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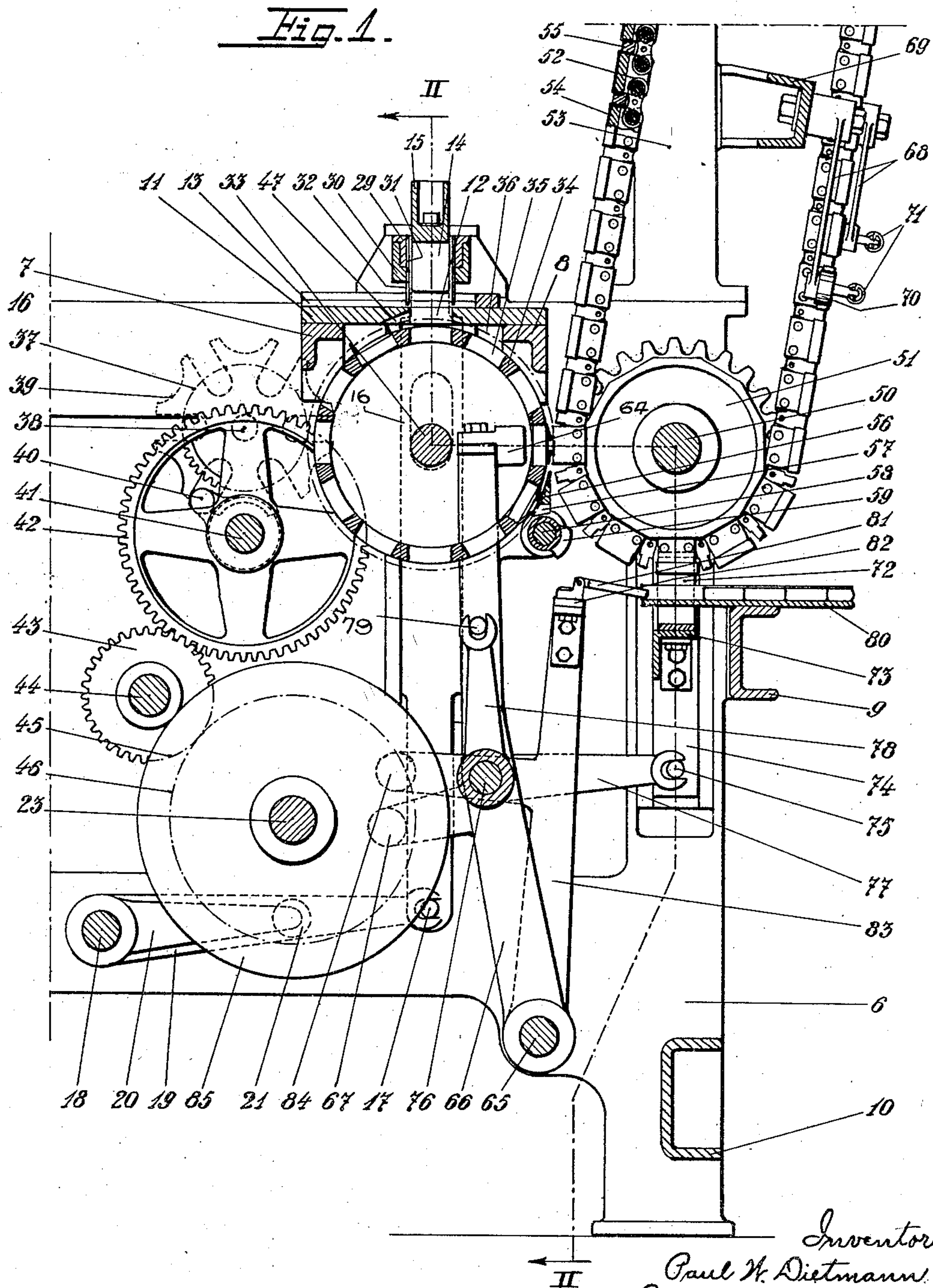
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2,125,430

