

917,715.

L. E. CURTIS.
MACHINE FOR EXPANDING SHEET METAL.
APPLICATION FILED JULY 7, 1906.

Patented Apr. 6, 1909.
5 SHEETS—SHEET 1.

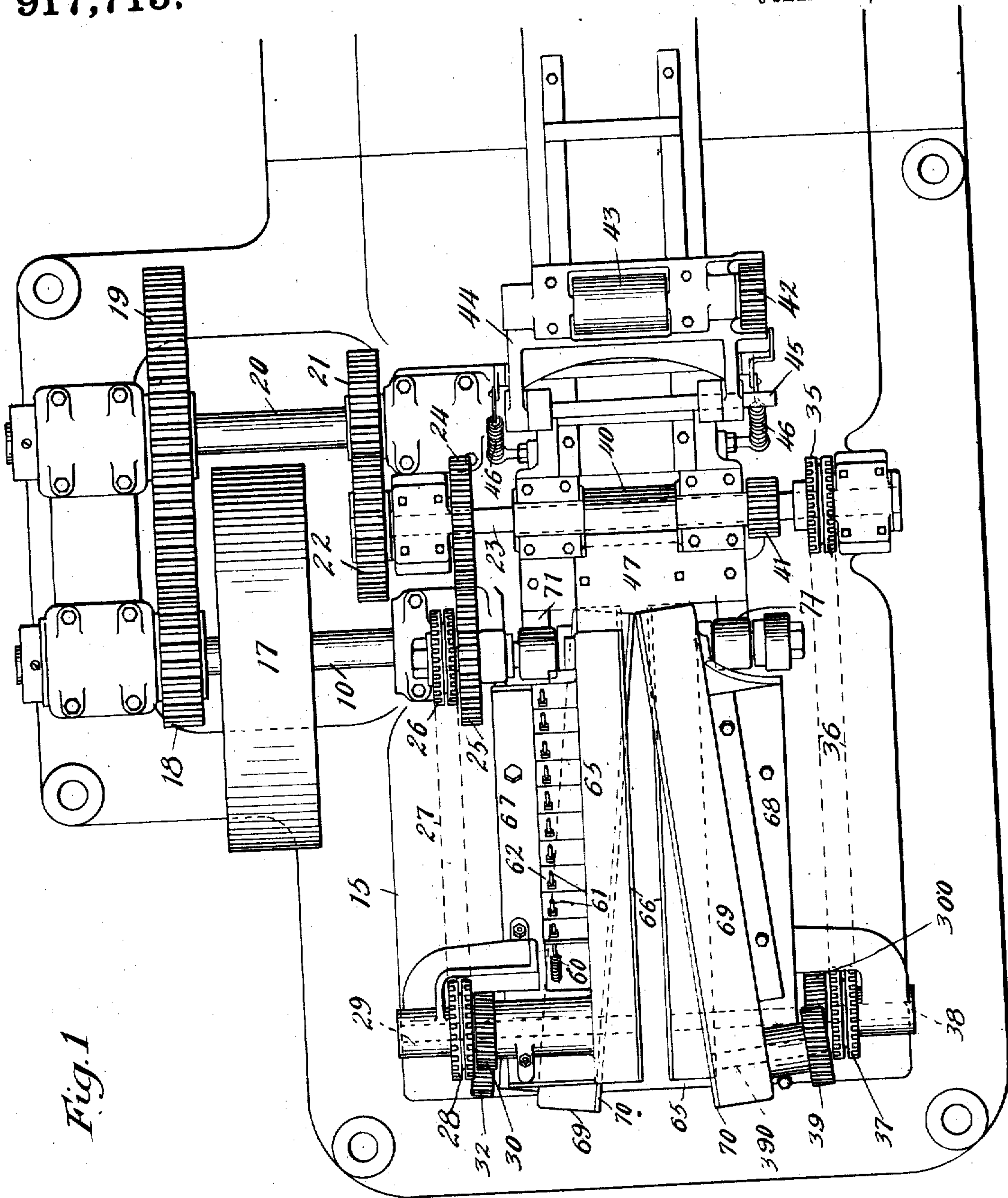


Fig. 1

Witnesses

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A. W. Mundy

Inventor
Lewis E. Curtis

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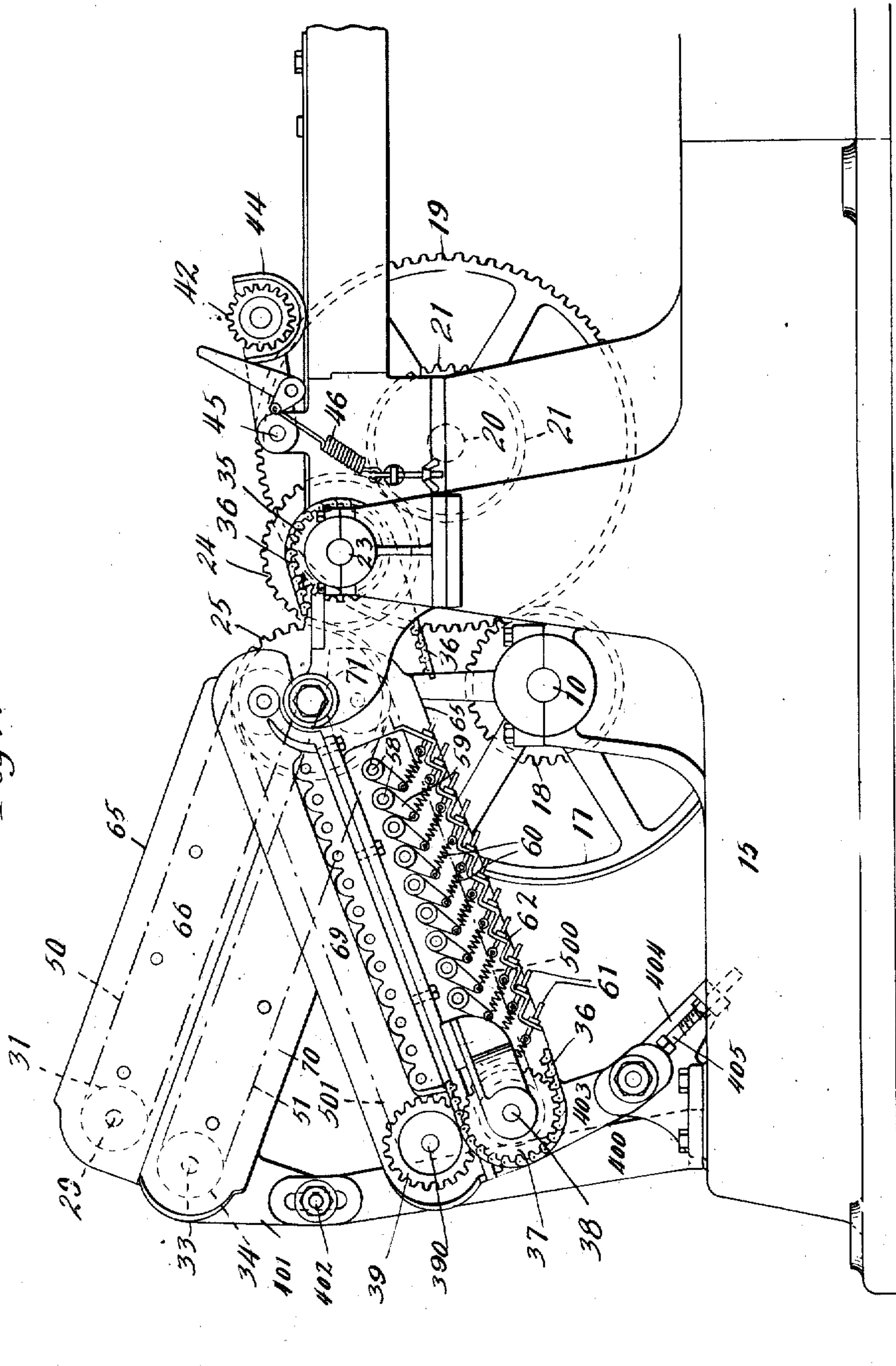
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6 SHEETS—SHEET 2.

