Nov. 15, 1932. W. E. JENSEN 1,887,977

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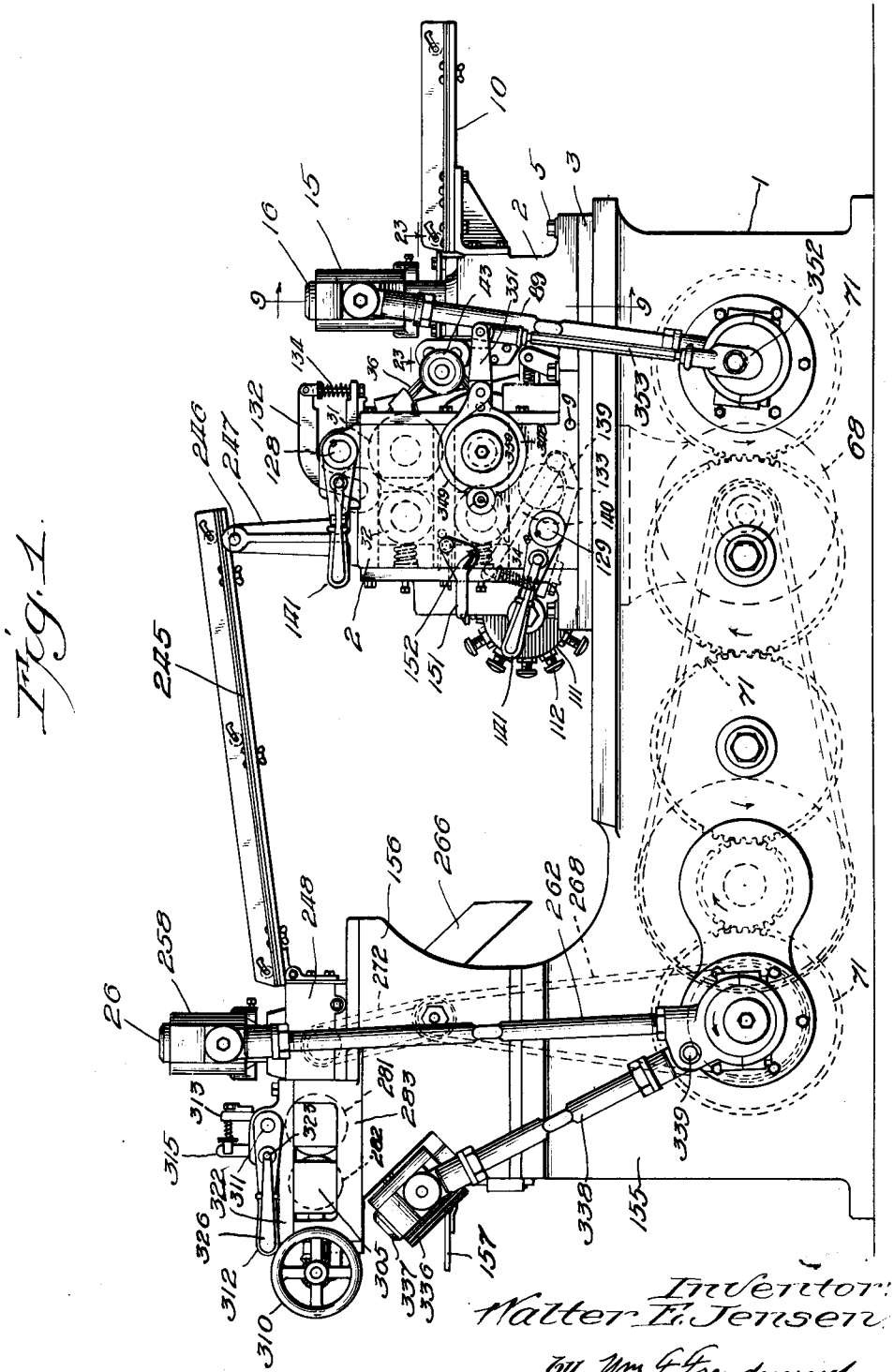


Fig. 1.

Inventor:
Walter E. Jensen
By Wm G. Brandenreich
Atty

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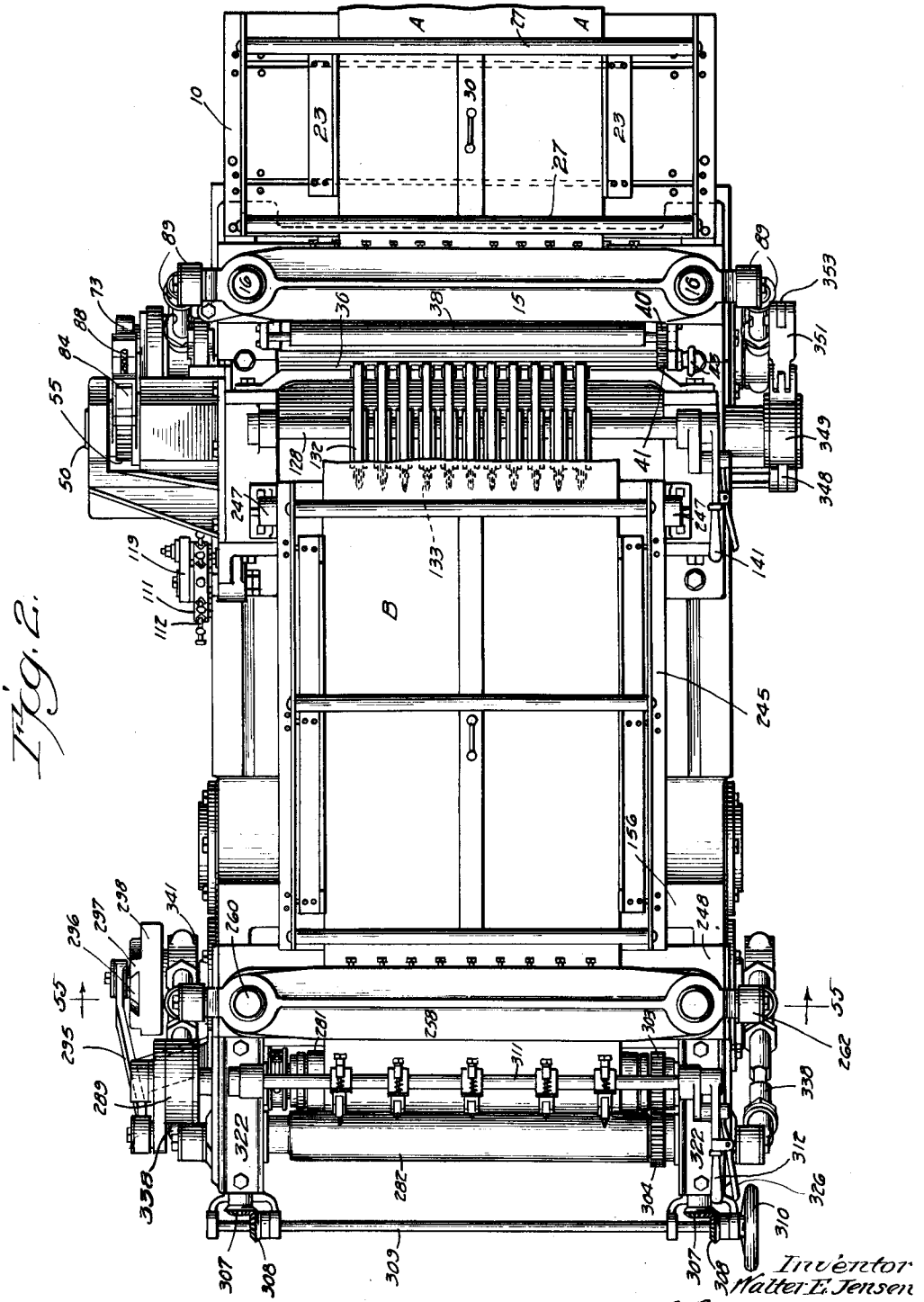


Fig. 2.

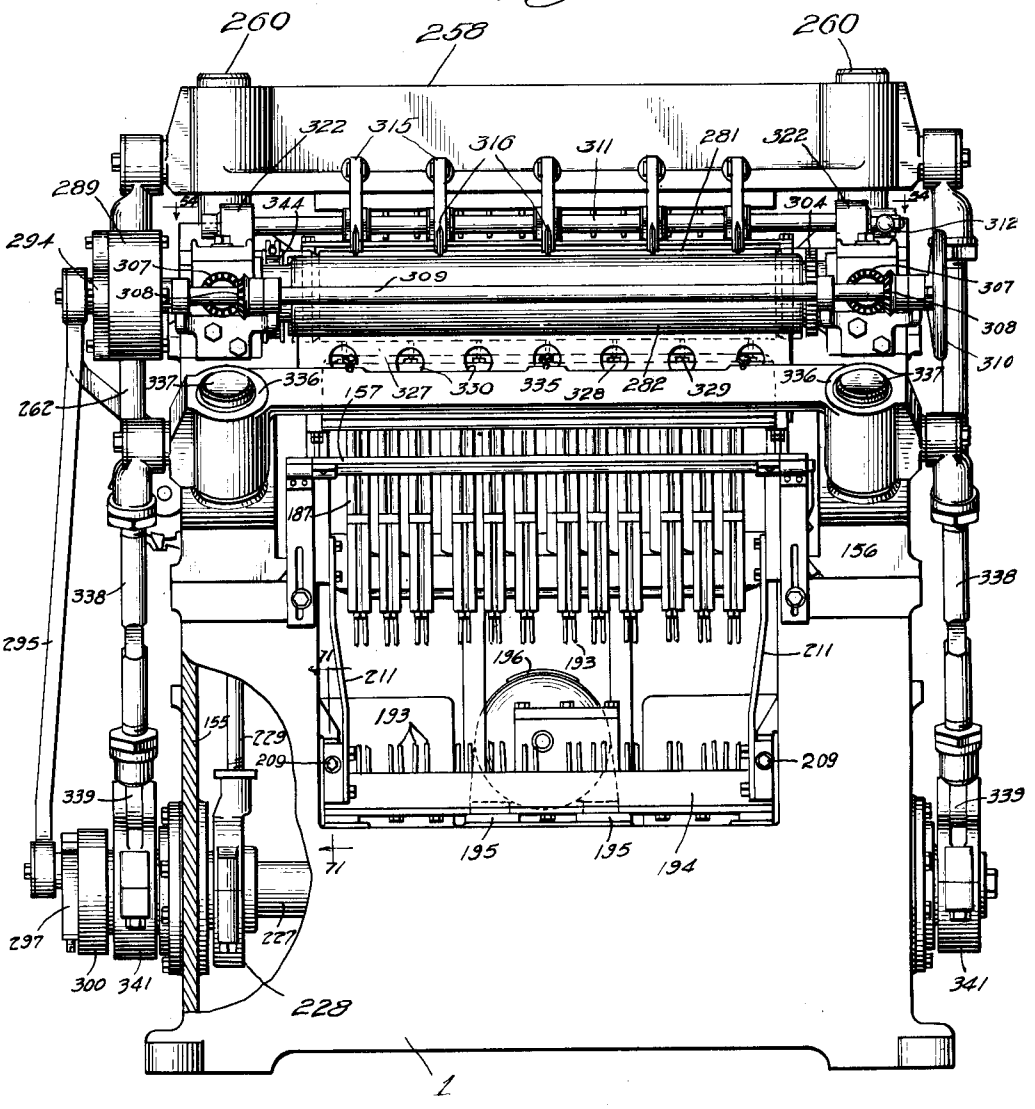
Inventor
Walter E. Jensen
by Wm. F. Prendergast,
Atty

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Fig. 3.



Inventor:
Walter W. Jensen
By W. F. Freudenreich,
Atty

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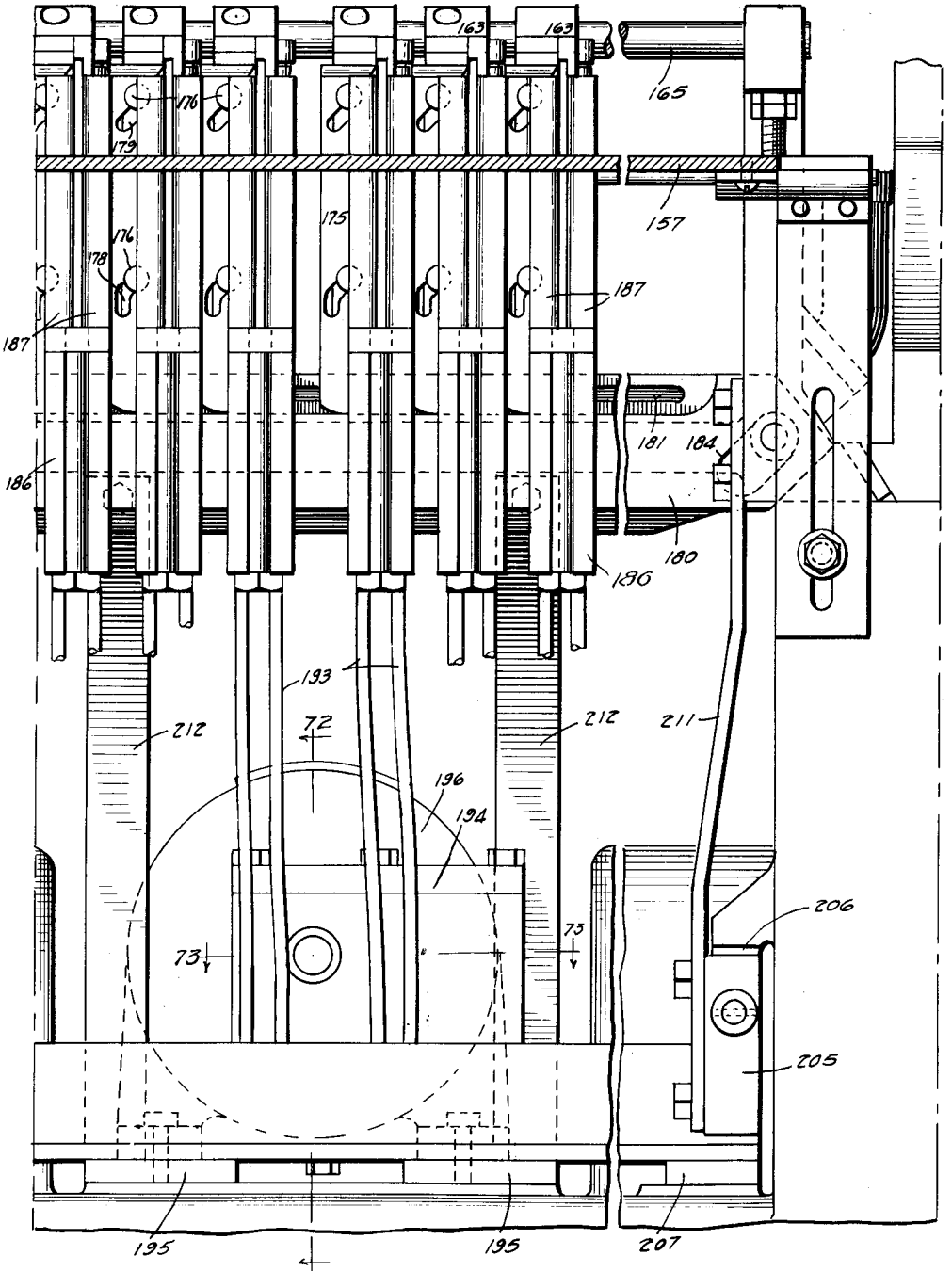


Fig. 4.

Inventor:
Walter E. Jensen
by Wm. F. Frendenreich,
Atty

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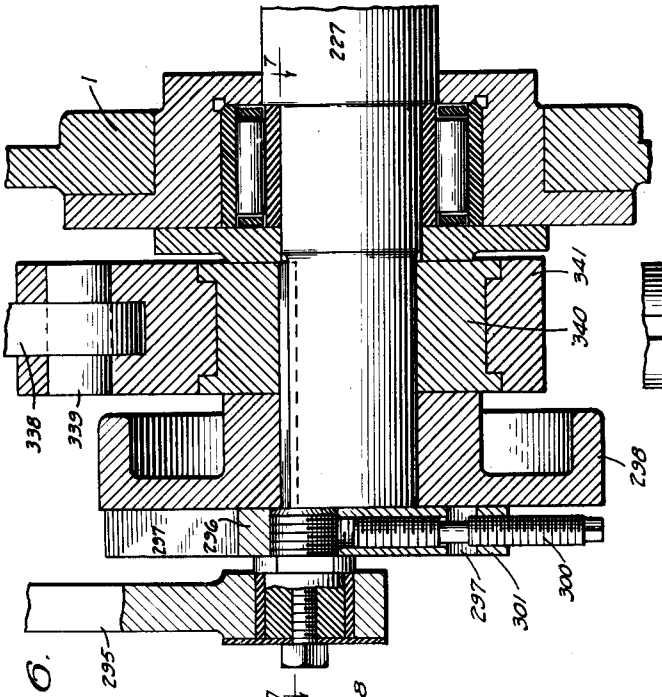


Fig. 6.

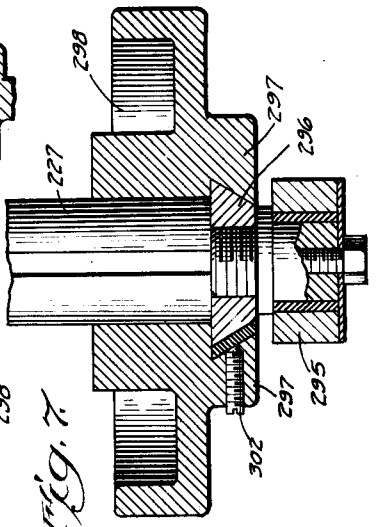


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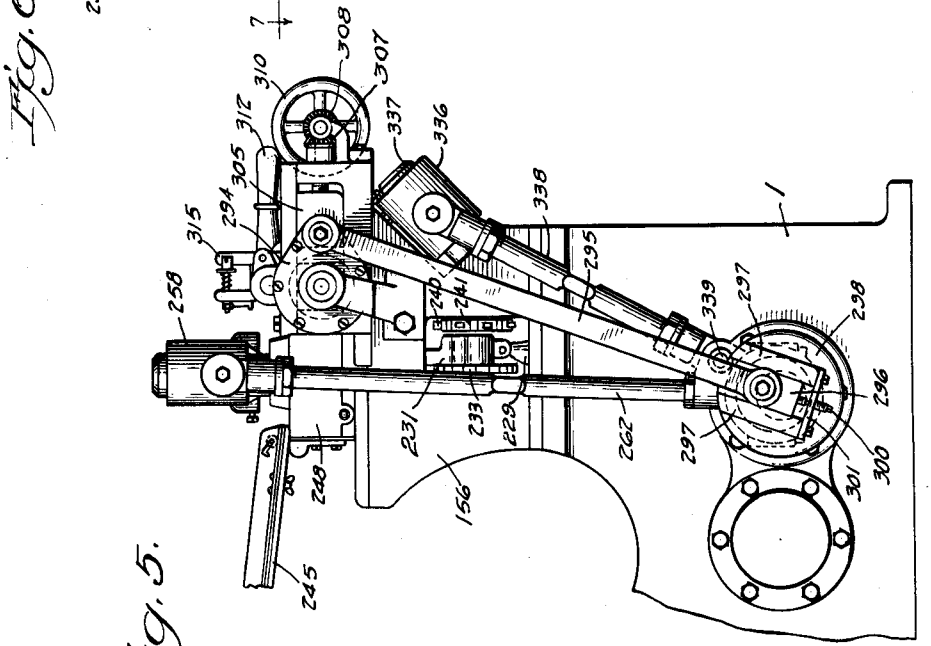


Fig. 5.

Inventor:
Walter E. Jensen
By Wm. F. Frendenreich
Atty

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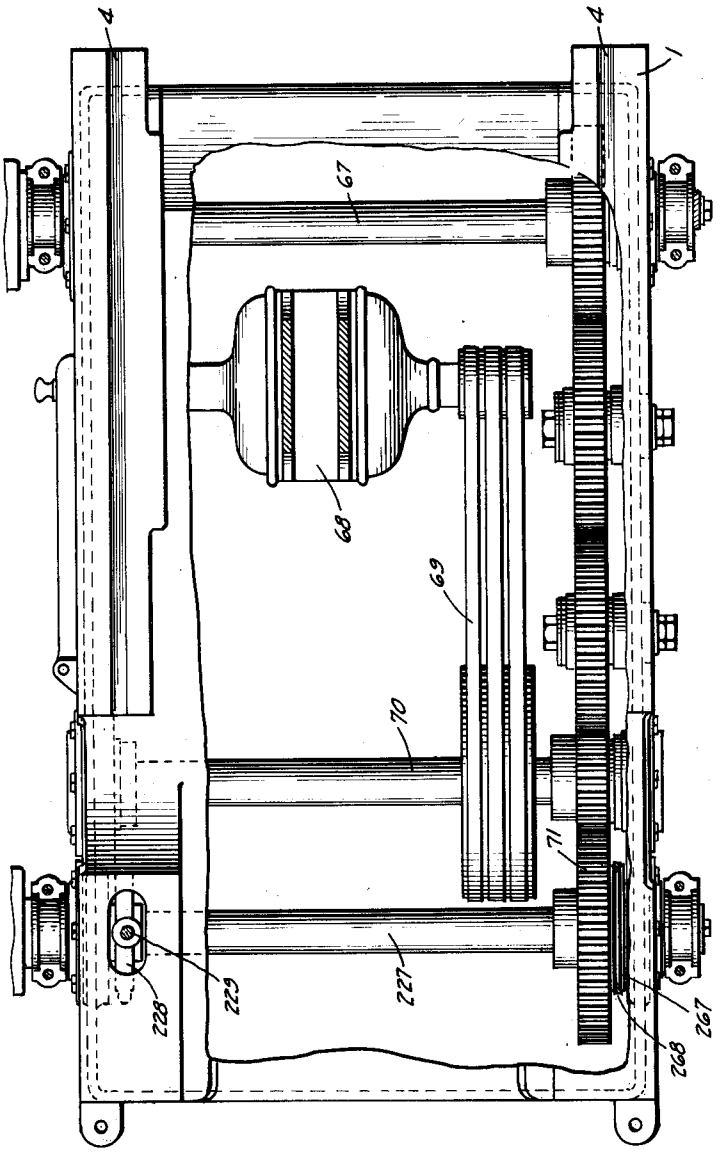


Fig. 8.

Inventor:
Walter E. Jensen
By Wm. F. Frendenreich
Atty

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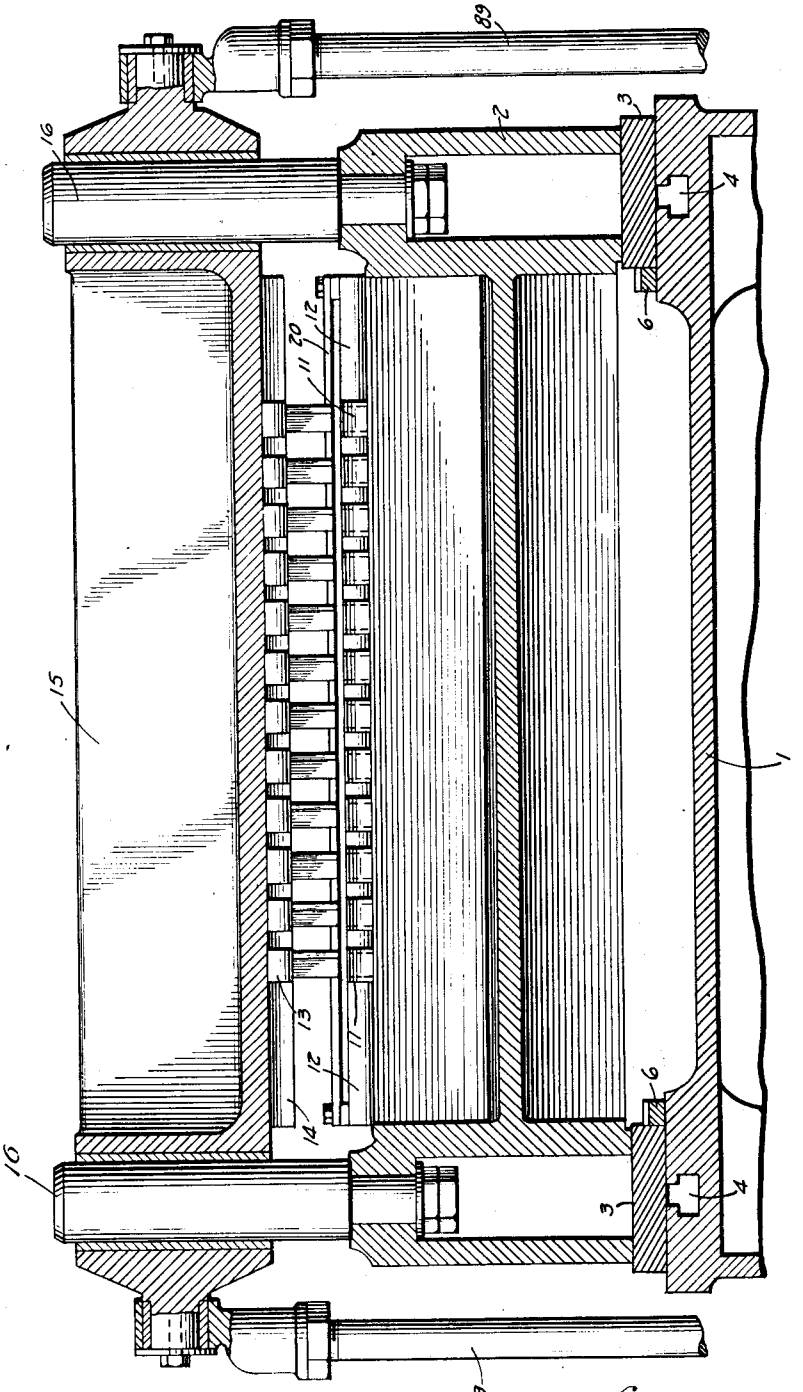


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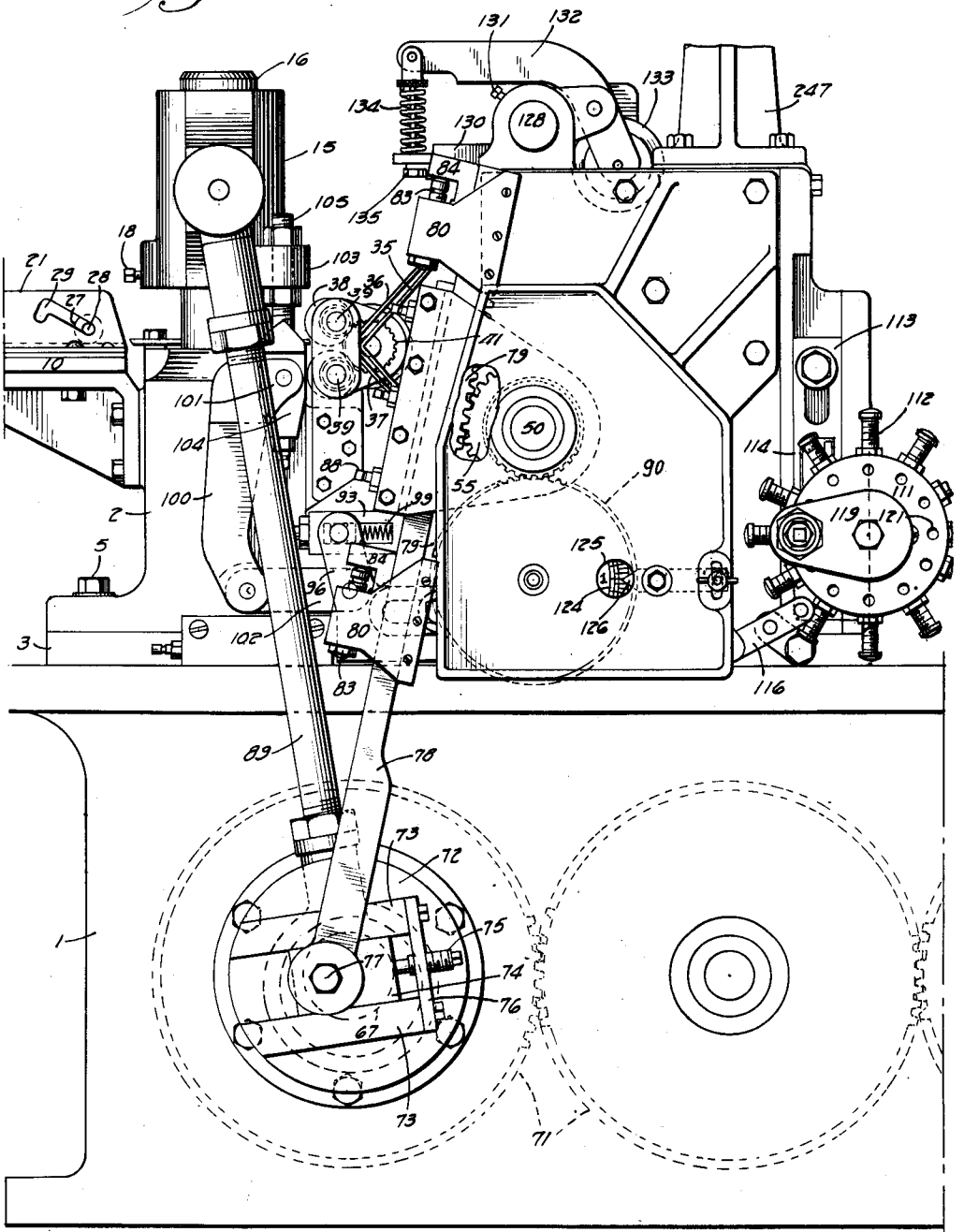
Inventor:
Walter E. Jensen
by Wm. F. Frendenreich
Atty

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Fig. 10.



