

No. 837,573.

PATENTED DEC. 4, 1906.

A. JOHNSTON.  
MACHINE FOR MAKING BALLS FROM SHEET METAL.

APPLICATION FILED FEB. 13, 1905.

3 SHEETS—SHEET 1.

Fig. 1.

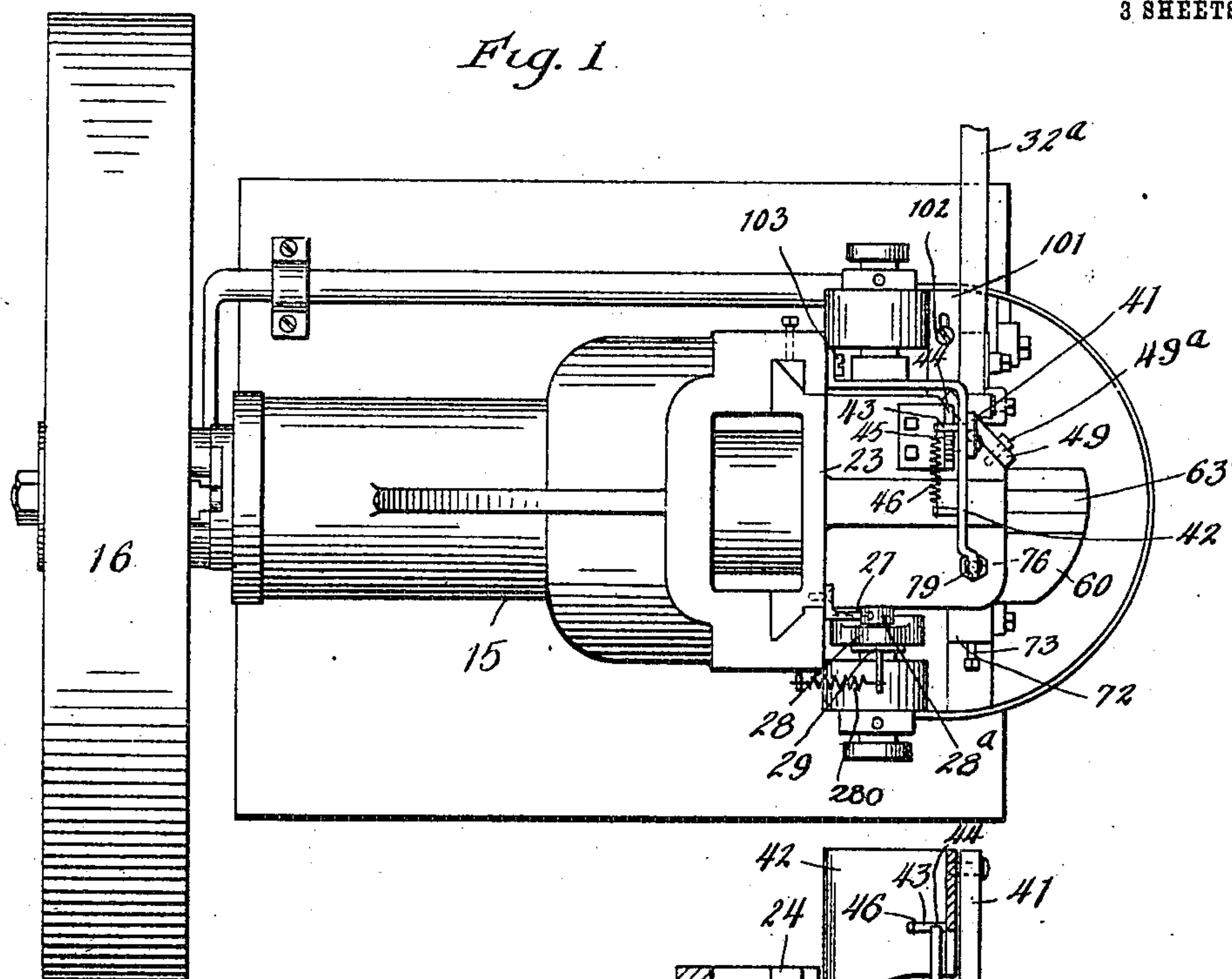
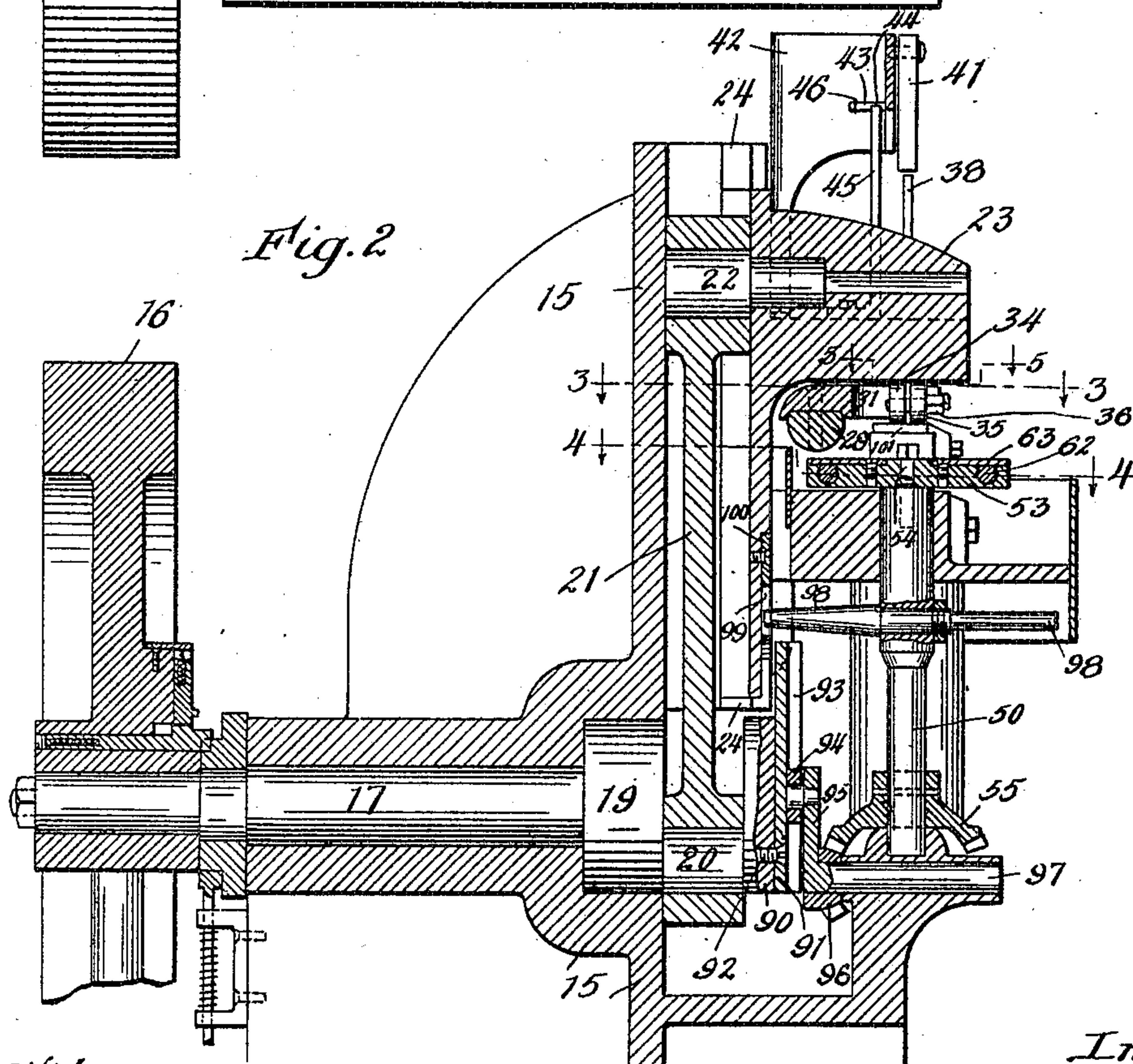


