

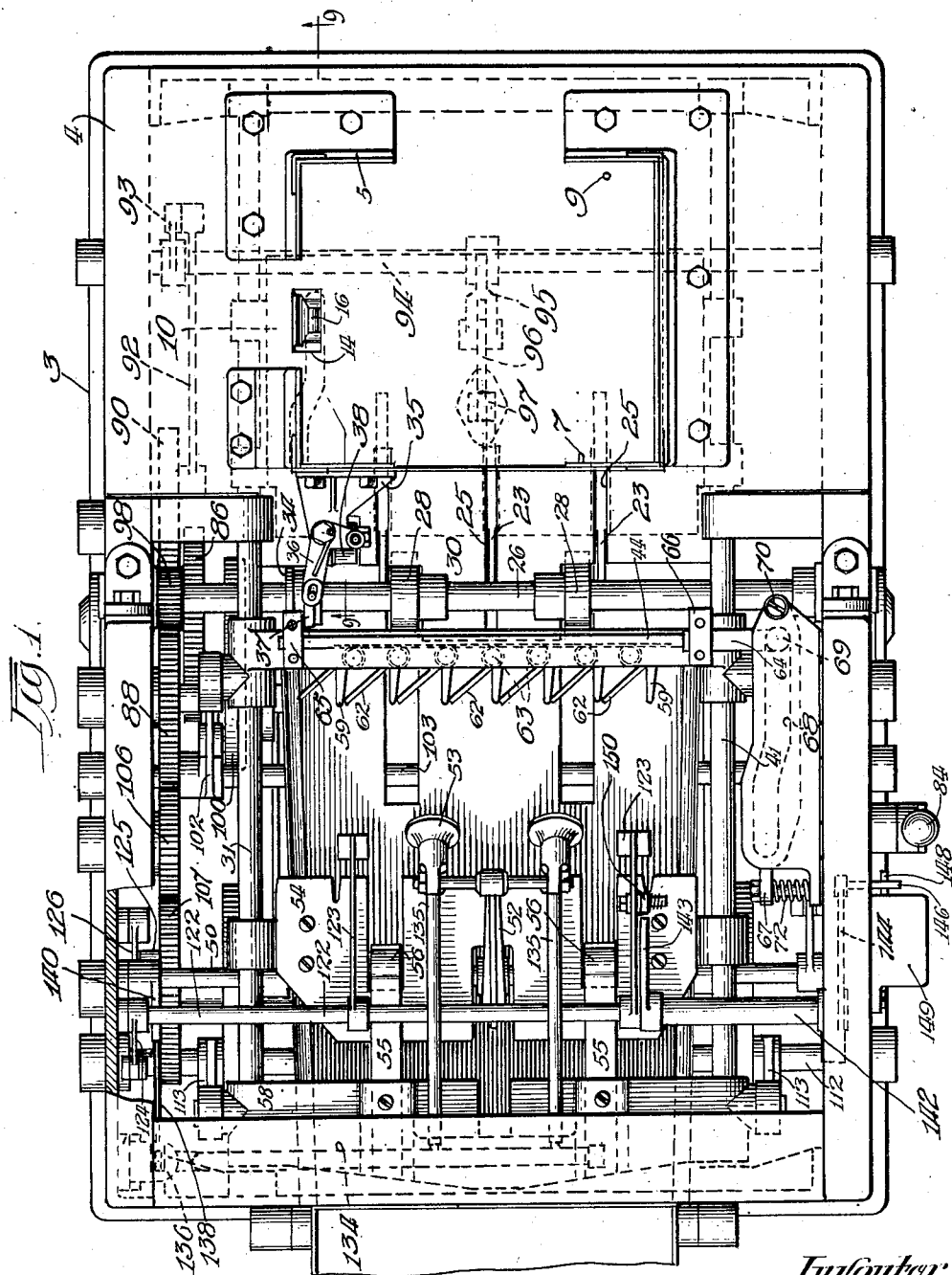
Oct. 22, 1935.

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2,018,396

AUTOMATIC CARTON SETTING-UP MACHINE

Original Filed June 20, 1931 16 Sheets-Sheet 1



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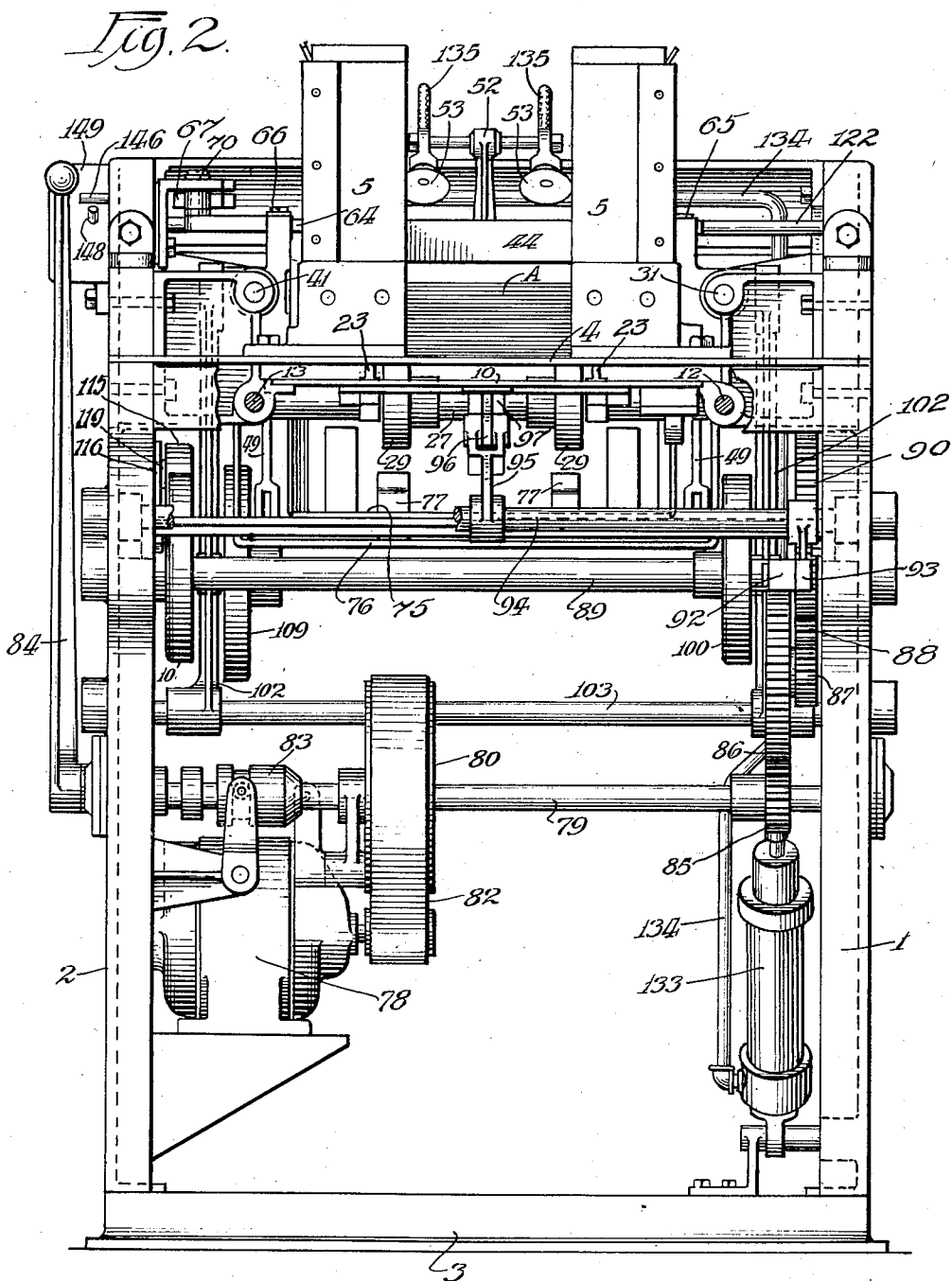
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AUTOMATIC CARTON SETTING-UP MACHINE

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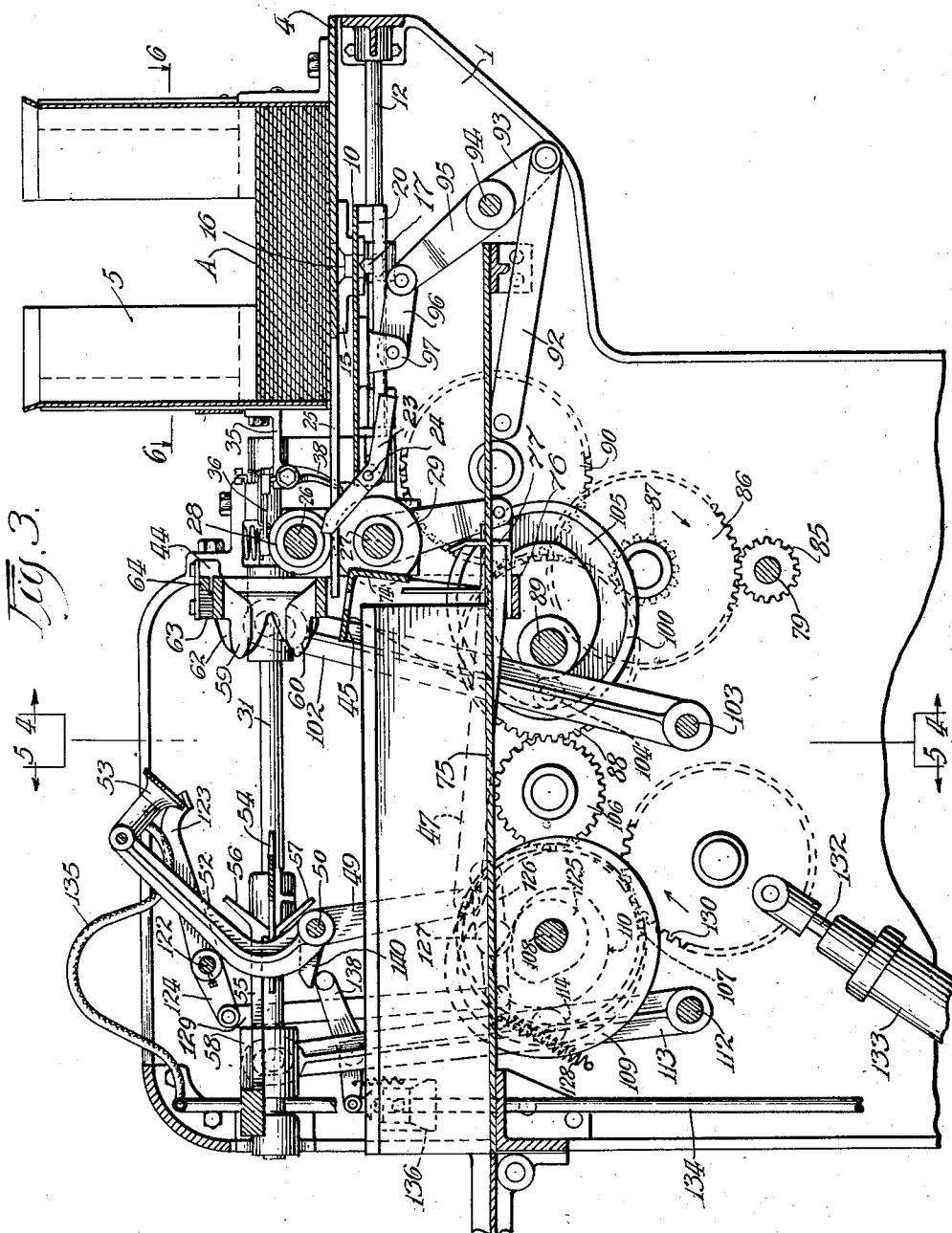
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AUTOMATIC CARTON SETTING-UP MACHINE

