

No. 776,427.

PATENTED NOV. 29, 1904.

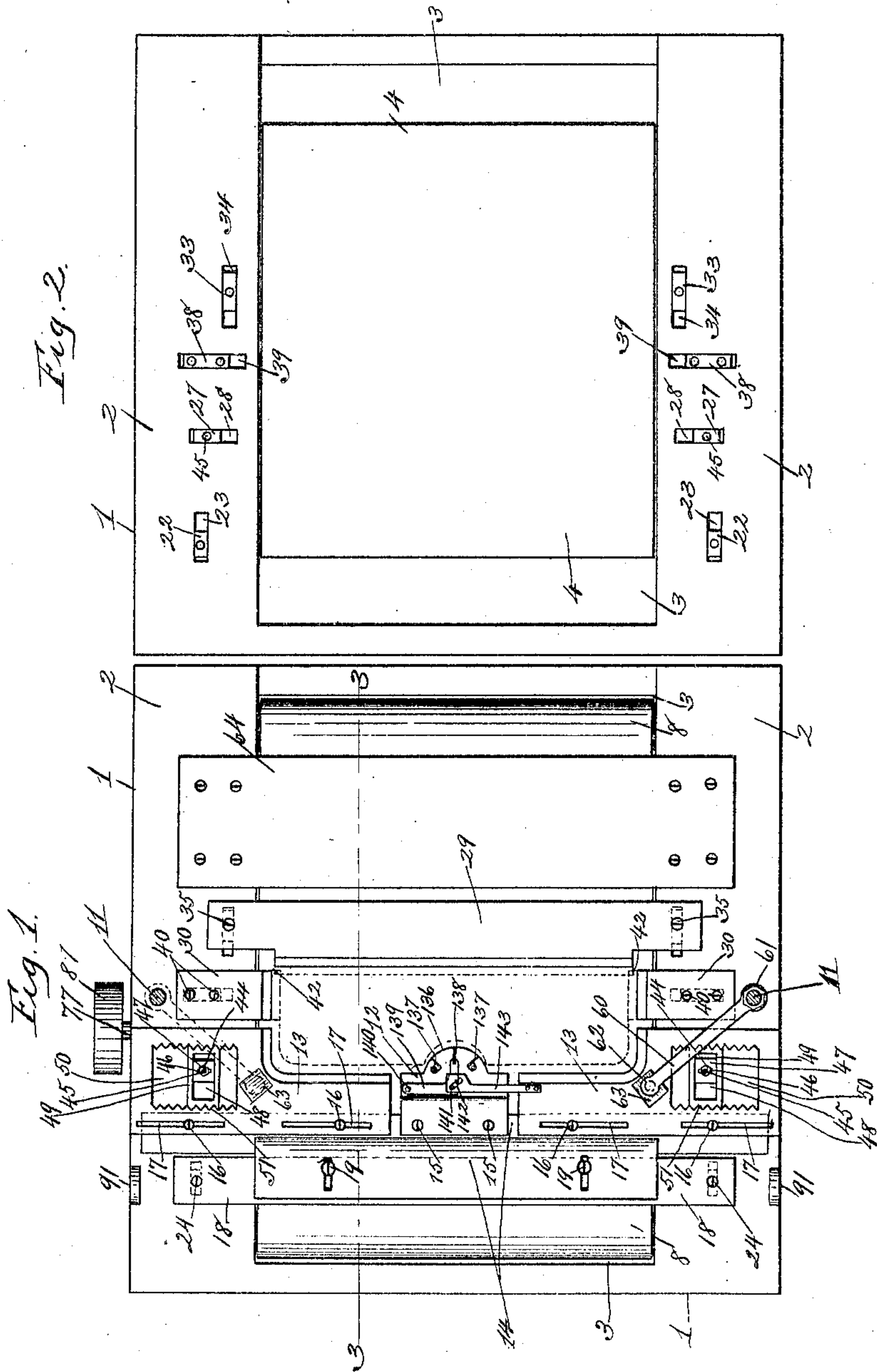
T. D. ROBINSON & R. D. VIELE.

FOLDING MACHINE.

APPLICATION FILED JULY 3, 1902.

NO MODEL.

4 SHEETS—SHEET 1.



Witnesses:
 C. B. Smalley.
 E. M. O'Reilly.

Inventors:
 Theodore D. Robinson
 Ransom D. Viele
 By Mosher & Curtis
 attys.

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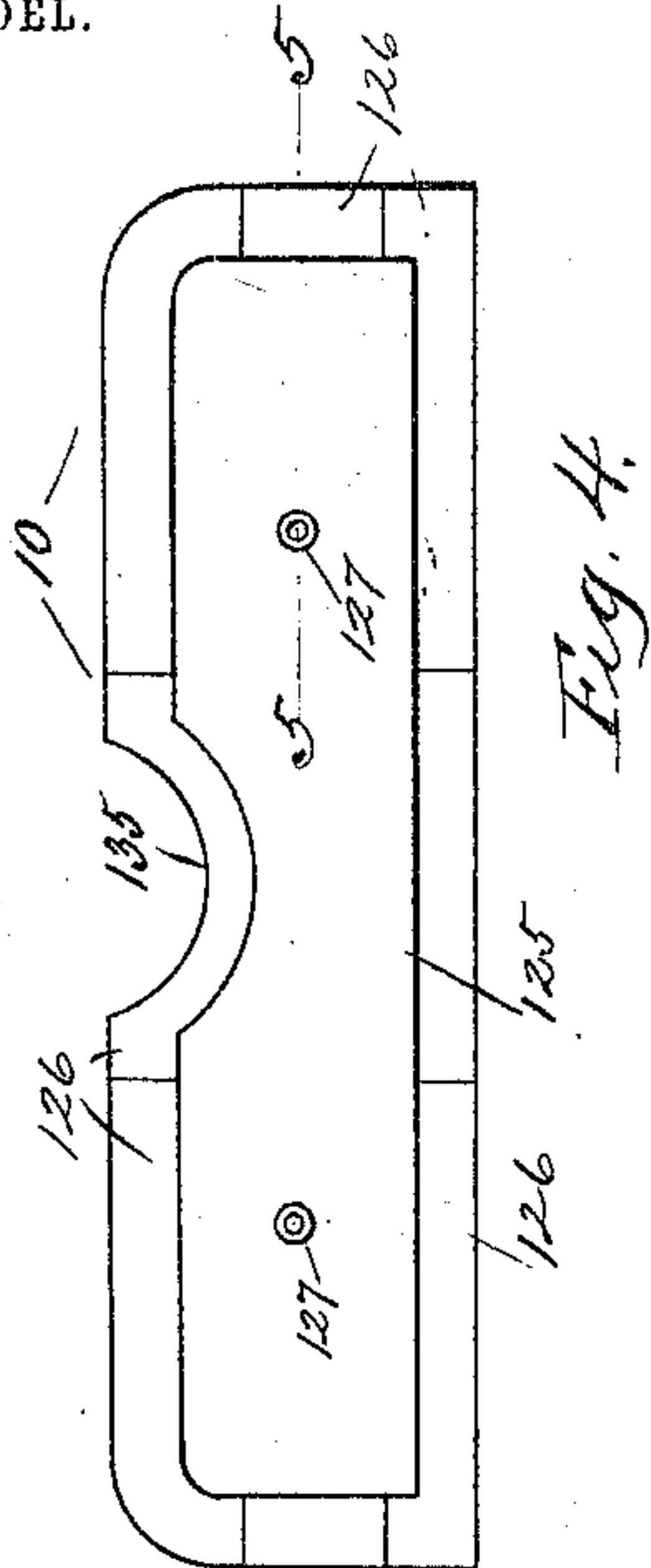


