A. J. LEWIS.

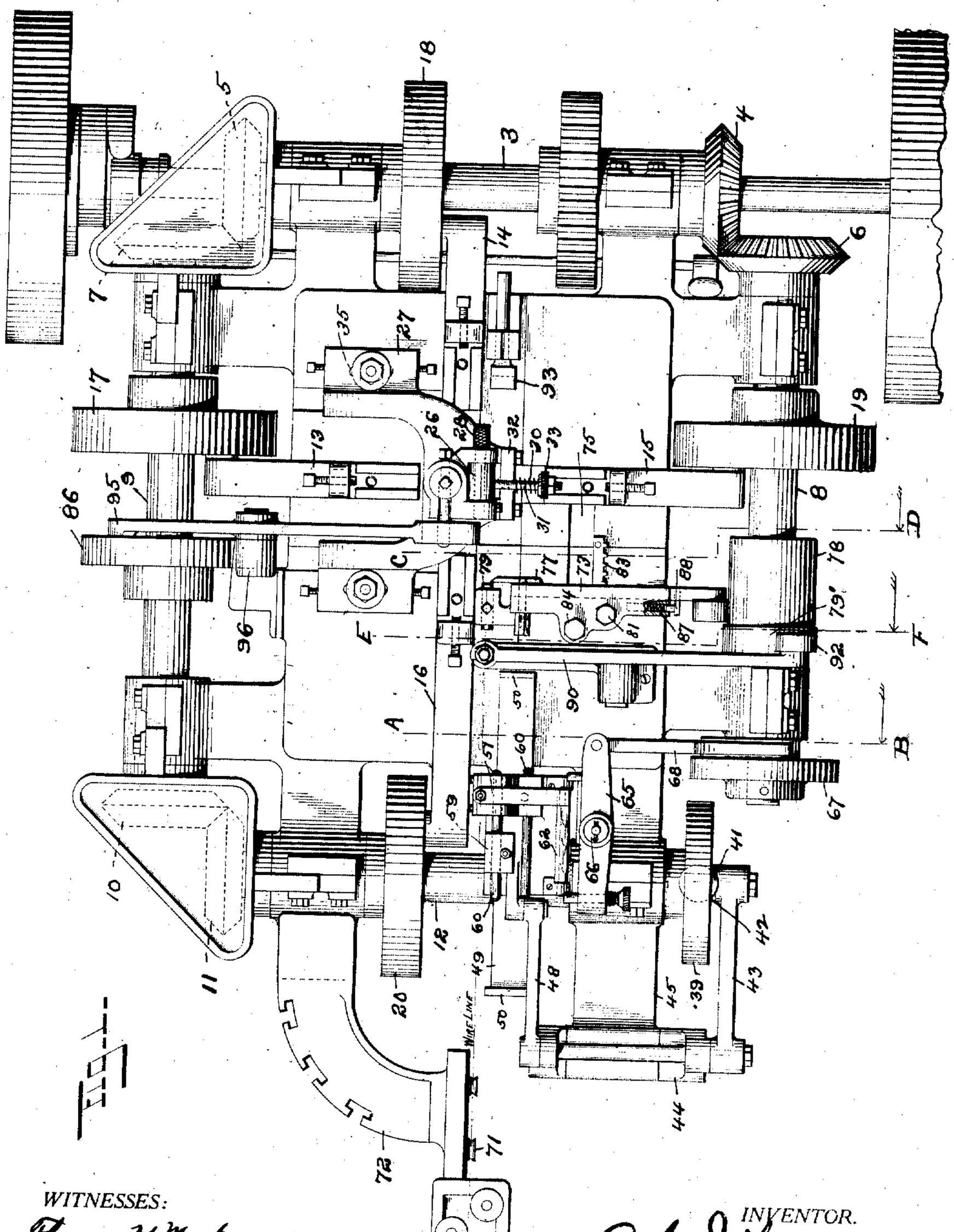
METAL FORMING MACHINE.

APPLICATION FILED JUNE 10, 1909.

992,890.

Patented May 23, 1911.