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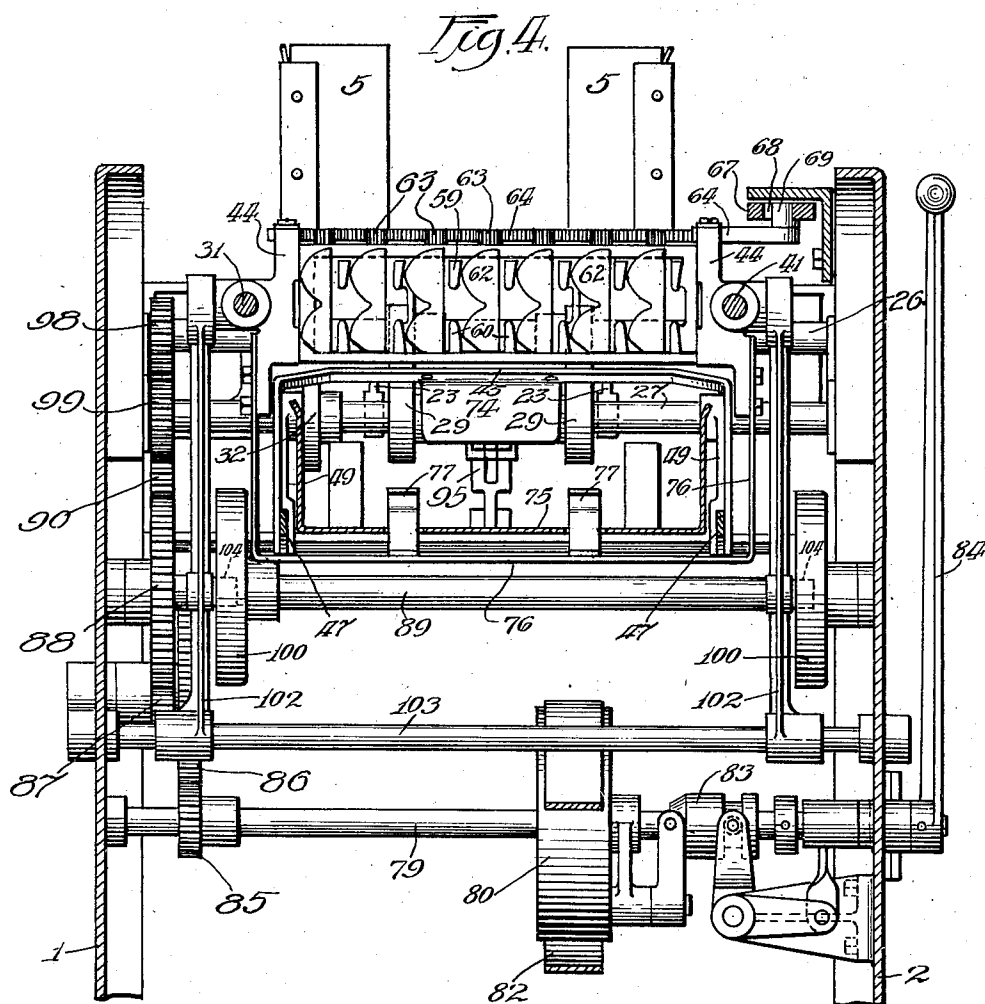
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AUTOMATIC CARTON SETTING-UP MACHINE

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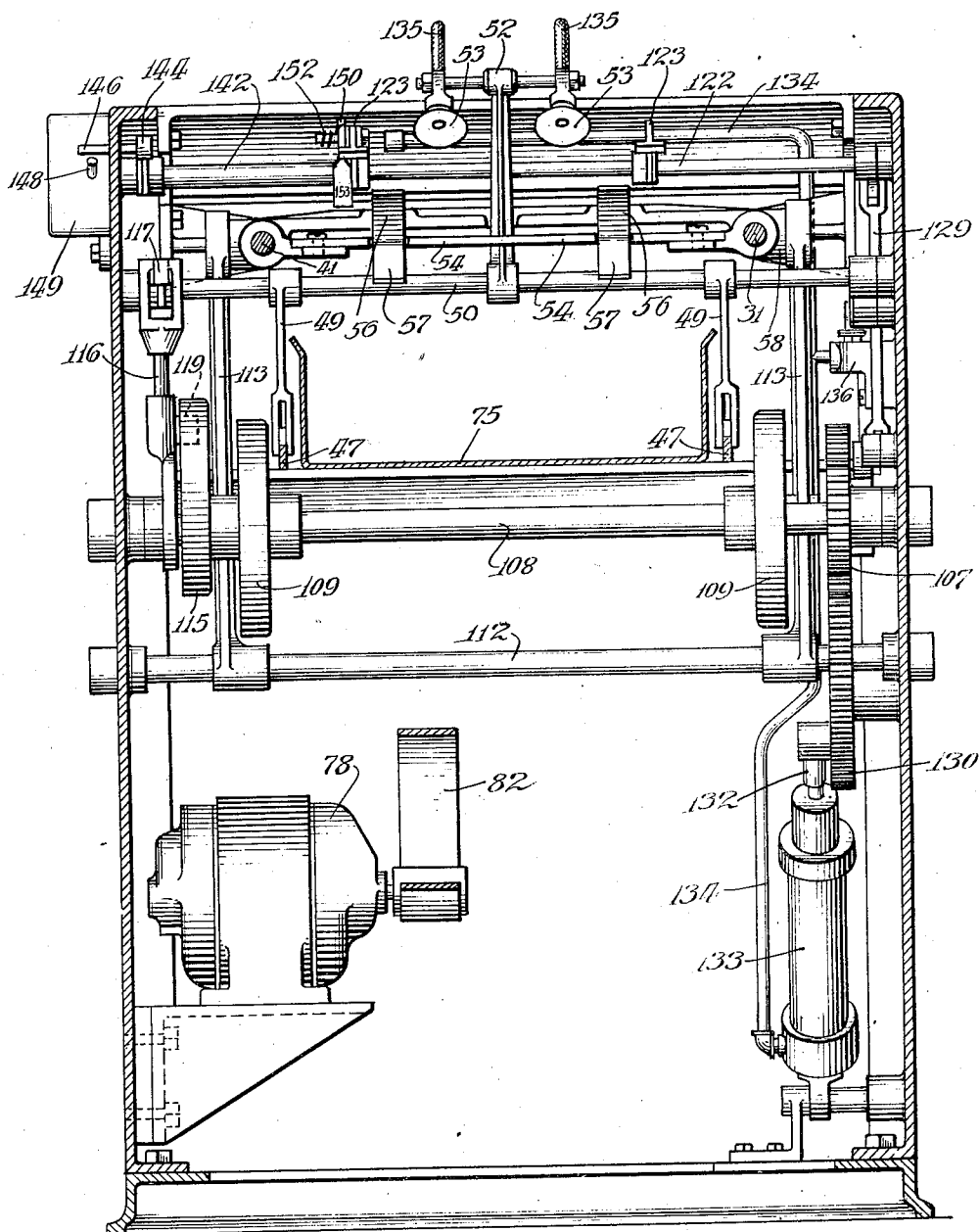
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AUTOMATIC CARTON SETTING-UP MACHINE

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Fig. 5.



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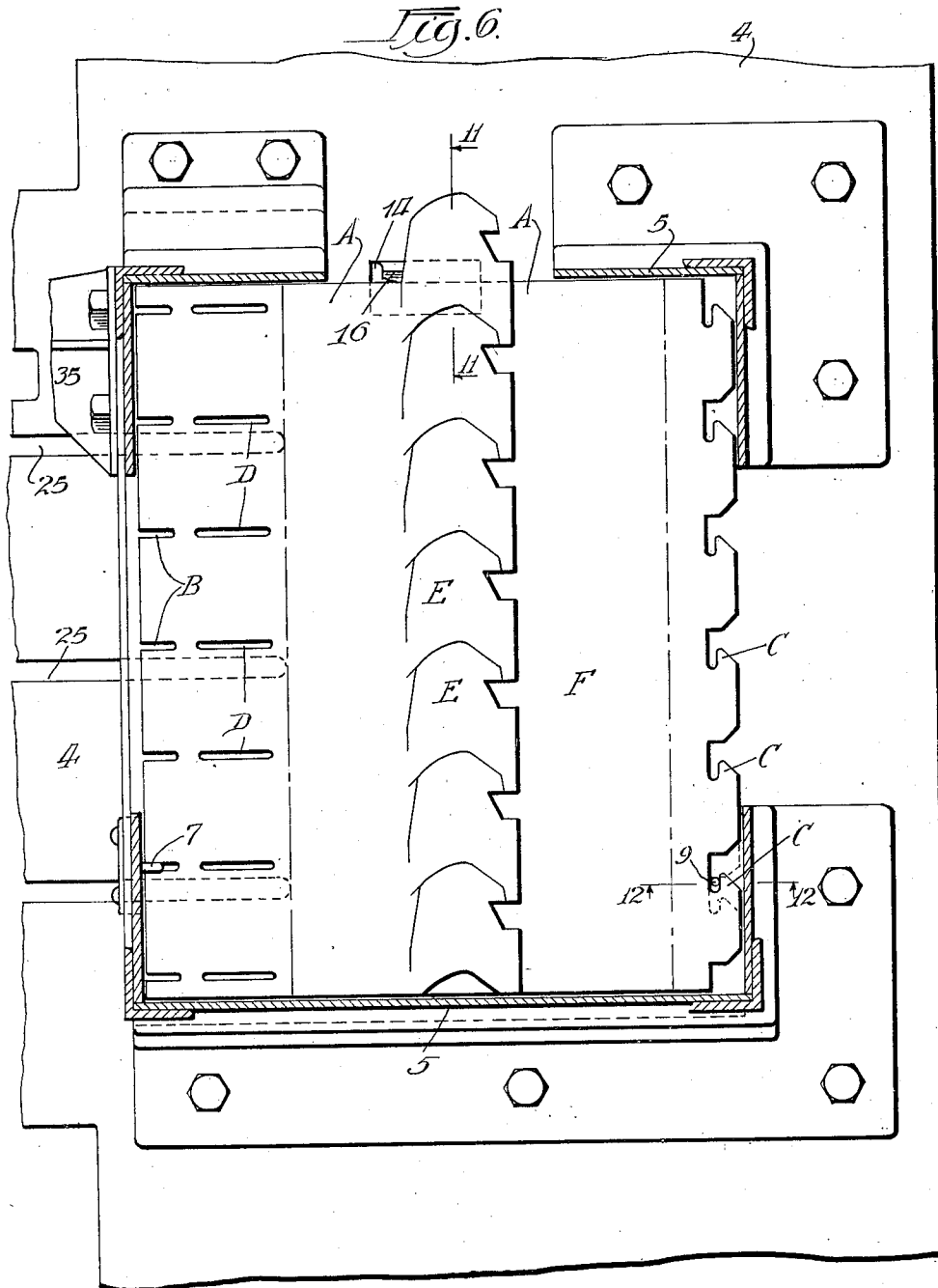
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AUTOMATIC CARTON SETTING-UP MACHINE

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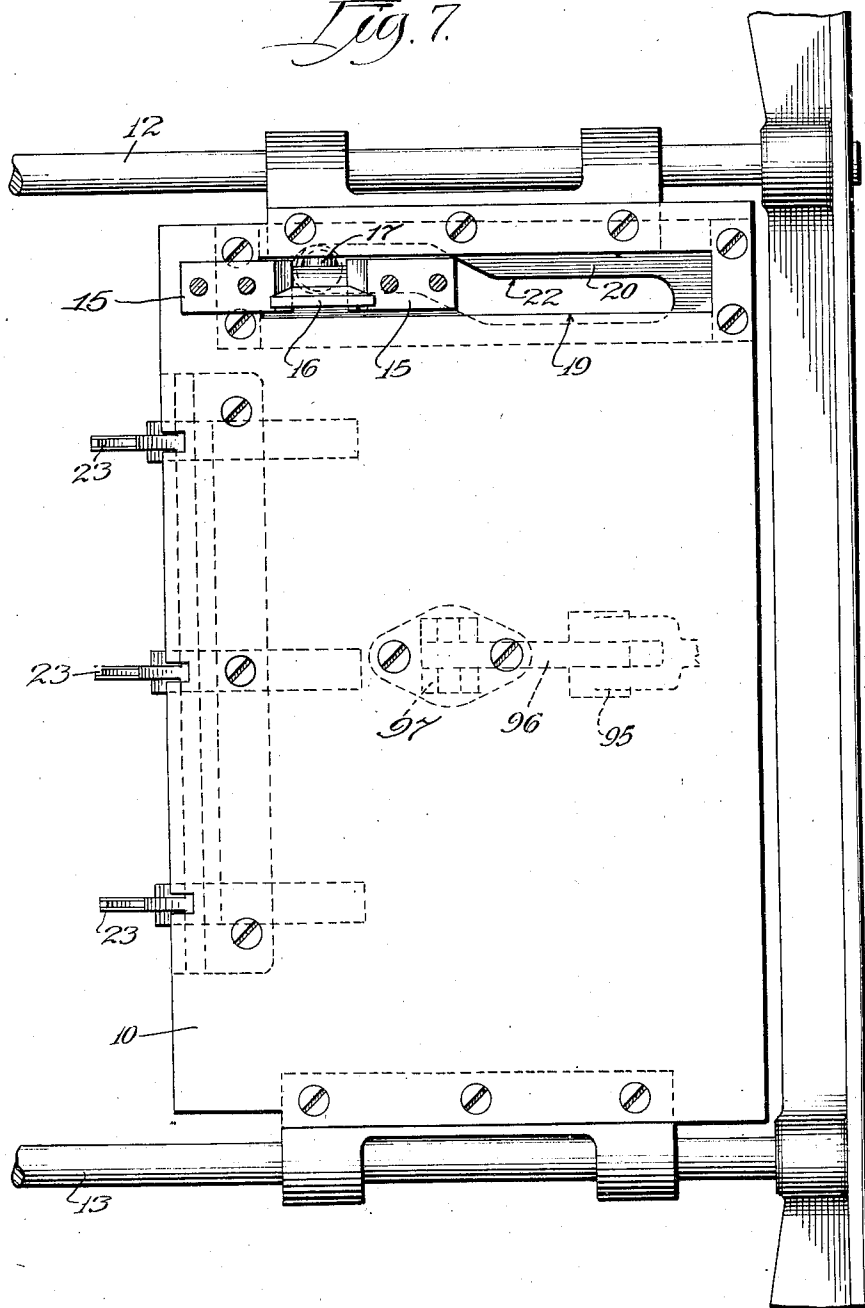
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AUTOMATIC CARTON SETTING-UP MACHINE

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Fig. 7.



