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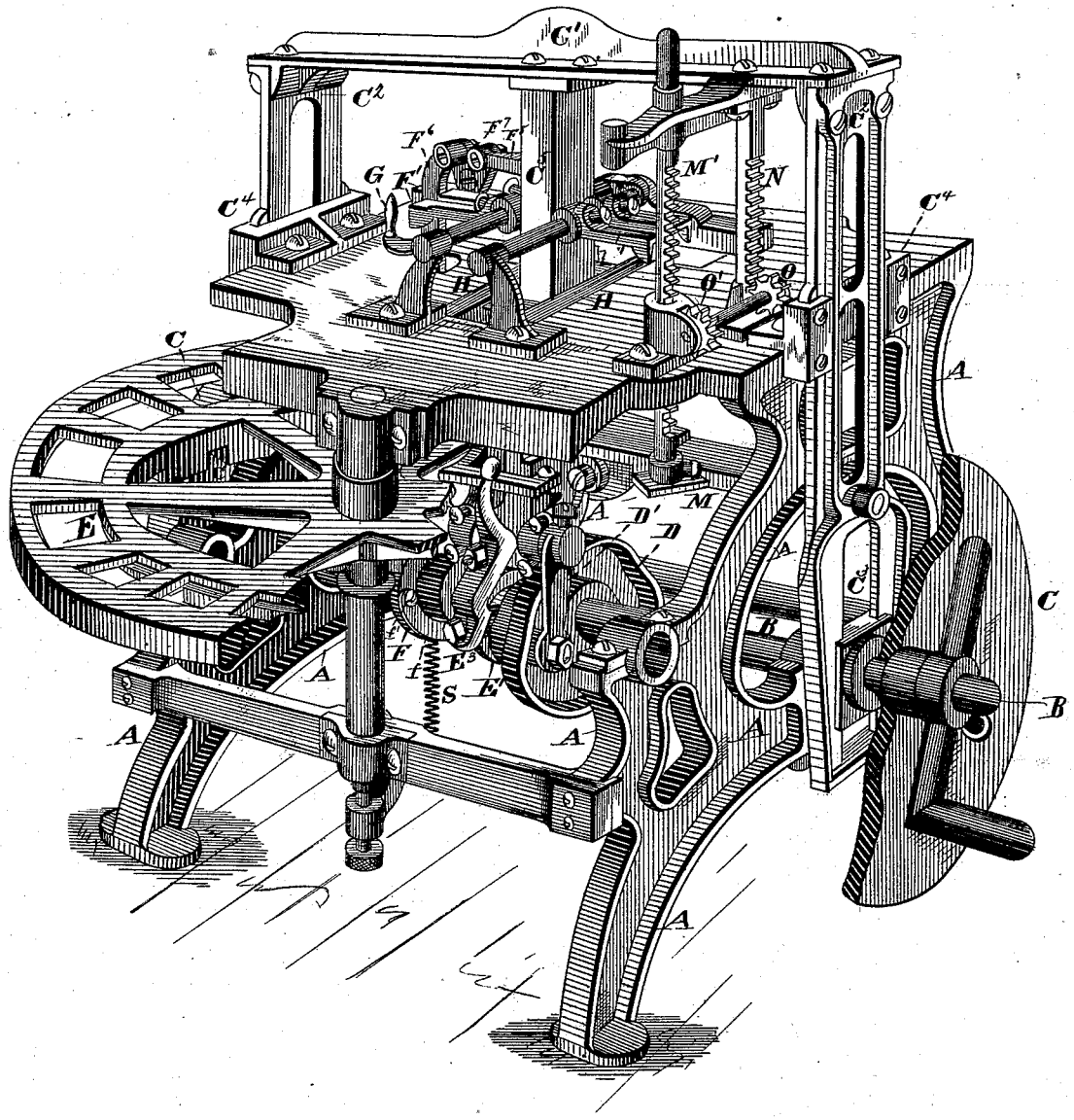
F. H. STRIEBY & J. C. RANKIN.

Paper-Box Machine.

No. 216,357. Patented June 10, 1879.

Fig. 1.