5 SHEETS—SHEET 1.



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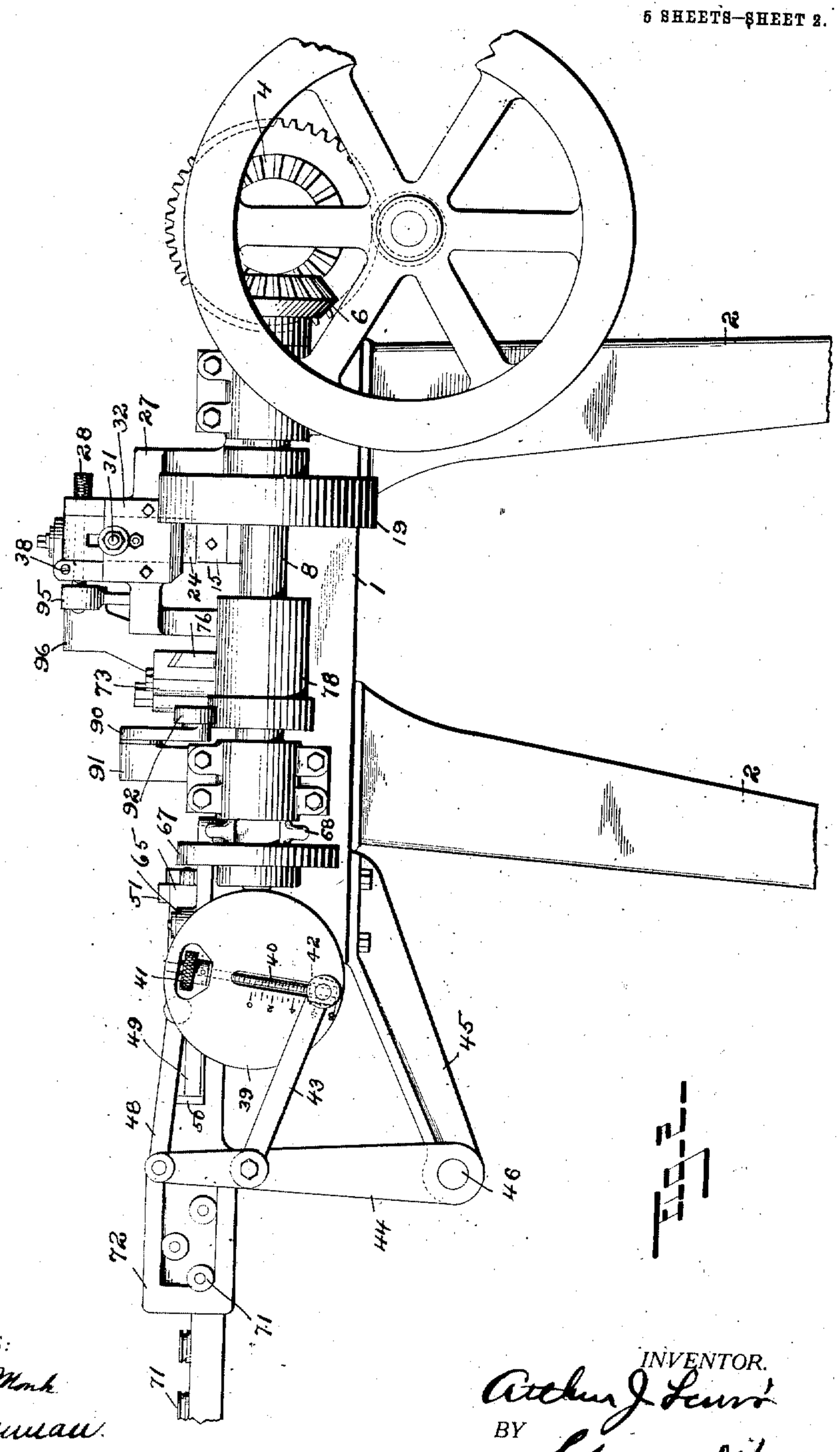
5 SHEETS—SHEET 2.



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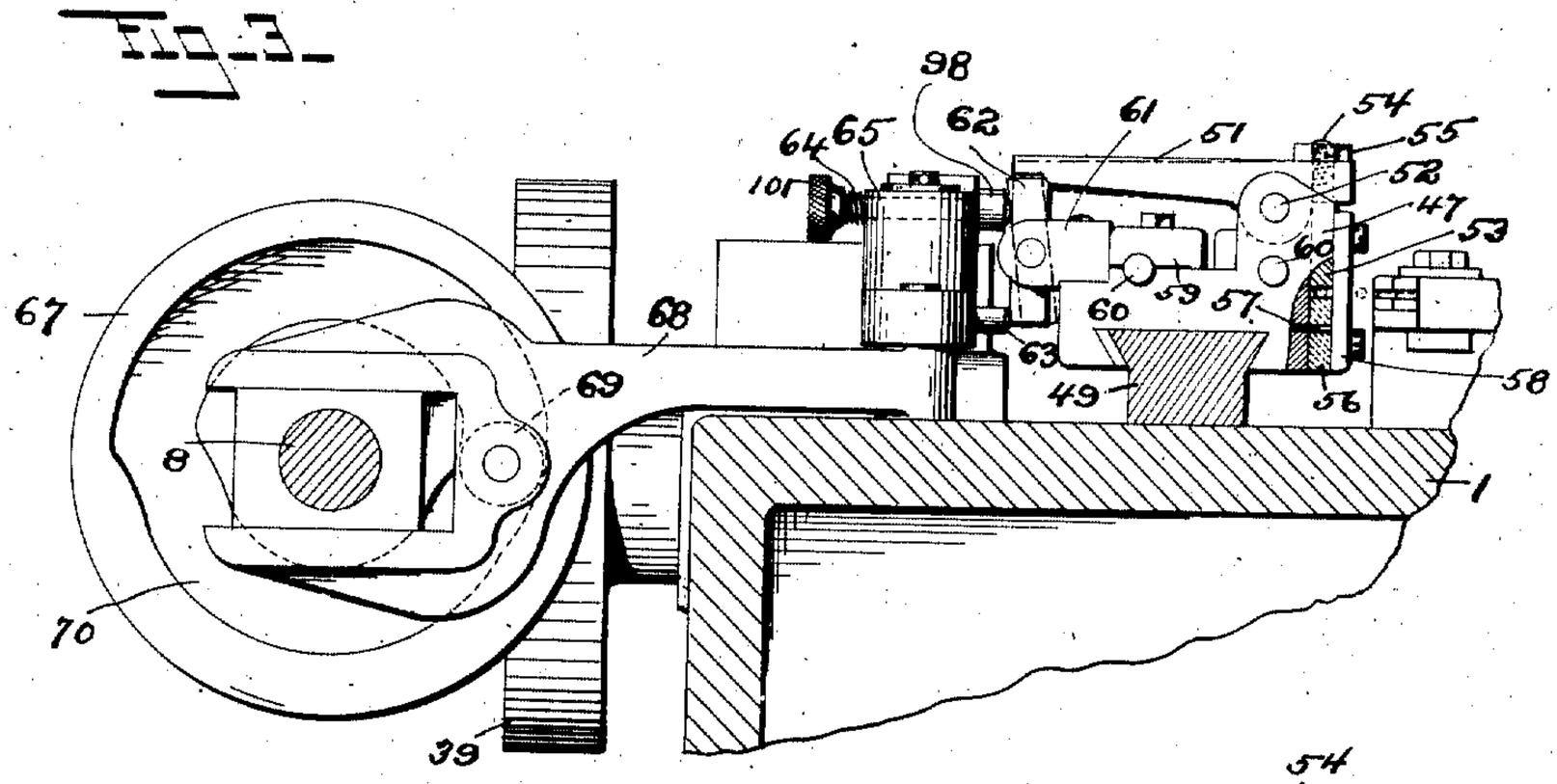
5 SHEETS—SHEET 3.