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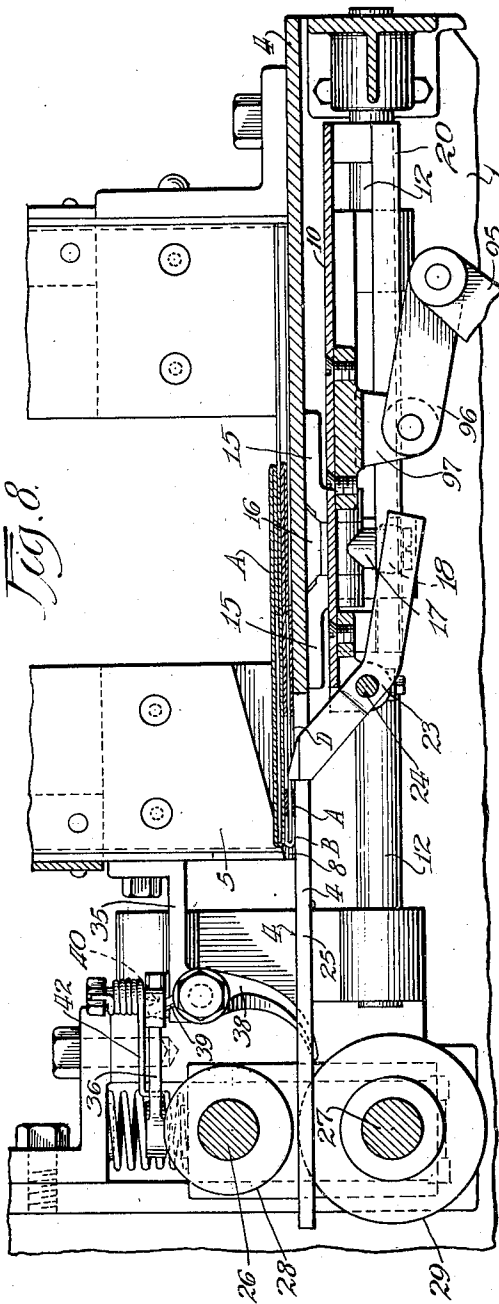
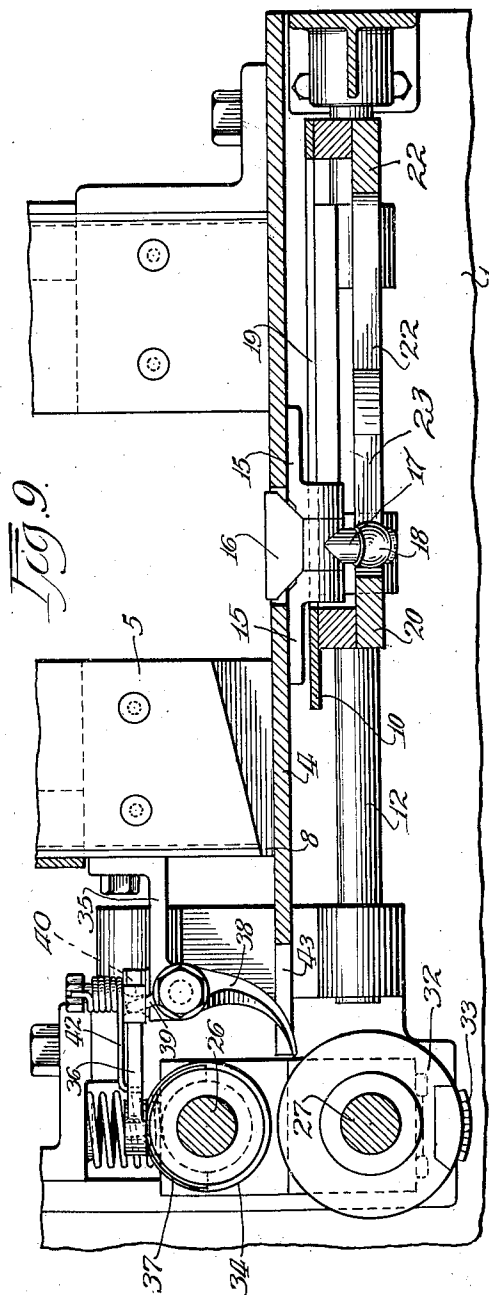
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AUTOMATIC CARTON SETTING-UP MACHINE

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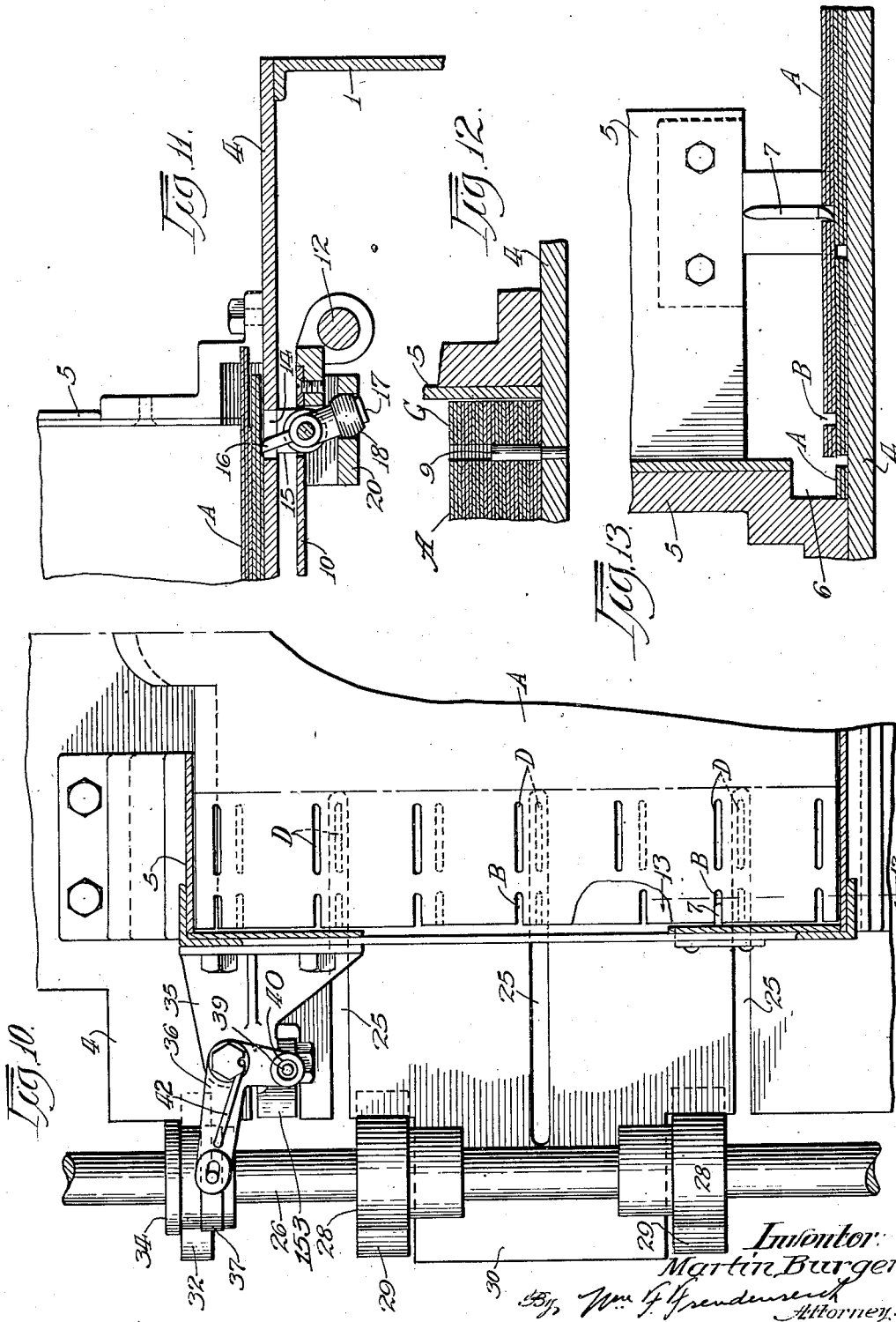
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AUTOMATIC CARTON SETTING-UP MACHINE

