No. 641,303. Patented Jan. 16, 1900.

W. LANG & W. ZANDER.

PAPER FOLDING MACHINE.

(Application filed Nov. 28, 1898.)

(No Model.) 3 Sheets—Sheet 1.

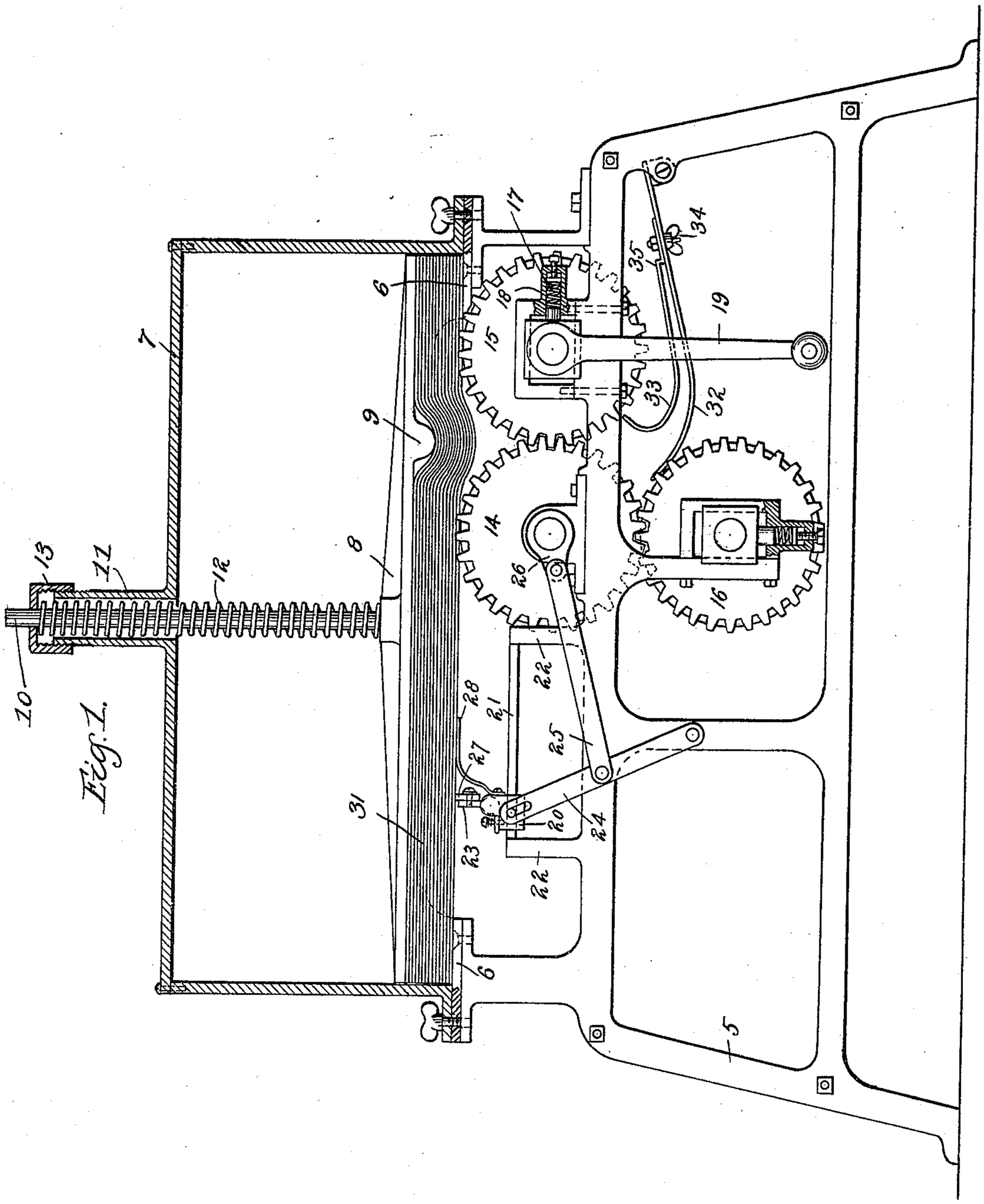