Fig. 3.



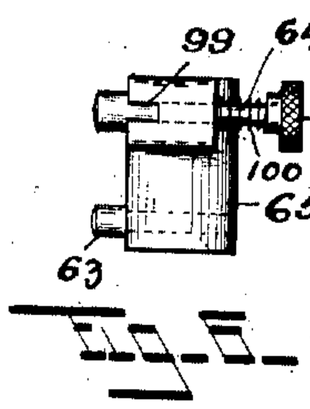


Fig. 6.

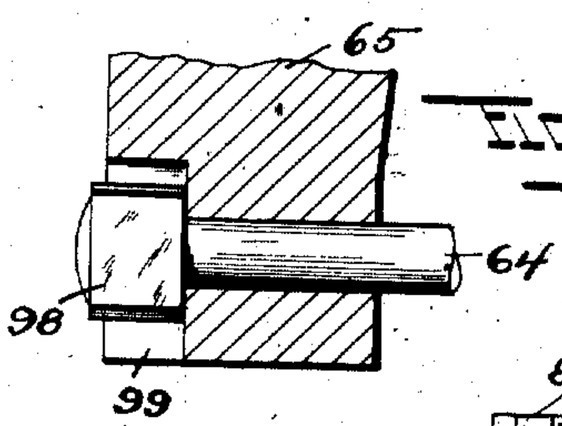


Fig. 7.

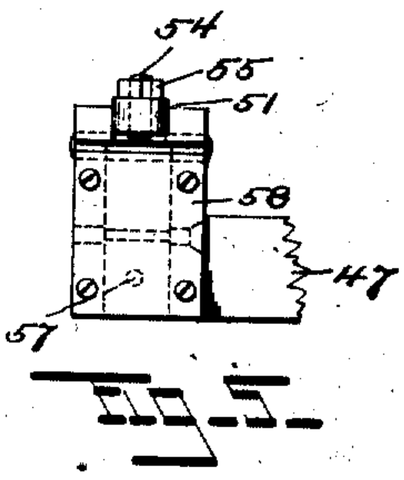


Fig. 5.

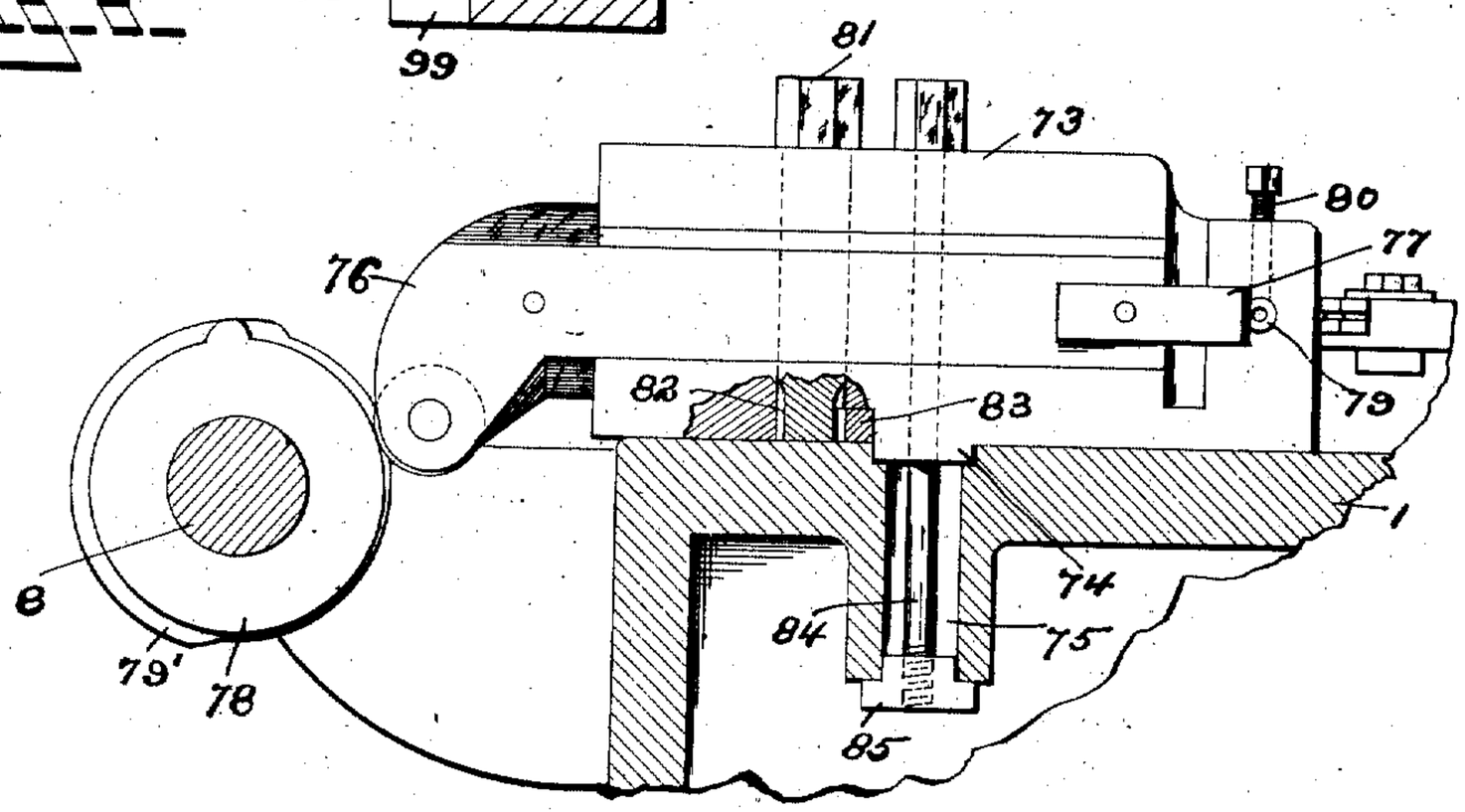


Fig. 4.

