

No. 715,046.

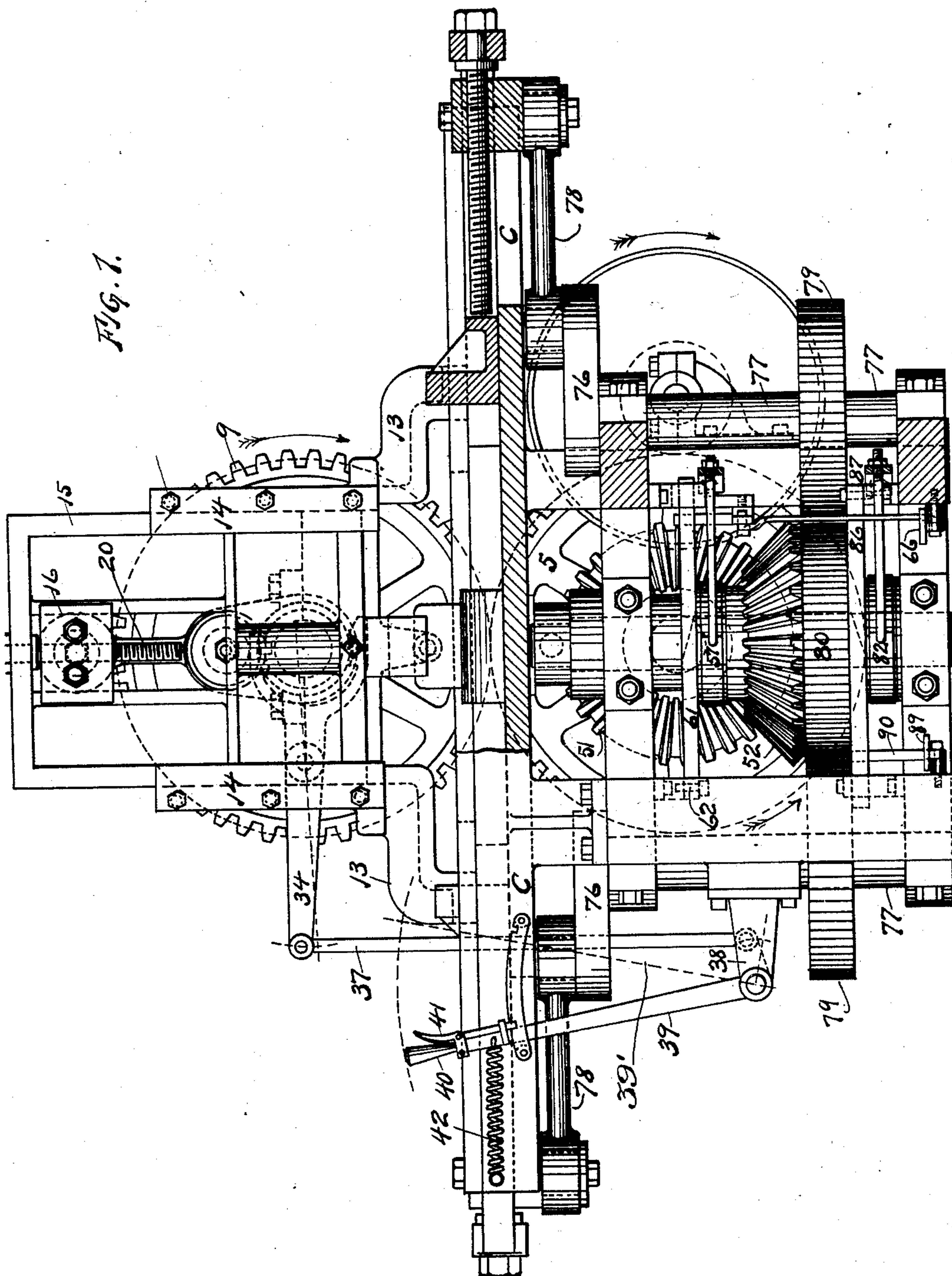
Patented Dec. 2, 1902.

H. W. FORSLUND.  
METAL FORMING MACHINE.

(Application filed May 22, 1901.)

(No Model.)

6 Sheets—Sheet 1.



WITNESSES:

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A. S. Phillips

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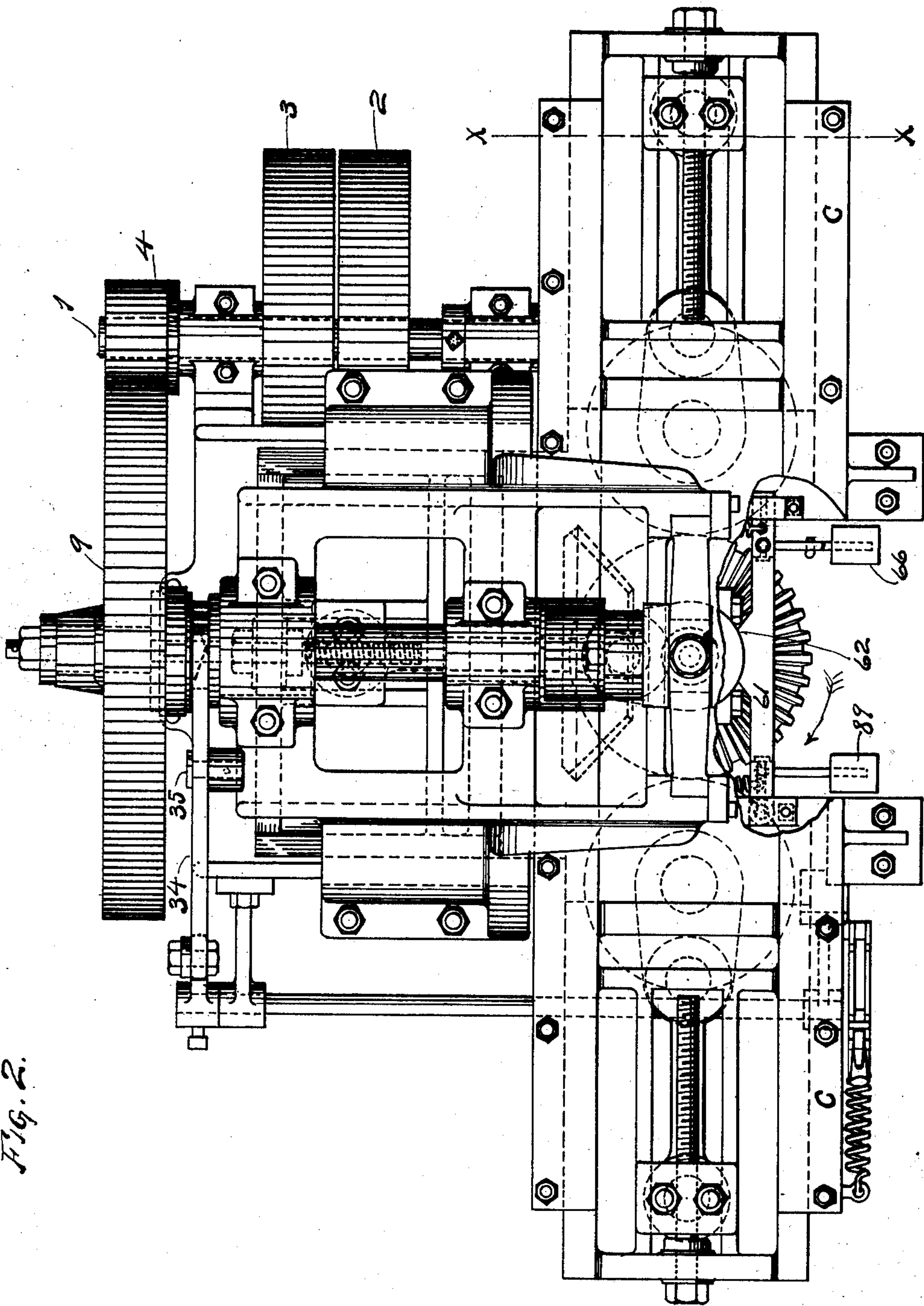


Fig. 2.

