dated March 14, 1884, and No. 3,667, dated March 16, 1886,) of which the following is a specification.

My invention relates to machines employed for folding newspapers, pamphlets, and the like, and provided with several deliverers, whereby they may be made to deliver the sheet folded three or four times at will; and my object is in part to provide such a machine with improved delivery mechanism, and, in part, to provide it with an improved device for counting the folded sheets as they are delivered.

My invention will be hereinafter described, and its novel features carefully defined in the claims.

In the drawings which serve to illustrate my invention, Figure 1 is a fragmentary sectional elevation of the lower part of a paper-folding machine provided with my delivery mechanism and adapted for four-fold delivery. Fig. 2 is a detached side view (as seen from arrow *a* in Fig. 1) of the improved delivery mechanism. Figs. 3 and 4 are enlarged detail views of parts of the mechanism illustrated in Fig. 2. The remaining figures show the machine adapted for three-fold delivery, together with the delivery and counting mechanism. Fig. 5 is a plan of the delivery end of the machine. Fig. 6 is a side view of the same end of the machine. Fig. 7 is a fragmentary view of the mechanism at the delivery end of the machine as seen from the side opposite to that in Fig. 6. Fig. 8 is an elevation of the delivery end of the machine. Fig. 9 is a detached plan view of the ratchet device for lowering the receiving-table. Fig. 10 is a detached view of the mechanism for counting the sheets as delivered. Fig. 11 is a view showing the manner in which the sheets are piled by the counting device.

14 represents the frame of the machine, and 15 the driving-shaft. The rollers, tapes, strikers, &c., are the same, substantially, as those in the ordinary paper-folding machines. In Fig. 1 only the lower set of tapes and the devices for effecting the fold are shown. The sheet, already three times folded, passes down the inclined tapes 26 onto the horizontal tapes 34. If the sheets are not required to be delivered with care—as in the case of newspapers, for example—and the last fold is to be effected parallel to that next preceding, then the striker 28 may be employed to strike the paper down between folding-rollers 27, from which the folded sheet falls into an ordinary box, 29; but if the sheet is to be folded a fourth time at right angles to the preceding fold, then the sheet will be permitted to pass onto folding-rollers 1, when it will be struck down by striker 30 between said rollers, and will pass thence into the improved delivery mechanism that I will now describe, referring especially to Figs. 2, 3, and 4.

5 is a shelf or platform, on which is mounted an upright slide, 2, which receives a to-and-fro reciprocating motion through the medium of a rack, 3, and vibrating toothed segment 4 in mesh therewith. This segment may receive its motion from any convenient source. Fixed on or to shelf 5 is a trough-like receiver, 11, to receive the folded sheets *a*, which are held clear out of the way of each newly-folded sheet by means of a series of upright fingers, *b*, which are secured to a head or bar below the shelf 5 and project up and play through said shelf. They receive an up-and-down longitudinal motion through the medium of a rack, 6, and a toothed segment, 7, which meshes therewith. This segment is vibrated through the medium of a rod, 8, a lever, 9, and a cam, 10^a, the latter acting on a pawl on the end of said lever. This mechanism operates as follows:

When the folded sheet (as *a*^x) leaves rollers 1, it drops down between the slide 2 and the fingers *b*. These fingers are now withdrawn and the slide advances and pushes the folded sheet forward against those already delivered and in receiver 11. On the face of slide 2 are projecting ribs 2^x, (seen in Fig. 1,) arranged to

register with the spaces between fingers *b*, and these push the sheet forward far enough to permit the said fingers to be pushed up behind the sheet before the slide 2 starts to return. The slide is now withdrawn in time to receive the next sheet.

In Fig. 3 I have shown one of the fingers *b* enlarged, in order to more clearly illustrate an adjustable bracket-stop, 12, mounted thereon and adapted to be clamped fast at any height by a screw, 13. Fig. 4 is a cross-section of the fingers, showing the longitudinal guideway therein and a guide, 13^a, in which the screw 13 is set. The bracket 12 receives the folded sheet *a*^x from the rollers 1 as it falls, and the adjustment is to adapt said bracket to sheets of different sizes. The finger may have a scale with numerals, as shown in Fig. 3, to aid in setting the bracket at the proper height. This receiving-bracket 12 has for its principal object the easing down of the sheets as they fall from the rollers 1—that is, when the sheets issue from the rollers they rest on this bracket as soon as they are free, and they are then carried down gently to the shelf 5 by the descent or withdrawal of the fingers *b*. Consequently the folded sheets do not drop from the rollers, whereby they would be disarranged, but are gradually lowered.

I will now describe the device employed for a three-fold delivery and the mechanism for counting the sheets or separating them into piles or bunches having the same number in each. This has before been done by mechanism connected with this class of machines, but by different means from that I employ.