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5 SHEETS—SHEET 4.

Fig. 5.

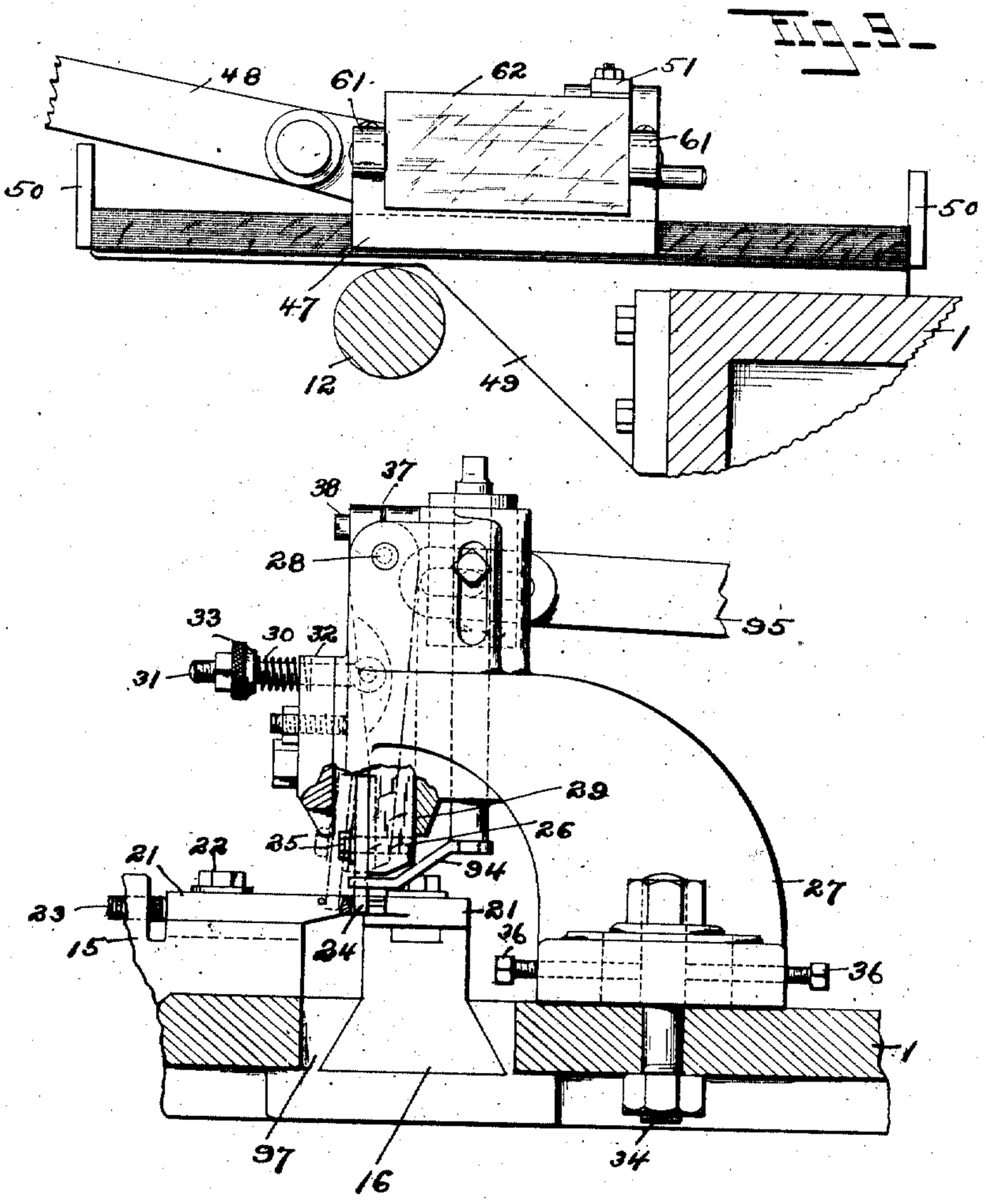

Fig. 6.

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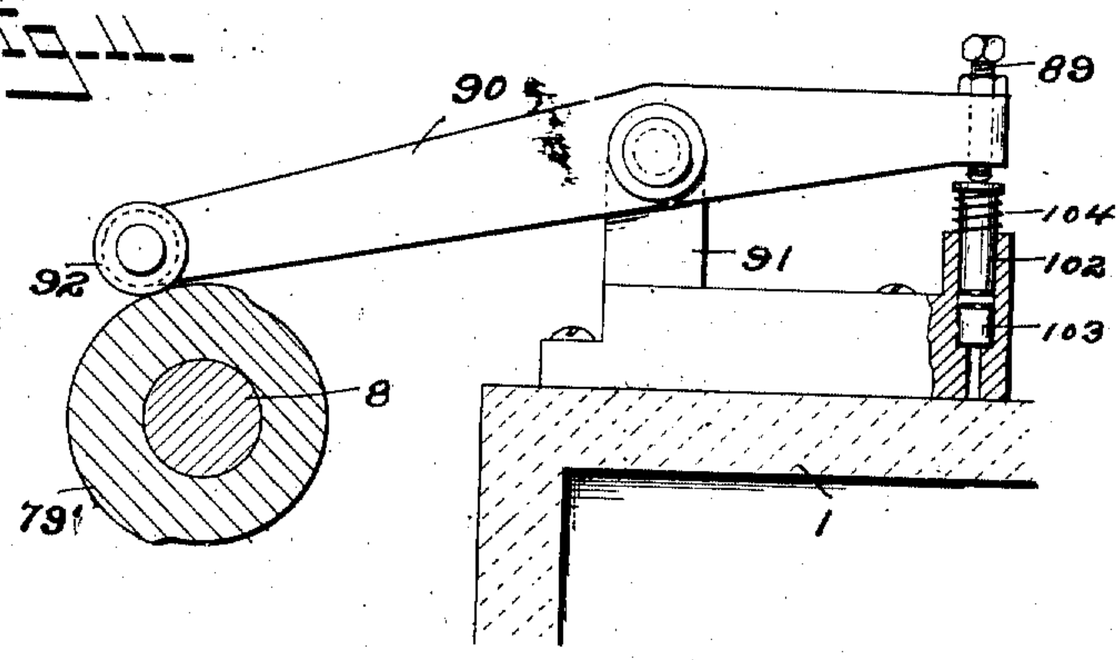
5 SHEETS—SHEET 5.