Fig. 4.

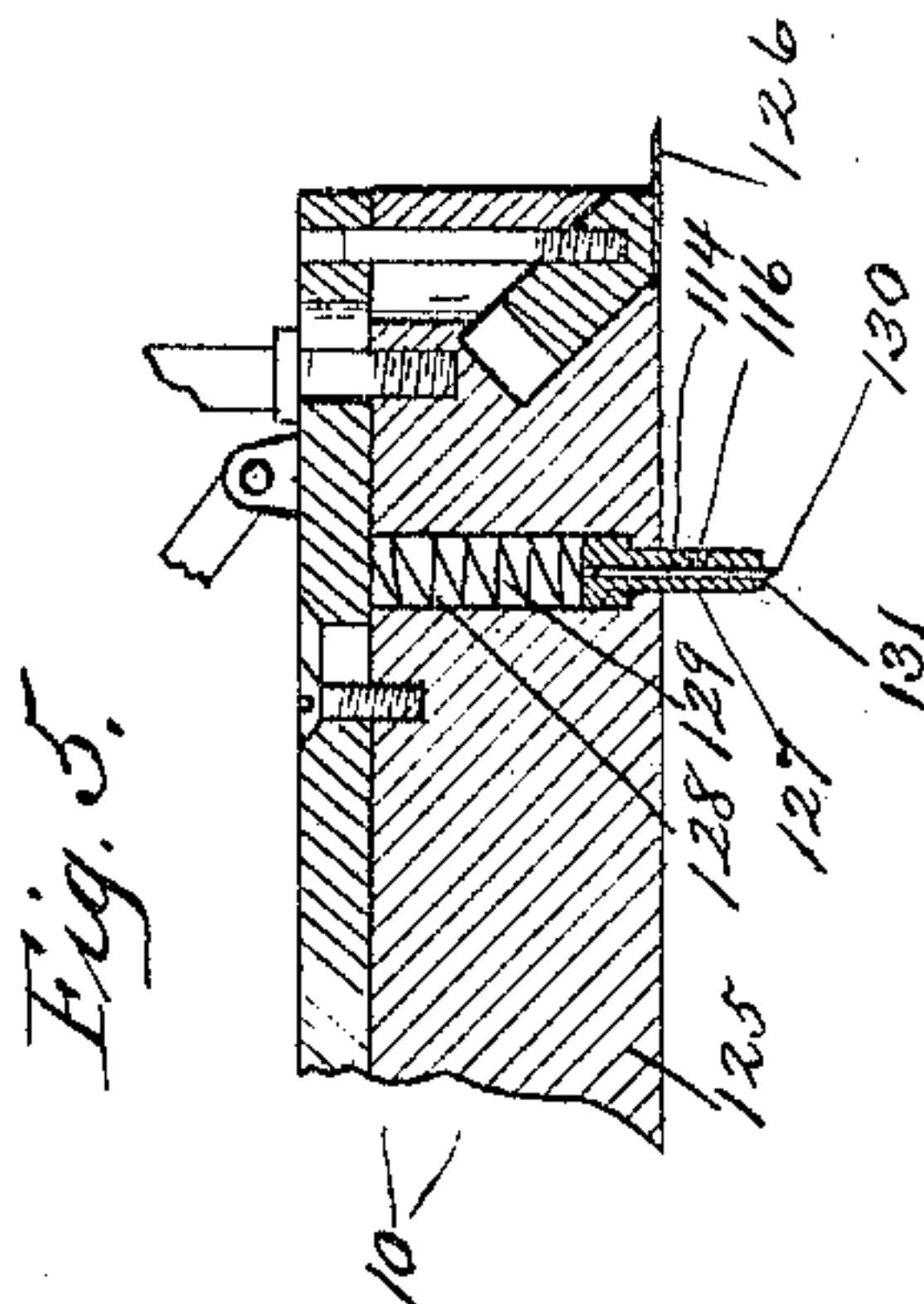


Fig. 5.