Fig. 2



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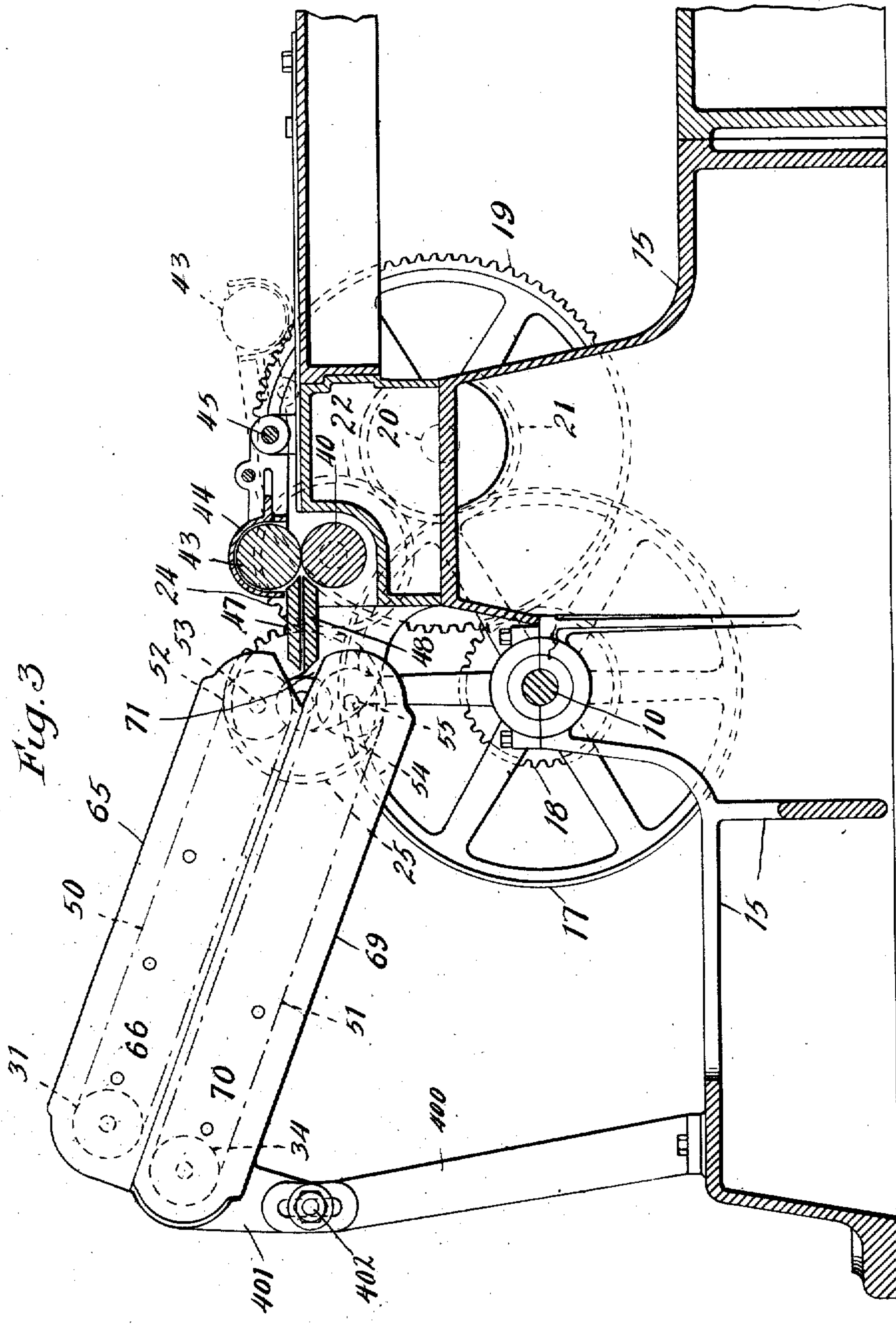
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5 SHEETS—SHEET 3.