Fig. 11.



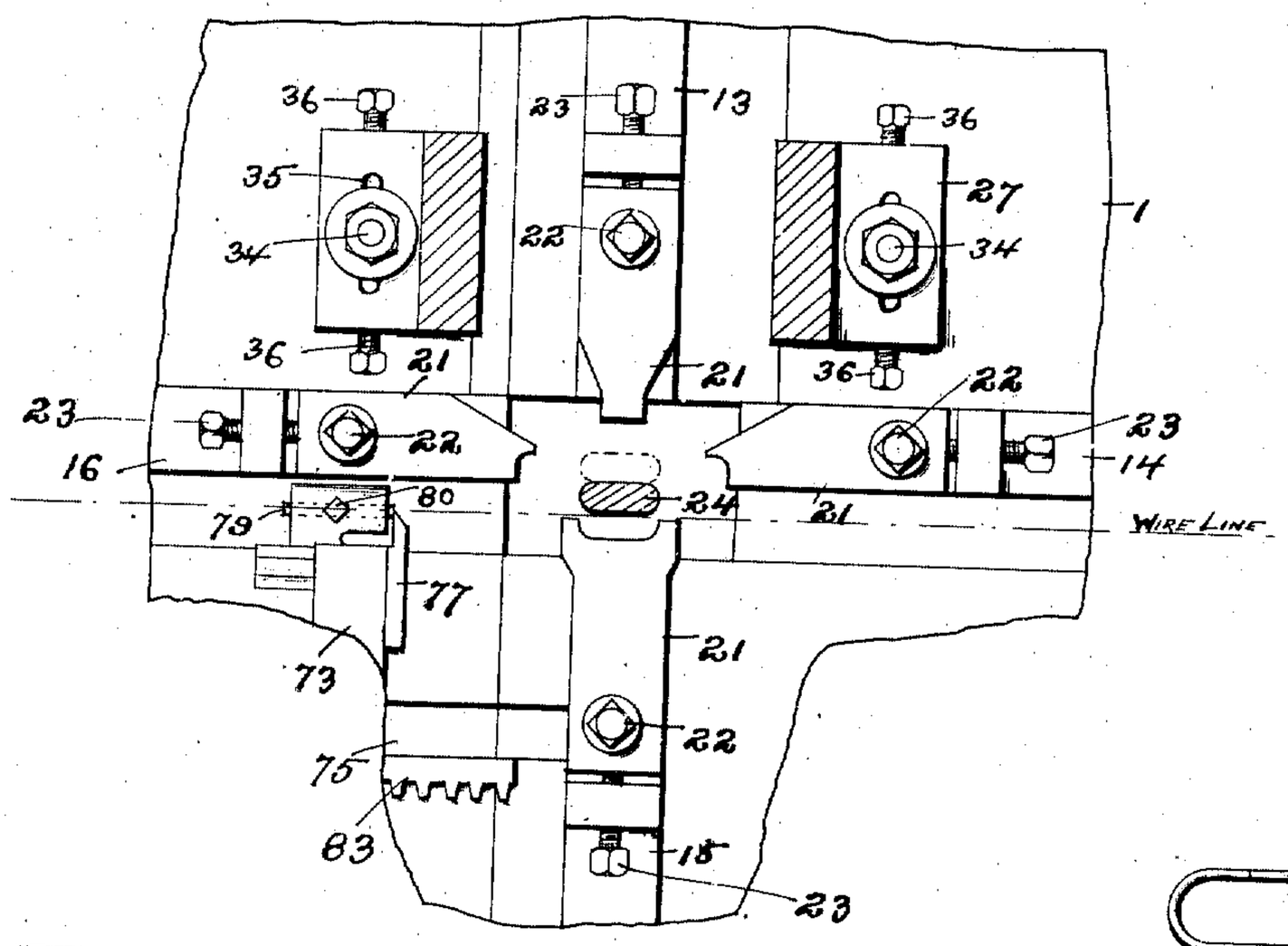


Fig. 10.

Fig. 12.

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UNITED STATES PATENT OFFICE.

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METAL-FORMING MACHINE.

992,890. Specification of Letters Patent. Patented May 23, 1911.

Application filed June 10, 1909. Serial No. 501,295.

To all whom it may concern:

Be it known that I, ARTHUR J. LEWIS, a citizen of the United States, residing at Watertown, in the county of Litchfield and State of Connecticut, have invented certain new and useful Improvements in Metal-Forming Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to new and useful improvements in metal forming machines, and refers more particularly to that type of machine wherein the metal is automatically fed between a plurality of forming tools, then cut off into a predetermined length and bent into the desired form by the action of the said forming tools thereon.