METHOD OF AND MACHINE FOR MANUFACTURING BOXES

Filed May 7, 1936

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

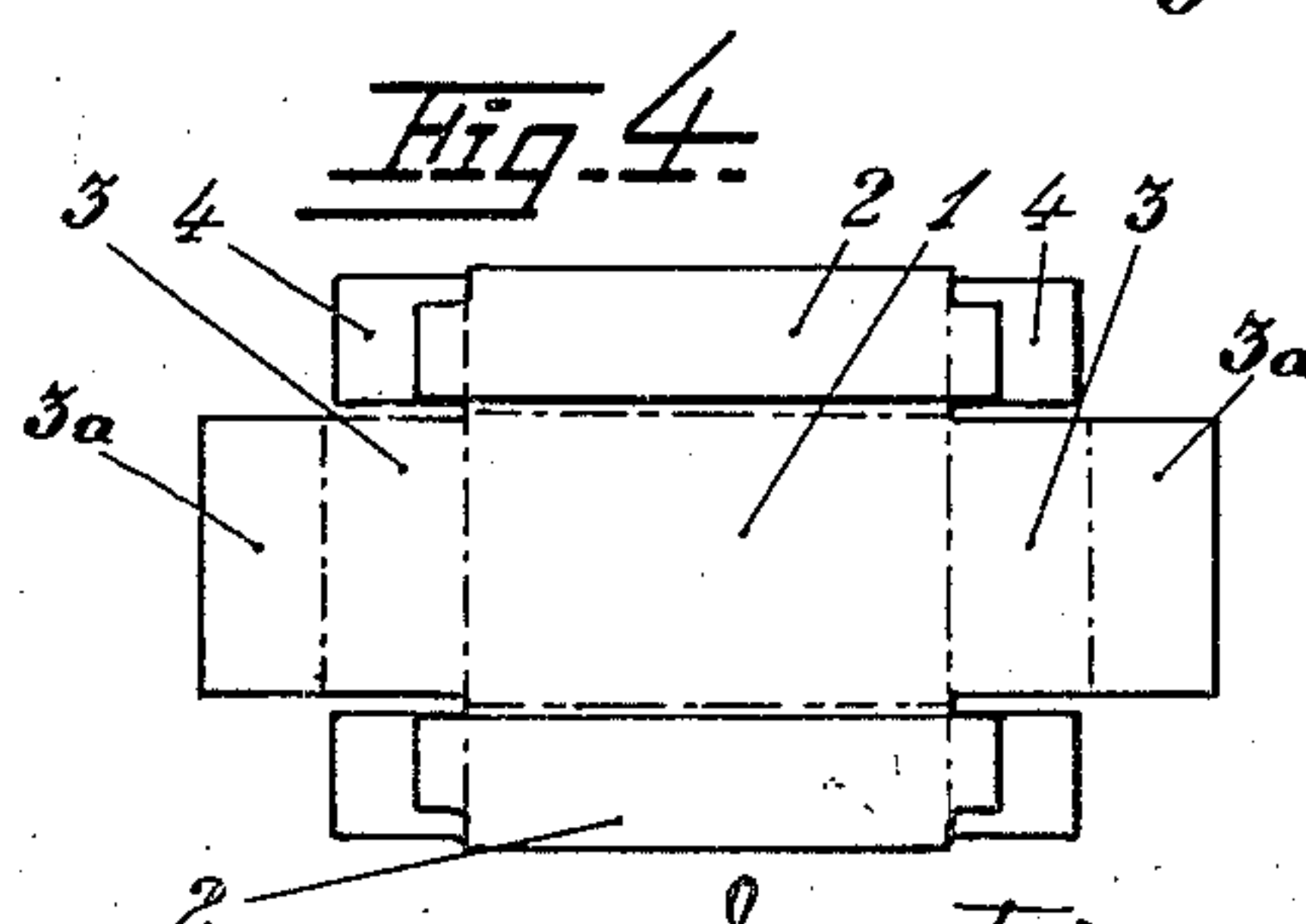
