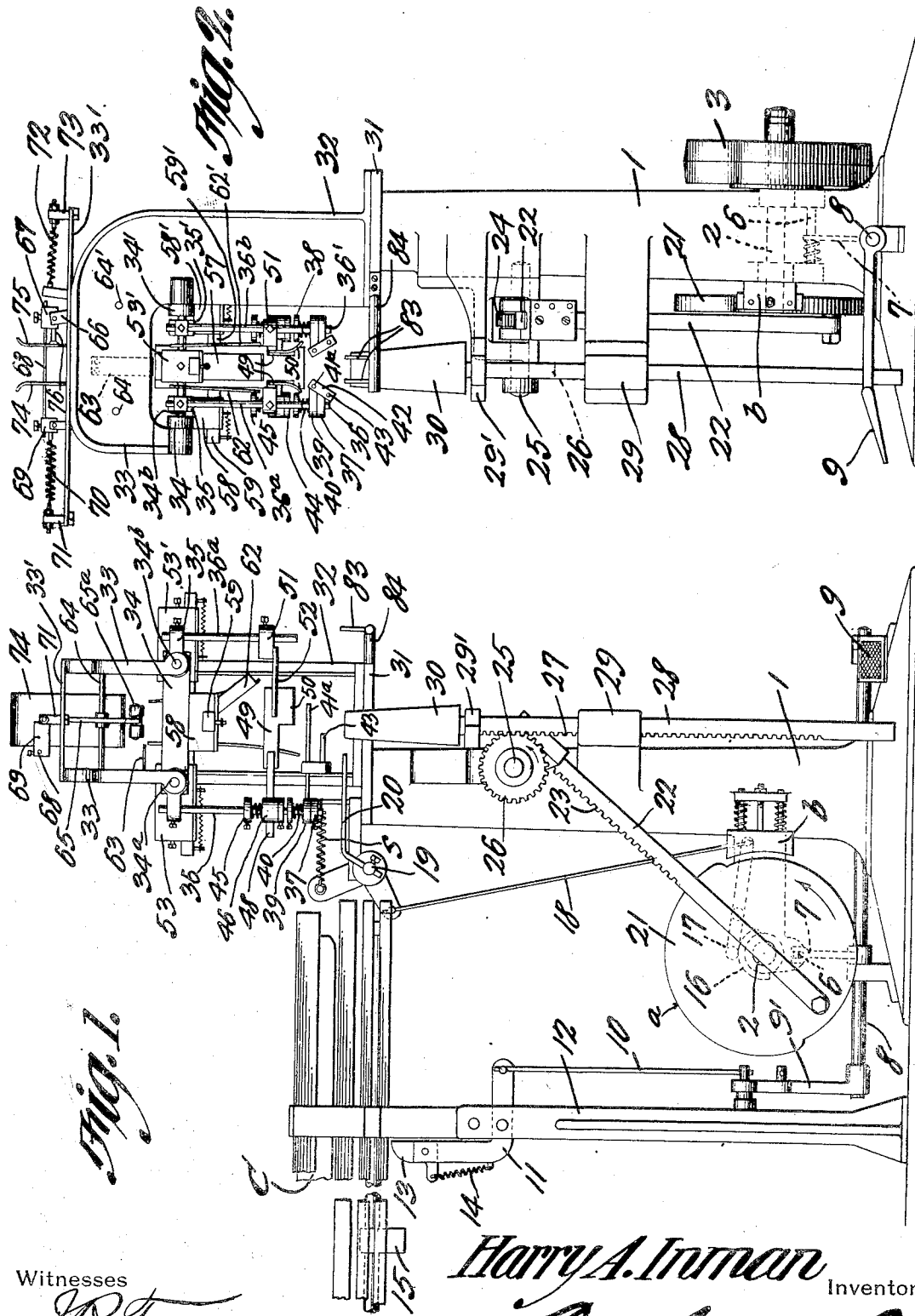


1,115,822.

Patented Nov. 3, 1914.