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

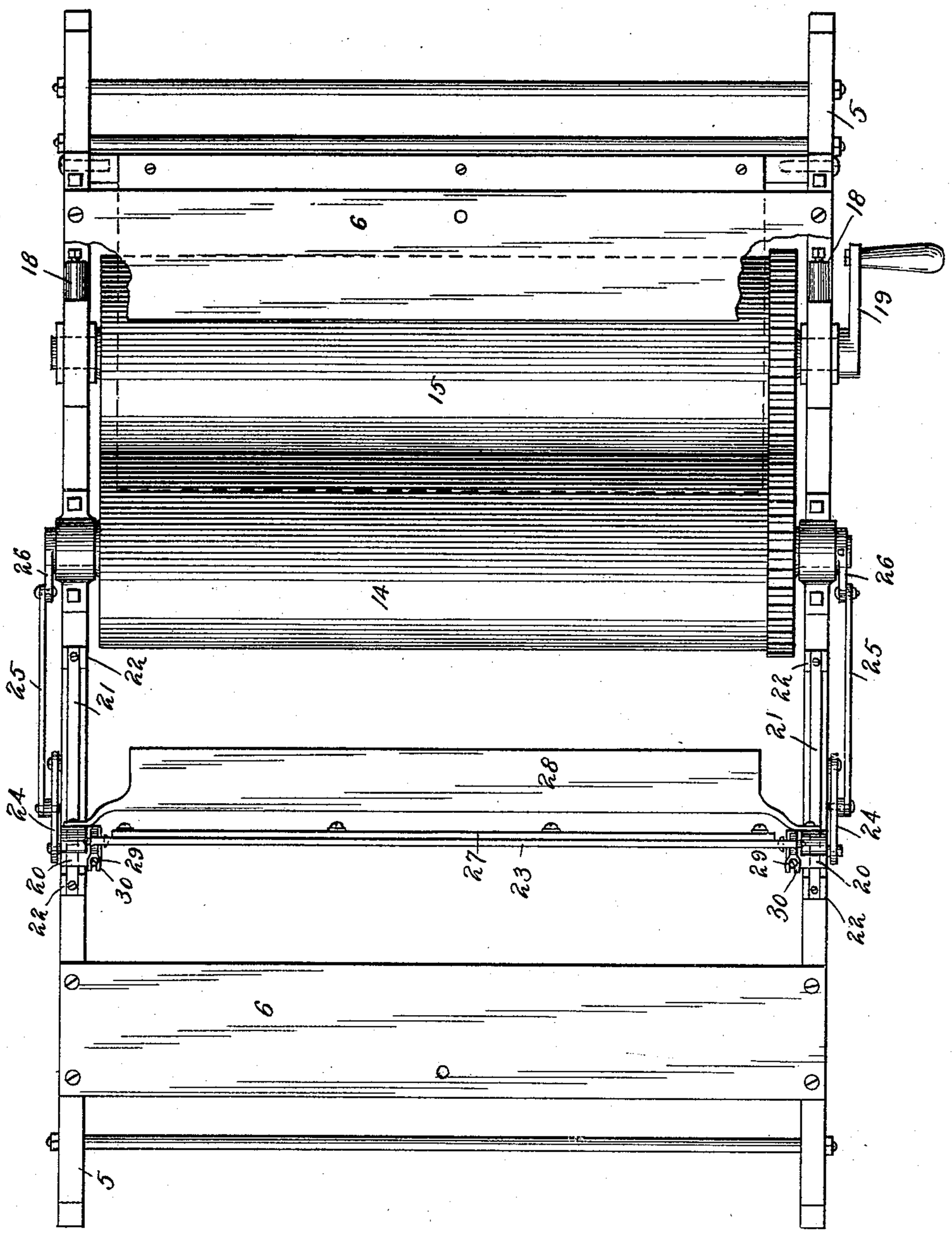

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Fig. 3.