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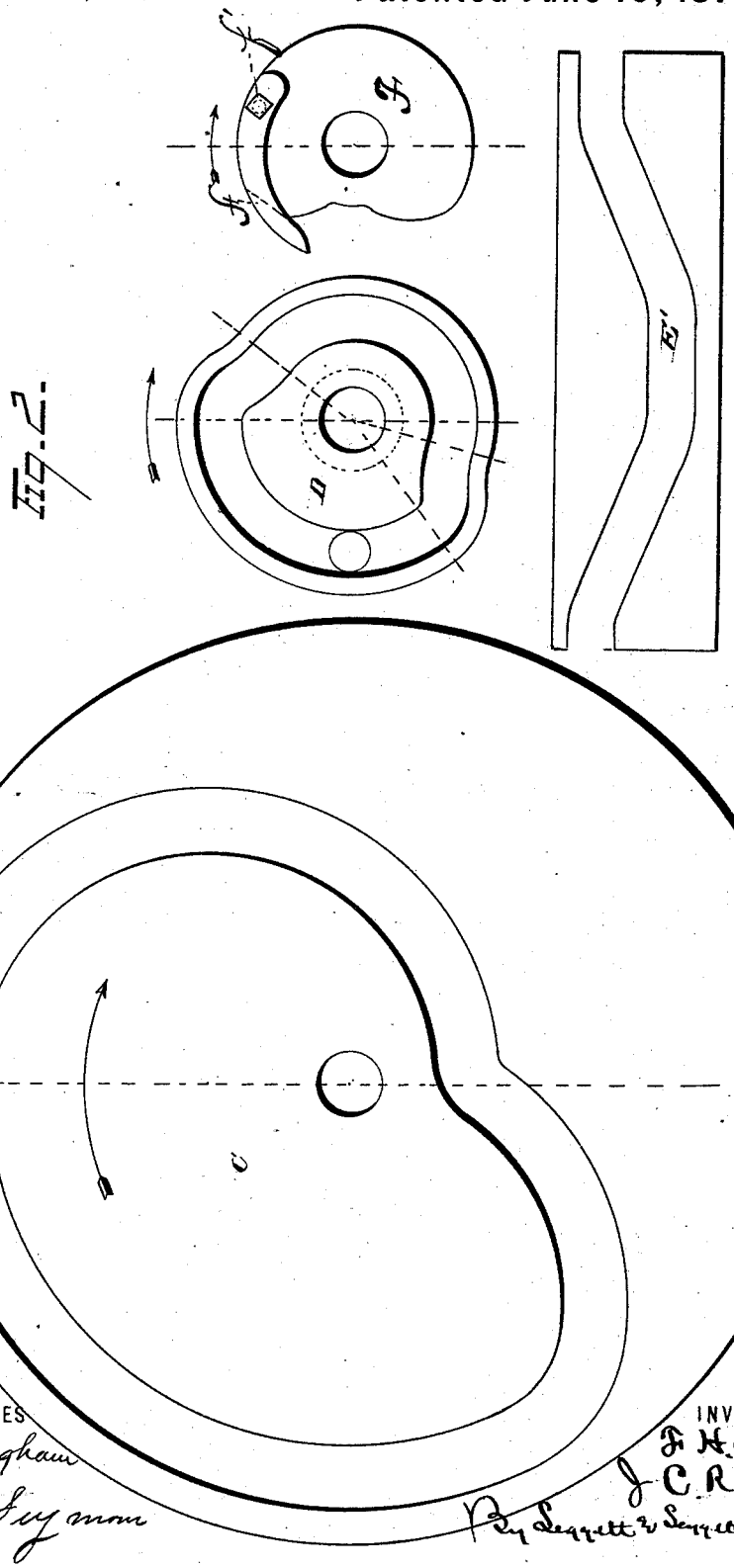

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Fig. 3.