4 SHEETS-SHEET 1.



Witnesses

J. P. Linn
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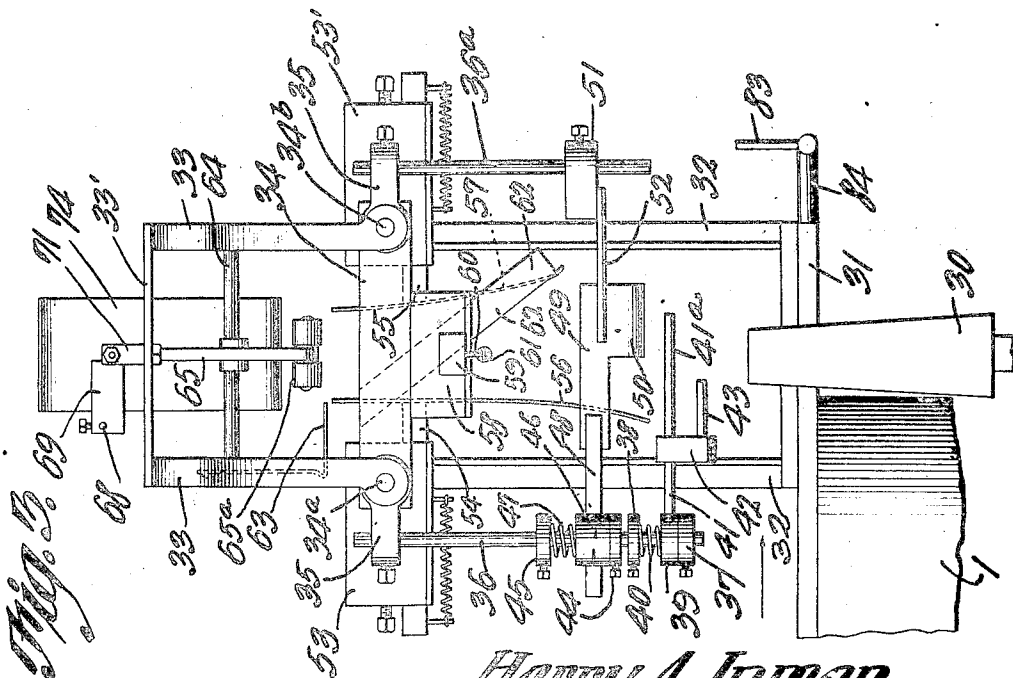
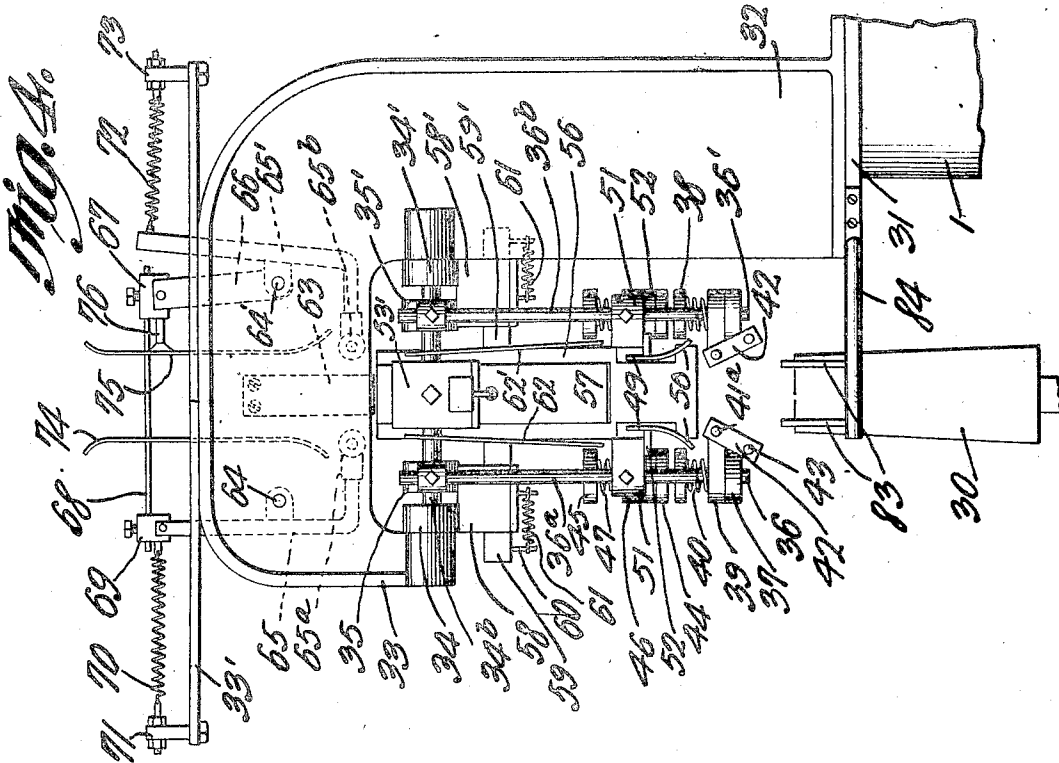
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H. A. INMAN.
BOX FOLDING MACHINE.
APPLICATION FILED FEB. 12, 1914.

1,115,822.

Patented Nov. 3, 1914.

