

No. 503,907.

Patented Aug. 22, 1893.

Fig. 1.

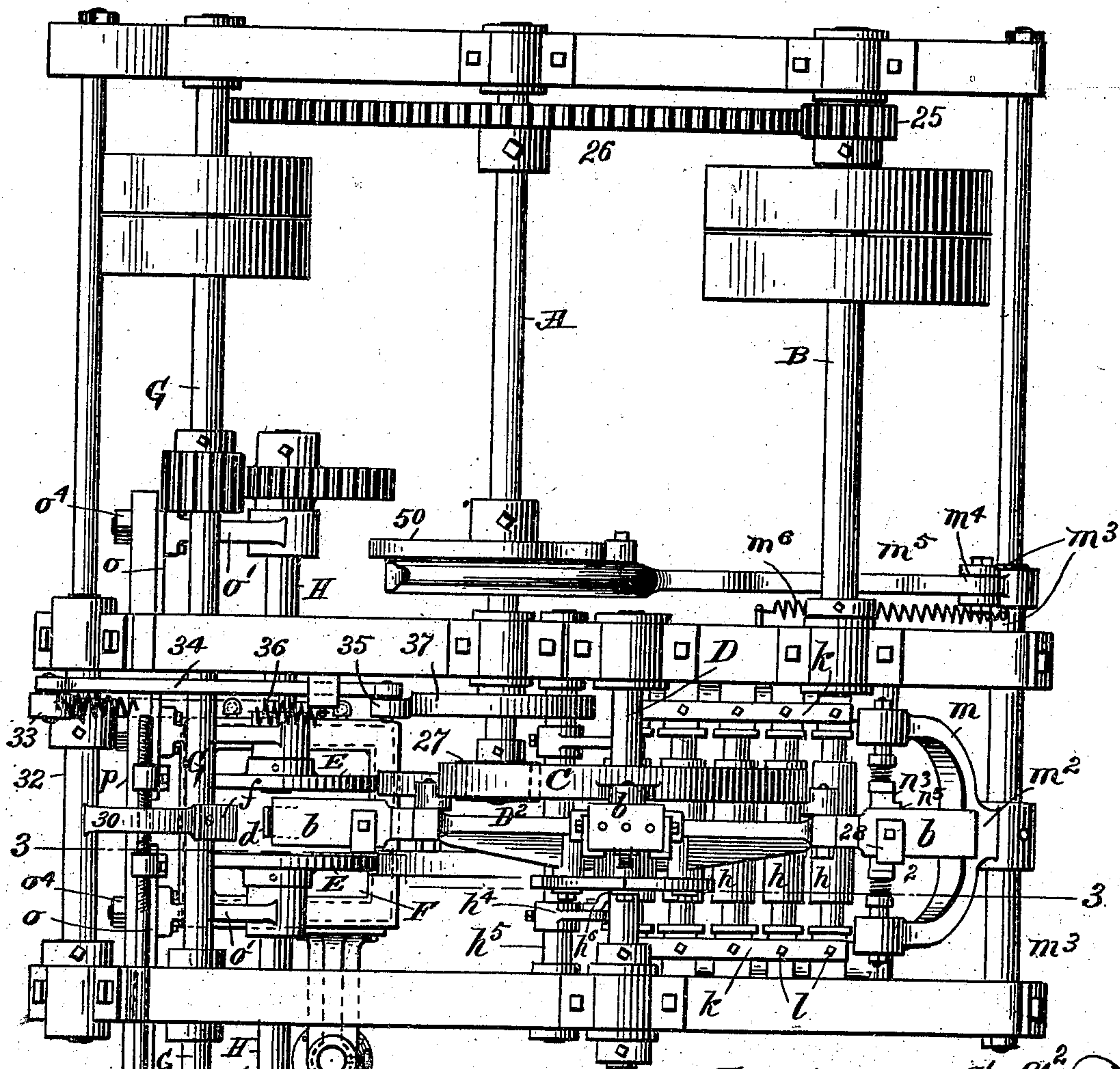
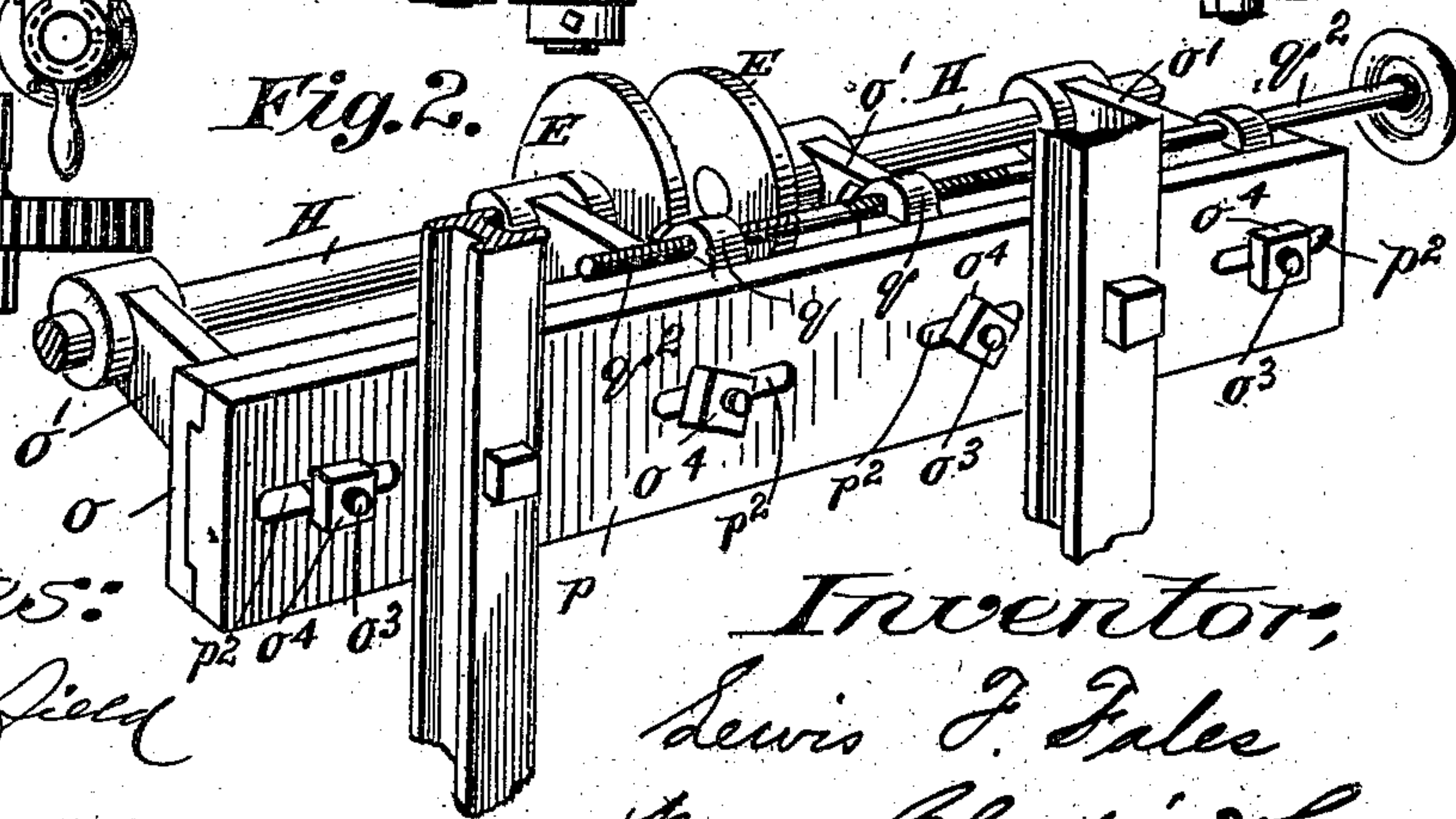