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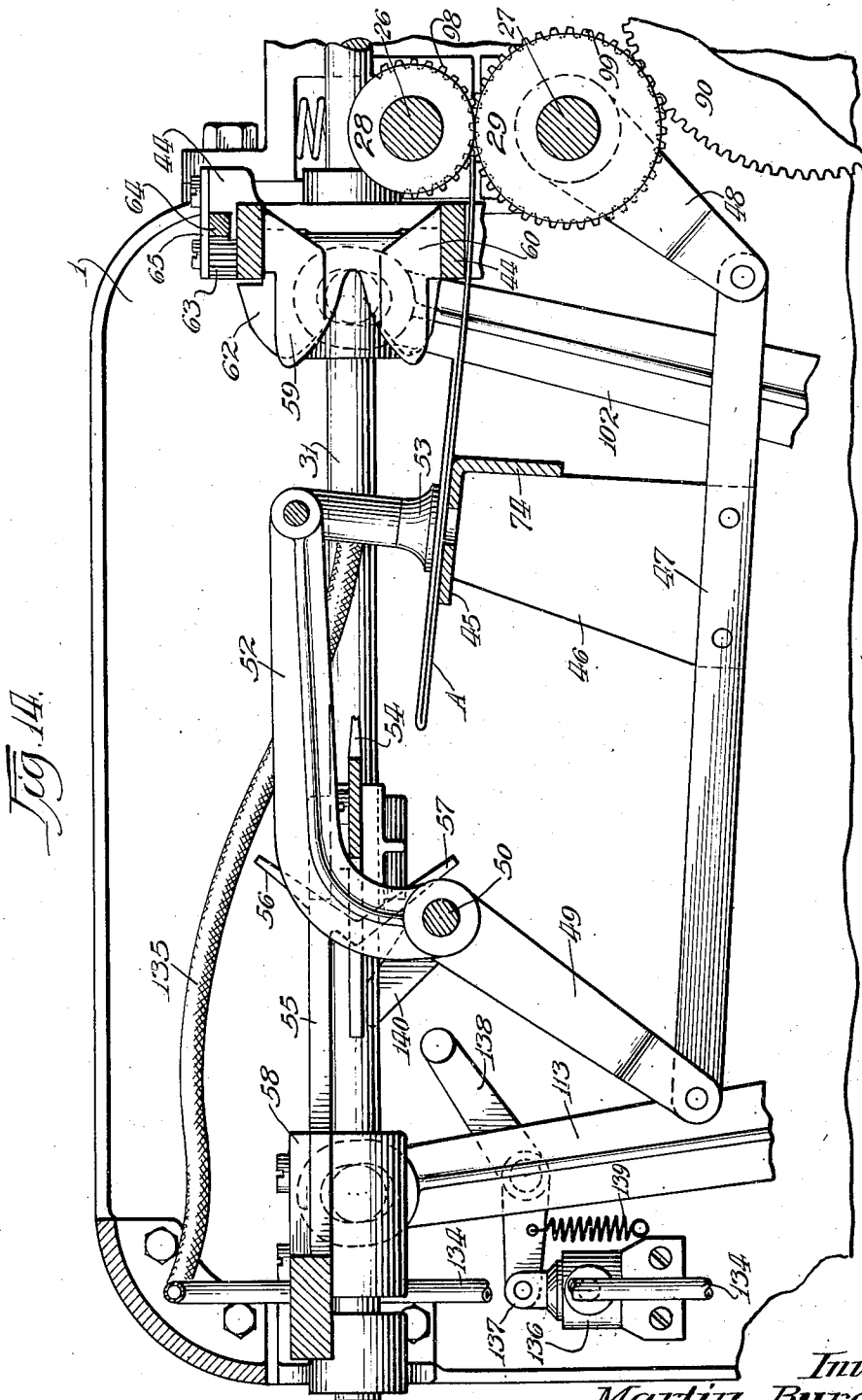
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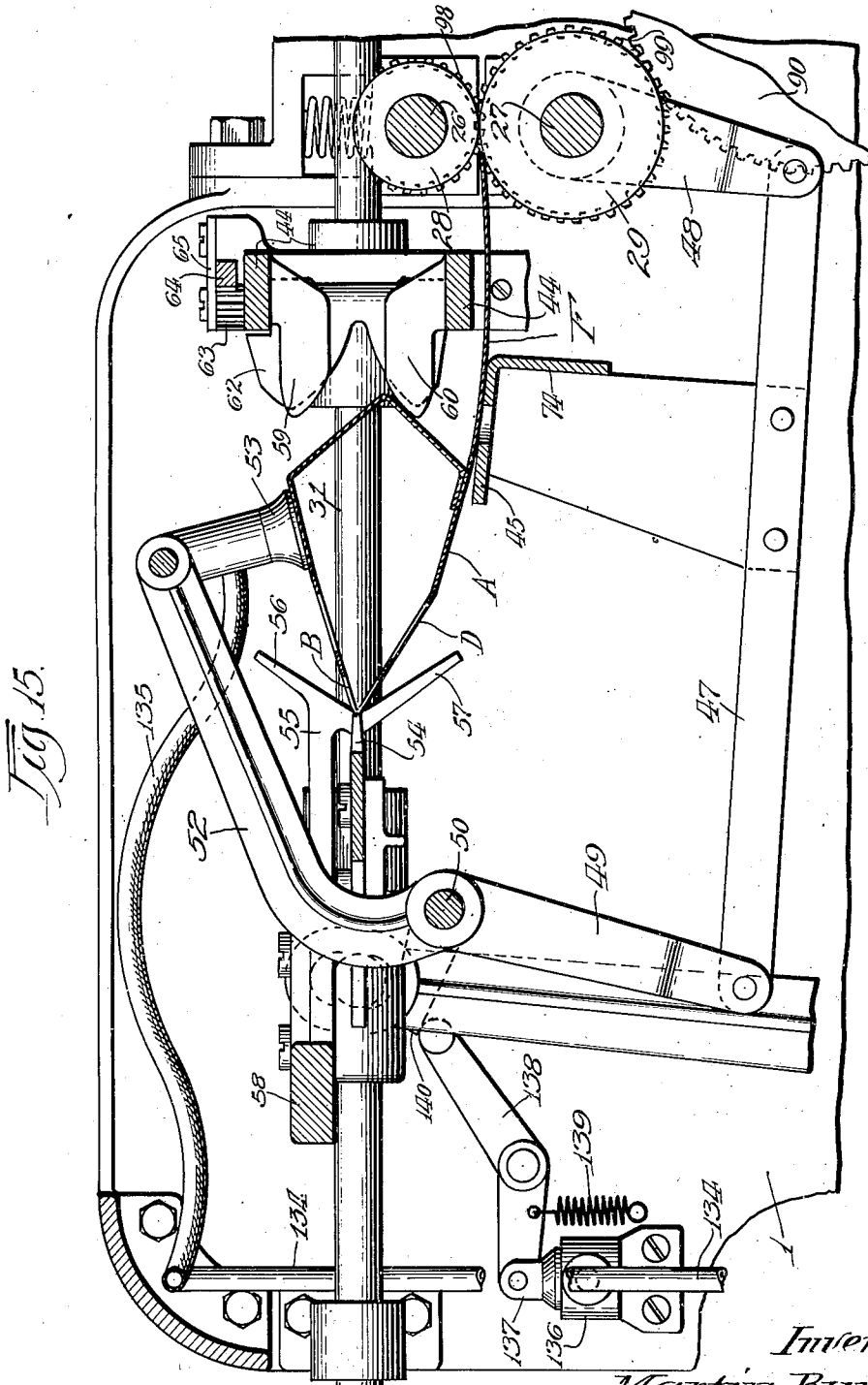
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AUTOMATIC CARTON SETTING-UP MACHINE

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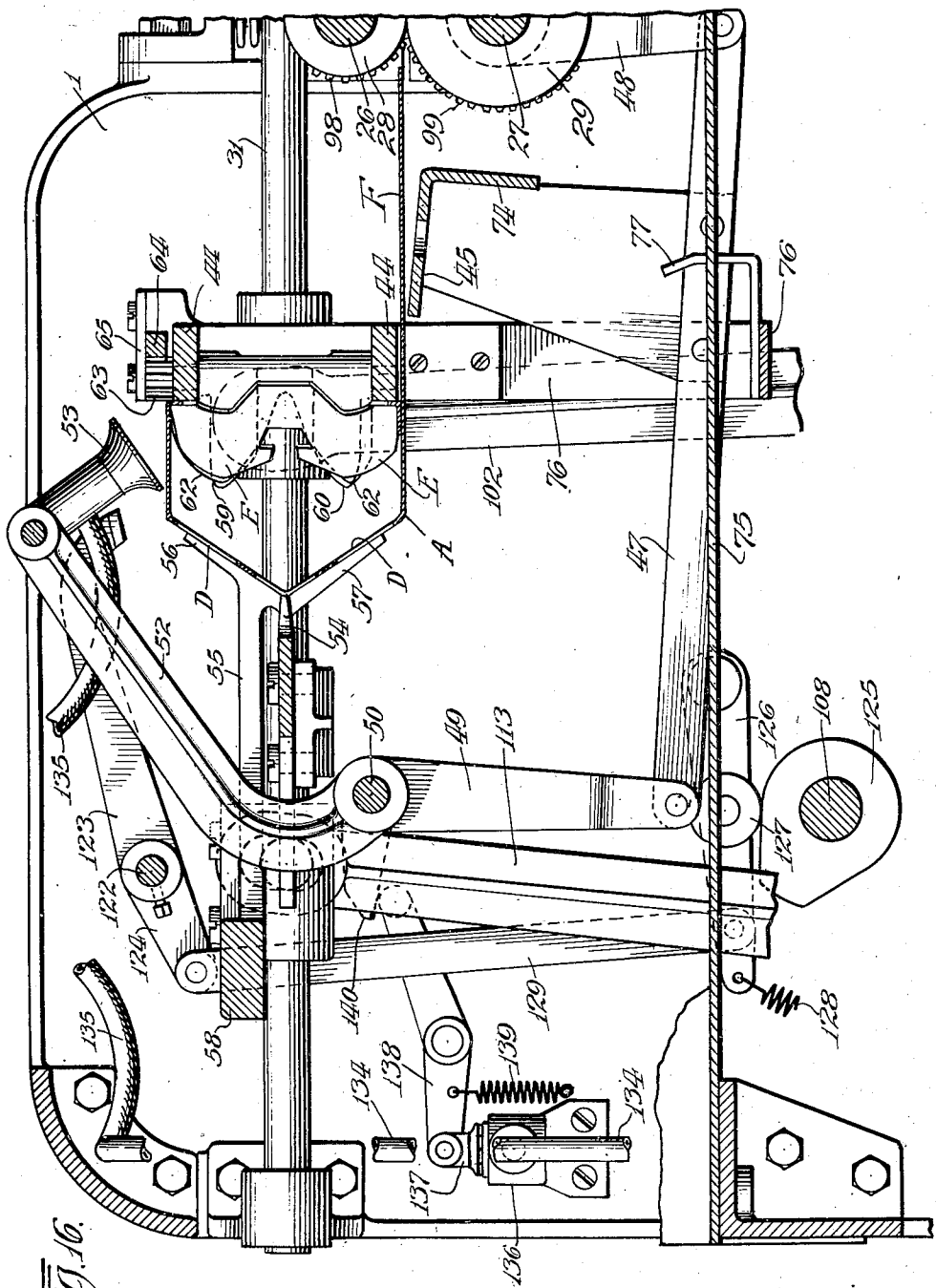
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AUTOMATIC CARTON SETTING-UP MACHINE

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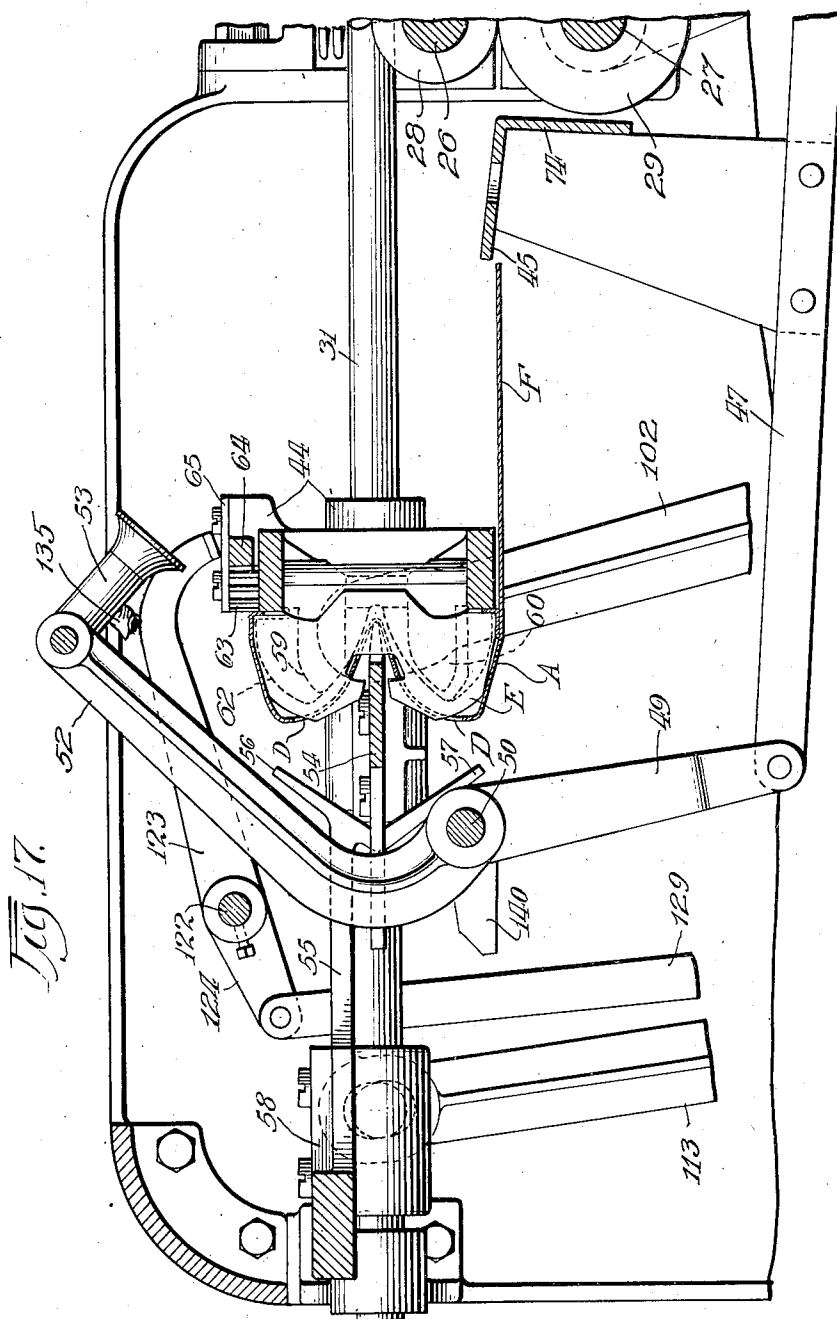
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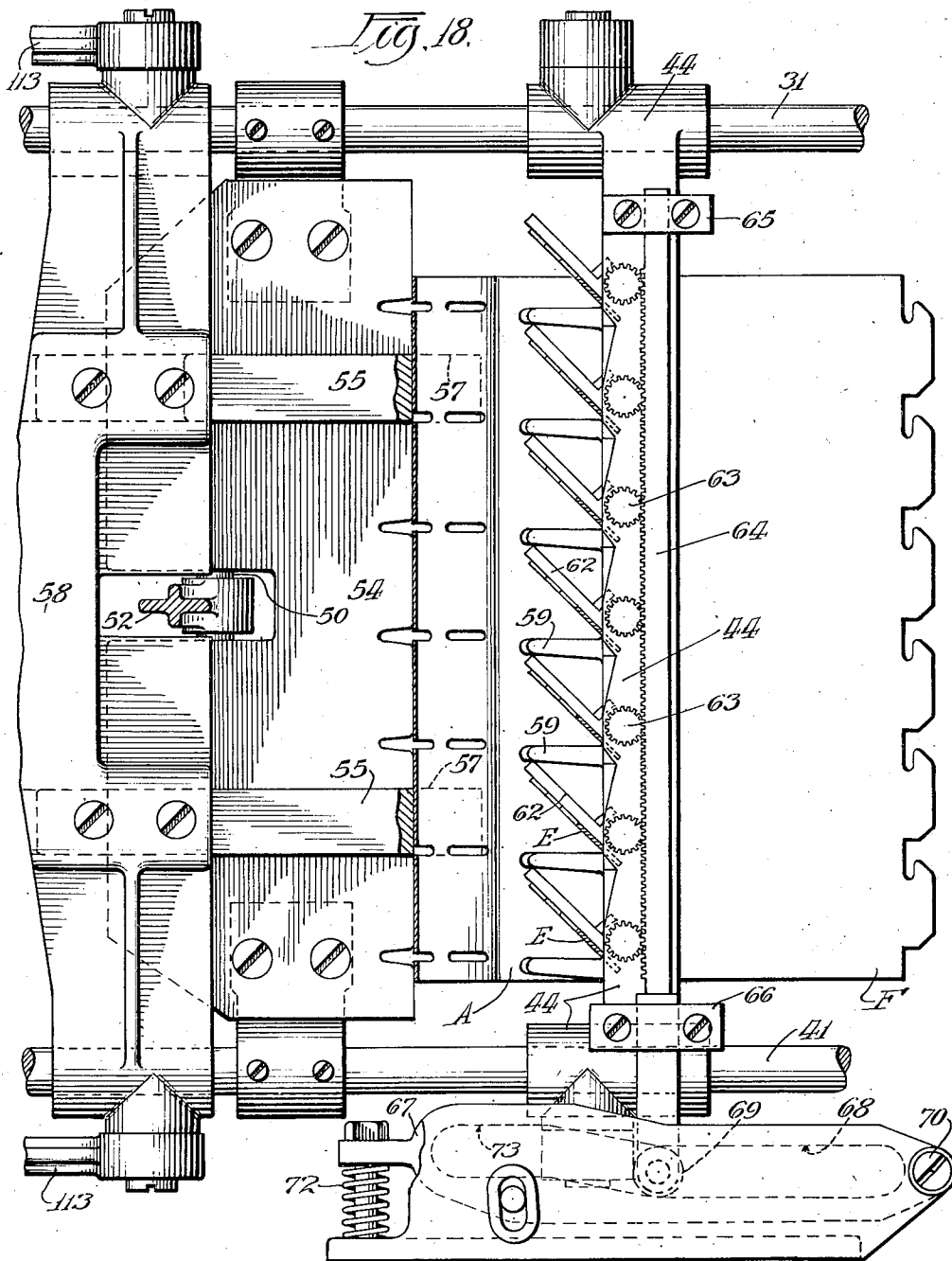
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AUTOMATIC CARTON SETTING-UP MACHINE