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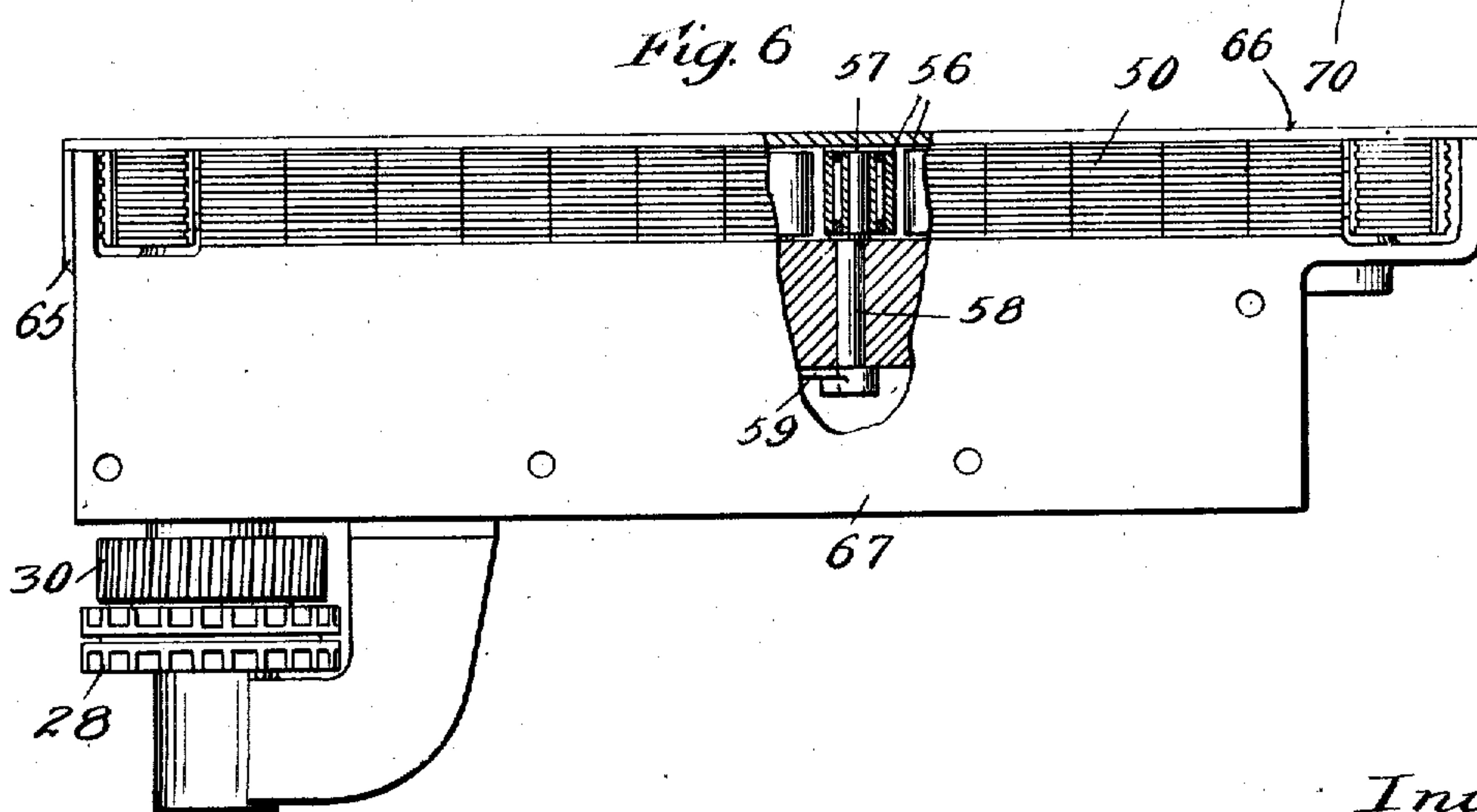
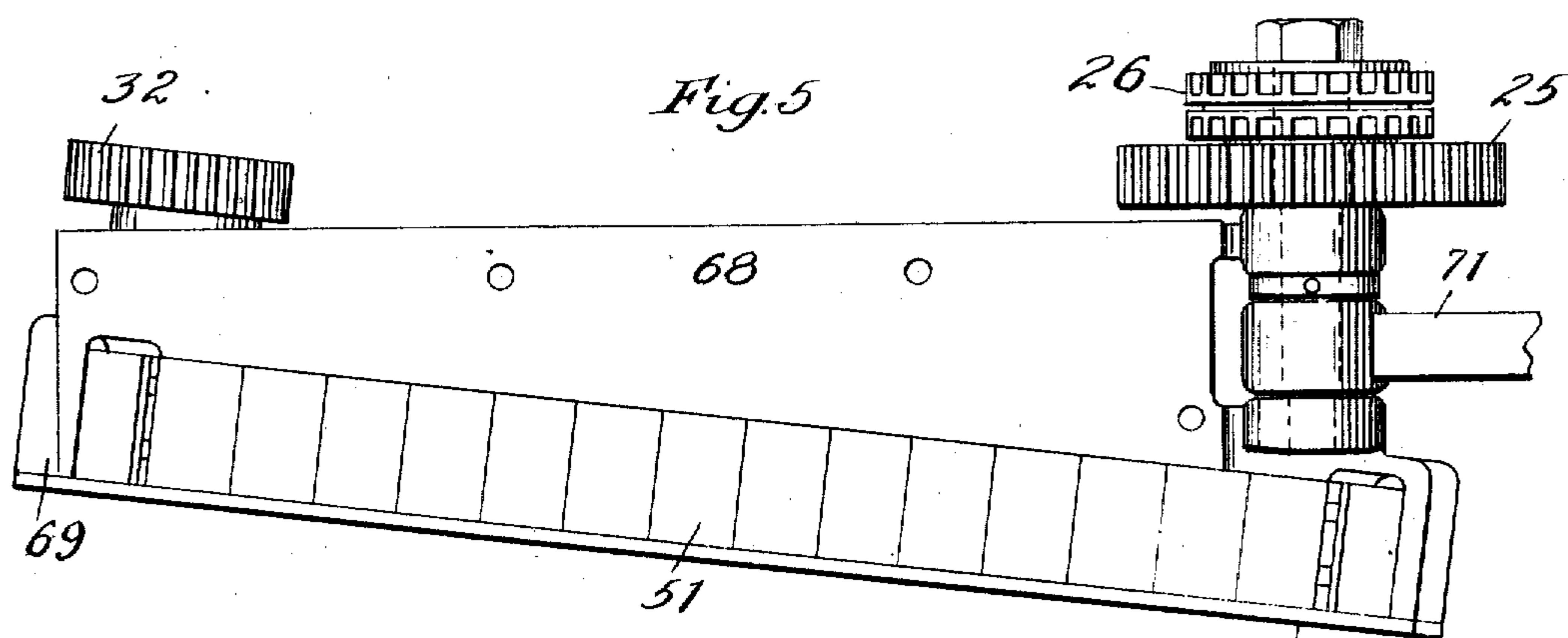
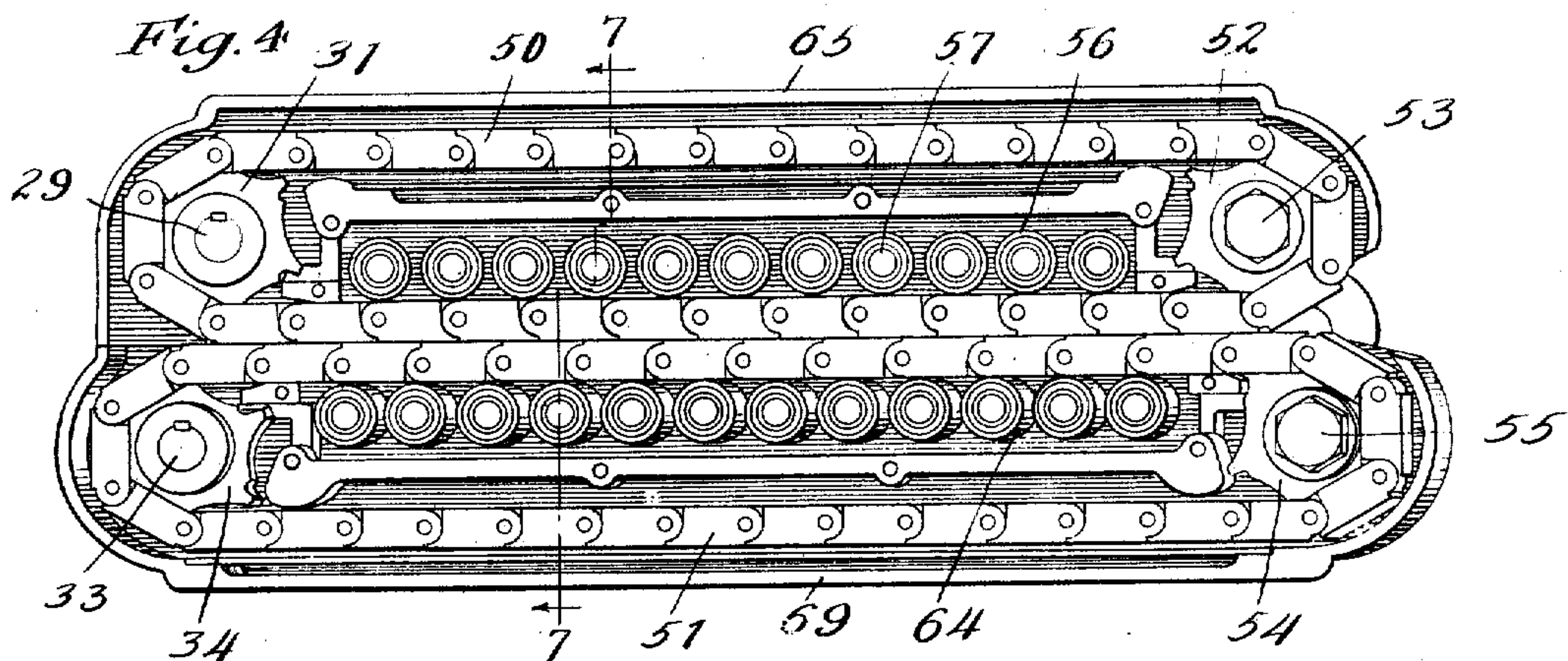
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5 SHEETS—SHEET 4.