Fig. 2.



Witnesses:

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By Munday, Curtis & Adcock,  
Attorneys

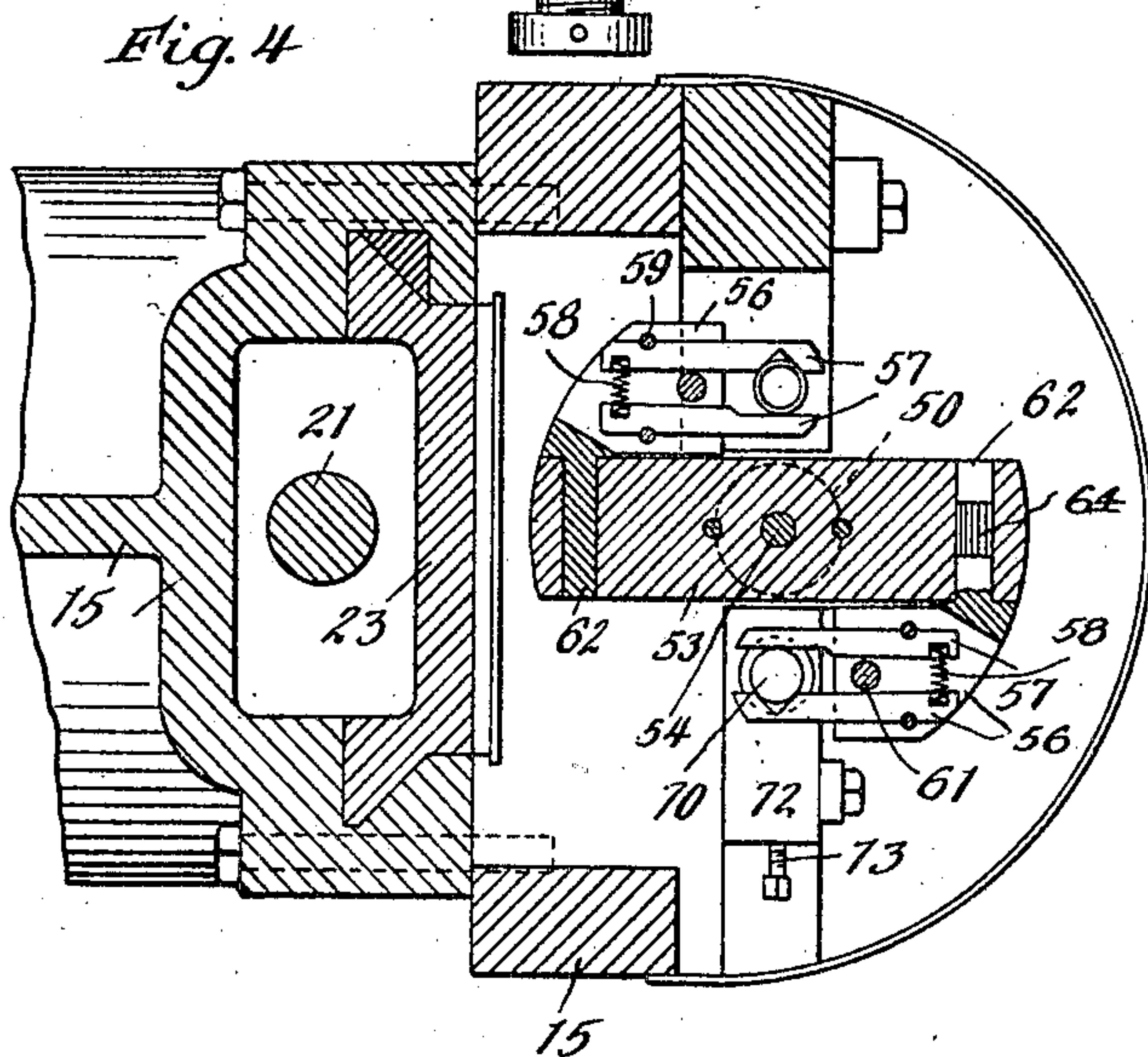