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FIG. 11.

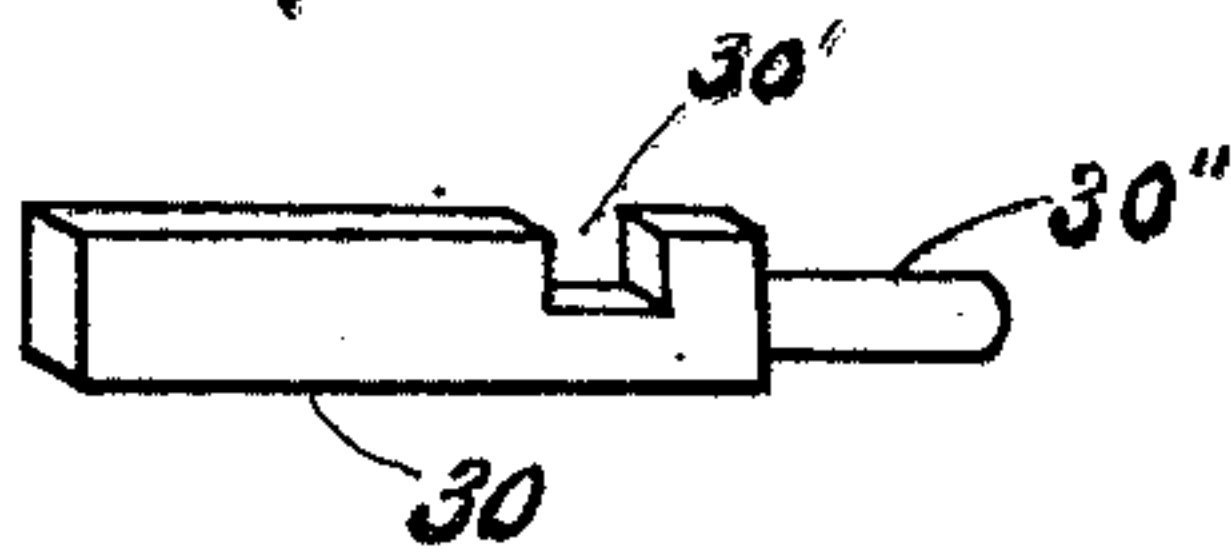
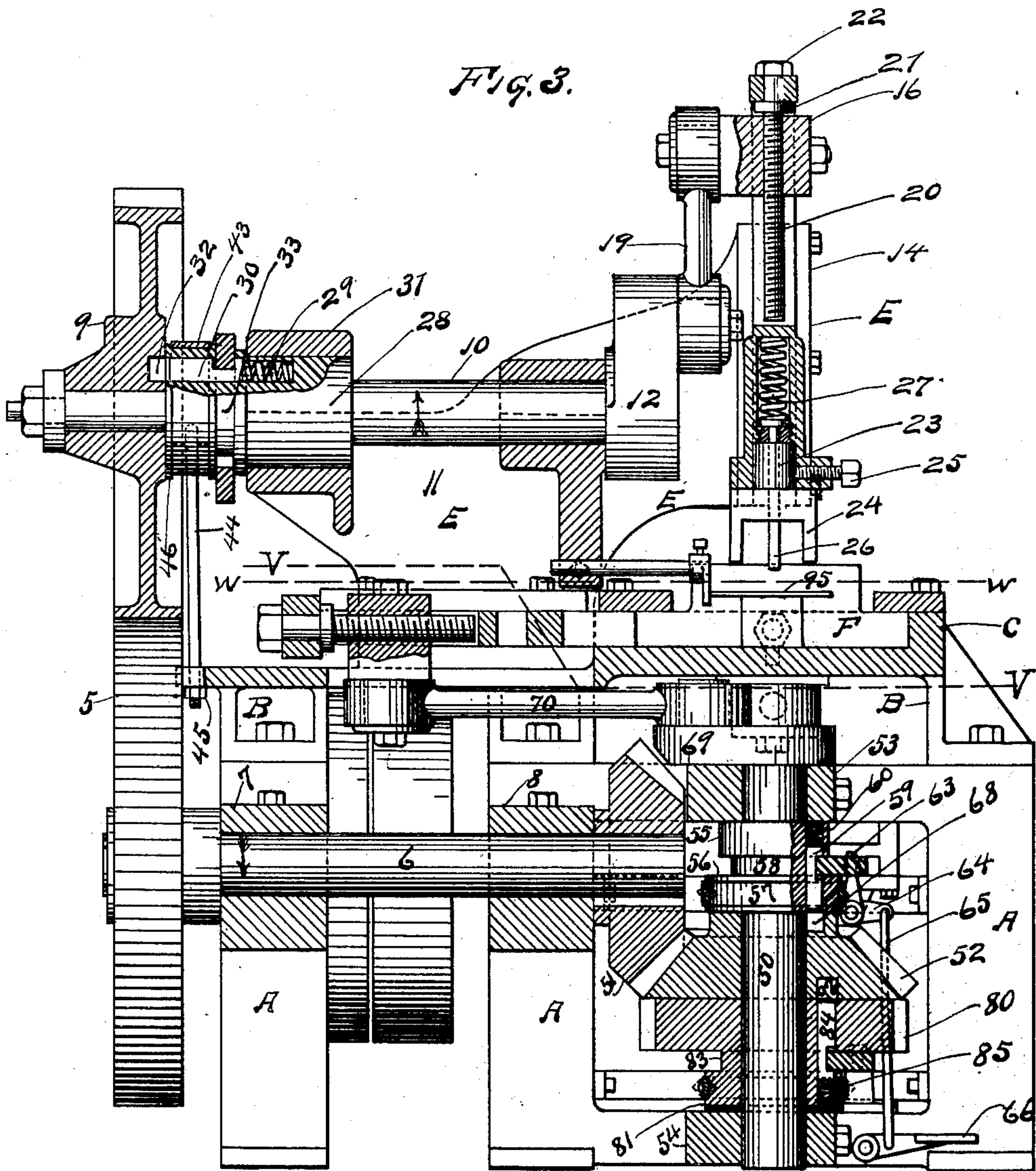


FIG. 3.