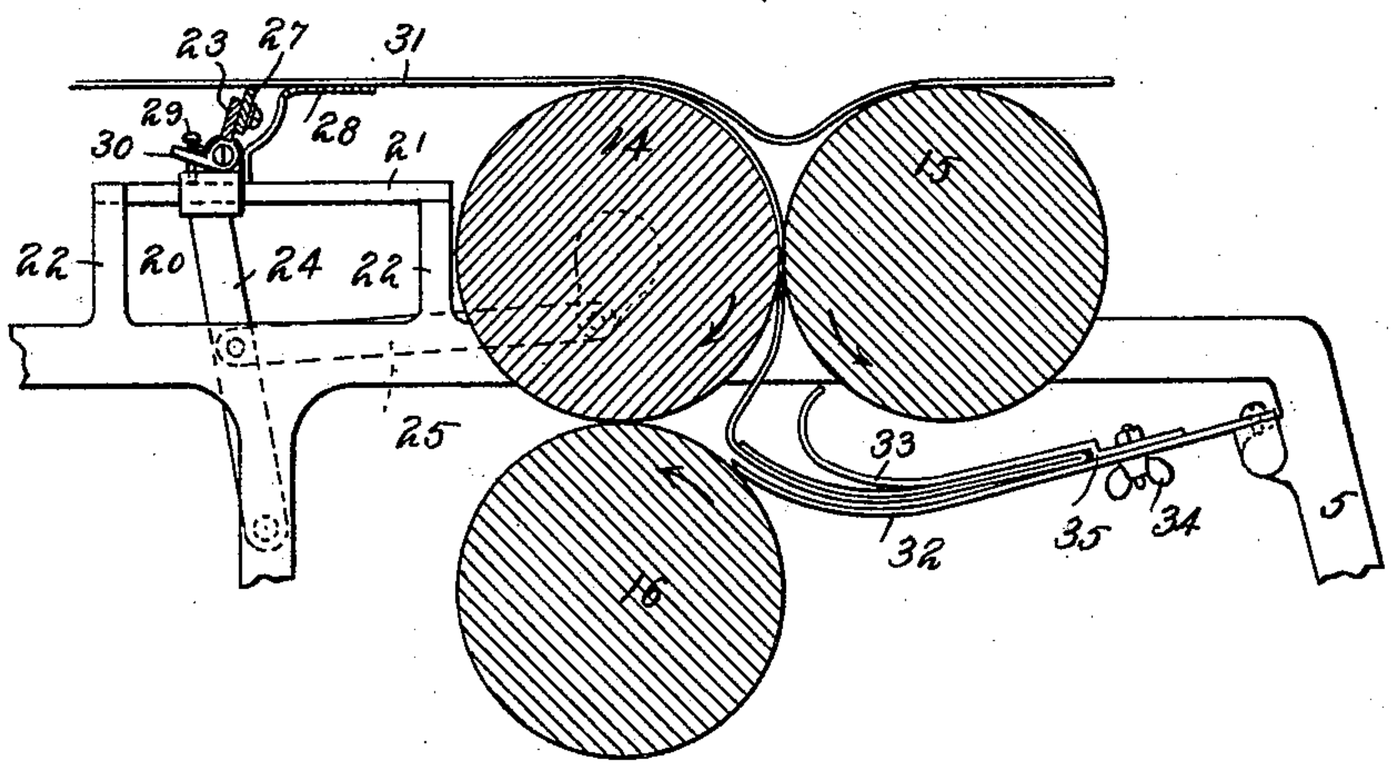
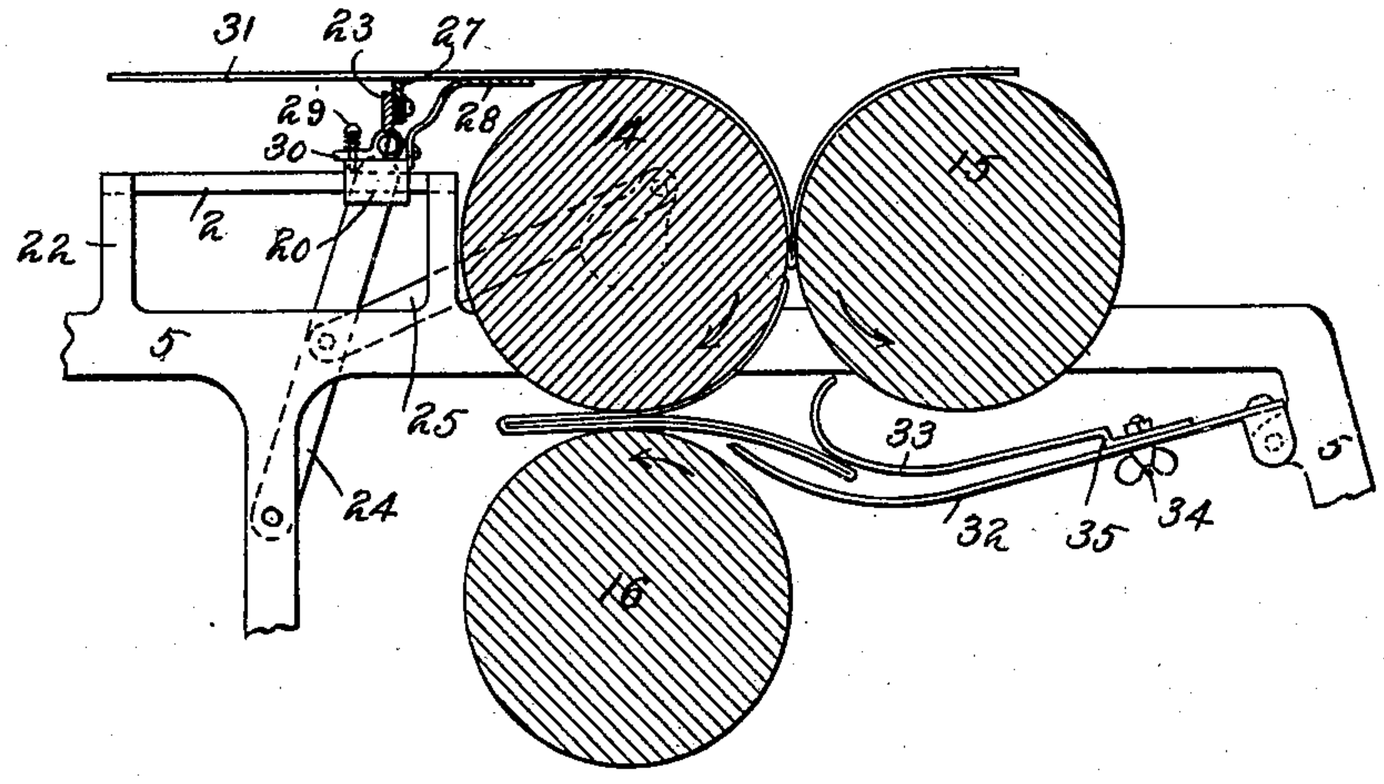