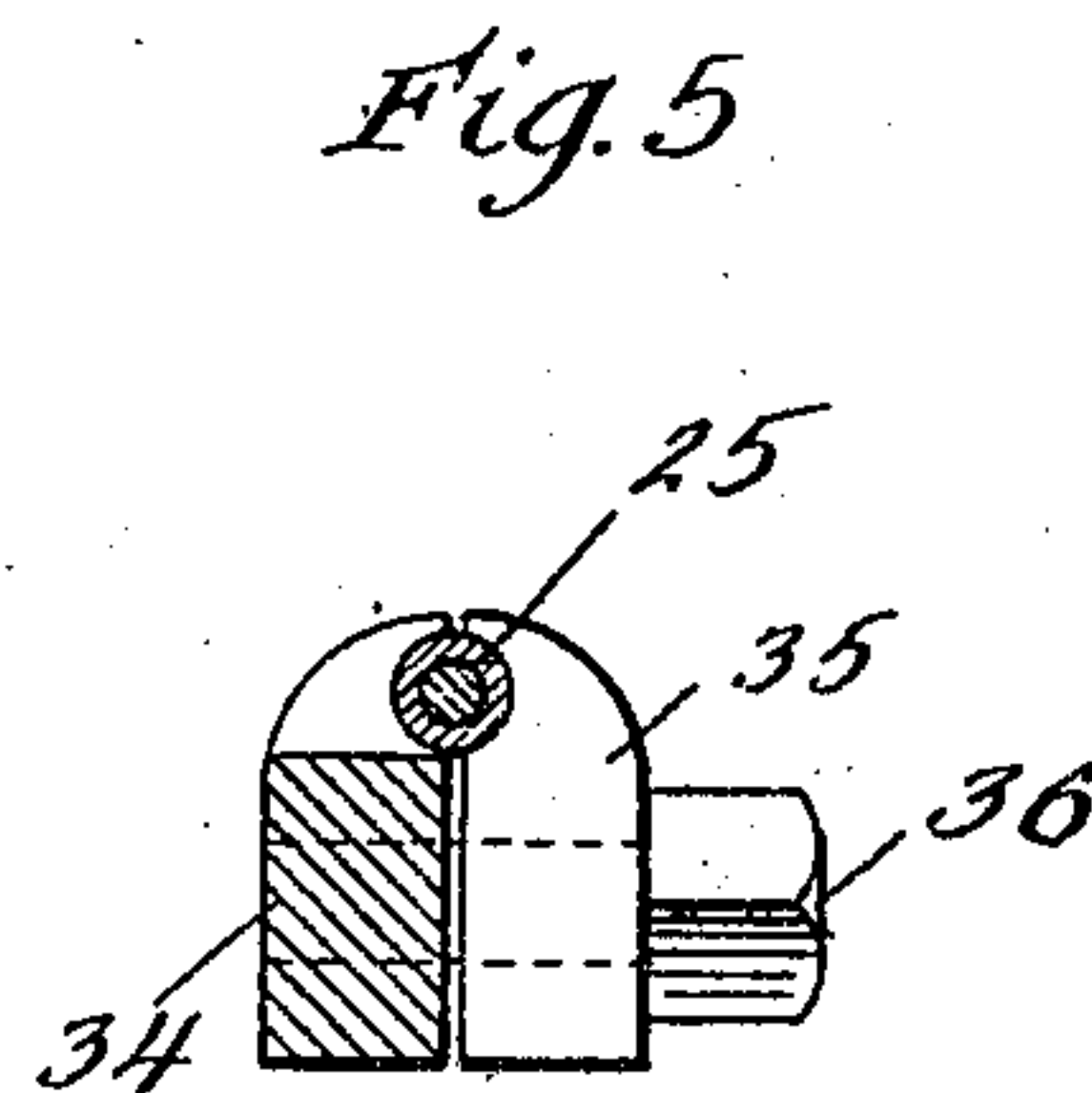
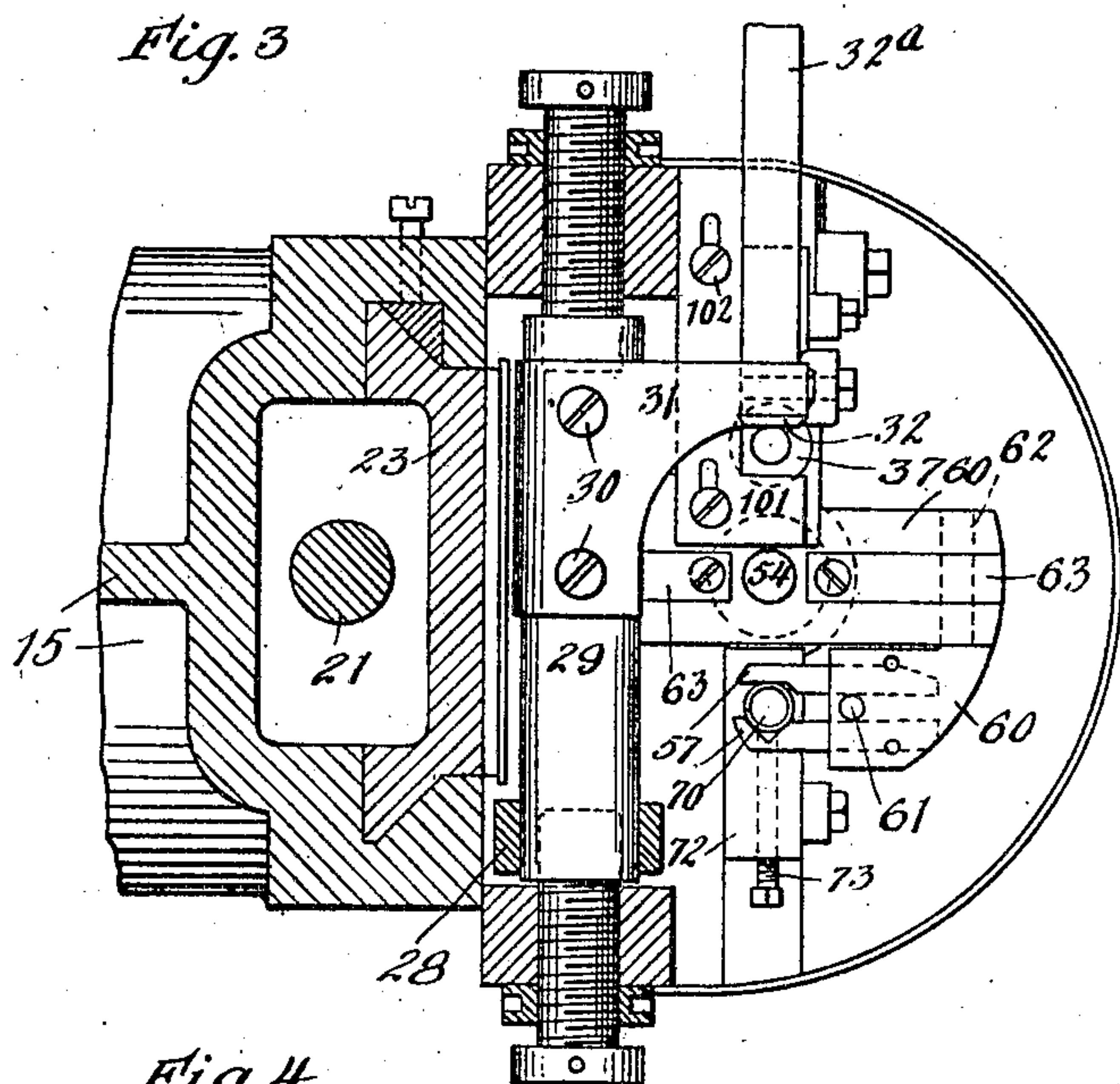
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8 SHEETS—SHEET 2.