Fig. 2.



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(No Model.)

4 Sheets—Sheet 2.

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PAPER BOX MACHINE.

No. 503,907.

Patented Aug. 22, 1893.

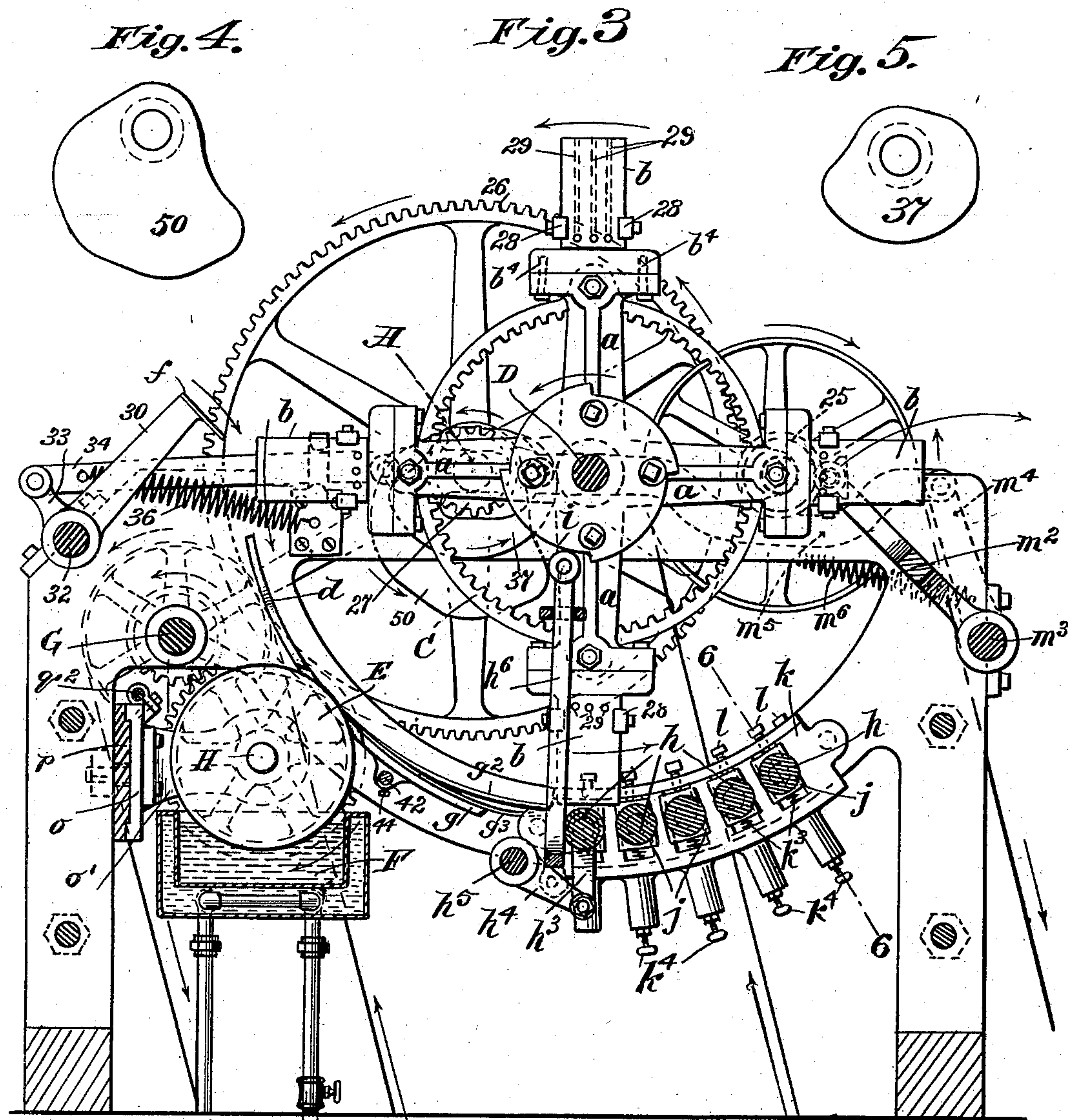


Fig. 4.

Fig. 3.

Fig. 5.