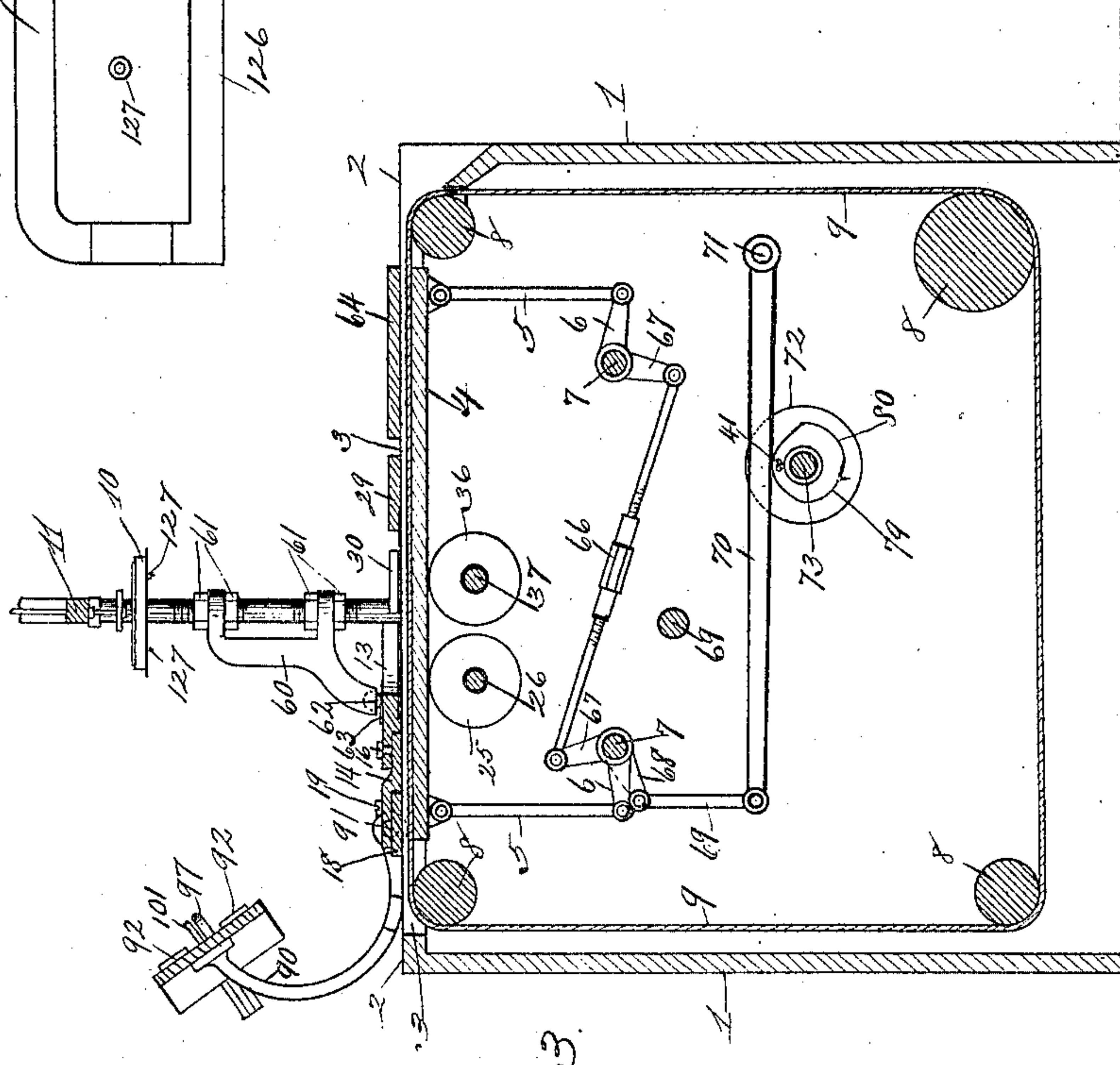


Fig. 3.

Witnesses:
C. B. Smalley.
E. M. O'Reilly.

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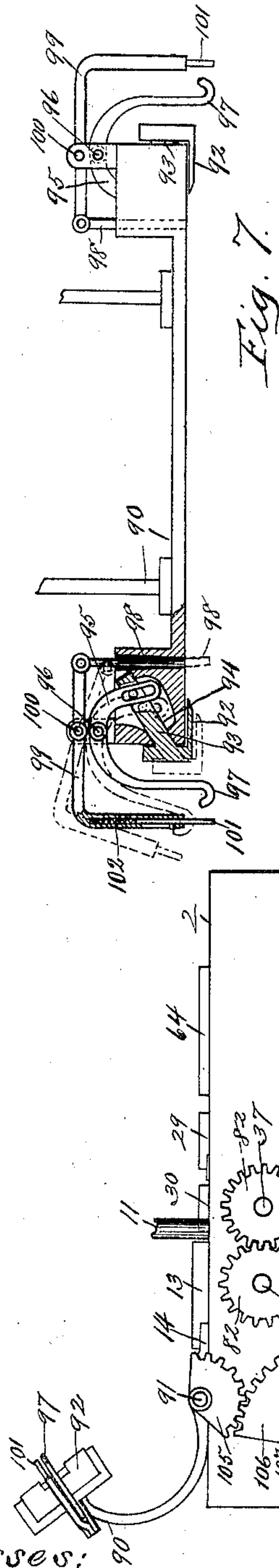
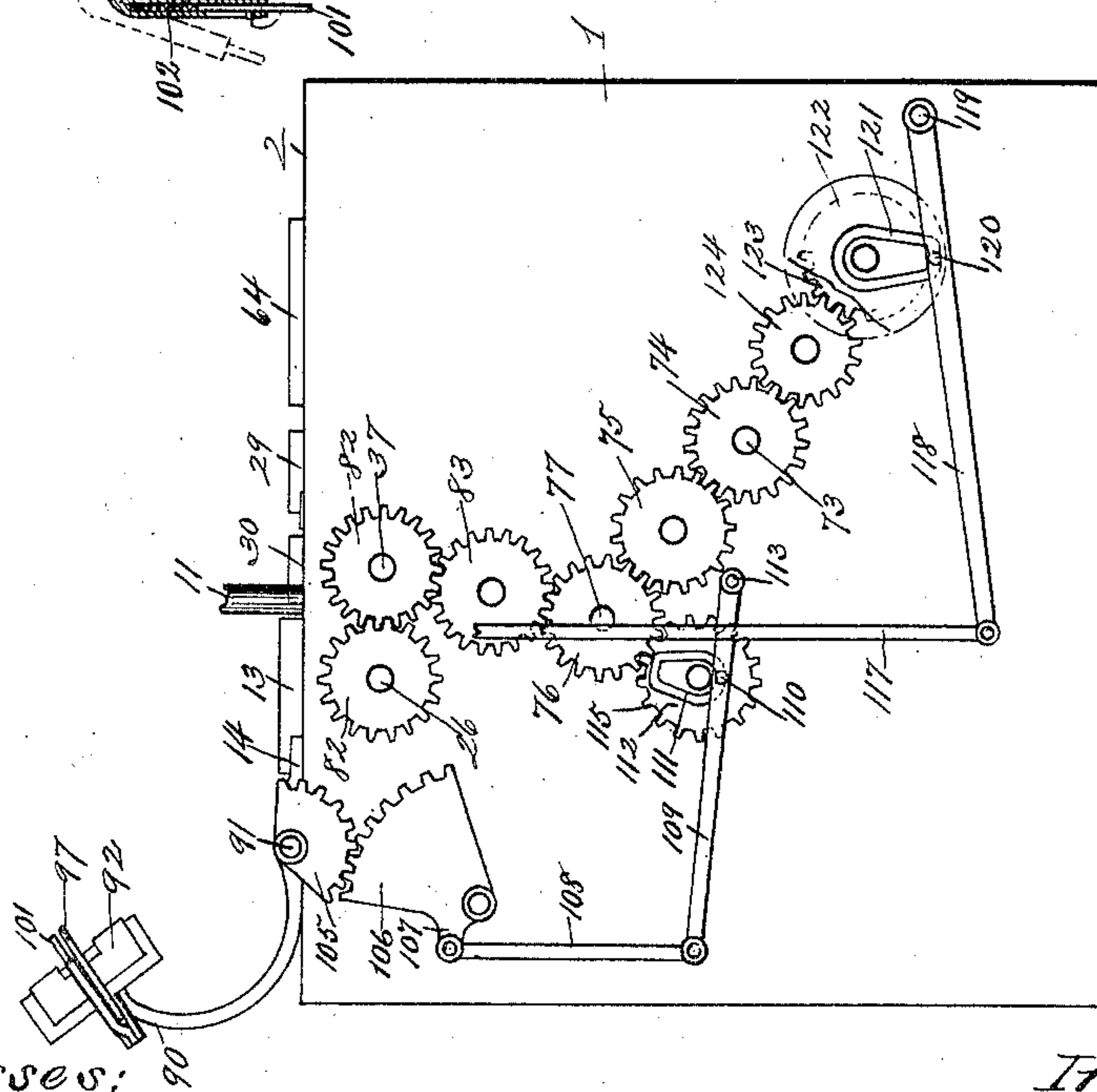