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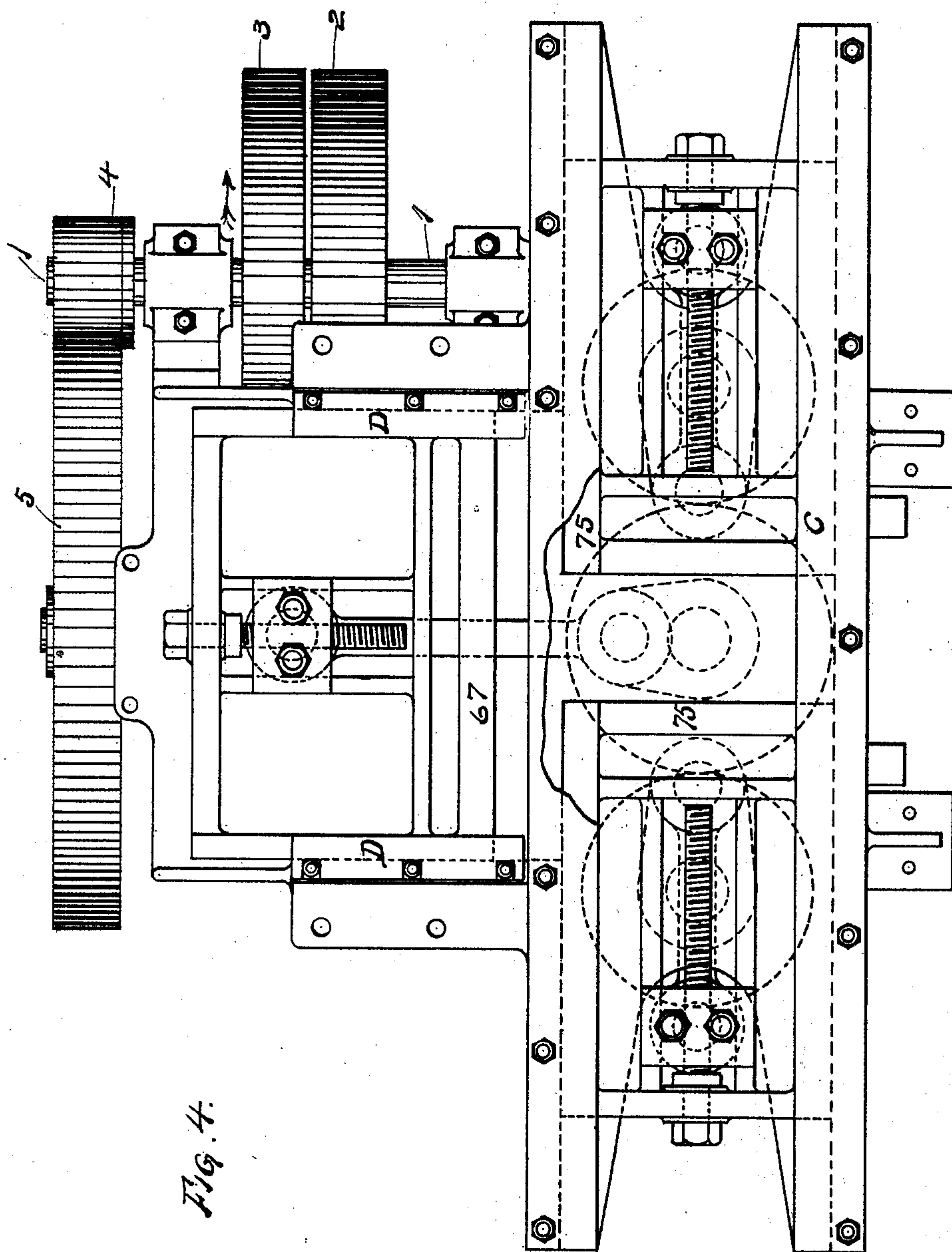


Fig. 4.

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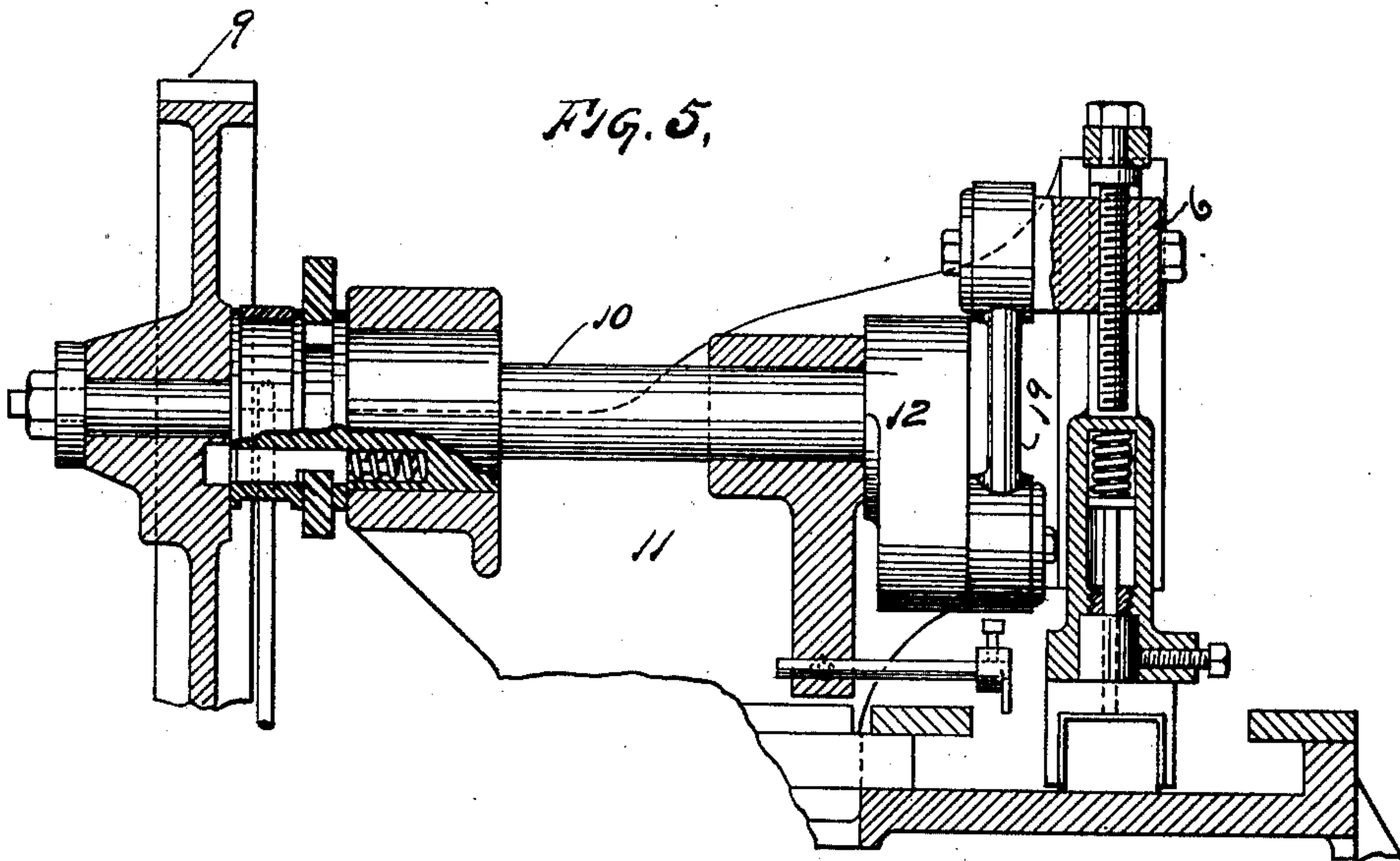
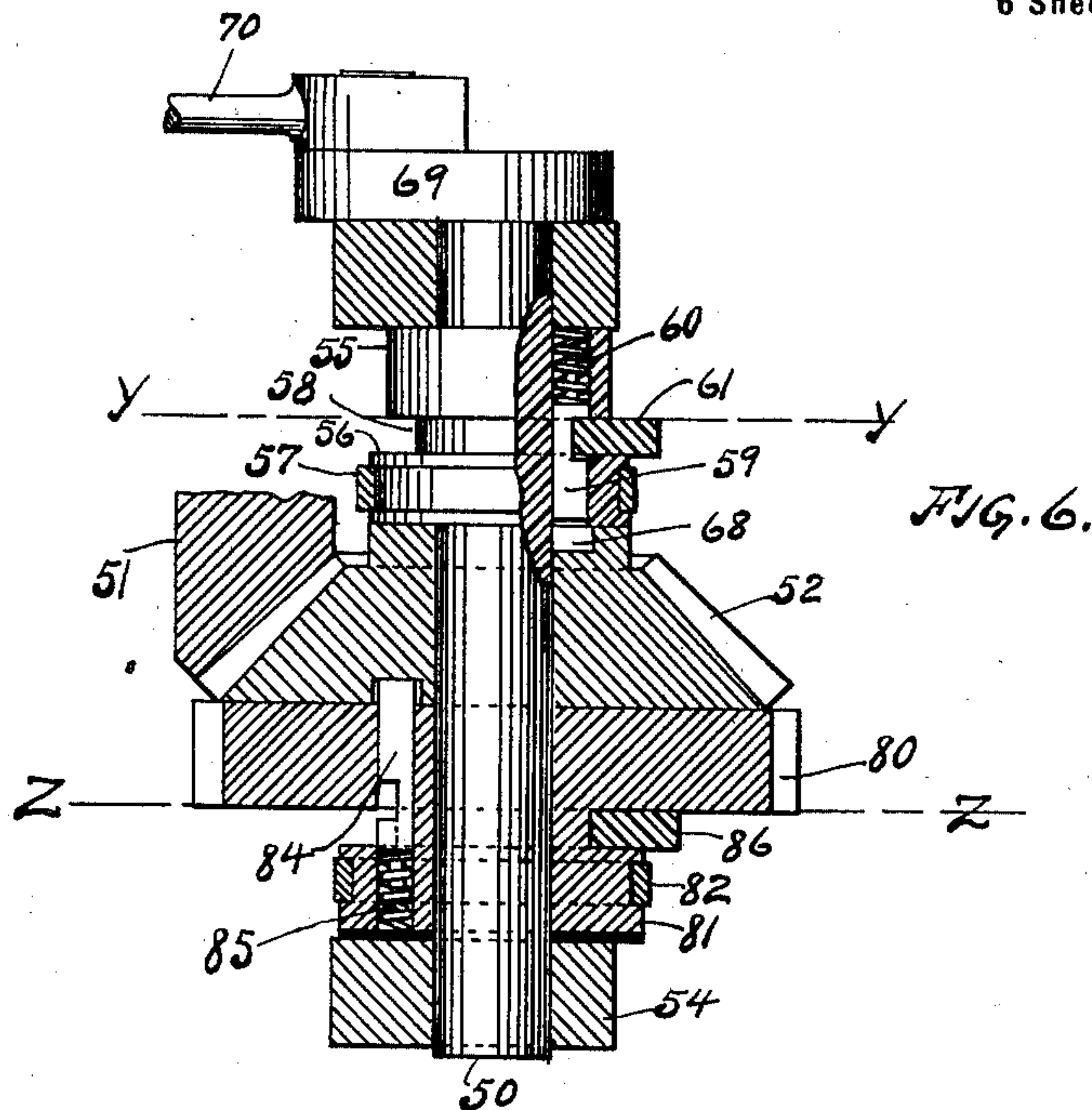
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6 Sheets—Sheet 5.