Inventor:
Walter E. Jensen
by Wm. F. Freudenreich,
Atty

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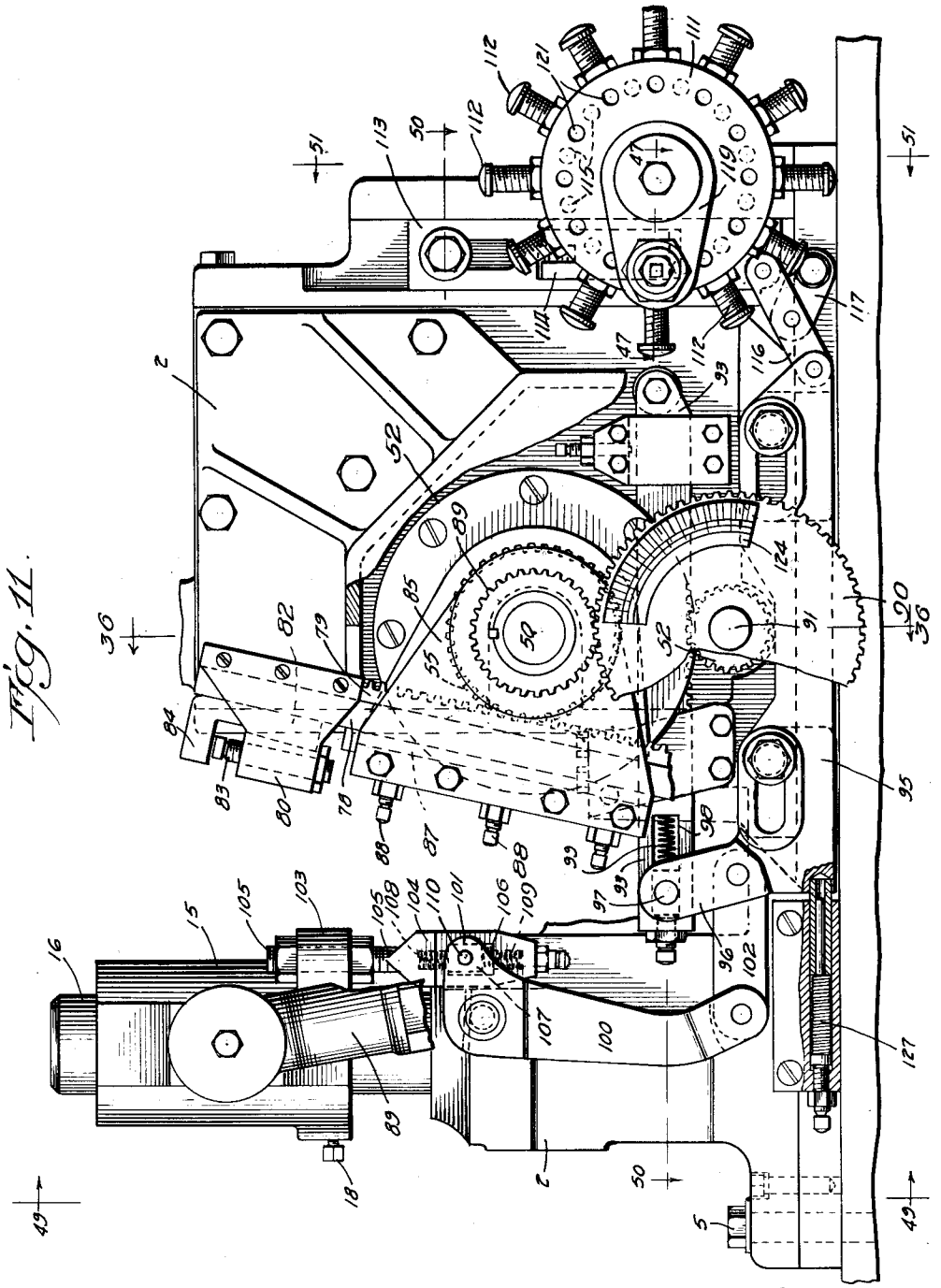


Fig. 11.

Inventor
Walter E. Jensen
by Wm. F. Frendenreich,
Atty

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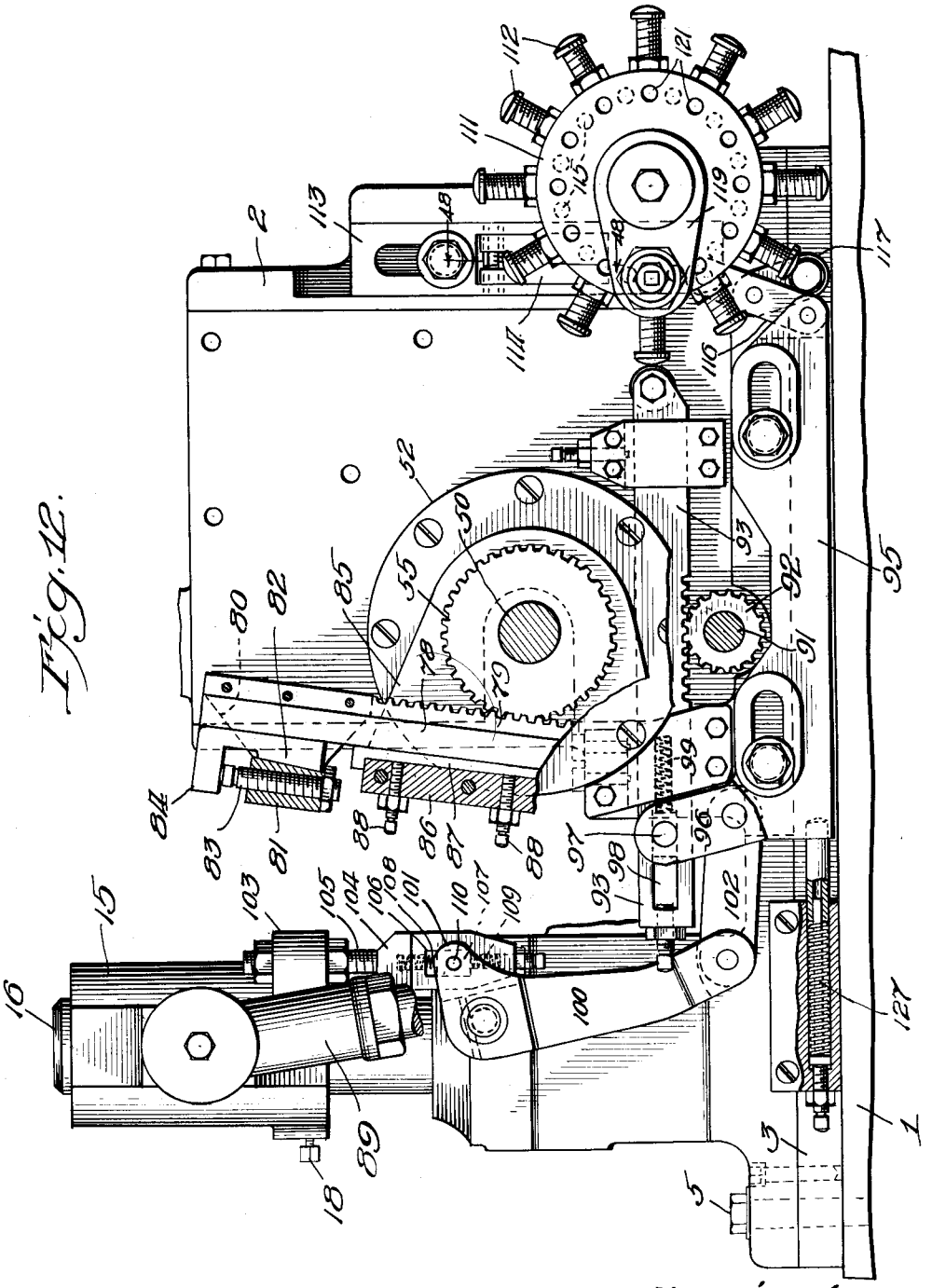


Fig. 12.

Inventor:
Walter E. Jensen
By Wm. F. Frendenreich, Atty.

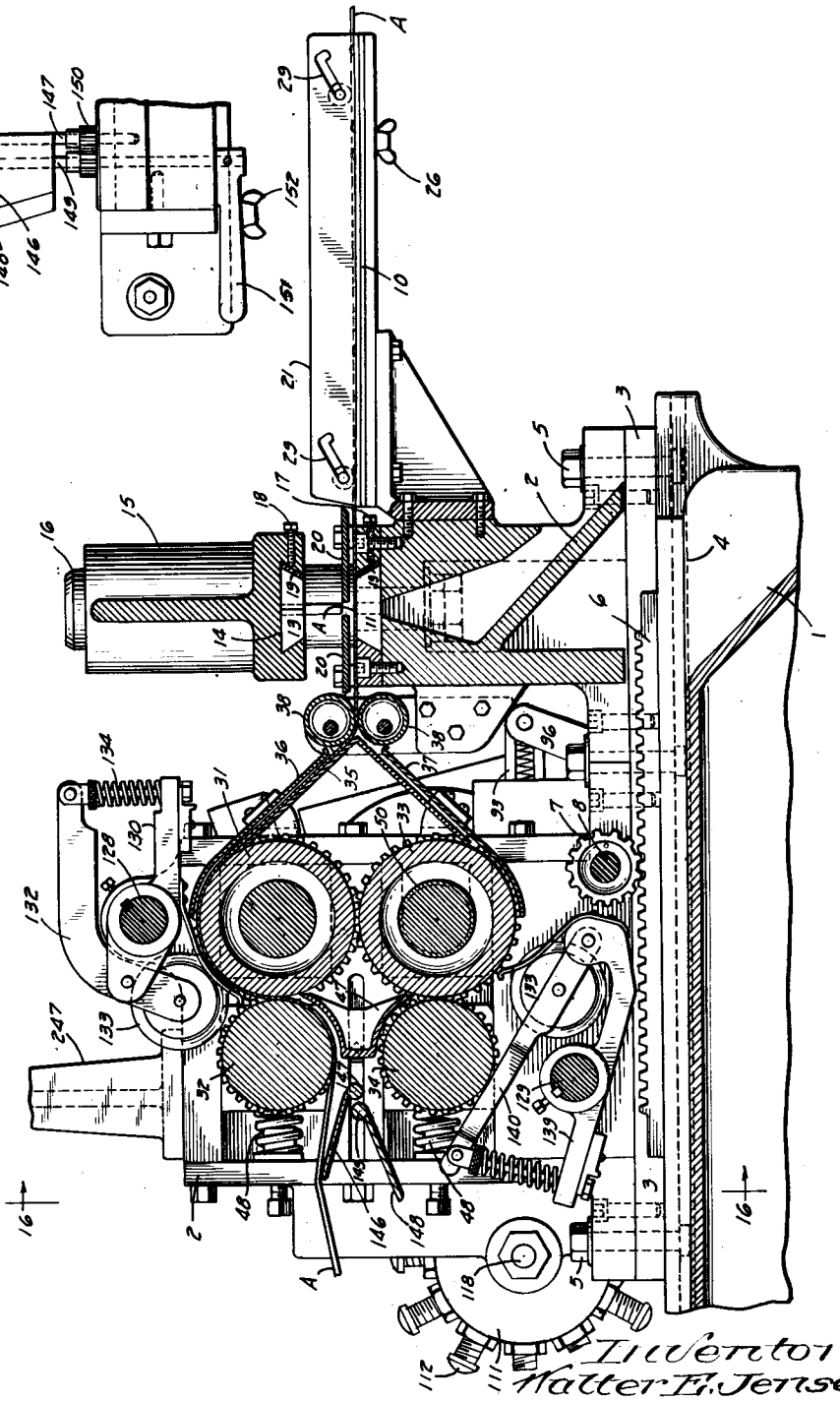
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Fig. 14.

Fig. 15.



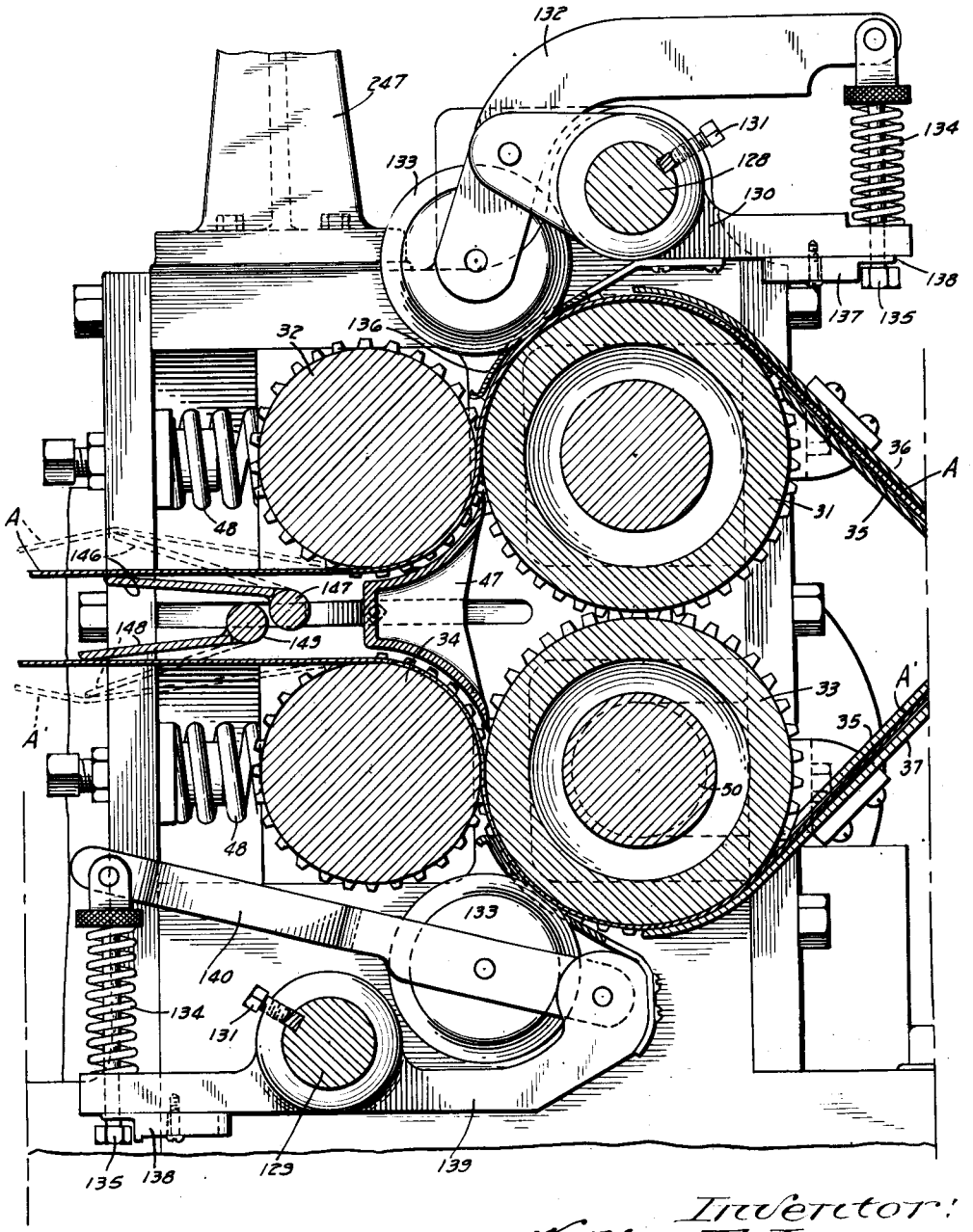
Inventor:
Walter E. Jensen
By Wm. G. Trendenreich
Atty

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Fig. 15.



Inventor:
Walter E. Jensen
by W. F. Freudenreich,
Atty

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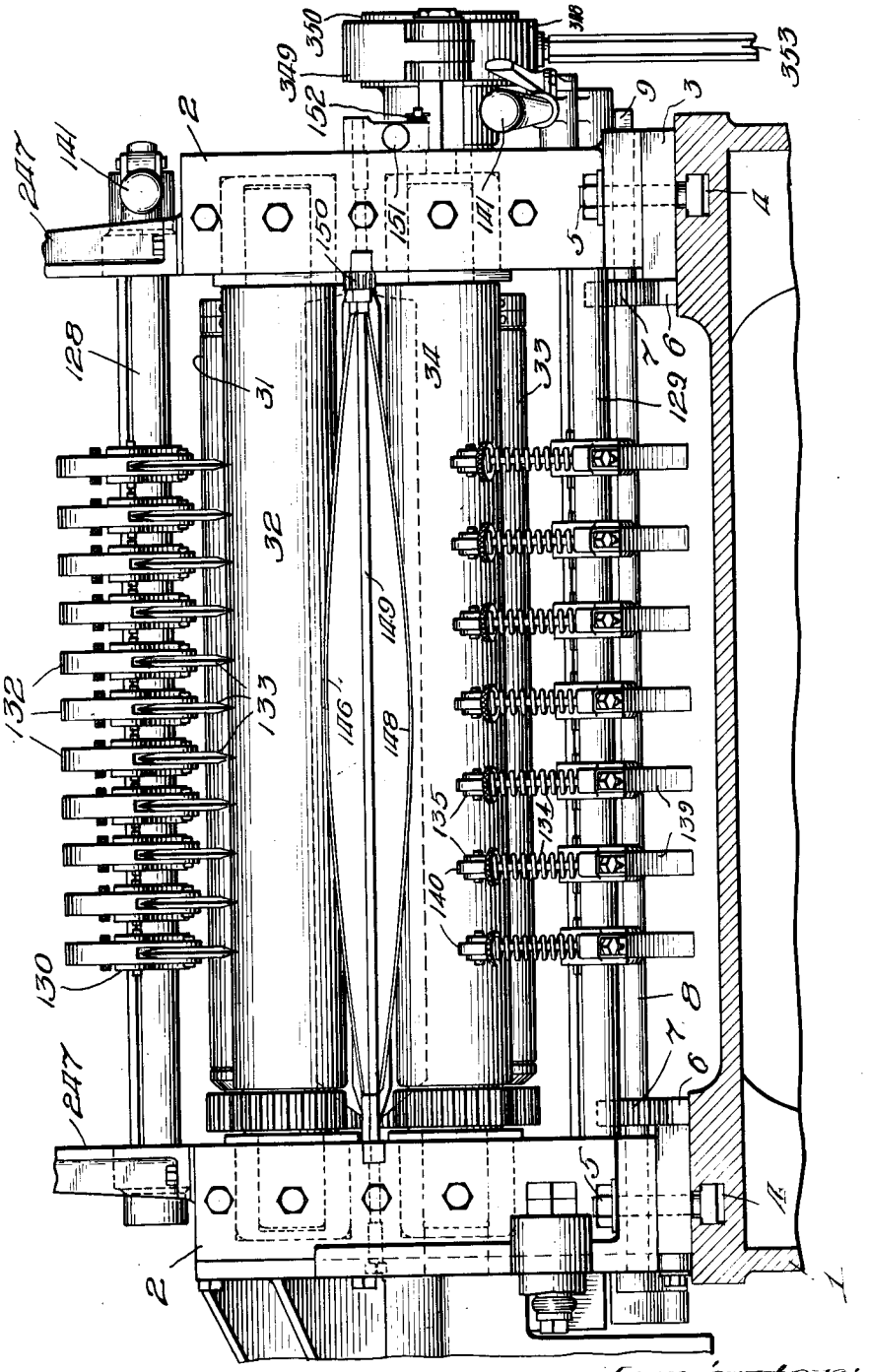


Fig. 16.

Inventor:
Walter E. Jensen
by Wm. F. Prendergast
Atty

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Fig. 17.

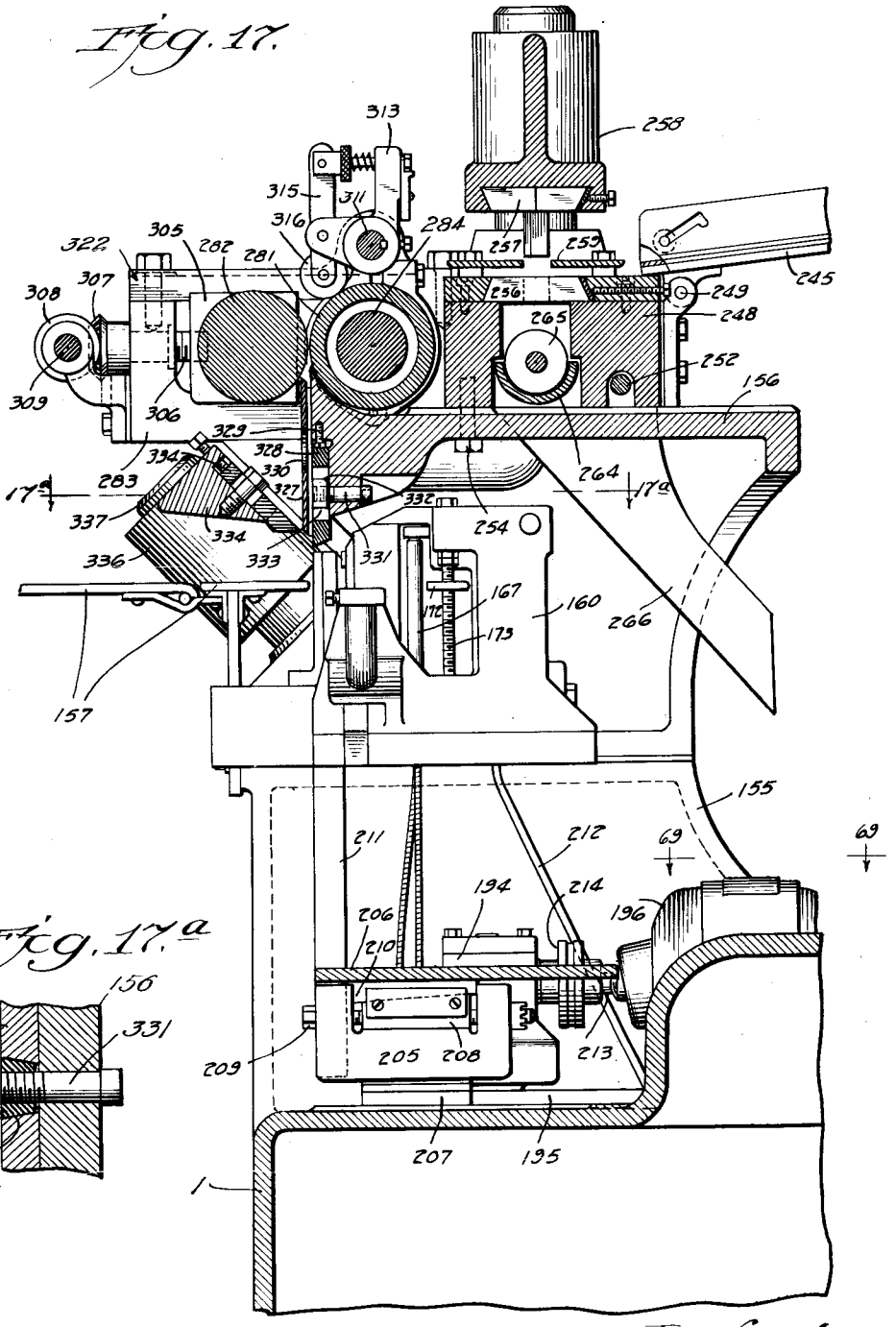


Fig. 17a.

Inventor:
Walter E. Jensen.
By Wm. F. Frendenreich,
Atty.

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Fig. 18.

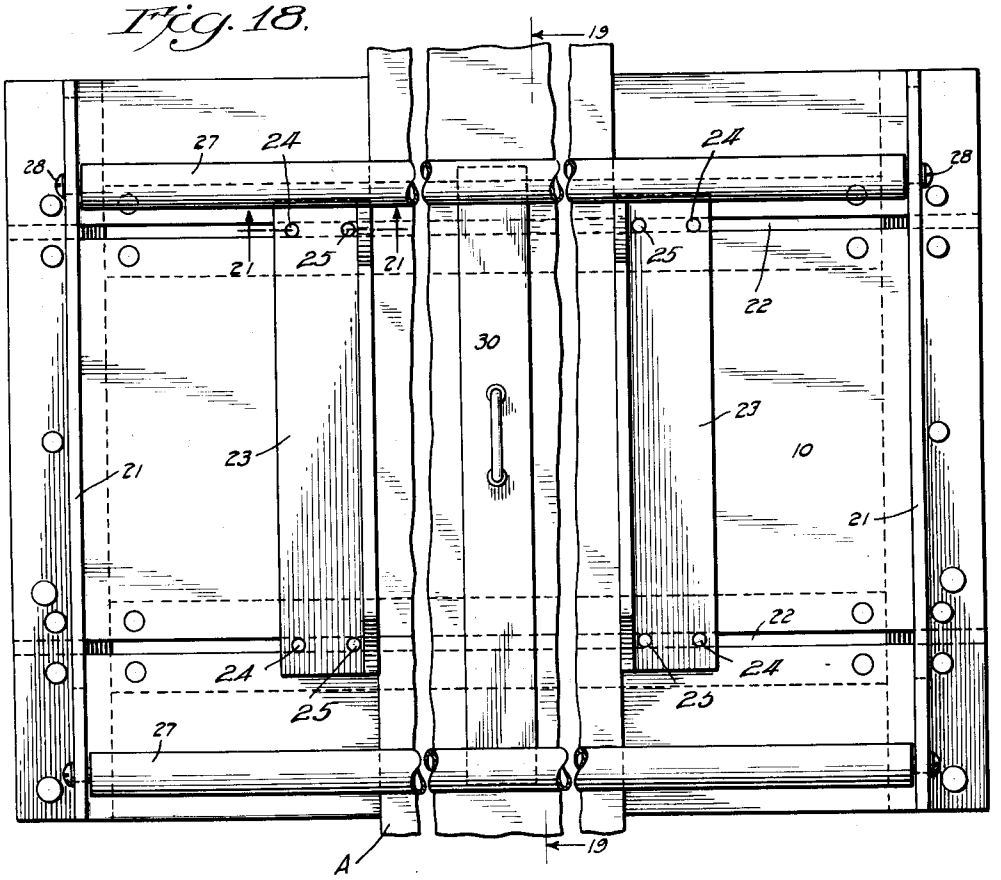


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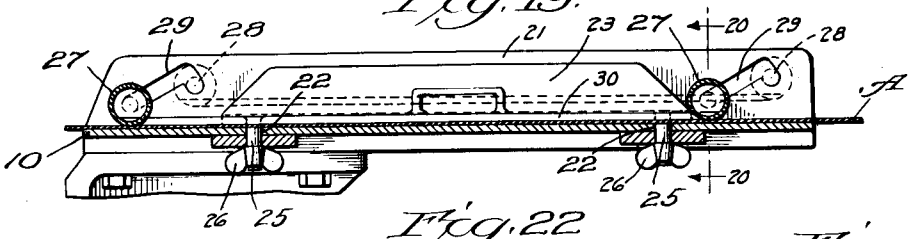


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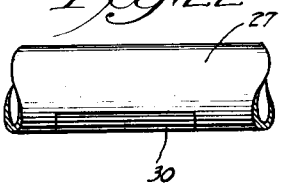


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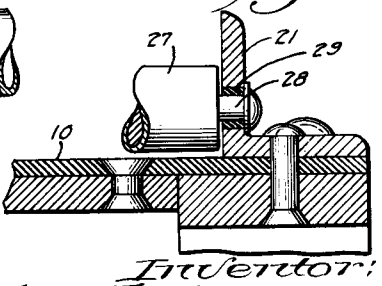
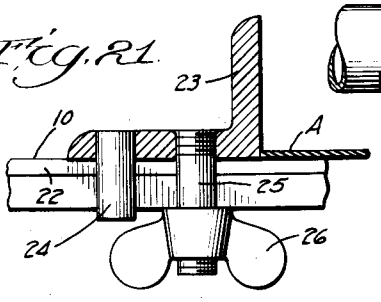


Fig. 21.