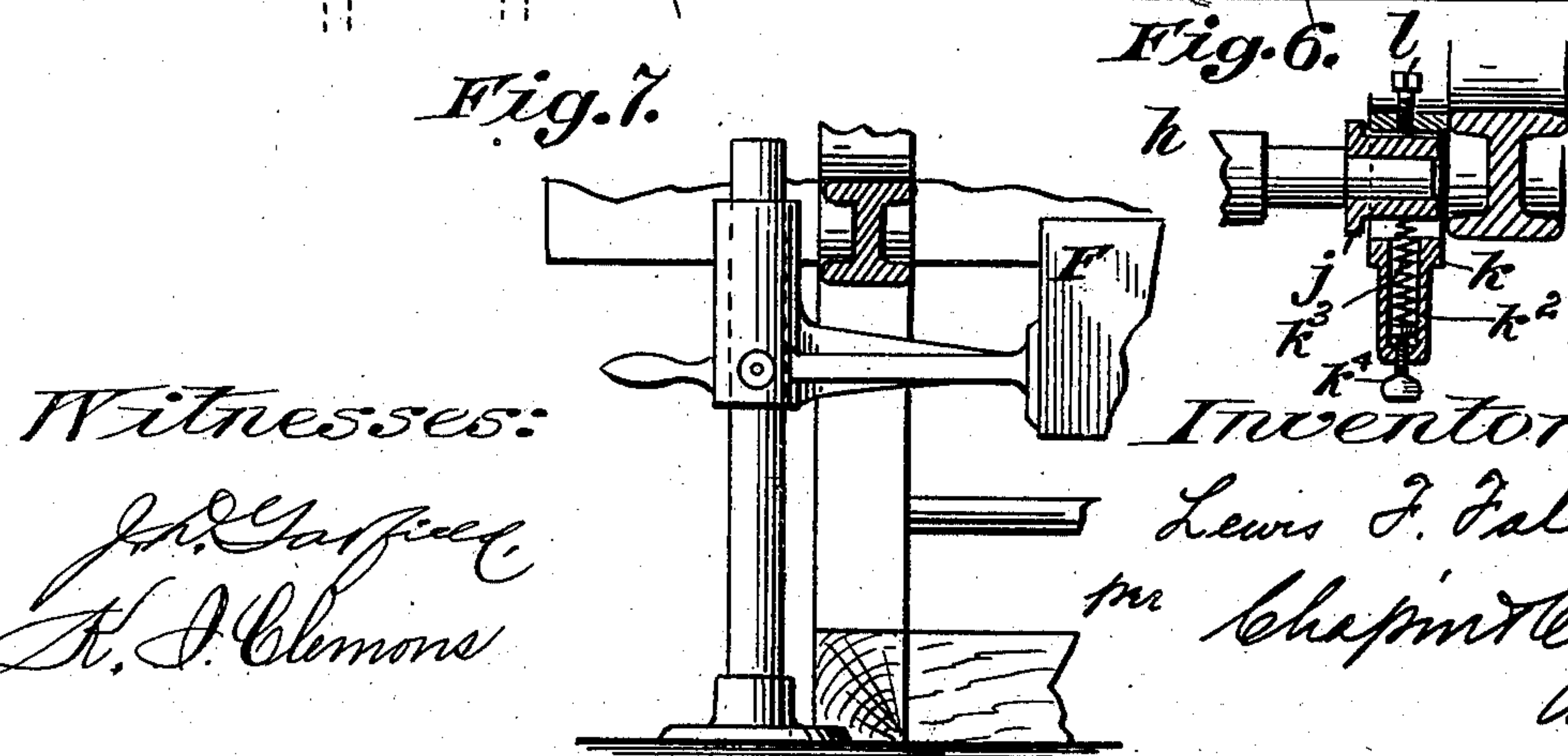


Fig. 7.

Fig. 6.

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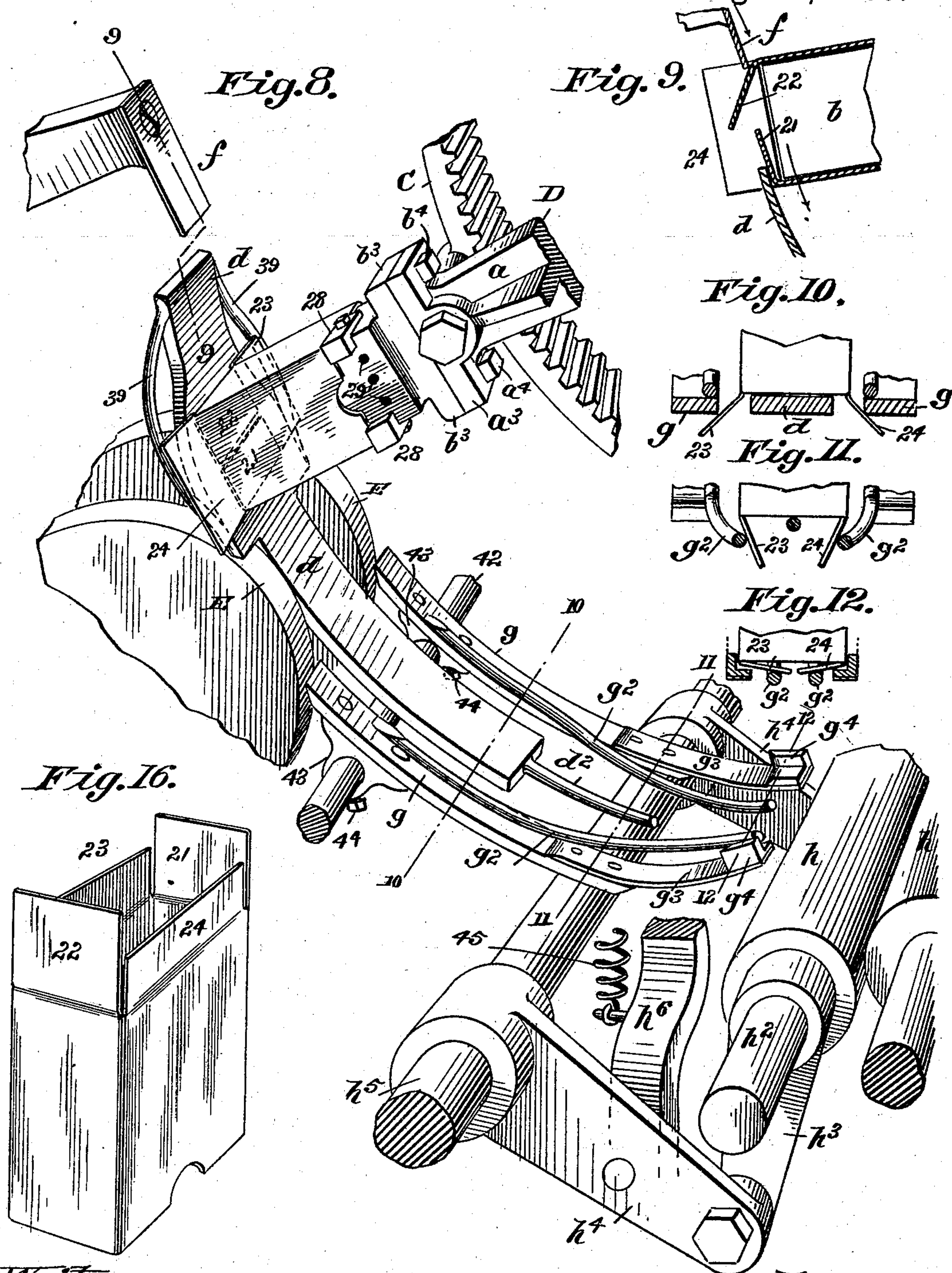
(No Model.)