Fig. 4.



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UNITED STATES PATENT OFFICE.

WILLIAM LANG AND WILLIAM ZANDER, OF CHICAGO, ILLINOIS.

PAPER-FOLDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 641,303, dated January 16, 1900.

Application filed November 28, 1898. Serial No. 697,619. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM LANG and WILLIAM ZANDER, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Paper-Folding Machines, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to machines for folding sheets of paper, and is primarily designed for use in folding circulars or other small sheets. So far as we are aware machines that have heretofore been designed for folding sheets have ordinarily had such sheets fed to the folding mechanism from the top of a pile of sheets, and where it was designed to present a buckled portion of such folding mechanism as the sheet was separated from the pile difficulties would necessarily arise in properly presenting the buckled portion to the folding mechanism, owing to the buckling being liable to be formed at the wrong place in the sheet and also because of the tendency of such buckled portion to fall and be distorted owing to the action of gravity.

We have for our object the production of a machine for the purpose named by which the difficulties referred to will be obviated and a sheet be enabled to be moved forward, buckled, and delivered at the buckled portion to the folding mechanism. Broadly stated, we accomplish this object by supporting a pile of papers above a suitable folding mechanism, which mechanism is shown as formed by ordinary folding-rollers suitably journaled in a frame and providing below such pile of papers suitable means for projecting successively a buckled portion of the lowermost sheet of the pile into the folding mechanism, the formation of the buckled portion of the sheet being aided, of course, by gravity. To arrange the pile of sheets so as to be successively acted upon by the folding mechanism, the machine is constructed so as to allow them to be placed in position or inserted directly over the folding mechanism.

In the accompanying drawings we have illustrated the best means now known to us for carrying out our invention. That which we regard as new will be set forth in the claims.