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6 SHEETS—SHEET 5.

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Fig. 7

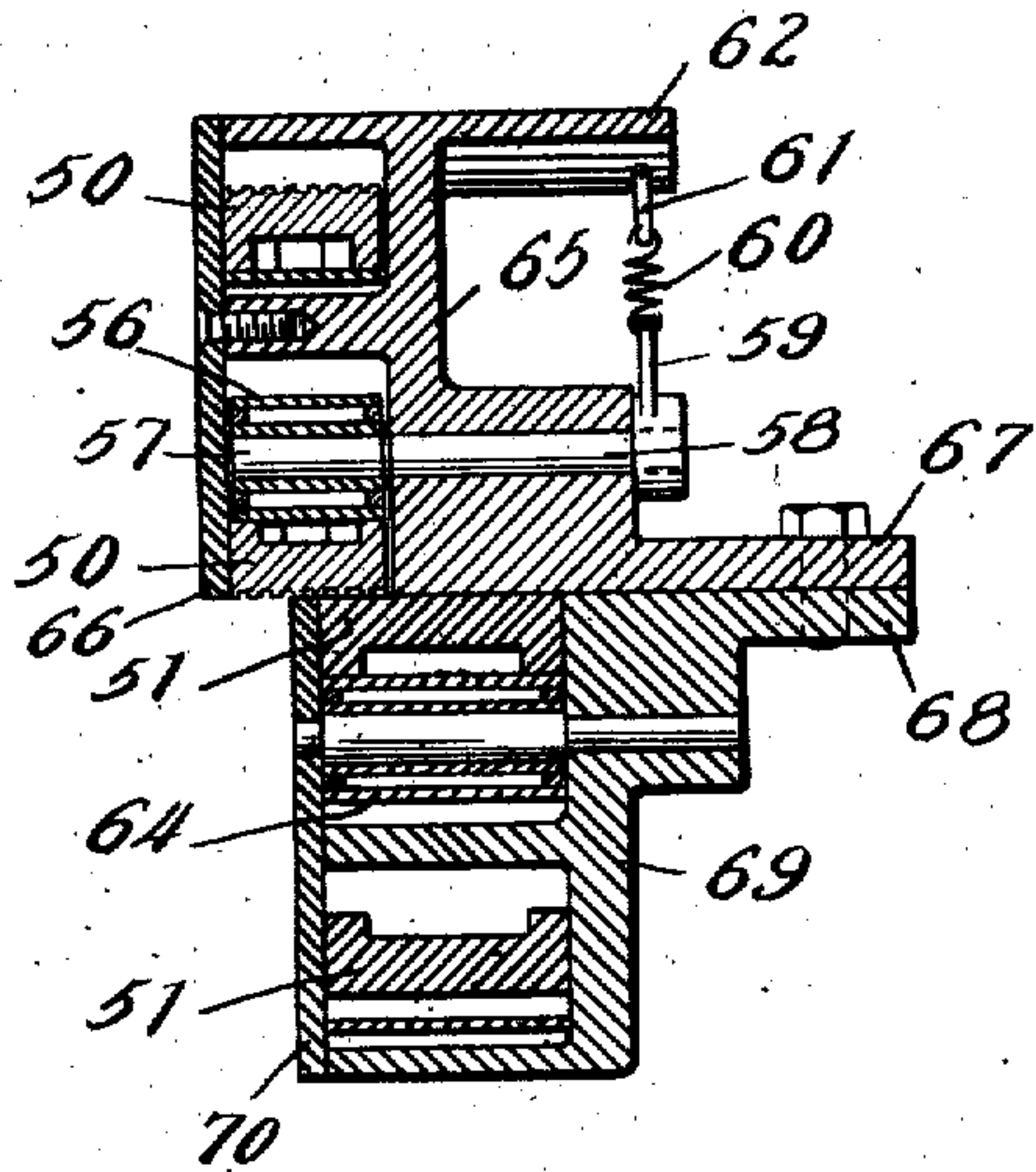


Fig. 8

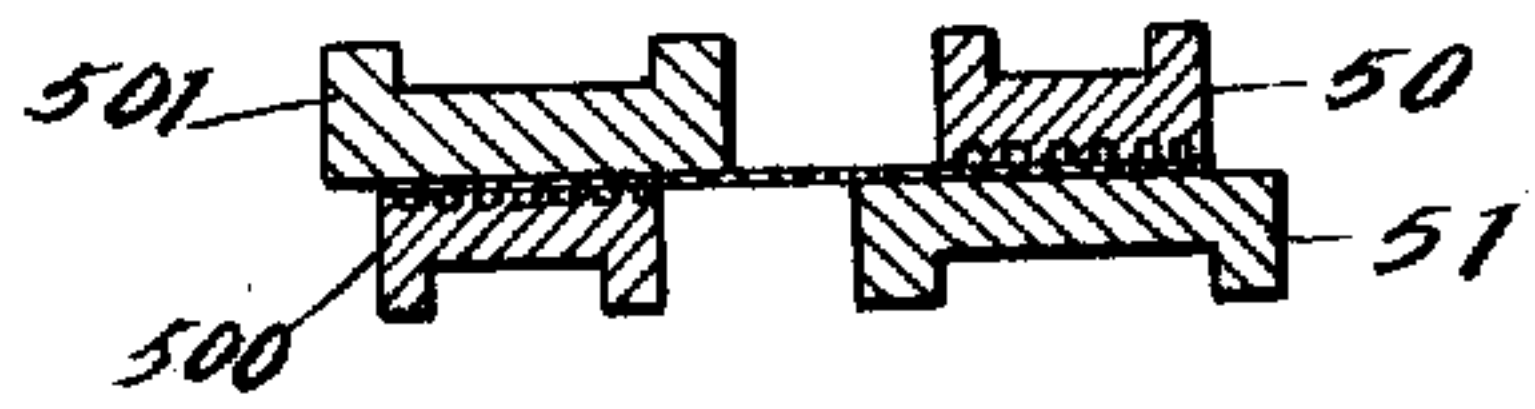


Fig. 9

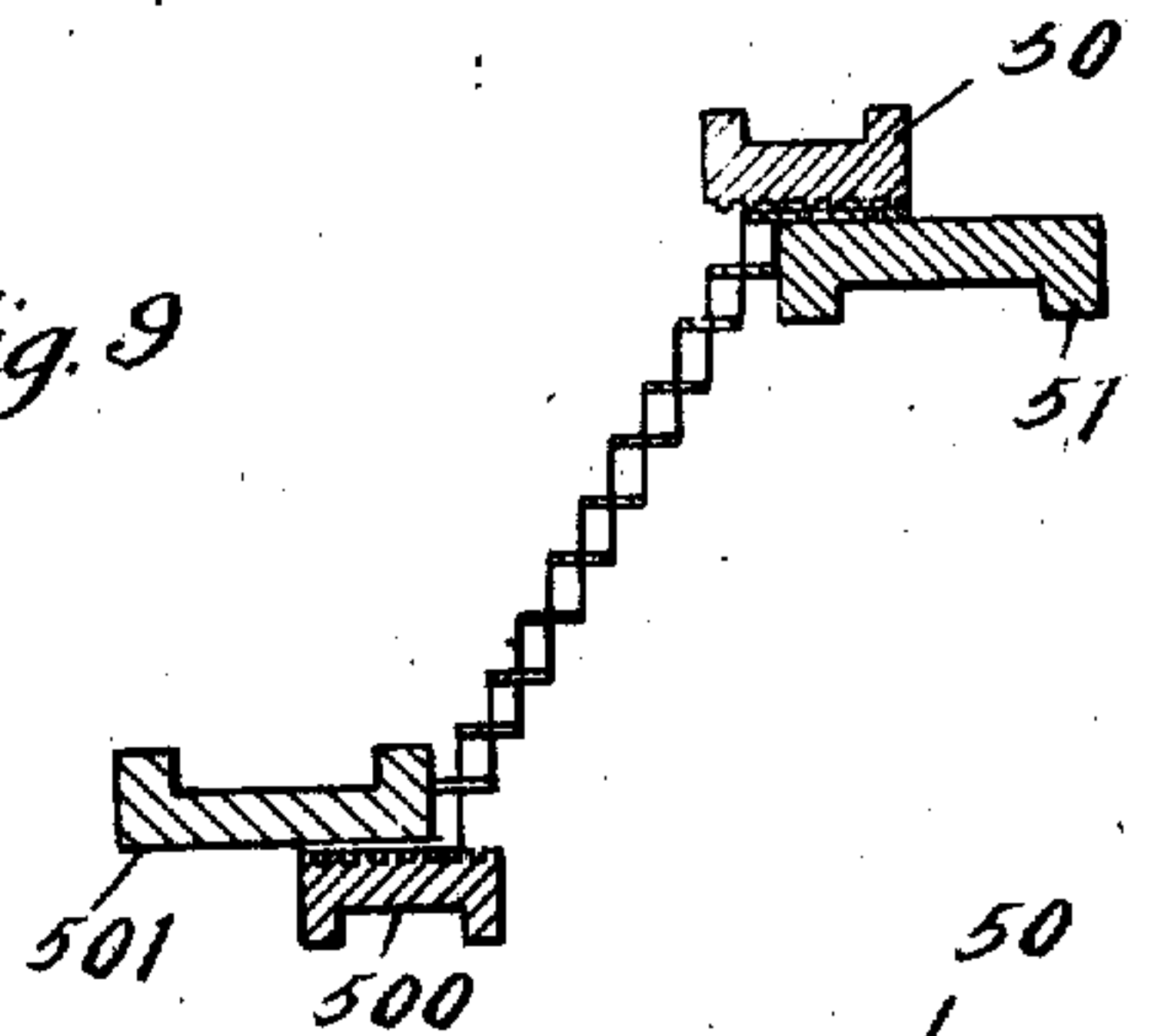


Fig. 10

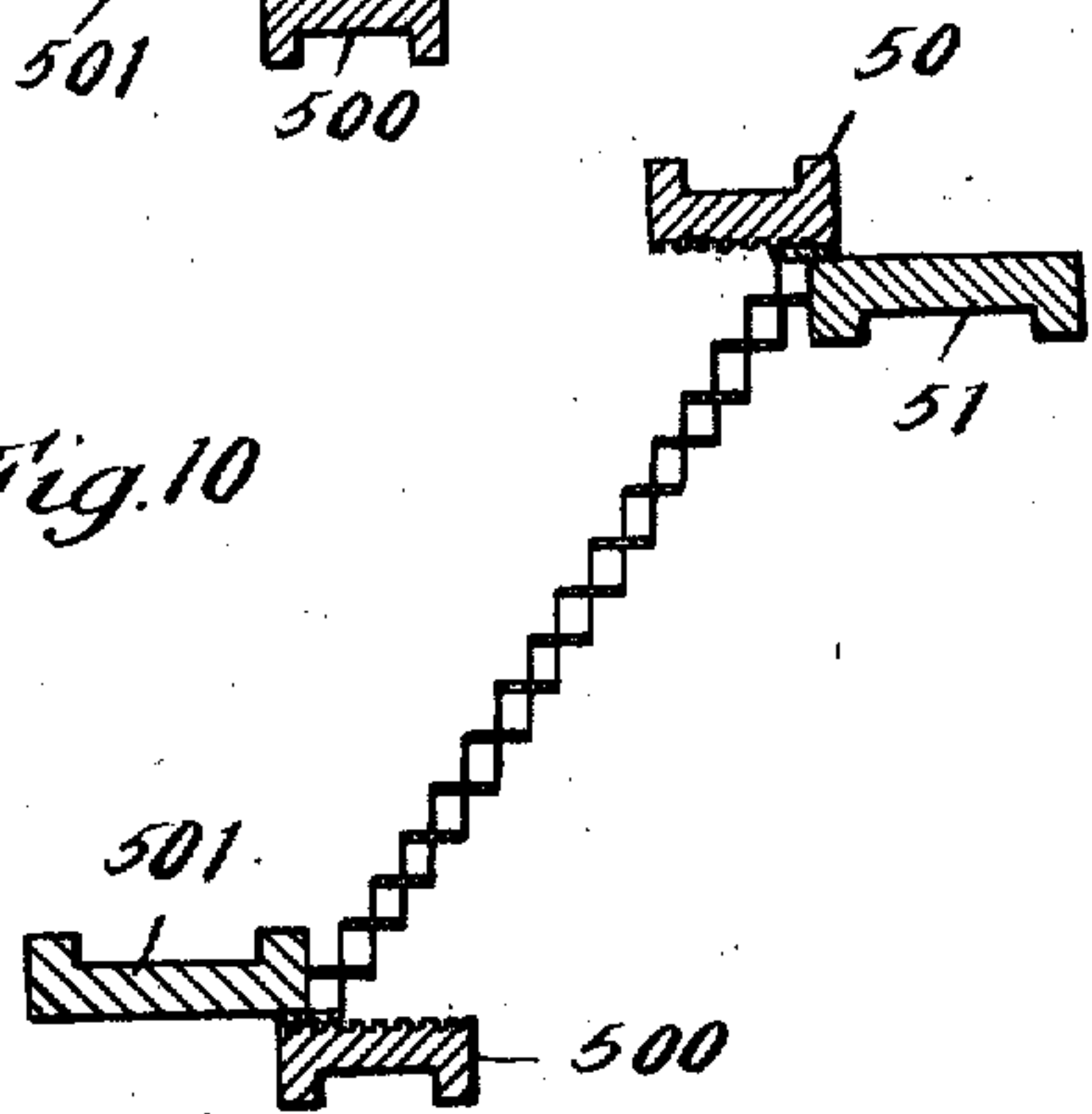