Fig. 7.

Fig. 6.



Witnesses:
C. B. Smalley.
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4 SHEETS—SHEET 4.

Fig. 9.

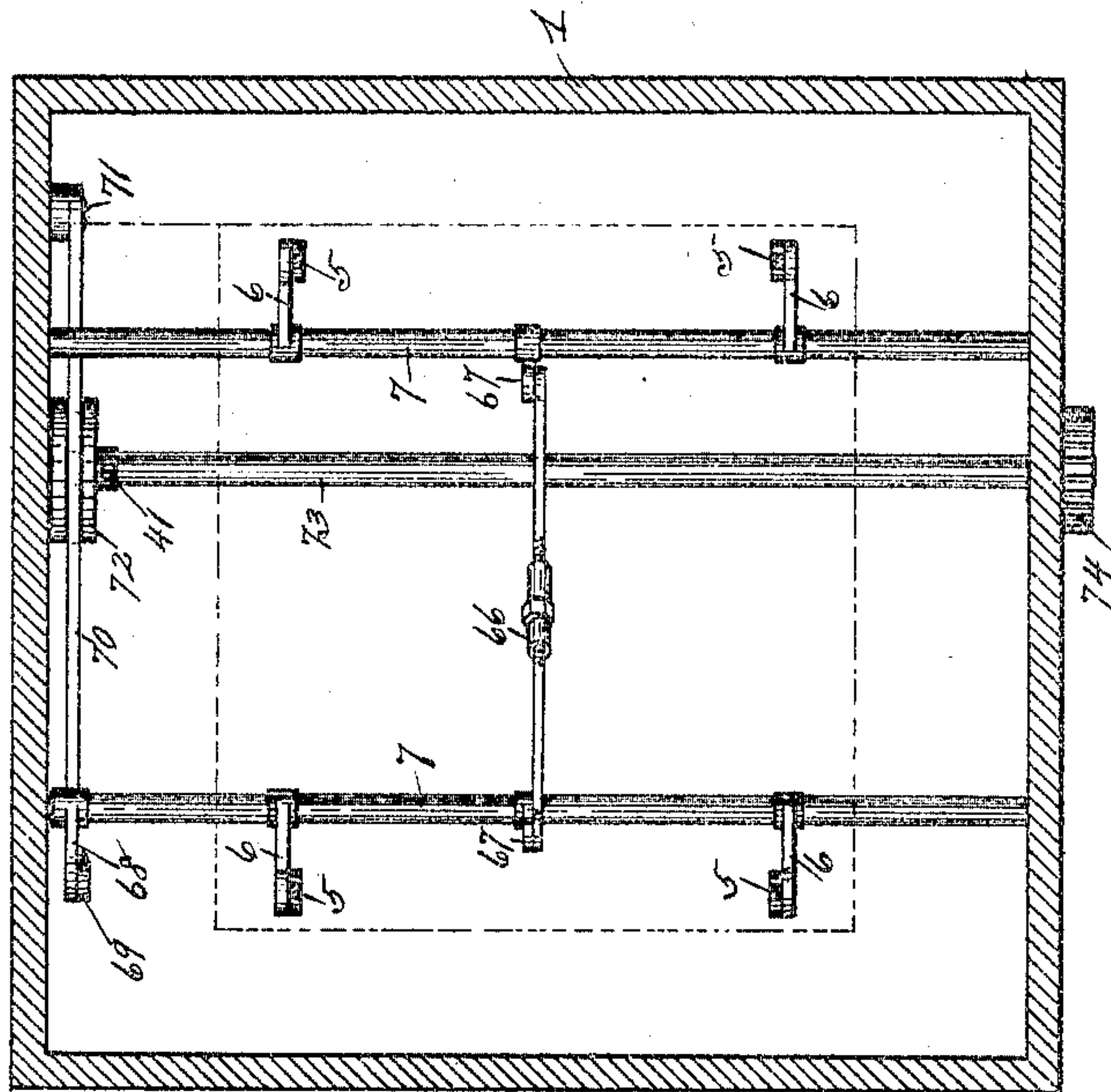
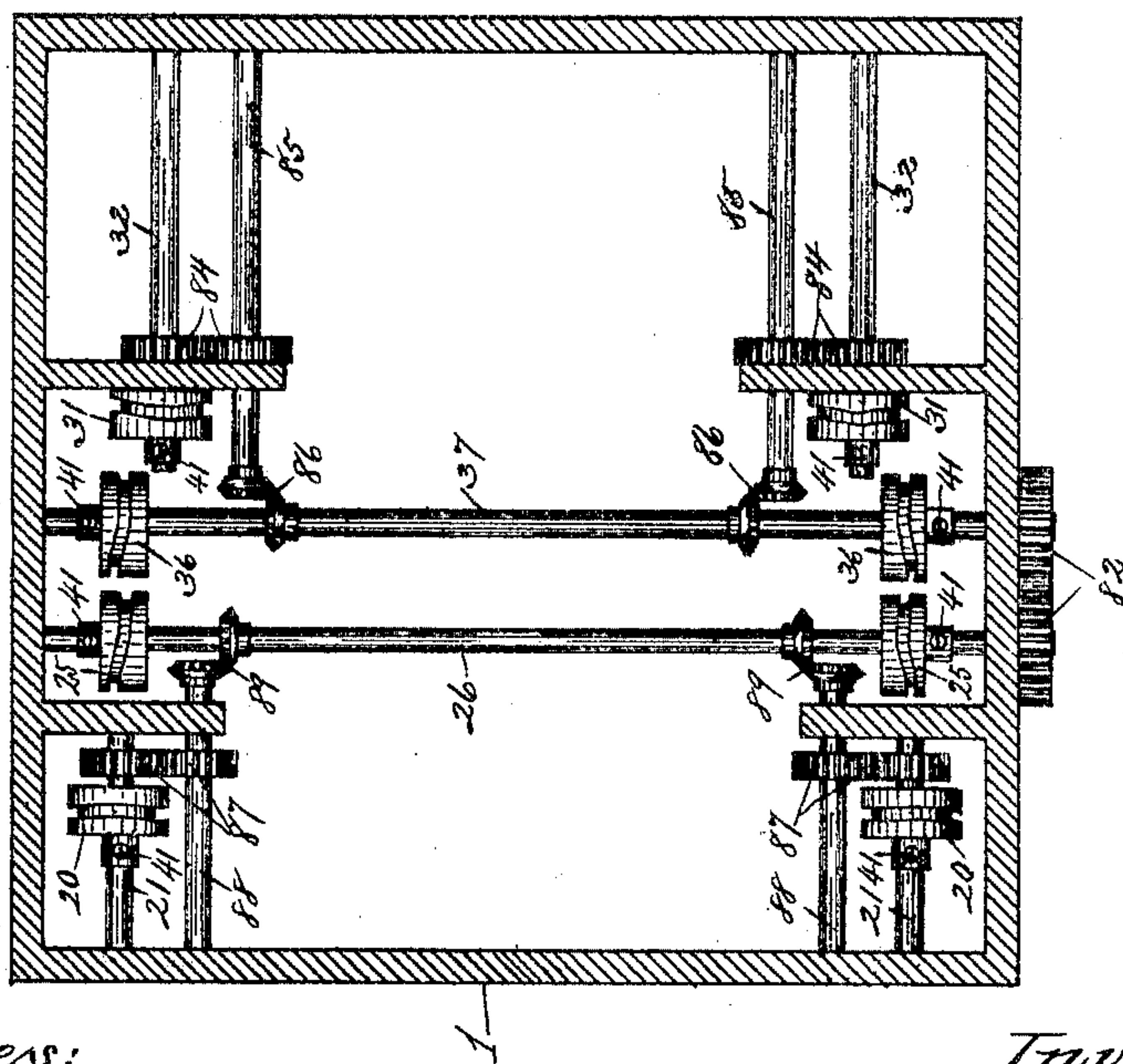