4 Sheets—Sheet 3.

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PAPER BOX MACHINE.

No. 503,907.

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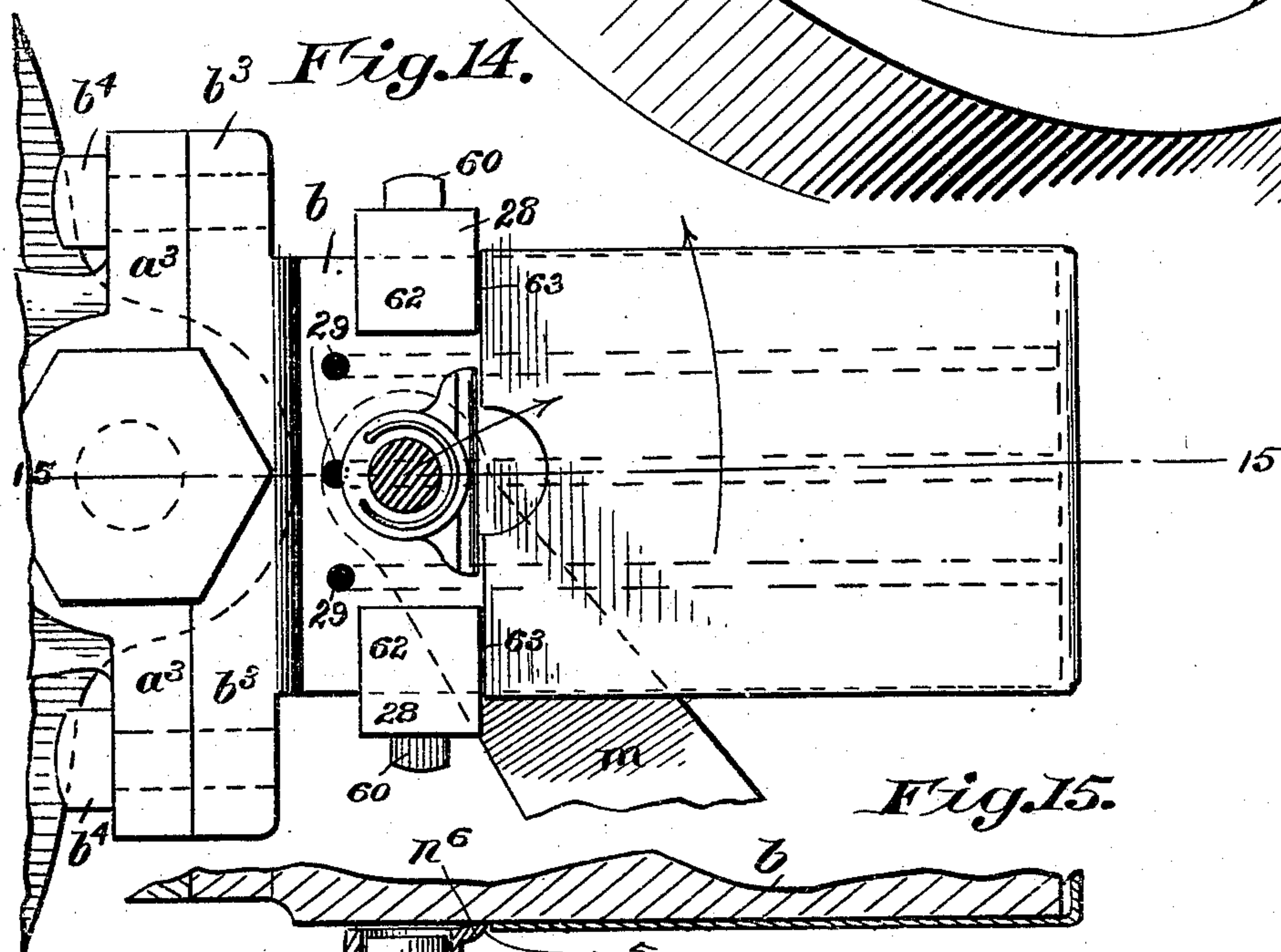
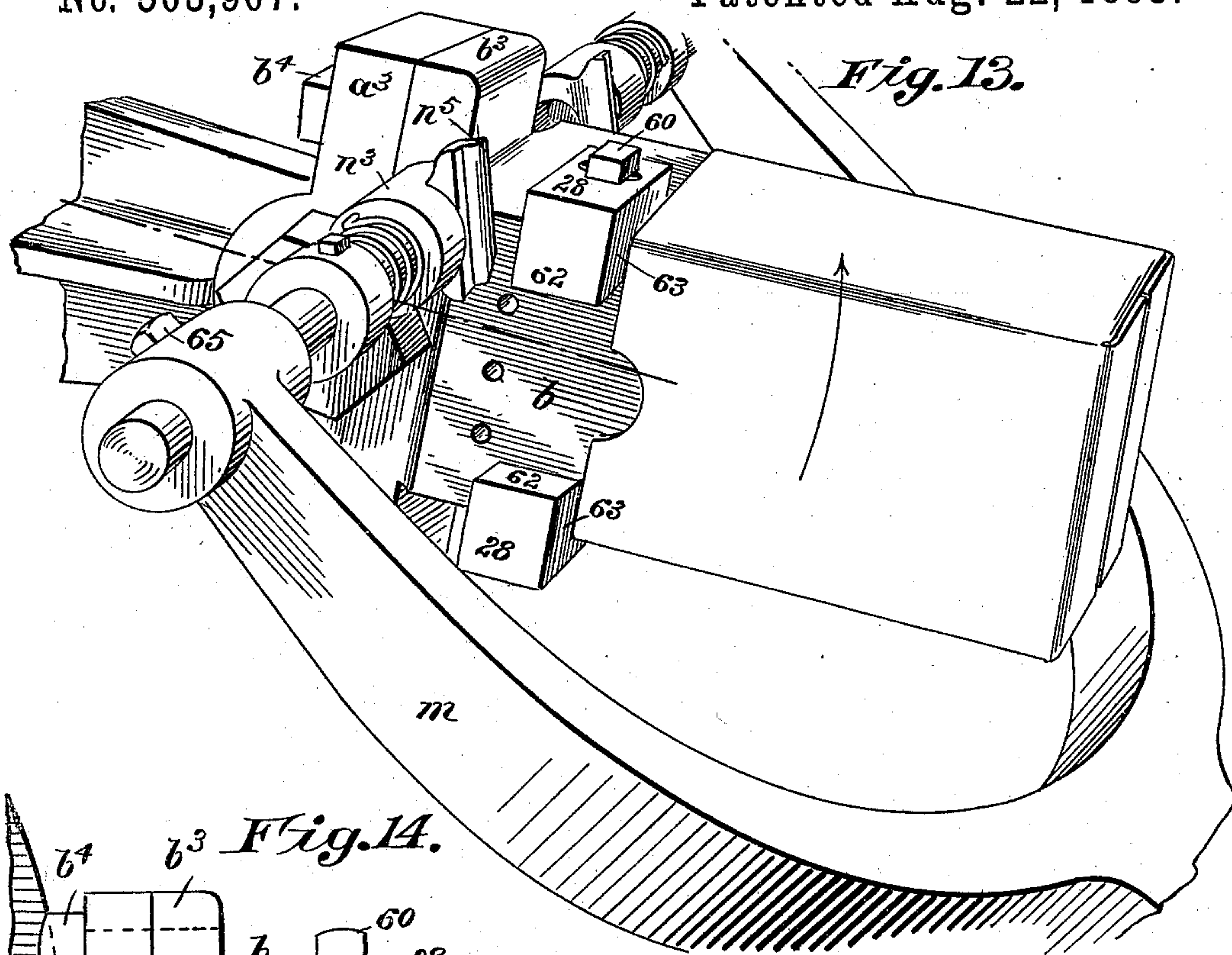
(No Model.)