Referring to the drawings, Figure 1 is an end view, partly in section. Fig. 2 is a plan view of the folding devices, the receptacle for paper that is shown in Fig. 1 being removed; and Figs. 3 and 4 are details of the folding devices illustrating the progress of a sheet of paper through the folding-rollers.

In the drawings, 5 indicates the framework of the machine, across the top of which on each side extend pieces 6, upon which the ends of a pile of paper rest, as shown.

7 indicates a box or cover over the top of the machine and suitably secured to the framework in such manner that it can be readily and quickly removed or replaced. The lower end of this box or cover is open, as shown.

8 indicates a follower of a size to fit within the box or cover 7 and adapted to move freely therein. As shown in Fig. 1, this follower has on its lower face a projection 9, the object of which will hereinafter be explained.

10 indicates a rod attached to the upper face of the follower 8 and projecting, as shown, into and through a hub 11 on the upper surface of the box 7.

12 indicates a spring surrounding the rod 10 and bearing at its lower end against the follower 8 and at its upper end against a screw-cap 13 on the hub 11.

14 15 16 indicate rollers suitably journaled in the framework 5, as shown. These rollers are each provided on one end with cogs, which intermesh and cause all of the rollers to turn together. The rollers 15 16 are slidingly secured in place and are each held in nipping engagement with the roller 14 by coiled springs 17 in boxes 18, as shown in Fig. 1. This construction allows, of course, for a slight yield when necessary to permit the passage of paper between the rollers.

19 indicates a crank-handle attached to the shaft of the roller 15 and by means of which the machine is operated. It is of course to be understood that any other suitable power-applying device may be employed.

20 indicates two side pieces, one at each side of the machine, which are adapted to be moved forward and back upon suitable slides, such as 21, which slides are secured to short standards 22 on the framework of the machine.

23 indicates a cross-bar extending between

and connected to the two side pieces 20, such side pieces and the said cross-bar together forming what may appropriately be termed a "carriage." In the form of mechanism shown this carriage is reciprocated on the slides 21 through rods 24 25 and a crank 26, said crank 26 being attached to the shaft of the roller 14. The rod 25 is connected at one end to such crank 26, and at its other end is pivoted at a suitable point to the rod 24, which rod 24 is pivoted at its lower end to the side of the framework 5, and at its upper end is loosely connected to the carriage 20 23.

To insure perfect operation at all times, each side of the machine is provided alike with the rods 24 25 and crank 26.

The carriage 20 23 carries a strip 27, preferably made of rubber, but which may be of other suitable material, which strip, as shown, is bolted or otherwise secured to the cross-piece 23 of the carriage and extends slightly above the upper edge of said cross-piece. 28 indicates a plate, also carried by said carriage and extending forward therefrom some little distance, as shown. This forwardly-extending support 28 holds the pile of paper up sufficiently at a point forward of the carriage to prevent buckling of the lower sheet at a point forward of the bite of the rollers 14 15. As shown, the cross-piece 23, with its attached strip 27, is pivotally secured to the side pieces 20, so that it can tilt a little on the return motion of the carriage, as illustrated in Fig. 3, for a purpose that will be set forth in the description of the operation of the machine. The limit of the tilting motion is regulated by a coiled spring that bears between the head of a bolt 29 and a short rearwardly-projecting lip 30, connected to the cross-piece 23 of the carriage.

31 indicates a pile of papers within the box 7 and resting at its ends upon the cross-pieces 6 on top of the framework of the machine and also upon the plate 28 and the surfaces of the rollers 14 and 15. The follower 8 will of course be pressed down by its spring 12, and thus cause the pile of papers to be forced down and rest upon the parts specified, and the effect of the projection 9 upon the pile of papers is, as indicated in Fig. 1, to cause them to be depressed at a point between the two rollers 14 and 15.

32 33 indicate a guide consisting of an upper and a lower portion which in the form of construction shown consists of two separate pieces, 32 indicating the lower portion and 33 the upper portion. The upper portion is made adjustable upon the lower portion by means of a set-screw 34, passing through a slot in the lower portion 32. The upper portion of the guide has formed at its rear portion a shoulder 35, and from such shoulder toward the center of the machine it is for a portion of its length substantially parallel with the lower portion 32, but toward its free end it is curved upward, so that, as shown, a wide mouth for the guide as a whole is provided. The lower member 32 of the guide projects forward and comes very close to the surface of the roller 16. The guide as a whole is suitably secured to the framework 5 and is of a width sufficient to receive and support one of the sheets of paper from the pile 31.