Inventor:
Walter E. Jensen
by W. F. Freudenreich, Atty

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Fig. 23.

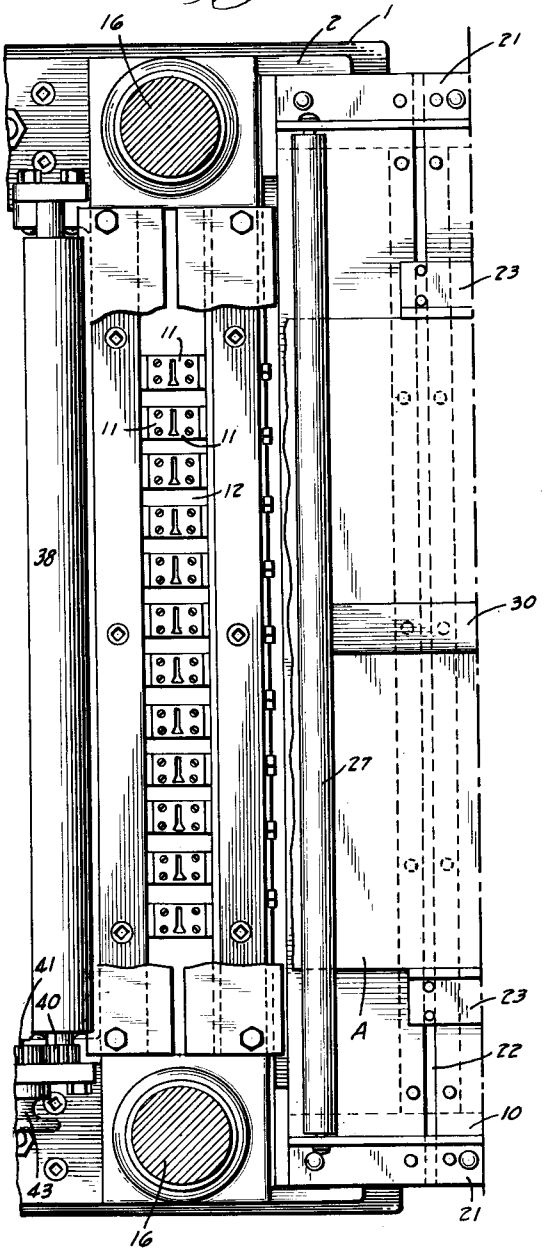


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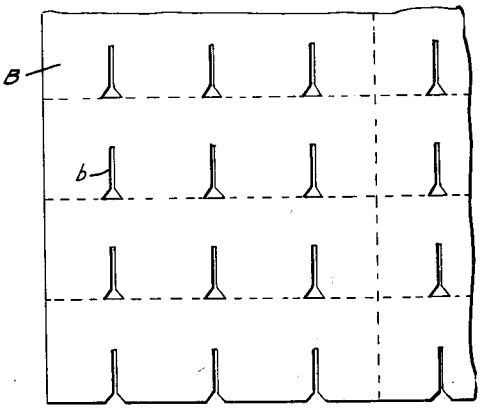
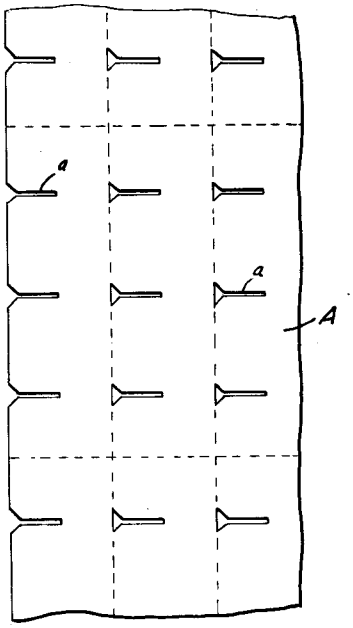


Fig. 25.



Inventor:
Walter E. Jensen
by W. F. Freudenreich,
Atty.

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Fig. 26.

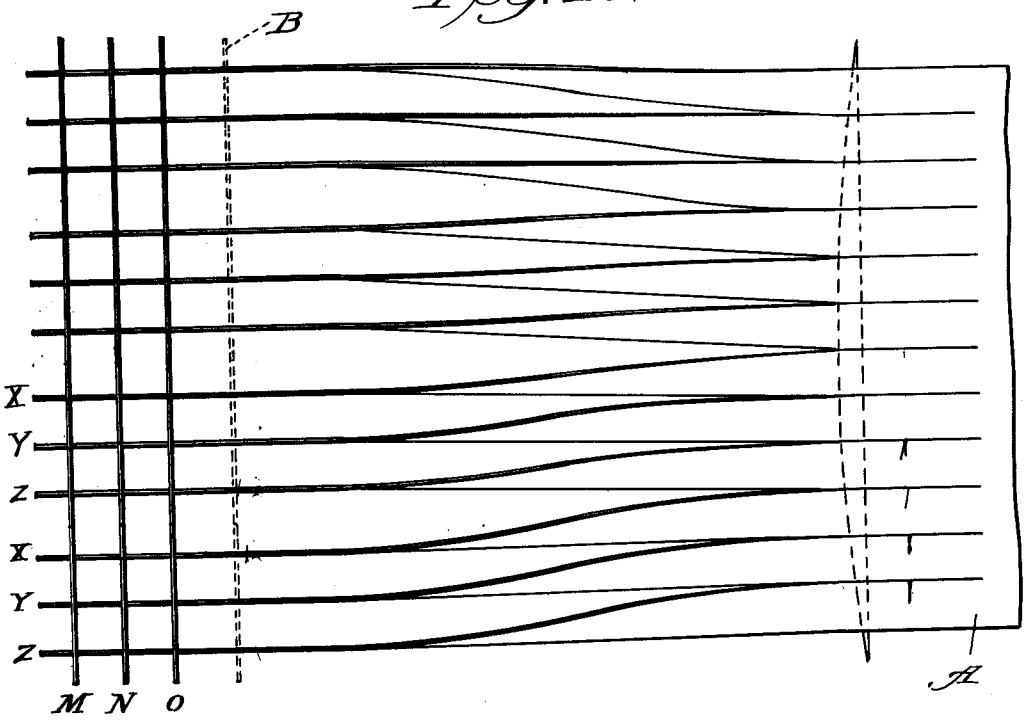
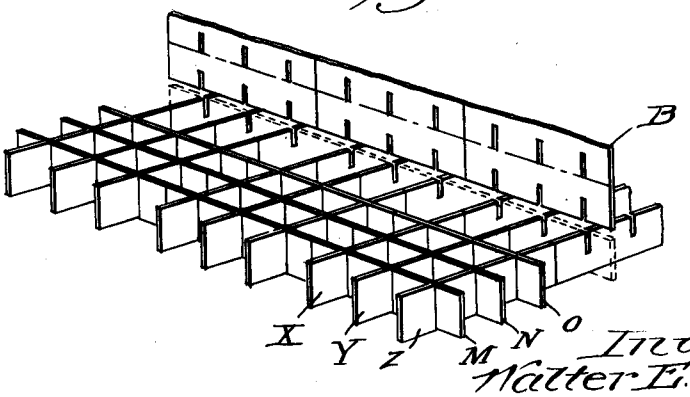


Fig. 27.



Inventor:
Walter E. Jensen.
By Wm. F. Frendenreich, Atty

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Fig. 32.

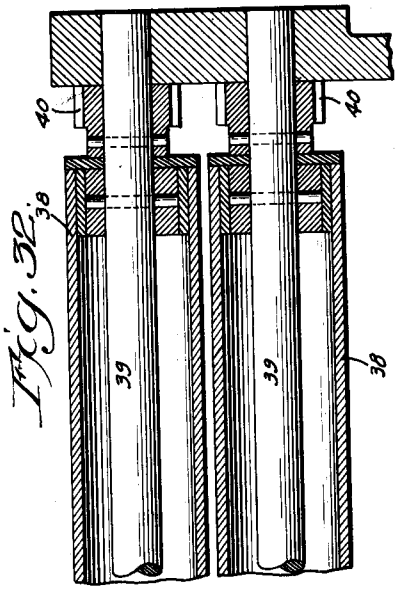


Fig. 31.

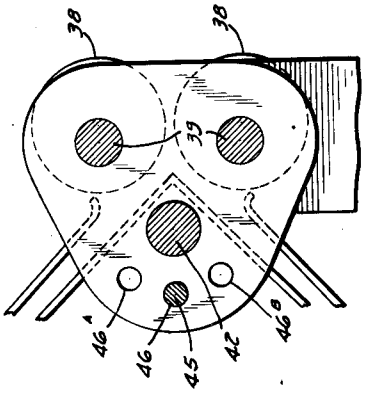


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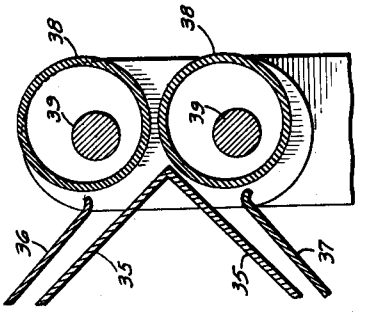


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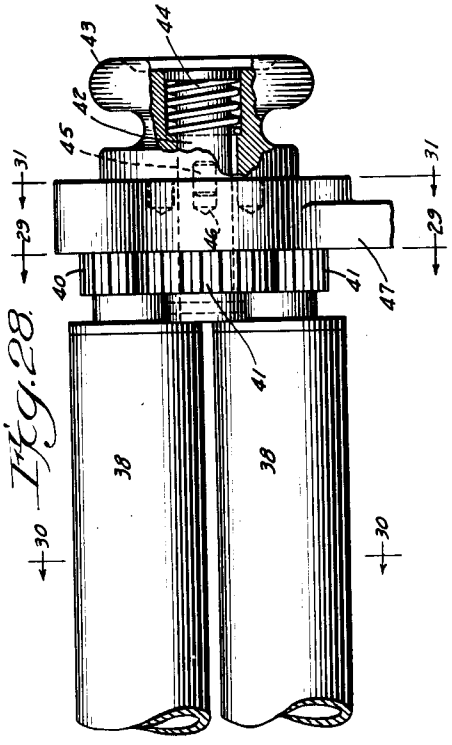
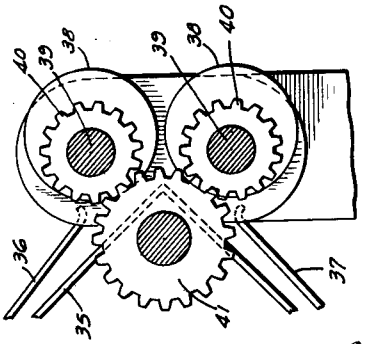


Fig. 29.



Inventor.
Walter E. Jensen
By Wm. F. Frendenreich,
Atty.

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Fig. 33.

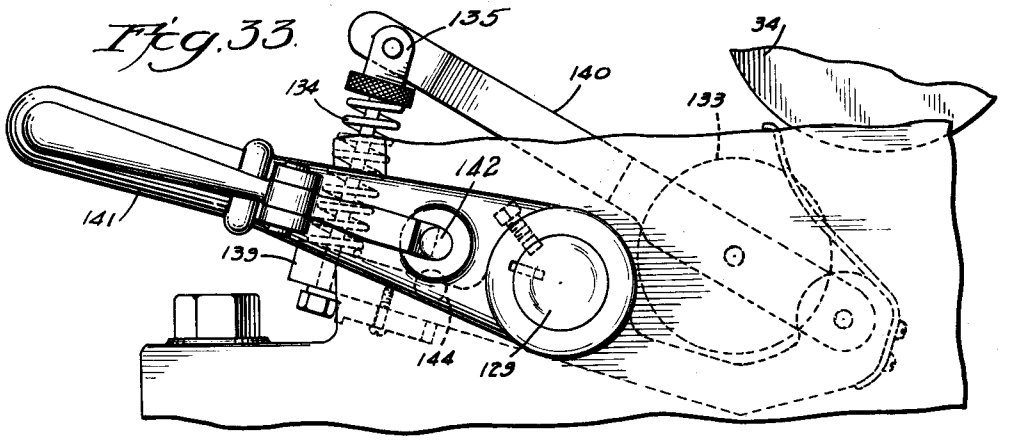


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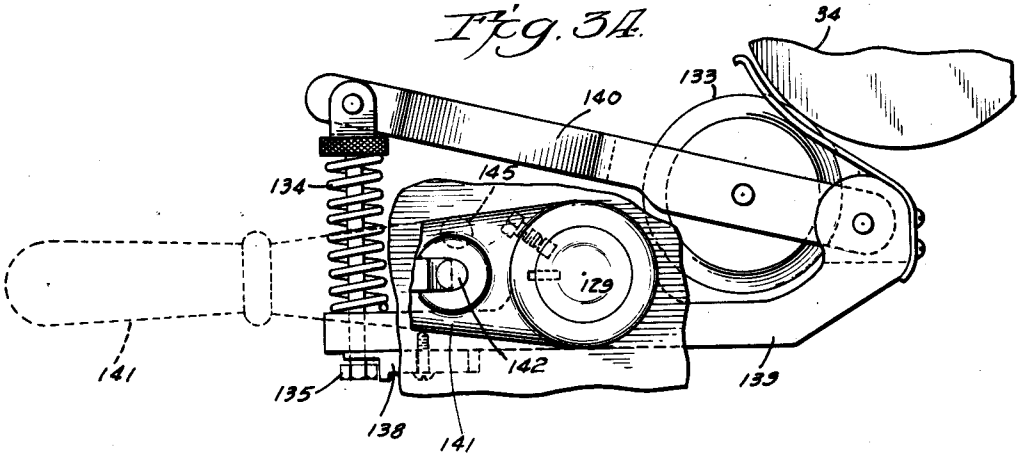
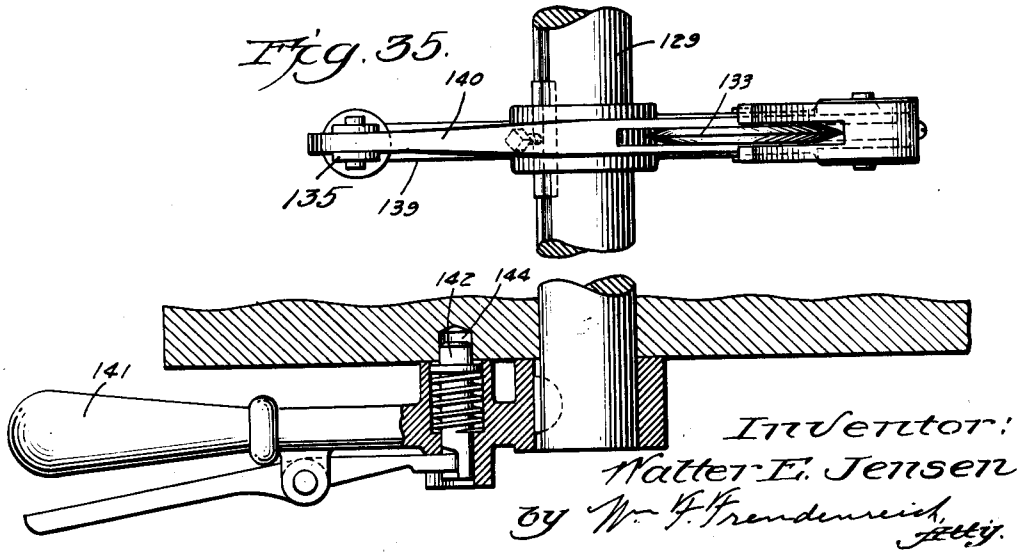


Fig. 35.



Inventor:
Walter E. Jensen
by Wm. F. Frendenreich, Atty.

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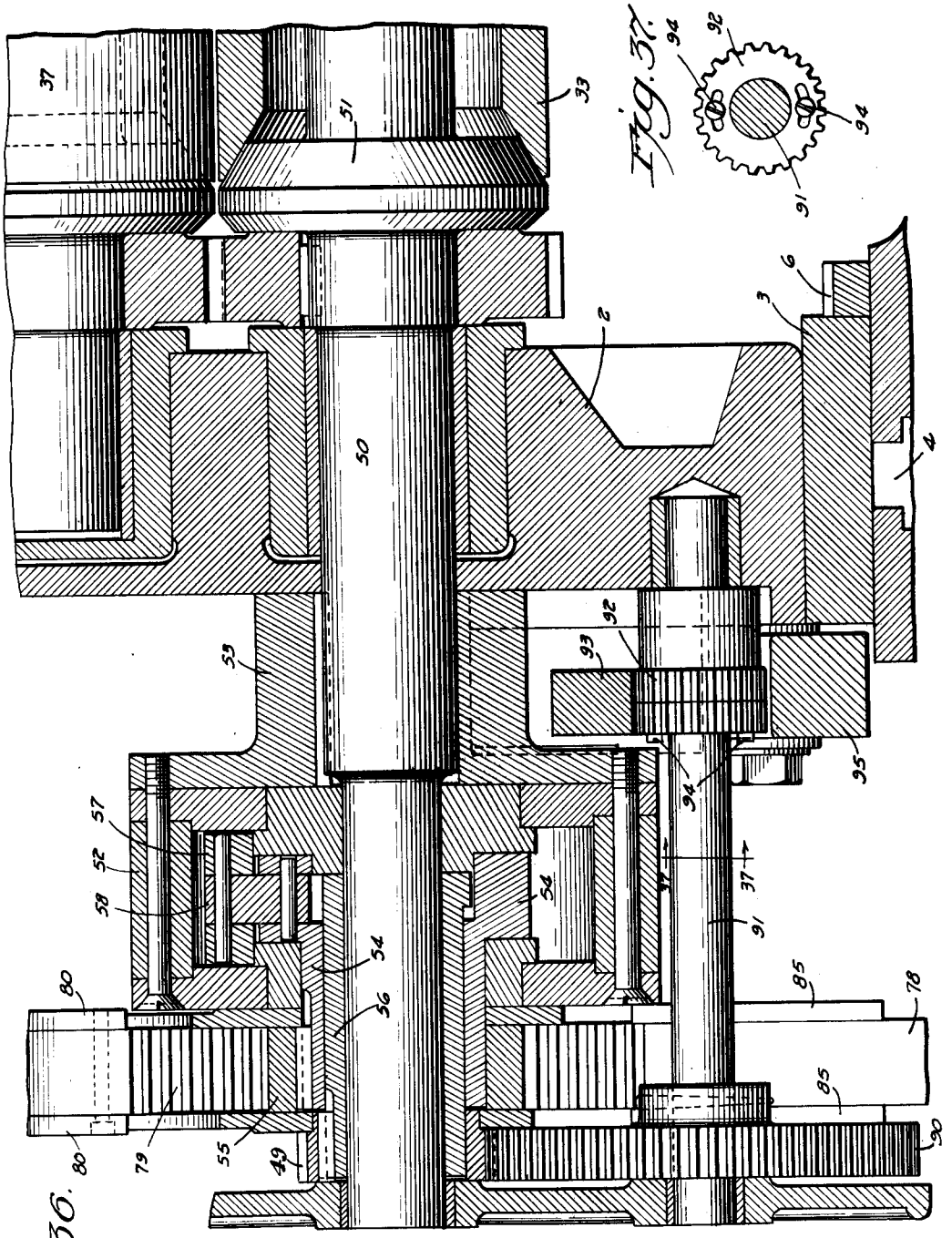


Fig. 37.

Fig. 36.

Inventor:
Walter E. Jensen
by Wm. F. Freudenreich,
Atty

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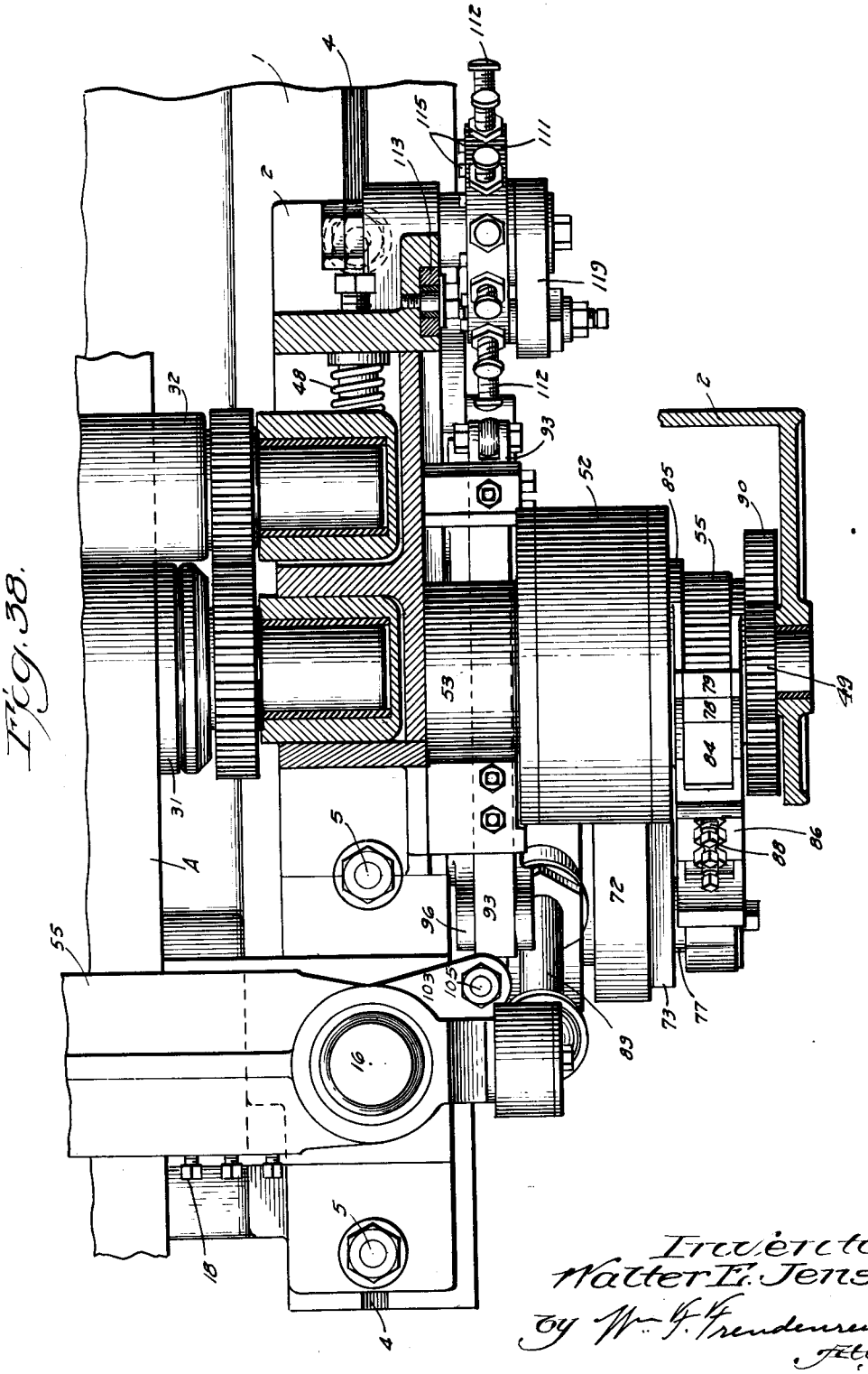


Fig. 38.

Inventor:
Walter E. Jensen
by Wm. G. Frendenreich
Atty

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Fig. 39.

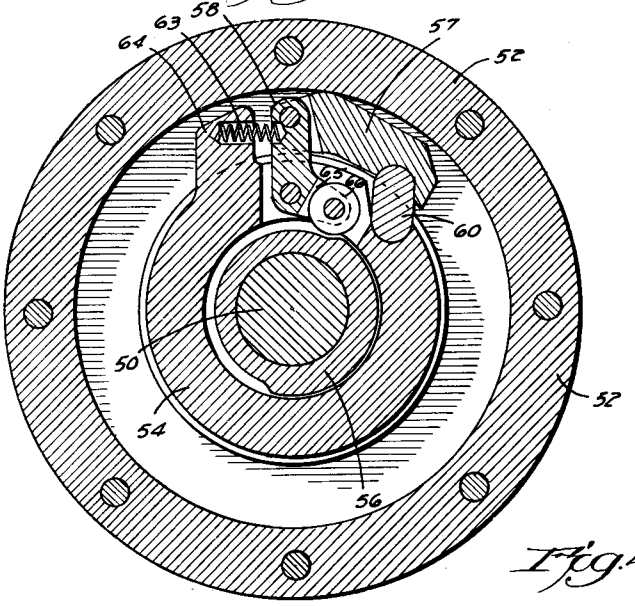


Fig. 41.



Fig. 40.

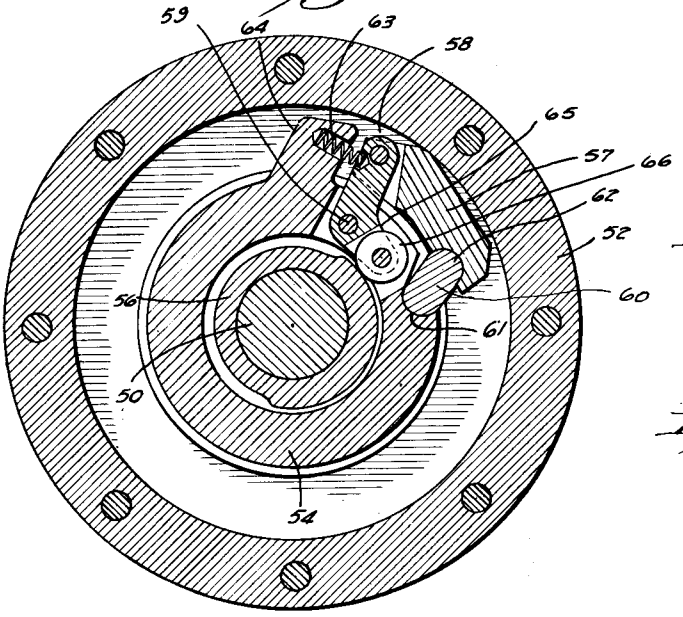


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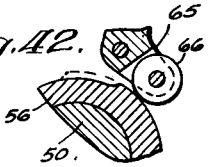


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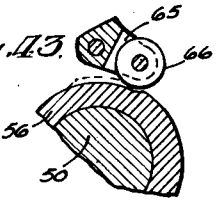
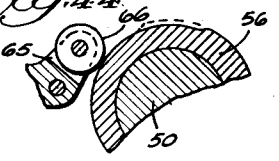


Fig. 44.



Inventor:
Walter E. Jensen
by W. F. Frendenreich
Atty

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Fig. 45.

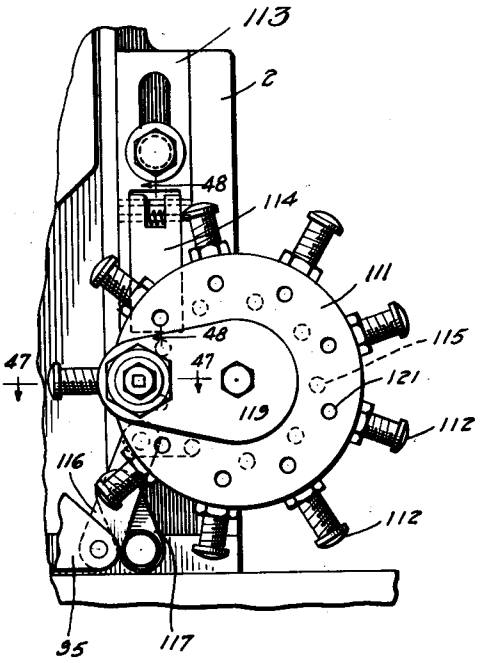


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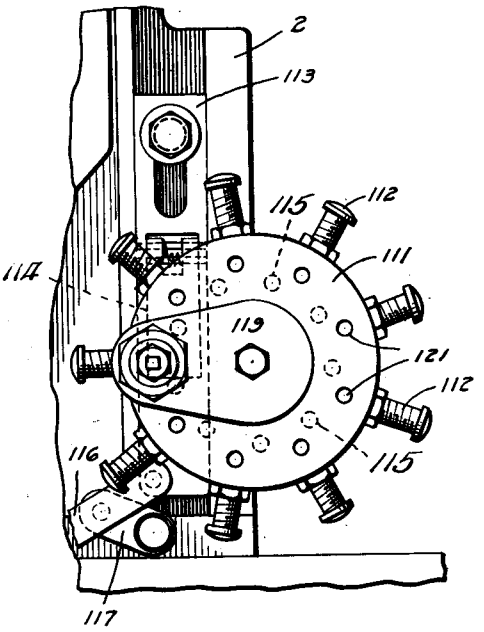


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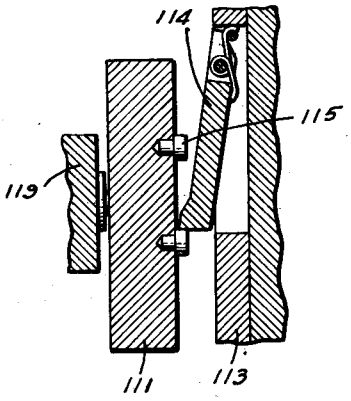
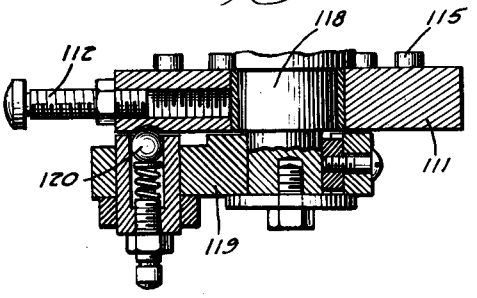


Fig. 47.