4 Sheets—Sheet 4.

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UNITED STATES PATENT OFFICE.

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PAPER-BOX MACHINE.

SPECIFICATION forming part of Letters Patent No. 503,907, dated August 22, 1893.

Application filed January 31, 1893. Serial No. 460,370. (No model.)

To all whom it may concern:

Be it known that I, LEWIS F. FALES, a citizen of the United States, residing at Walpole, in the county of Norfolk and State of Massachusetts, have invented new and useful Improvements in Paper-Box Machines, of which the following is a specification.

This invention, for improvements in machines for making paper boxes, more particularly relates to devices for closing and gluing or cementing the flaps which constitute the bottom, or one end wall of the box, the other end thereof, as understood, being left open, as common in a well known form of telescoping box or case.

The purpose of this invention is to devise a machine which will perform the indicated work efficiently and with a satisfactory degree of speed,—and which machine will, furthermore, be readily adjustable and adaptable to the reception of interchangeable parts for operation upon various sizes of boxes.

The invention consists in certain several and various combinations and arrangements of parts, and the constructions of certain of the parts, substantially as will hereinafter appear and be covered in and by the claims.

An embodiment of the invention as at present carried out and practiced is illustrated in the accompanying drawings in which—

Figure 1 is a plan view of the machine. Fig. 2 is a perspective view of the adjustable supports for the glue rollers. Fig. 3 is a sectional elevation of the machine taken on the line 3—3, Fig. 1. Figs. 4 and 5 are side views of cams employed in the machine to which reference will be hereinafter made. Fig. 6 is a sectional view in detail on the line 6—6 of Fig. 3. Fig. 7 is a view substantially in elevation showing an adjustable support for the glue or cement receptacle. Fig. 8 is a perspective view of one of the carriers or formers and the folding and gluing devices, on a larger scale. Fig. 9 is a longitudinal, vertical, sectional view of parts of the folding devices as taken on line 9—9, Fig. 8, said view also showing the position relative thereto of the flaps of the box being folded thereby. Figs. 10, 11, and 12 are vertical sections taken across the folding devices on the lines 10—10, 11—11, and 12—12, respectively of Fig. 8, illustrating the different stages in the folding operation.

Fig. 13 is a perspective view on the larger scale showing devices for automatically withdrawing the box from the carrier,—the bottom flaps of which box have been folded and stuck. Fig. 14 is a side elevation of these last named devices, they, however, being understood as having come into different relative positions, as will be hereinafter explained. For clearness of illustration the front one of the pair of arms which carries the stripping, or box withdrawing device is understood as removed, the supporting stud for the stripper being shown as in vertical section taken just inside of the front carrying arm. Fig. 15 is a partial sectional view, as taken horizontally on the line 15—15, Fig. 14. Fig. 16 is a perspective view of one of the "blanks" or partially formed boxes,—with the unfolded and unsecured flaps.

Similar characters of reference indicate corresponding parts in all of the views.

The form of box-blanks such as is operated upon by this machine and as shown in said Fig. 16, has four flaps which, when folded and stuck, constitute the bottom of the box. The machine operates to fold the one side flap, 21, inwardly, then the other, 22, upon it, and then the other pair of flaps 23, 24, receive a layer of glue or cement and are folded inwardly, the one toward the other, and both upon the first pair of folded flaps. The folded and glued flaps are then acted upon for the purpose of squaring the box at the corners, and pressure is then applied to fix and retain the relations of the stuck flaps after which the box is automatically discharged from the machine.

I will now proceed to describe the machine in detail and, referring to the drawings A will be regarded as the main-shaft although B is the driving shaft, the latter receiving its rotation through belt and pulley and has a pinion-gear, 25, thereon which meshes into the larger spur-gear 26, of the main shaft. The shaft, B, rotates several times to one rotation of shaft, A.

C represents an internal gear which is mounted on suitable supports for rotation about a fixed axis this gear receiving its comparatively slow rotation by the mesh which the pinion-gear, 27, of the main shaft A, has therewith. It will be noticed that upon a shaft, D, a frame D² is mounted for rotation

which comprises several, here four, radial arms *a* in the form of a cross and the internal gear C, is clamped to this cross-shaped frame. This is a practical and preferred manner of mounting the internal gear for its rotational movement but limitation is not to be made to this specific mode. Each of the radial arms, *a*, has as a longitudinal radial continuation thereof a carrier and former, *b*, of a rectangular form and size corresponding to the size of the boxes, the bottom flaps of which are to be operated upon.

28 28 represent adjustable gages upon the carriers, *b*, which are to be set so that the tubular blanks may be placed with a sliding fit thereon so far as to bring the outer end of the carrier coincident with the folding lines of the flaps.