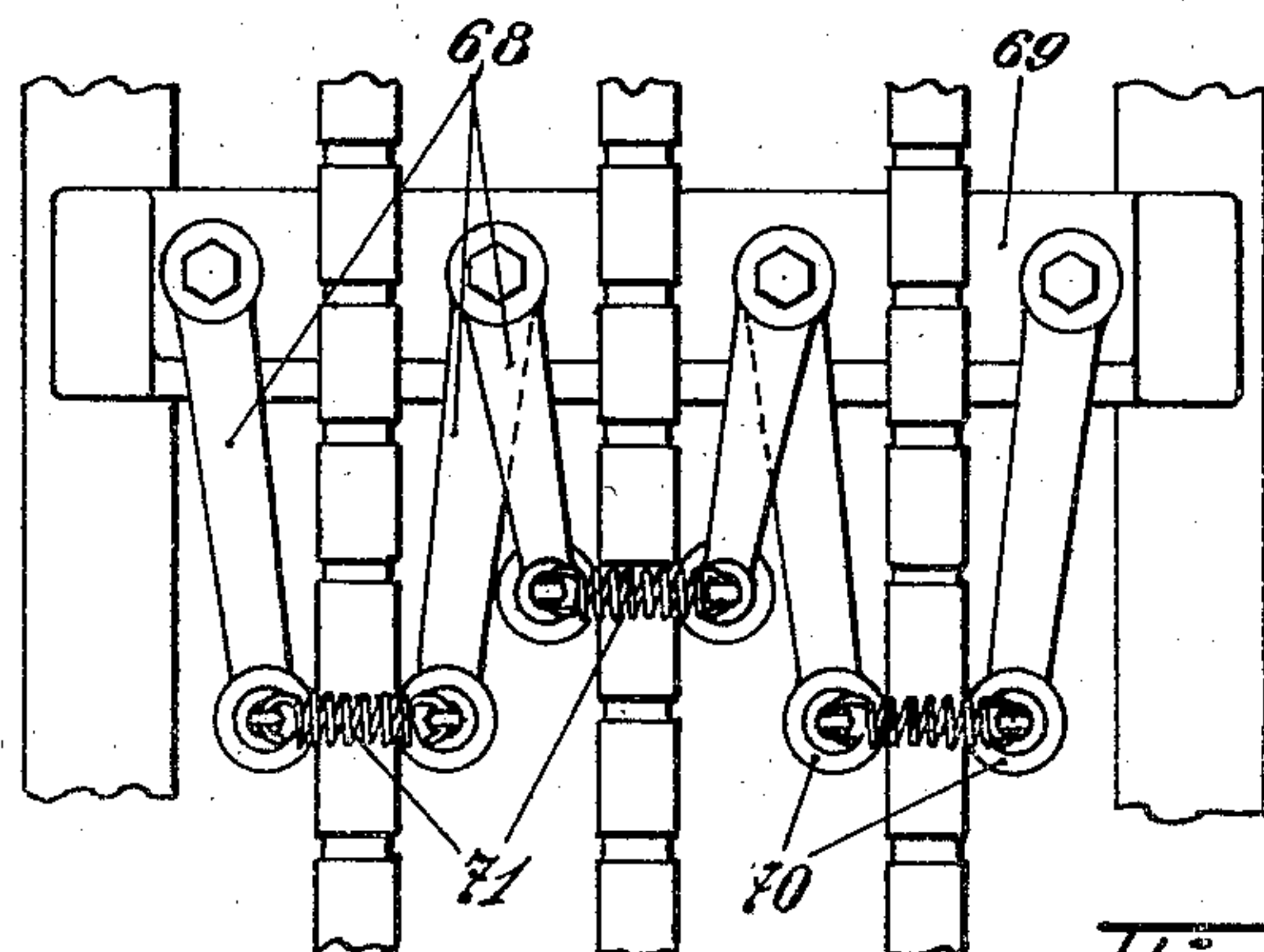
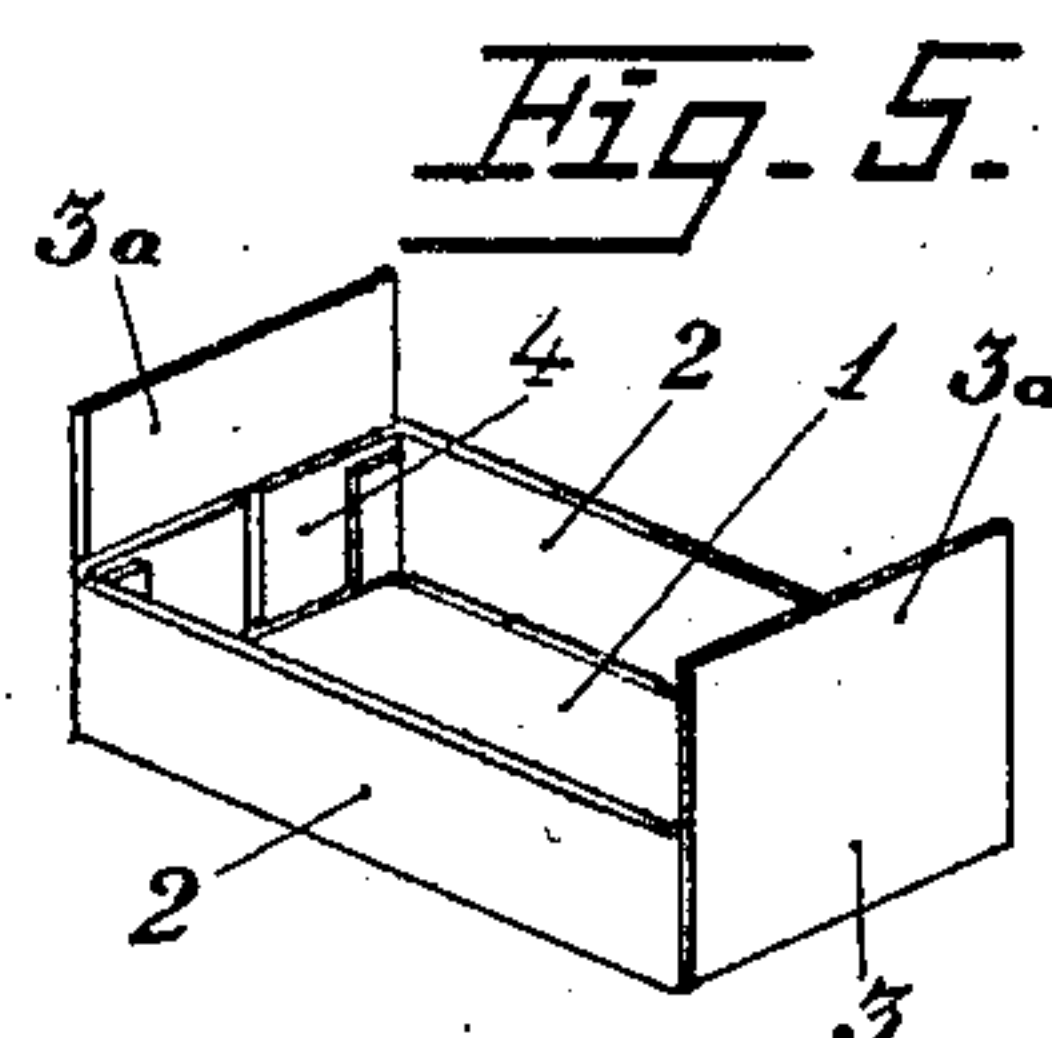
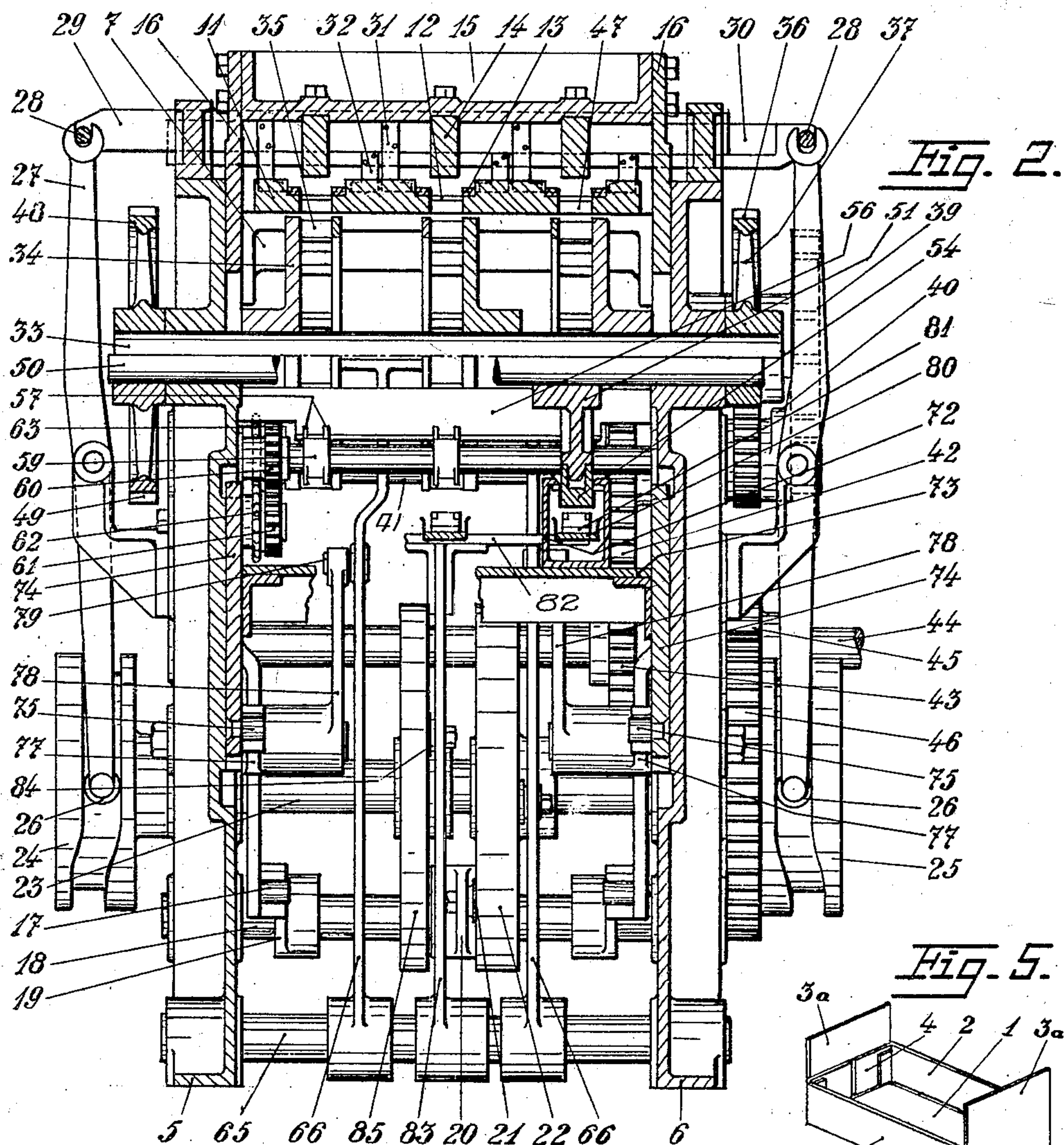