Fig. 11

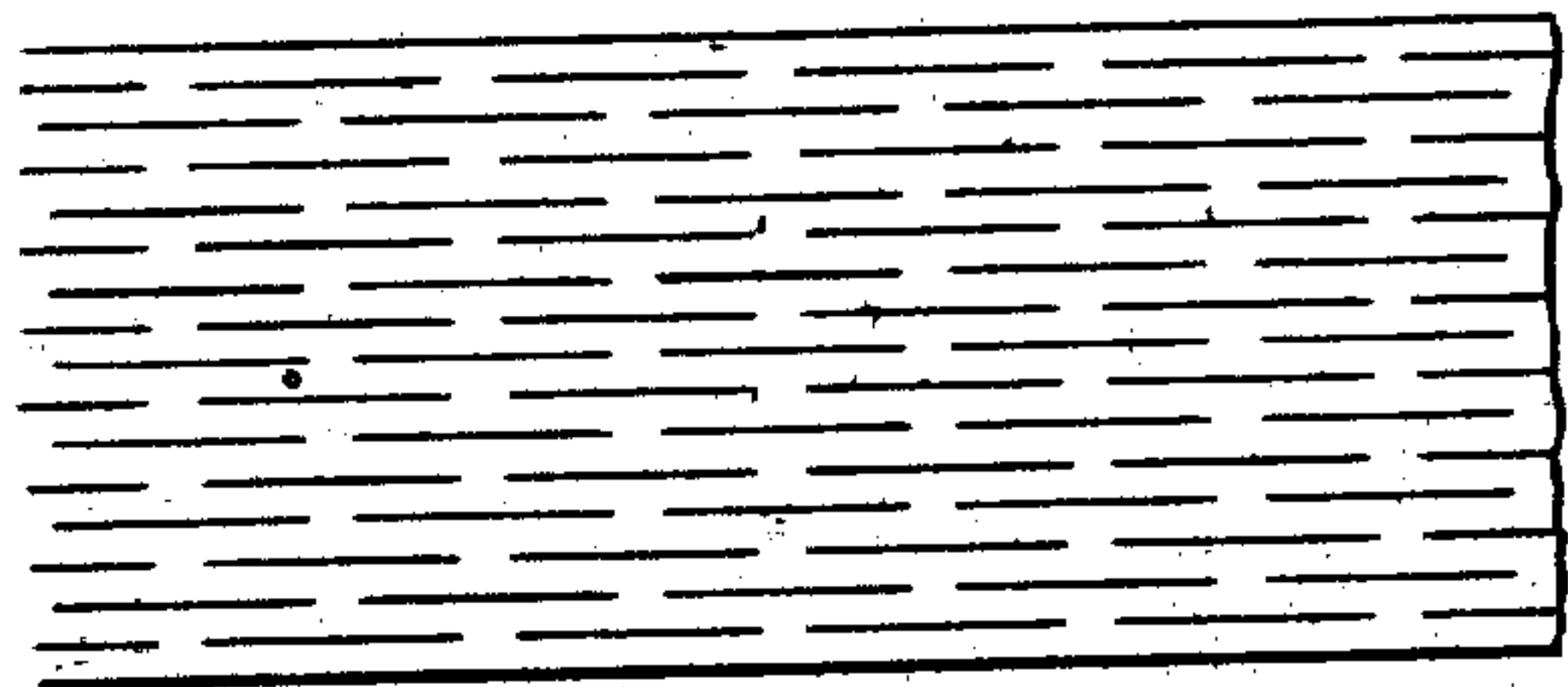
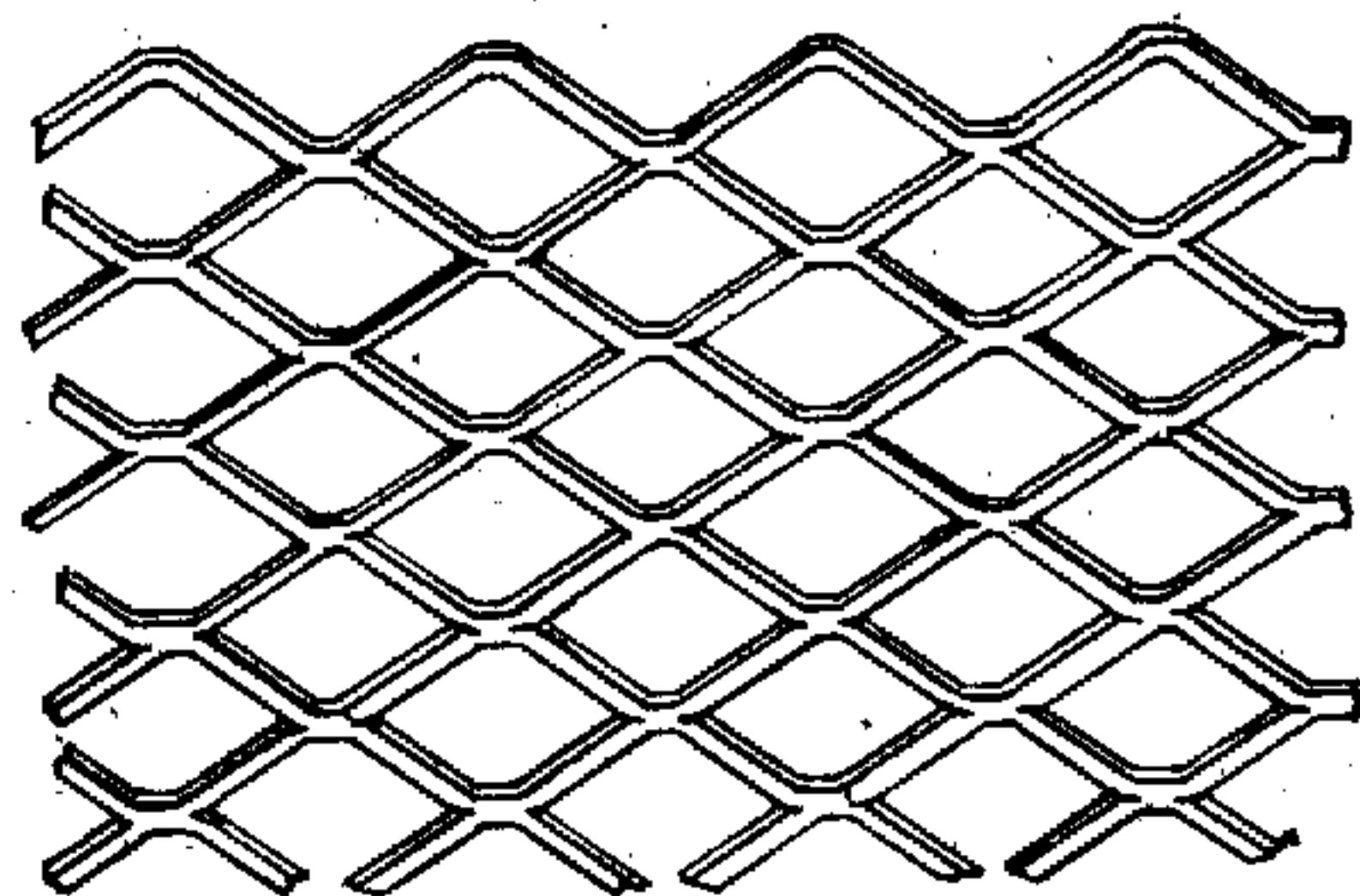


Fig. 12



Witnesses:

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UNITED STATES PATENT OFFICE.

LEWIS E. CURTIS, OF CHICAGO, ILLINOIS, ASSIGNOR TO BRECKENRIDGE JONES, TRUSTEE,
OF ST. LOUIS, MISSOURI.

MACHINE FOR EXPANDING SHEET METAL.

No. 917,715.

Specification of Letters Patent.

Patented April 6, 1909.

Application filed July 7, 1906. Serial No. 325,068.

To all whom it may concern:

Be it known that I, LEWIS E. CURTIS, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Machines for Expanding Sheet Metal, of which the following is a specification.