4 SHEETS—SHEET 2.



Witnesses

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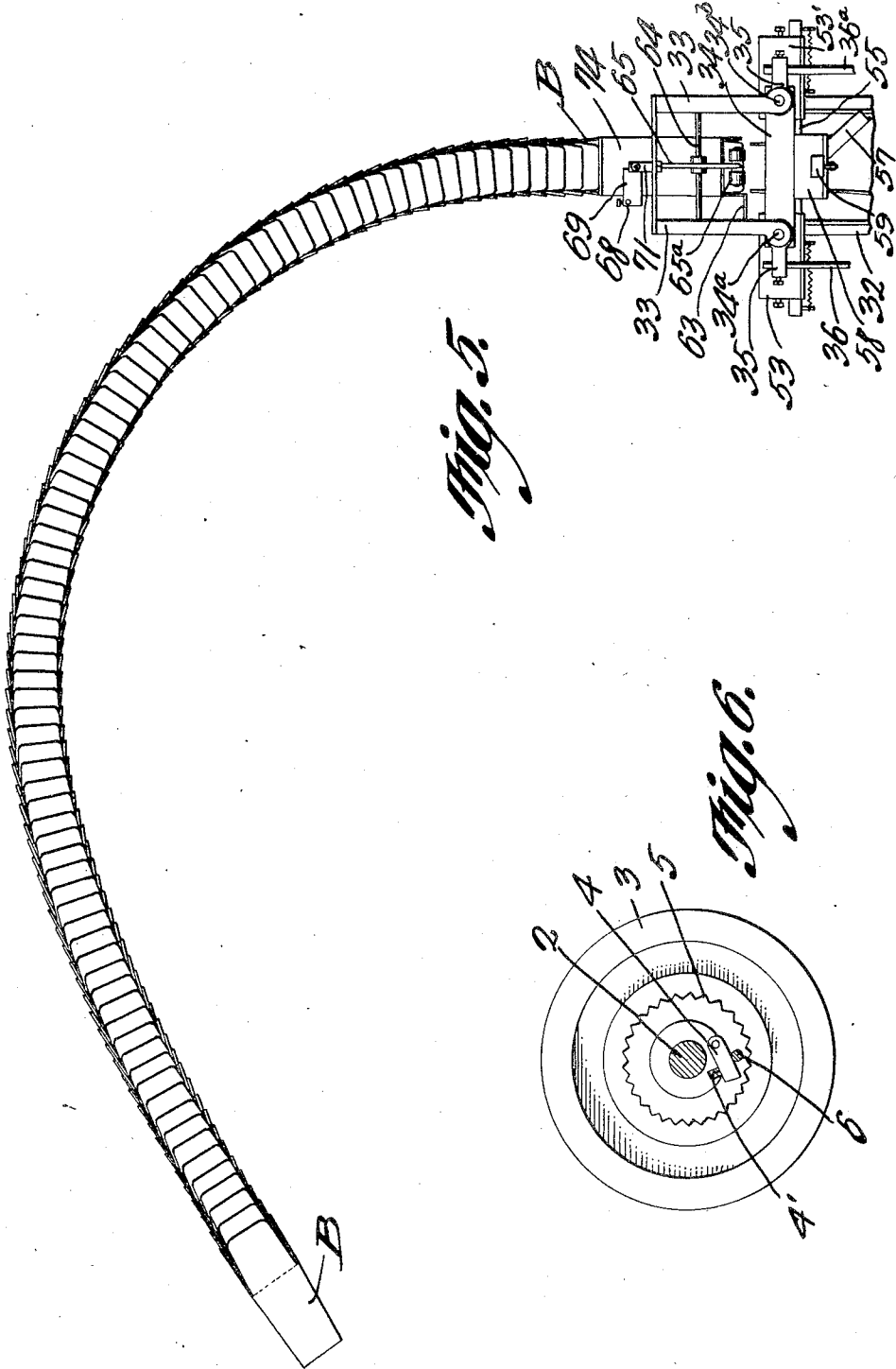
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1,115,822.

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4 SHEETS—SHEET 3.