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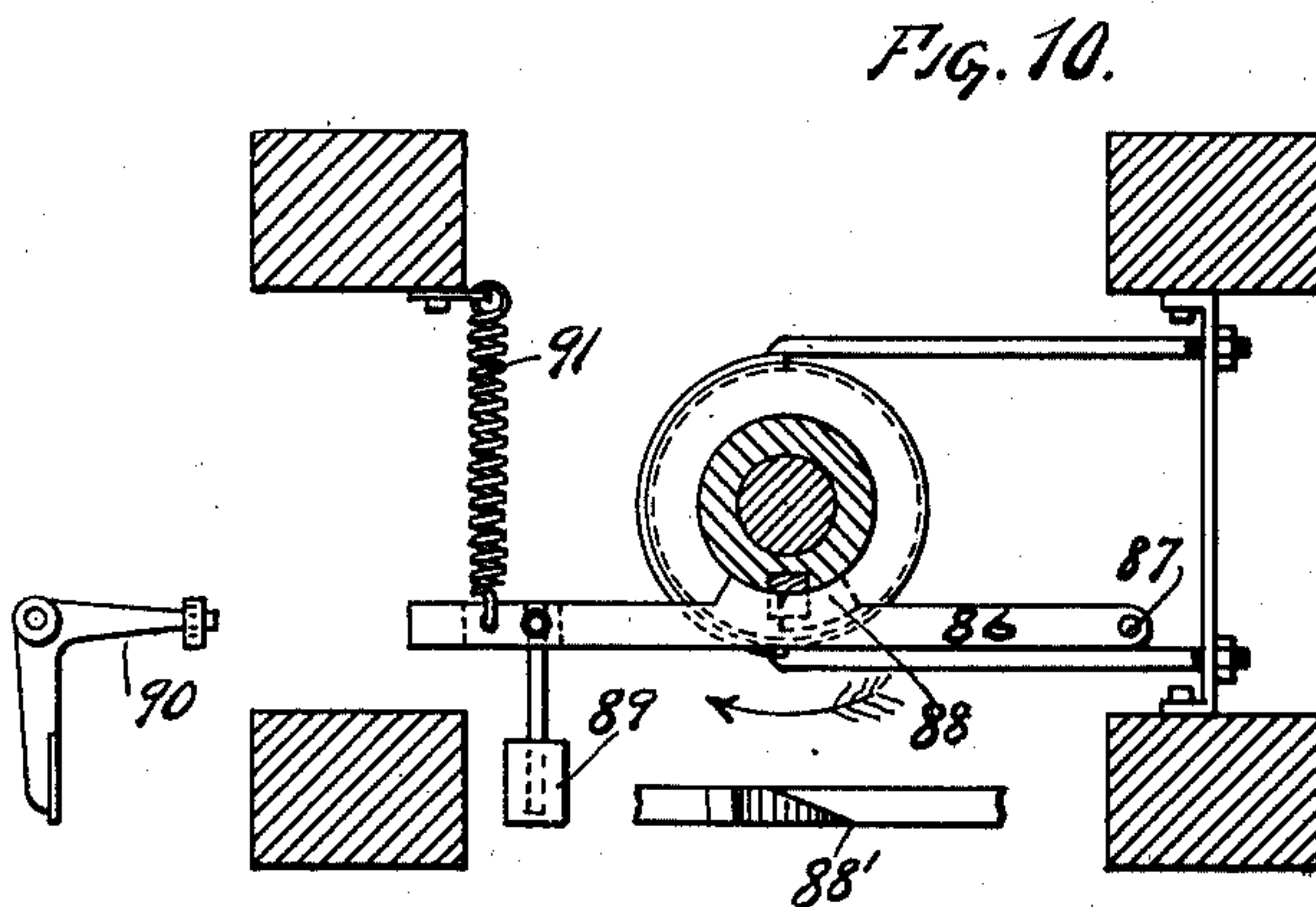
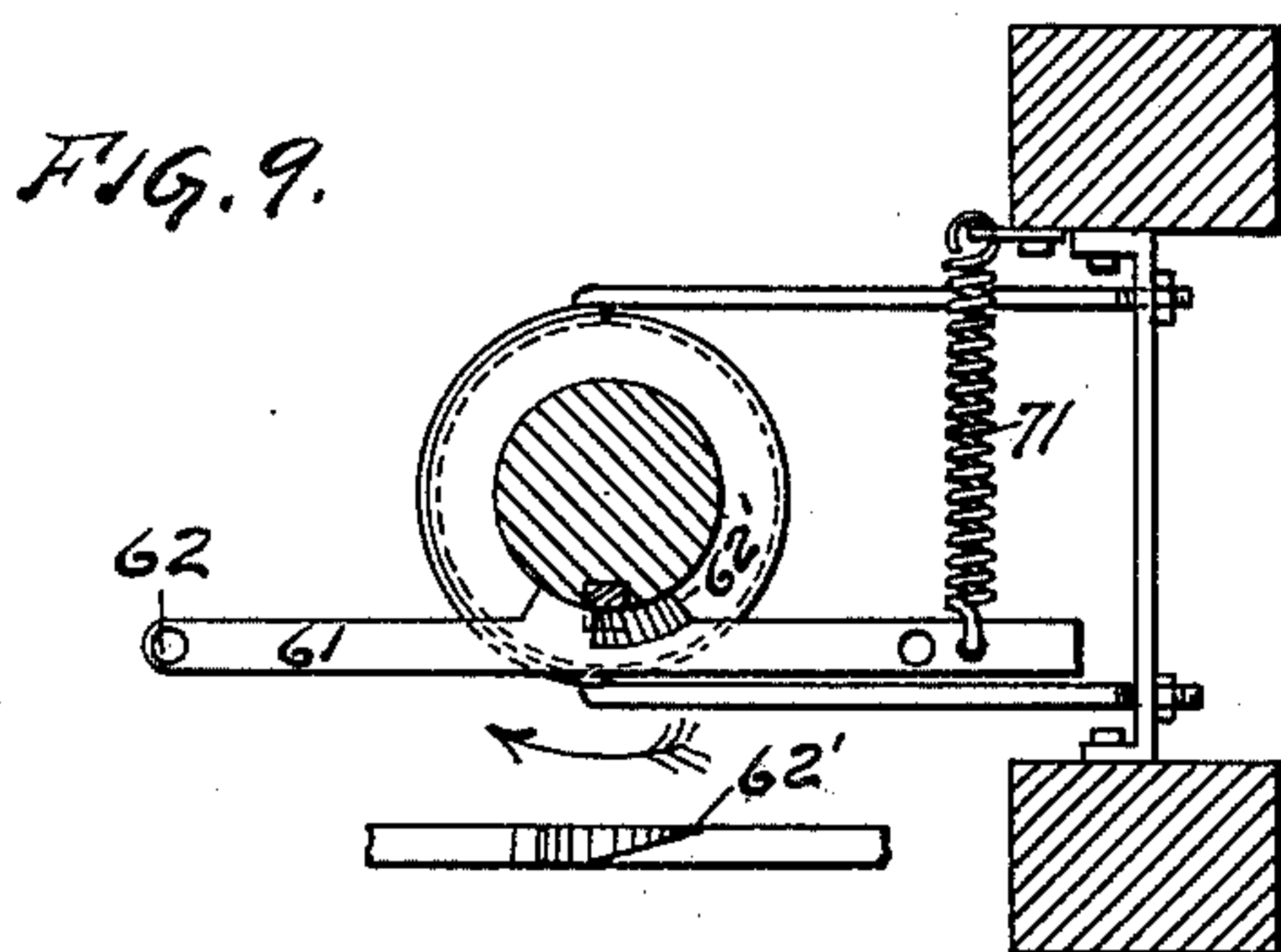