It will be noticed that one or more ducts, 29, are formed through the carriers, *b*, they extending from the outer end longitudinally and then transversely, terminating inwardly beyond the portion of the carrier which is inclosed by the paper blank. These are to prevent the establishment of a vacuum within the box after its bottom has been closed upon the carrier and former which might interfere with the easy discharge of the box.

Now it is understood that the attendant, standing, as the machine is here represented at the right thereof, places the blank upon the adjacent carrier, *b*, with the flaps in their natural longitudinal, or radial extension,—and the blank is carried through a part of a revolution to the folding devices at the left which will be now described reference being directed to Figs. 1, 3, 8 and 9 to 12.

d represents a plate which is arranged adjacent the path of the outer end of each of the carriers, *b*, and this plate extends about parallel and in proximity to said path downwardly and to the right as more clearly indicated in Fig. 3. Now the forward flap, 21, in being brought against the upper edge of the folding plate, *d*, is turned thereby toward the end of the carrier, as plainly indicated in Fig. 9. About concurrent with this action the folding blade, *f*, has a quick downward and forward movement to overtake the retreating carrier, and striking against the flap, 22, also folds it inwardly. This folder, *f*, is mounted upon an arm, 30, which has a rocking movement upon the shaft, 32. This rock-shaft, 32, has a crank-arm, 33, to which is connected one end of a thrust-rod, 34. This thrust-rod has its other end, which is provided with the stud and roller, as seen at 35, maintained by the spring, 36, against the cam, 37, which is on the main shaft, A. The blade, *f*, will be reciprocated in proper time each time that a carrier with a blank thereon is brought to the folding plate, *d*, the main shaft and cam rotating four times to one of the internal gear. The next operation of the machine is to turn the other pair of flaps, 23 and 24, outwardly, as seen in Fig. 8. It will be perceived that the upper extremity of the folding plate, *d*

is approximately the width of, but no wider than, the width of the box between flaps 23 and 24, and this upper portion has the downwardly and forwardly divergent parts 39, 39, formed thereon or attached thereto. In this illustration, Fig. 8, they are shown as in the form of bowed wires but this is only an immaterial structural detail. It will be apparent by reason of the form and position of these divergent parts, 39, 39, relative to the path of the flaps, 23 and 24, that the flaps will, soon after having passed the upper end of the plate, *d*, be laid out more or less nearly in outward right angular extension from the sides of the body of the blank and so that they may next run upon the peripheries of the rollers, E E, which turn in the receptacle F, for the cement, gum, or other adhesive employed. The next operation of the machine is to turn the outwardly extended and now glue-covered side flaps inwardly to lie upon the already intumed flaps, 21 and 22 and this is accomplished by the carrying of the flaps under the strips at each side of the course of movement of the extremity of the carrier all so that the flaps are gradually drawn toward each other and finally come adjacent the first folded flaps in the manner indicated and as will be clearly understood without extended description on reference to Figs. 10, 11 and 12. Each of these strips indicated at *g*, *g*, is of itself formed with or has a supplemental part as *g*², which is inwardly deflected or inclined, the extremities of these parts, as seen in Figs. 8 and 12, standing quite closely together and they are also brought into closer proximity to the path of the end of the carrier than are the more rearward portions of the said parts, *g* *g*. The downwardly and forwardly extended portion of the plate, *d*, (regarding the right hand portion of the machine as the front) serves to hold the first folded flap from unduly springing outwardly away from the end of the carrier during the time the out-turned flaps are being gummed and then being in-turned. This plate has the narrowed forward extension, *d*², so that the space between this portion and the convergent members, *g*², *g*², may be ample to permit the inward turning of the flaps; and this narrowed extension terminates somewhat to the rear of the ends of the parts *g* and *g*², so as to constitute no impediment to the final closing together of all of the flaps as occurs by the sliding impingement which the said glued flaps have with the forward extremities of the convergent members, *g*², *g*², just previous to the passage of the carrier and box thereon to the pressure rolls which are indicated in plurality at *h*. It will be furthermore perceived that the strips or plates, *g*, *g*, have their forward extremities extended substantially in parallelism these extensions being constituted by spring members, *g*³, *g*³, of steel or other suitable metal, with the opposing angular lugs, *g*⁴, having a separation corresponding to the width of the box. These tend to "square-up"

the bottom corners of the box, serving as guides and as angular pressure fingers thereupon. The parts, d, g, g^2 , with the described supplemental or conjunctive devices all receive support from the horizontal transverse brace-rod, 42. By adjustment, transversely, of the strips, g, g , and auxiliary members carried thereby, these devices may become adaptable to different sized boxes. These parts may be adjustable by reason of the lugs, 43, which are formed on or secured to the strips, g, g , having sliding engagements with the aforesaid support-rod, 42, and the set screws, 44, for holding them in adjustment.

The series of pressure rolls, h, h , are arranged axially parallel in proximity the one to another and all to the circular path of the end of the carrier upon which is the folded end of the box. The first of these rollers, just as the carrier comes thereover, is given a slight upward impulse through the means to be now described.

The gudgeons h^2 of the first roller, are constrained in suitable guides therefor at each end thereof, for the upward movement and to the gudgeons are engaged the upper portions of depending bars or links, h^3 . Connected to these bars, h^3 , is another link, h^4 , its other end being connected pivotally with the transverse bar or shaft, h^5 , which is supported between side members of the framing. It will be apparent that these parts, h^4, h^3 , amount substantially to a toggle and the actuating means therefor consist in a quite powerful and active spring, 45, applied so as to upwardly force the first roll, h , and the toggles with considerable power, and the cam-operated thrust-rod, h^6 , for maintaining a pressure-roll for the greater portion of the time in its lowered position. The said thrust-rod, h^6 , has its lower end pivoted to the link-member, h^4 , and carries at its upper end a friction roller against which the cam, i , has its forcing bearing. This one here employed is a multiple cam, that is to say it has four cam surfaces corresponding to the four carriers embodied in the machine as here shown. Each cam is so timed that as the end of the carrier comes over the first roll edge the most prominent cam portion passes the friction roller of the first rod permitting the latter to rise under the reaction of the aforesaid spring to impart the hard and initial squeeze to the folded and gummed bottom flaps. The succeeding rollers of the series have less pressure their purpose being to merely exercise such contact upon the now stuck flaps as to prevent their opening up before the cement or gum has become sufficiently set. Each of the last four rollers in the series, here shown, has its gudgeons or journals extended into the externally squared boxes, j , which are fitted for approximately vertical movements in the apertured support, k , therefor. This apertured support under the boxes has respectively therefor sockets, as seen at k^2 , within which are the springs, k^3 , which are set for upward reaction against

the boxes, j . The degree of compression of the spring may be varied by turning in or out the screws, k^4 . The extent of upward movement of the rolls may be regulated by the adjustable stop screws, l , so that the normal position of the upper portions of the roller peripheries may be properly relative to the path of the ends of the carriers, b , as most efficient for the performance of the work to be performed by the machine. The box is next withdrawn from its carrier block by means which will be now described, reference being had to Figs. 1, 3, 13, 14, and 15.