Witnesses

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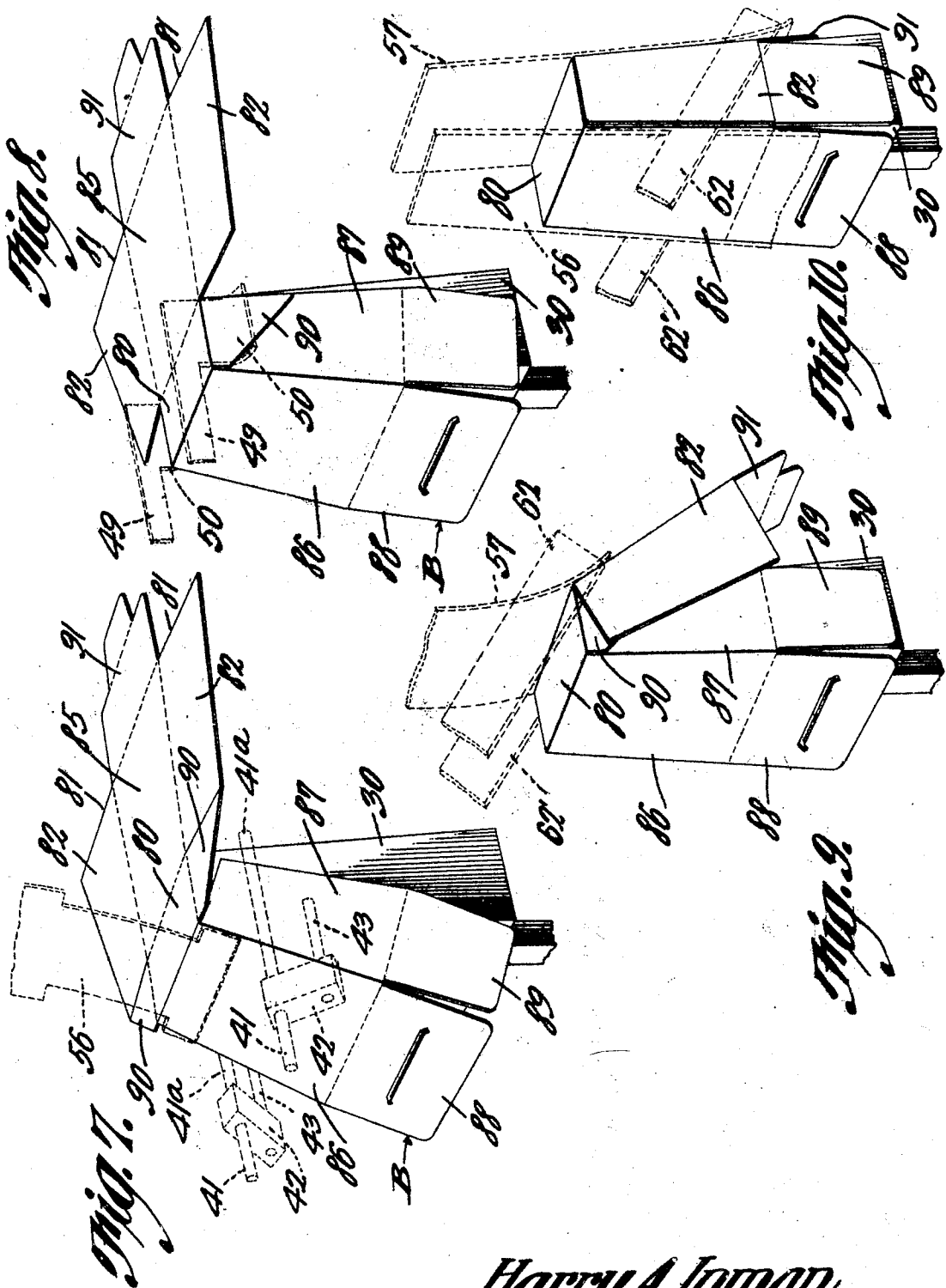
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1,115,822.

Patented Nov. 3, 1914.

4 SHEETS—SHEET 4.



Witnesses

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UNITED STATES PATENT OFFICE.

HARRY A. INMAN, OF AMSTERDAM, NEW YORK.

BOX-FOLDING MACHINE.

1,115,822.

Specification of Letters Patent.

Patented Nov. 3, 1914.

Application filed February 12, 1914. Serial No. 818,367.

To all whom it may concern:

Be it known that I, HARRY A. INMAN, a citizen of the United States, residing at Amsterdam, in the county of Montgomery and State of New York, have invented a new and useful Box-Folding Machine, of which the following is a specification.

The present invention relates to improvements in box folding machines, the present mechanism being particularly designed for folding a gummed and taped blank as particularly gummed and taped in my gumming and taping machine as set forth in my co-pending application for patent filed February 13, 1913, Serial No. 748,166, and also in combination with the blank conveying mechanism as set forth in my co-pending application filed February 10th, 1914, Serial No. 817,852, one object of the present invention being the provision of folding means, which will insure the proper sequence of operation in folding the various elements of the box blank, so that when the same is properly seated about and folded upon the plunger, the adhesive carrying parts will be properly compressed so that the adhesive thereupon will properly hold the box in assembled position, there further being provided means whereby each succeeding box is telescoped within the preceding box, so that the boxes thus telescoped may be directed to any desired point of discharge and thus render the counting, inspecting and final disposition of the boxes more easy.