This invention relates to a machine for expanding sheet metal which has been previously cut or slitted. It embodies the invention set forth in the patent to me, dated August 1, 1905, and numbered 796,402, and is an improvement thereon. Its object has been to obtain a construction which will insure more perfect work than previous machines. In said patented machine, the sheet is drawn continuously over the edge of a support and deflected away from the plane of the support as it moves off the same, the edge over which the sheet is drawn being in the construction illustrated, arranged at an angle to the direction of the feed; and in the preferred construction of the machine, also disclosed in the patent, the sheet is moved longitudinally over two diverging supports which are adapted to deflect the sides of the sheet in opposite directions from the plane of the sheet, one half of the sheet upward and the other half downward, the supports mentioned being stationary. While these constructions were great improvements on the prior art, and are calculated to expand sheets more or less perfectly, and with a rapidity previously deemed impossible, I have conceived that an expanding machine constructed like the preferred construction of the patented one except that the supports over which the sheet is moved and from which it is deflected are provided with moving instead of stationary surfaces, would perform the work with the same rapidity but in a better manner than the patented machine, and avoid the difficulties met with in operating it.

To that end I have devised the machine of the present application, and it consists in the novel construction of parts and devices and in the novel combinations of parts and devices hereinafter set forth.

In the drawing, Figure 1 is a plan of the invention. Fig. 2 is a side elevation. Fig. 3 is a longitudinal vertical section. Fig. 4 is an enlarged side elevation of the co-operating feed chains acting on one side of

the sheet. Fig. 5 is a plan view of the lower half of the right hand expander arm and Fig. 6 is a bottom plan of the upper half of the same arm partly broken away. Fig. 7 is a cross section on the line 7—7 of Fig. 4. Figs. 8, 9 and 10 are sectional views of a sheet undergoing expansion. Fig. 11 is a partial plan of a slitted sheet upon which the machine is adapted to operate. Fig. 12 shows the expanded sheet.

Referring to said drawings, 15 represents the frame of the machine. The drive shaft is shown at 10 receiving power from the pulley 17 and communicating it to the machine by a pinion 18 meshing with a gear 19 on shaft 20. Shaft 20 carries a gear 21 meshing with a gear 22 upon a shaft 23 extending across the machine and carrying at one side of the machine a gear 24 meshing with a gear 25 upon the shaft of a sprocket wheel 26. This sprocket wheel is connected by a chain 27 to another sprocket wheel 28 on the shaft 29. Shaft 29 carries a gear 30 and also a sprocket wheel 31 adapted to actuate one of the feed chains. Gear 30 upon shaft 29 meshes with another gear 32 on the shaft 33 carrying a sprocket wheel 34 driving another of the feed chains. On the shaft 23 is a sprocket wheel 35 connected by a chain 36 to a sprocket wheel 37 on a shaft 38; shaft 38 also carries a gear 300 similar to gear 30, and meshing with a gear 39 driving a shaft 390. Shafts 38 and 390 each carry a sprocket wheel, not shown, adapted to actuate the feed chains of the downwardly inclined arm.

Upon the shaft 23 is mounted a feed roll 40 and said shaft also carries a pinion 41 meshing with a pinion 42 on the journal of a second feed roll 43. These feed rolls coact in forcing the slitted sheets into the expander. The upper of these feed rolls is supported in a pivoted frame 44, the pivot being shown at 45 in such manner that it can be thrown over from its operating position, shown in full lines at Fig. 3, to that shown in dotted lines in the same figure. Said roll 43 is shown in Figs. 1 and 2 as thrown back to its non-acting position, thus destroying the mesh between its actuating pinions 41 and 42. This enables access to be had to the passing sheet. When in its acting position, this roll 43 is held to its work by springs 46. The feed rolls 40 and 43 deliver the slitted sheets between the stationary guides 47 and 48

which conduct it to the expanding mechanism.

The expanding devices which are now to be described form practically two diverging arms, one operating on one side of the sheet and the other upon the other side. These arms are substantially alike in construction, differing only in the fact that one is the reverse of the other and acts to force its side of the sheet upward while the other acts to force its side of the sheet downward, and consequently a description of one will answer in large measure for a description of the other. The main feature of the arms are the feeding chains of which there are two in each arm. Those in the right hand or upwardly inclined arm are shown at 50 and 51, the former being the upper chain and located above the sheet and the latter being the lower chain and located below the work. The chain 50 is made of links longitudinally grooved on their faces to increase their holding power, and runs over the driving sprocket 31 already mentioned, and over a second sprocket 52 on a short shaft 53. The chain 51 is composed of flat faced links, preferably somewhat wider than the links of chain 50, and runs over the driving sprocket 34 above mentioned, and also over another sprocket 54 on a shaft 55. The chain 50 is arranged parallel with the direction of the feed, while the chain 51 is arranged at an outward angle and both are in bearing contact with unexpanded parts of the sheet so long as any parts remain unexpanded, and the necessary pressure upon the work is caused by providing one of the chains with pressure devices back of that course of the chain which is in contact with the work. I prefer to combine these pressure devices with the grooved link chain 50, and they consist of rollers 56 on studs 57 which are eccentrically supported upon rocking pivots 58 having arms 59 to which springs 60 are secured. The ends of the springs 60 are attached to adjustable bolts 61 passing through openings formed in the zig zag portion 62 of the frame 65 of the arm, and their tension tends to rock the pivots in the direction which will cause pressure by the rollers.

Back of that portion of chain 51 which bears against the work and consequently sustains the pressure caused by the rollers 56, I place a series of anti-friction rollers 64 adapted to ease the movement of the chain without detracting from the pressure upon the work. The bearings of the shafts 29 and 53 are formed in the longitudinal frame 65 as well as those of the pressure roller pivots, and the chain 50 is moved through an inclosed path formed in the side of the frame and closed at its vertical side by the plate 66. The frame has a lateral flange 67 at its bottom which serves as a means of uniting frame 65 to the lateral flange 68 of the frame

69 of the lower chain 51. Frame 69 is similar to frame 65 and it furnishes bearings for the sprocket wheel shafts operating chain 51 and for the rollers 64, and the ways traversed by said chain are shaped to conform to the chain, and a plate 70 closes said ways at the vertical side. The two frames 65 and 69 and the chains unitedly form one of the diverging expander arms adapted to operate on one side of the sheet and such arm is pivotally secured to the main frame at one end by the arm 71. The other expander arm is downwardly inclined but it is like the upwardly inclined arm in many respects. It is provided with a longitudinal frame 69, having a lateral flange 68, is provided with a grooved link chain 500 similar to chain 50, and with a flat link chain 501 similar to chain 51 and with similar sprocket wheels for driving said chains. It differs from the upwardly inclined arm however in these additional respects; the chains 500 and 501 are reversed in location, the former being below the work and the latter above it, and the latter is arranged at an angle to the line of movement of the sheet which is reversed from the angle of chain 50. Pressure rollers supported by eccentrics and controlled by springs similar to rollers 56 are provided acting upwardly on chain 500, and anti-friction rollers similar to rollers 64 are provided above the lower course of chain 500. Chain 500 is arranged parallel to chain 50.