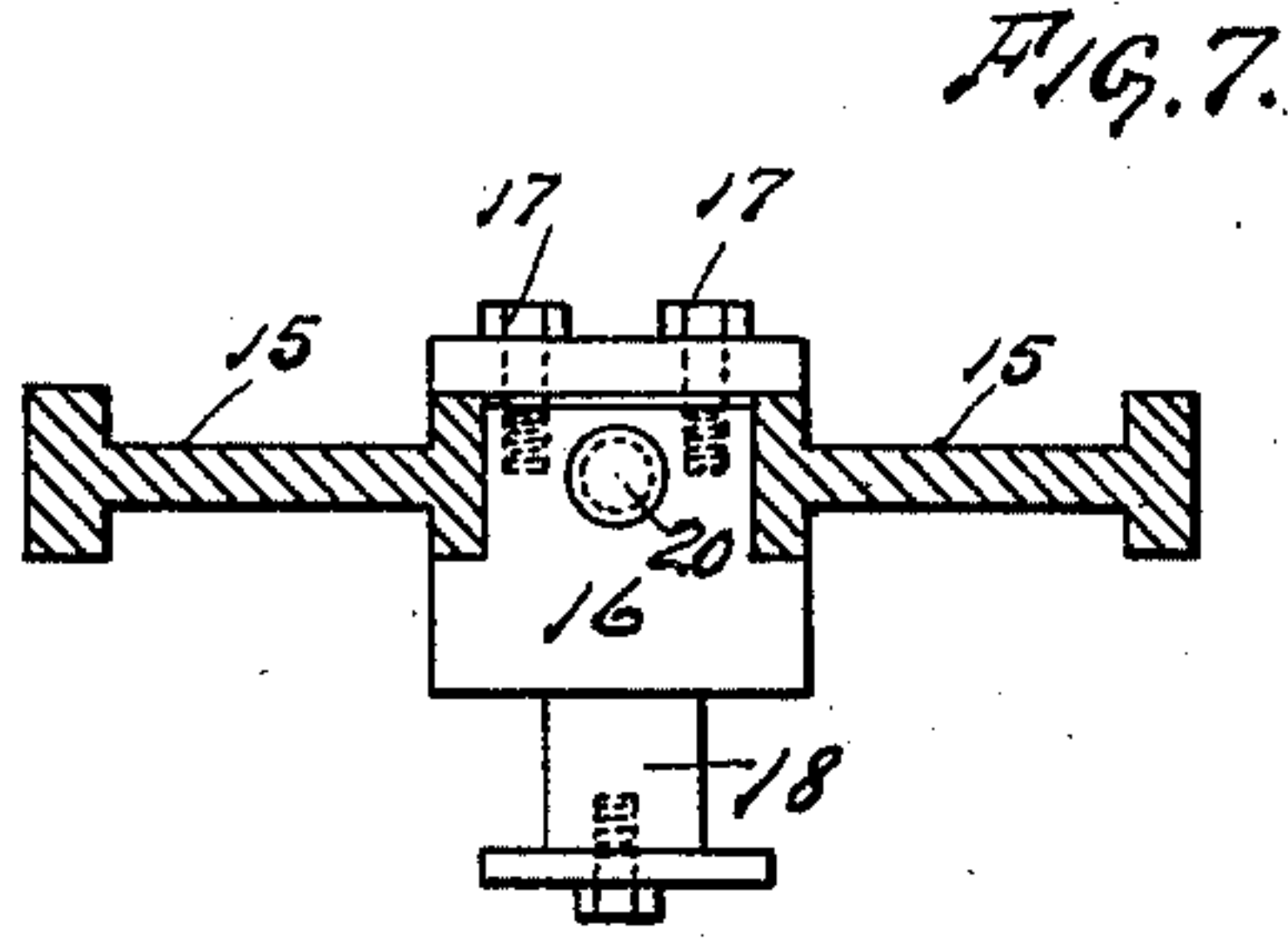
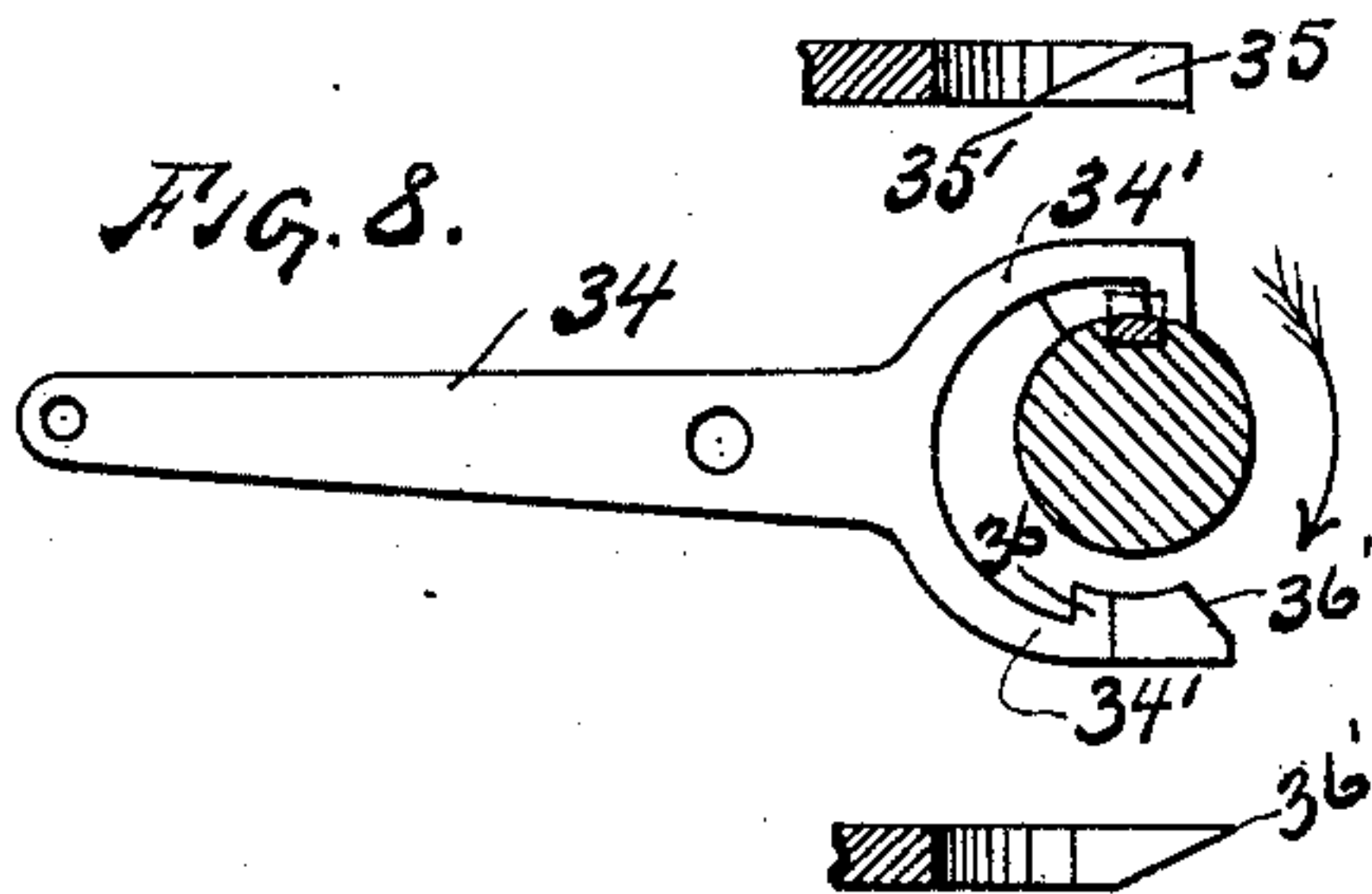
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(Application filed May 22, 1901.)