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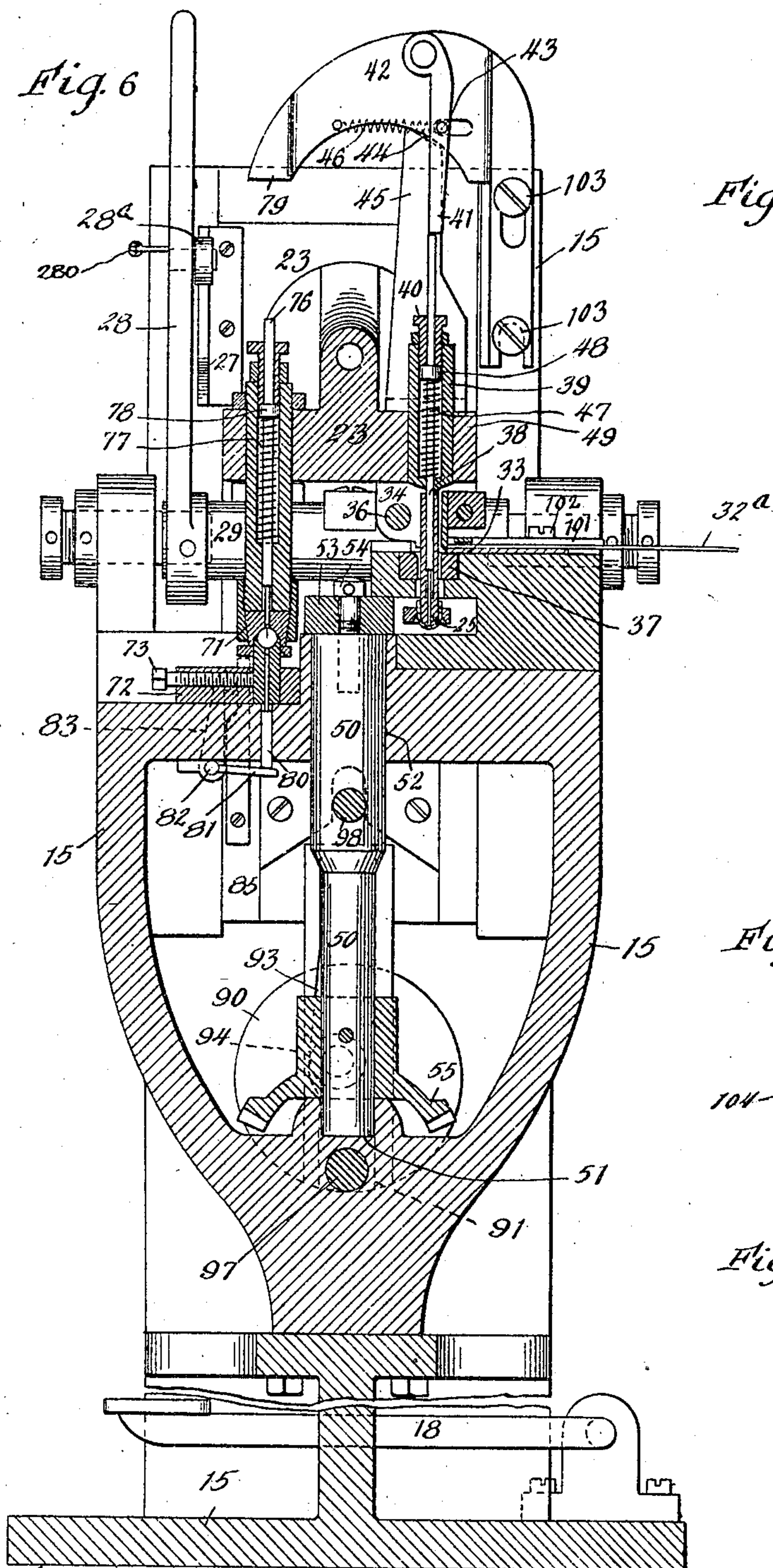
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