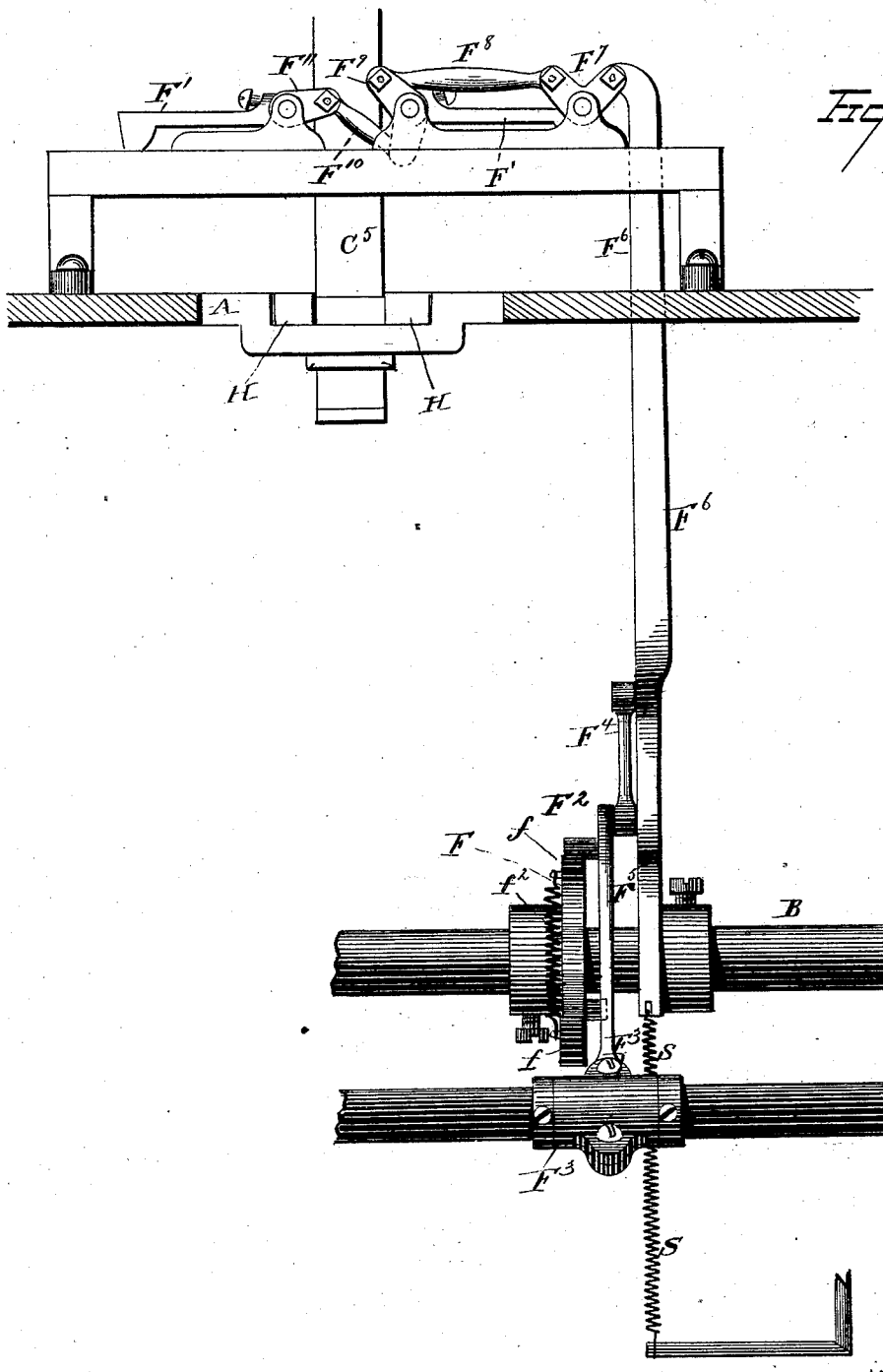

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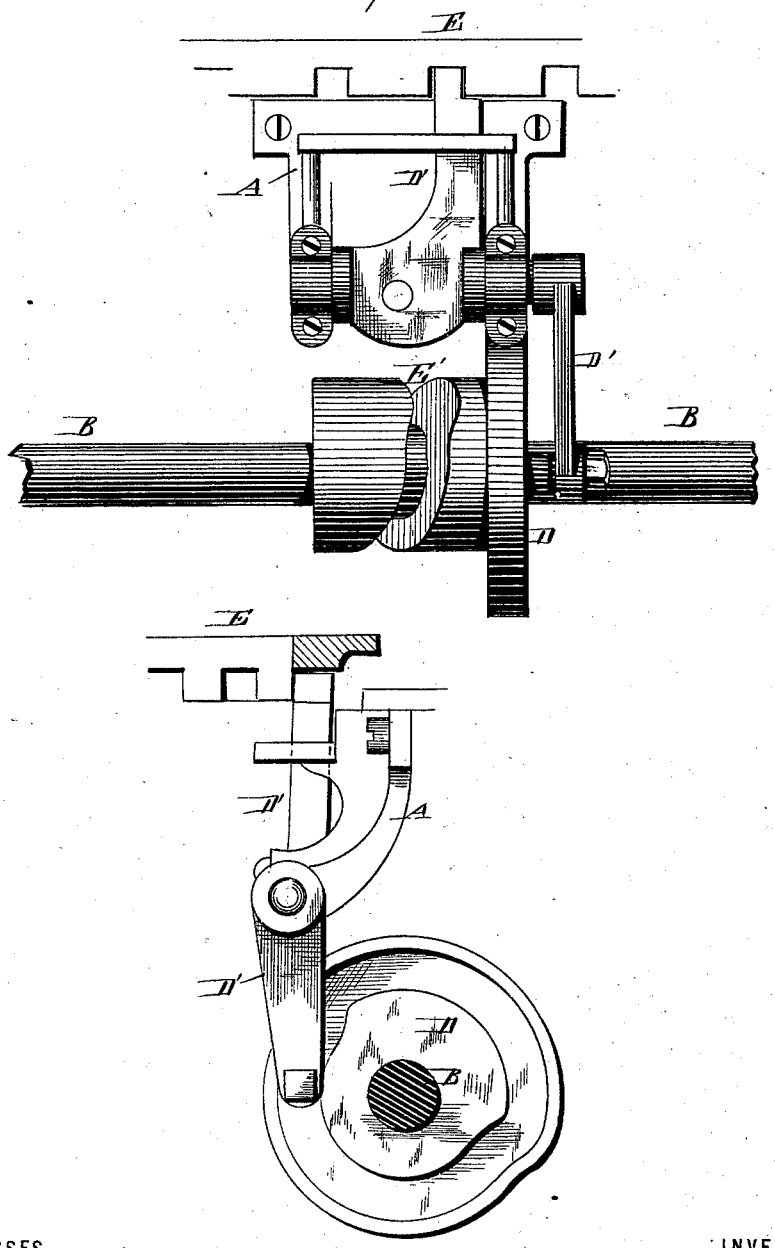