(No Model.)

6 Sheets—Sheet 6.



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Hugo W. Forslund



# UNITED STATES PATENT OFFICE.

HUGO W. FORSLUND, OF CHICAGO, ILLINOIS, ASSIGNOR TO GEORGE W. MOORE AND PETER A. LORENZ, UNDER THE FIRM-NAME OF MOORE & LORENZ, OF CHICAGO, ILLINOIS.

## METAL-FORMING MACHINE.

SPECIFICATION forming part of Letters Patent No. 715,046, dated December 2, 1902.

Application filed May 22, 1901. Serial No. 61,359. (No model.)

*To all whom it may concern:*

Be it known that I, HUGO W. FORSLUND, a citizen of the United States of America, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Metal-Forming Machines, of which the following is a specification.

My invention relates to machinery for forming sheet metal cut into a suitable blank by folding the edges thereof about a central form, and the object thereof is to provide means whereby suitable movements of forming-dies may be given toward the central and stationary form, so as to bend or shape the metal about the said form from the upper side, the rear, and from either end. To accomplish this, I provide a suitable frame upon which to mount the moving parts of the mechanism, which consists of suitably-related shafts, gears, cranks, and connecting-rods adapted to move the several dies in the proper direction and to the desired distance and suitable clutch and controlling mechanism to govern the said movements both individually and with reference to each other. The means by which I accomplish these ends are set forth and described in this specification, reference being had to the drawings, in which—

Figure 1 shows a front view of my machine; Fig. 2, a top view of the same; Fig. 3, a vertical-cross-section of Fig. 1 looked at from left to right. Fig. 4 is a horizontal cross-section of a machine, taken on the dotted line *ww*. Fig. 5 is a vertical section of the upper portion of Fig. 3, showing the former-die at the lowest portion of its stroke, together with the corresponding positions of the clutch mechanism. Fig. 6 is an enlarged vertical section of the central vertical shaft 50. Fig. 7 is a cross-section of a die-carrying cross-head and adjustment on the dotted line *xx*. Fig. 8 shows the double clutch mechanism by which the vertically-moving head is controlled. Fig. 9 is a vertical section of the shaft 50 on the line *yy*. Fig. 10 shows a vertical section of the shaft 50 on the line *zz*, and Fig. 11 is a longitudinally-sliding key controlled by the clutch mechanism.

The operation for the performance of which my machine is designed and intended com-

prehends three distinct but relative movements by which the metal is formed and shaped around a central die or form. These movements and the mechanism provided 55 them, while separate and distinct, are correlated to each other so that the several parts shall work in harmony with each other and yet neither interfere with the movement of any other part.

My machine therefore provides mechanism, first, by which a vertically-moving die is brought to bear upon the metal to be formed, so as to hold the same in place during the subsequent movements of the other forming- 65 dies; second, a die moving toward the central block from the rear to turn the ends of the metal around the central block, and, finally, horizontally-moving dies working from either end of the machine toward the center to form and crimp the ends of the material into permanent form, the rear die meanwhile being withdrawn after its work is completed. Accordingly I shall describe the second parts of the machine in the order indicated, reference being made to the drawings, 75 in which like figures and characters of reference denote like parts throughout.

A represents the legs, and B represents the table-supports constituting the main frame 80 of my machine.

C represents the horizontal guideways for the end forming heads and dies.

D represents similar guideways for the rear forming head and dies. 85

E is a head, supported by the main frame and secured rigidly thereto.

1 is the main shaft, with the fixed and loose pulleys 2 and 3 mounted thereon, by means of which external power is communicated and 90 controlled.

4 is a pinion on the main shaft which communicates the motion thereof to the main gear 5, which is mounted on the central main shaft 6, the latter being journaled to the main 95 frame of the machine in the bearings 7 and 8, and which communicates the power to the rear and end dies in the manner hereinafter described.