m represents a yoke or stirrup-formed part carried at the rearwardly and upwardly extended extremity of a lever, m^2 , which is mounted upon the rock-shaft, m^3 . The rocking motion is imparted to this shaft in one direction through the connection with the radial arm, m^4 , thereof, of the forward end of a thrust-rod, m^5 , the rear extremity of which has a roller engagement with the cam, 50, on the main shaft A and which cam is clearly shown in side view in Fig. 4. The rocking movement is imparted in the other direction by the spring, m^6 , applied for a rearward reaction relative to the rock-shaft arm, m^4 , by having one end connected thereto and its other end connected to a fixture of the machine. The upwardly and rearwardly extended arms of this yoke, m , stand opposite each other at each side of the plane of travel of the carriers, b, b, b, b and each has fixed to its extremity a transversely and inwardly extended stud or bar, n , with its inner end headed, as indicated, at n^2 , in Fig. 15. A cylindrical part, n^3 , is fitted upon the extremity of the stud, n , the same being bored with axial openings of two diameters whereby a suitable chamber for the enlargement, n^2 , is provided and an aperture for the passage of the portion of the bar next thereto; the junction of the bores of different diameters also constitutes an internal seat or shoulder, n^4 , for limiting, by its engagement with the stud enlargement, n^2 , the axial movement of the said part, n^3 . This part has, at its inner end, a lip, n^5 , which has a straight edge, as indicated in Figs. 13 and 14 and which is extended slightly beyond the end of the part, n^3 , and which also rearwardly is beveled, as seen at n^6 . The parts, n^3 , which may, with propriety, be termed fingers are normally inwardly pressed by the spring, n' , to the extent permitted by the enlargement or stop, n^2 . Now as the carrier is moving forwardly and upwardly after the sticking and roll-pressing of the flaps of the box-blank, the yoke, m , is rearwardly and downwardly moved and in meeting the carriers the fingers, n^3 , are, by reason of said bevel formation, n^6 , caused to so recede on their studs, n , as to allow the contact lips, n^5 , to come against the opposite faces of the carrier. Now, while the carrier continues its forward movement the fingers will have come to the position relative to the opposite sides of the carrier indicated in Fig.

14, and at or about this instant the cam, 50, causes such a forward movement of the yoke as to move the fingers exactly, or approximately, in the median longitudinal line of the carrier. There is to this end, of course, the compound of the revoluble movement of the carrier and of the swinging movement of the yoke, but the effect for the withdrawal of the box is the same as if the carrier remained stationary and the fingers moved in straight lines longitudinally against the opposite sides thereof.

The glue rollers, E, E, are driven, primarily, through means of the rotation of the shaft, G. As shown, each roller is mounted on a short counter-shaft, H, which is geared to the shaft, G, and which counter-shafts have suitable bearing supports which are carried by the bracket arms, o' , o' , of separate boards or bars, o , o , which have tongue-and-groove engagements with a fixed bar or part, p , of the frame. This fixed, supporting bar, p , has the slots, p^2 , p^2 , and the bar, o , has the screw-spindle o^3 rigidly secured thereto which passes through the slots, beyond the outer face of the slotted bar receiving the set nuts, o^4 , thereon. Each of the movable bars, o , o , has a lug, q , and these lugs have screw-tapped aligned apertures in and through which engages the right and left screw-threaded rod, q^2 , with hand-wheel thereon for convenience of securing its rotation. By loosening the nuts and turning the screw-rod, the rolls will be brought to the proper adjustable separation to conform to the work desired to be performed by the machine.

The receptacle, F, for containing the glue or cement is surrounded by a steam jacket with which are connected steam ingress and egress pipes. No novelty is, however, claimed to exist in this apparatus for maintaining the adhesive at the desired high temperature.

To adapt the machine for operation on tubular blanks for boxes of a given cross sectional size but of varying lengths, the set screws, 60, for the slotted, adjustable gages, 28, are loosened and the gages moved endwise of the former and carrier, b . These gages, by being in the form of angle-lugs, each with its slot, 61, arranged parallel with the inner face of the offset member, 62, may be readily slid along the corners of the rectangular carrier with the abutment faces, 63, of the gages, always parallel with the end of the carrier.

The carriers, b , b , are removable to be replaced on the arms, a , of the frame, D^2 , by carriers having greater or smaller cross sectional dimensions for the purpose of rendering the machine adaptable for operation on tubular blanks for boxes of varying transverse dimensions. Each of said arms, a , therefore, as seen in Figs. 3, 8, 13 and 14, has its extremity widened, as at a^3 , and the carrier, b , has a widened base, b^3 . The bolts or set screws, b^4 , pass through these extended parts, a^3 , b^3 , and hold them so long as desired, as one.

The ejector fingers, n^3 , n^3 , may be made to

conform to the different sized carriers for blanks by loosening the set screws, 65, and moving the studs, n , transversely through the hubs on the ends of the arms of the yoke, m ,—resetting the screws.

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

1. In a paper box machine, the combination with a continuously revoluble carrier upon which a tubular box blank may be placed with opposite flaps thereof extended endwise, of a stationary plate closely past which the end of the carrier has its travel and against the edge of which the forward flap may be brought to be thereby folded toward the end of the carrier and a folding blade mounted independently of the carrier adjacent the course of the end thereof and adapted periodically to follow and overtake the carrier to force the rear extended flap toward the carrier end, and means for imparting to said blade its accelerated movement, substantially as set forth.

2. In a paper box machine, the combination with a continuous revoluble carrier on which a tubular blank may be placed with a flap thereof extended beyond the carrier end, of an arm mounted for a swinging movement, independently of the carrier with a folding blade, and operating after the carrier has passed the blade to follow and overtake the carrier to force the extended flap toward the carrier end, and means for imparting to said arm and blade their accelerated movement and then a retracting movement, substantially as set forth.