A further object of the present invention, is the provision of a box folding mechanism by means of which the blank when placed above the plunger will be so positioned as to have the bottom forming portion of the blank disposed directly in line with the upper end of the plunger so that as the blank is gradually carried in a vertical direction by such plunger, the various foldable parts of the box will be folded in the proper sequence or succession so as to insure the proper formation of the box before the recession of the plunger and the completion of the box, which remains in the upper portion of the machine to be removed therefrom by the next succeeding formed boxes.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangements of parts and in the details of construction hereinafter described and claimed, it being understood

that changes in the precise embodiment of the invention herein disclosed can be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawings—Figure 1 is a side elevation of the complete folding machine showing the operable connection thereof with the outlet end of my blank conveying mechanism. Fig. 2 is a view looking from the right of the folding machine as shown in Fig. 1. Fig. 3 is a similar view to Fig. 1 of the upper folding mechanism of the present machine on an enlarged scale. Fig. 4 is a similar view to Fig. 2 on an enlarged scale of the upper folding mechanism. Fig. 5 is a diagrammatic view showing the method of delivery of the finished box of the present folding machine. Fig. 6 is a detail view of the clutch used for setting in operation the present folding mechanism. Figs. 7, 8, 9 and 10 are diagrammatic perspective views showing the various steps of a box folded and completed in the present machine.

Referring to the drawings, the numeral 1 designates the base or pedestal for the present machine, which has journaled therein, the drive shaft 2 which has rotatably mounted thereon, the drive pulley 3, there being provided means, as clearly shown in Fig. 6, for permitting the rotation of the pulley 3 for transmission of power therefrom to the shaft 2, the same consisting of the spring actuated pawl 4 for engagement with the internal ratchet teeth 5 of the pulley 3, a pin 6 being provided for permitting when the same is withdrawn from the position, as shown in Fig. 6, the pawl 4 by means of its spring 4' to engage the teeth 5 and thereby lock the drive pulley 3 fast to the drive shaft 2. In order to provide a means for operating the pin 6, either manually or automatically, a yoke lever 7 is provided and is keyed upon the shaft 8 that is journaled in the base of the pedestal and is provided with the foot treadle 9 and with the upstanding crank arm 9' by means of which the pin 6 is operated automatically.

As particularly set forth in my co-pending application filed even date herewith and heretofore mentioned, the operation of the pin 6 through the crank 9' is automatic and is controlled through the instrumentality of the lug 15 carried by the conveyer mechanism C, and the bell crank lever 11, the said bell crank lever 11 being journaled in the

standard 12 which constitutes a portion of the conveyer mechanism and which is connected for operating the crank 9' by means of the link or rod 10. This bell crank lever 11 is provided with the flexing end 13, which when the lug 15 engages the same when moving from left to right, as viewed in Fig. 1, will be tilted against the action of the spring 14 so as to not operate the bell crank lever 11 during the placing of a blank from the end of the conveyer over the guiding arms 20 above the plunger 30, the retractive action of the lug 15, or when the same is moved from right to left, pushing the end 13 which at that stage is rigid and consequently elevating the rod 10 and removing the pin 6 from engagement with the pawl 4. Thus at the desired time, the continuously rotating pulley 3 is operably connected to the shaft 2 and the folding mechanism, as will presently appear, is set in operation and only after the blank is placed in a stationary position above the plunger 30.

In order to provide a means to place the blank holding fingers or members 20 out of the way as the plunger 30 is elevated, the cam 16 is carried by the shaft 2, and is disposed to engage the inner end of the lever 17 and when the depressed portion of the cam engages such lever, the rod 18 is elevated and consequently the rock shaft 19 is rocked so as to incline the blank holding member 20. The spring S is connected to a lug carried by the rock shaft to return the parts to the normal receiving position, as clearly illustrated in Fig. 1.

The means for operating the plunger 30, as clearly illustrated, includes a disk or wheel 21, which is keyed to and rotatable with the shaft 2, the same having fixed eccentrically thereto, a rod or bar 22, the upper portion of which, as clearly illustrated in Fig. 1, is provided with rack teeth 23 which normally engage the pinion 24 keyed to the short shaft 25 which is journaled properly adjacent to and upon the pedestal 1. Keyed upon the rock shaft 25 is a pinion or gear 26, which is in mesh at all times with the rack teeth 27 of the vertically reciprocatory bar 28, said bar being mounted for sliding movement in the straps or bearings 29 and 29' also carried by the pedestal 1. Thus it will be seen that when the disk 21 is rotated, that the rack bar 22 will be moved to rotate the gear 26 in the direction of the arrow in Fig. 1, and thus elevate the bar 28 and carry therewith, the box forming plunger 30.