Inventor:
Walter E. Jensen
by Wm. F. Frendenreich,
Atty

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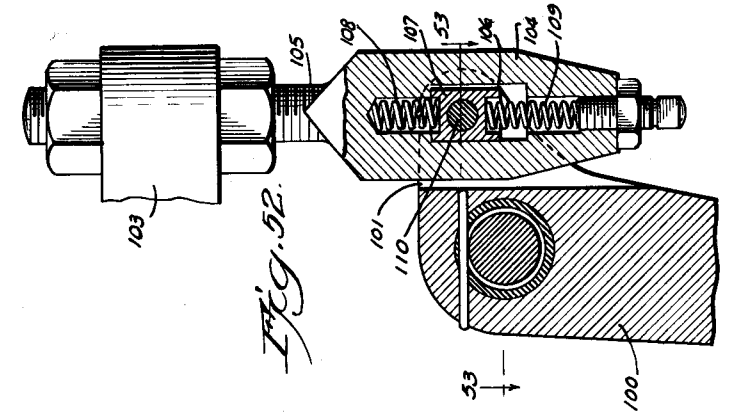


Fig. 52.

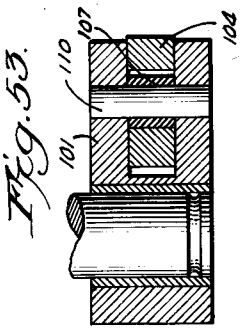


Fig. 53.

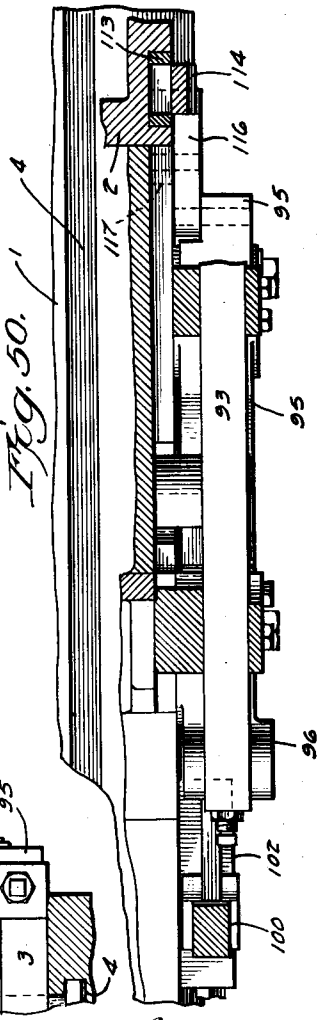


Fig. 50.

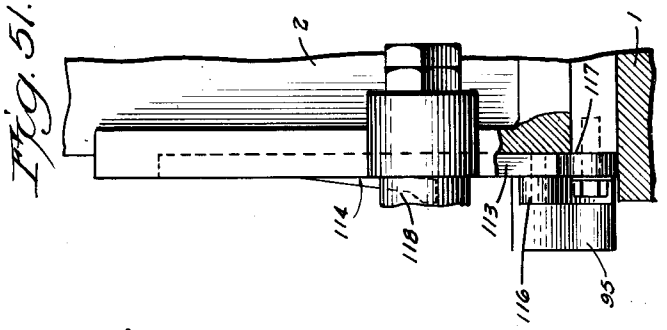


Fig. 51.

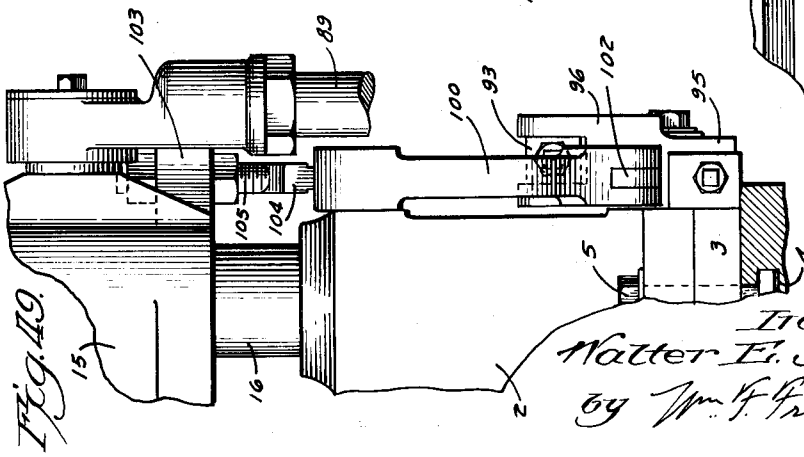


Fig. 49.

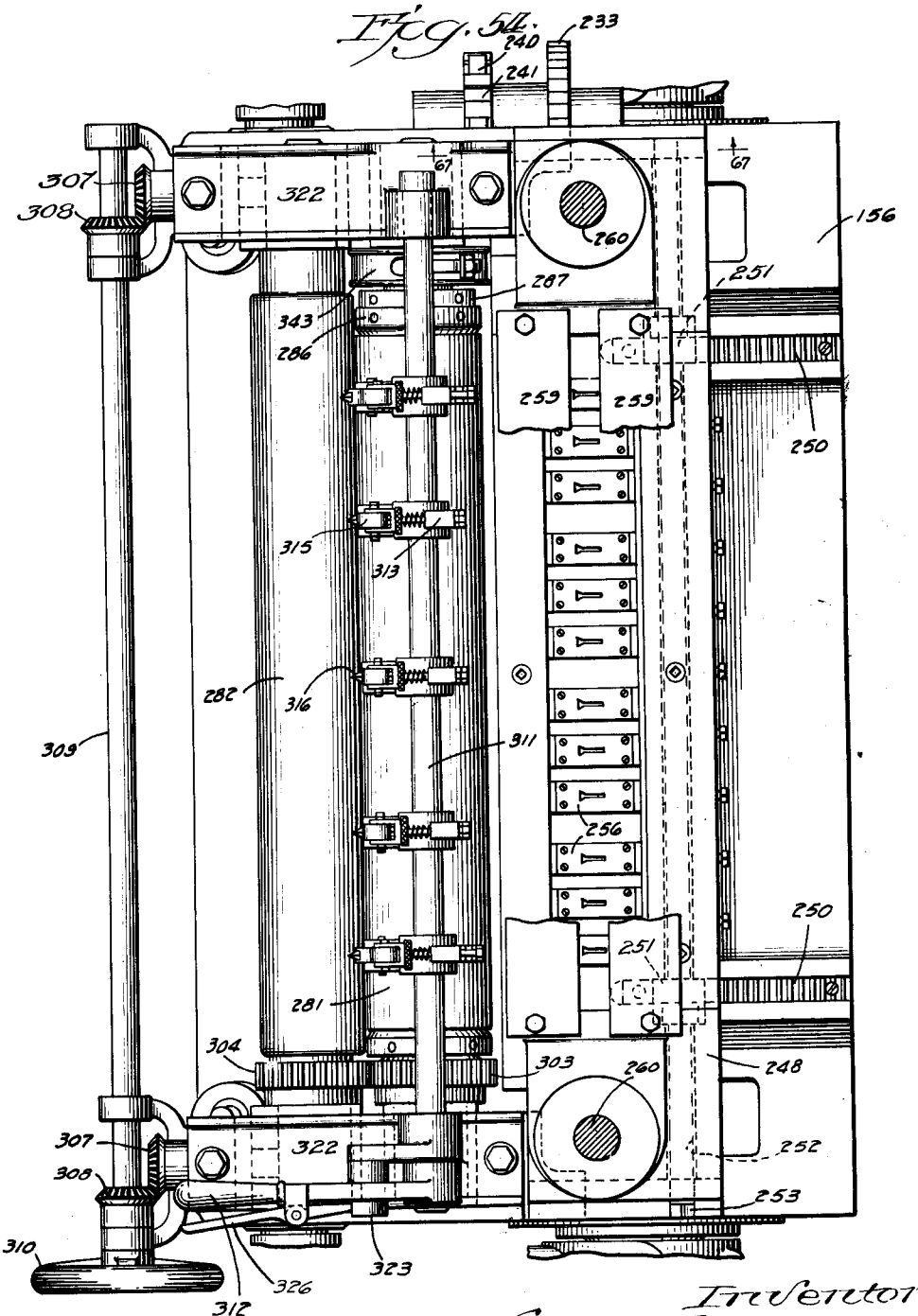
Inventor:
Walter E. Jensen
by Wm. F. Frendenreich,
Atty

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Fig. 54.



Inventor
Walter E. Jensen
By Wm F Frendenreich
Atty

Nov. 15, 1932. W. E. JENSEN 1,887,977

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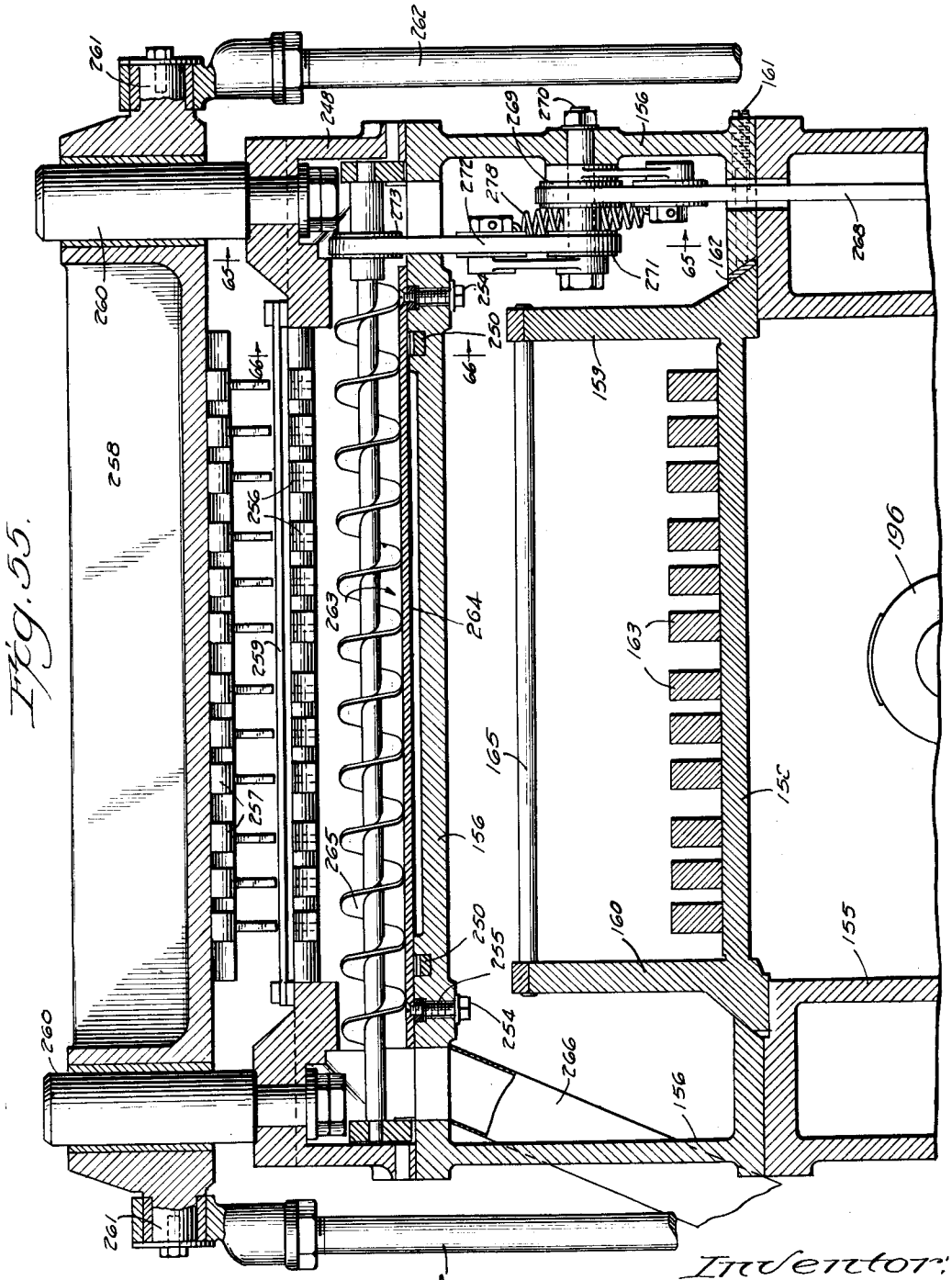


Fig. 55.

Inventor:
Walter E. Jensen
by Wm. F. Frendenreich
Atty

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PARTITION MACHINE

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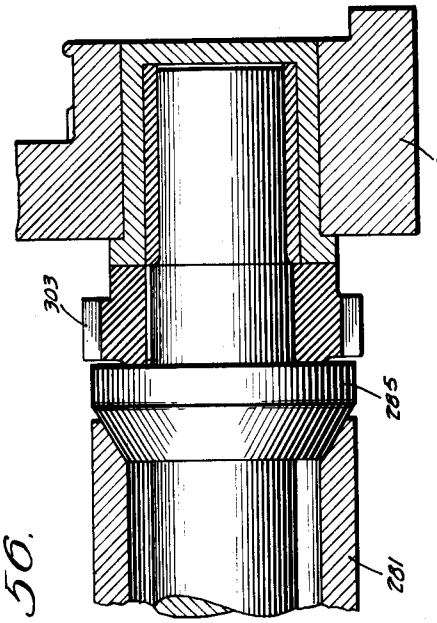


Fig. 56.

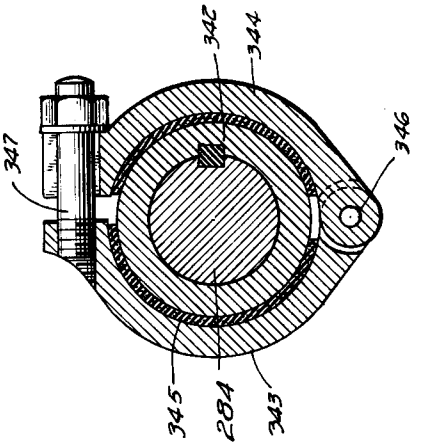
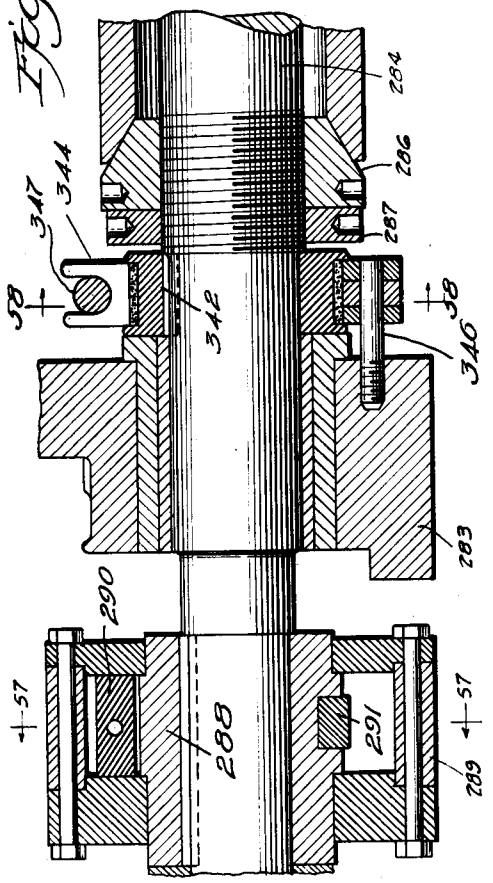


Fig. 58.



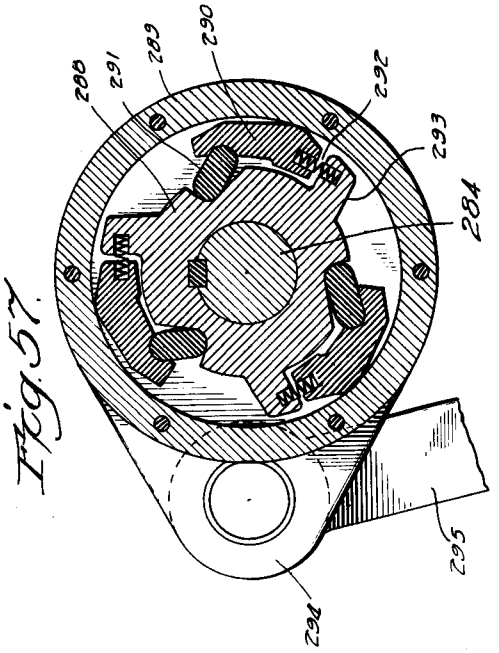


Fig. 57.

Inventor
Walter E. Jensen
by Wm. F. Frendenreich,
Atty.

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Fig. 60.

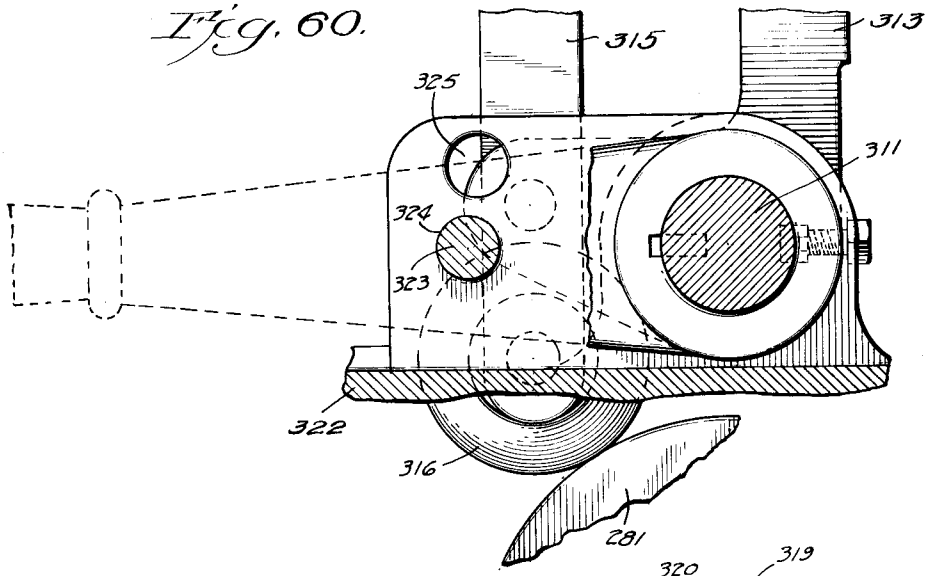
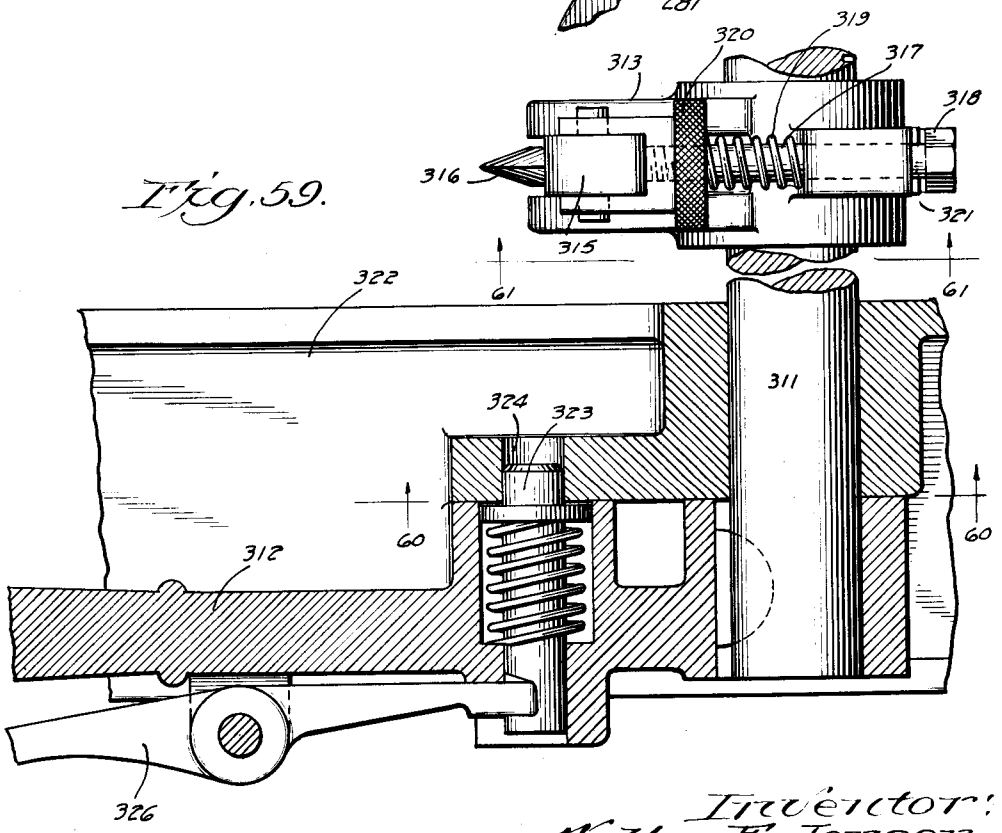


Fig. 59.



Inventor:
Walter E. Jensen
By Wm. F. Frendenreich,
Atty

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Fig. 62.

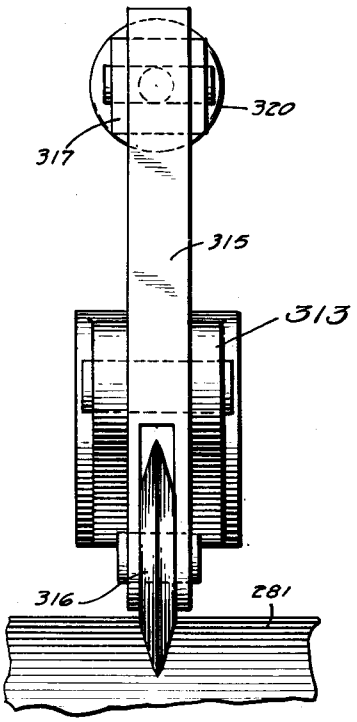


Fig. 61.

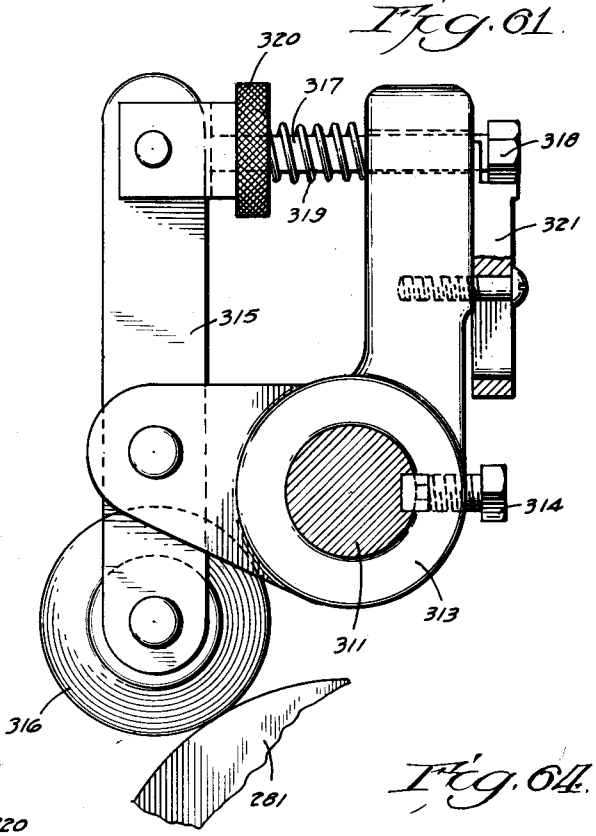


Fig. 64.

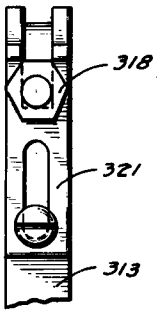
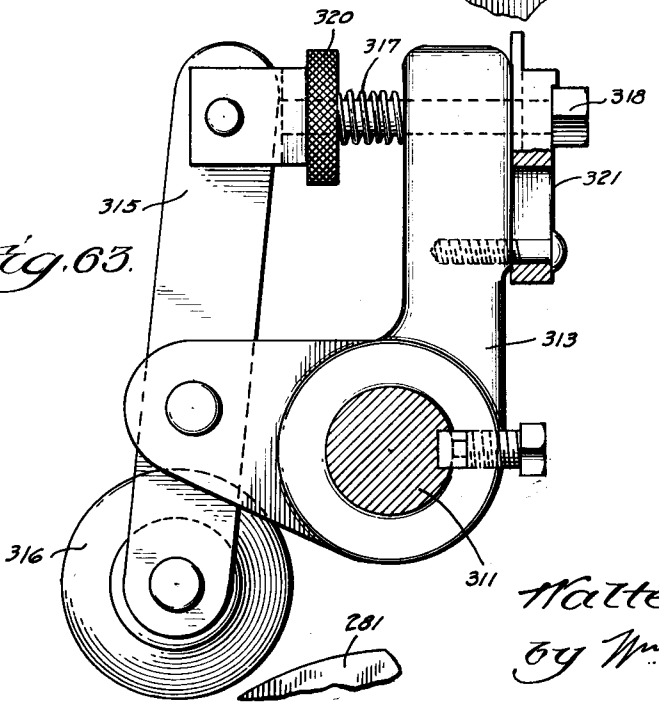


Fig. 63.



Inventor:
Walter E. Jensen
by Wm. F. Frendenreich,
Atty

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Fig. 65.

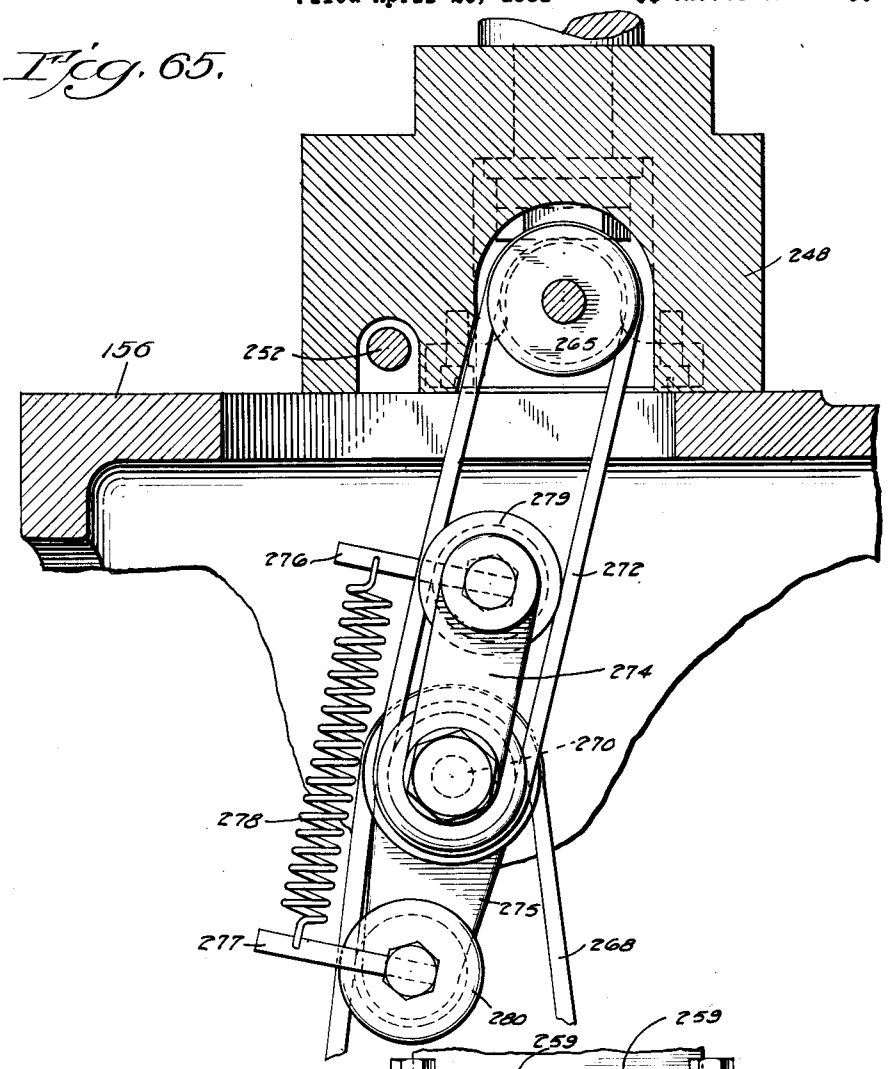
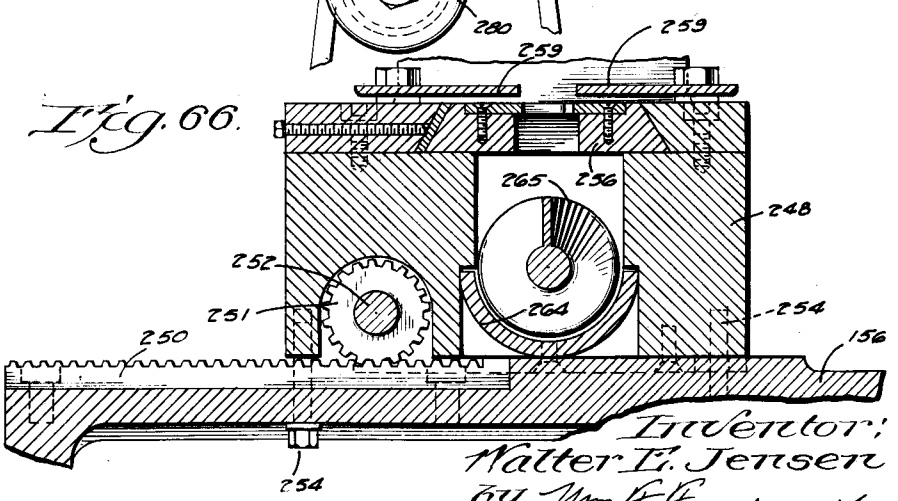


Fig. 66.