It is the object of my invention, among other things, to provide a new and improved feed for such a machine that will operate with greater speed and less power than such mechanisms now in common use; have but few adjustable parts that are simple in structure and operation and arranged so as to be convenient of access; non-friction gripping members that are operated independently of the feed slide; and adjustable pin mechanism to prevent overthrow of the feed members; means for instantly and positively stopping the feeding of the metal; a graduated adjustment of the feed that will insure the accurate feeding of metal of predetermined lengths; means for rigidly holding the metal during the return of the feed slide; to so design and arrange the cut off mechanism that it may be quickly and accurately adjusted without the use of the tamping means common at the present time; to provide a metal clamping or binding device that may be operated from fixed cam means; and to apply a swinging form holder so mounted as to be interchangeable with a fixed form holder; and to accomplish these and other desirable objects with mechanism that is simple in design, may be constructed and assembled economically, and will operate at the highest speed and with the maximum efficiency.

To these, and other ends, my invention consists in the metal forming machine, having certain details of construction and combinations of parts, as will be hereinafter described and more particularly pointed out in the claims.

Referring to the drawings, in which like numerals of reference designate like parts in the several figures; Figure 1 is a plan view of my improved metal forming machine; Fig. 2 is a front elevation thereof; Fig. 3 is an enlarged sectional view upon line A—B of Fig. 1, showing an end view of the feed mechanism; Fig. 4 is a sectional view upon line C—D of Fig. 1 showing a side elevation of the cut-off mechanism; Fig. 5 is a fragmentary elevati n of the feed slide; Fig. 6 is an end view of the feed rock lever; Fig. 7 is a fragmentary sectional plan view thereof; Fig. 8 is a side elevation of the swinging former and the parts adjacent thereto; Fig. 9 is a side elevation of the feed slide and bracket; Fig. 10 is a fragmentary plan view of the inner ends of the former slides and the formers connected therewith; Fig. 11 is a sectional view upon line E—F of Fig. 1 showing a side elevation of the clamping or binder mechanism; and Fig. 12 is a shape which is the product of my machine, being one of the many forms that can be produced thereon.

In the drawings, the numeral 1 designates the bed of the machine, which is supported upon suitable legs 2 and having journaled upon one end the main driving shaft 3 upon which the bevel gears 4 and 5 are fixed, which respectively mesh into the bevel gears 6 and 7 upon the shafts 8 and 9. Upon the shaft 9 is a bevel gear 10 which meshes into and drives a gear 11 upon the shaft 12 journaled in one end of the machine.

The feed mechanism comprises a disk 39 fixed on the shaft 12 and having a screw 40 therein that is rotated through the thumb nut 41 and threaded into the slidable block 42; a link 43 connecting the block 42 with a rock lever 44 that is journaled to the fixed bracket 45 by the pin 46; a slide 47 that is connected with the rock lever 44 by the link 48 and movable upon the bracket 49 fixed to the bed 1, said bracket having the stop plates 50 at both ends thereof; a grip lever 51 that is fulcrumed on the slide 47 by the pin 52; a movable grip plate 53 that is held against lateral displacement by the cap 58, and is actuated from the grip lever 51 through the set screw 54 that impinges against the upper edge thereof. This set screw provides means for adjusting the gripping mechanism for metals of various dimensions, and regulating the pressure thereon and is retained in its adjusted positions by the lock nut 55. Be-

low the plate 53 is a fixed plate 56 that is held in place by the dowel pin 57 and cap 58. Adjustably secured to the slide 47 by the caps 59 are the stop pins 60 which strike the stop plates 50 at the end of each stroke of the feed slide to prevent overthrow thereof, which might occur as the result of wear and consequent looseness in the various joints between the slide and the disk 39, thereby assuring the feeding of successive pieces of metal of uniform lengths.

Journaled at both ends in the blocks 61 fixed to the slide 47 is the oscillating plate 62 which contacts with one end of the grip lever 51 to impart a rocking movement thereto. This oscillating plate 62 is actuated by the pins 63 and 64 projecting laterally from the rock lever 65 that is mounted upon the stud 66 fixed in the bed and actuated from the cam 67 on the shaft 8 through the lever 68 that is connected at one end to the rock lever 65 and having a cam roll 69 thereon, which lies within the groove 70 in the cam 67.

The metal from the rolls 71 upon the straightener bracket 72 passes between the plates 53 and 56 and as the disk 39 rotates a rocking movement is imparted to the rock arm 44 and a reciprocating movement to the slide 47 through the link 48, the length of the movement of the slide being determined by the radial position of the block 42, and at each limit of the stroke of the slide one of the stop pins 60 abuts against one of the stop plates 50. During this movement of the feed slide the oscillating plate 62 moves in front of the pins 63 and 64 fixed to the rock lever 65, and at its extreme retracted position the stop pin 64 engages the oscillating plate 62 and moves the same so that the grip lever 51 is actuated and the metal gripped between the plates 53 and 56. This grip upon the metal continues during the entire forward movement of the slide, when the rock lever 65 is actuated so as to move the pin 63 against the oscillating plate 62 and release the grip upon the metal through the movement of the lever 51, when the slide is returned and the above operations repeated. The pin 64 is constructed with a flat head 98 that normally lies against one face of the rock lever 65 and is pulled into a pocket 99 in said rock lever 65 by the spring 100 when the same is given a quarter turn about its axis. This construction and mounting of the pin 64 enables the operator to instantly stop the feeding movement by simply grasping the knurled head 101 of the pin 64, give it a quarter turn and the head 98 moves out of the path of the oscillating plate 62.