In operation, the parts being assembled as shown and the pile of papers being placed in the box 7 and resting upon the supporting-surfaces described, power is to be applied to the machine to rotate the rollers 14 15 16 in the direction indicated by the arrows in Figs. 3 and 4. As the rollers rotate, the crank 26, in connection with the rods 24 25, will cause the carriage 20 23 to move forward on the slides 21, and as such forward movement takes place the strip 27 will engage the lower sheet of paper and carry it with the carriage, but as the forward edge of the paper cannot be moved forward, the paper will buckle at the point where it has already been depressed by the projection 9, which will cause it to be caught between the two rollers 14 and 15 and given a fold. These rollers 14 and 15 will carry the sheet downward, passing it into the guide 32 33, at the farther end of which it will abut at its forward portion against the shoulder 35, and its further movement in that direction will of course be stopped. As the rotation of the rollers continues, it will be carried between the rollers 14 and 16, as indicated in Fig. 4, a second fold thus being given to it, and the paper thus twice folded will, as indicated in said Fig. 4, pass between such last-named rollers and be discharged into any suitable receptacle or upon the floor or stand upon which the machine may be secured. As shown, the various parts are so arranged that the two folds given to the sheet of paper are practically equidistant from the center of the sheet, so that the folded paper presents a neat appearance and is adapted for insertion in an ordinary mailing-envelop.

By reason of the adjustability of the upper section of the guide 32 33 the shoulder 35, against which the paper at its first fold abuts, can be moved forward or back as the length of the sheet demands in order to insure proper folding.

By an inspection of Fig. 4 it will be seen that a second sheet is started through the folding-rollers and, in fact, given its first fold before the first sheet has been passed from the machine, the fold of the second sheet following through between the rollers 14 and 15 very closely after the tail end of the first sheet passes therethrough, and thus a large number of sheets can be quickly as well as accurately folded. It is of course essential to proper folding that the position of the sheets be not disturbed except upon the forward movement of the carriage, and in order to prevent the lower sheet of the pile from being engaged by the strip 27 on the carriage as the carriage makes its return movement, we have provided for the cross-bar 23 and its attached strip 27 being allowed to yield, as

indicated in Fig. 3, and thereby prevent such a rubbing action of the strip 27 upon the under sheet of the pile as would cause such under sheet to be displaced or disarranged. Immediately, however, upon the movement of the carriage in a forward direction, the strip 27 of rubber or other suitable material engages the under sheet and carries it forward, as before explained, the cross-bar 23 immediately falling into place, as indicated in Figs. 1 and 4.

In the form of construction shown a box or cover 7 is provided which, as shown, is readily removable from the frame. Such box or cover serves as a guide for the vertical rod attached to the follower 8 and also as a protecting-housing for the upper part of the machine. It is evident that other means may be employed for properly holding the follower 8 down than those shown and that such box or cover may then, if desired, be dispensed with. In either case the machine may be regarded, for the purpose of adjusting a pile of sheets in place, as being open at the top, by which is meant that inasmuch as the sheets are successively fed from the bottom of the pile a clear space above the folding mechanism must be left for the admission or placing of a pile of sheets.

That which we claim as our invention, and desire to secure by Letters Patent, is—

1. In a folding-machine, the combination with a pair of folding-rollers, of a fixed guide to receive a sheet of paper after such paper has been folded by said folding-rollers and a second pair of folding-rollers engaging the sheet as such sheet bends in toward the bite of said second pair of rollers after being stopped in the said guide, said second pair of rollers acting to withdraw the sheet from said guide and impart to the sheet a second fold, substantially as and for the purpose specified.

2. In a folding-machine, the combination with a pair of folding-rollers, of a reciprocating carriage, means for actuating said rollers and carriage, a device carried by said carriage for frictionally engaging the lower sheet of a pile of papers located above said rollers and carriage, and a support for said pile of papers connected to and moving with said carriage, substantially as and for the purpose specified.