It will be noted that the periphery of the disk or wheel 21 is provided with a raised portion *a* which forms with the spring projected brake shoe *b* a cooperating means therefor, to prevent a too rapid fall or descension of the bar 28 and plunger 30 after the plunger has been elevated to its extreme upper position and is released practically to

gravity, this braking device constituting means to slightly retard the descension of the plunger and consequently prevent any damaging jar to the mechanism of the machine.

Carried by the upper end of the pedestal or base 1 is a plate 31, which has connected thereto, two plates 32, each one of which is spaced apart and provided with the overhanging portion 33, there being connected to the upper portion of both of the plates 32, a bridging plate 33', so that the folding mechanism later to be described, is disposed below the overhanging portion so that the box during the folding operation will be fed between the overhanging portions 33 and out of the upper portion of the machine.

Two bars 34—34' are connected in opposite positions, and with the overhanging portions 33 and the adjacent face of the supporting members 32, constitute supports for the lower folding mechanism to permit the suspension of the same properly with relation to the plunger 30. Two rods 34^a and 34^b are connected to the respective blocks 34 and 34' and have fixed thereto, the screw held blocks 35—35' two to each plate 32, and as particularly shown in Figs. 2 and 4. As there are four of these blocks there are four rods 36, 36', 36^a and 36^b, one to each thereof, connected to and depending therefrom, the rods 36—36' being longer than the rods 36^a—36^b, and all of said rods being normally in parallel, and as particularly illustrated in Figs. 3 and 4.

Connected adjustably, yet fixedly to the lower ends of each respective rod 36—36' are limiting collars 37 and 38 between which is disposed for oscillation, the apertured disk 39, which is normally held downwardly upon the limiting collar 37 by means of the coiled spring 40. Carried by each of the respective disks 38 is a rod or arm 41, the outer terminal 41^a of which constitutes a folding member and is disposed in the path of the plunger, as will presently appear. A block 42 is connected to the rod 41 intermediate of its ends and depends outwardly at the angle as clearly illustrated in Figs. 2 and 4, there thus being two of the blocks 42 at the inlet side of the folding mechanism. A short rod 43 is carried in the lower end of the block 42 and extends inwardly and parallel to the folding rod 41^a, said rod 43, however, being shorter, the purpose of which will presently appear. Thus, there are two folding rods 41^a and 43, which normally are held and disposed as clearly illustrated in Fig. 4, so as to properly wipe the respective portions of the blank B when the same is positioned above the plunger, as illustrated in Fig. 3, against the limiting pins 83 carried by the arm 84.

Fitted upon each rod 36—36' above the upper limiting disk 38 thereof, is a limiting

collar 44 which with the limiting collar 45, spaced therefrom, constitutes the proper limiting and holding means for the disk 46, which is normally held downwardly by means of the spring 47. Connected to the two disks 46 and extending inwardly are the two arms 48, each one of which carries the plate 49 whose lower end 50 is curved to properly accommodate the plunger 30 with its blank during folding and during the upward vertical movement of such plunger 30, the same normally occupying the position as shown in Fig. 4 and having a function which will be set forth particularly when the folding operation of the present machine in connection with the diagrams of the box as illustrated in Figs. 7, 8, 9 and 10, is particularly set forth.

Carried by the depending rods 36^a and 36^b are the adjustable blocks 51 one to each rod and extending inwardly from each rod is a folding member 52, which as clearly shown in Figs. 3 and 4, is disposed slightly above and exteriorly of the folding plates 50, the purpose of which will presently appear. These arms or members 52 therefore constitute a limiting means for the outward movement of the folding plates 50 but are not rigidly secured thereto.

Fixed centrally to and projecting outwardly from the respective rods 34^a and 34^b are two blocks 53—53'. Upon the inner face or reduced end 54 of the block 53 is secured a folding plate 56, whose lower end depends down between the inner ends of the folding plates 50 at a point slightly above the folding member 41^a, the lower end being curved outwardly so as to normally be beyond the respective aligned plates of the plunger 30 during the elevation and lowering thereof. Carried by the projection 55 of the block 53' is the opposed folding plate 57 whose lower curved end is in a plane above the two folding plates 50 or as particularly illustrated in Figs. 3 and 4. The plates 56 and 57 are oppositely disposed so as to fit astride of the plunger 30 as the same is moved upwardly and thus coöperate as will presently appear to assist in the final completion and folding of the box blank for the passage thereof to the extreme upper end and between the overhanging portions 33 of the supporting plates 32. The two resilient folding fingers 62 and 62' are properly supported in the inclined position, as shown in Fig. 3, and are carried by their respective carrying blocks 58 and 58', as clearly shown in Fig. 4. The sliding plates or carrying members 59—59' thereof, are mounted for sliding movement in the respective blocks 58—58' and upon the inner ends have secured thereto, the inclined fingers 62—62' respectively. The pin 60 is carried by each carrying member 59—59' so that the spring 61 which is connected to the block 58—58'

exerts a resilient tension inwardly, so that the folding fingers 62—62' will be normally pressed toward the center of the machine to yieldingly engage its respective portion of the box blank during the ascension or upward movement of the plunger 30.