The power by which the vertically-moving 100 die is operated is communicated from the main gear 5 to the gear 9, which is mounted



on the shaft 10, journaled to the head or bracket 11 and which terminates in the crank 12. A vertical framework or arch 13 is secured to the frame or table of the machine 5 and is provided with vertical guideways 14, in which slides the die-carrying cross-head 15. An adjustable block 16 is attached to the framework and clamped thereto, as shown in Fig. 7, which is an enlarged detail thereof, 10 by means of the binding-screws 17. To the said block is attached or formed integrally therewith a bearing-pin 18. A connecting-rod 19 connects the crank 12 to the said bearing-pin and communicates the motion of the 15 crank to the vertical cross-head 15. Further security for the block 16 and an accurate adjustment thereof are provided by means of the screw 20, which is threaded longitudinally through the said block and is provided with 20 flanges 21 and 22, which embrace the upper portion of the framework 15, through which an unthreaded portion of the screw passes. By this arrangement the vertical movement of the head 15 with reference to the crank 25 12 may be adjusted by loosening the binding-screw 17 and then turning the screw 20 until the block 16 is in the desired position. By then turning up the binding-screws the block is secured firmly in place and becomes 30 for all practical purposes in whatever position placed an integral part of the cross-head. A hollow is formed in the lower part of said framework, in which is inserted the shank 23 of the die 24, which is secured in place by 35 the set-screw 25. A vertical aperture extends centrally through the said die and shank, and seated therein is a plunger 26, headed at its upper extremity, which plays in the hollow of the cross-head, and between 40 the head of which and the extreme portion of such hollow is interposed a spiral spring 27, which extends normally to force the said plunger downward out of the die.

The gear 9 is loosely mounted on the shaft 45 10 and normally idles thereon. In the operation of my machine it is necessary to communicate power to the crank-shaft in such a manner as to carry the forming-head attached thereto either to the extreme upward or the 50 extreme downward portion of the stroke and to hold the same in one of the said positions until the other position is desired. The upward position (shown in Fig. 3) is the normal one, in which it stands until by shifting of 55 the appropriate mechanism the crank is carried to the extreme lowest part of the stroke, as shown in Fig. 5. It is held in this position until the appropriate mechanism is shifted, whereupon the crank is carried again to the 60 normal position, at which it automatically stops and where it is held until the clutch mechanism, now to be described, is shifted. To effect this result, I prefer to form the shaft 10 with an enlargement 28, which is 65 preferably integral with the shaft and the outer portion of which may form the journal-bearing thereof. A longitudinal opening 29

is formed in the said enlargement, and a sliding key 30 is seated therein. A spiral spring 31 is so placed in the rear of said key as to 70 tend to slide the same in the slot against the inside face of the gear 9, which is provided with a notch 32, into which the key may seat itself by the impulse of the spring when brought opposite thereto and the resistance 75 to such movement removed. An annular groove 33 surrounds the enlargement of the crank-shaft 10, and a notch 30' is formed in the sliding key 30 at such a portion thereof that the same registers with said groove when 80 the gear-engaging end of the key is flush with the end of the shaft enlargement. A crutch-formed clutch 34 is pivotally mounted at 35 on the framework of the machine, so that the arms thereof, 34', embrace the shaft 85 10 within the groove 33 at the upper and lower sides thereof, respectively. The two arms of the said clutch are at a distance from each other equal to the diameter of the embraced portion of the shaft plus the depth of 90 the annular groove.

The construction of the clutch-arms 34' and 34'', respectively, is shown in Fig. 8, in which the said portions are also indicated as 95 broken away and respectively looked at as from the center of the inclosing shaft. The said arms have projections of such depth and width as to fill the annular groove. The upper projection has a knife-edge 35' on its inner 100 portion, and the lower projection has a knife-edge 36' on its outer portion. The lever 34 is pivotally attached to the framework at 35 and has attached thereto at the free end a connecting-rod 37, by which it is similarly 105 attached to the short arm 38 of a bell-crank lever, the long arm 39 terminating in a handle 40 and being provided with the latch 41, which is normally held in the position shown in the drawing Fig. 1 by the spring 42. In 110 this position of the lever the upper arm of the clutch is thrown into engagement with the pin 30. A brake-shoe 43 is secured to the table of the machine by rods 44 and nuts 45. The shoe bears upon an enlarged portion 115 of the shaft 10 or a pulley 46 thereon, and the tension of the shoe may be adjusted by means of the nuts as desired.

The operation of the upper portion of my machine, including the vertical forming-die, is as follows: When the moving parts of the 120 machinery are in the position shown in Figs. 1 and 3, the gear 9 is constantly turning on its bearing on the extremity of the shaft 10, the pin 30 being withdrawn from the notch 32 in said gear and held in the withdrawn 125 position by the thickened portion of the projection 34', which engages the notch 30' in the said pin. When it is desired to bring down the forming-die 24 to bend the sheet of metal 95 placed on the block F downward thereon, 130 the handle 40 is moved to take the position indicated by the dotted line 39'. By this movement the projection 36 on the clutch 34 is thrown into the annular groove 33, and the



pin 30 is released by the withdrawal of the projection 35. The pin 30 thus engages the notch 32, causing the shaft 10 to turn, carrying with it the crank 12 and attached cross-head and forming-die until the lower portion of the crank-stroke is reached, when the knife-edge 36' engages the notch 30' of the pin 30, withdrawing the same from its engagement with the gear 9 and causing the same to rest upon the thickest portion 36 of said projection, in which position the resistance of the brake-shoe 43 causes the die to stop at the lowest portion of its travel, in which position it will be retained until the pin 30 is again freed by the movement of the hand-lever 39. The operation thus described forms the sheet of metal over the block F and provides a means for holding the same while the subsequent operations hereinafter described are carried on. The movement of the rear forming-dies is controlled by the centrally-placed vertical shaft 50, motion being communicated thereto from the main shaft 6 by the beveled gears 51 and 52, the latter of which is journaled upon the shaft 50 and normally idles thereon. The shaft 50 is mounted in bearings 53 and 54 and is provided with the projections, either integrally formed or keyed thereto, 55 and 56, upon the latter of which bears the brake 57, and which projections are separated from each other by the annular groove 58. The longitudinally-slidable key 59, in all respects similar in construction and operation to that shown in Fig. 11 and described in connection therewith, is controlled by the spiral spring 60. A clutch-lever 61 is pivoted at one end 62, and the other end thereof engages one arm 63 of the bell-crank lever, whose other arm 64 is attached by the connecting-rod 65 to the foot-pedal 66. The lever 61 has a clutch 62, with knife-edge 62', adapted to fit into the annular groove 58 and engage a corresponding depression in the key 59. The operation of this clutch is in all respects the same as that of either half of the clutch arrangement 34. When it is desired to bring up the forming-die attached to the table or cross-head 67, a pressure on the pedal 66 withdraws the clutch 62, allowing the key 59 to engage the notch 68 in the beveled gear 52. The motion of the said gear is thus communicated to the shaft 50, which revolves, carrying with it the crank 69 and the connecting-rod 70, attached to the cross-head 67, which will thus move backward and forward as long as the pedal is kept in the depressed position. When this is released, however, the clutch 62 on the lever 61 is thrown into the annular groove 58 by the action of the spring 71. The knife-edge 62' of such clutch engages the notched pin at the forward portion of its rotation, leaving the crank in the backward position and the rear forming-die withdrawn. The side forming cross-heads 75 are operated by cranks 76 on the upper extremities of shafts 77, which are attached to the cross-heads by the con-

necting-rods 78. Gears 79, secured to the shafts 77, engage a central gear 80, which is journaled on the central vertical shaft 50. The said gear has formed integrally therewith or attached thereto a projection or pulley 81, upon which bears the brake-shoe 82 and which is separated from the main portion of the gear by the annular groove 83. A sliding pin 84 of practically the same construction as the pin 30 is seated in a vertical opening passing through the said gear and projection and is normally projected therefrom by the spiral spring 85. A clutch-lever 86, pivoted at 87, carries a clutch 88, with knife-edge 88', adapted to fit within the annular groove 83, and its forward-and-backward movement is controlled by the pedal 89 on one arm of a bell-crank, whose other arm 90 engages the free end of said lever, the same being held in its normal position by the spiral spring 91. In the latter position the knife-edged clutch holds the pin out of engagement with the notch 92 in the gear 52. When, however, it is desired to move the side forming heads and dies, a pressure on the pedal 89 withdraws the clutch on the lever 86, permitting the pin 84 to engage the notch 92. The motion of the bevel-gear 52 is thus communicated to the gear 80, which in turn communicates its motion to the gears 79, causing the cross-heads on either side to be thrown to the central portion of the machine by the movement of the cranks 76. This position of the side cross-heads is dependent on the position of the gears. (Shown in Fig. 6.) The reciprocating motion of these cross-heads will be continued until the pedal is released, whereupon under tension of the spring 91 the clutch-lever 86 is thrown so that its knife-edged clutch engages the pin 84 on its forward rotation, thus withdrawing the same and throwing it out of engagement with the beveled gear 52, at which position the cross-heads are left at the outer portions of their stroke, as shown in Figs. 1 and 2.