Fig. 5.



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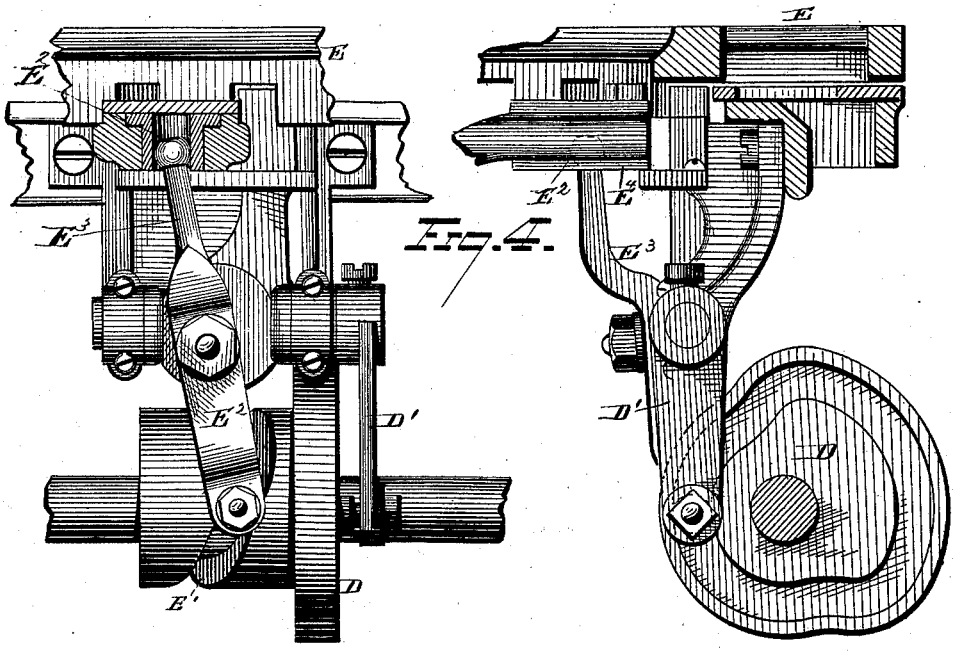

Fig. 4.