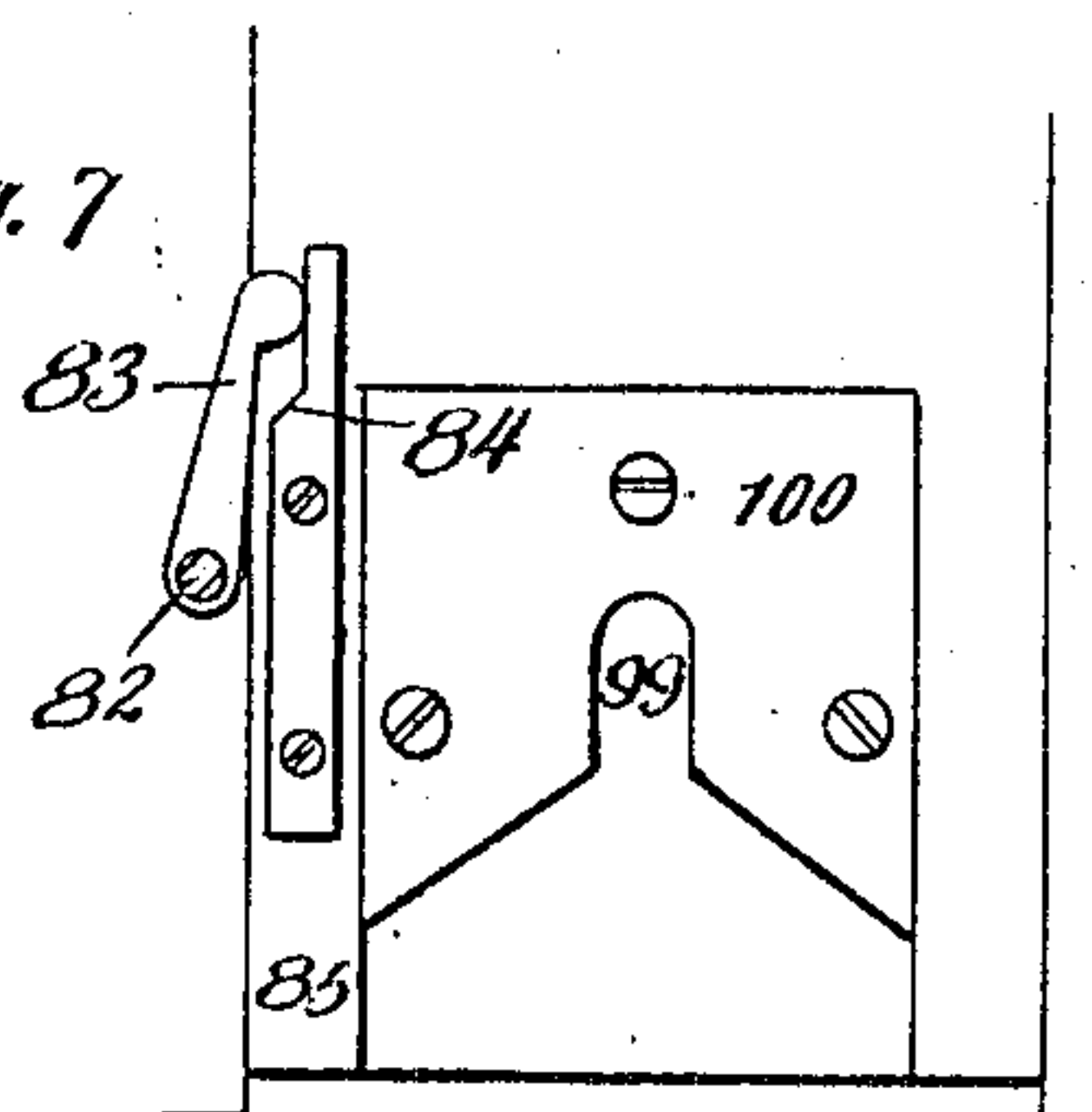
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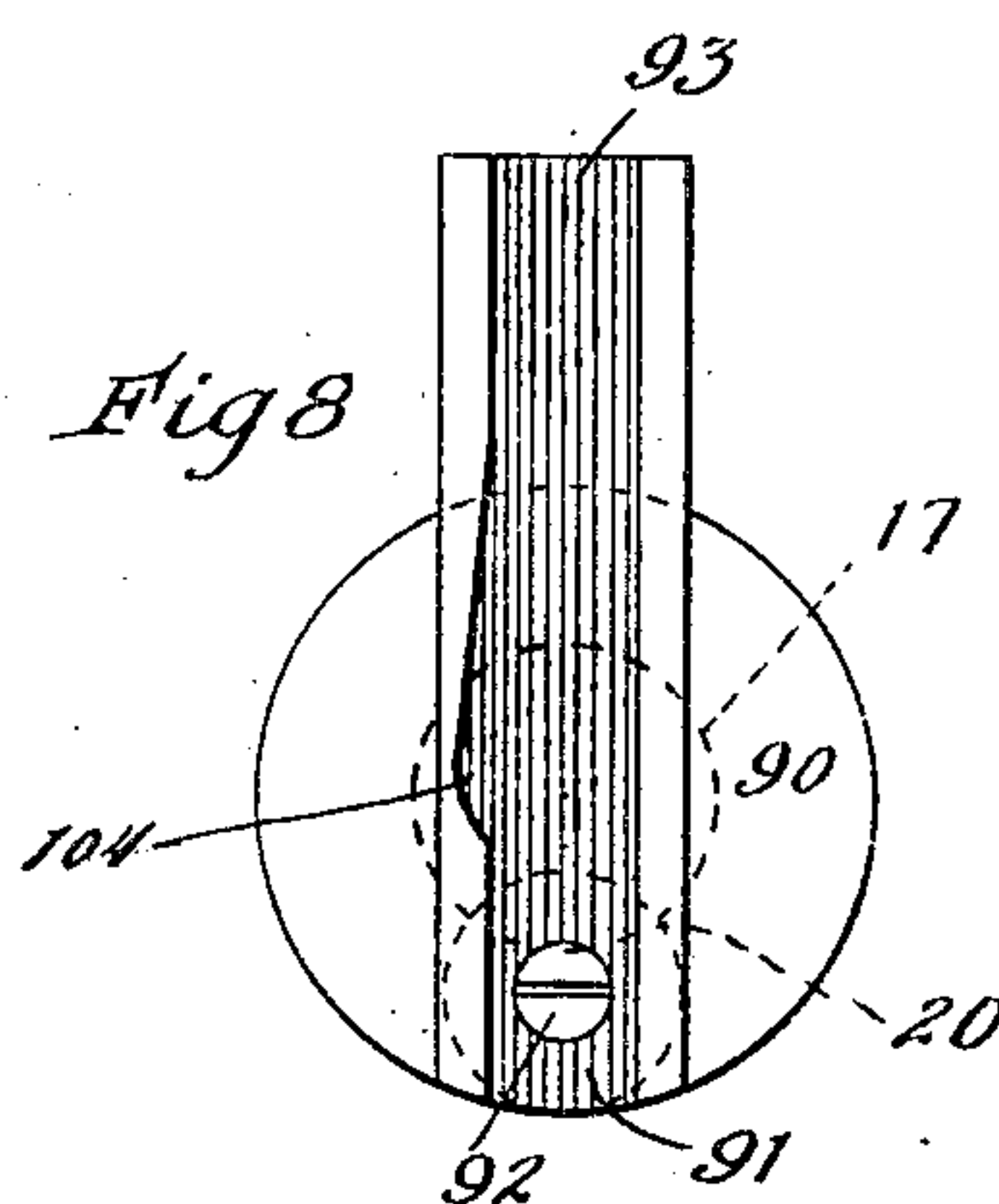
3 SHEETS—SHEET 3.