Further describing and recapitulating the consecutive movements and operations of the machine in their order, when it is desired to form a sheet of metal 95 over the die F the same is placed in position, as shown in Fig. 3, the lever 39 being thrown to the inward position. The upward die is brought down, holding the plate in place during the subsequent operations, the movement thereof being terminated for the present at the lowest portion of the stroke by the operation of the lower portion of the clutch 34. Pressure on the pedal 66 operates the rear forming-die by which the rear portions of the plate 95 are formed about the block F. When the pedal is released, allowing the rear die to recede and take its extreme backward position, pressure on the pedal 89 causes a similar forward movement of the end cross-heads, which move up with their dies to perform the final operation upon the metal. Upon releasing the pedal 89 the same assume their outward po-



sition, whereupon the lever 39 is thrown to its normal place, as shown in Fig. 1, whereupon the top forming-die is withdrawn. As the same is withdrawn the pin 26, which previously had been driven into the recessed head, is forced outwardly by the spiral spring 27, thus freeing the formed metal from the inside of the female die 24. The formed metal is then removed, and the machine is ready for the ensuing succession of movements comprising another complete operation.

I have described my invention with reference to a practical and operative embodiment thereof. I do not, however, confine myself to the structural form shown; but

I claim, and desire to secure by Letters Patent, the following:

1. In a metal-forming machine, the combination with a revoluble shaft having an idler thereon and a key on the shaft adapted normally to engage the idler; of key-controlling dogs so related to each other that when one dog is in position to release the key the other dog is in position to withdraw the same, and means for shifting the dogs with reference to the shaft, substantially as set forth.

2. In a metal-forming machine, the combination with a revoluble shaft having an idler thereon and a key on the shaft adapted normally to engage the idler; of key-controlling dogs so rigidly related to each other that when one dog is in position to release the key the other dog is in position to withdraw the same, and means for shifting the dogs with reference to the shaft, substantially as set forth.

3. In a metal-forming machine, the combination with a revoluble shaft having an idler thereon and a key on the shaft adapted normally to engage the idler; of a crutch-lever with arms embracing the shaft, key-controlling dogs on the arms so related that when one dog is in position to release the key the other is in position to withdraw the same, and means for shifting the lever with reference to the shaft, substantially as set forth.

4. In a metal-forming machine, the combination with a revoluble shaft having an idler thereon and a key on the shaft adapted normally to engage the idler; of a pivotally-mounted crutch-lever with arms embracing the shaft, key-controlling dogs on the arms so related that when one dog is in position to release the key the other is in position to withdraw the same, and means for shifting the lever with reference to the shaft, substantially as set forth.

5. In a metal-forming machine, the combination with a revoluble shaft having an idler thereon and a key on the shaft adapted normally to engage the idler; of a crutch-lever with arms embracing the shaft, key-controlling dogs on the arms so related that when one dog is in position to release the key the other is in position to withdraw the same, means for shifting the lever with reference to the shaft, and means for retarding the motion of the shaft, substantially as set forth.

6. In a forming-machine having a revoluble shaft, supports therefor, and a sliding head operated thereby; a wheel with a key-engaging notch journaled on the shaft, a longitudinally-slidable key mounted on the shaft adapted normally to engage the notch on the wheel, and arms rigidly attached to each other embracing said shaft, said arms being each adapted to engage and withdraw said key at predetermined points of the revolution of the shaft, and means for shifting said arms, substantially as set forth.

7. In a forming-machine having a revoluble shaft, supports therefor, and a sliding head operated thereby; a wheel with a key-engaging notch journaled on the shaft, a longitudinally-slidable key mounted on the shaft adapted normally to engage the notch on the wheel, means for engaging the key at the upper point of shaft rotation, and means for engaging the key at the lower point of shaft rotation, said upper and lower engaging means being so related to each other that the release of the key by the one places the other in the key-engaging position at the opposite point of shaft rotation, substantially as set forth.

8. In a forming-machine having a revoluble shaft, supports therefor, and a sliding head operated thereby; a wheel with a key-engaging notch journaled on the shaft, a longitudinally-slidable key mounted on the shaft adapted normally to engage the notch on the wheel, a lever with arms adapted to embrace the shaft and severally to engage the key, and means for shifting the lever so that the key-engaging position of the one arm becomes the key-disengaging position of the other arm, substantially as set forth.

9. In a forming-machine having a revoluble shaft, supports therefor, and a sliding head operated thereby; a wheel with a key-engaging notch journaled on the shaft, a notched longitudinally-slidable key mounted on the shaft adapted normally to engage the notch on the wheel, a crutch-shaped lever with double arms embracing said shaft said arms being adapted to engage and withdraw said key at predetermined points of the revolution of the shaft, and means for shifting the said lever, substantially as set forth.

10. In a forming-machine having a revoluble shaft, supports therefor, and a sliding head operated thereby; a wheel with key-engaging notch journaled on the shaft and adapted to idle thereon, a notched longitudinally-slidable key mounted on the shaft and adapted normally to engage the notch in the wheel, and a crutch-shaped lever with double arms embracing said shaft and dogs on said arms severally adapted to engage the notch on said key and withdraw the same at predetermined points of the rotation of the shaft, substantially as set forth.

11. In a metal-forming machine having a framework and stationary die and rear and end die-carrying heads; the combination of a vertically-moving head and die thereon



adapted to form the metal over the stationary die and to hold the same in position thereon during the successive operations of the rear and end die-carrying heads, substantially as set forth.

12. In a metal-forming machine having a framework and stationary die; a vertically-moving die adapted to form the metal over the stationary die, means for moving said die and for holding it in the final forming position until released, a rear forming-head, and end forming-heads adapted to operate on the metal while held by the vertically-moving die, substantially as set forth.

13. In a metal-forming machine having a framework and stationary die; a vertically-moving die adapted to form the metal and for holding it in the formed position until released, a pedal-controlled rear forming head and die, end forming heads and dies con-

trolled by a separate pedal, said rear and end forming-dies being adapted to operate on the metal while held by the vertically-moving die.

14. In a metal-forming machine having guideways and means for reciprocally moving a cross-head thereon, a cross-head comprising a framework, a block mounted thereon, a screw threaded in said block, flanges on said block adapted to engage said framework and means for clamping the flanges to the framework, substantially as set forth.

In witness whereof I have hereunto set my hand this 20th day of May, 1901, in the presence of two subscribing witnesses.

HUGO W. FORSLUND.

Witnesses:

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ANNIE S. PHILLIPS.