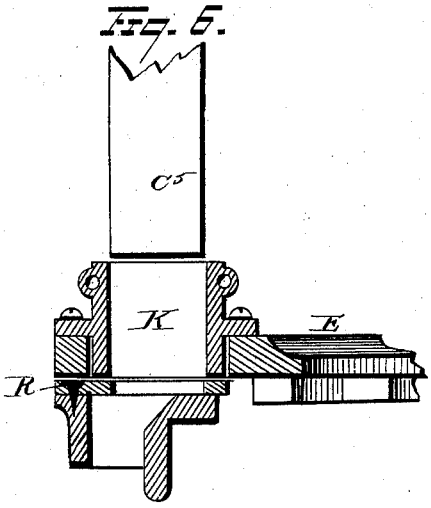

Fig. 6.

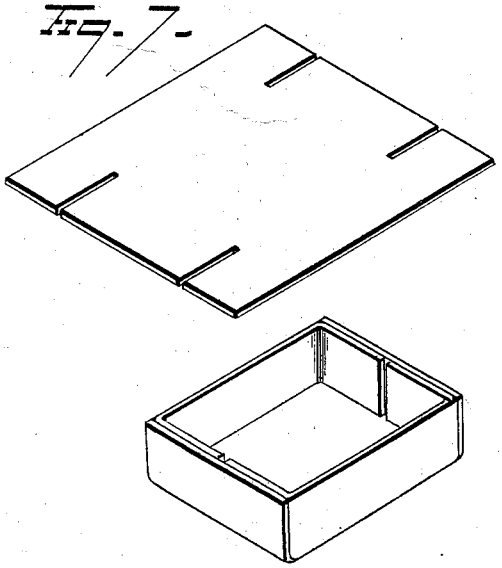

Fig. 7.

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UNITED STATES PATENT OFFICE.

FRANK H. STRIEBY AND JOHN C. RANKIN, OF CLEVELAND, OHIO.

IMPROVEMENT IN PAPER-BOX MACHINES.

Specification forming part of Letters Patent No. **216,357**, dated June 10, 1879; application filed November 4, 1878.

To all whom it may concern:

Be it known that we, FRANK H. STRIEBY and JOHN C. RANKIN, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in a Machine and Process for Making Paper Boxes; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

Our invention relates to a machine for making paper boxes, the same consisting of the parts and combination of parts hereinafter described and claimed.

In the drawings, Figure 1 represents a perspective view of a machine embodying our invention, a portion of the disk being cut away to expose the working parts. Fig. 2 is a view showing the various cams of our machine, also showing their relative positions at the time when the plunger is at its extreme upward position. Fig. 3 is a detached view of the flap-folder cam, with its connections, &c., showing its construction and its feature of permitting a reverse motion of the machine. Fig. 4 represents the mechanism for imparting rotary motion to the disk. Fig. 5 shows a detached view of the mechanism for operating the disk-lock. Fig. 6 is a detached view showing the feature of plunger, receiver, and female die for forming the shells of box-drawers, as will hereinafter more fully appear. Fig. 7 represents the blank to which the machine is adapted preparatory to being operated upon, and also the same when folded.

A A is a general frame of any form or material suitable for holding, containing, and accommodating the various operative parts of our machine. B is the main shaft, to which the motive power is preferably applied in any effective manner.

Upon the shaft B are fixed the cam-disks C C for operating the cross-head C^1 through its slotted standards C^2, which are suitably adapted to engage in the cams of the disks C. The standards C^2 have also each a slot, C^3, for the accommodation of the stationary guide-blocks C^4, stationed in the frame A at each end of the shaft B. This arrangement, in combination with the guides C^4, insures an accurate up-and-down movement of the cross-head C^1 and its attached parts.