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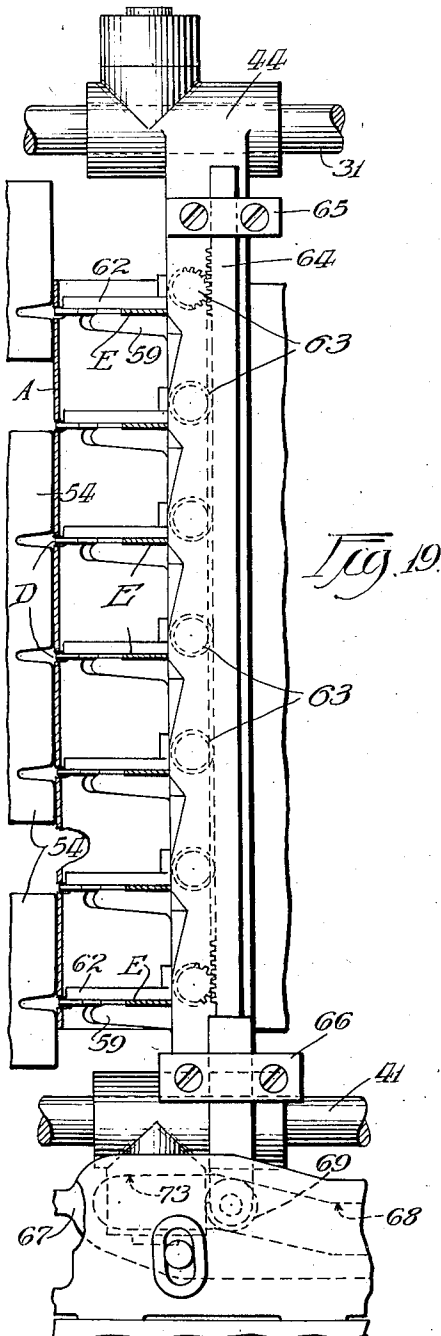
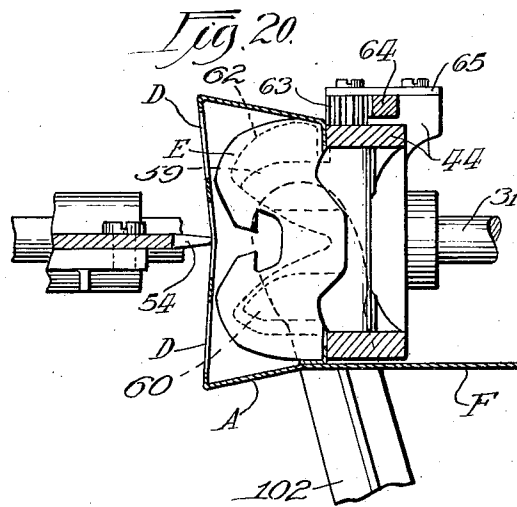
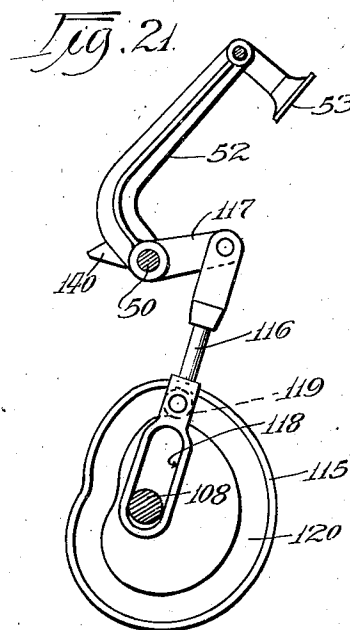
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AUTOMATIC CARTON SETTING-UP MACHINE

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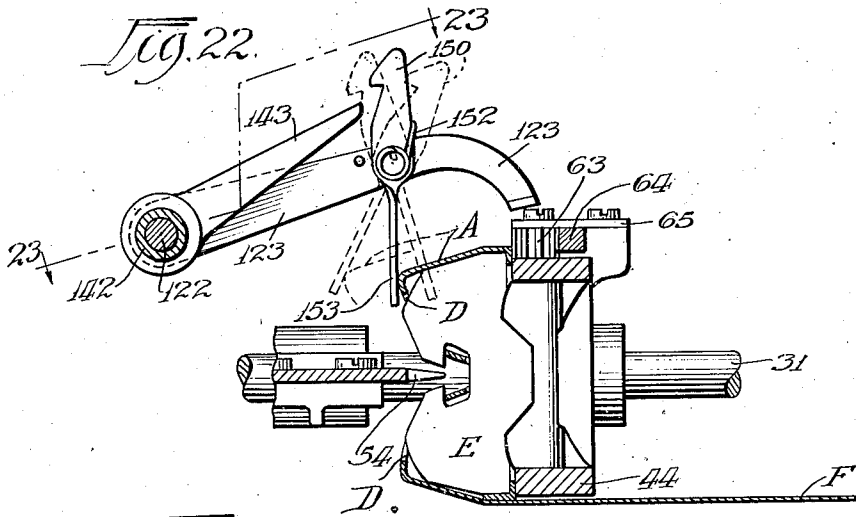
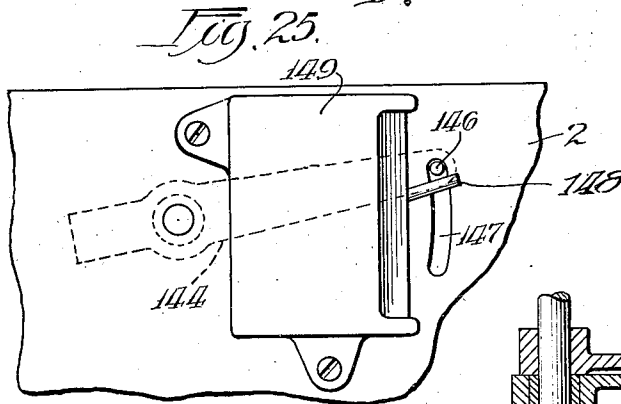
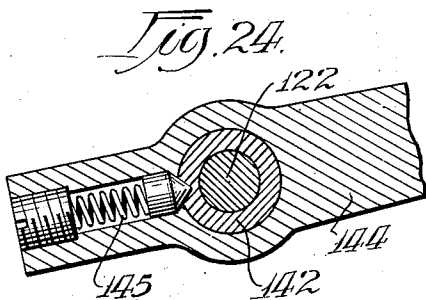
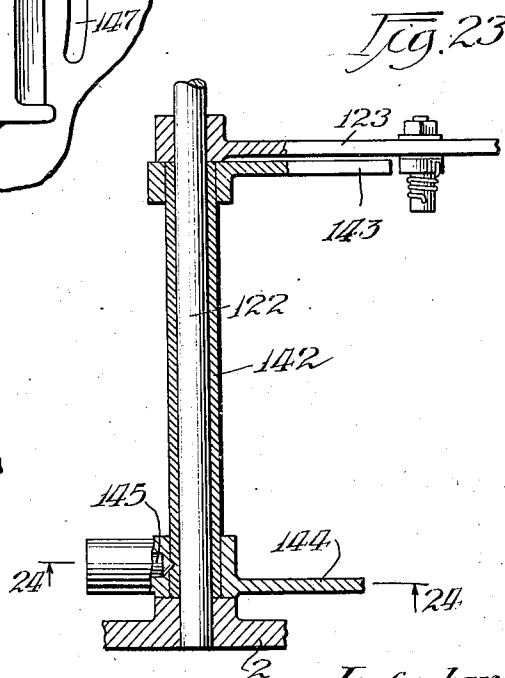
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AUTOMATIC CARTON SETTING-UP MACHINE

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UNITED STATES PATENT OFFICE

2,018,396

AUTOMATIC CARTON SETTING-UP
MACHINE

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Application June 20, 1931, Serial No. 545,788
Renewed February 17, 1933

34 Claims. (Cl. 93—37)

Cartons, particularly of the cellular type adapted to contain eggs, are used in such large quantities that they must be shipped in a collapsed form and be set up by the packer of eggs in order to place them in condition to receive their contents. Since a great many millions of these cartons are used annually, it is desirable to provide means for automatically setting them up, with no more manual labor than that required to pile the collapsed or flattened cartons in stacks. The object of the present invention is to produce a simple and novel machine that will automatically open out and set up collapsed cartons delivered to it in any convenient way.