Fig. 8.



Witnesses:

L. B. Smalley.
E. M. O'Reilly.

Inventors:

Theodore D. Robinson
& Ransom D. Viele
by Mosher & Curtis attys.

UNITED STATES PATENT OFFICE.

THEODORE D. ROBINSON, OF ALBANY, AND RANSOM D. VIELE, OF AMSTERDAM, NEW YORK, ASSIGNORS TO THEMSELVES, AND EDWARD M. WALKER, OF TROY, NEW YORK.

FOLDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 776,427, dated November 29, 1904.

Application filed July 3, 1902. Serial No. 114,190. (No model.)

To all whom it may concern:

Be it known that we, THEODORE D. ROBINSON, residing at Albany, county of Albany, and RANSOM D. VIELE, residing at Amsterdam, county of Montgomery, State of New York, citizens of the United States, have invented certain new and useful Improvements in Folding-Machines, of which the following is a specification.

The invention relates to such improvements; and it consists of the novel construction and combination of parts hereinafter described and subsequently claimed.

Reference may be had to the accompanying drawings, and the reference characters marked thereon, which form a part of this specification.

Similar characters refer to similar parts in the several figures.

Figure 1 of the drawings is a top plan view of our improved folding-machine with the former and its supporting mechanism and the feeding mechanism removed. Fig. 2 is a similar view showing the machine stripped of the various folding devices, showing only the movable bed and the cam-actuated slide-blocks in their slideway-slots. Fig. 3 is a vertical longitudinal section taken on the broken line 3 3 in Fig. 1, the former-supporting frame being partly broken away. Fig. 4 is a bottom plan view of the former detached. Fig. 5 is a vertical longitudinal section of the same, taken on the broken line 5 5 in Fig. 4. Fig. 6 is a view in side elevation of the machine with the former and its supporting mechanism broken away. Fig. 7 is a view, partly in front elevation and partly in central vertical longitudinal section, of the head of the feeding-frame. Fig. 8 is a horizontal section taken below the bed of the machine, showing the several folder-operating cams and operating mechanism therefor. Fig. 9 is a similar view showing the mechanism for actuating the vertically-movable bed.

Our invention relates more particularly to the class of folding-machines adapted for in-turning the edges of fabric blanks in the manufacture of collars and cuffs.

The principal objects of the invention are to facilitate the folding operation and to increase the capacity of the machine. Other objects of the invention will appear in connection with the following description.

Referring to the drawings, 1 is the frame of the machine, having the top or table 2 provided with a central aperture 3, located within which aperture is a vertically-movable bed 4, supported, by means of links 5 and arms 6, from the rock-shafts 7, supported in bearings in the frame of the machine beneath said bed. Passing over the movable bed and around the rollers 8, supported in bearings in the frame of the machine, is an endless belt or apron 9. This belt or apron is constructed and operates in substantially the manner shown and described in United States Letters Patent No. 693,931, dated February 25, 1902, to which patent reference may be had, in connection with this specification, for a more full understanding of the present invention.

The former 10 may be of any known construction, the construction shown being similar to that shown in said Patent No. 693,931. The former is moved toward and from the bed 4 at intervals and may be so moved in any known manner, as in the manner shown in said patent, the former being supported upon a stem adapted to reciprocate vertically in a slideway in the frame 11, erected from the frame of the machine. In the present construction, however, we prefer to erect the former-supporting frame 11 from the fixed framework of the machine instead of from a movable carriage, as shown in said prior patent.

The machine may be adapted for folding different kinds and styles of blanks.