The several cams of our machine are arranged as follows, (although, be it understood, we do not, in any degree, limit ourselves to any definitely consecutive arrangement of said cams, so long as they can be placed to perform in the substantial manner and concert as hereinafter specified:) On each end of the shaft B are fixed the cams C C, which operate to impart a vertically-reciprocating motion to the cross-head C^1 and its attached parts in the manner already specified.

D is the locking-cam, whose function is simply to insert and withdraw the locking end of the bell-crank or lever D′ into and from the notches on the nether face of the disk E. The lever or bell-crank D′ is pivoted or journaled upon a cross-bar of the frame A. The entry and withdrawal of bolt E^2, Fig. 4, by lever E^3 is caused by cam D, through the medium of lever D′, to which E^3 is pivotally attached, thereby imparting an intermittent rotary movement to disk E. This function is performed as follows: One end of a lever, E^3, engages with the cam E^1. This lever E^3 is so pivoted and journaled on a bell-crank as to have two reciprocating movements, each at right angles to the other, so that the peculiar movement imparted to the cam and eccentric end of this lever will be reproduced in the opposite directions at the opposite end, which is joined preferably by a ball-and-socket connection to the sliding dog or bolt E^2, whereby said dog or bolt is first made to move forward and engage in a notch of the disk E, then rotate said disk forward a required distance, then withdraw from said disk-notch, then return to its original position, then forward to again engage in another disk-notch, and again rotate said disk forward.

The dog or bolt E^2 moves in an oscillating frame, E^4, pivoted concentrically with the axis of the disk E. By this most important provision the dog or bolt aforesaid will operate with the greatest certainty and directness, and with the least danger or wear upon the disk E or its notches. If desired, the notches beneath the disk E may be formed by removable cogs attached to said disk. Thus, as said

cogs are worn or broken, they may be readily replaced without the destruction or disturbance of the disk E.

Next to the cam E^1, as shown in our present machine, is the cam F, for operating the flap-folders. This cam should be shaped and set so as to perform the function of opening the flap-folders F^1, retaining them in an open position from the time that the plunger C^5 has accomplished about one-half of its downward movement, has finished its return movement, and has again passed down sufficient to fold the box-pattern upon two sides, after which the flap-folders F^1 are suddenly and with sufficient force brought down against the plunger C^5 by the operation of the spring S, folding the flaps of the box by the operation. The cam F is provided with the yielding section *f*, which is pivoted at *f*, Fig. 2, to the main cam F, and retained in a closed position by a spring, f^2, Fig. 3. When moving forward in the normal operation of the machine, this yielding section performs no special function, except to act as a part and portion of the main cam in the usual manner; but if the machine is reversed, the boss F^2, impinging against and under the section *f*, will cause said section to yield, and the boss F^2 will be able to ride completely under the section *f* and take a position behind said section on the main cam F, while the spring f^2 will return to its normal position, and if the machine now be moved forward the section *f* will assist in the normal operation of the cam the same as though it were rigidly attached. The method of communicating the motion of the cam F to the flap-folders, as shown in our present machine, is as follows: The boss F^2, which engages directly with the cam F, is fixed upon the end of a lever of the second order swinging from a cross-rod of the main frame at F^3, the weight being the link F^4. This link connects the lever F^5 and the vertically-reciprocating bar F^6. The bar F^6 has a slot or fork at its lower end straddling the main shaft B, which arrangement acts as a sufficient guide to said bar F^6. The upper end of the bar F^6 journals with a bell-crank, F^7, swinging from the frame A, which bell-crank again connects with a link, F^8, and this, in turn, with the bell-crank F^9, which is attached to and operates the shaft of one of the flap-folders F^1, and the bell-crank F^9 further connects, through a link, F^{10}, with a crank, F^{11}, fixed to the shaft of the other flap-folder F^1.

All these connections, substantially as shown in the drawings, operate simultaneously to move the flap-folders F^1 in opposite directions to and from each other. The flap-holders F^1 may be of any suitable fashion or dimensions adapted to the particular description of box to be formed. They are attached to arms attached to shafts operated by the bell-crank F^9 and crank F^{11}.