The cut-off mechanism comprises a standard 73 having a lip 74 upon its underside that enters the slot 75 in the bed 1; a cutter slide 76 having a cutter 77 fixed thereto; a bushing 79 secured by the set screw 80; and a cam 78 fixed on the shaft 8. A lateral movement is imparted to the standard 73 upon the bed through the stud 81 having a pinion 82 on its lower end which engages with the teeth in the fixed rack 83 and secured in any of its adjusted positions by the bolt 84 which is threaded into the nut 85 held against rotation in the said slot 75. The head of the stud 81 and the bolt 84 are the same shape and size so that one wrench may be used interchangeably. Lateral adjustment of the cut-off standard is obtained by first turning the bolt 84, then shifting the wrench to the stud 81, and by rotating this stud the bracket is moved along the bed by reason of the engagement of the pinion 82 with the rack 83, and when moved into the desired position is then secured against movement by rotating the bolt 84 in the reverse direction. The slide 76 is kept in contact with the cam 78 through the spring 87 which lies within a pocket in the bracket 73 and exerts its tension against an arm 88 fixed in the slide 76. During the return movement of the slide the metal is held by a binding machanism, comprising a standard 91 having a rock lever 90 mounted therein and carrying a roll 92 at one end which contacts with the cam 79′ and having a screw 89 threaded in the other end which engages a block 102 movably mounted in the said standard; a spring 104 surrounding the block 102; and a fixed block 103.

Heretofore it has been the practice to operate the feed mechanism of a machine of this character from a cam or disk with a fixed or adjustable block and slotted lever mechanism and prevent the overthrow thereof through friction devices. This practice has been found faulty in many particulars, more especially from the fact that the friction devices of such mechanism necessitate constant attention to keep them adjusted, the friction heats the parts, and this and more complicated mechanism than in my device, require an excessive amount of power to operate them, and the speed of movement of the feed is also thereby necessarily limited. In my device, as herein shown and described, the feed mechanism is simple in construction and operation, does not depend upon friction devices, but has adjustable stop pins to prevent overthrow, and can be operated at greater speed with less power. Also the time for gripping and releasing the metal in my device being in the same relation for any length of feed, which is not the case in machines using a disk and slotted lever mechanism, allows me to use a fixed clamping or binding cam as hereafter described.

The cut-off standard will accommodate the full capacity of the feed of the machine and its adjustment is obtained by mechanical

means rather than by pounding or tamping, as is the present practice. Heretofore the clamping or binding mechanism has been operated from at least two cams that are secured together and have a rotary adjustment in relation to each other, but this method is expensive and mechanically faulty, because it is difficult to adjust the cams in relation to each other with the requisite nicety and maintain them permanently in such adjusted positions. In my device all of these difficulties are overcome, and the binding mechanism is operated from a single cam that has a fixed relative position at all times to the shaft upon which it is mounted and requires no adjustment.

Mounted in the bed of the machine are the former slides 13, 14, 15 and 16, which are given a reciprocating movement from the cams 17, 18, 19 and 20, fixed on the shafts 9, 3, 8 and 12. On the inner ends of these slides are fixed the forming tools 21 by the bolts 22 and are given a slight adjustment thereon by the set screws 23. The inner ends of these forming tools are shaped so as to cooperate in the bending of the metal into the proper shape. Suspended between the inner ends of the formers 21 is the former 24 which is fixed by the bolt 25 to the holder 26 that is pivotally connected to the standard 27 by the removable pin 28. When the holder 26 is in its rearmost position the rear face thereof abuts against the face 29 in the standard 27 and is moved forwardly from this position by the spring 30 which surrounds the rod 31 joined to the former 26, and lies between the plate 32 fixed to the front of the standard 27 and the nut 33, this forward position being shown by broken lines in Fig. 8. The standard 27 is secured to the bed 1 by the bolts 34 which pass through slots 35 in the standard and have a limited adjustment from front to rear through the screws 36 which are threaded in the base of the standard 27, the ends of which impinge against the bolts 34. The swinging former is removed by taking out the pin 28, and a stationary former may be substituted if desired, the said stationary former filling the entire space between the back of the plate 32 and the face 29 in the standard 27. To prevent displacement of the pin 28 the bracket 27 is split at 37 and a screw 38 threaded therethrough, which, when tightened, grips the end of the pin 28.

In operation, the metal is fed through the machine, by the means heretofore described, between the former 24 and the forming tool 21 upon the slide 15 and its inner end supported by a stop 93 which is adjustable in any desired or well known manner. The cams are so timed that the slide 15 then moves forward and holds the metal between the former 21 thereon and former 24, at which time the metal is cut off by the tool 77. The slide 15 continues its movement and forces the holder 26 backward against the tension of the spring 30 to its stationary position against the face 29, but the slide 15 continues its movement and folds the metal around two sides of the former 24. The back position of the former 24 is shown by broken lines in Fig. 10. At this point the slides 14 and 16 begin their inward movement and the formers 21 connected therewith fold the ends of said metal around the back of the former 24, at which time the slide 13 begins its inward movement and the former 21 thereon closes upon the bent ends of said metal, thus completing the forming operation and producing a metal shape as shown in Fig. 1. All of the slides are now withdrawn and the metal shape removed from the former 24 by the stripper 94, which is operated through a rock lever 95 mounted upon a fixed bracket 96 and actuated from the cam 86 on the shaft 9. After leaving the former 24 the finished shapes drop through a hole 97 in the bed of the machine into a receptacle conveniently located to receive them. There is no limit to the number of finished shapes that may be produced upon this machine by substituting other former tools and the shape shown in Fig. 11 is only inserted for purposes of illustration.

There are minor changes and alterations that can be made within my invention, aside from those herein suggested, and I would therefore have it understood that I do not limit myself to the exact construction herein shown and described, but claim all that falls fairly within the spirit and scope of my invention.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a metal forming machine, the combination with a slide; of gripping means thereon; a rotary plate; a rock lever actuated from said plate; a connection between said slide and rock lever; a second rock lever pivotally mounted upon a fixed part; and means for operating said gripping means independently of said slide from said second rock lever.