*Fig. 7*



*Fig. 8*





# UNITED STATES PATENT OFFICE.

ALLEN JOHNSTON, OF OTTUMWA, IOWA.

## MACHINE FOR MAKING BALLS FROM SHEET METAL.

No. 837,573.

Specification of Letters Patent.

Patented Dec. 4, 1906.

Application filed February 13, 1905. Serial No. 245,360.

*To all whom it may concern:*

Be it known that I, ALLEN JOHNSTON, a citizen of the United States, residing in Ottumwa, in the county of Wapello and State of Iowa, have invented a new and useful Improvement in Machines for Making Balls from Sheet Metal, of which the following is a specification.

This invention relates to machines for forming balls from sheet metal and is adapted to form the metal from the flat into spherical form, and it is an improvement upon the machine set forth in the patent to me, No. 756,965, dated April 12, 1904. The machine is adapted, like the machine of the patent, to form the ball completely without any handling; and the invention consists in the mechanism fully set forth in the accompanying drawings and described herein.

In the accompanying drawings, Figure 1 is a plan view, and Fig. 2 is a vertical section, of my improved machine. Figs. 3 and 4 are horizontal sections on the lines 3-3 and 4-4, respectively, of Fig. 2. Fig. 5 is a detail section on the line 5-5 of Fig. 2. Fig. 6 is a vertical section at right angles to Fig. 2. Fig. 7 is a partial enlarged front elevation. Fig. 8 is a detail view, and Fig. 9 is an enlarged section of the dies employed in the closing operation.

In the drawings, 15 represents the frame of the machine, 16 the drive-pulley, and 17 the main shaft, on which the pulley is loosely mounted, to which it is adapted to be clutched at will. As any suitable form of clutch may be used, I do not deem it necessary to describe the one which is partially shown and which is operated by a foot-treadle 18. The shaft 17 has a boss on its inner end, upon which is formed an eccentrically-located wrist-pin 20. From this pin 20 a pitman 21 extends to a second wrist-pin 22, secured in the upper end of the pitman and entered in a vertically-moving head 23, traveling between the ways 24, formed on the frame. The head 23 has formed upon it a cam-surface 27, whereby an arm 28 on the end of a rock-shaft 29 and carrying a roller 28<sup>a</sup> may be actuated in one direction at each stroke imparted to the head by the mechanism described. The shaft 29 extends horizontally across the machine and is supported at its ends by screws mounted in stationary bearings, and between the bearings a horizontally-extending arm 31 is attached to the shaft by screws 30, and this arm carries a

knife 32. The strip 32<sup>a</sup>, from which the blanks are cut, is fed into the machine at right angles to this knife and up to the stop or gage 101 and is severed by the knife with the assistance of a stationary knife 33 below the strip at each operation of the rock-shaft. The shaft is rocked back after each operation by the means of a spring 280 or other suitable means.