About the simplest way of handling the cartons preparatory to setting them up is to pile them in stacks; and, viewed in one of its aspects, the present invention may be said to have for its object to produce a simple and novel machine for automatically removing folded or collapsed cartons, one at a time, from stack formation and setting them up ready for their final use.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of my invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a top plan view of a machine embodying the present invention; Fig. 2 is an elevation of that end of the machine to which the flattened cartons are delivered; Fig. 3 is a central longitudinal section through the machine; Figs. 4 and 5 are sections taken on lines 4—4 and 5—5 of Fig. 3, respectively, looking in the direction of the arrows; Fig. 6 is a section, on an enlarged scale, on line 6—6 of Fig. 3; Fig. 7 is a top plan view of the carton-feeding slide and its guides, the same lying directly below the part of the frame of the machine shown in Fig. 6; Fig. 8 is a view similar to Fig. 3, on a larger scale, showing only a fragment of the machine with the carton-feeding slide in a different position than in Fig. 3; Fig. 9 is a section taken approximately on line 9—9 of Fig. 1, on the same scale as Fig. 8, and with the parts in the same positions as shown in Fig. 8; Fig. 10 is a section on the same plane as Fig. 3, showing only a fragment of the stack support but including portions of the feed rolls and printing device for marking the cartons; Fig. 11 is a section taken approximately on line 11—11 of Fig. 6; Fig. 12 is a section on line 12—12 of Fig. 6; Fig. 13 is a sec-

tion on line 13—13 of Fig. 10; Figs. 14, 15, 16 and 17 are sections on the same plane as Fig. 3, being on a larger scale, and each showing only that part of the machine comprising the setting-up and ejecting mechanism, showing different positions in each of these four figures; Fig. 18 is a top plan view of the setting-up mechanism in the position shown in Fig. 16, the stationary frame of the machine being omitted and a carton being shown in section in the setting-up mechanism; Fig. 19 is a view similar to Fig. 18, a smaller fragment being shown, the parts being in different positions, and all of the body of the carton, except the cross partitions, being omitted; Fig. 20 is a section on the same plane as Figs. 16 and 17, showing only a small fragment of what appears in these figures, and indicating a position of the parts which is intermediate between the positions of Figs. 16 and 17; Fig. 21 is a detail, showing the operating mechanism for the knock-out arms; Fig. 22 is a vertical longitudinal section through the setting-up mechanism in a closed condition, together with one of the knock-out arms and an automatic stop of which the catch is shown in several positions in full and dotted lines; Fig. 23 is a section on line 23—23 of Fig. 22; Fig. 24 is a section, on a larger scale, on line 24—24 of Fig. 23; and Fig. 25 is a side elevation of a fragment of the machine at one end of the automatic stop device.

In the drawings, there is illustrated a machine in which the invention is embodied in a form particularly adapted for setting up a well known form of one-piece, cellular egg carton, in which the bottom is an inverted V in cross section and is provided with slots through which project hooks on transverse partitions hung from their upper ends on the front and rear walls of the carton; the cartons being delivered to the user in a flattened condition whose thickness is no greater at any point than the combined thickness of three layers of the cardboard or paper stock of which the cartons are made; and, for the sake of brevity, the present invention will be described in connection with this particular machine.

Referring to the drawings, 1 and 2 represent vertical side members, and 3 a base member of a box-like frame open at the front and rear ends and at the top. Extending across the top of this frame at one end, which will hereinafter be referred to as the rear end, is a horizontal table or platform 4 on which a stack of cartons A is adapted to be supported, and from which the folded or collapsed cartons are adapted to be fed forward, from the bottom of the stack, one at a time. The

stack of cartons is accurately positioned on the table by a box-like structure 5 rising from the table and open at the top. In the arrangement shown, wide central panels, extending from the top to the bottom, are left open at the front and rear ends at one side of the box-like structure.

As best shown in Figs. 10 and 13, the interior of the carton-centering structure 5 is abruptly widened, transversely of the machine, just above the table, to enable the lowermost carton to be shifted laterally; this abrupt widening forming, at one side at least, a pocket 6 into which the adjacent edge of a carton may enter through a lateral movement across the table. In Fig. 13, there are shown two collapsed cartons, of which the lowermost has been shifted laterally into the pocket, whereas the upper one has not yet been shifted. As will appear from Figs. 6 and 10, the forward edge of each collapsed carton has therein notches B. On the inner face of the forward wall of the box 5 is a projecting vertical rib 7 which enters corresponding notches B in the cartons as they are dropped down into the box. As best shown in Fig. 13, this rib 7 does not extend down to the table but terminates at a point spaced apart from the table a distance equal to or slightly greater than the thickness of one collapsed carton. Therefore, the lowermost carton is free from this rib or projection, whereas the overlying cartons that are in registration with the pocket 8 are restrained from moving laterally into the pocket by the rib or projection.

The feeding movement of the cartons is in the forward direction, the forward wall of the box 5 being cut away just above the table, as clearly shown in Figs. 8 and 9, to provide a slot 8 extending across the width of the box and just wide enough, in its vertical dimension, to permit a carton on the table to slide forward through the same. The front wall of the box may hold back the second carton from the table. However, additional holding means have been provided to restrain all of the cartons except the lowermost one. As clearly shown in Fig. 6, the cover member of the carton projects rearwardly from the body portion, in the position which the carton occupies in the stack, and the extreme rear edge of the cover has thereon a series of hooks C. Rising from the table, as shown in Fig. 6 and also in Fig. 12, is a pin 9 that engages one hook on each of several cartons at the bottom of the stack and thus prevents them from being pushed forward. However, the lateral movement which may be given the lowermost carton, as heretofore explained, will release from the pin that hook thereon which was previously engaged with the latter, so that the lowermost carton is left quite free to be pushed out from under the stack. In Fig. 6, the carton is shown in full lines in locking relation to the pin 9 and in dotted lines in a laterally shifted position free from the pin.

The lateral shifting of the lowermost carton of the stack, and the forward feeding thereof, is produced by a slide 10 underlying the table 4 and supported at its ends on a pair of long stationary cylindrical rods 12 and 13 extending throughout the entire length of the machine near opposite sides thereof.

The means for shifting the lowermost carton laterally will first be described. As shown in Figs. 7, 9 and 11, the table has therein an opening 14 that is only partially covered by that portion of the lowermost carton on the opposite side from that which is pushed into the pocket 6. Mounted in a bracket 15 on the under side of the table, so

as to be capable of oscillating about an axis extending lengthwise of the machine, is a carton shifter consisting of a finger 16 projecting up through the hole 14 and a depending stem 17 having thereon an anti-friction roller 18; the finger extending upwardly from the pivotal axis and the stem extending downwardly from this axis. When the lowermost carton settles on the table, the finger 16 will lie just outwardly from the adjacent side edge of the lowermost layer of the carton. Then, if the shifter be swung in the counter-clockwise direction, as viewed in Fig. 11, it will push the lowermost carton laterally and place it in a position to be fed forwardly by other means. The shifter may conveniently be actuated by a suitable cam device on the slide 10. In the arrangement shown, the slide has a long side slot 19 extending in the direction of the length of the machine, through which slot the bracket 15 and the shifting device extend; thus permitting the slide to move back and forth. On the under side of the slide is fixed a plate 20, having therein a cam groove 22 within which lies the anti-friction roller 18 on the shifting device. This cam groove is so shaped that, when the slide is at the rear end of its movement, the finger of the shifting device lies in the position shown in Fig. 11, namely, at the end of its working stroke. As the slide moves forward through somewhat less than half of its stroke, no change in position in the shifting device occurs. As the slide continues to move forward, the shifting device is quickly swung in a clockwise direction, as viewed in Fig. 11, through its return stroke, and is, therefore, made ready to engage with the next carton that reaches the table. During the remainder of the forward stroke of the slide, no change in the shifting device takes place, nor does it during the first part of the return stroke. Only after almost half of the return stroke of the slide has been completed, does the cam operate again to swing the shifting device through a working stroke. In other words, the means for shifting the lowermost carton laterally operates only after a carton has been pushed forward by the slide, as will hereinafter be explained, and the slide is well on its return stroke; thereby insuring that there will be no effort made to shift a carton laterally until the preceding carton has been completely removed.

The forward feed movement of the lowermost carton at the bottom of the stack is accomplished by a plurality of dogs 23, each connected by a pivot 24 to the slide, between the ends of the dog and at the forward edge of the slide, as best shown in Figs. 7 and 8. These dogs are shown as being counterweighted, so that their forward ends or noses tend constantly to rise above the top of the slide, but will yield in the manner of a trailing pawl during the back stroke of the slide. Each folded or collapsed carton has therein, inwardly from the forward edge, closed slots D extending lengthwise of the machine where the cartons are in stack formation. The table 4 has therein a series of longitudinal slots 25 corresponding in number and in position, transversely of the machine, to the dogs 23, these slots extending from the front end of the table rearwardly to a point underneath the stack of cartons, as best shown in Fig. 8. The parts are so proportioned that, when the cartons are placed on the table, the slots D do not register with the slots 25 in the table, but, when the lowermost carton is shifted laterally, as indicated in dotted lines in Fig. 10, certain of the slots D in the carton are brought directly above the slots 25 in the table. The parts are also so

proportioned that, whenever the slide is in its retracted position, the noses of the dogs 23 press up against the under side of the lowermost carton so that, as soon as the lowermost carton 5 is shifted laterally, the noses of the dogs enter the corresponding slots D. Then, when the slide is moved forward, the dogs push the lowermost carton ahead, and from beneath the stack. On the return movement of the slide, the dogs simply trail 10 idly in the manner of a trailing pawl.

In front of the table are two transverse shafts 26 and 27, one above the plane of the table and the other below this plane. On the shafts are cooperating feed rollers 28 and 29, respectively. 15 These feed rollers may be made comparatively short, so that an extension 30 at the front end of the table may project forward through the space between cooperating pairs of rollers 28 and 29. These rollers being suitably driven, it will be seen 20 that, as a carton is pushed forward along the table, it will be gripped between the feed rollers and moved ahead still farther, or at least until its trailing end leaves the rollers.

In packaging eggs, it is desirable that the date 25 on which a box was filled be marked on the box or carton. I have therefore, provided means whereby a date or other information may be printed on each carton as it passes through the feed rollers. Cartons set up by machines of this kind are 30 filled when and as delivered by the machine, so that the date of filling will be the same as the date of setting them up. This printing device, as shown in Figs. 8-10, consists of a rotary head 32 having thereon a die 33. Above the rotary head, 35 on the shaft 26, is a pressure roller 34. Each carton, as it passes between the printing head and the pressure roller, receives the impression of the die. In order to save wear, in case no carton is passing through the machine, means are provided for 40 holding the pressure roller 34 clear of the printing head, except at times when a carton is present. In the arrangement shown, there is a bracket 35 fixed to the front side of the box 5. On this bracket is pivoted a horizontal bell crank lever 45 36, on one end of which is a device 37 adapted to shift the roller 34 lengthwise of the shaft. Hanging down from one side of the bracket is a forwardly curved arm 38 having at the top a pin 39 extending into a hole 40 in one arm of the bell crank lever. A spring 42, acting on the bell crank lever, tends constantly to hold it in a position wherein the pressure roller 34 lies at one side of 50 the printing head 32, as shown in Fig. 10. The spring, acting through the bell crank lever, swings the arm 38 so that its lower end projects down through a slot 43 in the table. When a carton comes along, the forward edge thereof engages with the arm 38, swinging the lower end of the arm forward and up, and thereby moving the pressure roller 34 into its working position against the resistance of the spring. Therefore, while the controlling arm rests on a carton which is passing between the feed rolls, the printing mechanism will be operative to mark the carton, 65 but, at other times, will be idle and the die thus be saved from wear.

After leaving the feed rolls, the carton is engaged by a mechanism that opens it and sets it up. The operation, generally speaking, is partially to open up the carton, grip the transverse flaps or partitions and swing them parallel with the longitudinal axis of the machine, and then push in the bottom to give it the V form and interlock it with the partitions.

75 Fig. 14 shows a carton just leaving the feed

rolls. It will be seen that the trailing end, which is the cover section, underlies a transverse frame 44 which, as will be seen from Fig. 1, is slidably supported at its ends on stationary longitudinal guide rods 31 and 41 above the front portion of the machine and at opposite sides thereof. The forward part of the collapsed carton, namely, the body portion thereof, rests on a shelf 45 which, at the time, lies at some distance in front of the frame 44. The shelf 45 is supported from up- 10 rights 46 fixed to and projecting upwardly from points between the ends of a pair of long links, or connecting rods, 47 toward opposite sides in the machine. The rear end of each connecting rod is pivoted to the lower end of an arm 48 15 loosely hung at its upper end on the feed roll shaft 27. The forward end of each connecting rod is pivotally connected to the lower end of an arm 49 fixed to a transverse rocker shaft 50 lying at some distance above the connecting 20 rods. As the rocker shaft oscillates, the shelf will be moved back and forth, at the same time lowering and rising. Fixed to the middle of the rocker shaft is an arm 52 that extends upwardly and rearwardly, this arm having at its free end a 25 pair of suction cups 53, 53.