Inventor:
Walter E. Jensen
by Wm. F. Frendenreich
Atty

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Fig. 67.

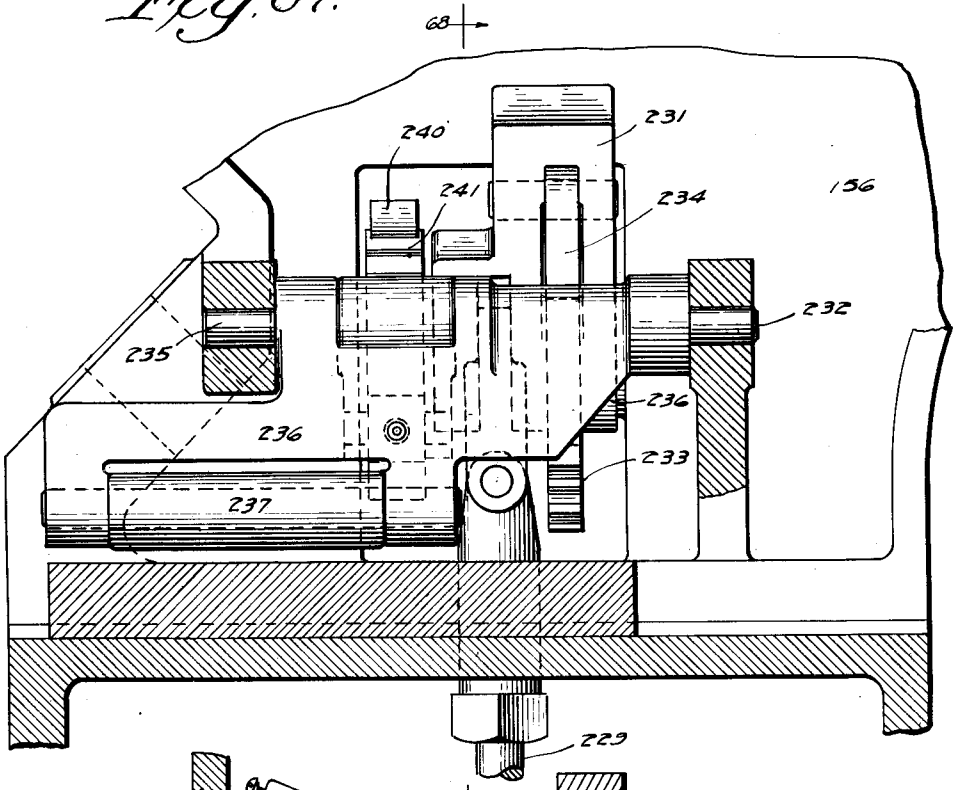
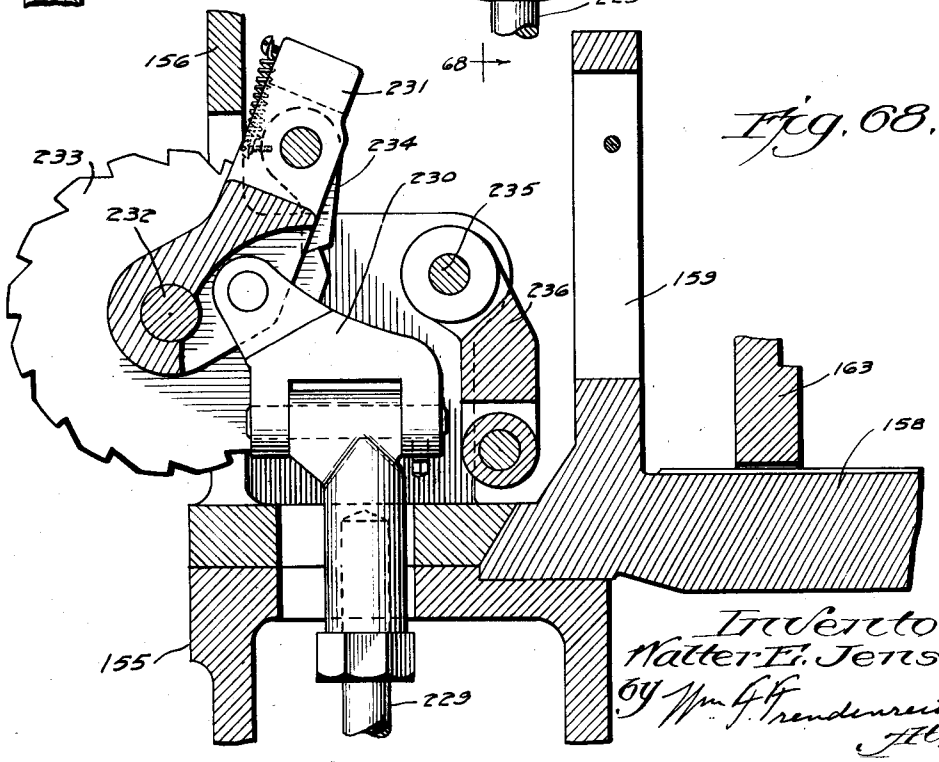


Fig. 68.



Inventor:
Walter E. Jensen
by Wm. G. Trendenreich
Atty

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Fig. 69.

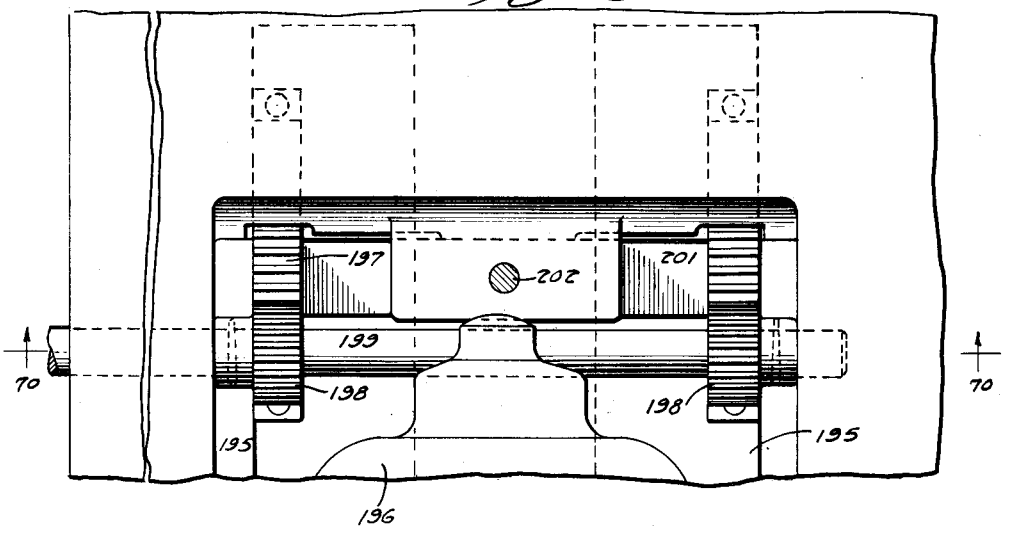


Fig. 70.

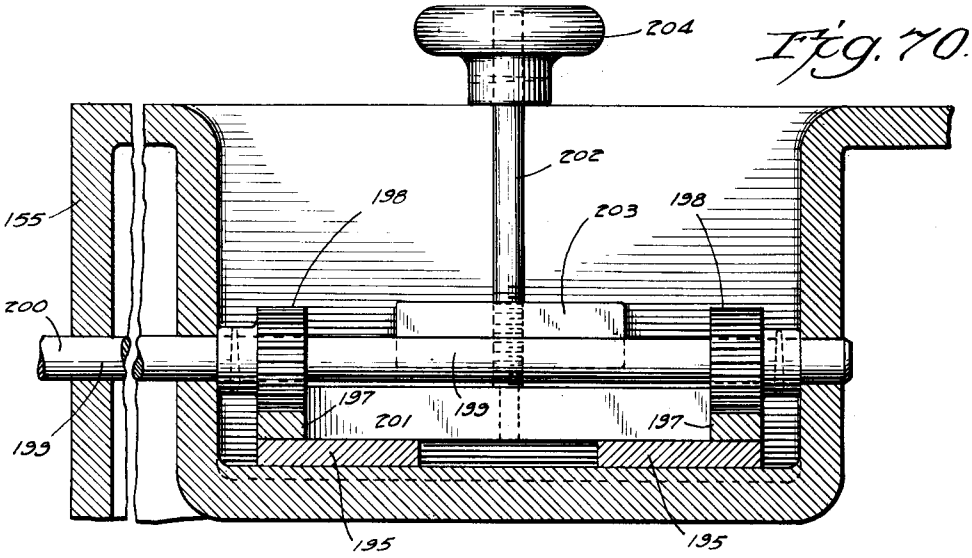
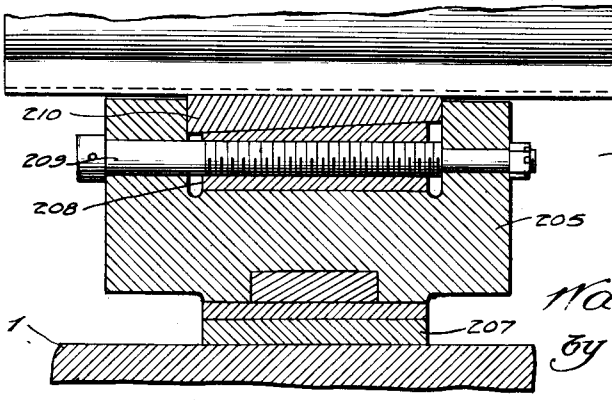


Fig. 71.



Inventor:
Walter E. Jensen
By Wm. F. Frendenreich,
Atty.

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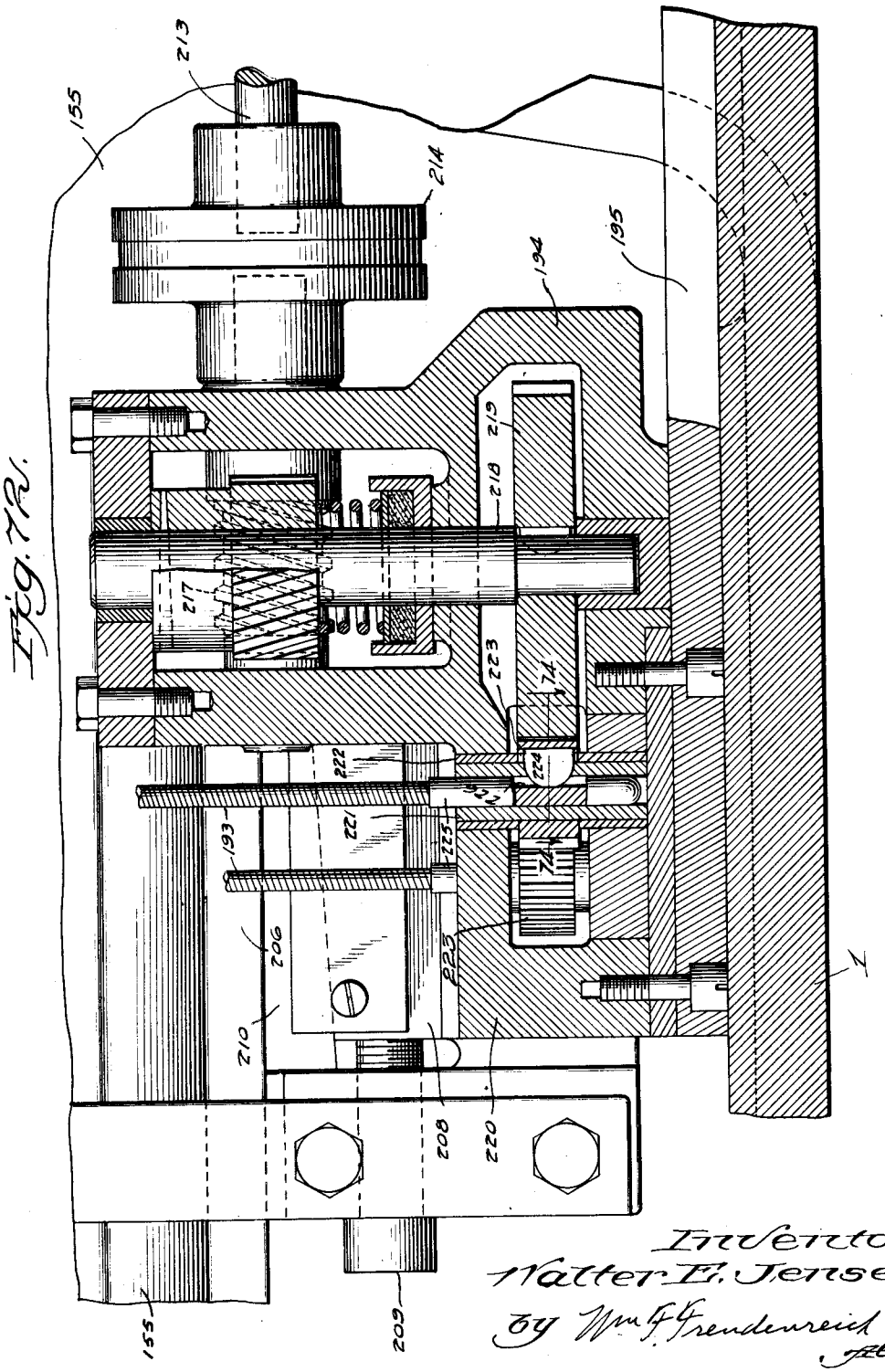


Fig. 72.

Inventor:
Walter E. Jensen
by Wm. F. Frendenreich
Atty

Nov. 15, 1932. W. E. JENSEN 1,887,977

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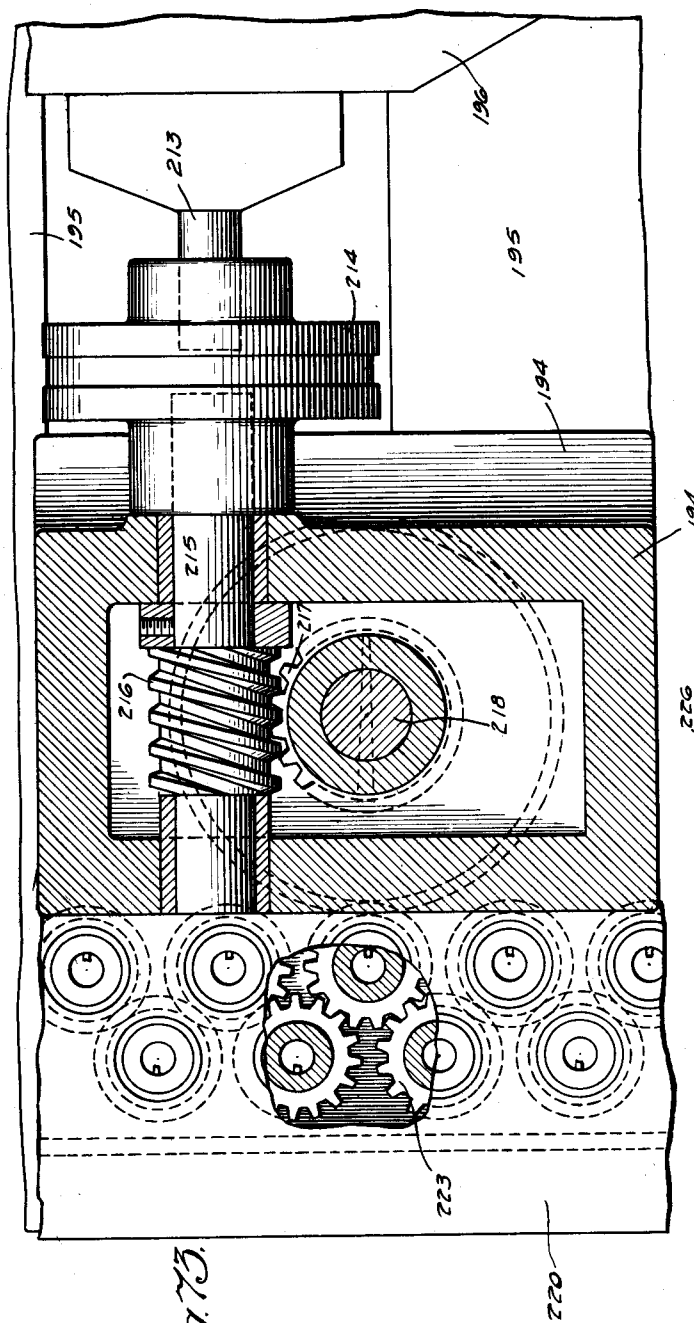


Fig. 7B.

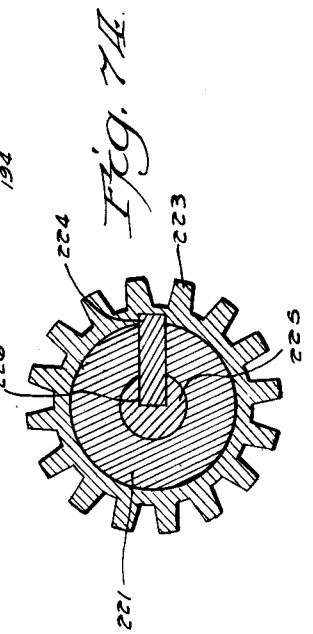


Fig. 7A.

Inventor:
Walter E. Jensen
by Wm F. Frenderick
Kelly

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Fig. 75

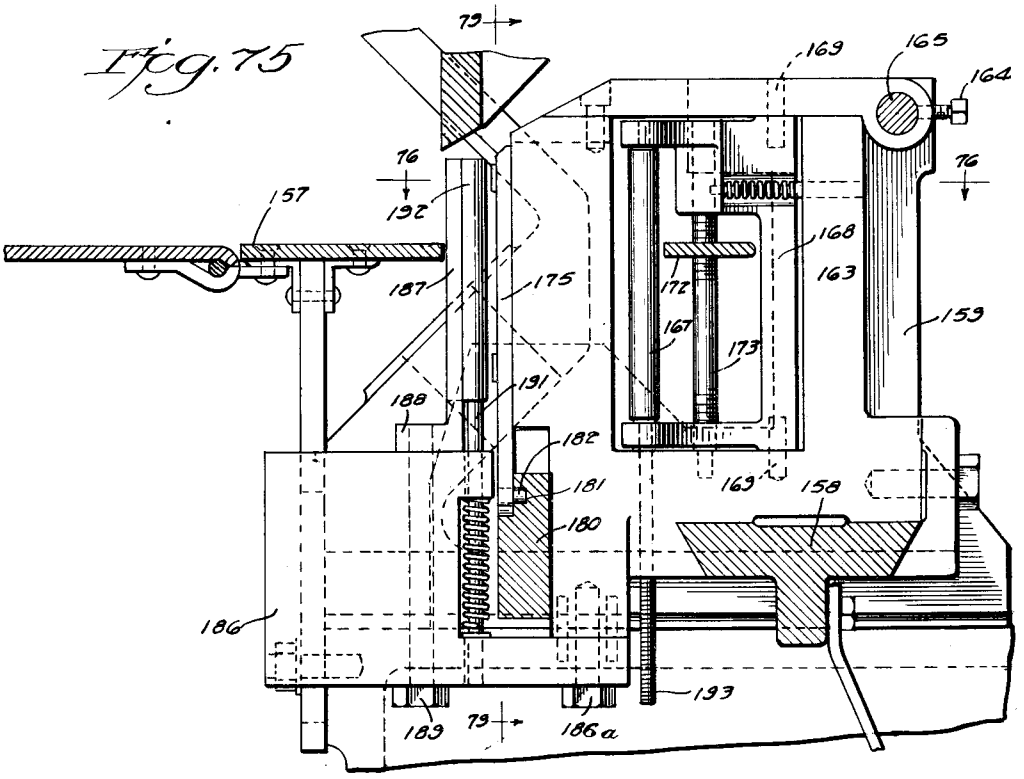


Fig. 76

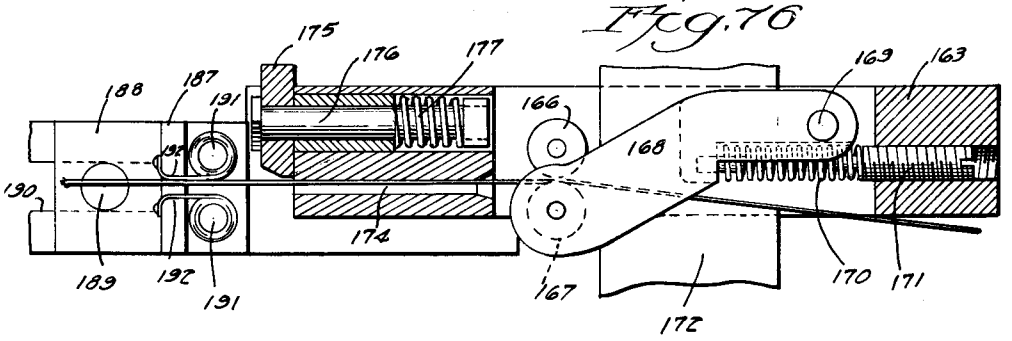
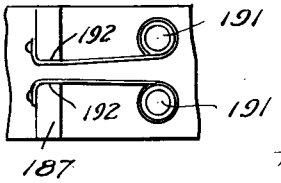


Fig. 77.



Inventor:
Walter E. Jensen
by Wm. F. Freudenreich
Atty

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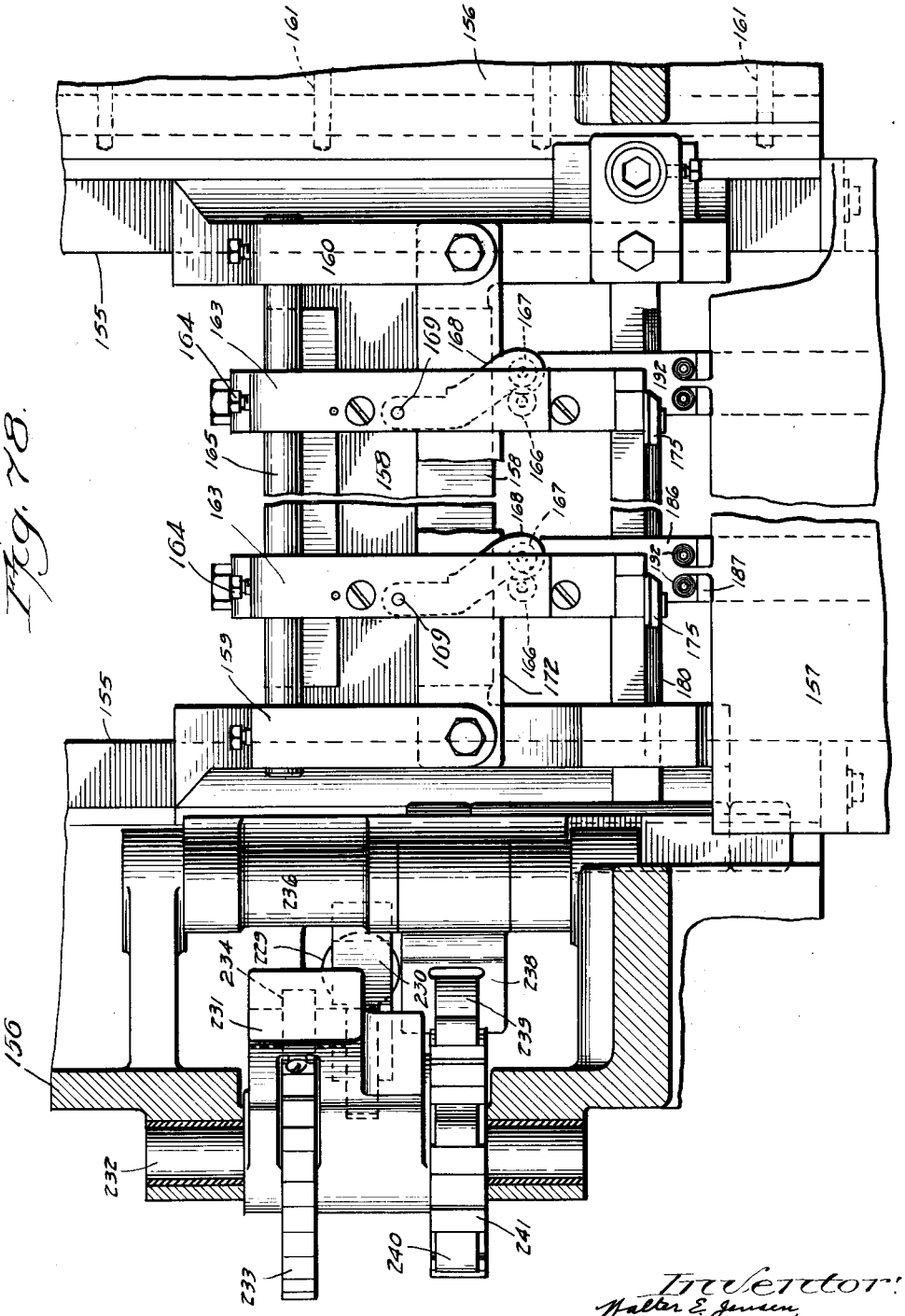


Fig. 78.

Inventor:
Walter E. Jensen,
by Wm. F. Freudenreich,
Atty.

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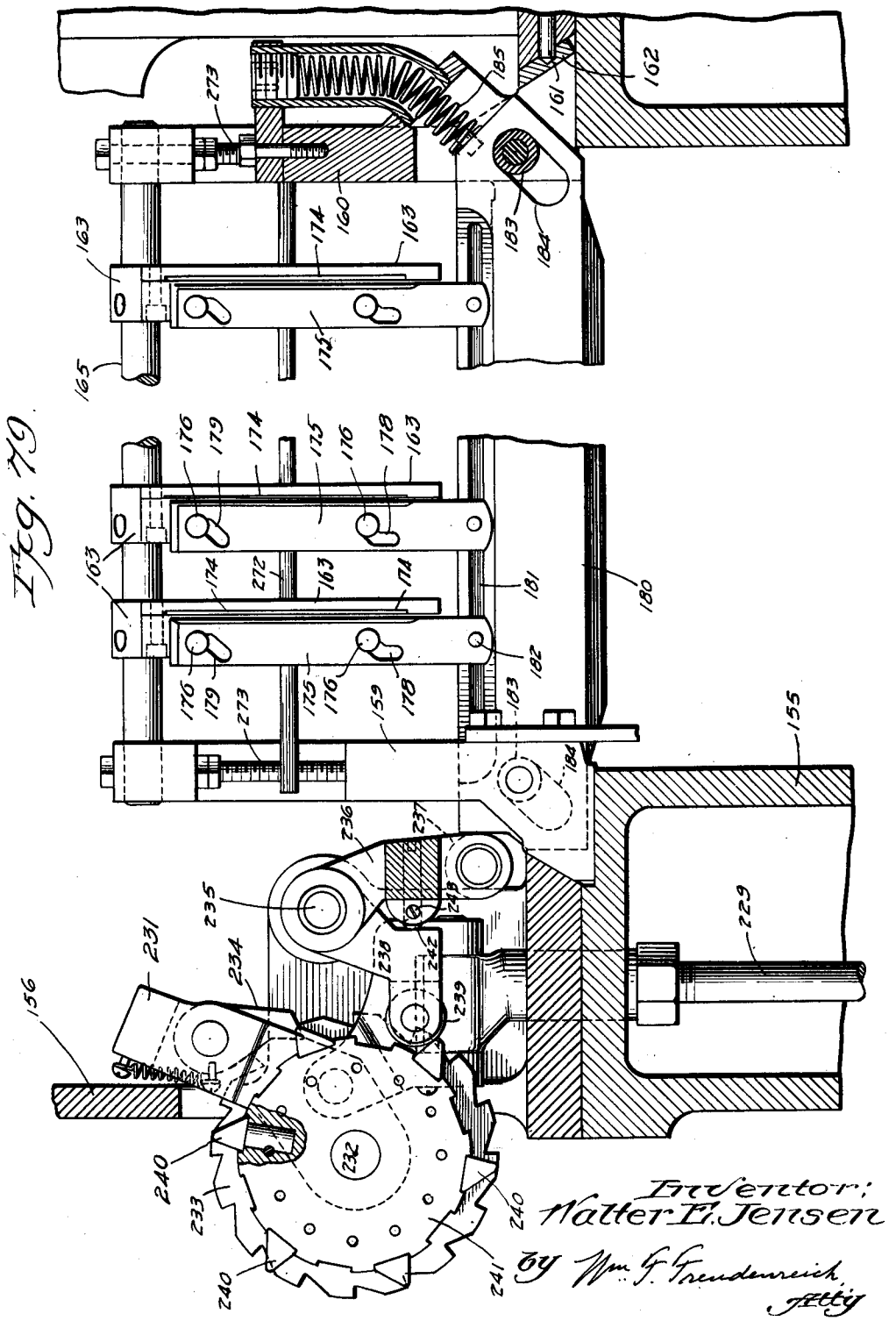


Fig. 79.