Fig. 3.

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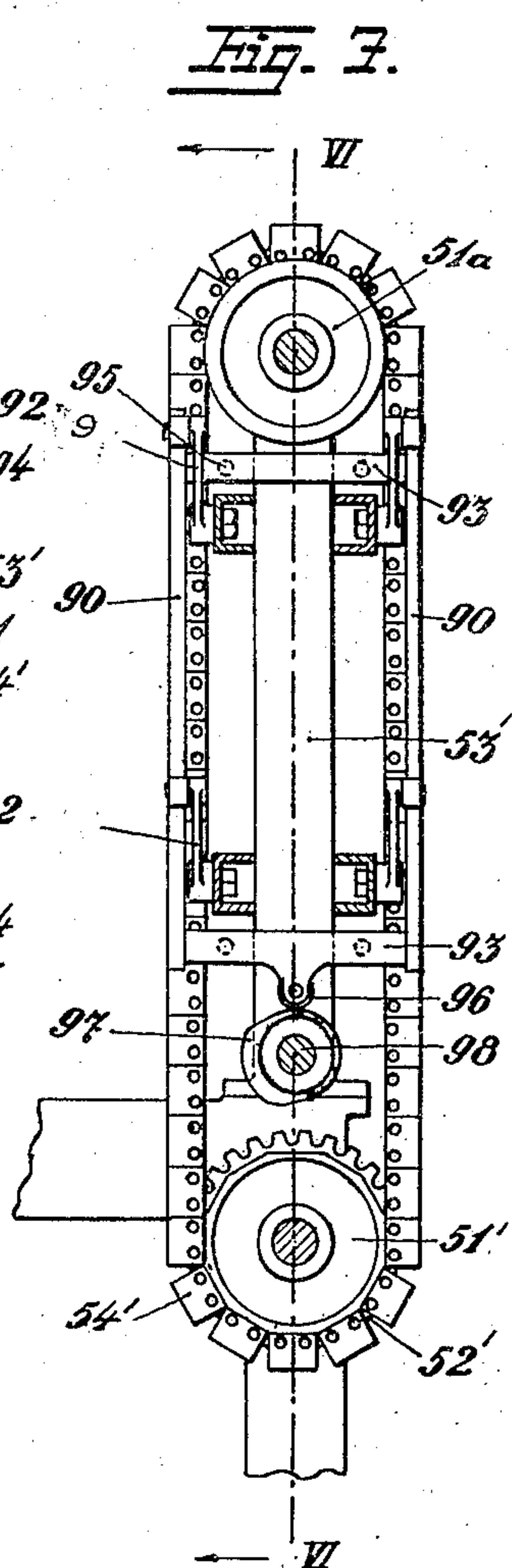
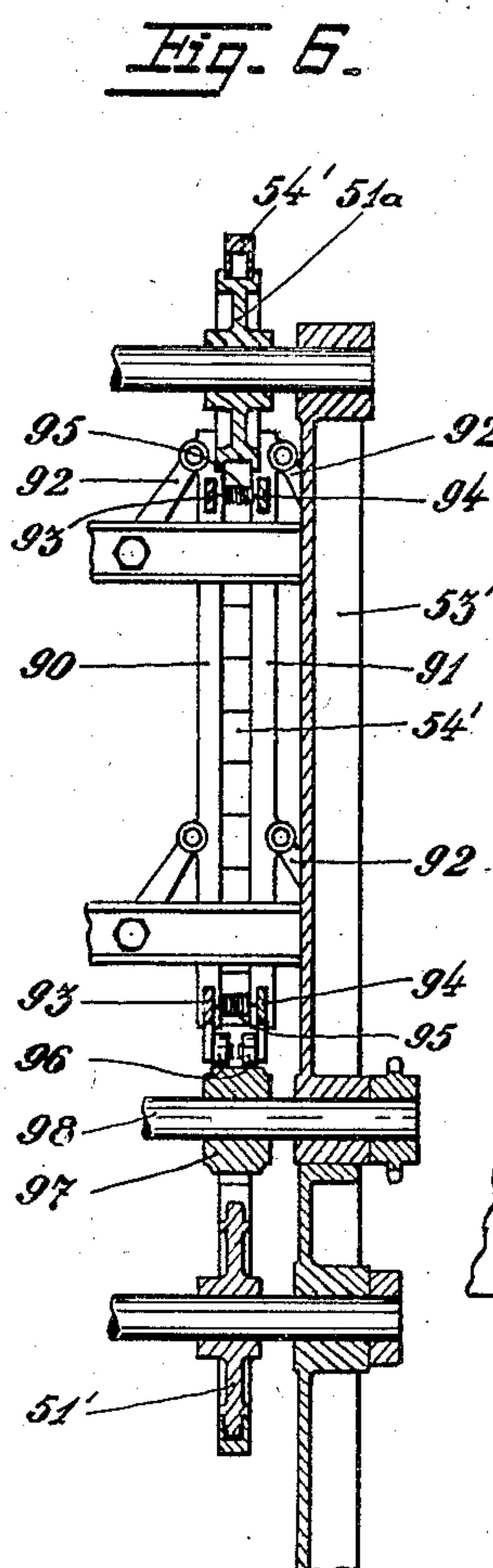
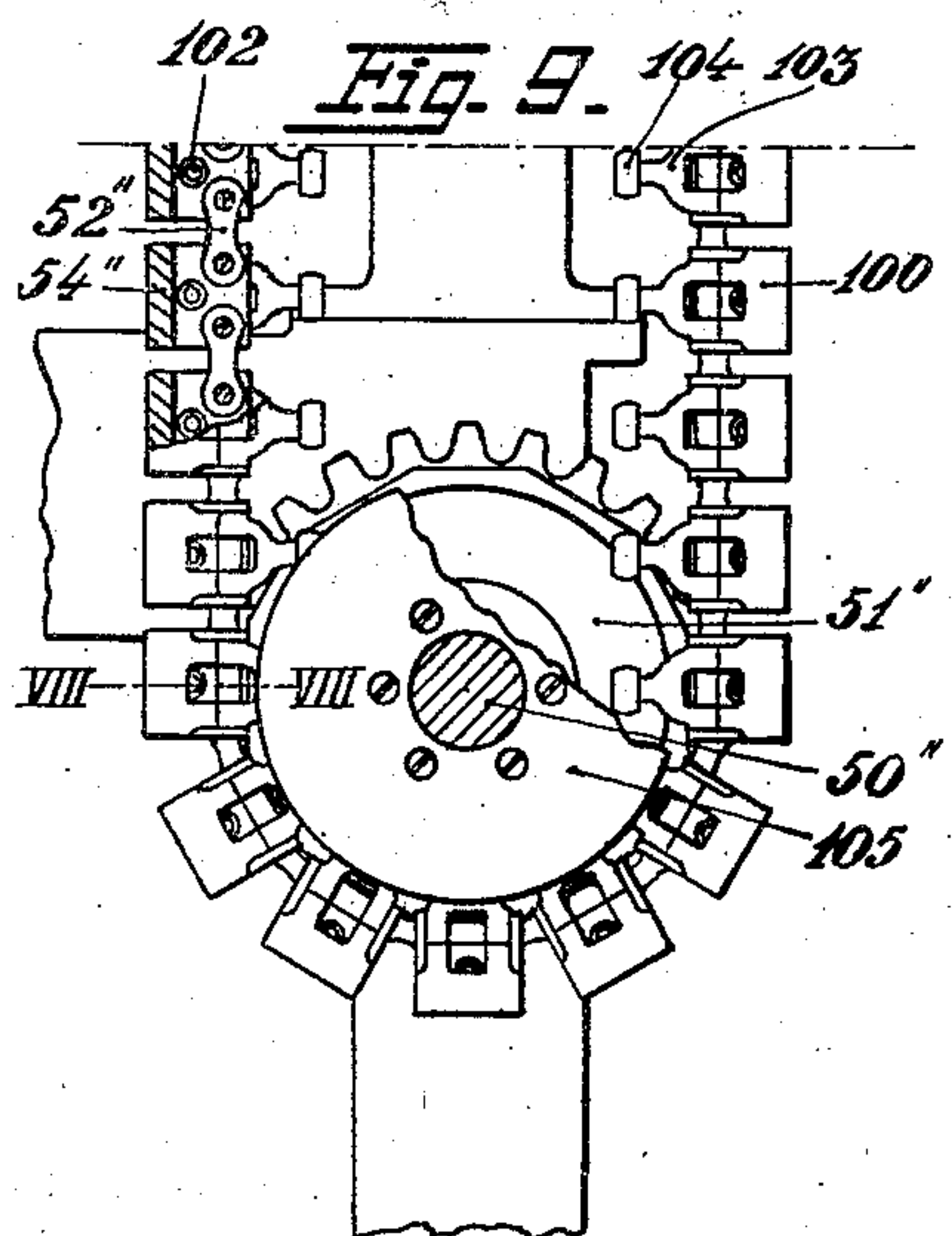
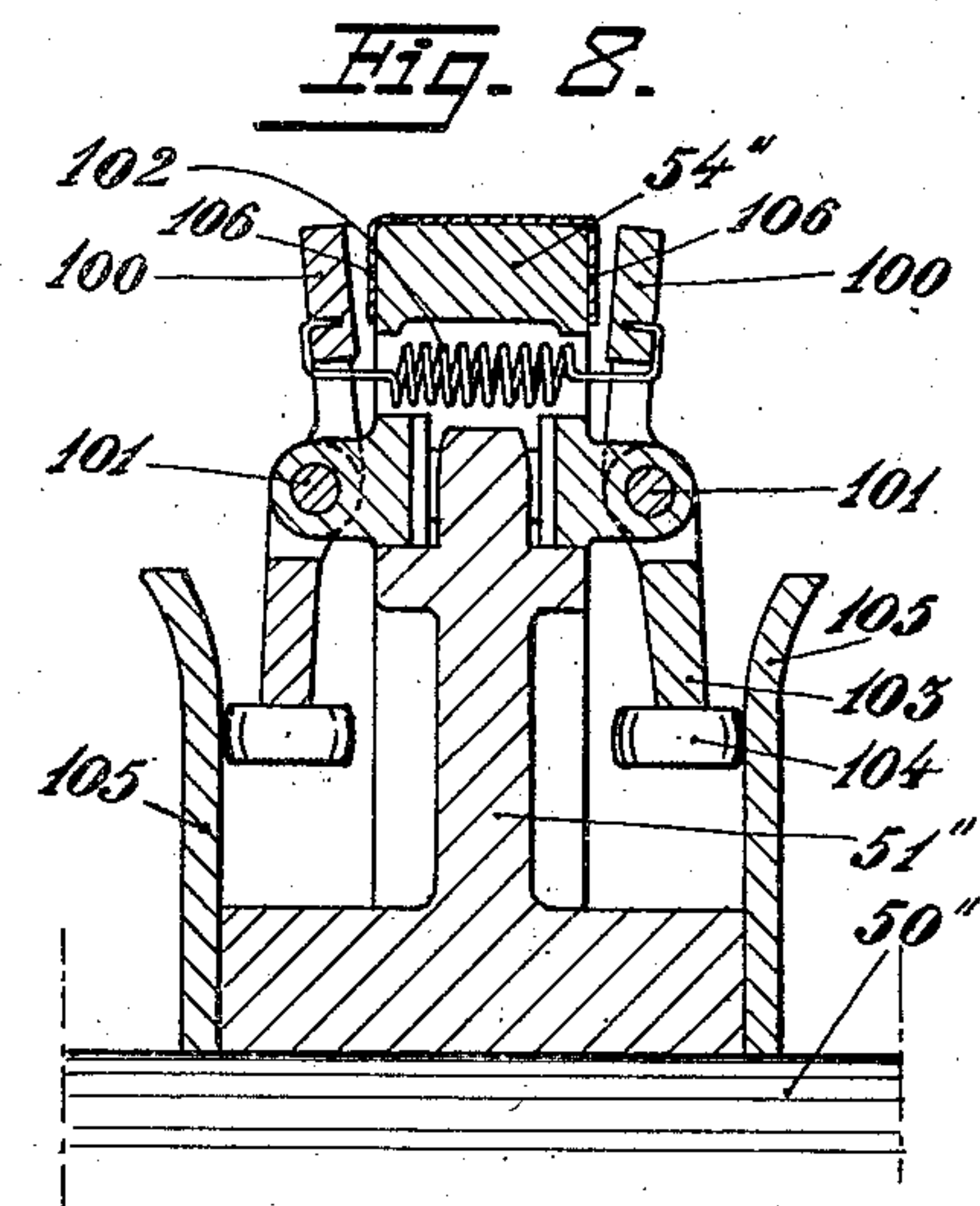
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METHOD OF AND MACHINE FOR MANUFACTURING BOXES