As will hereinafter be explained, by the time the carton reaches the position shown in Fig. 14, the shelf will have been moved forward and up and the suction cups will have been brought down into 30 contact with the top of the carton. Then, when the rock shaft turns in the counter-clockwise direction, as viewed in Fig. 14, the body of the carton will be lifted by the suction cups and will be partially opened, as indicated in Fig. 15. 35

In the plane of the longitudinal axes of the guides 12 and 13 is a transverse blade member 54. As the carton is raised, the central fold in the bottom wall is brought against the rearwardly facing edge of this blade member, the carton being guided into this position by rearwardly facing shoes 55, each having an arm 56 directed upwardly and rearwardly, and the second arm 57 directed downwardly and rearwardly; these arms meeting at a point in the plane of the blade member. 45 The shoes are fixed to and project forwardly from a slide 58 mounted on the guide rods 31 and 41, in rear of the blade member. When the carton reaches the position shown in Fig. 14, the shoes are retracted, but, as the suction cups move up, 50 the shoes travel rearwardly.

The blade member and the shoes cooperate with means carried by the frame member 44 to complete the opening and setting up of the carton. 55

The frame 44 includes separated, parallel upper and lower bars, between which are fixed a series of parallel vertical elements lying in planes extending lengthwise of the machine and cooperating with a corresponding number of movable 60 gripper elements to straighten out and hold the flaps that are to form the cross partitions of the carton. As best shown in Fig. 15, each of these stationary gripper elements consists of upper and lower blades or plates 59 and 60, spaced apart 65 from each other and projecting forward beyond the frame 44. Between the bars of the frame 44 are a series of swinging gripper elements 62, each journaled at its rear end in the upper and lower bars of the frame beside one of the stationary 70 grippers. On the upper trunnion or journal of each swinging gripper element, above the frame 44, is a pinion 63. A long rack bar 64, meshing with the pinions on all of the swinging grippers, is mounted on top of the frame for lengthwise 75

movements transversely of the machine. In the arrangement shown, as best seen in Fig. 18, the rack bar is held to the frame by guide straps 65 and 66 secured over the rack bar at opposite ends of the frame.

It will be seen that, by reciprocating the rack bar, the swinging grippers may be moved from the open positions shown in Fig. 18 to the closed positions of Fig. 19.

When the carton reaches the position shown in Fig. 15, the grippers are open, as in Fig. 18. The frame 44 then moves forward to the position indicated in Fig. 16, causing the carton to become more fully opened. During this movement of the frame and its grippers, the partially severed flaps E, that are in the V-shaped part of the carton facing the grippers in Fig. 15, engage the open swinging gripper wings or elements 62 and are turned partly into the interior of the carton, as indicated in Fig. 18. Further forward movement of the gripper structure to the position indicated in Fig. 17 then causes the grippers to close on the flaps E and set them parallel to the longitudinal axis of the machine, as shown in Fig. 19.

The means for operating the rack bar to close the grippers will now be described. On the frame of the machine beside the guide rod 13, and opposite one end of the rack bar 64, is a cam plate 67 having therein a cam groove 68 extending lengthwise of the machine. On the rack bar is a cam roll 69 riding in the cam groove. As the gripper structure moves forward between the positions indicated in Figs. 16 and 17, respectively, the cam shifts the rack bar and closes the grippers on the flaps or cross partitions of the carton. The cam plate may be hinged to the machine frame at one end, as indicated at 70, and be yieldingly held in its working position by a spring 72 at the other end. This arrangement enables the cam plate to yield after the rack bar has completed its working stroke and avoid objectionable stresses in the mechanism without requiring extreme accuracy in construction. It will be seen that the cam groove has a straight portion 73 along which the cam roll may travel while the gripper mechanism is travelling through the last half of the movement from the position indicated in Fig. 16 to that of Fig. 17.

When the grippers are closed on the flaps or cross partitions, the forward edges of the latter are brought into the same vertical longitudinal planes as the corresponding slots D in the bottom wall of the carton, as best shown in Fig. 20, which illustrates a position intermediate between those of Fig. 16 and Fig. 17. The shoes or pressure feet are retracted as the gripper mechanism moves ahead, so that only the blade element 54 is in contact with the bottom wall of the carton. Since this blade member is stationary, the continued forward movement of the gripper mechanism and the carton, from a position illustrated in Fig. 20 to that illustrated in Fig. 17, causes the bottom of the carton to be pressed in along its longitudinal center, and the hook elements on the flaps or cross partitions of the carton to pass through the slots D; the setting up of the carton being now complete.

It will be seen that the shelf or rest 45 lies slightly above the trailing end of the cover section F of the carton in Fig. 17. Therefore, when the gripper mechanism, with the carton held therein, moves backward, the cover of the carton will pass under the shelf and strike against a depending flange 74 on the latter. When the cover of the carton strikes this shelf, the rearward travel

of the carton is stopped and, therefore, the continued rearward movement of the gripper mechanism in which, in the meantime, the grippers have been opened, causes the gripper mechanism to strip or free itself from the carton which then falls down upon a suitable bed 75, best shown in Fig. 16. As appears in Figs. 4 and 16, there is a yoke 76 depending from the gripper frame 44, the cross piece of the yoke lying underneath the bed 75. On this cross piece are fingers 77 extending up through slots in the bed and adapted, whenever the gripper mechanism moves forward, to engage with a carton that has dropped down on the bed and move it forward to be discharged at the front end of the machine.

The mechanisms heretofore described may be operated in any suitable way and the suction of the lifting cups may also be controlled in any usual or suitable manner.

In the arrangement shown, the machine is driven from a motor 78 placed inside of the main frame toward the front and near the base. At about the middle of the machine, between the side frame members 1 and 2, is a transverse main shaft 79 having thereon a loose pulley 80 driven from the motor by a belt 82. This pulley may be clutched to the shaft by suitable means controlled by a clutch controller 83 operated by a suitable hand lever 84 at one side of the machine. The shaft 79 has thereon a pinion 85 meshing with a large gear wheel 86 to which is fixed a pinion 87. The pinion 87 meshes with a large gear wheel 88 on a transverse shaft 89. The gear wheel 88 meshes with a gear wheel 90 placed rearwardly therefrom.

As best shown in Fig. 3, there is a connecting rod 92 pivoted at one end to the gear wheel 90, while its other end is pivoted to the free end of an arm 93 fixed to and depending from a transverse rocker shaft 94 below the stack-supporting table 4 and slide 10. The rocker shaft 94 has a second arm 95 extending upwardly therefrom and connected by a link 96 to an ear or ears 97 on the under side of the slide 10. Therefore, whenever the motor is running and the clutch is in, the feed slide for the collapsed cartons will move back and forth, feeding cartons one at a time from a stack on the table.

As best shown in Fig. 15, the gear wheel 90 may also serve to drive the carton feed rolls; the shafts 26 and 27 having thereon gear wheels 98 and 99 which mesh with each other and one of which meshes with the gear wheel 90.

On the shaft 89 are two similar cams 100, 100, one at each side of the machine, for the purpose of reciprocating the gripper frame. As best shown in Figs. 3 and 4, there are two long connecting rods 102, 102, one at each end of the frame 44, the upper end of each rod being connected to the said frame and the lower end being journaled on a transverse shaft 103 placed forwardly of and below the shaft 89. Of course, the connecting rods may be fixed to the shaft 103 and the shaft be permitted to turn. On each of these connecting rods is a cam roll 104 extending into a continuous cam groove 105 in the corresponding cam member. Therefore, as the shaft 89 revolves, the gripper mechanism will move back and forth.

The gear wheel 88 meshes with an idler gear wheel 106 which in turn meshes with a gear wheel 107 on a transverse shaft 108 near the front end of the machine. On the shaft 108 are two cam members 109 each having a cam groove 110. Forwardly of and below the shaft 108 is a shaft

112 from which rise two connecting rods 113 whose upper ends are pivoted or hinged to the slide 58 that carries the presser feet or shoes 55. On each connecting rod is a cam roll 114 extending into the cam groove in corresponding cam member; whereby, as the shaft 108 revolves, the presser feet or shoes will be reciprocated in definite time relation to the movements of the carton feed and the gripper mechanism.

10 There is a third cam, 115, on the shaft 108. As best shown in Figs. 5 and 21, there is a rod 116 connected at one end to a radial arm 117 on the rock shaft 50 that carries the suction lifters, and having in its other end a long slot 118 through which the shaft 108 passes. On this rod is a cam roll 119 extending into an endless cam groove 120 in the cam 115. Therefore, as the shaft 108 revolves, the suction cups are raised and lowered.

20 In order to assist in stripping the cartons from the gripping mechanism after the cartons have been set up, suitable ejectors may be provided. In the arrangement shown, there is a transverse shaft 122 above the stationary blade member 54 and the slide 58. On this shaft are two arms 123, 123 extending rearwardly past the blade member. On one end of this shaft is a forwardly extending radial arm 124. On the shaft 108, in the plane of the arm 124, as best shown in Fig. 16, is a cam 125. Mounted above this cam is a swinging, approximately horizontal lever 126. Between the ends of the lever is a cam roll 127. A spring 128, acting on the free end of the lever, holds the cam roll down on the cam. The arm 124 is connected to the free end of the lever 126 by a connecting rod 129. Therefore, as the shaft 108 revolves, the arms 123 are swung up and down, striking against the top of a carton in the gripping mechanism as that mechanism moves back toward its receiving position.

40 A partial vacuum may be produced and broken in the suction cups as follows: The gear wheel 107 meshes with a gear wheel 130, below the same. The piston rod 132 of a suction pump 133 is connected to the gear wheel 130, eccentrically of the latter. As the gear wheel revolves, the pump operates. A conduit 134 from the pump is divided into two branches 135, 135, each of which communicates with one of the lifting cups 53. In the conduit 134 is a valve device 136 which, when open, breaks the vacuum at the cups. The movable member or valve stem 137 of the valve device is connected to one arm of a bell crank lever 138 pivoted to the main side frame member 1 and having its other arm extended upwardly and rearwardly to a point in front of the shaft 50. A spring 139, acting on the bell crank lever, normally holds the valve device closed, whereby the pump will draw air in through the suction cups. On the shaft 50 is a finger 140 which, when the shaft is turned to bring the suction cups near the upper limits of their movements, presses on the adjacent end of the bell crank lever and swings the lever in a direction to open the valve. However, when the cups are in their down positions or are rising to lift the carton into the setting up mechanism, the finger 140 is held clear of the bell crank lever. Thus, the valve is closed in Figs. 14 and 15, while the carton is being lifted, and is partially opened in Fig. 16, where the carton is shown as being held in the setting mechanism after delivery thereto by the suction lift.

75 It is desirable to be able automatically to stop the machine, in case the supply of cartons is ex-

hausted, or, if for any reason, no carton is delivered to the setting-up mechanism. Such stop means have, therefore, been provided, being shown in the general views, Figs. 1 to 5, and in detail in Figs. 22-25. Referring to these figures, it will be seen that there is loose on one end of the shaft 122 a long sleeve 142 having at one end a radial arm 143 lying beside one of the ejector arms 123 and at its other end a second radial arm 144 lying just inside of the main side frame member 2. The arm 144 is loose on the sleeve, and a spring catch device 145 yieldingly holds it to the sleeve. On the arm 144 is pin 146 extending through a slot 147 in the frame member 2 above the operating arm 148 of a motor-controlling switch 149. As the shaft 122 oscillates, the sleeve simply stands still. However, if the sleeve be locked to the shaft, the arm 144 will swing down with the ejector arms and thus open the switch. In the arrangement shown, the locking of the sleeve to the shaft is under the control of a carton in the gripping mechanism. To this end there is mounted on the ejector arm, beside the arm 143, a swinging hook catch 150 in position to engage with the arm 143 and draw it down as the ejector arm moves down; a spring 152 tending constantly to hold the catch in locking engagement with the arm on the sleeve. The catch has a depending stem 153 in position to strike against a carton in the gripping mechanism as the ejectors descend and thus release the catch from the arm 143; the catch remaining undisturbed, however, if there be no carton present and the motor circuit consequently being opened.

The operation of the catch can best be seen in Fig. 22. The gripping mechanism is shown as having receded somewhat from the blade member 54, carrying the carton with it from the carton position indicated in dotted lines. The ejector arms begin to move down before the gripping mechanism moves back, so that the stem 153 strikes the carton and releases the catch which then travels down with the ejector arms. However, if there be no carton in the gripping mechanism, there is nothing to engage with the stem on the catch and the arm 143, therefore, remains locked to the shaft 122 and is carried thereby in the direction to open the switch.