The head 23 carries a punch 25, and this punch is secured to the head between two clamping-jaws 34 and 35, the jaw 34 being integral with the head and the jaw 35 being united to the jaw 34 by the bolt 36. This method of supporting the punch renders it easy to remove for repairs and to replace it. The punch when carried down by the head forces the blank severed by the knives 32 33 through the hollow die 37 and in so doing forms it into the cup shape shown in the case of the blank in Fig. 6. The punch also carries the cupped blank down beyond the die and delivers it to one of the holders, hereinafter described, by which it is transferred to the closing-dies. Lest the cupped blank should stick to the punch instead of being held by the holder when the punch retracts, I provide means for stripping it from the punch. In the construction I have adopted for this purpose the removal is effected by means acting on the interior of the cupped blank rather than upon its exterior. My motive in this change from the old way of stripping is to avoid the injury to the blank and especially to the points thereof, which is apt to attend the use of exteriorly-acting strippers—as, for instance, those shown in my said patent—such injury usually resulting in an imperfect ball. The preferred stripping means consists of a movable rod 38, passing vertically through the punch and also through a cylindrical guide 39, secured in the head 23. The rod also extends up above the top of cylinder 39 and through the plug 40, which closes the top of the cylinder. The upper end of the rod is adapted to contact with a stop 41, hinged to the overhanging arm 42, supported upon the main frame and normally positioned directly over the rod. This contact continues long enough to insure the detaching of the blank, and the stop is then forced to one side by the contact with its pin 43 of the cam-surface 44 on an upstanding arm 45, attached to the head 23. A spring returns the stop to its normal position after the cam-surface descends. Within the



cylinder 39 the detaching-rod 38 is encircled by a spring 47, as plainly seen at Fig. 6, and the rod is also provided with a collar 48, whereby the spring will be compressed when the rod descends, so that the rod will be forced back to its normal position in case it does not return with the cylinder. This collar also serves as a means of forcing the rod down with the movement of the head. The cylinder 39 is removably held to the head 23 by the plate 49 and bolt 49<sup>a</sup>. Below the head is an intermittently-turning vertical shaft 50, supported in bearings 51 and 52, carrying at its upper end a head 53, bolted to the shaft by the bolt 54, and at its lower end a bevel-gear 55. Upon the head 53 at each side of the shaft 50 is a pivotally-supported plate 56, upon which are mounted holders for the cupped blanks. These holders consist of parallel bars or jaws 57, preferably shaped to conform somewhat to the exterior of the cupped blank, as will be understood from Figs. 3 and 4, and provided with springs 58 and stops 59. The springs act outwardly, so that the ends of the jaws 57 between which the cupped blank is located are caused to clamp the blank. The jaws are confined upon the plates 56 by top plates 60 and bolts 61. The plates 56 are supported upon the ends of pivots 62, mounted in the opposite ends of the head 53, so that the holders 57 may be tipped and carry the blank to a lower plane than that in which they receive the cupped blanks, as will be understood later on. Springs 63 bear upon flattened portions 64 of the pivots 62 and return the holders to their horizontal position at the completion of each ball.

After the cupped blank has been positioned in one of the holders the shaft 50 is turned a half-revolution by mechanism presently to be described and in so doing carries the cupped blank into position for the operation upon it of the closing-dies. These closing-dies consist of a stationary lower die 70 and a vertically-movable upper die 71. The stationary die is supported in a plate 72 and locked therein by a screw 73. The stationary die is located in a plane below that of the cupping mechanism and below that of the transfer devices, as plainly shown at Fig. 6, so it may not interfere with the latter. The movable die is fitted in a shell 74, threaded upon a cylinder 75, rigidly secured in the head 23. The die is adapted to set over the upper end of the lower die, and also when it descends its bottom comes in contact with the holder containing the cupped blank and depresses such holder upon its pivot 62 from the plane shown at the right of Fig. 6 to that shown at the left, and in this descending motion the top of the cupped blank is closed.

At each descent of the head 23 a blank is cut off and formed into cup shape, as described, and at the same time the last previ-

ously-cupped blank is closed into ball form, and when the head rises it not only carries the punch 25 upward, so as to release the cupped blank just formed, but it also carries up the upper die, so as to release the formed ball. The operation of freeing the cupped blank from the punch 25 has already been described, and both the upper and lower dies are preferably provided with means for dislodging therefrom the completed ball. In the case of the upper die an ejecting-rod 76 passes down through the cylinder 75 and die 71 and is provided with a spring 77 and collar 78, similar to those used upon the ejector 38 of the cupping-punch. The ejector 76 is operated as the head 23 nears the top of its stroke by its contact with the end 79 of the overhanging arm 42, and the lower die is provided with an ejector 80, passing up through its center and operated by an arm 81 upon a horizontal shaft 82, said shaft being rocked by an arm 83, mounted thereon, which is engaged by a cam-surface 84, secured upon the depending part 85 of the head 23, the construction being such that the upward movement of the head 23 will rock shaft 82, and thereby force the arm 81 to lift the ejector 80.