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,125,430

METHOD OF AND MACHINE FOR MANUFACTURING BOXES

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Application May 7, 1936, Serial No. 78,496
In Sweden May 9, 1935

16 Claims. (Cl. 93—44)

This invention relates to the manufacture of boxes of paper, cardboard or the like, and more especially open-ended boxes or box parts having one or more of their walls reinforced by inturned extensions of the material of which the bodies of the boxes are composed.

One of the objects of this invention is the provision of an efficient method of making boxes of the kind referred to which shall be of a relatively perfect or finished character.

A further object of the invention is the provision of a practical method of folding and shaping previously formed box-blanks.

Another object of the invention is the provision of a method of treating the folded box-blanks in a series of successive steps including the applications of external pressure to the reinforced walls of a box during the setting of the adhesive applied thereto.

Another object of the invention is to provide a machine of simple and improved construction, and operating automatically for rapidly and effectively shaping blanks of cardboard or the like to form open-ended boxes or box parts.

A further and more particular object of the invention is to provide, in a machine of the class mentioned, an improved and effective mechanism for holding and pressing the folded boxes so as to insure effective union of contiguous parts of the box-walls.

Another object is to devise a simple, improved arrangement for turning in the reinforcing extensions projecting from a partially formed box, thereby completing the folding of the box-blank.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention is illustrated by way of examples in the accompanying drawings, wherein:

Figure 1 is a sectional side elevation of a box-making machine according to the invention, Figure 2 is a cross-sectional view taken on the line II—II of Figure 1, and Figure 3 is a front view on an enlarged scale of part of the machine shown in Figures 1 and 2. Figures 4 and 5 show a box blank in two different stages of the folding operation.

Figure 6 is a cross-sectional view taken on the line VI—VI of Figure 7 which is a side elevation of a second embodiment of the conveyor with holders and appendant pressing members.

Figure 8 is a sectional view taken on the line VIII—VIII of Figure 9 which is a side-view, partly in section, of a third embodiment of the conveyor.