We have shown in the drawings a construction adapted for folding a blank of general rectangular form having two rounded and two square corners and whereby the square corners of the blank can be folded in such a manner that when the blanks are assembled in pairs the edge folds will interlock those of one blank with those of another. The mechanism for folding the rounded corners and the side

of the blank therebetween consists of a side-folder 12 and a pair of curved corner-folders 13. These folders are mounted upon a common supporting-plate 14, the side-folder 12 being fixed thereto by screws 15 and each corner-folder being movably mounted thereupon by means of the screws 16 and slots 17, said screws passing through said slots into the supporting-plate 14 and serving as guides in the movement of the corner-folders. The corner-folders are thus adapted to reciprocate toward and from each other longitudinally of and upon the supporting-plate 14. The folder-supporting plate is fixed upon an actuating-plate 18 by means of the screws 19.

Reciprocating movements may be imparted to the actuating-plate 18 in any known manner, preferably in straight lines toward and from the space occupied by the former when depressed upon the bed 4, and reciprocating movements may be imparted in any known manner to the corner-folders, whereby they are moved toward and from each other in lines at right angles to the line of movement of the actuating-plate 18.

As a means for inducing the reciprocating movements of the actuating-plate 18 and corner-folders 13 we have shown cam mechanism located beneath the bed or table of the machine connecting with the several folders and plate through apertures formed in said table.

A pair of cam-wheels 20, fixed upon the respective shafts 21, rotatively supported in bearings in the frame of the machine, are engaged by cam-followers on the respective slide-blocks 22, reciprocatory in slideway-apertures 23 in the top of the machine and secured by screws 24 to opposite ends of the actuating-plate 18, whereby the desired reciprocating movements are imparted to said actuating-plate 18 by means of said cams.

A pair of cams 25, fixed upon the cross-shaft 26, rotatively mounted in bearings in the frame of the machine, are engaged by cam-followers on the respective slide-blocks 27, reciprocatory in apertures 28 in the top of the machine and connected with the respective corner-folders in a manner which will be hereinafter more fully described, whereby the desired reciprocating movements are imparted to said corner-folders by means of said cams. It will thus be seen that the corner-folders have not only a movement toward and from the former corresponding with the movement of the actuating-plate 18, but a movement toward and from each other, the resultant of which movements causes the corner-folders to travel in lines substantially diagonal or radial to the respective rounded corners, which is a desirable movement for folding such corners.

As a means for connecting the corner-folders 13 with their cam-operating mechanism we have shown each of the slide-blocks 27 provided with a stud 45, which passes upwardly through a slot 46 in the block 47 and is se-

cured therein by a nut 44, said block 47 fitting a slideway-aperture 48 in the plate 49, which plate is located in an opening 50 in the folder 13 and connected at its opposite ends with the folder 13 by tongue-and-groove connections 51, as shown. The slot 48 is elongated in the direction of movement of the actuating-plate 18, so as to permit the free movement of the corner-folder accompanying said movement of the actuating-plate without interference therewith by the cam mechanism which serves to move the corner-folders toward and from each other. The tongue-and-groove connection between the plate 49 and folder 13 permits the corner-folders to be readily adapted for folding blanks of different lengths when changing from one size to another, it being necessary only to lift the plate 49 out of the opening 50 and then slide the folder 13 upon its supporting-plate 14 to the desired position, after which the plate 49 is replaced in the opening 50, the tongues on its ends registering with a different set of grooves in the walls of said opening. The grooves in one wall of the opening 50 are preferably located opposite the tongues on the opposite wall, and the tongues and grooves on the ends of the plate 49 are similarly arranged, so that by inverting the plate 49 an adjustment of the folder can be obtained equal to half the distance between neighboring tongues or grooves. The slot 46 permits the block 47 to be given a slight degree of adjustable movement when desired.

The adjustment above provided for permits the initial position of the folders 13 upon the plate 14 to be regulated at will, and after the adjustment has been obtained movements are imparted to the folders in the same manner for whatever size of blank they may be adapted. In thus adapting the corner-folders for different sizes of blanks the side-folder 12 is removed by loosening the screws 15 and is replaced by a side-folder of suitable length to fill the space between corner-folders when the same are contracted.

As a means for holding the folders to their work we have shown a swing-bracket 60, pivotally mounted upon the framework 11, erected from and forming a part of the fixed frame of the machine, which bracket can be locked to said frame by means of the nuts 61 at any desired point in its swinging movement and thereby made to overhang the corner-folder 13. Between said bracket and the folder we interpose a ball-bearing or other form of rotatory bearing device 62, whereby the folder is held to its work without undue friction as it moves toward and from the former. The bracket 60 may be adjusted to overhang different portions of the folder to secure different results.

If desired, the folder may be provided with an inclined surface 63 on the portion engaged by said ball-bearing 62, whereby the pressure

of the folder upon the edge of the blank may be increased after the edge has been partly folded over upon the former.

The mechanism for folding the square corners and the other edge portions of the blank consists of a side-folder 29 and a pair of end-folders 30, each interposed between said side-folder 29 and one of the corner-folders 13. A pair of cam-wheels 31, fixed upon the respective shafts 32, rotatively supported in bearings in the frame of the machine, are engaged by followers on the respective slide-blocks 33, reciprocatory in slideway-apertures 34 in the top of the machine and secured by screws 35 to opposite ends of the folder 29, whereby reciprocating movements are imparted to said folder, causing the same to move toward and from the former along lines parallel with the end edges of the blank. A pair of cam-wheels 36, fixed upon the cross-shaft 37, are engaged by cam-followers on the respective slide-blocks 38, reciprocatory in slideway-apertures 39 in the top of the machine and secured by screws 40 to the respective end-folders 30, whereby said end-folders are reciprocated toward and from the former along lines parallel with the side edges of the blank.

In folding lock-cornered work one of the folders adjacent to the square corner is operated in advance of the other, and by means of the cam mechanism shown the folders 29 and 30 can be operated successively, the order of their operation being determined by the position of the cams, all of the cam-wheels being preferably adjustably secured to their respective shafts by means of the set-screws 41, thereby making it possible to vary the time of operation of a cam by loosening said set-screw and imparting to the cam-wheel a partial rotary movement of adjustment, the wheel being locked to the shaft in its adjusted position by tightening said set-screw. The two folders adjacent to a rectangular corner to be thus folded are adapted to overlap one another when operated.