Inventor:
Walter E. Jensen
By Wm. F. Freudenreich
Atty

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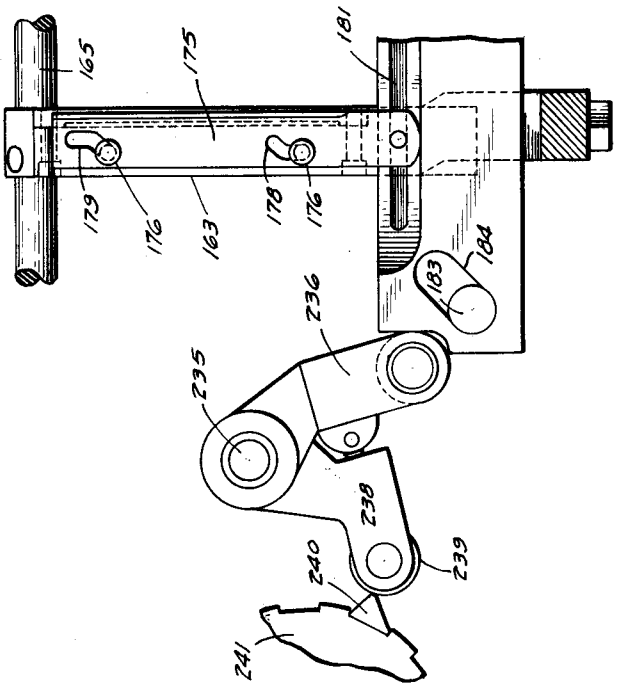


Fig. 81.

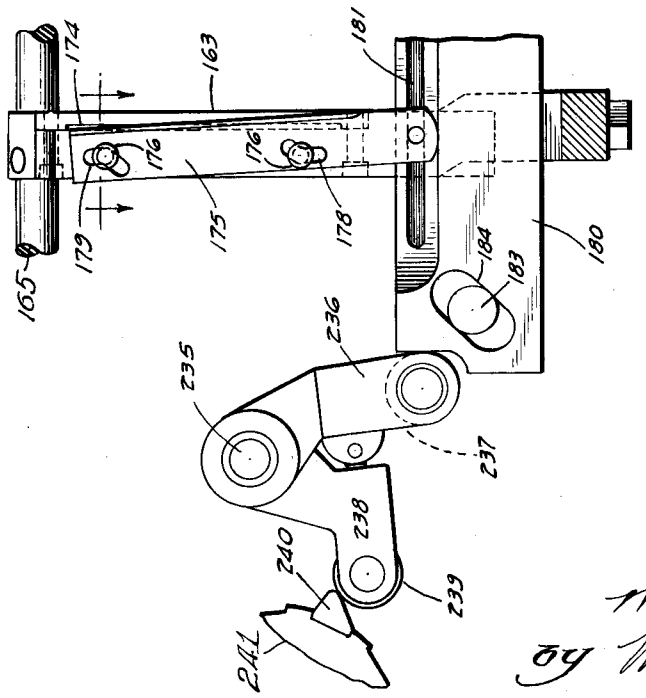


Fig. 80.

Inventor:
Walter E. Jensen
by Wm. F. Frendenreich,
Atty.

Patented Nov. 15, 1932 1,887,977

UNITED STATES PATENT OFFICE

WALTER E. JENSEN, OF CHICAGO, ILLINOIS, ASSIGNOR TO PARTITION MACHINERY, INC., A CORPORATION OF ILLINOIS

PARTITION MACHINE

Application filed April 20, 1931. Serial No. 531,430.

Cellular structures, composed of two sets of strips of heavy paper stock, crossing each other and interlocked, known as cell cases, fillers, or partitions, are used for a great variety of purposes and must, therefore, be manufactured in a great variety of sizes. Not only do the heights and the numbers of cells in an individual device vary, but often it is necessary to have a variation in the corresponding transverse dimensions of cells in different rows in a single device. Since these devices, to which I shall hereafter refer as "partitions", are used in large quantities, they must be manufactured by automatic machinery.

The object of the present invention is to produce an automatic machine adapted to be readily adjusted or changed over to manufacture many kinds of partitions, regardless of the height and number of cells, or whether the transverse dimensions of the cells are the same throughout the structure or are different in some rows than in other rows.

When these partitions are made high, the capacity of the present types of machine is limited by the width of a single sheet which must be split longitudinally into ribbons, each as wide as the height of the device to be produced. A further object of the present invention is to devise a machine which, without being wider than ordinary machines, will have at least twice the capacity of the latter in manufacturing high partitions.

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 side view of a machine constructed in accordance with the present invention; Fig. 2 is a top plan view of the machine containing two shets of paper to be worked into partitions; Fig. 3 is a front view of the machine, fragments being broken away; Fig. 4 is a view, partly in front elevation and partly in section, on a much larger scale than Fig. 3; Fig. 5 is a side view of the front portion of the machine, looking at the opposite side from that shown in Fig. 1; Fig. 6 is a section, on an enlarged scale, on a plane passing through the axis of the crank shaft and crank pin shown in the lower part of Fig. 5; Fig. 7 is a section on line 7—7 of Fig. 6, showing only those parts appearing on the left hand in Fig. 6; Fig. 8 is a plan view of the frame of the machine, the upper parts being broken away so as to show the motor and the main drive; Fig. 9 is a section, on an enlarged scale, on line 9—9 of Fig. 1; Fig. 10 is a side elevation, on an enlarged scale, of the rear end of the machine, looking at the opposite side from that which appears in Fig. 1; Fig. 11 is a view similar to Fig. 10, on a somewhat larger scale, parts being broken away and other parts being omitted, to disclose elements that would otherwise be hidden; Fig. 12 is a view similar to Fig. 11, showing different positions of some of the moving members, and still more of the parts being broken away, to disclose normally concealed elements; Fig. 13 is a longitudinal vertical section through the rear end of the machine; Fig. 14 is a plan view of a fragment of the ribbon length equalizer shown at the left in Fig. 13; Fig. 15 is a view similar to Fig. 13, on a larger scale, and showing only a part of what appears in Fig. 13, but showing two sheets of paper being fed simultaneously and cut into ribbons to form corresponding strips in a series of partitions; Fig. 16 is a section on line 16—16 of Fig. 13; Fig. 17 is a vertical longitudinal section through the front end of the machine, namely, the left-hand end appearing in Fig. 1; Fig. 17*a* is a detail section taken on line 17*a* of Fig. 17; Fig. 18 is a top plan view, on an enlarged scale, of the feeding table at the rear end of the machine, a sheet of paper being shown on the table, and portions of the sheet and of the table being broken away; Fig. 19 is a section taken on line 19—19 of Fig. 18; Fig. 20 is a section, on a larger scale, on line 20—20 of Fig. 19; Fig. 21 is a section on line 21—21 of Fig. 18; Fig. 22 is a side view, on the same scale as Fig. 20, of a fragment of one of the tubular bars adapted to rest on the paper ly-

ing on the table; Fig. 23 is a section on line 23—23 of Fig. 1, on a somewhat larger scale; Fig. 24 is an elevation of a fragment of a sheet that is punched and fed at the front end of the machine to form the cross strips of the particular partition which will be produced by the machine adjusted as it appears in the drawings; Fig. 25 is an elevation of a fragment of the sheet that is fed from the front to the rear end of the machine to form the longitudinal partitions, this sheet being shown as having been punched and, as is the case in Fig. 24, dotted lines appear where the sheet is to be cut; Fig. 26 is a plan view of the complete sheet of which a fragment is shown in Fig. 25, the punchings being omitted, and the sheet being cut into ribbons which are twisted into upright positions, together with a sufficient number of cross strips engaged with the ribbons to produce a row of partitions; Fig. 27 is a perspective view illustrating the meeting of the material that is fed forwardly from the rear end of the machine and the material that is fed down at the front end, together with a completed row of partitions that has been formed and severed from the blank stock; Fig. 28 is an elevation of a fragment of the adjustable rollers for guiding and deflecting a sheet that enters at the rear end of the machine, either in the upward or in the downward direction; Fig. 29 is a section on line 29—29 of Fig. 28; Fig. 30 is a section taken on line 30—30 of Fig. 28; Fig. 31 is a section on line 31—31 of Fig. 28; Fig. 32 is a section taken on a plane containing the long axes of the rollers in Fig. 28; Fig. 33 is a side view of that small fragment of the machine in the zone of the upper slitting cutters at the rear end of the machine; Fig. 34 is a view, similar to Fig. 33, showing different positions of the parts; Fig. 35 is a top plan view of a fragment of a supporting shaft for the upper slitting cutters at the rear end of the machine, one of the slitting cutters and the operating handle, the operating handle being partly in section, as is also an adjacent fragment of the frame of the machine; Fig. 36 is a section, on an enlarged scale, on line 36—36 of Fig. 11; Fig. 37 is a section on line 37—37 of Fig. 36, only the shaft and the pinion thereon being shown; Fig. 38 is a plan view, on a larger scale than Fig. 2, of a fragment of the rear end of the machine, parts being shown in section; Figs. 39 and 40 are sections through the shaft of that feed roll at the rear end of the machine which is the driving member for the other feed rolls adjacent to the same, and the clutch through which it is driven, showing relatively movable parts in different positions; Figs. 41, 42, 43 and 44 are details of the clutch shown in Figs. 39 and 40 and the clutch controller, showing different positions that the parts may take; Figs. 45 and 46 are side elevations of the indexing device for controlling the step-by-step movement of the sheet entering the rear end of the machine, illustrating the same positions as does the indexing device in Figs. 12 and 11, respectively, but showing a different number of controlling pins or stops than in Figs. 12 and 11; Fig. 47 is a section on line 47—47 of Fig 11, and also on line 47—47 of Fig. 45; Fig. 48 is a section on line 48—48 of Fig. 12, or line 48—48 of Fig. 45; Fig. 49 is a section taken approximately on line 49—49 of Fig. 11; Fig. 50 is a section approximately on line 50—50 of Fig. 11; Fig. 51 is a section on line 51—51 of Fig. 11; Fig. 52 is a vertical section through the connection between the punch head at the rear end of the machine and the operating lever for the feed indexing means; Fig. 53 is a section on line 53—53 of Fig. 52; Fig. 54 is a top plan view of the front end of the machine, parts being broken away, or, it may be regarded as a section on line 54—54 of Fig. 3; Fig. 55 is a section on line 55—55 of Fig. 2; Fig. 56 is a longitudinal section on a plane containing the long axis of one of the front feed rolls, showing the feed roll, parts of the frame, the driving clutch and the brake; Fig. 57 is a section on line 57—57 of Fig. 56; Fig. 58 is a section on line 58—58 of Fig. 56; Fig. 59 is a top plan view of a fragment of the supporting shaft for the forward slitters, one of the slitters being shown, and the operating handle and the adjacent portion of the frame of the machine being shown in section; Fig. 60 is a section taken approximately on line 60—60 of Fig. 59; Fig. 61 is a section on line 61—61 of Fig. 59; Fig. 62 is a view looking toward the left-hand side of Fig. 61; Fig. 63 is a view similar to Fig. 61, showing the slitter shifted into an idle position on the shaft; Fig. 64 is an edge view of a fragment of the bracket carrying the slitting cutter, being a view looking toward the left at the right-hand side of Fig. 63; Fig. 65 is a section, on a larger scale, taken approximately on line 65—65 of Fig. 55; Fig. 66 is a section, on the same scale as Fig. 65, taken approximately on line 66—66 of Fig. 55; Fig. 67 is a longitudinal vertical section through the lower part of the front end of the machine taken approximately on line 67—67 of Fig. 54, but on a larger scale, showing portions of the operating mechanism to actuate the shears that sever the longitudinal paper ribbons into partition strips; Fig. 68 is a section taken approximately on line 68—68 of Fig. 67; Fig. 69 is a top plan view of a fragment of the base portion of the machine, and the longitudinally adjustable carriage mounted thereon, at the front end of the machine, looking down from the plane of line 69—69 in Fig. 17; Fig. 70 is a section taken approximately on line 70—70 of Fig. 69; Fig. 71 is a section, on the same scale as Figs. 69 and 70, taken approximately on line 71—71 of Fig. 3; Fig. 72 is a

section, on a larger scale, taken approximately on line 72—72 of Fig. 4; Fig. 73 is a section taken approximately on line 73—73 of Fig. 4, the scale being the same as that of Fig. 72; Fig. 74 is a section on line 74—74 of Fig. 72, on a larger scale, showing one of the forward driving spindles for the ribbon feed, and its pinion; Fig. 75 is a longitudinal vertical section through the forward end of the machine, showing only the lower portion thereof; Fig. 76 is a section, on a larger scale, taken approximately on line 76—76 of Fig. 75; Fig. 77 is a view similar to Fig. 76, showing only a fragment that appears at the left-hand end of Fig. 76, the parts being in different positions of adjustment than in Fig. 76; Fig. 78 is a transverse horizontal section taken on a plane above the top of Fig. 75, showing the ribbon feed rollers and guides, the shears and the indexed actuating mechanism for the shears, a wide, longitudinal, central panel being broken away; Fig. 79 is a section on the same scale as Fig. 78, taken approximately on line 79—79 of Fig. 75, only the shears, indexed operating mechanism therefor and fragments of the frame being shown; Figs. 80 and 81 are views, more or less similar to Fig. 79, showing one pair of shears in two different positions, which are both different from those illustrated in Fig. 79, together with fragments of the operating mechanism for the shears.

Referring to the drawings, 1 represents a long, heavy, rugged, hollow base constituting the frame of the machine. Above the rear end of the base is a head, preferably in the form of a main casting or castings 2, resting on and secured to long, heavy plates or shoes 3, 3, one at each side, as best shown in Figs. 9, 13 and 16. In the top of the rear end of the frame, shown in Fig. 8, as well as in Figs. 9, 13 and 16, are two longitudinal undercut grooves 4, 4, one under each of the shoes. Heavy bolts 5, 5 extend through parts of the head 2 and the shoes into the grooves in the base, the bolt heads forming with the grooves a sliding interlock between the head and the base. On the base, beside the shoes, are fixed longitudinal racks bars 6, 6 engaged by pinions 7, 7, fixed to a shaft 8 journalled in and extending transversely across the head. One end of this shaft, as indicated at 9, in Fig. 16, may be fashioned to receive a handle or wrench to turn the same. When the bolts 5 are loosened, the head may be moved along the base by turning the shaft 8 and, when the bolts are tightened, the head is held to the base in any position into which it may have been brought by the rack and pinions.

A table 10, as wide as the machine, is attached to and projects rearwardly from the base. Just in front of the table is a punch apparatus comprising, as shown in Figs. 9 and 13, female die blocks 11 slidable transversely of the machine in an undercut groove 12; together with cooperating male die blocks 13 slidable in a transverse groove 14 in the underside of a heavy beam 15. The beam slides vertically on heavy fixed posts 16, 16 rising from the head at opposite ends of the beam. The die blocks are locked in place by set screws 17 and 18, respectively, the set screws preferably acting upon plates 19 interposed between them and the die blocks. Above the lower dies are suitable stripper plates 20 which overlie the paper stock and hold it down when the upper dies are retracted. It will thus be seen that the machine may readily be equipped with any desired sets of dies and that these may easily be adjusted at any desired distances apart. A sheet of paper A being fed between the punches from the table 10 and moved ahead, step by step in time with the operation of the punches, longitudinal rows of notches, such as shown at *a* in Fig. 25, will be punched in the sheet. The paper entering the machine must be accurately guided, and I have, therefore, so constructed the table from which the paper enters the machine that this end will be attained.

The details of the table 10 are best shown in Figs. 18–22. The table proper has ledges 21, 21 projecting above the same at the sides, and is provided with a pair of slots 22, 22 cut through and extending transversely across the same. The actual guides for engaging with the edges of the paper may be pieces 23, 23 of angle iron shape, each having one flange resting on the table and the other flange rising above the table. That flange of each guide resting on the table has two pins 24 and 25 extending down through each of the slots in the table. At least one of the pins of each pair is screw-threaded at its lower end and has thereon a thumb nut 26, whereby the guides may be locked to the table in any positions into which they must be brought to engage the opposite long edges of the paper. Means are preferably provided to hold the paper down upon the table while permitting it to slide along the same into the machine. In the arrangement shown, this purpose is served by two round rods or tubes 27, 27 extending across the table from one ledge to the other at the front and rear ends of the table. At the ends of the rods are pins 28 which extend through slots 29 in the ledges. These slots incline upwardly and rearwardly from the table and then turn downwardly so that, when the rods are lifted, they also move rearwardly and the pins therein drop into seats or pockets at the upper ends of the slots and hold the rods in their elevated positions. The rods are connected together by a handled bar 30 so that they may be raised and lowered together. When a sheet of paper is to be entered upon the table, the rods are lifted and remain out of the way until the paper is

in place. The rods are then lowered and thereafter rest on the paper so as to hold it down and offer a slight resistance to movement thereof across the table.

The sheet of paper A is drawn from the table through the punching mechanism by feed rolls located in front of the latter mechanism. Ordinarily, there are two such rolls. However, in accordance with one feature of my invention, it is possible to feed two sheets at a time so that, in case the partitions are made very high, at least twice as many partitions can be made at one time as would otherwise be possible, and the capacity of the machine be at least double that of an ordinary machine. Therefore, as best shown in Figs. 13 and 15, I employ four feed rolls, or two sets one above the other; 31 and 32 indicating one set and 33 and 34, the other set. In Fig. 13 only one set of these rolls is in use and, for the sake of brevity, I shall describe the operation of the machine as used in this way, since it will readily be understood that two overlying sheets will be punched simultaneously and that the ribbons into which two sheets are afterwards slit are simply directed so as to form two groups arranged side by side, as though they were all a part of a single sheet, as they reach the front end of the machine. In Fig. 15, I have shown two sheets, the sheet A and a second, underlying sheet A′ being fed in and slit into ribbons.

Suitable guides are required properly to direct the incoming sheets to their respective feed rolls. In the arrangement shown, one guide member is a stationary plate 35 bent in the middle to form a V-shaped trough having its apex near the punching zone and the free edges of its wings near the rolls 31 and 33, the wings being substantially tangential to these rolls. Cooperating with the wings of the plate 35 are two other stationary plates 36 and 37, respectively, overlying and underlying the member 35 and spaced apart therefrom to provide spaces through which the paper may pass; thus forming an upper set of guides that lead the top sheet to the top of the roll 31 and a lower set of guides that will direct the lower sheet, (if one be employed), underneath the roll 33.

To facilitate the entering of the paper between the guides just described, a pair of small, transverse rollers 38, 38 are placed adjacent to the apex of the guide member 35. These rollers are mounted on and eccentrically of shafts 39, 39, as best shown in Figs. 28–32. Each shaft has thereon a pinion 40 meshing with a gear wheel 41 mounted to revolve about a stationary axis. By turning the gear wheel, the gap between the rollers may be raised and lowered. In the neutral position of the rollers, as shown in Figs. 13, 29 and 31, the gap is just opposite the apex of the member 35. In Fig. 30, the rollers are shown as having been shifted to raise the gap. By turning the shafts in the clockwise direction, as viewed in Fig. 30, the gap between the rollers may be dropped down as far below the apex of the member 35 as it appears above the same in that figure. The shaft 42 that carries the gear wheel 40 has thereon a button 43 that may be pulled outwardly thereon but is normally held in by a spring 44. On the button is a pin 45 adapted to enter any one of three holes 46, 46*a* and 46*b* in that part of the head 2 in which the adjacent ends of the shafts 39 are journalled, and hold the rollers in any one of three positions. Upon pulling out the button, the pin is withdrawn from the hole in which it happens to be, and the rollers may then be shifted. When entering the end of a single sheet or the upper of two sheets, the rollers 38 should be in the position shown in Fig. 30. When a sheet is to be led to the lower set of feed rolls, the rollers should be shifted so as to bring the gap below the apex of the guide member 35, thereby deflecting the oncoming end of the sheet downwardly into the lower guides. The running position of the rollers should be that illustrated in Figs. 13, 29 and 31.

There are also guides 47, 47 to direct the advance ends of the sheets forwardly after passing the rolls 32 and 34.

The rolls 31–34 are geared together so as to run at exactly the same peripheral speed. Furthermore, the rolls 32 and 34 are pressed by springs 48, 48, against their cooperating rolls.

One of the important features of my invention has to do with the driving of the feed rolls. The feed rolls must turn intermittently so as to feed the paper step by step, the length of each step corresponding to the length of a cell in the finished product or partition, or to the combined lengths of projections or buffers that are left at the ends of the partition. By properly controlling the feed, partitions with cells of any desired length, or of any desired combination of lengths, may be produced; meaning by the "length" of a cell that transverse dimension which extends longitudinally of the machine in the process of manufacturing the cell. In accordance with my invention, I make it possible to control the length of each cell independently of the others, and quickly and easily to adjust the machine so as to vary the length of any cell or any number of cells. Since all of the feed rolls are geared together, it suffices that one of them be driven. In the particular arrangement shown, it is the lower roll 33 which is the driven roll and which in turn drives the others. Referring to Fig. 36, it will be seen that the lower roll 33 is in the form of a heavy cylindrical shell of hard steel surrounding a shaft 50 and supported at its ends upon frusto-conical collars or enlargements 51 on the shaft. The shaft is journalled in

suitable bearings in the side members of the head 2. On one end of the shaft is a clutch, one member of which is fixed to the shaft, while the other member is power-driven. This clutch is alternately released and thrown in. The clutch itself, as shown, (see Figs. 36, 38, and 39–44), consists of a heavy cylindrical casing 52 surrounding the shaft 50 and having a hub 53 keyed to the shaft; together with a heavy sleeve 54 surrounding the shaft and lying partly within and partly outside of the casing; the sleeve having fixed to its outer end a pinion 55 which is driven as will hereinafter be explained. The sleeve 54 surrounds and is rotatable upon another sleeve 56 that is loose on the shaft, which is the clutch controller. The sleeve 54 carries a clutching element 57 in the form of a shoe adapted to bind against the inner surface of the cylindrical wall of the clutch casing and lock the driving sleeve and the casing together. The shoe is pivoted at one end to an almost radial arm 58 of a bell crank lever pivoted at the angle thereof, as indicated at 59, to the driving sleeve, and rests at its other end upon a strut 60. The strut 60 is a member having a semi-cylindrical edge that rests in a semi-cylindrical seat 61 in the driving sleeve, while the end that engages with the shoe is also semi-cylindrical and rests in a seat 62 similar to the seat 61. There is a spring 63 between the bell crank lever arm 58 and a projection on the driving sleeve. The parts are so proportioned that the spring tends to swing the arm 58 into a completely radial position, thereby forcing the corresponding end of the shoe outwardly, as indicated in Fig. 39. If, while the parts are in the position shown in Fig. 39, the driving sleeve is turned in the counter-clockwise direction, the shoe will be forced more tightly against the cylindrical wall of the casing, and the casing will move with the driving sleeve. However, if the lever arm 58 is moved toward the projection 64 that forms the abutment for one end of the spring, as shown in Fig. 40, the pressure of the shoe against the casing will cease and the driving sleeve will revolve without moving the casing. It will be seen that the long axis of the strut 60 is such that any circumferential movement of the shoe in the direction of the thrust of the casing which is resisting the driving impulse, will simply tend to swing out the trailing end of the shoe and make it grip the casing more firmly. I employ the controlling sleeve 56 for the purpose of actuating the bell crank lever, whereby the clutching and unclutching intervals may be regulated and be varied over wide limits. The controlling sleeve remains stationary except during those times in which it is being shifted from one position to the other. A portion of the control sleeve, in the plane of the bell crank lever, is cut away so as to provide what may be termed a "low zone" extending almost halfway around the same. On the second arm 65 of the bell crank lever is a roller 66. While the roller is opposite the low zone on the controlling sleeve, it does not touch the sleeve and, therefore, leaves the spring 63 free to act. While any part of the high portion of the controlling sleeve is opposite the roller, it engages with the roller and holds the bell crank lever in its clutch-releasing position.

The driving sleeve 54 is not driven so as to revolve constantly in one direction, but it is oscillated, through a greater or lesser angle. Assuming that the parts are in the position shown in Fig. 40 and that the sleeve 54 begins to turn in the counter-clockwise direction, it will be seen that no clutching action takes place until the roller 66 drops off the high portion of what may be termed the "cam" on the controlling sleeve. In other words, the driving member of the clutch must turn through a sufficient angle to bring it into the position shown in Fig. 39 before a clutching action takes place. Thereafter, the clutch will remain in until the driving sleeve starts on its return stroke, whereupon the clutch will be automatically released. If the clutch sleeve be shifted in the clockwise direction to the position indicated in Fig. 41, it will be seen that the clutch will be engaged much earlier in the working stroke of the sleeve 54, or, if the controlling sleeve be turned from the position shown in Figs. 39 and 40, and the full line position in Fig. 42, to the dotted line position shown in Fig. 42, the driving sleeve will have to turn farther than it has in Fig. 39 in order to cause the clutch to act. In short, for any given angular length of oscillation of the driving sleeve 54, any portion thereof may be accompanied by a clutching action, so that the feed rolls may be turned through any desired angle during each complete working stroke of the driving sleeve.

The length of angular movement of the driving sleeve may be varied. The power for the driven parts, which we have heretofore described, is obtained from a heavy transverse shaft 67 which, as shown in Fig. 8, is driven from a suitable motor 68 in the base of the machine, through belting 69, a counter shaft 70, and gearing 71. On one end of the shaft 67, as will best be seen in Fig. 10, is fixed a disk 72 having thereon spaced parallel guides 73, 73 between which is slidably fitted a block or cross head 74. This block or cross head is held in place, against movement along the guides, by a screw 75 connected with the same and extending through a cross member 76 extending between corresponding ends of the guides. On the block or cross head 74 is a crank pin 77 to which is connected the lower end of a more or less upright connecting rod 78. The upper end of the connecting rod is

in the form of a rack bar 79 meshing with the pinion 55 on the shaft 50 of the feed roll 33. As the shaft 67 revolves the connecting rod is reciprocated, oscillating the pinion 54 and, therefore, the driving member of the clutch for the feed rolls. The stroke of the connecting rod and, therefore, the angle of oscillation of the clutch sleeve may be varied by shifting the block 74 along the guides 73 so as to vary the distance between the axis of the crank pin and the axis of the shaft 67. It will thus be seen that the feed of the paper is controlled: first, by varying the stroke of the connecting rod; and, second by shifting the position of the cam sleeve. Therefore, the crank pin that drives the connecting rod and the cam sleeve for the clutch may be set so that the feeding movement of the feed rolls will be very slight during a given stroke of the connecting rod, or it may be considerable; thereby making it possible to vary, within wide limits, the length of paper that is fed during a given stroke.

The rack bar 79 is preferably a separate element secured to the connecting rod in order to permit it to be adjusted lengthwise of the rod. In the arrangement shown, the rack bar has secured thereto, at each end, a pair of cheek plates 80, 80 that engage with the sides of the connecting rod and extend rearwardly beyond the rod. Between each pair of cheek plates, behind the rod, is secured a block 81 whose forward face makes a small angle with the rear face of the connecting rod, as will best be seen in Fig. 12. A wedge 82 lies between each block 81 and the connecting rod and is drawn into intimate contact with both by a screw 83 carried by the block and engaged with an arm 84 on the wedge. Upon loosening these screws, the rack bar is left free to be shifted endwise along the connecting rod.