The machine shown in Figures 1—3 is primarily

adapted for making boxes of blanks of the figuration shown in Figure 4, said blanks comprising a rectangular bottom portion 1 and portions 2, 2 and 3, 3 coherent to the long and short sides, respectively, of the bottom portion, the portions 2, 2 being two-ply and provided with lateral flaps 4 adapted to form the corners of the box. Such box blanks may be produced from a continuous web in a manner forming no part of the present invention. The various parts of the machine are supported by two side-frames 5, 6 interconnected by cross-beams 7, 8, 9 and 10. Carried by the cross-beams 7 and 8 is a folding table 11 having three openings 12 provided therein corresponding in shape to the bottoms 1 of the boxes and located alongside of one another in the transverse direction of the machine. Mounted on the top of the table 11 along opposite sides of the openings 12 are pairs of lengthened plates 13, each pair serving as a feed path for the box blanks that rest upon the plates with their long side portions 2, 2. Extending over the row of openings 12 is a beam 15 carrying, opposite each opening, a folding plunger 14, corresponding in shape to that of the opening. The beam 15 is carried by two vertically movable slides 16, 16, slidably mounted in the side-frames 5, 6 and each carrying at its lower end a pin or roller 17, embraced by the forked end of an arm 19 fixed to a shaft 18. Rigidly secured to said shaft is also an arm 20, carrying at its free end a roller 21, running in a cam slot of a cam disc 22 mounted on a continuously rotating cam shaft 23 journaled in the side-frames. Fixed to said cam shaft outside the side-frames 5, 6, are two further cam discs 24 and 25, respectively, each cooperating with a roller 26 carried at one end of a two-armed lever 27 mounted to swing in a vertical plane parallel to the beam 15. At their opposite, upper ends the levers 27 are forked, each forked end embracing a bolt 28 rigidly connecting two guide-rods 29, 29 and 30, 30, respectively, located one at each side of the beam 15 and mounted to slide in the longitudinal direction thereof. Fixed to each of the guide-rods 29, 30 are three folding fingers 31 and 32, respectively, projecting with their lower ends into grooves provided in the plates 13 and the table 11 and extending parallel to the guide-rods.

A shaft 33, journaled in the side-frames 5, 6, extends parallel to the row of openings 12 right below the same. Fixed to that shaft opposite each of the openings is a drum 34 having twelve openings or cells 35 radially disposed at the circumference of the drum and corresponding in

shape to the openings 12. Fixed to the shaft 33 is also a gear 36, meshing with a gear 37 mounted for free rotation on a stub shaft 38 supported rigidly in the side-frame 6. Fixed to the gear 37 is a six-armed Geneva movement driven member 39 positively controlled by a driving member 40 mounted on a transmission shaft 41. By means of gears 42, 43 this shaft is operatively connected with a main shaft 44, adapted to rotate continuously in a clock-wise direction (Figure 1). By means of further gears 45, 46 the main shaft 44 is operatively connected also to the cam shaft 23 above referred to, the ratio of the various gears being such that the cam shaft 23 performs one revolution and the drum shaft 33 a twelfth of a revolution upon each two revolutions of the main shaft 44. The cells 35 are thus caused to occupy successively a receiving position right below the openings 12. Recesses 47 in the under side of the table 11 extend from each of the openings 12 in the direction of movement of the cells 35.

By means of gears 48, 49 the drum shaft 33 is operatively connected to a shaft 50 extending parallel to the shaft 33 and carrying a sprocket-wheel 51 opposite each of the drums 34. Driven by said sprocket-wheels are three conveyer-chains 52 supported by corresponding wheels on an upper shaft not shown in the drawings, said shaft being suitably mounted in standards 53 mounted on the side-frames 5, 6. Every other link 54 of the conveyer-chains conforms in shape to the internal dimensions of the boxes to be manufactured, and between each two adjacent holders or links 54 a presser plate 55 is suitably mounted on the chain so that it will be pressed against the boxes carried by adjacent holders when the chain is straightened. The movement of the sprocket-wheels 51 is such that the chains are moved stepwise in a clock-wise direction, one of their holders occupying a vertical receiving position opposite a cell 35 when the chains are at rest. Extending parallel to the drum-shaft 33 close to the circumference of the drums 34 is a stationary folding plate 56 located with one of its edges in the proximity of the transfer position between the drums 34 and the chains 52 wherein the cells and the holders face one another. In its opposite edge facing the direction of movement of the cells the plate 56 is provided with recesses 57 for the free passage of three rotatable folding members 59 mounted on a shaft 58 and each positioned opposite one of the drums 34. By means of gears 60, 61 the shaft 58 is operatively connected to a sprocket-wheel 62 driven, by means of an endless chain not shown in the drawings, from a sprocket-wheel 63 on the shaft 41, so that upon each forward step of the drums 34 the shaft 58 is caused to turn one revolution in a clockwise direction (Figure 1). Located within each drum opposite the delivery position of the cells adjacent the conveyers 52 is a pusher 64 corresponding in shape to the cells, said pushers being supported by arms 66 fixed to a shaft 65. Carried by one of said arms is a roller 67 engaging in a slot in one side of the cam-disk 22 adapted to impart to the arms 66 a swinging motion in timed relation to the movement of the drums 34, so that the pushers 64 are moved into and out of the cells at each time the drums are at a stand-still.

Arms 68 are located at opposite sides of each chain 52, as best shown in Figure 3, said arms being pivotally mounted on a cross-beam 69 carried by the standards 53. Carried at the free end of each of the arms is a roller 70, and the arms

are connected in pairs by draw-springs 71, pressing the rollers against opposite sides of the chains. This additional press device is primarily intended for use in case the side-walls 2, as shown in Figure 4, consist of two coherent layers to be fixed by means of glue or another adhesive.

When the chains 52 are at rest one of the holders of each chain will occupy a delivery position vertically below the shaft 50 where it is embraced by two stripping-claws 72, 72. The claws 72 are mounted on a bar 73 carried by two vertically movable slides 74, 74 mounted in the side-frames 5, 6. Each of these slides carries a pin 75, embraced by the forked end of an arm 77 loosely mounted on a shaft 76. Rigidly connected to said arm is a second arm 78 extending along one of the swinging arms 66 and having a pivoted connection 79 therewith, so that the slides 74 together with the stripping claws 72 are alternately raised and lowered in timed relation to the swinging motion of the arms 66. Located beneath each of the holders 54, when in their delivery position, is a chute 80 mounted on the crossbeam 9. A pusher-plate 81 resting with one end upon the bottom of the chute is, at its other end, hingedly connected to a crossbar 82 mounted on an arm 83 loosely mounted on the shaft 65. Carried by said arm is a roller 84 engaging in a slot in a cam disk 85 by which a swinging motion is imparted to said arm.