3. In a folding-machine open at the top to receive a pile of sheets, the combination with a pair of folding-rollers, of means for supporting a pile of papers over said rollers, and other means for buckling the lower sheet of such pile above the bite of said rollers so as to be caught by the rollers and folded, substantially as and for the purpose specified.

4. In a folding-machine, the combination with a pair of folding-rollers, of means for supporting a pile of papers over said rollers, means for moving the lower sheet of such pile to cause it to buckle downward over the line of contact of said rollers and be folded by said rollers, a guide to receive said folded sheet, and means for withdrawing such sheet from said guide and giving to it an additional fold, substantially as and for the purpose specified.

5. In a folding-machine, the combination with a pair of folding-rollers, of devices for supporting a pile of sheets above said rollers, means for moving the lower sheet of said pile, and a follower resting upon said pile and provided with a projection for depressing said sheets over the line of contact of said rollers, substantially as and for the purpose specified.

6. In a folding-machine, the combination with a pair of folding-rollers, of a reciprocating carriage, means for actuating said rollers and carriage, a strip extending across said carriage and adapted to frictionally engage the lower sheet of a pile of papers located above said rollers and carriage when said carriage is moved toward the rollers, and adapted to be swung out of operative engagement on the return movement of the carriage, and a spring to return said strip to its operative position, substantially as and for the purpose specified.

7. In a folding-machine, the combination with a pair of folding-rollers, of a reciprocating carriage, means for actuating said rollers and carriage, a device carried by said carriage for frictionally engaging the lower sheet of a pile of papers located above said rollers and carriage when said carriage is moved toward the rollers, means for allowing such engaging device to yield on the return movement of the carriage so as not to disarrange or disturb the position of the paper, and a supporting device carried by said carriage on which the pile of papers rests, substantially as and for the purpose specified.

8. In a folding-machine, the combination with a pair of folding-rollers, of means for supporting a pile of sheets or papers over said rollers, said means being arranged to receive the sheets above said rollers, and other means for buckling the lower sheet of such pile above the bite of said rollers so as to be caught by the rollers and folded, substantially as and for the purpose specified.

9. In a folding apparatus open at the top to receive a pile of sheets, the combination of sheet-supporting means, sheet-creasing mechanism arranged below the sheet-supporting means and adapted to receive the sheet to be folded from above, and other means for projecting a buckled portion of the sheet to be folded into the creasing mechanism, substantially as and for the purpose specified.

10. In a folding apparatus open at the top to receive a pile of sheets, the combination of means adapted to support such pile of sheets, sheet-creasing mechanism arranged below the sheet-supporting means and adapted to receive the sheets to be folded from above, and other means for projecting successively a buckled portion of the lowermost sheet of the pile into the creasing mechanism, substantially as and for the purpose specified.

11. In a folding apparatus open at the top to receive a pile of sheets, the combination of

means adapted to support such pile of sheets, sheet-creasing mechanism arranged below the sheet-supporting means and adapted to receive the sheets to be folded from above, a stop at one end of the sheets, and means adapted to engage the lowermost sheet and carry the opposite end forward, thereby buckling said sheet and causing said buckled portion to engage the creasing mechanism, substantially as and for the purpose specified.

12. The combination with sheet-folding mechanism, of means upon which a pile of sheets is adapted to be supported at each end of said pile, other means for affording an intermediate support for the pile, each of said supporting means being arranged to receive the said pile over said folding mechanism, and means for moving the lowermost sheet of said pile to cause it to buckle downward over said folding mechanism and be caught and folded thereby, substantially as and for the purpose specified.

13. The combination with a pair of folding-rollers, of means upon which a pile of sheets is adapted to be supported at each end of said pile, other means for affording an intermediate support for said pile, each of said supporting means being arranged to receive the said pile over said rollers, and means for moving the lower sheet of said pile to cause it to buckle between said rollers and be caught and folded thereby, substantially as and for the purpose specified.

14. The combination with a pair of folding-rollers over which a pile of sheets can be placed, of means for supporting such pile of sheets over said rollers, said rollers constituting a portion of said supporting means, and other means for buckling the lower sheet of said pile above the bite of said rollers so that said buckled portion will be caught and the sheet folded, substantially as and for the purpose specified.

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