With this construction the operation is substantially as follows: The sheet which is advanced by the rollers 40 and 43, after passing the guides 47 and 48, enters between the chains of the expander arms, chains 50 and 51 taking hold of it at one side of its central longitudinal line and chains 500 and 501 taking hold of it at the other side of said line. As the paths of the two pairs of chains diverge and as the chains are adapted to grip the sheet firmly and to feed it along, it will be seen that as the sheet is moved one side or half of the sheet will be carried upward and the other side or half will be forced downward. This divergence in the paths of the chains causes such a strain upon the portions of the sheet lying between the chains as to force those portions to open, and as the chains 50 and 501 are arranged at angles diverging oppositely from the center of the sheet, the portion of the sheet between those chains widens as the operation proceeds until finally all portions of it become expanded. In the operation, the sheet is drawn or flows over the proximate sides or edges of chains 51 and 501, which serve the same purpose in opening the slits as do the proximate edges of the tables or supports of my said patent. At the point where the sheet is first taken hold of by the chains, the chains 51 and 501 come close together but their paths diverge from that point to their

outer ends, so that they gradually slip or shift outward toward the margins of the sheet and finally pass beyond the same, retaining however, in conjunction with chains 50 and 500 such control of the sheet as is needed to cause the opening of all the slits in it. All the chains move at a speed corresponding to that of the rolls 40 and 43 and the operation as an entirety is very similar to that of the patented machine, the opening commencing at the center of the forward end of the sheet, and proceeding in gradually lengthening diagonal lines extending from the central line to the margins. The unexpanded portions of the sheet are maintained in a flat condition until they reach the inner edge of and are drawn off the chains 51 and 501. Each pair of chains thus constitutes a gripping means comprising two continuous flexible grippers. Relative to one of these two pairs of chains, the other pair may be considered as a holding means which holds the sheet at one edge against transverse edgewise movement while the first mentioned pair of chains effects the expansion of the sheet.

The upwardly inclined arm is supported at its outer or rear end by an upstanding arm 400, in conjunction with a depending projection 401, which is adjustably bolted to the arm by the bolt 402, and the downwardly inclined arm is supported at the rear end by providing it with a depending leg 403, which may be bolted to a stationary riser 404. To adjust this arm a bolt 405 is arranged under leg 403.

I claim:—

1. In a machine for expanding a slitted sheet of metal, the combination, with means for holding the sheet at one edge against transverse edgewise movement, of a gripping means at the other edge of the sheet comprising two continuous flexible grippers one at each side of the sheet, the gripping means diverging from the holding means, and mechanism for causing a progressive movement of the said holding and the said gripping means to cause the expansion of the sheet.

2. In a machine for expanding a slitted sheet of metal, the combination of two gripping means, one at each edge of the sheet, said two gripping means diverging from each other and each comprising two continuous flexible grippers, one at each side of the sheet; and mechanism for causing the progressive movement of the grippers to expand the sheet.

3. In a machine for expanding a slitted sheet of metal, the combination of two gripping means, one at each edge of the sheet, each gripping means comprising two continuous flexible grippers, one at each side of the sheet, and the two gripping means being divergent from each other in a direction at an angle to the normal plane of the sheet;

and mechanism for causing the progressive movement of the grippers to expand the sheet.

4. In a machine for expanding a slitted sheet of metal, the combination of two gripping devices, one at each edge of the sheet, the two gripping devices diverging from each other, and each gripping device having two gripping surfaces extending continuously along the sheet one at each side thereof, between which surfaces the sheet is held, and mechanism for causing the progressive movement of said surfaces to expand the sheet.

5. In a machine for expanding a slitted sheet of metal, the combination of two gripping means, one at each edge of the sheet, said two gripping means diverging from each other, and each comprising two endless chains one at each side of the sheet, between which chains the sheet is held, and mechanism for causing a progressive movement of the chains to expand the sheet.

6. In a machine for expanding a slitted sheet of metal, the combination, with means for holding the sheet at one edge against transverse edgewise movement, of a gripping means at the other edge of the sheet comprising two chains, one at each side of the sheet, between which chains the sheet is held, the said gripping means diverging from the holding means, and mechanism for causing a progressive movement of the said holding means and the said gripping means to cause the expansion of the sheet.

7. In a machine for expanding a slitted sheet of metal, the combination, with means for holding the sheet at one edge against transverse edgewise movement, of a gripping means at the other edge of the sheet comprising two continuous flexible grippers, one at each side of the sheet, the gripping means diverging from the holding means in a direction at an angle to the normal plane of the sheet, and mechanism for causing the progressive movement of the said holding means and of the said gripping means to cause the sheet to be drawn over the edge of one of the grippers and cause the progressive expansion of the sheet.

8. The machine for expanding slitted sheets of metal, having diverging expander arms provided with moving pressure-exerting chains respectively above and below the sheets.

9. The machine for expanding slitted sheets of metal, having diverging expander arms provided with feeding and expanding means consisting of opposing pressure-exerting chains arranged above and below the sheet and gripping the unexpanded portions thereof between them.

10. The machine for expanding slitted sheets of metal having diverging expander arms, the feeding means whereof consist of opposing chains, one above and one below

the sheet and moving with it, and gripping its unexpanded marginal portions, said chains being adapted to release the widening expanded zone of the sheet as the operation proceeds.

11. The machine for expanding slitted sheets of metal having diverging expander arms, the feeding means whereof consist of opposing chains in each arm, one above and one below the sheet and moving with it, and gripping its unexpanded margins, one of each pair of chains being arranged parallel to the line of the feed and the other one of each pair being arranged at an angle to such line.

12. In a metal expanding machine, the combination with diverging expander arms, of a pair of feeding chains for each arm, one above and one below the sheet and acting to grip the unexpanded margins of the sheet, one of each pair of chains forming an edge over which the sheet is drawn.

13. In a metal expanding machine, the combination of two diverging pairs of gripping feeding chains adapted to grip the unexpanded margins of the sheet, one chain of each pair being above the sheet and one chain of each pair below it.

14. In a metal expanding machine, the combination of two diverging pairs of gripping feeding chains, each pair adapted to grip one of the unexpanded margins of the sheet at the outer line of the expanding zone.

15. In a metal expanding machine, the combination of two diverging pairs of gripping feed chains arranged to grip the unexpanded margins of the sheet at the outer lines of the expanding zone and to shift their hold outwardly as that zone widens.

16. In a metal expanding machine, the combination of two diverging pairs of grip-

ping feed chains, adapted to grip the unexpanded margins of the sheet along the outer lines of the expanding zone, their gripping action changing location with the widening of the expanded zone and during the operation.

17. In a machine for expanding previously slitted sheets, the combination of pairs of continuously moving opposing chains gripping the surfaces of the sheets and diverging supports traversed by said chains, each pair of said chains serving to draw the sheet off the edge of the other pair.

18. The machine for expanding previously slitted sheet metal wherein are combined feeding means traveling with the sheet and adapted to hold a longitudinal marginal portion of the unexpanded sheet in a fixed plane, with means for deflecting the adjacent longitudinal portion of the sheet from said plane and simultaneously expanding it.

19. The machine for expanding previously slitted sheet metal wherein are combined feeding means traveling with the sheet and adapted to hold a gradually narrowing longitudinal marginal portion of the unexpanded sheet in a fixed plane, with means for deflecting the adjacent longitudinal portion of the sheet from said plane and simultaneously expanding it.

20. The machine for expanding slitted sheets of metal, having diverging expanders provided with moving, continuous and flexible pressure-exerting devices respectively above and below the sheets.

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Witnesses:

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