The operation of the machine shown in Figures 1-3 is as follows: While the folding plungers 14 are in their raised positions shown in the drawings and the fingers 31, 32 occupy a position laterally of the plates 13, three box blanks are, by any suitable means not shown in the drawings, advanced to positions above the openings 12. At the succeeding downward movement of the plungers 14, taking place in two steps, the under side of the plungers will engage the bottom-edges of the blanks, said blanks being, by the first step, forced downwardly between the plates 13 until in flush with the top of the table, whereby the side-walls 2 with lateral flaps 4 are folded upwards to assume a vertical position. Through the action of the cam disks 24, 25 the guide-rods 29 and 30 are now moved in opposite directions towards one another, the lateral flaps 4 being engaged by the fingers 31 and 32 and caused to assume a position at right angles to the side-walls 2. At the subsequent second step of the folding plungers 14 the box blanks are first forced through the openings 12 and are thereafter placed into the opposite cells 35 in which they are held by friction. By the action of the edges of the openings 12 the end-walls 3 have simultaneously been folded upwardly to a vertical position, so that the box blanks placed in the cells will have the box-like shape shown in Figure 5. However, the folding of the box blanks is not yet completed, the end-walls 3 being provided with upstanding flaps 3a, provided with glue upon their surfaces facing one another and adapted to be folded downwardly upon the lateral flaps 4. By suitable means, acting, for instance, upon the upper edges of the side-walls 2, the boxes are prevented from escaping together with the plungers when the latter resume their upper positions and the guides 29, 30 are retracted to their positions shown in the drawings.

After the return movement of the plungers 14 the drums 34 are rotated one step in the counter-clockwise direction, the recesses 47 leaving free passage for the projecting flaps 3a. By the step-

wise movement of the drums the cells 35 thereof are successively brought to the receiving position opposite the openings 12 to receive, in their turn, box blanks folded to the shape of a box and the boxes thus received are gradually brought to the proximity of the folding-plate 56 which is located in the path of travel of the flaps 3a. The foremost flap of each box will consequently strike against said plate, by which it is forced to assume a position substantially parallel to the bottom of the box. Before being advanced so far that the folding-plate would strike also against the rear flap, this flap is struck from behind by the rotatable folding member 59 by which it is folded downwards to a position substantially parallel to the bottom of the box and is maintained in this position until, due to the movement of the box, it enters under the plate 56, by which it is then maintained in the folded position. During the subsequent movement of the box towards the transfer position opposite a holder 54 the flaps are, by engagement with said holder, prevented from resuming an upright position due to the elasticity of the box-material. When the arms 66 are hereafter swung to the right, Figure 1, the pushers 64 will act upon the bottoms of the boxes so that the latter are forced out of the cells and are each slid on to a holder 54, the flaps 3a being thereby folded downwards upon the lateral flaps 4. By the succeeding movement of the drums 34, serving as transfer means, and of the chains 52, succeeding cells 35 and holders 56 are brought into juxtaposition, and simultaneously the holders furnished with boxes enter a straightened part of the course of travel of the chains. By the straightening of the chains the pressing plates 55 are caused to engage the end-walls 3 of the boxes which will, consequently, be subjected to a pressing action between the holders and adjacent presser-plates, and this pressing action will obviously last as long as the boxes are in a straight part of the course of travel of the chains. By this pressing action, the duration of which may be determined at will by suitably choosing the length of the chains, the different layers of the end-walls are firmly held in contact with one another during the coagulation of the glue, and said pressing action also improves the shape given to the boxes by the preceding folding operations. If the pressing plates be made resilient or exchangeable for similar plates of different dimensions in the direction of the chains their pressing action will be maintained irrespective of the thickness of the walls of the boxes. After having passed round the upper turning wheels, not shown in the drawings, the holders, carrying boxes, pass between the rollers 70 by which the twofold side-walls 2 of the boxes are pressed against the holders, thereby securing binding also between the layers of these walls.

Arriving at the curved course round the sprockets 51 the pressing plates 55 are automatically moved from engagement with the end-walls of the boxes so that the pressing action ceases. When the holders arrive at the delivery position below the shaft 50, the bar 73 is in its raised position but is thereafter lowered so that the boxes carried by the holders are stripped off the holders by the stripping claws 72 and drop down onto the chutes 80. The bar is then immediately raised, whereupon the chains are advanced a further step and the sequence of operations previously described is repeated. By the pushing-

plates 81 the finished boxes are successively advanced in the chutes 80.

Also in the embodiment shown in Figures 6 and 7 the holders 54¹ constitute alternate links of an endless chain 52¹, mounted on a sprocket 51¹ and a turning wheel 51a, and the boxes are to be slid on to and stripped off from the holders when the latter are in the curved part of the chain, determined by the sprocket 51¹. However the holders are here designed to directly, without the mediation of special pressing plates, clamp the opposite walls of the boxes when in the straight portions of the course of travel located between the wheels 51¹ and 51a. For the purpose of pressing the boxes also in the transverse direction of the row of holders two press-bars 90, 91 are provided, one at each side of the path of travel of the holders, said press-bars being hingedly connected to stationary journalled arms 92. The bars 90 as well as the bars 91 are rigidly connected to one another by cross-pieces 93 and 94, respectively, connected by draw-springs 95 by which the bars are operated upon in a direction towards the chain 52¹. Each of the lower cross-pieces 93, 94 carries a roller 96, said rollers engaging a cam 97 fixed to a rotatable shaft 98 journalled in standards 53¹, one of which only is shown in the drawings. By the action of cam 97 the bars 90, 91 are raised and, consequently, also swung from the chain 52¹ and the boxes carried thereby before each forward movement of the chain, and are thereafter lowered towards the same under the influence of the springs 95. By this arrangement the boxes will, consequently, be subjected to an intermittent pressing in the transverse direction of the holder-row for a considerable period of time and not only momentarily, as in the embodiment shown in Figures 1-3.

In the embodiment shown in Figures 8 and 9 the pressing action is not due to the straightening the conveyer, as was the case in the two embodiments previously described, and no pressure will, consequently, be exerted in the longitudinal direction of the row of holders. The holder blocks 54¹¹ constitute alternate links of an endless chain 52¹¹, mounted on a sprocket wheel 51¹¹ fixed to the shaft 50¹¹ and on a turning wheel not shown in the drawings. Carried by each holder are two opposite presser-plates 100 mounted to swing about pins 101 and operated upon towards one another by a draw-spring 102 mounted in the holder. An elongation 103 of each plate 100 carries a roller 104 situated in the path of travel of disks 105 fixed to the sprocket wheel 51¹¹ at opposite sides thereof and having out-turned curved edges. By said disks the presser-plates are held in the open position shown in Figure 8 during the passage of the holders round the sprocket wheel, permitting the boxes to be mounted on and stripped off the holders. While the latter are in the remaining part of their course of travel the presser-plates 100 are in contact with the side-walls 106 of the boxes under the pressure from the springs 102. In case also the rest of the walls are to be pressed it will, of course, be possible also in this embodiment to provide the chain with pressing plates 55 between the holders.

Also other embodiments of the conveyer with appendant box holding and pressing means will be possible within the scope of the invention which is applicable also in the manufacture of boxes from other types of box blanks than the one described and shown by way of example. Evidently,

the machine may be modified also in various other respects, such as to the construction and arrangement of the transferring means, without departing from the spirit of the invention.