In order to provide a means for preventing the descending or retrograde movement of the finished box as the same is moved above the upper end of the respective plates 56 and 57, and also to assist in the withdrawal of the box from the plunger and thus prevent the box from being lowered with the plunger 30, the resiliently supported catch or plate 63 which is connected to and supported by one of the overhanging portions 33, as particularly illustrated in Figs. 3 and 4, is provided.

A rod 64 is fixed between the overhanging portions 33 of the plate 32, while mounted for swinging movement therebetween, is a rod 64', the function of which is to properly support as a fulcrum, the respective levers 65—65', so that the rollers 65^a and 65^b carried respectively thereby may be properly disposed to engage the corners of the blank at the final folding thereof to thus insure the proper adhesion of the tacky gum at the final folding of the box and before the delivery of the same between the guiding and retaining plates 74 and 75. The lever 65' as before stated is carried by the rod 64' and said rod is swingingly supported from the plate 66 between the plates 32 of the machine. The upper ends of the respective plates 66 are connected to the block 67 which by means of the rod 68 is connected to the block 69, said block 69 being connected to the upper end of the lever 65 so that as the rollers 65^a are engaged to move the lower end of the lever 65 outwardly, the block 69 will be moved inwardly and consequently move the block 67 to the right, as viewed in Fig. 4, thus changing the relative position of the plate 66 and the fulcrum 64' of the lever 65' so that the rollers 65^b will be moved nearer the center of the machine or in closer contact with the folded blank as the same is carried upwardly by the plunger 30. A spring 70 is connected to the block 69 and to the post 71 which is supported upon the bridging plate 33 and thus resiliently holds the rollers 65^a toward the plunger at the center of the machine while the spring 72 connected to the upper end of the lever 65' and to the post 73 carried by the opposite end of the bridging plate 33' holds the roller 65^b resiliently toward the center of the machine.

In order to provide a means for receiving the folded blank or the completed box, after the same has been delivered above the retrograde movement preventing plate or catch 63, and so that the next succeeding completed box may be telescoped therewithin,

the two plates 74 and 75 are provided, the plate 74 being rigidly supported between the plates 32 of the frame while the plate 75 is connected to the rod 76 and is carried by the block 67 so that when the rollers 65^a are engaged by the plunger 30 in its upward movement and the block 69 is moved inwardly, the block 67 will be moved to the right to consequently move the plate 75 to the right to release the plate 75 from the pile of boxes, while the plunger 30 pushes another box up into the nested boxes which are elevated therewith without any drag due to the engagement of the plates 74 and 75 upon opposite sides thereof.

With this machine as clearly shown in Fig. 5, the boxes B are telescoped one within the other so that the same may be directed to any point desired as clearly illustrated in Fig. 5, or where the gumming and taping mechanism and conveying mechanism heretofore mentioned is used in connection with the folding machine, the boxes are conveyed to a point adjacent the feed-in end of the gumming and taping machine so that one or two operatives are necessary only to feed the blanks to the gumming and taping machine and count and inspect the completed boxes, such operatives being disposed side-by-side so that the material is fed as for instance at the right and the completed boxes received at the left of the gumming and taping machine.

In order to completely follow the operation from the reception of the blank, the parts being in the position as shown in Fig. 1, with the blank above the upper end of the plunger 30 and the member 20 inclined, the lug 15 of the conveyor C, engaged the bell crank 11. This caused the throwing in of the clutch mechanism, as shown in Figs. 1 and 6, so that the shaft 2 was connected operatively to the pulley 3. Thus the rack 22 was pushed upwardly and the shaft 25 was rotated to elevate the plunger 30. At this period, or just before the plunger 30 started to move upwardly, the base or bottom 80 of the blank was directly above the upper reduced end of the plunger 30. The first upward movement of the plunger 30 will cause the blank to assume the position, as shown in Fig. 7, wherein the side 85 with its wings 82 are in a flat position with the edges 81 in engagement or contact with the limiting fingers or pins 83 which regulate the projection of the blank within the folding machine. As the plunger 30 is elevated, the folding fingers 43 primarily engage the edges of the flaps or side walls 87 of the large wall 86 of the blank, moving the same inwardly and toward the smaller sides of the plunger 30, the continued upward movement bringing into play, the longer fingers 41^a while the lower end of the plate 56 engages the wall 86 at its junction