2. In a metal forming machine, the combination with a slide; of gripping means thereon; a rotary plate; a rock lever connected with said slide; a connection between said rock lever and plate; means for adjustably securing said connection to said plate; and means, as a rock arm mounted on a fixed part, and an oscillating plate, for operating said gripping means independently of said slide.

3. In a metal forming machine, the combination with a slide; of gripping means thereon, comprising a movable member contacting with the metal, and an oscillating plate for actuating said movable member;

a rock arm pivotally mounted upon a fixed part and imparting movement to said oscillating plate; a rotary plate; a connection between said rotary plate and slide whereby a reciprocating movement is imparted to said slide; and means for adjusting the length of the stroke of said slide.

4. In a metal forming machine, the combination with a slide; of gripping means thereon, comprising a movable member contacting with the metal, and an oscillating plate for operating said movable member; a rotary plate; means connected with said rotary plate for imparting a reciprocating movement to said slide; means for adjusting the length of the stroke of said slide at either or both ends thereof; and means, as a rock arm mounted upon a fixed part for operating said oscillating plate during the instant of rest of said slide.

5. In a metal forming machine, the combination with a slide; of gripping means thereon, comprising a movably member contacting with the metal, and an oscillating plate for operating said movable member; a rotary plate; means connected with said rotary plate for imparting a reciprocating movement to said slide; a rock arm mounted upon a fixed part; and cam means for operating said rock arm.

6. In a metal forming machine, the combination with a slide; of gripping means thereon, comprising a movable member contacting with the metal, and an oscillating plate for operating said movable member; a rotary plate; means connected with said rotary plate for imparting a reciprocating movement to said slide; means for adjusting the length of the stroke of said slide at either or both ends thereof; a rock arm mounted upon a fixed part; and cam means for operating said rock arm.

7. In a metal forming machine, the combination with a slide; a grip lever mounted thereon and actuated by an oscillating plate; a rotary plate; means for imparting a reciprocating movement to said slide from said rotary plate; means for varying the length of stroke of said slide; a rock lever connected to a fixed part and during its movement having contact with said oscillating plate; and cam means for actuating said rock lever.

8. In a metal forming machine, the combination with a slide; of gripping means connected therewith, said means comprising an oscillating plate having contact with a grip lever mounted on said slide; means for imparting a reciprocating movement to said slide; and means for operating said oscillating plate, comprising a rock lever having parts thereon which contact with said oscillating plate upon opposite sides of the center thereof, and means for imparting movement to said rock lever.

9. In a metal forming machine, the combination with a slide; of a grip lever and an oscillating plate mounted thereon; means for imparting a reciprocating movement to said slide; a rock lever mounted upon a fixed part and having contact points upon either side of the center thereof which contact with said oscillating plate during the movement of said rock lever; and means for actuating said rock lever.

10. In a metal forming machine, the combination with a slide; of a grip lever thereon; an oscillating plate also mounted thereon and having a contact with said grip lever; means for imparting a reciprocating movement to said slide; a rock lever mounted upon a fixed part and having contact points upon either side of the center thereof which engage said oscillating plate upon opposite sides of its center during the movement of said rock lever; and means for actuating said rock lever.

11. In a metal forming machine, the combination with a slide; of a grip lever thereon; an oscillating plate also mounted thereon and having contact with said grip lever; means for imparting a reciprocating movement to said slide; a rock lever mounted upon a fixed part and having contact points upon either side of the center thereof which engage said oscillating plate during the movement of said rock lever; means for actuating said rock lever; and means for mounting one of said contact points on said rock lever so that the same may be moved out of the path of said oscillating plate.

12. In a machine of the character described, the combination with means for feeding metal; of means for cutting the same into lengths; and rack and pinion means for adjustably moving said cut-off mechanism toward and away from said feed means.

13. In a machine of the character described, the combination with means for feeding metal; of means for cutting the same into lengths; and means for adjusting the position of said cut-off means toward and away from said feed means, comprising a pinion rotatably connected with said cut-off mechanism, and a rack connected with a fixed part.

14. In a metal forming machine, the combination with reciprocating slides movable toward and away from each other; forming tools connected therewith; a fixed part above said slides; a former holder pivotally mounted therein; and spring means for moving said holder in one direction.

15. The combination with the reciprocating slides; of former tools separably connected therewith; a standard secured to a fixed part; a former holder having a hinged connection with said standard; a bolt pivotally connected with said holder; a spring

surrounding said bolt and contacting with a nut thereon for moving said holder in one direction; and a former separably secured to said holder.

16. In a metal forming machine, the combination with reciprocating slides movable toward and away from each other; forming tools connected therewith; a pivotally mounted former having a part thereof between the said slides; means for feeding metal between one of said slides and said former; and means for operating said last slide so that before the forming operation said metal will be held between the former on said last slide and said pivotally mounted former and while therebetween conveyed to a position for the forming operation.

17. In a metal forming machine, the combination with reciprocating slides movable toward and away from each other; forming tools connected therewith; a swinging former having a part thereof between the said slides; and means for holding a metal length between said swinging former and one of said slides during the movement of said swinging former prior to the forming operation.

18. In a metal forming machine, the combination with reciprocating slides movable toward and away from each other; forming tools connected therewith; means for feeding metal between said slides; a swinging former having a part thereof between the said slides; means for cutting said metal into lengths; and means for conveying said metal lengths between one of said slides and said swinging former from the line of the feed thereof to the forming position.

In testimony whereof I affix my signature in presence of two witnesses.

ARTHUR J. LEWIS.

Witnesses:
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CHAS. L. WARNER.