5 What I claim is:—

1. A method of making open boxes from corner-cut blanks having side-portions and extensions integral with some of said portions, comprising the steps of forming a blank into tray-
10 shape by folding up the side-portions thereof, turning inwardly the upstanding extensions, folding down said extensions by sliding the box on to a holder corresponding in shape to the interior of the box, and pressing the two-fold side-
15 walls thus produced against the box supporting holder.

2. In a box-making machine, the provision of an endless conveyer having a plurality of holders each shaped to fit the interior of a box, the
20 said holders being so arranged on the travelling conveyer, that the boxes may be slid on to the holders when these are in a curved part of the course of travel of the conveyer, whereas their side-walls positioned between adjacent holders
25 are clamped by the holders when entering a straighter part of the course.

3. In a box-making machine, the provision of an endless conveyer chain having a plurality of holder blocks corresponding in shape to the interior of the boxes and forming links of said conveyer chain, the arrangement of the holder blocks
30 being such that the boxes may be slid on to the holders when these are in a curved part of the course of travel of the conveyer, whereas their side-walls positioned between adjacent holders
35 are clamped by the holders when entering a straighter part of the course.

4. In a box-making machine according to claim 3, the provision of a special pressing member between each pair of adjacent holder blocks of the
40 conveyer chain.

5. In a box-making machine, the combination of a movable box transfer device having pockets provided therein for the boxes, a conveyer movable in timed relation to said transfer device and
45 having a plurality of holders arranged in a row in the direction of travel of the conveyer and each shaped to fit the interior of a box, means for successively removing the boxes from said pockets and sliding them on to said holders, and means
50 at the sides of the path of travel of the holders for effecting a pressing upon the boxes in the transverse direction of the row of holders.

6. In a box-making machine, the combination set forth in claim 5, and wherein the pressing means disposed laterally of the path of travel
55 of the holders comprise rollers resiliently pressing against opposite side-walls of the boxes and preferably carried by stationarily mounted pivot-arms.

7. A box-making machine, comprising in combination a box folding mechanism, an endless cellular carrier adapted to receive in its cells the boxes delivered from said folding mechanism, a series of holder blocks corresponding in shape to
65 the interior of the boxes and interconnected to an endless chain located close by said carrier with a curved part of its course of travel, and a reciprocating pusher adapted to engage the outer side of the bottom of the boxes contained in the cells
70 so as to expel the same from the cells and slide them on to adjacent holder blocks, the carrier and the conveyer chain being movable in timed relation to one another so as to coincide with their cells and holders, respectively, at one location in
75 their course of travel, and the holder blocks being

so arranged that the boxes may be slid on to the holder blocks when these are in a curved part of the course of travel of the conveyer chain whereas their side-walls positioned between adjacent holder blocks are clamped by the said blocks when
5 entering a straighter part of the course.

8. A box-making machine, comprising in combination a movable carrier having openings provided therein in which partially formed boxes having upstanding flaps are contained, an endless conveyer travelling past said carrier and having a series of holders shaped to fit the interior of the boxes, said openings being positioned, at one location in their path of travel, just opposite one of the holders of the conveyer, means for pushing
15 the boxes out of said openings and on to said holders when at said location, and means at a preceding location in the said path of travel for turning inwardly the upstanding flaps of the boxes.
20

9. A box-making machine, comprising in combination, a movable carrier having a box-receiving opening provided therein, means for depositing in said opening a partially formed box having two upstanding flaps succeeding one another in the direction of travel of said carrier, an endless travelling conveyer having a series of holders corresponding in shape to the interior of the box, said opening being positioned, at one location in its path of travel, just opposite one of the holders
30 of the conveyer, means for pushing the box out of said opening and on to said holder when at said location, and means at a preceding location in the said path of travel for folding inwardly the upstanding flaps of the box, said folding means
35 comprising a stationary plate for folding the foremost flap and a movable member adapted to engage the rear flap from behind for folding it into a position below the stationary folding plate.

10. In a box-making machine, the combination set forth in claim 9, and wherein the folding plate extends along the path of travel of the carrier so as to maintain the flaps in the folded position until reaching the position opposite a holder.
40

11. In a box-making machine, the combination of an endless travelling carrier having a series of box-receiving openings provided therein, means at one location in the course of said carrier for depositing partially formed boxes in the said
50 openings, means at a second location in said course for bending inwardly flaps projecting from opposite walls of the boxes, a series of holder blocks corresponding in shape to the interior of the boxes and inter-connected to an endless conveyer chain having a curved part of its course of travel immediately opposite a third location in the course of said carrier, means for stepwise moving said carrier and said chain in timed relation to one another, means at said third location
60 in the course of the carrier for pushing succeeding boxes out of the openings and sliding them on to opposite holder blocks, means for pressing two opposite side-walls of the boxes against the holder blocks carrying the same, and means at a curved part of said chain for stripping the boxes off said holder blocks.
65

12. In a box-making machine, the combination set forth in claim 11, and wherein a plurality of endless carriers and conveyer chains with ap-
70 pendant means are arranged side by side and movable in unison, each carrier consisting of a rotatable drum having a series of equi-distant box-receiving openings round its circumference.

13. In a box-making machine, the combination 75

- of a movable box transfer device having pockets provided therein for the boxes, a conveyer movable in timed relation to said transfer device and comprising a plurality of holders each shaped to fit the interior of a box, means for removing the boxes from said pockets and sliding them on to said holders, and means for pressing two opposite side-walls of the boxes against the holders carrying the same.
14. A box-making machine, comprising in combination, a box transfer device having openings provided therein corresponding in shape to that of the boxes, a travelling conveyer having a plurality of holders shaped to fit the interior of the boxes, and a reciprocating pusher adapted to engage the outer side of the bottom of boxes contained in the openings so as to expel the same from the openings, the transfer device and the conveyer being movable by steps in timed relation to one another and adapted, at one location in their paths of travel, to coincide with one of their openings and holders, respectively, so as to enable a direct delivery of a box from the transfer device to the conveyer.
15. A box-making machine, comprising in combination, a stepwise rotatable drum having box receiving openings round its circumference, a

box-folding mechanism comprising a reciprocating folding-plunger adapted to deposit the boxes in said openings when at rest in a receiving position opposite the plunger, a series of holder blocks corresponding in shape to the interior of the boxes and interconnected to an endless conveyer chain movable past said drum in timed relation thereto and having, when at rest, one of the blocks located just opposite a delivery position of the openings in said drum, and a reciprocating pusher located within the drum opposite said delivery position and movable into and out of the openings when in said position for successively pushing the boxes out of said drum while simultaneously sliding them on to the holder blocks.

16. In a box-making machine, the combination set forth in claim 11, and wherein said means for stripping the boxes off the holder blocks comprise a pair of stripping claws capable of being moved into and out of a position in which they embrace the holder blocks, and adapted to occupy said position during each forward step of the conveyer chain, said stripping claws being radially movable with respect to said chain.

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