Fig. 7 shows the tapes 34 on rollers 35 and 36 projecting beyond the frame of the machine, and also the three-fold delivery mechanism freed from the frame-work, which would obscure it. In Fig. 6, 10 is a cam-shaft bearing a cam, 45, which actuates a lever, 43, fulcrumed on a stud, 44. The operating end of lever 43 is coupled by a slotted connection to a toothed wheel or segment, 42, which is thus given a vibrating motion by cam 45. The segment meshes with a pinion, 41, on a rock-shaft, 39, and on this shaft are fingers 38, forming a "fly," said fingers having a stop-piece, 37. This fly takes the sheet from tapes 34 and carries it over in the well-known manner of a fly, depositing it on a table, 40. A spring, 46, assists in retracting segment 42. This table 40 is caused to descend through the medium of a screw-and-ratchet device as fast as the folded sheets are placed thereon. Figs. 5, 6, 8, and 9 show this mechanism for lowering the table 40. A nut, 47, secured to the table 40 at its end, travels on an upright screw, 48, which rotates in bracket-bearings 49 and 50. On the lower end of screw 48 is a ratchet-wheel, 51, and a lever-arm, 53, carries a pawl, 52, which engages said ratchet. Arm 53 is coupled to an arm of a bell-crank, 55, by a rod, 54, and the other arm of said crank is coupled by a rod, 56, with a lever, 57, actuated by a cam, 58, on cam-shaft 10. Thus every revolution

of shaft 10 imparts a movement to the ratchet-wheel 51 and screw 48, and also at each revolution of said shaft a folded sheet is delivered by the fly onto the table 40. When the table has nearly reached the lowest point, a finger, 60, on the nut 47 comes in contact with an arm, 61, from a bell, 62, which latter will thus be sounded and arrest the attention of the workman and enable him to stop the machine. The table may be raised by disengaging the pawl 52 from the ratchet-wheel, and then rotating screw 48 backward by means of a hand-wheel, 59, on the upper end of same.

I will now describe the device which I have called a "counter" for the sheets: This counter is used in connection with the delivery device last described. The counter divides the pile of folded sheets into lesser piles or tiers, containing each a known number of sheets—say twelve—the division being effected by pushing twelve successive sheets a little farther over on the fly or tapes than the twelve preceding and succeeding sheets, whereby the pile is made to present the appearance seen in Fig. 11. A lever, 63, is pivoted or fulcrumed at 64, and its lower end is held up to cam 66 by a spring, 65. At its upper end this lever is forked to form several fingers, (seen best in Fig. 7,) which stand at the side of the fly when the latter is in position to receive a sheet from tapes 34. In the present case one half of cam 66 is plain and circular peripherally, while the other half is provided with twelve equally-spaced notches. This cam makes one revolution for each twenty-four deliveries by the fly, and it is rotated intermittently through the medium of a ratchet-wheel, 67, (having twenty-four teeth,) fixed on the same shaft with said cam and actuated by a pawl, *f*, (see dotted lines in Fig. 8,) carried by the fingers *b*, heretofore described. The movement is so timed that at the moment a sheet is delivered onto the fly or placed in position against stop 37 by tapes 34 the beak on the lower end of lever 63 is drawn into a notch of the cam 66 by spring 65. This throws forward the fingers on the upper end of lever 63 and they push the sheet over a little way on the tapes. As there are twelve notches in the cam, twelve sheets in succession will be thus shifted; but while the other or plain half of the cam is passing twelve sheets will be delivered that will not be acted upon and shifted by lever 63. This will produce an arrangement of the sheets as represented in Fig. 11. Of course by a proper arrangement of the parts described the piles may be divided into tiers containing other numbers of sheets than twelve. This number is here employed merely for illustration.

In Fig. 8 I have not shown all the teeth in ratchet-wheel 67; but it will have teeth all around its circumference.

I am aware that it is not new to construct a receiving-table to be lowered as fast as the sheets are placed thereon, and I do not claim this feature.

Having thus described my invention, I claim—

1. In a paper-folding machine, the combination, with the last pair of folding and delivering rollers, of the slide 2, the mechanism for imparting reciprocating motion to said slide, comprising the rack 3 and oscillating segment 4, the table 5, the vertically-reciprocating fingers *b*, projecting up through said table, and the mechanism for actuating said fingers, comprising the rack 6, connected to the latter, and the oscillating segment 7, all arranged to operate substantially as set forth.

2. In a paper-folding machine, the combination, with the last pair of folding and delivering rollers, of the reciprocating slide and its operating mechanism, the table 5, the reciprocating fingers *b*, mounted in guides and free to play longitudinally, said fingers being provided with adjustable brackets 12 to receive the folded sheet, and the mechanism which imparts a reciprocating motion to said fingers *b*, all arranged to operate substantially as set forth.

3. In a paper-folding machine, the mechanism for automatically arranging the delivered sheets in distinct piles containing predeter-

mined numbers of sheets, which comprises the lever 63, fulcrumed at 64 and provided with fingers, its spring 65, the rotary cam 66, provided with notches on a part only of its periphery, and mechanism, substantially as described, for imparting an intermittent rotary motion to said cam 66.

4. In a paper-folding machine, the combination, with the endless delivery-tapes, of the pivotally-mounted forked lever 63, its spring 65, the rotatively-mounted cam 66, provided with notches on a part only of its periphery, the ratchet-wheel 67, mounted on the same axis with the cam 66, the reciprocating fingers *b*, and the pawl *f*, carried by said fingers *b* and engaging the ratchet 67, whereby the movements of said fingers *b* are imparted to the cam 66, for the purposes set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ROBERT CUNDALL.

Witnesses:

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HERBERT INGHAM,

Both of Commercial Street, Halifax.