The connecting rod must swing as it reciprocates and, at the same time, must be held against the pinion 54. In the arrangement shown, the rod slides between two plates 85, 85 journalled on the shaft 50 and having at their rear ends a keeper to engage the rear side or edge of the rod. This keeper is in the form of a filling piece 86, between which and the connecting rod is a gib 87 held to the rod by set screws 88.

It may also be mentioned at this point that the cross beam 15 of the punching mechanism is moved up and down by eccentric rods 89, 89 driven from eccentrics on opposite ends of the shaft 67; whereby the punches and the feed rolls are operated in definite time relation to each other and the paper remains stationary while being punched and is fed ahead while the male dies are clear thereof.

Means are employed automatically to shift the cam sleeve that controls the clutch for the feed rolls, during each working stroke of the connecting rod and rack bar, if required, so that the length of each forward step of the paper is accurately determined independently of other feeding steps. This is accomplished by means of an indexing or selecting device which is set to correspond to the lengths of the cells and buffers in the longitudinal rows of a single partition or a multiple of such partitions; this indexing device being caused automatically to bring about a shifting of the cam sleeve to effect the proper spacings of the punchings as the paper is moved through the machine.

As shown in Fig. 36, the cam sleeve 56 has on its outer end a pinion 49 meshing with a gear wheel 90 on a short transverse shaft 91 journalled in the head 2. This shaft has thereon a pinion 92 with which meshes a rack bar 93. I prefer, as shown in Fig. 37, to divide the pinion into two parts on a plane at right angles to the shaft, these two parts being connected by pin and slot devices 94, 94. If one of the halves of the pinion is fixed to the shaft, the pin and slot connection between the same and the other half permits the latter to be adjusted angularly so as to take up wear and prevent backlash between the rack and the pinion. This rack bar and pinion are best shown in Fig. 12, from which it will be seen that the rack bar extends longitudinally of the machine. Since the gear wheel 90 is much larger in diameter than either the pinion 49 or the pinion 92, a slight lengthwise movement of the rack bar will be translated into a considerable angular movement of the cam sleeve 56. The rack bar is driven from some moving part of the machine so that it will cause the cam sleeve to be set while the punching of the paper is being done; thus making ready that the clutch for the feed rolls will take hold at the proper point in the up stroke of the connecting rod 78. In the arrangement shown, as will best be seen from Figs. 10, 11 and 12, there is mounted at one side of the head 2, below the rack bar 93, a slide 95 having an upwardly projecting arm 96 that is connected to the rear end of the rack bar. The part 96 is preferably a fork, the two members of which lie on opposite sides of the rack bar. Cross piece 97, connecting the two arms of the fork 96 together, passes through a long slot 98 extending lengthwise of the rack bar. Therefore, the rack bar and the slide may move relatively to each other, a limited distance, in the direction of their lengths. Within the slot 98, in front of part 97, is a spring 99, preferably extending into a deep pocket in the body of the rack bar and opening forwardly from the front end of the slot; whereby the member 97 will strike a fixed stop when at the forward limit of its movement relatively to the rack bar. On the stationary frame portion of the punch head is pivoted a bell crank lever having a depending long arm 100 and a forwardly directed short arm 101. The lower end of the arm 100 is connected to the slide

by a link 102. Means are arranged between the vertically movable beam 15 of the punch head and the short arm of the bell crank lever to oscillate the lever. In the arrangement shown, the beam is provided with a projecting ear 103 from which depends a block 104. This block, as best shown in Fig. 52, is preferably formed on the lower end of a screw-threaded stem 105 passing through the ear and held thereto by suitable nuts; thereby permitting the block to be adjusted in the vertical direction relatively to the beam. The block 104 has therein a vertical slot 106 in which slides a shoe 107. In the block, above and below the shoe, are springs 108 and 109, respectively; the parts being so arranged that the shoe may bottom at either end of the slot when the corresponding spring is compressed. The short arm 101 of the bell crank lever is in the form of a fork between the halves of which the block 104 is located. A pin 110 passes through the shoe 107 and into the two halves of the short arm of the bell crank lever. When the upper punching dies move down, the bell crank lever will be oscillated in the counter-clockwise direction, as viewed in Figs. 10 and 11. However, since the springs 108 and 109 are light, the resistance of the bell crank lever and of the parts operating thereby will be too great to be overcome by the upper spring and, therefore, this spring must be compressed, as shown in Fig. 52, before any turning movement of the bell crank lever takes place. As soon as the shoe 107 reaches the upper end of the slot 106 in the block 104, the bell crank lever will begin to turn in a direction to retract the slide. If the part 97 on the slide is not at the rear end of the slot 98 in the rack bar, the slide will move back until the lost motion between it and the rack bar is taken up, and then the rack bar will be drawn back. In other words, regardless of the position in which the rack bar may be at the time the upper punching dies start down, it will always be drawn back to a predetermined position, namely, the position illustrated in Figs. 10 and 11. As the upper punching dies begin to rise, the bell crank lever, after the lower spring 109 in the block 104 has been compressed, begins to swing in the counter-clockwise direction, as viewed in Figs. 10 and 11. The spring 99 between the slide and the rack bar is sufficient to overcome the resistance that the rack bar encounters to forward movement and, therefore, the slide and the rack bar will move ahead.

The forward and backward movements of the rack bar 93 oscillate the shaft 91 and, therefore, the cam sleeve that controls the clutch for the feed rolls. However, both these movements of the rack bar take place while the punches are acting on the paper, namely, during the latter part of the downward movement and during the first part of the upward movement of the upper punching dies. Therefore, while the dies are going in and being withdrawn from the paper, the cam sleeve will first be set in what may be said to be its "base position", and is then moved angularly from such base position to a working position which determines the point at which the clutch will be thrown in. This is illustrated in Figs. 41–44. The dotted lines in Figs. 42–44 indicate what may be said to be the "base position" to which the cam sleeve is always brought upon the down stroke of the punches; the left-hand ends of the portions in dotted lines representing the beginning of the high portion of the cam in the base position. In full lines, I have shown the high points displaced at various angular distances from the base positions; the arrangements shown in full lines representing a series of working positions.

If nothing is done to prevent it, the strokes of the rack bar 93 will always be of equal lengths and, therefore, the working position of the cam sleeve will always be the same. However, if an obstruction be placed in the path of the rack bar, before it has completed its possible forward stroke, the rack bar will remain stationary when it strikes the obstruction, the slide continuing to move ahead while compressing the spring 96. I make use of this characteristic by providing a selecting or indexing device which, during each cycle of operations, presents an obstruction in the path of the forwardly moving rack bar and thus stops the rack bar at a point to produce the desired working position of the cam, while the punching dies are completing travelling through the upper half of their upward stroke; that is, prior to the time at which the feed rolls, whose feeding movement must be completed before the punches again descend far enough to enter the paper, must begin to operate.

The indexing or selecting means consists of a vertical disk 111 arranged in front and in the plane of the rack bar 93 and rotatable about a transverse axis. Screwed into the periphery of the disk and projecting radially therefrom is a series of screws 112. If the disk be set so that one of the screws is aligned with and lie in the path of the forward end of the rack bar, it will form such an obstruction as that to which I have just referred. The screws may be adjusted in or out, so that the point in its stroke at which the rack bar encounters any one of the screws that may be in line therewith it may be varied. Also, if means be provided to turn the disk step by step, so as to present a different screw during each cycle of operations, each forward feeding movement of the paper sheet has its length determined independently of the length of any other such feeding movement. I have, therefore, provided means for thus turning the disk step by step. To this end there is placed beside the disk 111 a vertical

slide 113 carrying a pawl 114. This pawl, as best shown in Fig. 48, cooperates with ratchet pins or projections 115 on the adjacent side of the disk. The slide 113 is connected to the slide 95 so that, during each forward and return stroke of the latter, the pawl will move the disk ahead one step. In the arrangement shown, there is a diagonal link 116 between the forward end of the slide 95 and the lower end of the slide 113. There is also another link 117 pivoted at one end to the stationary frame and at its other end to the middle of the link 116. The link 117 being half as long as the link 116, the forward end of the latter link must move up and down in a straight line, thus moving the slide 113 up and down without imposing lateral stresses thereon. As the slide 95 moves forward, it raises the slide 113 and its pawl and, as the slide 95 moves backward, the pawl is carried through a working stroke. In other words, the indexing or selecting device is set while the rack bar 93 is moving backward, so that it will always be in the proper position to stop the forward movement of the rack bar 93, which is the stroke or movement that causes the setting of the cam sleeve.

As best shown in Fig. 47, the disk 111 revolves on a stationary stub shaft 118. On the outer end of this shaft is fixed a radial arm 119 carrying a suitable catch device, such as a spring pressed ball 120 adapted to enter depressions 121 in the outer side or face of the disk. The parts are so proportioned that, whenever one of the screws on the disk is properly aligned with the rack bar 93, the ball will be resting in one of the seats and will yieldingly hold the disk against accidental displacement.

In the drawings, the machine is shown as adjusted to manufacture partitions, such as shown in Fig. 27, each composed of three cross strips, M, N and O, and three longitudinal strips X, Y and Z, there being one inch buffers at the forward and rear ends and the length of the cells being one and one half inch. Therefore, in feeding the sheet A, from which the strips X, Y and Z are cut, it must be moved two inches, (the length of two buffers), then one and a half inches, one and a half inches, two inches, etc. The disk 111 is, therefore, provided with twelve stop screws. The first screw, beginning with the one registering with the rack bar in Fig. 12, is a long one, arresting the rack bar in a position that causes the paper to feed two inches. The next two screws, reading in the clockwise direction, are shorter, producing feeds of one and one half inches. The fourth screw is a long one and then come two short screws. In other words, there are four long screws and eight short screws, two short screws being interposed between each pair of consecutive long screws. It will thus be seen that, during each revolution of the disk, the paper will be fed far enough to produce four sets of longitudinal partition strips which are properly punched as the paper advances. If the two cells or either of them, or the buffers are to be made longer or shorter, the screws need only be screwed in or out to produce the desired result. Or, if desired, longitudinal strips for partitions, one, two, three, five or eleven cells long, and having any desired cell lengths and buffer lengths may be punched without doing more than adjust the screws; it being sufficient that the sum of the cells in a lengthwise row plus one (to take care of the buffers) be a divider for the number of screws in the indexing device. Additional disks may be provided to take care of partitions having four, six, seven, eight, nine or ten cells in each longitudinal row. Thus, in Figs. 45 and 46, I have shown a disk 111, having nine screws, permitting longitudinal strips for partitions having two or eight cells in each longitudinal row to be punched.

There must be as many pins or ratchet teeth on each disk as there are screws and, therefore, the angular movement of the disk during each working stroke of the pawl will vary with the number of pins. In order that the same pawl will be able to cooperate with all of the disks, I make it comparatively wide and set the ratchet pins closer to the center of the disks as the number of screws is reduced. In this way, the pins on all the disks will lie in the path of the pawl but, when there are fewer pins, each stroke of the pawl will produce a greater angular movement of the disk.

To facilitate the setting of the indexing device, the gear wheel 90, on the shaft 91 which actuates the cam sleeve, (see Figs. 10 and 11), has thereon a graduated scale 124. This scale is visible through a small window 125 in the frame of the machine. A stationary pointer 126 cooperates with the scale. To set the indexing means, the machine is turned over until the rack bar 93 has reached the end of its forward stroke. Then, the disk 111 is turned, while the bar is held back by hand, to bring a screw in registration with the bar. The bar is then released and engages with the screw. The screw is then turned until the pointer points to that graduation on the scale corresponding to the length of the first cell, for example. The disk is then turned to bring the next screw in line, and that screw is adjusted until the pointer is on the graduation representing the length desired for the second cell. In this way, turning the disk 111 step by step and adjusting the screws by the indicator, the indexing device will become set to regulate the feed of the paper and cause it to be advanced through steps of predetermined lengths arranged in

a predetermined order when the machine is run under power.

It should be mentioned, before describing other features of the machine, that a spring 127 may be placed behind the slide 95, as shown in Figs. 11 and 12.

After the sheet has been punched, it must be slit into ribbons, as shown in Fig. 26. The rolls 31 and 33, being of hard steel, permit the paper to be cut by rotary slitters while passing over the same. Above the roll 31 is a transverse shaft 128 and below and forward from the roll 33 is a second similar shaft 129. On the shaft 128 is a series of brackets 130, keyed thereto but slidable along the same, set screws 131 being provided to lock the brackets to the shaft. A rocking lever 132 is pivoted to the forward end of each bracket at a point between the ends of the lever. A rotary cutter 133 is carried by the forward end of each lever. A spring 134 between the rear end of each lever and the rear end of the bracket tends to swing the lever so that the cutter will move downwardly and rearwardly. A tie member 135 extends between each lever and its bracket, through the spring; this member limiting the swinging movement of the lever. It will be seen that the brackets may be set anywhere along the shaft and that, if a suitable handle be provided, the shaft may be turned so that the cutters will be yieldingly pressed against the feed roll or be held away from the feed roll. The cutters operate through slotted stripper plates 136 overlying the front portion of the feed roll. All of the cutters are not always required, and I, therefore, make it possible quickly to throw any of the cutters into idle position. In the arrangement shown, the tie member 135 has on its lower end a head. Slidable on the under side of the bracket is a dog 137 having a lip 138 that normally lies between the head on the tie and the bracket but does not touch the head. When it is desired to render the cutter inoperative, the rear end of the lever 132 is pressed down far enough to permit the dog to be slid rearwardly underneath the bolt head on the tie; thus raising the front end of the lever high enough to prevent the cutter from coming in contact with the feed roll when other cutters, in their working positions, are brought against the roll.

The roll cutting mechanism on the shaft 129 is the same as that just described; the bracket 139 being of a somewhat different shape from the bracket 130, and the rocking lever 140 being connected to the bracket at one end instead of in the middle. However, the spring 134, the tie member 135 and the dog 138 are the same in both forms.

In Figs. 33–35, I have illustrated the operating handle for the lower slitting mechanism. This same handle mechanism is also employed at the top. Referring to these figures, 141 is a handle fixed to one end of the shaft 129 and having a spring catch 142 adapted to engage with either one of two holes 144 and 145 in an adjacent portion of the frame of the machine. When the catch is in one of the holes, it locks the shaft with the cutters raised from the feed roll, whereas, when the catch is in the other hole, the shaft is locked in a position which causes the cutters to be yieldingly pressed against the feed roll.

The sheet is, therefore, slit into ribbons before it reaches the feed roll 32 from the roll 31, and these ribbons must be twisted so as to stand on edge by the time they reach the front end of the machine. In some instances, the width of the cells of a partition will be considerably greater than the height which equals the width of the ribbons into which the sheet A is cut, requiring that the ribbons be spread out fanwise as they travel toward the front. Those ribbons which move straight ahead will reach a given transverse line sooner than those that lie at an angle and, therefore, corresponding notches in all of the ribbons will not be in a straight line. I have, therefore, provided a take-up device or equalizer that will insure that corresponding notches in all of the ribbons will be in line with each other when the front end of the machine is reached, in the event that it is necessary to spread the ribbons. This take-up device, or regulator, as best shown in Figs. 13 and 14, may simply be a plate 146 extending transversely of the machine, the plate having a curved front edge so that the width of the plate increases gradually from both ends to the middle, and the plate being fixed at the rear edge to a shaft 147 extending transversely across the machine just below the feed roll 32 and journalled at its ends in the frame. A second plate 148, similar to plate 146, lies below the latter plate, being fixed to and carried by a shaft 149. The shafts 147 and 149 may be connected by gearing 150. On one end of the shaft 149 is a handle 151. By turning the handle, the plate 146 may be swung up while the other swings down, or the upper plate may be swung down while the lower plate moves up. It will be seen that, as the plate 146 is swung up, the central portion rises at an increasing rate because it is farthest from the axis of rotation and, therefore, upon engaging with the overlying ribbons, it will push up the middle ones farther than those at the ends. Therefore, if the ribbons are required to be spread out fanwise, the plate 146 need only be swung up until the point is reached at which corresponding notches in all of the ribbons at the front end of the machine will be in the same transverse line, in order to compensate for the irregularity that would otherwise result from the diverging relation of the ribbons. As shown in Fig. 1, the handle 151 may have therein a slot through which passes a thumb

screw 152 to lock the handle in any position into which it may be brought.

At the front end of the machine there are means for feeding a sheet of paper, punching it, cutting it into transverse strips, assembling these strips with the longitudinal ribbons, and severing the ribbons.

The front end of the base of the machine, as best shown in Figs. 3 and 17, has vertically extending side members 155 on which rests a secondary frame 156 of inverted U-shape. Mounted on and projecting forwardly from the main frame, at the front end, is a table 157 over which the longitudinal strips, heretofore described, are fed and finally emerge as part of the finished product. Because partitions are made of various heights, the table is adjustable in the vertical direction.

Resting on the sides 155 of the frame within the auxiliary frame is a rigid carriage comprising a heavy cross bar 158 and upright end pieces 159 and 160 at the sides of the machine. As best shown in Fig. 55, the carriage, base and auxiliary frame are so designed that the carriage rests, as it were, in a dovetail groove that permits it to slide forwardly and rearwardly while held against movement in other directions. A set screw 161, acting on one side of the carriage in the groove, through a gib 162, serves to clamp the carriage in place. When the set screw is loosened, the carriage may be shifted by means to be hereafter explained. A series of frame-like brackets 163 are mounted on the bar 158 so as to be slidable along the same, transversely of the machine. These brackets may be secured by means of set screws 164 carried by the same and adapted to engage a cross bar 165 connecting the carriage sides or wings 159 and 160 at their upper, rear corners, as best shown in Fig. 75. These brackets carry feed rollers for the ribbons and shears for severing the ribbons.

As will be seen in Figs. 75 and 76, there are two vertical feed rolls in each bracket, one roll 166 being mounted to revolve about a stationary axis and the other roll 167 being supported between the free ends of arms of a U-shaped frame 168, journalled to the bracket, at top and bottom, as indicated at 169—169, for swinging movements about a vertical axis. A spring 170 between the vertical member of the frame 168 and the rear member of the bracket holds the frame in a position in which the roller 167 yieldingly presses against the roller 166. A screw stud 171 forms the rear bearing for the spring and, by adjusting the stud, the pressure of the spring may be varied. Each ribbon is threaded between a set of feed rolls which, as will hereinafter be explained, are rapidly revolved and thus draw the ribbon ahead. The ribbons should be supported from below before reaching the feed rollers, in order that they may run straight ahead upon the table 157 after leaving the rollers. I have, therefore, provided an auxiliary table in the form of a flat bar 172 lying on its side and extending through all of the brackets behind the feed rollers. This auxiliary table is supported at its ends on vertical screws 173—173, one at each side of the carriage. By turning these screws, the auxiliary table may be raised and lowered at will.

The front member of each of the frame-like brackets 163 is preferably made of hard steel and has a narrow slot or passage 174 extending through the same from front to rear and for a height corresponding to that of the feed rollers. The ribbon, after leaving the rollers, travels through this slot or passage to the receiving table 157. This slotted bracket member forms the stationary element of a pair of shears. Each pair of shears, as best shown in Figs. 75, 76, 80 and 81, includes, in addition to the frame member, a vertical blade 175 lying flat against the front face of the frame member besides the slot 174. The blade is held in place by two bolts 176—176 that pass through slots in the blade and into the frame member. The rear ends of the bolts lie in pockets or chambers in the frame member open on the rear side, and are surrounded by compression springs 177 which lie between nuts on the bolts and the walls bounding the inner ends of the pockets or chambers. By this means the blades are yieldingly held against their cooperating shear members. The slots through which the bolts pass are of peculiar shape so as to cause the blade to have a most efficient shearing action. Each slot is in the form of a flattened V. One wing or arm of the lower slot 178 extends lengthwise of the blade while the other, or upper, arm extends upwardly and toward the right. One arm of the upper slot 179 extends downwardly in the direction of the length of the blade, while the other, or lower, arm extends downwardly and toward the left. Normally the blades occupy the position shown in Fig. 79, the bolts being in the upper ends of the two slots in each blade, and the blade lying at one side of the slot or passage 174 in the carrying bracket. When a force is applied tending to push one of the blades upwardly, the upper end of the blade tends to rise in a straight line because that bolt is in the straight portion of the upper slot. However, the lower bolt is in the inclined portion of its slot and, therefore, the lower end of the blade must swing toward the right as the blade rises. Fig. 80 illustrates the parts and the positions which they occupy after the blade has been moved about halfway up, and it will be seen that the lower end of the blade has been swung completely across the slot 124, whereas the upper end has not yet begun to pass over the slot. A continued upward movement of the blade causes the upper end to swing toward the right, because the upper

bolt is now riding in the inclined portion of its slot; whereas the lower part of the blade has no bodily lateral movement because the lower bolt is in the straight portion of the corresponding slot. The final position of the blade is illustrated in Fig. 81, the blade being again vertical and having passed completely over the slot in the stationary member.

All of the shears are operated simultaneously through a long cross bar 180 having in one side, near the top, a groove 181 extending from end to end; each blade having at its lower end a pin 182 that extends into the groove. When the bar is raised, the blades perform a shearing movement and, when the bar is lowered, the blades resume their normal positions of rest. The bar 180 extends between the side member 159 and 160 of the carriage and is supported by rollers 183—183, mounted on these side members and extending into parallel-inclined slots 184—184 in the ends of the bar. A compression spring 185 bears against one end of the bar and exerts a pressure thereon in the direction of the length of the adjacent slot 184 so that, when free to do so, it positions the bar down. The bar is pushed laterally and up against the resistance of the spring by mechanism that will hereafter be described.

The ribbons must be accurately positioned when they reach the receiving table. Ordinarily, there is such a short distance between the shears and the receiving table that no additional guide means is required beyond the shears. However, sometimes the carriage as a whole stands back considerably farther than is shown in Fig. 75, for example, and it is then desirable to have additional guide means for the forward ends of the ribbons. I have provided for this purpose auxiliary brackets 186, one of which may be placed in front of each of the brackets 163 and be fastened thereto by bolts 186*a*. The top of each auxiliary bracket is below the plane of the lower arms of the U-shaped frames 168 in which the feed rollers 167 are mounted. Resting on top of each auxiliary bracket is a plate 187 having a foot piece 188. A bolt 189 extends from this foot piece through a slot 190 in the auxiliary bracket. The slots 190 extend in the direction of the length of the machine so that, by loosening the bolts, the guide plates may be shifted forwardly or rearwardly on the auxiliary brackets. Each of the plates 187 is made in two parts spaced from each other so as to provide a slot through which the paper may extend. Rising from each auxiliary bracket, behind the guide plate, are two members 191, similar to ordinary spring curtain rollers, there being one of these on each side of the slot in the guide plate. Flexible curtain-like members 192 are wound on the rollers 191, the outer ends being extended through the slot in the guide plate and being fastened to the guide plate at the front of the latter, in any suitable way. These curtain-like members form a channel or passage for the ribbon. As the guide plates are drawn forward, these curtain-like members unwind so as to maintain intact the passage through which the ribbon must travel. When the guide plate is moved back toward the rollers, the curtain-like members are wound up on the same, leaving no slack.

It must be possible to drive the little feed rollers 166 and 167, regardless of the positions which they occupy transversely of the machine. I have, therefore, provided each roller with a flexible shaft 193 extending downwardly therefrom into the main base of the machine. Within the base of the machine, below the carriage in which are contained the little feed rollers and the shears, there is a second carriage consisting of a gear casing 194 mounted upon and fixed to the forward end of rails 195—195 extending longitudinally of the machine and supporting, rearwardly of the gear casing, a motor 196 whose function is to drive the little feed rollers. The rails rest on what may be termed the bottom wall or bed of the base of the machine and, as indicated in Figs. 69 and 70, at least two of the rails have on top thereof, at their rear ends, rack bars 197 with which mesh pinions 198—198, fixed on a transverse shaft 199 extending transversely across and journalled in the base. One end of the shaft is shown as projecting beyond the base and being fashioned as indicated at 200 in Fig. 70, to receive a wrench or other means for turning the same. By turning the shaft in one direction or the other, the lower carriage may be moved forwardly or to the rear. The carriage may be locked in any position, conveniently by means of a heavy shoe 201 overlying the rails 195—195, between the two rack bars. What is in effect a large, heavy set screw 202 extends down through a heavy lug, or projection, 203 on the base and engages with the shoe 201. The member 202 has on the upper end a large head 204 that may conveniently be grasped to turn the same and thus press the shoe down upon the rails or release the rails from the pressure of the shoe. This lower carriage is additionally secured in place by providing each end of the gear case 194 with a strong housing 205 underlying a longitudinal ledge or guide 206 on the adjacent side wall of the base of the machine and overlying the bottom or bed. The ends of the gear casing itself have shoes 207 resting and slidable along the bed or bottom of the base. Within each housing 205, as best shown in Fig. 71, is a longitudinal wedge 208 through which passes a screw device 209 that is simply journalled in the housing 205 but is in screw-threaded engagement with the wedge block. The member 209 may be turned from the outside. Above the block, and in engagement

with the under side of the ledge 206, is a second wedge block 210 oppositely disposed with respect to the block 208. Upon turning the screw device in one direction, the block 210 is forced up against the ledge and the shoes on the ends of the gear casing are forced down against the bed or bottom of the base so as rigidly to hold the gear case to the base.

The gear case is connected to the upper carriage by heavy bars 211—211, the lower ends of which are conveniently fastened to the heavy housings 205. The upper carriage is also connected to the rails 195 by more or less diagonal bars 212 extending from the upper carriage downwardly and rearwardly to the rails. Therefore, when the lower movable unit is shifted back and forth, the upper carriage must travel in the same direction and to the same extent.

I shall now explain the manner in which the flexible shafts for the little feed rollers 166 and 167 are driven. Referring to Figs. 72–74, it will be seen that the shaft 213 of the motor 196, through a flexible joint 214, drives a short shaft 215 extending through and journalled in the gear casing 194. On the latter shaft is a worm 216 meshing with a worm wheel 217 on an upright shaft 218, also journalled in the gear casing. On the shaft 218, in the bottom of the gear casing, is a gear wheel 219. The gear casing has at the front, at the lower side, an extension 220 in which are mounted two rows of upright tubular spindles, each row extending transversely across the machine. Each spindle is shown as being composed of a tube having keyed thereto, at about the middle, a pinion 223, one of which meshes with the large gear wheel 219. Around each spindle, above and below the pinion thereon, is a stationary antifriction bushing 222. The spindles in one row are staggered with respect to those in the other row so that each of the pinions 223 in each row meshes with two pinions in the other row; thereby causing all of the spindles in one row to turn in one direction and those in the other row to turn in the opposite direction, when the motor is running. The key 224 between each pinion and its spindle is shown as projecting into the central bore of the spindle.

On the lower end of each flexible shaft 193 is a stem 225 that may be plugged into any one of the spindles. Each stem has a keyway or groove 226 in the side thereof to receive the projecting end of the key 224 in the spindle into which the stem is inserted. By this means each flexible shaft will be positively driven when connected to one of the spindles. It will thus be seen that, no matter into what position, transversely of the machine, one of the feed roller brackets is adjusted, the flexible shaft of one of the rollers need only be plugged into the nearest spindle of the front row and the shaft of the other roller into the nearest spindle of the back row to cause the rollers to be driven in opposite directions and at the same speed.

The mechanism for operating the shears will now be described. Referring to Fig. 8, it will be seen that in the base of the machine, near the front end, is a shaft 227, similar to the shaft 67, and which may, therefore, be called the second main shaft, driven from the main motor 68. Toward one end of the shaft 227 is an eccentric 228 actuating a more or less upright eccentric rod 229. Referring now to Figs. 67, 68, 78 and 79, it will be seen that the upper end of the eccentric rod terminates just above one of the side walls 155 of the base, besides the carriage on which the feed rollers and the shears are mounted. Through a flexible connection 230 between the same and a pawl-carrying arm 231 journalled on a shaft 232, the rod oscillates the arm once during each revolution of the shaft 227. The shaft 232 extends lengthwise of the machine and is mounted on the box-like frame 156. Fixed to this shaft is a ratchet wheel 233 that is engaged by a pawl 234 on the arm 231. Therefore, the ratchet wheel will be turned through an angular length measured by one tooth, carrying the shaft 232 with it, during each revolution of the second main shaft. A shaft 235 is mounted on the frame 156 inwardly from and parallel to the shaft 232. On the shaft 235 is a rocker device actuated from the shaft 232 and in turn actuating the shear-operating bar 180. Since the bar may be adjusted lengthwise of the machine with the carriage on which it is mounted, the rocker device must be designed to be in actuating relation to the bar regardless of its position. The rocker device, therefore, has as one element a long apron-like member 236 hung on the shaft 235 and carrying at its outer or free end a long roller 237. This roller engages with the adjacent end of the shear bar 180 and is long enough to maintain such engagement throughout the range of adjustment of the carriage. The second element of the rocker device is an arm 238 hung on the shaft 235 and lying outwardly from the member 236. On the free end of the arm 238 is a cam roll 239 adapted to be engaged and pushed inwardly by any one of a series of cam blocks 240 on an indexing wheel 241 fixed to the shaft 232, as that shaft turns. The arm 238 bears against a part of the member 236, so that whenever the arm is pushed in, it causes the member 236 to swing and force the roller 237 against the shear bar 180; whereby the shear bar will be moved and the shears will execute a shearing stroke. When the cam roll drops off the block with which it has been engaged, the spring 185, that presses against the shear bar at the opposite side of the machine, moves the bar back so as to open the shears and place the parts in positions in

which they will be ready to perform another shearing operation as soon as the next cam block comes into place. In order to facilitate accurate adjustment and to take up wear, I provide the member 236 with a pin or screw 242 for engagement with the actuating arm 238. After the pin or screw has been properly adjusted, it may be locked in place by a set screw 243. This set screw is so positioned that its outer end is the only part of the member 236 that engages with the actuating arm.