with the bottom 80 so that the wall 86 and the side walls 87 are folded inwardly upon the front side and the two opposite short sides of the plunger 30. As the plunger 30 is moved farther upwardly, the folding plates 50 are brought into play and engage the two triangular reinforcing flaps 90 and move them from the flat position, as shown in Fig. 7, to the position coextensive with the flaps 87, as shown in Fig. 8, the continued movement of the plunger 30 to the position shown in Fig. 9, permitting the lower end of the folding plate 57 to engage the wall 85 at its junction with the bottom 80 and thus tilt or hold the wall downwardly so that the inclined folding fingers 62—62' will engage the side walls 82 and thus consequently fold them to assume the position as shown in Fig. 9. The further continued upward movement of the plunger 30 will cause the walls 82 to be placed in parallel or coextensive position with the walls 87 and flaps 90, and as the blank in the gumming and taping machine has been properly gummed, the rollers 65^a and 65^b will ride upon the edges or corners of the small sides of the plunger and consequently compress the flaps 82, 90 and 87 together and insure the proper adhesion of the parts. As the plunger continues in its upward movement, the box assumes the position as shown in Fig. 10, the body thereof passing between the retaining plates 74 and 75 where the second formed box or the following ones will be telescoped within the preceding box to form the delivering shape as shown in Fig. 5, the lower edge of the straight flap 88 being disposed above but in engagement with the retrograde movement preventing means 63 so that when the plunger 30 is retracted or moved from its uppermost to its lowermost position, the completed box will be retained between the plates 74 and 75 to be finally removed from therebetween by the next succeeding completed box during the movement upward of the plunger 30. The flap 91 of the box carrying the tongue which is usual in boxes of this type, is as a rule upon the lower side or at the shorter arc of the segment, as shown in Fig. 5, as the lower edge of the larger flap or closure 88 constitutes a better abutting means for the retrograde movement preventing means 63.

It will thus be seen that with a mechanism of the present character, that the respective walls or flaps of the blank are properly folded in succession, as clearly illustrated in Figs. 7 through 10, so that when the completed box is delivered with the lower edge of the closure 88 above the retrograde movement preventing means 63, the body of the box at its larger sides will be resiliently held between the retaining and guiding plates 74 and 75 to be properly released at the initial engagement of the

plunger 30 with the rollers 65^a and 65^b, so that the box thereabove to receive the next preceding box will not offer any too great resistance but will be properly moved between the plates 74 and 75 and finally from therebetween to assume any desired delivering position, it being preferable to telescope the boxes to assume the position as shown in Fig. 5, so as to bring the same in such positions that may be readily counted and inspected in nested bunches from 10 to 25.

What is claimed is:

1. A folding machine for box blanks, including a plunger, a flap folding and blank directing means disposed in the path of the plunger, means for receiving the finished box and retaining it to receive telescopically the next succeeding box, and a resiliently supported retrograde movement preventing means disposed in the path of the box and below the last mentioned means whereby upon the recession of the plunger, the box is held in a fixed position relatively to the receiving means, said latter means being automatically released as the plunger with the next succeeding box enters the preceding box held by the latter means.

2. In a folding machine for box blanks, including a plunger, a flap folding and blank directing means disposed in the path of the plunger, means for receiving the finished box and retaining it to receive telescopically the next succeeding box, and means disposed in the path of the plunger for operating to release the receiving means to permit of the nesting within the box of the next succeeding box and without undue pressure upon the box so received.

3. A folding machine for box blanks, including a plunger, a flap folding and blank directing means disposed in the path of the

plunger, means for receiving the finished box and retaining it to receive telescopically the next succeeding box, means disposed in the path of the plunger for operating to release the receiving means to permit of the nesting within the box of the next succeeding box and without undue pressure upon the box so received, and means disposed in the path to engage the box while upon the plunger to receive the same from the plunger as the plunger recedes.

4. The combination with a blank conveyer, of a folding mechanism, including a reciprocatory plunger, flap folding and blank directing means disposed in the path of the plunger, operating means for the plunger, and means carried by the conveyer and operably connected to the operating means for setting in motion the operating means and plunger after the blank has been placed to be acted upon by the plunger.

5. A box folding machine, including a support, a reciprocatory plunger carried thereby, flap folding and blank directing means carried by the support in coöperative relation to the plunger, means for reciprocating the plunger, means for automatically retarding the return movement of the plunger, means for receiving and holding a blank to receive the plunger, and means operated by the plunger reciprocating means to remove it from the path of the plunger during its reciprocatory movements.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

HARRY A. INMAN.

Witnesses:

CHAS. E. HARDIES,
MARIE B. SNYDER.