G, Fig. 1, is a lock. It is a simple bar pivoted to the main frame A, and engaging in any notch made in the vertically-reciprocating bar F^6 to hold said bar at any point desired.

The plunger C^5, which operates as the primary folder, is a bar of suitable shape and dimensions, firmly attached to and operated by the cross-head C^1. On each side of this plunger are placed the flap folders F^1.

To the frame A, upon each side of the aperture through which the plunger C^5 passes, are placed the bars H. These bars are removably attached to the frame A, and are designed to be removed when necessary for repairs or new adjustments, or when bars of any other fashion or description need to be substituted.

The mechanism heretofore specified for operating the receiver-disk E is arranged and adjusted to revolve said disk in such a manner that at every downward movement of the plunger C^5 a receiver, K, Fig. 6, shall be directly in line with said plunger, so that it may enter, at every successive plunge, a successive receiver, thus carrying the folded box down with it, and depositing it in its receiver. Meantime, while the plunger is within any receiver K, the disk E is locked and held stationary by the dog or bolt E^2, as aforesaid.

The disk E is suitably journaled to the frame A in substantially a horizontal position. Upon its outer portion are formed cells for containing the receivers K. These receivers are removably attached in their cells, and are made of any suitably shape, dimensions, or material fit for the particular product to be made. They are made removable for reasons already specified in connection with the bars H.

After a box has been deposited in its receiver by the plunger, it is slowly carried around to the delivering or discharging apparatus. Meanwhile its paste is setting and drying to a sufficient degree. When any receiver with its box reaches a point beneath the discharger, said discharger operates to force the box out of its receiver, thus emptying said receiver, which passes on to be filled again.

The discharger M is any suitable plate or block fixed upon the end of a vertically-reciprocating rack-bar, M′, and its function is to force the pasted box down through and out of its receiver.

In the manufacture of boxes of certain dimensions it has been found necessary that the discharger should have an extended motion sufficient to carry it a considerable distance below the receivers. We accomplish this result as follows: To the cross-head C^1 is rigidly attached a rack, N, and the vertically-reciprocating movement of this rack is communicated in an increased degree to the discharger-bar M′ by the differential gear O O′. The smaller pinion, O, engaging with the rack N, and the larger pinion, O′, fixed upon the same shaft with pinion O, engaging with the rack M′, will cause, in an obvious manner, any motion of the rack N to be imparted in a multiplied degree to the plunger-rack M′. Both racks M′ and N should be provided with suitable guides, to insure steady and accurate movements with the least wear and friction.

A very important feature of our invention

is the function of the plunger in acting as the male member of a punching-die, to cut out the bottom of a box to form the shell of a box-drawer, so called. To accomplish this, we provide in a cross-bar of the main frame A, beneath the plane of the receivers, the female member of a punching-die, and this, in combination with the plunger, forms a complete punch. We consider this combination of plunger, receiver, and die as novel with this invention and as very important, as it enables us to make shells for box-drawers in a new manner, and with a facility and economy heretofore unequaled.

The female member R is made removable from its place in the frame A, and it may be replaced by one of any style to suit the product required.

What we claim is—

1. The combination, with the two vertically-moving standards and cross-head connecting the same, of differential gearing adapted, by mechanism substantially as described, to actuate the discharger in movement increased in extent over that of said standards or cross-head, substantially as set forth.

2. The combination, with a vertically-reciprocating plunger or primary folder, of a female member of a punching-die, located below the horizontal plane of the receivers, said plunger and female member being adapted to form a complete punch in a paper-box machine, substantially as set forth.

3. The combination of the cross-head C^1, discharger M, racks M′ N, and differential gearing O O′, substantially as specified.

4. The mechanism shown for operating the flap-folders, consisting of the combination of cam F, yielding section *f*, lever F^5, link F^4, bar F^6, bell-crank F^7, link F^8, bell-crank F^9, link F^{10}, and crank F^{11}, or their equivalents, substantially as specified.

5. The combination of plunger C^5, receiver K, and female member R of a punching-die, substantially as shown.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

FRANK H. STRIEBY.
JOHN C. RANKIN.

Witnesses:
JNO. CROWELL, Jr.,
J. H. SNOW,
MATTW. RANKIN.