In order to provide a space for the fullness of fabric at a square-folded corner during the folding operation, we have shown each of the folders adjacent to such a corner movable into and out of the path of the other, each of said folders when withdrawn terminating at the end adjacent to said corner a short distance from the other and being wholly beyond the path of the other, leaving between the adjacent corner edges of said folders a free corner-space 42 for the reception of the fullness of the fabric formed by either folder when operated in advance of the other. The several cams are so timed in their movements that the side-folder 12 and corner-folders 13 are moved inwardly simultaneously with the side-folder 29 in folding one set of blanks and simultaneously with the end-folders 30 in folding another set of blanks adapted to inter-

lock with and be secured, respectively, to the other set of blanks.

By varying the position of the cams, as above described, any desired order of movement of the parts can be secured.

As a means for imparting the desired rotary movement to the several cams above referred to we have shown the cross-shafts 26 and 37 connected together by gear-wheels 82, one of said wheels being connected, through the intermediate gear 83, with the gear 76 on the main drive-shaft 77, provided with a pulley 81, adapted to receive a driving-belt in the usual manner. Parallel with the shaft 32 and connected therewith by gear-wheels 84 is a counter-shaft 85, rotatively supported in bearings on the frame of the machine and having a bevel-gear connection at 86 with the cross-shaft 37. In like manner the shafts 21 are connected by gears 87 with the respective counter-shafts 88, rotatively supported in bearings on the frame of the machine and having each a bevel-gear connection 89 with the cross-shaft 26. Rotary movements are thus imparted to all the cams simultaneously, the operation of each cam being timed by its position of rotative adjustment on its shaft.

Blanks may be supplied to the machine by hand or in any known manner.

We have shown means for introducing blanks into position to be folded, comprising a feeding-frame 90, movable toward and from the bed, which movement is permitted by pivoting said frame to the frame of the machine at 91, adapting the same for oscillating movement. The feeding-frame is provided with clamping mechanism adapted to engage and support upon the head of the frame a blank, as the clamping-plates 92, fixed to the respective slides 93, movable in upwardly and inwardly inclined slideways 94, formed in said head. The slides 93 are each actuated by means of a lever 95, fulcrumed at 96 upon said head and having an arm 97, engageable with the bed of the machine when the feeding-frame is lowered thereupon, such engagement serving to force the slides 93 downwardly and outwardly to release the clamped edges of the blank.

In applying a blank to the feeding-frame the operator places the blank upon the face of the head with the edges of the blank beneath said clamps, which are forced into engagement with the blank by a hand-operation of the arm 97.

To facilitate the removal of the blank from the feeding-frame, we provide a stripper comprising a reciprocatory plunger 98, adapted to be forced into engagement with the blank between the clamping-plates at each side of the feeding-frame, said plunger being connected with an angle-lever 99, fulcrumed at 100 upon the feeding-frame and provided with a yielding arm 101, engageable with the

bed of the machine. As the feeding-frame is moved toward the bed of the machine the arm 101 by engagement with said bed is caused to compress the spring 102, inclosed in a chamber in the angle-lever 99, and when the feeding-frame is withdrawn from the bed after the clamping-plates 92 have been forced out of engagement with the blank the expansion of said spring 102 operates to force downwardly the plunger 98, which serves to hold the blank down upon the bed as the feeding-frame rises and continues to hold the same upon the bed until danger of disturbance by the movement of the feeding-frame is passed.

The clamping and stripping mechanisms are preferably duplicated on opposite sides of the feeding-frame.

Pressure is applied to fix the folded edges of the blank, both before and after the same leaves the former, by means of the movable bed 4, coöperating with the several folders and with the fixed presser-plate 64, overlying a portion of said bed. The rock-shafts 7, whereby said movable bed is operated, are connected together to operate in unison by an adjustable link 66 and the arms 67, fixed upon the respective rock-shafts, and rocking movements are imparted to said connected shafts through the arm 68 and link 69 from the lever 70, fulcrumed at 71 upon the frame of the machine and engageable intermediately of its ends with a cam-wheel 72, fixed upon the shaft 73, rotatively supported in bearings on the frame of the machine and provided with a gear 74, connected by an intermediate gear 75 with the gear 76 on the main drive-shaft. The cam-wheel 72 is preferably provided with two distinct cam-surfaces, the surface 79 being adapted to cause the movable bed 4 to exert a lesser pressure upon the blanks and the surface 80 a greater pressure. The operation of the cam is so timed that the lesser pressure is exerted while the folders are operating to inturn the edges of the blank upon the former and the greater pressure after the folders have completed their inward movement. The folders are thus stationary when the greater pressure is applied, whereby we obviate the danger of breaking or tearing the fibers of the goods under the greater pressure. The bed 4 is depressed after each folding operation and during the intermittent movement of the apron 9, which serves to transfer a folded blank from its position beneath the former to a position beneath the stationary presser-plate 64. This movement of the apron may be accomplished in any known manner, as in the manner shown and described in said prior patent.

The feeding-frame may be moved toward and from the bed of the machine by hand or in any known manner. As a means for imparting the desired movement to the feeding-frame we have shown the gear-segment 105, fixed thereto concentrically with its axis of

movement and adapted to be engaged by a gear-segment 106, adapted to be operated by means of the arm 107, fixed thereto, link 108, and lever 109, fulcrumed at 113, and having a cam-follower 110, adapted to travel in the cam-groove 111 in the cam-disk 112. The cam-disk 112 is provided with a gear 115, connected with the gear 76 on the main drive-shaft.

The former may be operated in any known manner.

As a means for operating the former, whereby the same is moved toward and from the bed, we have shown the former-actuating mechanism connected by a link 117 with a lever 118, fulcrumed at 119 upon the frame of the machine and having a cam-follower 120, adapted to travel in the cam-groove 121 in the cam-disk 122, having fixed thereto the gear 123, connected by an intermediate gear 124 with the gear 74, whereby the former is moved toward and from the bed in substantially the manner shown and described in said prior patent. The movement of the former and feeding mechanism is so timed that they are moved toward and from the bed in alternation with each other.

The former comprises the former-head 125 and the former-plates 126, contractible and expansible thereupon and adapted to be contracted and expanded in the manner shown and described in said prior patent.