The cam blocks are preferably detachable from the wheel 241, so that the number thereof and their positions may be changed. Furthermore, additional wheels corresponding to the wheel 241 and the ratchet wheel 233 may be provided; thereby making it possible to secure a wide range of intervals between successive shearing operations. In the arrangement shown, remembering that the machine is illustrated as being set to form partitions having only two cells in each longitudinal row, longitudinal strips must be cut from the ribbons after every three forward steps of the ribbons or the sheet from which they are formed. Therefore, the relation between the ratchet wheel and the cam wheel of the shearing mechanism is so arranged that, after a cam block has actuated the rocker device, the ratchet wheel must be moved through three steps before the next cam block is brought into play. The main shaft 227 runs at the same speed as the shaft 67 and, therefore, the timing of the shearing operations is in synchronism with the feeding of the sheet A. When there are more cells in a longitudinal row, the ratchet wheel, corresponding to the wheel 233, or the cam wheel, or both, will, of course, be such that the proper number of feeding steps of the sheet for the longitudinal strips may intervene between successive shearing operations.

Having now described all of the mechanisms for handling the sheet from which are fashioned the completed longitudinal strips of a partition or a series of partitions extending in a row transversely of the machine, there remains only the mechanism for producing the cross strips and interlocking them with the longitudinal strips.

The sheet of paper B, from which the cross strips for the partition are cut, enters the machine from the rear and over an elevated table 245 which is similar to, though longer than, the table 10 and need, therefore, not be described in detail; this table resting at its rear end, as best shown in Figs. 1 and 2, upon a cross piece 246 extending between a pair of standards 247—247, rising from the top of the head 2. The forward end of the table 245 is hinged to a heavy cross member 248 that forms the base of what may be termed the "punch press" for the sheet B, the hinge being indicated at 249. The member 248 rests on the flat top of the forward frame section 146, so as to be slidable thereon lengthwise of the machine. As best shown in Figs. 55 and 66, there are racks 250 flush with the top of the frame member 156. Meshing with these racks are pinions 251 fixed upon a shaft 252 mounted in the base device 248 and extending transversely across the machine. One end of the shaft is shaped to receive a wrench or other tool for turning the shaft, as indicated at 253 in Fig. 54. By turning the shaft 252 the base of the punch press may be adjusted lengthwise of the machine. Then, by tightening a plurality of bolts 254, passing through slots 255 extending longitudinally of the machine in the top of the frame member 156, the base of the punch press may be locked to the frame.

The punch press itself is substantially the same as that heretofore described, except that the punches are arranged to cut out slots that extend longtiudinally of the machine instead of crosswise, as indicated at *b* in Fig. 24. In other words, there are lower and upper die blocks 256 and 257, respectively; the blocks 256 being adjustable transversely of the base 248, and the die blocks 257 being adjustable lengthwise of a heavy cross beam 258. There are also suitable stripper plates 259 above the lower dies; the sheet of paper passing underneath the stripper plates in its progress through the machine. The cross beam 258 slides up and down upon heavy posts 260—260 rising from the ends of the base 248 at opposite sides of the machine. At its ends, the beam has trunnions 261 engaged by the upper ends of eccentric rods 262—262 driven from the main shaft 227. The base 248 is made hollow underneath the punching dies to provide a chamber 263 for receiving the pieces punched out of the sheet. In this chamber is a suitable trough 264 within which lies a conveyor screw 265 extending across the machine from one side to the other. The conveyor moves the punched pieces along the trough toward the left, as viewed in Fig. 55, causing them to drop out through a discharge chute 266. The conveyor is driven from the main shaft 227 which, as shown in Fig. 8, has thereon a pulley 265 over which extends a belt 268 which passes up, as shown in Figs. 55 and 65, over a pulley 269 on a short stub shaft 270 projecting inwardly from one of the side walls of the frame section 156. The pulley 269 is fixed to a second pulley 271, also rotatable on the shaft 270. A belt 272 passes over the pulley 271 and a pulley 273 on the shaft of the conveyor screw. Therefore, whenever the machine is running, the conveyor will also be running. When the parts above the stationary frame section 156 are shifted lengthwise of the machine, there is no interference with the conveyor drive, because the belt 272 simply swings around the shaft 270. However, I prefer to

provide a suitable belt tightener which may conveniently consist of a pair of arms 274 and 275 journalled on and extending in opposite directions from the shaft 270. Pins 276 and 277 extend laterally from the outer ends of the arms 274 and 275, respectively, these pins lying on the same side of the device and in a plane at right angles to the shaft 270. A tension spring 278 connects these pins. The arm 274 has thereon a roller 279 situated between the two runs of the belt 272, the arm 275 having a similar roller 280 engaging one of the runs of the belt 268. The spring holds these rollers constantly pressed against corresponding runs of the two belts and will take up any slack, particularly slack that would be produced in the belt 272 by shifting the punch base 248 toward the left, as viewed in Fig. 65.

In front of the punching mechanism are feed rolls adapted to draw the sheet B from the table 245 through the punching mechanism and feed it to the period of assembly with the longitudinal partition strips. There are two of these rolls, 281 and 282, As best shown in Figs. 1, 2 and 17, these rolls extend transversely across the machine and are supported at their ends in two bearing frames 283—283 overlying the front end of the main frame section 156 and firmly secured thereto; the roll 281 lying behind the roll 282. The details of the roll 281 are shown in Fig. 56. Referring to this figure, it will be seen that the roll proper is a cylindrical steel shell surrounding a shaft 284 and fixed to the latter by cones 285 and 286 arranged on the shaft and wedged into the ends of the shell. The cone 285 may be stationary on the shaft, but the other cone is screwed upon the shaft so that, by turning it, it may be forced into the shell and clamp the latter between the two cones. After the cone 286 has been screwed tight, it may be held against backing off by a lock nut 287.

The roll 281 is driven through a suitable clutch comprising a spider 288 fixed to one end of the shaft beyond the corresponding supporting frame, and a surrounding clutch casing 289. Between the spider and the cylindrical wall of the clutch casing are a plurality of dogs 290. Between one end of each dog and the body of the spider is a rocking strut 291 whose ends are semi-cylindrical and rest in complementary seats in the spider and the dogs, respectively. In front of each dog is a spring 292 abutting against a radial projection 293 on the spider. The rocking struts are positioned more or less tangentially, the inclination to corresponding radii of the clutch being such that any movement of the dogs produced by the springs rocks the struts into more radial positions, forcing the dogs outwardly against the casing. When the casing is turned in the clockwise direction, as viewed in Fig. 57, it will slip over the dogs, because there is only the resistance of the springs to be overcome. However, when the casing is turned in the counter-clockwise direction, it is assisting the springs in forcing the dogs outwardly and, therefore, the clutch casing is locked to the spider and, consequently, to the shaft. The clutch casing has a projecting web 294 to which is pivoted the uper end of a connecting rod 295. This rod, as shown in Fig. 5, extends down to one end of the main shaft 227 where it is pivoted to a block or cross head 296 (see Figs. 6 and 7) slidable between guides 297—297, preferably made integral with, and lying on opposite sides of a diameter of, a disk 299 on the end of the main shaft. A screw 300 extending through a cross bar 301 between corresponding ends of the guides and into the block or cross head serves as a means to adjust the latter along the guides from and toward the axis of rotation of the shaft and thus vary the length of stroke of the connecting rod. The cross head or block may be locked in any adjusted position by a set screw 302 extending through one of the guides 297.

It will thus be seen that the feed roll 281 is turned through a predetermined angle during each revolution of the main shaft 227, this angle being variable, at will, through a lengthening or shortening of the stroke of the connecting rod. Therefore, since the feed rolls 281 and 282 are geared together by gear wheels 303 and 304 (see Fig. 2) so as to run at the same peripheral speed, they will draw forward a predetermined length of the paper sheet B for each step that is made by the sheet A. The length of each feeding movement of the sheet B determines the distance between successive rows of punchings in that sheet and, therefore, the height of the cross strips afterwards to be cut from the sheet.

The bearing boxes 305 for the ends of the roll 282 are slidable in the frames 283 and screws 306 extend inwardly through the front ends of these frames to the boxes; the screws turning freely in the frames, while held against endwise movement, and being screw-threaded into the boxes. On the outer ends of the screws are bevel gears 307—307 meshing with complementary gears 308—308 on a transverse shaft 309 provided with a hand wheel 310. By turning the hand wheel the roll 282 may be moved from or toward the cooperating roll.

Partitions as wide as the machine may be made. However, the partitions will usually be narrower so that several can be made at one time. I have, therefore, provided means for slitting the sheet B into widths equal to those of the group of partitions that are to be made side by side. To this end I have placed above the feed roll 281 a transverse shaft 311 supported in upward extensions of the frames

283—283. On one end of the shaft is a handle 312 for turning the same. Keyed to and slidable along the shaft are slitter devices similar to those at the rear end. These slitter devices are shown in detail in Figs. 59–64. Each such device consists of an L-shaped bracket 313 keyed to the shaft so as to be slidable along the same, a set screw 314 holding it in any desired position. A rock lever 315 is pivoted to one arm of the bracket and carries at its lower end a rotary slitting cutter 316. A forked stem 317 is pivoted to the other arm of the lever and extends through the second arm of the bracket. The stem has a head 318 thereon behind the bracket. A spring 319 surrounds the stem, pressing at one end against the bracket and at its other end against a nut 320 screwed on the stem. The spring normally holds the cutter against the roll 281 when the shaft 311 is turned into its slitting position. The pressure of the spring may be varied by turning the nut 320. On the rear side of the bracket is a slide 321 that may be pushed under the head on the stem 319, as shown in Fig. 63, and cause the cutter to be held away from the feed roll even when the supporting shaft is in slitting position. The handle 312 lies just outside of one of the frame members 322 in which the shaft 311 is supported and carries a spring-pressed locking pin 323 adapted to enter either the hole 324 in the frame member, as shown in Figs. 59 and 60, or the hole 325 appearing in Fig. 60. When the pin is in hole 324, the shaft is locked in its slitting position and such of the slitters as are not being kept idle, as shown in Fig. 63, will act on the paper sheet B as it is drawn between the feed rolls. When the pin is in hole 325, the shaft is locked in its idle position with all of the slitters raised from the cooperating feed roll. The pin may be released by means of a small lever 326 mounted on the side of the operating lever and engaged at one end with the pin while its other end is in position to form part of the grip of the operating lever and be pressed against the same when the operating lever is grasped to turn the slitter shaft.

In the arrangement shown, as appears in Fig. 2, the sheet B is just wide enough to make four cross strips arranged end to end; there being five slitters; and, because the endmost slitters are not needed, they are locked in idle positions.

After the sheet B leaves the feed rolls, it passes down along the vertical front face of the main frame section 156, behind a guide plate 327, best shown in Fig. 17. The front wall of this frame member terminates at about the top of the carriage for the feed rollers for the ribbons approaching from the rear of the machine, permitting the ribbons to pass out upon the feed table 157. A vertically adjustable stationary shearing blade 328 is secured to the lower part of this front wall, on the front side, and extends entirely across the machine. The frame carries a series of screws 329 arranged in vertical positions above and engaged with the upper edge of the blade 328. The guide plate 327 has therein openings 330, registering with these screws and thus giving access to the same from the front of the machine. The shearing blade is secured to the frame by suitable fastenings, of which one is shown at 331, passing forward through the front wall of frame section 156 into nut devices 332 lying in vertical slots 333 in the blade. The usual inclined movable shear blade 334 is mounted on top of a heavy cross bar 335 having at the ends heavy tubular hubs 336—336, slidable on posts 337—337 extending forwardly and upwardly from the lower part of the main frame section 156. Two eccentric rods 338—338, one on each side of the machine, are pivoted at their upper ends to the hubs 336—336 and are driven at their lower ends from the same eccentrics that operate the forward punches through the rods 262. Since the upper ends of the rods 338—338 move lengthwise of the machine, as well as up and down, they are pivoted to their eccentric straps, as indicated at 339. One of these eccentrics is shown in detail in Fig. 6; the eccentric, indicated at 340, being fixed to main shaft 227, and having a strap, indicated at 341. The long shears, therefore, operate in unison with the forward punches, cutting off a series of cross strips, which may be the strips M, N, or O of Fig. 27, while the punching mechanism is punching a transverse row of holes in the sheet B.

Whenever the longitudinal strips come to rest on the table 157, corresponding notches therein are in position to receive a cross strip or a series of the latter arranged end to end. The sheet B is fed while the sheet A and longitudinal strips therefrom are at rest, so that the advance end of the sheet B may be interlocked with the longitudinal strips and then be severed by the long transverse shears in the usual way.

It should perhaps be explained that the reason why the carriage that supports the little feed rollers and the shears for cutting longitudinal strips from the ends of the ribbons into which sheet A is slit, is that the shearing of the ribbons must take place at a definite distance from the assembling point. This distance varies for different partitions and, therefore, the shearing point for the ribbons must be variable since the assembling point is fixed. So, also, to secure perfect coordination between the meeting sets of strips approaching each other from the rear and from above, the forward punching mechanism must be adjusted back and forth as the character of the product to be manufactured varies.

There remains only one other mechanical

feature to be considered. Since the machine should run at comparatively high speed to attain maximum production, there is danger that the feed rolls will overrun when the clutches let go. I have, therefore, provided the feed rolls with brakes to prevent overrunning. The brake for the forward feed rolls is illustrated in Figs. 56 and 58. Referring to these figures, 342 is a collar keyed to the shaft 284. Embracing this collar are two semi-circular brake shoes 343 and 344 faced with a suitable brake lining 345. The shoes are hinged together at one end, the hinge pin 346 extending into and being fixed in the adjacent frame member 283. A bolt 347 connects the other ends of the shoes together and clamps them about the collar. The shoes, therefore, offer frictional resistance to turning of the shaft. This resistance is not great enough to interfere with normal turning of the shaft but is sufficient to prevent further motion thereof when the clutch releases.

The rear feed rolls are provided with a more positive brake. On the end of the feed roll shaft 50, opposite that at which the clutch is located, as best shown in Figs. 1 and 2, is a brake comprising two semi-circular shoes 348 and 349 hinged together at one end and surrounding a brake drum 350 on the shaft. The opposite end of the shoe 349 extends beyond the corresponding end of the shoe 348 and, pivoted to both of these latter ends, is a lever 351; the pivot connection with one shoe being nearer the long axis of the shaft 50 than is that with the other shoe. Therefore, a pressure on the lever in one direction will draw the shoes tightly about the drum, whereas a pressure on the lever in the opposite direction will loosen the grip of the shoes. On the end of main shaft 67, on the same side of the machine as the brake, is a crank pin 352 between which and the outer end of the lever 351 is a connecting rod 353. The crank pin is so placed, angularly of the main shaft, that the brake is released during the major portion of each turning movement of the rear feed rolls but is applied before the clutch is released. Consequently, the feed rolls are free from any brake load except just before they come to rest.

It is believed that the operation of the machine has been explained sufficiently in connection with the detailed description of its construction and, therefore, for the sake of brevity, I shall not further describe the operation.

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 machine of the character described, feed rolls, a rotatable driving member, mechanism between said member and the rolls to turn the latter step by step during rotation of said member, a movable selective device determining the length of each individual step according to the position of the device, and means actuated by said member to bring said device into a different position for each step through which the rolls are turned, and mechanism cooperating with a sheet fed by said feed rolls, and a second sheet to form cell cases.

2. In a machine of the character described, feed rolls, a rotatable driving member, mechanism between said rolls and said member to turn the rolls step by step during rotation of said member, a selective device having numerous working positions, a corresponding number of controlling elements on said device which in succession determine the length of the steps through which the rolls are turned as the selective device is shifted through its several working positions, and means actuated by said member to shift the selective device into its various working positions in recurring series as said member revolves, and mechanism cooperating with a sheet fed by said feed rolls, and a second sheet to form cell cases.

3. In a machine of the character described, feed rolls, a rotatable driving member, mechanism between said rolls and said member to turn the rolls step by step during rotation of said member, a selective device having numerous working positions, a corresponding number of controlling elements on said device which in succession determine the length of the steps through which the rolls are turned as the selective device is shifted through its several working positions, means actuated by said member to shift the selective device into its various working positions in recurring series as said member revolves, each of said elements being adjustable on said device to permit the length of the step determined thereby to be varied, and mechanism cooperating with a sheet fed by said feed rolls, and a second sheet to form cell cases.

4. In a machine of the character described, rolls for feeding a sheet, a rotatable shaft, driving mechanism between the shaft and the rolls to turn the latter step by step during rotary movements of said shaft, said mechanism including a clutch, a clutch-controlling means determining the length of time the clutch is in, a selective device having a plurality of working positions in each of which it acts on the clutch-controlling means, and means actuated by said shaft to bring said selective device into the different working

positions in recurring succession as the shaft revolves, and mechanism cooperating with a sheet fed by said feed rolls, and a second sheet to form cell cases.

5. In a machine of the character described, rolls for feeding a sheet, a rotatable shaft, driving mechanism between the shaft and the rolls to turn the latter step by step during rotary movements of said shaft, said mechanism including a clutch, a clutch-controlling means determining the length of time the clutch is in a selective device having a plurality of working positions, a plurality of elements on said device, each of which acts on the clutch-controlling means in the corresponding working position of the device, said elements being individually adjustable to vary the effect thereof on the clutch-controlling means, and means actuated by said shaft to bring said selective device into the different working positions in recurring succession as the shaft revolves, and mechanism cooperating with a sheet fed by said feed rolls, and a second sheet to form cell cases.

6. In a machine of the character described, a feed roll shaft, a clutch member fixed to said shaft, an oscillating member, a movable clutch element on said oscillating member adapted to drive the clutch member on the shaft when engaged therewith while the oscillatory member moves forward and to ride idly upon the member on the shaft when the oscillatory member turns backward, a cam controlling the point in the forward stroke at which said clutch element takes hold, and means to shift the cam to vary said point and thus vary the angular distance through which the shaft is turned during a given forward stroke of the oscillatory member, and mechanism cooperating with a sheet fed by said feed rolls, and a second sheet to form cell cases.

7. In a machine of the character described, a feed roll shaft to be turned step by step, a driving member movable forward and backward, a clutch between said member and said shaft, including a member fixed on the shaft and a shoe mounted on the driving member and movable thereon into and out of engagement with said member, a controller for determining the point in the forward stroke of the driving member at which the shoe takes hold on the member fixed to the shaft, and means for shifting said controller while the machine is running and thus vary the said point and, therefore, the effective length of the working stroke of the driving member, and mechanism cooperating with a sheet fed by said feed rolls, and a second sheet to form cell cases.

8. In a machine of the character described, a feed roll shaft adapted to be turned step by step, an oscillatory driving sleeve surrounding the shaft, a clutch casing surrounding the shaft and the driving sleeve and fixed to the shaft, a spring pressed shoe on the driving sleeve adapted to ride idle on the back stroke of the driving sleeve and to take hold of the casing, when permitted to do so, on the forward stroke of the driving sleeve, a cam member mounted on the shaft so as to be free to turn relatively thereto, said cam member having a part to engage the shoe and hold it in its idle position, and means to turn said cam member while the machine is in operation to vary the point in the working stroke of the driving sleeve at which the shoe takes hold, and mechanism cooperating with a sheet fed by said feed rolls, and a second sheet to form cell cases.

9. In a machine of the character described, a shaft of one of a plurality of feed rolls to be turned step by step, a constantly rotating main shaft, a crank pin carried by the main shaft and adjustable from and toward the axis of the latter, a connecting rod connected at one end to said crank pin and extending at its other end to the feed roll shaft, a clutch including a driven member fixed to the feed roll shaft and a driving member actuated by the connecting rod and automatically releasable on the back stroke of the connecting rod, a controller determining the point in the working stroke of the connecting rod at which the clutch takes hold, and means to shift said controller while the machine is running and thereby vary said point, and mechanism cooperating with a sheet fed by said feed rolls, and a second sheet to form cell cases.

10. In a machine of the character described, a shaft of one of a plurality of feed rolls to be turned step by step, a constantly rotating main shaft, a crank pin carried by the main shaft and adjustable from and toward the axis of the latter, a connecting rod connected at one end to said crank pin and extending at its other end to the feed roll shaft, a clutch including a driven member fixed to the feed roll shaft and a driving member actuated by the connecting rod and automatically releasable on the back stroke of the connecting rod, a controller determining the point in the working stroke of the connecting rod at which the clutch takes hold, and means to adjust the controller to vary the said point, whereby the length of the feeding movement of the rolls may be varied both by adjusting the crank pin and by adjusting the controller, and mechanism cooperating with a sheet fed by said feed rolls, and a second sheet to form cell cases.

11. In a machine of the character described, feed rolls for a sheet of paper at one end of the machine, mechanism to move said feed rolls step by step, means to adjust said mechanism to vary the length of the steps, a shaft extending lengthwise of and near one of said rolls, slitting devices adjustable lengthwise of said shaft, means to hold the shaft either in a working position in which the slitting

devices will operate on a sheet passing over one of said rolls or in an idle position, means to lock any of the slitting devices in positions in which they will be clear of the rolls when the supporting shaft is in its working position, pairs of feed rollers at the other end of the machine each adapted to receive one of the ribbons into which the sheet is slit, and driving means for each feed roller to cause the rollers of each pair to be positively driven in opposite directions at high speed and mechanism adapted to operate on a second sheet to produce strips and engage them with said ribbons.

12. In a machine of the character described, means to feed a sheet and slit it into longitudinal ribbons, means for spreading the ribbons fanwise, and means to bend the ribbons to bring their advance ends in line transversely of the machine, and means to engage cross strips with the advance ends of said ribbons.

13. In a machine of the character described, means for slitting a sheet lengthwise into ribbons and feeding them in the direction of their lengths, a support extending transversely across the ribbons and spaced apart from the same, brackets slidable along said support transversely of the machine, a pair of feed rollers on each bracket to receive between them a ribbon, a row of driving elements rotatable about stationary axes extending across the machine beyond one end of the rollers, flexible shafts connected to at least one of each pair of rollers, and means on each shaft and each driving element to permit each shaft to be plugged into and be driven by any one of the driving elements that happen to be near thereto, and means to engage cross strips with the advance ends of said ribbons.

14. In a machine of the character described, pairs of ribbon-feeding rollers arranged in a transverse row and adjustable along the row independently of each other, a row of rotatable driving elements spaced apart from and paralleling the row of rollers, flexible shafts connected to at least one of each pair of rollers, and means on the shafts and on the driving elements to permit each shaft to be plugged in and driven by any driving element that happens to be near thereto.

15. In a machine of the character described, pairs of ribbon-feeding rollers arranged in a transverse row and adjustable along said row, two rows of driving elements spaced apart from and paralleling the row of rollers, means for causing the driving elements in one row to rotate in the opposite direction from those in the other row, a flexible shaft connected to each roller, each shaft and each driving element having thereon means to permit the shafts of any pair of rollers to be plugged in and driven by the corresponding driving elements in the two rows that happen to be near thereto.

16. In a machine of the character described, a frame, two carriages in the frame arranged one above the other and adjustable simultaneously longitudinally of the machine, a plurality of pairs of vertical feed rollers arranged in a transverse row in the upper carriage and adjustable lengthwise of the row, a transverse row of driving elements on the lower carriage rotatable about axes fixed with respect to the latter carriage, a flexible shaft connected to at least one roller of each of said pairs, and means on each flexible shaft and each driving element to permit each shaft to be interlocked with and driven by that driving element that happens to be near thereto.

17. In a machine of the character described, means for slitting a sheet into longitudinal ribbons and feeding the ribbons lengthwise step by step, shears to sever strips from the ribbons, a transverse shear actuator, means to support the shears and the actuator for bodily adjusting movements lengthwise of the ribbons, an operating member for the actuator extending across one end of and movable toward and from the actuator, said operating member being long enough to remain in operative relation to the actuator in any position in which it may be adjusted, and means for moving the said operating member in definite time relation to the feeding of the ribbons, and means for engaging cross strips with the aforesaid strips.

18. In a machine of the character described, feed rolls, a reciprocatory driving member, means to vary the length of stroke of said member, driving mechanism between said member and the rolls to cause the rolls to turn through a step for each cycle of movement of said member; means, including a series of adjustable stops, an element adapted to be arrested by any one of said stops in the path thereof, to control said mechanism to vary the length of the feeding step of said rolls for a given stroke of said reciprocating member; and means to bring said stops into the path of said element in recurring succession as the machine operates, and mechanism cooperating with a sheet fed by said feed rolls and a second sheet to form cell cases.

19. In a machine of the character described, a frame, heads supported on top of the frame at opposite ends thereof for independent movements lengthwise of the frame, punch mechanisms on said heads each of which includes an upper vertically movable die-carrying member; means for feeding a sheet through the rear punch mechanism, slitting it into longitudinal ribbons and feeding the ribbons to the front end of the machine; means for feeding a sheet through the forward punch mechanism and downward to meet the ribbons; and means to cut cross strips from the advance end of the latter sheet.

20. In a machine of the character described, frame heads supported on top of the frame at opposite ends thereof for independent movements lengthwise of the frame, punch mechanisms on said heads each of which includes an upper vertically movable die-carrying member; means for feeding a sheet through the rear punch mechanism, slitting it into longitudinal ribbons and feeding the ribbons to the front end of the machine; means for feeding a sheet through the forward punch mechanism and downward to meet the ribbons; means to slit the second sheet into longitudinal bands; and means to cut cross strips from the advance ends of said bands.

21. In a machine of the character described, a frame, two transverse main shafts at opposite ends of and toward the bottom of the frame, a motor housed in the frame, driving connections between the motor and said shafts for causing the shafts to revolve at the same speed, punching and slitting mechanisms at each end of the machine, driving mechanisms between each main shaft and the adjacent punching and slitting mechanisms, two shear mechanisms at the front end of the machine, and driving mechanisms between the forward main shaft and both shear mechanisms.

22. In a machine of the character described, a frame, two transverse main shafts at opposite ends of and toward the bottom of the frame, a motor housed in the frame, driving connections between the motor and said shafts for causing the shafts to revolve at the same speed, punching and slitting mechanisms at each end of the machine, driving mechanisms between each main shaft and the adjacent punching and slitting mechanisms, two shear mechanisms at the front end of the machine, driving mechanisms between the forward main shaft and both shear mechanisms, feed rollers at the front end of the machine, and a separate motor for driving said feed rollers.

23. In a machine of the character described, punch mechanism, two sets of feed rolls one above the other in advance of said punch mechanism, each set of feed rolls being adapted to engage one of two overlying sheets and move it through said punch mechanism, means to slit each of the aforesaid sheets into longitudinal ribbons, means to arrange said ribbons on edge and sever strips from the ends thereof, and means to cut a second sheet into strips arranged on edge transverse to the aforesaid strips and interlock them with the latter strips.

24. In a machine of the character described, punch mechanism, two sets of feed rolls one above the other in advance of said punch mechanism, each set of feed rolls being adapted to engage one of two overlying sheets and move it through said punch mechanism, means to guide the upper of such two sheets between the rolls of the upper set and the lower sheet between the rolls of the lower set, means to slit each of the aforesaid sheets into longitudinal ribbons, means to arrange said ribbons on edge and sever strips from the ends thereof, and means to cut a second sheet into strips arranged on edge transverse to the aforesaid strips and interlock them with the latter strips.

25. In a machine of the character described, a frame having thereon an assembly point for strips, means to feed strips vertically to said point, rollers to feed strips horizontal thereto, a support for said rollers adjustable to move the rollers from and toward said point, and guides on said support movable along the same to guide the latter strips in the vicinity of said assembly point regardless of the position of the rollers.

In testimony whereof, I sign this specification.

WALTER E. JENSEN.