While I have illustrated and described with particularity only a single preferred form of my invention, I do not desire to be limited to the exact structural details thus illustrated and described; but intend to cover all forms and arrangements which come within the definitions of my invention constituting the appended claims.

I claim:

1. In a carton setting-up machine, separate mechanisms movable relatively toward each other to complete the setting up of a partially opened carton, means to feed a collapsed carton opposite the space between said mechanisms, means to lift the carton into said space and partially open it, and means to actuate said mechanisms in proper time relation to the lifter to cause them to close on a carton positioned between the same by the lifter.

2. In a machine for setting up a collapsed carton having cross partitions adapted to be swung at right angles to the bottom wall in setting up the carton, mechanism to set the cross partitions at right angles to the bottom of the carton, means to place a collapsed carton opposite the aforesaid mechanism and partially open the same, means to engage the bottom of the carton, and means to produce a relative approaching

movement between the last-mentioned means and said mechanism for setting the cross partitions at right angles to the bottom of the carton.

3. In a machine for setting up a collapsed carton of the type comprising a slotted body portion and transverse partitions adapted to be placed at right angles to the bottom and be engaged in slots in the body of the carton in setting up the carton, mechanism to move said partitions into and hold them in positions at right angles to the bottom of the carton, means to place a collapsed carton in operative relation to said mechanism in a partly opened condition, and means cooperating with said mechanism to complete the opening of the carton and cause the partitions to enter the slots in the body thereof.

4. In a machine of the character described, a row of pairs of grippers, a support for the grippers, a blade member having a long edge opposite and parallel to the row of grippers, and automatic means to produce a relative approaching movement between said support and the blade and simultaneously closing the grippers.

5. In a machine of the character described, a row of pairs of grippers, a support for the grippers, a stationary blade member having a long edge opposite and parallel to the row of grippers, a long abutment parallel and adjacent to said blade, and automatic means to move the abutment and the said support toward each other and simultaneously close the grippers.

6. In a machine of the character described, a row of pairs of grippers, a support for the grippers, a stationary blade member having a long edge opposite and parallel to the row of grippers, a long abutment parallel and adjacent to said blade, means to place between the blade member and the grippers a partially opened carton, and means to move the abutment and the said support toward each other and simultaneously close the grippers.

7. In a machine of the character described, two separated long, parallel guides, a stationary blade member extending across the space between the guides, a support extending between and mounted on the guides to move from and toward said blade member, a row of pairs of grippers distributed along said support, and means to move said support along the guides toward said blade member and simultaneously close the grippers.

8. In a machine of the character described, two separated long, parallel guides, a stationary blade member extending across the space between the guides, a support extending between and mounted on the guides to move from and toward said blade member, a row of pairs of grippers distributed along said support, means to place a carton to be opened in the space between said blade member and said grippers, and means to move said support along the guides toward said blade member and simultaneously close the grippers.

9. In a machine of the character described, a row of pairs of grippers, a stationary blade member lying parallel to and at some distance from said row, a presser foot having a V-shaped end facing toward the grippers and movable past the blade member from and toward the grippers, the apex of the V being in about the plane of the blade member, and means to move the presser foot and the grippers toward each other and then move the presser foot away from the grippers while the latter are in proximity to the blade member.

10. In a machine of the character described, a row of pairs of grippers, a stationary blade mem-

ber lying parallel to and at some distance from said row, a presser foot having a V-shaped end facing toward the grippers and movable past the blade member from and toward the grippers, the apex of the V being in about the plane of the blade member, means to place between the grippers and the blade member a carton to be set up, and means to move the presser foot and the grippers toward each other and then move the presser foot away from the grippers while the latter are in proximity to the blade member.

11. In a machine of the character described, means to support a stack of collapsed cartons, a row of pairs of grippers movable from and toward the stack, means to feed the cartons one at a time from the bottom of the stack and deliver them with their body portions extending beyond the positions of the grippers nearest the stack, means to raise the body portions of the cartons in front of the grippers, and means cooperating with the grippers to set up each carton so delivered.

12. In a machine of the character described, means to support a stack of collapsed cartons, carton setting-up mechanism laterally spaced apart from the stack position, means to feed the cartons one at a time from the bottom of the stack to a point near said mechanism, means to move the cartons one at a time from said point into said mechanism, and means to operate said mechanism to set up each carton received by the same.

13. A machine for setting up collapsible egg cartons having cross partitions pivoted to the carton, comprising a hopper for holding a stack of collapsed cartons, feeding means for delivering a collapsed carton from said hopper, means adjacent said feeding means for receiving the collapsed carton and for distending the walls thereof, and means for moving the cross partitions of the carton into an erect position at right angles to the distended carton walls.

14. A machine for setting up collapsible egg cartons having cross partitions pivoted to the carton, comprising a hopper for holding a stack of collapsed cartons, feeding means for delivering a collapsed carton from said hopper, and means adjacent said feeding means for distending the walls of said carton and for moving the cross partitions into a vertical position at right angles to the carton walls.

15. A machine for setting up collapsible egg cartons having cross partitions pivoted to the carton, comprising a hopper for holding a stack of collapsed cartons, traveling dogs for delivering collapsed cartons from said hopper, a movable platform in the path of delivery of said cartons, carton erecting means having means for distending the walls of the carton and means for moving the cross partitions of the carton into vertical position at right angles to the walls of the carton, and means for moving said platform to a position adjacent said carton erecting means.

16. A machine for setting up collapsible egg cartons having cross partitions pivoted to the carton, comprising a hopper for holding a stack of collapsed cartons, traveling dogs for delivering collapsed cartons from said hopper, a movable platform in the path of delivery of said cartons, a carton erecting means having positioning means for the carton, means in association with said positioning means for moving cross partitions on said carton from a collapsed position to an erect position at right angles to the

carton walls, and means spaced from said positioning means for depressing the bottom portion of the carton into engagement with the cross partitions, and means for moving said platform from the path of delivery of said cartons to a position adjacent the carton erecting means.

17. A machine for setting up collapsible egg cartons having cross partitions pivoted to the carton, comprising a hopper for holding a stack of collapsed cartons, carton erecting means having positioning means for the carton, means for moving cross partitions on the carton from collapsed position into an erect position at right angles to the walls of the carton, and means spaced from said positioning means for depressing the bottom of the carton into engagement with the cross partitions, and means for delivering cartons one at a time from said hopper to said positioning means.

18. A machine for setting up collapsible egg cartons having cross partitions pivoted to the carton, comprising positioning means for a carton, means for rotating cross partitions hinged to said carton from collapsed position to an erect position at right angles to the walls of the carton, means spaced from said positioning means for depressing the bottom of the carton into engagement with the cross partitions, a platform movable to and from a position adjacent the space between said carton positioning means and said bottom depressing means, and means coacting with said platform for distending the walls of a collapsed carton thereon and for delivering said carton to said positioning means.

19. A machine for setting up collapsible egg cartons having cross partitions pivoted to the carton, comprising means for moving cross partitions hinged to said carton from collapsed position to an erect position at right angles to the carton wall, means spaced from said cross partition moving means for depressing the bottom of the carton into engagement with said cross partitions, means for distending the walls of the collapsed carton, and for delivering said carton to said cross partition moving means.

20. A machine for setting up collapsible egg cartons having cross partitions pivoted to the carton, comprising means for positioning a carton and for moving cross partitions joined to said carton from collapsed position into an erect position, feeding means for delivering a carton to said positioning means, means for depressing the bottom of said carton into engagement with said cross partitions, and means for removing said carton from said positioning means.

21. A machine for setting up collapsible egg cartons having cross partitions pivoted to the carton, comprising a hopper for holding a stack of collapsed cartons, positioning means for a carton, means adjacent said positioning means for distending the walls of said carton and moving cross partitions on said carton from collapsed position into erect position, and means for feeding cartons from said hopper to said positioning means.

22. A machine for setting up collapsible egg cartons having cross partitions pivoted to the carton, comprising a hopper for holding collapsed cartons, traveling dogs for delivering a carton from said hopper, positioning means for the carton, a series of upright plates mounted transversely of said positioning means, rotatable plates pivotally mounted adjacent the bases of said upright plates, means for rotating said plates to move collapsed partitions on the carton

into erect position and in engagement between said upright plates and said rotatable plates, a longitudinal bar facing said positioning means and spaced therefrom, a platform movable from a position adjacent the path of delivery of said dogs to the space between said bar, means including a suction device cooperating with said platform for distending the walls of the carton and for delivering said carton to said positioning means, and means for moving said positioning means toward said bar to depress the bottom of the carton into engagement with the cross partitions.

23. A machine for setting up collapsible egg cartons having cross partitions pivoted to the carton, comprising means for receiving a collapsed carton and for distending the walls thereof, means for moving the cross partitions of the carton into an erect position at right angles to the distended carton walls, and feeding means for supplying collapsed cartons to said first named means.

24. A machine for setting up collapsible egg cartons having cross partitions pivoted to the carton, comprising automatic means for receiving a collapsed carton and for distending the walls thereof, automatic means for moving the cross partitions into an erect position at right angles to the distended carton walls, and automatic means for causing engagement of interlocking parts on said walls and said cross partitions.

25. In a device for setting up collapsible cellular cartons of the type having a body portion composed of front and rear walls and a bottom, cross partitions and a longitudinal partition section adapted to divide said carton into two rows of cells, a frame structure, means on said frame structure for receiving one of said cartons and for maintaining the walls thereof in erect condition, automatic means for rotating the cross partitions into substantially erect position, and automatic means for producing relative movement between said body portion and said cross partitions whereby to interlock the same in erect condition.

26. In a device for setting up collapsible cellular cartons of the type having front and rear walls, a bottom portion, cross partitions and a longitudinal partition section adapted to divide said carton into two rows of cells, a frame structure, means on said frame structure for receiving one of said cartons and for maintaining the walls thereof in erect condition, automatic means for rotating the cross partitions into substantially erect position, and automatic means for moving the longitudinal partition into intersecting relation with the cross partitions.

27. In a device for setting up a carton of the type described, automatic means for distending the walls of said carton, automatic means for aligning cross partitions for said carton with slots in said walls, and automatic means for engaging said walls with said cross partitions.

28. A machine for setting up cellular cartons having pivoted cross partitions, comprising relatively movable erecting means for moving the pivoted cross partitions and the walls of the carton into erect position, means for feeding cartons to said erecting means, and drive mechanism for operating said feeding means in synchronized relation with respect to said erecting means.

29. A machine for setting up cellular cartons having pivoted cross partitions, comprising erecting means including means for maintaining cross

partitions of a carton in erect position, means for moving the walls of said carton into erect position, and means for interlocking the cross partitions with another portion of the carton, means
5 for feeding cartons to said erecting means, and drive mechanism for operating said feeding means in synchronized relation with respect to said erecting means.

30. A cellular carton setting-up machine for
10 setting up and interlocking edge notched cross partitions with a blank having middle and outer wall sections containing parallel slots for receiving the cross partitions, comprising the combination of movable means for maintaining the cross
15 partitions of a partially erected carton in substantially parallel relation in alignment with the slots in said blank, means operating to cause relative movement between the cross partitions and blank whereby to interlock the cross partitions with the blank, and means for feeding partially
20 erected cartons to said first named means in synchronized relation with the movement thereof.

31. In a device of the type described, an open
25 walled hopper for receiving carton blanks, a reciprocable dog adapted in its forward motion to progress the lowermost carton blank from said hopper, a cam-operated lever for actuating said

dog, a friction roller for receiving said blank and providing further motion therefor, and carton assembling means including means for engaging cross partitions with slots in said blank.

32. In a device of the type described, means for
5 rotating cross partitions of a cellular carton into substantially erect position, means for maintaining a carton blank in position with slots therein in alignment with said cross partitions, means
10 for feeding carton blanks to said last named means, means for engaging said cross partitions with said slots, and means for releasing said blank.

33. In a device of the type described, a reciprocal bar, rotatable fingers operable by said bar
15 for moving cross partitions into substantially erect position, means for maintaining a carton blank in position with slots therein in alignment with said cross partitions, means for feeding carton blanks to said last named means, and means
20 for engaging said cross partitions with said slots.

34. In a device of the type described, means for
feeding a collapsed carton, means for initially and partially separating the walls of said carton, additional means for further operating on said
25 walls to erect the same, and means for erecting cross partitions within said walls.

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