As a means for preventing displacement of the blank upon the bed we have shown the former provided with a plurality of yielding blank-engaging pins 127, projecting from its under side, each pin being located in a slide-way-aperture 128 in the former-head in engagement with a coiled spring 129, which yieldingly holds the pin in position to project beyond the face of the former. Each of these pins is provided with a pointed end 130, adapted to penetrate the blank, and a short distance from said pointed end with an offset or shoulder 131, adapted to limit the distance of such penetration of the pin into the blank. The shoulder 131 is so located that the pin cannot penetrate the blank a sufficient distance to bring its point into contact with the metal bed of the machine. As the former approaches the bed and blank supported thereupon these pins engage the blank in advance of the former-head and former-plates, forcing the blank down into position upon the bed and holding the same against displacement during the operation of the various mechanisms, the springs 129 permitting the movement of the former-head to continue after the movement of the pins has been arrested by engagement with the bed-supported plate. The pins may be applied to various constructions of former. The pointed member may be separable from the pin, as the member 114, secured in an axial aperture in the pin 127 by set-screw 116.

Difficulty is frequently experienced in folding blanks having a prominent edge irregularity, particularly when such irregularity is in the form of an edge depression in the blank, due to the fact that the folded-in edge must be expanded or stretched at such a depressed portion of the blank in order to lie flatly upon the body of the blank. In folding such a form of blank the former is provided with a recess of the desired form and the folder with a projection corresponding in form with said recess. When the folder is moved inwardly toward the former, the fabric edge is stretched, causing the same to occupy a flat position upon the blank so long as the folder is in contact therewith; but upon the folder being withdrawn such elasticity as the fabric possesses causes such expanded edge to contract more or less, such contraction causing the edge to rise to a more or less inclined position. We have shown in the drawings the former provided with such a recess 135 and the side-folder 12 with a corresponding projection 136. This side-folder is provided with one or more cutters adapted to be forced into engagement with the edge of the blank at its recessed portion when the folders are operated. We have shown two such cutters 137, fixed upon the side-folder 12, and a cutter 138, movably mounted upon the said folder, being fixed to the angle-lever 139, fulcrumed at 140 upon said side-folder and having a follower-pin 141, adapted to travel in the cam-slot 142 in the cam-plate 143, fixed to one of the corner-folders 13, whereby as the folders are operated the movement of said corner-folder 13 toward and from said side-folder 12 will cause a movement to be imparted to the cutter 138 relatively to the former and folder and transversely of the edge of the folder, whereby the cutter is caused to engage the edge of the recessed portion of the blank while the same is under tension due to its being stretched or expanded by the folding operation. The engagement of the cutter or cutters with the edge of the blank while under such tension serves to cut or slit the edge of the blank, relieving the tension and destroying the tendency of the inturned edge to contract after the folder is withdrawn.

What we claim as new, and desire to secure by Letters Patent, is—

1. In a folding-machine, the combination with a former and a folder having one a concaved edge and the other a correspondingly-convexed edge; of a cutter mounted upon the folder adapted to engage the edge of a blank interposed between said former and folder when the folder is operated, and means for producing a relative movement between said former and folder, substantially as described.

2. In a folding-machine, the combination with a former having a depression in its edge; and a folder having a corresponding edge projection; of a cutter mounted upon and mov-

able in the same direction with the folder and adapted to engage the edge of a blank interposed between said former and folder when the folder is operated, substantially as described.

3. In a folding-machine, the combination with a pair of members comprising a former and a folder, one having an edge depression and the other a corresponding edge projection, one movable toward and from the other; of a cutter mounted upon one of said members adapted to be brought into engagement with the edge of a blank interposed between said members when one is moved toward the other.

4. In a folding-machine, the combination with a former and folder, one having an edge depression and the other a corresponding edge projection; and means for producing a relative folding movement therebetween; of a cutter-support movably mounted on the folder; a cutter mounted on said support and capable of a movement relatively to and transversely of the edge of the folder; and means for imparting to the cutter such movement.

5. In a folding-machine, the combination with a blank-supporting bed, of a former movable toward and from the bed; a folder; a pin having a pointed end adapted to penetrate a bed-supported blank and a shoulder to limit its distance of penetration; and a yielding connection between said pin and former whereby said pin is carried by the former, substantially as described.

6. In a folding-machine, the combination with a blank-supporting bed; of a former movable toward and from the bed comprising a former-head and expansible and contractible plates mounted on said head; a pin having a pointed end adapted to penetrate a bed-supported blank, and a lateral offset to limit its distance of penetration; and a yielding connection between said pin and former-head, substantially as described.

7. In a folding-machine, the combination with a bed; and a folder; of a former movable toward and from the bed; a feeding-frame separate from the former movable toward and from the bed; blank-clamping mechanism on the feeding-frame; means for operating said blank-clamping mechanism; and means for moving said former and feeding-frame toward and from the bed in alternation with each other, substantially as described.

8. In a folding-machine, the combination with a bed; and folding mechanism; of a feeding-frame movable toward and from the bed; means for moving said frame; blank-engaging clamps on said frame; a clamp-operating arm supported on said frame projecting beyond the face thereof and adapted to be operated by engagement with said bed whereon the released blanks are deposited and folded, substantially as described.

9. In a folding-machine, the combination with a bed; and folding mechanism; of a feed-

ing-frame movable toward and from the bed; means for moving said frame; blank-engaging clamps on said frame; means for operating said clamps; a blank-stripper on said
5 frame; and means for operating said stripper when the clamps are released, substantially as described.

10. In a folding-machine, the combination with a bed; and folding mechanism; of a feed-
10 ing-frame movable toward and from the bed; means for moving said frame; blank-engaging clamps on said frame; means for operating said clamps; a blank-stripper movably
15 mounted on said frame; an arm engageable with said bed; and a yielding connection between said arm and stripper whereby the stripper is automatically operated, substantially
as described.

11. In a folding-machine, the combination
20 with a former; of a folder; a bed; means for producing a relative folding movement between said former and folder; and means for producing a relative pressing movement between said folder and bed while a folded
25 blank is interposed therebetween comprising

in part cam mechanism having a cam-surface operative to positively produce a lesser degree of pressure during the relative movement between the former and folder, and another
cam-surface operative to positively produce a 30 greater degree of pressure between the same folder and bed after the relative folding movement between the former and folder has been accomplished, substantially as described.

12. In a folding-machine the combination 35 with the frame of the machine; a former; and a movable folder having an inclined or wedge-shaped surface; of a bracket supported from the frame of the machine overhanging said folder; and rotatory bearing mechanism 40 mounted upon said bracket and adapted to engage said inclined surface on the folder, substantially as described.

In testimony whereof we have hereunto set our hands this 18th day of June, 1902.

THEODORE D. ROBINSON.
RANSOM D. VIELE.

Witnesses:

FRANK C. CURTIS,
E. M. O'REILLY.