3. In a paper box machine, the combination with a movable carrier upon which a tubular blank may be placed with a flap thereof extended beyond the carrier-end, of a part past which the end of the carrier has its course of movement and which has an outward or lateral inclination, and a glue-roll at one side of the path of the carrier and beyond the said laterally inclined device, substantially as and for the purpose set forth.

4. In a paper box machine, the combination with a movable carrier upon which a tubular blank may be placed and laterally beyond the end of which a flap thereof may be extended, of a glue-roll at one side of the path of the carrier and against the periphery of which the said laterally extended flap may have a contact for receiving a layer of adhesive substance, substantially as described.

5. In a paper box machine, the combination with a movable carrier upon which a tubular blank may be placed and laterally beyond the end of which a flap thereof may be extended, of a glue-roll at one side of the path of the carrier and against the periphery of which the said laterally extended flap may have a contact for receiving an adhesive layer and devices arranged farther along the path of the carrier for inwardly folding the flap toward the end of the carrier.

6. In a paper box machine, the combination with a movable carrier upon which a tubular blank may be placed and laterally beyond the end of which a flap thereof may be extended, of a glue-roll at one side of the path of the carrier and against the periphery of which the said laterally extended flap may have a contact for receiving an adhesive layer and devices arranged farther along the path of the carrier for inwardly folding the flap toward the end of the carrier and a suitable movable body located still farther along relative to the course of travel of the carrier for having an impact to forcibly press the glued flap toward the end of the carrier, substantially as described.

7. In a paper box machine, the combination with a revoluble carrier for tubular blanks, of a separated pair of glue-rolls, *E E*, arranged with their peripheries adjacent but to one side of the course of movement of the end of the carrier, the curved plate, *d*, having its surface arranged adjacent the circular path of the carrier and having at a portion behind the rolls the sidewise inclined surfaces, *39*, *39*, and the strips, *g g*, having ends thereof adjacent the periphery of the glue-rolls, and extended at either side of, and in proximity to, said circular path forwardly beyond said rollers, substantially as and for the purposes set forth.

8. In a paper box machine, the combination with the movable carrier for a box-blank, of strips, *g g*, arranged adjacent the course of movement of the carrier-end and provided at the extremities thereof with angular lugs, as *g⁴*, *g⁴*, which have a degree of separation corresponding to the width of the box.

9. In a paper box machine, the combination with the movable carrier for a box blank, of strips, *g g*, arranged adjacent the course of movement of the carrier-end and having extremities thereof spring-formed for a yielding reaction toward the end of the passing carrier and having the opposing angular lugs, *g⁴*, separated by a distance corresponding to the width of the box, substantially as described.

10. In a paper box machine, the combination with a movable carrier for the blank, of the strips, *g g*, arranged adjacent the course of movement of the carrier-end and having the opposing angular lugs, and a support on which said strips, *g g*, are adjustably supported whereby their separation may be changed, as desired, for the purpose set forth.

11. In a paper box machine, the combination with a movable carrier, the plate, *d*, adjacent the course of its movement, the opposing gum-rollers, *E E*, the oppositely arranged strips, *g g*, with the forwardly converging members, *g²*, *g²*, substantially as set forth.

12. In a paper box machine, the combination with the revoluble carrier, the curved plate, supported adjacent the path thereof, having at the rear portion thereof the forwardly diverging surfaces, *39*, *39*, the sepa-

rated glue-rolls, *E E*, the folder-blade, *f*, having a movement, as described, the separated strips, *g g*, forwardly extended in advance of the glue-rolls and having the converging portions, *g²*, *g²*, substantially as and for the purposes set forth.

13. In a paper box machine, the combination with a movable blank carrier, opposing rolls, *E E*, and supports on which they are adjusted for a variable degree of separation, as desired, and the strips, *g g*, also adjustably supported and having the converging portions or members, substantially as and for the purpose set forth.

14. In a paper box machine, the combination with a receptacle for an adhesive, of two bars arranged endwise relative to each other and having the screw-spindles, a slotted support on which said bars may slide and through the slots of which said spindles may be extended, and the set nuts therefor, and the arms, *o o'*, in which are journaled the carrying-shafts for the glue-rolls, substantially as described.

15. In a paper box machine, the combination with a receptacle for an adhesive, of two bars arranged endwise relative to each other and having the screw-spindles, a slotted support on which said bars may slide and through the slots of which said spindles may be extended, and the set nuts therefor, and the arms, *o o'*, in which are journaled the carrying-shafts for the glue-rolls and the ear-lugs on said movable bars, and the right and left screw-spindle engaged therewith and means for turning the spindle, substantially as described.

16. In a paper box machine, the combination with a rotatable support on which are a series of carriers for tubular blanks, and a cam having successive forcing surfaces corresponding in number to the carriers, a pressure-roll and a medium of connection between it and the said cam whereby the roll will be moved against a carrier each time one thereof comes adjacent the roll, for the purpose set forth.

17. In a paper box machine, the combination with a rotatable support having a series of radially extended blank carriers and a cam having a series of forcing surfaces corresponding in number to the carriers, a pressure-roll suitably guided and having toggles connected thereto, a thrust-rod in operative relation to the aforesaid cam and connected to the toggle and a retracting spring, substantially as described.

18. In a paper box machine, the combination with a rotatable support having a series of radially extended blank carriers, of a series of rollers movably mounted, and arranged adjacent the path of the ends of the carriers, and having springs whereby they are normally forced to present their peripheries slightly across and beyond said path, substantially as and for the purpose set forth.

19. In a paper box machine, the combina-

tion with a rotatable support having a series of radially extended blank carriers, of a series of rollers movably mounted and arranged adjacent the path traversed by the ends of the carriers and having springs whereby they are normally forced to present their peripheries slightly across and beyond said path and the initial one of said series of rollers having its spring of increased power, and means for forcing the roll against the spring away from said path and periodically permitting it to be subject to the reaction of its said spring, substantially as and for the purpose set forth.

20. In a paper box machine, the combination with a movable support having one or more extensions to constitute blank-carriers, of a series of rolls, the apertured frame, k , having the sockets, k^2 , the springs in the sock-

ets and the journal-boxes for the rolls movable in said apertures toward and away from the path of movement of the carrier, substantially as described.

21. In a paper box machine, the combination with one or more movable carriers of an opposing pair of apertured supports, as k , having the sockets, k^2 , the springs, k^3 , therein, and the compression regulating screws, k^4 , the journal boxes, and the rollers, h , mounted therein, and the screws, l , to constitute adjustable stops, substantially as described and shown.

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Witnesses:

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