The shaft 50 is given its intermittent motion by the following means: Attached to the wrist-pin 20 is a plate 90, and attached to the plate 90 is a second and larger plate 91, both being attached to the wrist-pin 20 by the screw 92, so as to be rigid therewith. The plate 91 is provided with a cam-groove 93, in which the roller 94, secured upon a crank-arm 95, works. Said arm 95 is in one piece with or attached to a bevel-pinion 96 upon a horizontal shaft 97, located in a plane below that of shaft 17. The bevel-pinion 96 meshes with the gear 55 already mentioned. This mechanism is very similar to that shown in my patent for driving the shaft 50 and operates in substantially the same way. It is adapted to convert the continuous motion of shaft 17 into an intermittent motion by the shaft 50 and to allow the intervals of rest by the latter necessary for the cupping and closing operations, and the motion given to the shaft 50 is also variable, starting slowly and increasing in speed and then diminishing gradually, substantially as fully explained in my patent.

The shaft is locked during its period of rest and for this purpose is provided with a pin 98, extending through the shaft with its ends projecting in opposite directions. The points of the pin are adapted to enter the notch 99 in the plate 100, attached to the depending part of the head 23. The plate is beveled at each side of said notch in order to guide the points of the pin into the notch. To secure the pin in the shaft, it is provided with a shoulder abutting against the shaft upon one side and with a threaded nut at the opposite side.



A gage 101 is shown at Fig. 3, against which the stock is positioned for the cutting operation, and this gage is adjustably held by the screws 102. The overhanging arm 5 42 is vertically adjustable, being attached to the main frame by screws 103 passing through elongated slots in the arm.

In the descent of head 23 the pins 98 should enter the notch 99 in plate 100 at 10 about the time the roller 94 reaches that part of cam-slot 93 having the belly or enlargement 104, and as this enlargement is very near the axial line of the shaft 17 it will be seen that the shaft will be able to 15 turn some distance before contact takes place between the roller 94 and the bellied surface of the cam-slot. During this interval in which the shaft 50 is stationary the head 23 completes its stroke and closes the ball 20 and also ascends far enough to free the pin 98 from the notch 99.

I claim—

1. The combination with means for forming the blank into cup shape, and means for 25 closing the open end of the cupped blank located in a plane below that of the cupping means, of a depressible holder essentially such as described, receiving the cupped blank from the cupping means and transfer- 30 ring it to the closing means.

2. The combination with means for forming the blank into cup shape, and means for closing the open end of the cupped blank, 35 of a depressible spring-supported holder essentially such as described, receiving the cupped blank from the cupping means and transferring it to the closing means.

3. The combination with means for forming the blank into cup shape, and means for 40 closing the open end of the cupped blank, of a spring-clamp receiving the cupped blank from the cupping means and transferring it to the closing means, the clamp being pivotally supported so it is adapted to deliver 45 the blank at a lower level than that in which it receives it.

4. The combination with means for forming the blank into cup shape, and means for closing the open end of the cupped blank, 50 of a depressible spring-holder essentially such as described, receiving the cupped blank from the cupping means and transferring it to the closing means, and a movable support for said holder.

55 5. The combination with means for forming the blank into cup shape, and means for closing the open end of the cupped blank, of a vertically-movable spring-clamp receiving the cupped blank from the cupping 60 means and transferring it to the closing means, and a movable support for said clamp.

6. The combination with a stationarily located means for cupping the blank, and 65 means for transferring the cupped blank, of

a stationary lower die receiving the cupped blank from the transferring means, and located below the path of the same, and a movable die coacting with said lower die in closing the open end of the blank. 70

7. The combination with means for forming the blank into cup shape, and means for closing the open end of the cupped blank, of a holder for transferring the cupped blank, 75 said holder being capable of moving vertically in delivering the blank to the closing means.

8. The combination with means for forming the blank into cup shape, and means for closing the open end of the cupped blank, of a 80 holder for transferring the cupped blank, said holder being capable of moving vertically in delivering the blank to the closing means, and a movable support to which the holder is pivoted. 85

9. The combination with means for forming the blank into cup shape, a holder for transferring the cupped blank to the closing means, and closing means embracing a stationary lower die, the holder being located in 90 a plane above that of said die, and depressible so it may deposit the blank in said die.

10. In a machine for forming balls from square blanks of sheet metal, mechanism for severing the blank from the sheet of metal 95 and acting to deliver the same to the punch and die, in combination with a hollow punch and coöperating die for cupping the blank, means for removing the formed cup from the punch acting against the interior of the cup, 100 and means for closing the cupped blank and forming a sphere therefrom.

11. In a machine for making balls from square sheet-metal blanks, means for cup- 105 ping the blanks consisting of a die through which the blank is forced, a hollow punch carrying the blank through said die, and a stripper acting upon the interior of the cup for removing it from the punch, in combination with means for closing the cupped blank 110 and forming a sphere therefrom.

12. The machine for forming balls from square blanks of sheet metal embodying a cupping die and punch, and upper and lower closing-dies, said punch and each of said clos- 115 ing-dies having ejectors moving through them and acting upon the blank and ball.

13. The machine for forming balls from sheet-metal blanks embodying a die and punch, provided with an ejector passing 120 through the punch and acting on the interior of the blank, and upper and lower closing-dies each provided with an interiorly-located ejector acting on the outside of the ball.

14. The machine for forming balls from 125 sheet-metal blanks, embodying a die and punch for cupping the blank and dies for closing the cupped blank, said punch and said closing-dies being each provided with its own ejector, in combination with means for trans- 130



ferring the cupped blank from the cupping die and punch to the closing-dies.

15. In a machine for making balls from sheet metal, the combination of a die through  
5 which the blank is forced, a hollow punch carrying the blank through said die, a stripper for removing the cupped blank operating thereon from within the punch and a  
spring-clamp receiving the cupped blank  
10 from said stripper.

16. In a machine for making balls from sheet metal, the combination of a die through

which the blank is forced, a hollow punch carrying the blank through said die, a stripper for removing the cupped blank operating  
15 thereon from within the punch, a spring-clamp receiving the cupped blank from said stripper, a transferring device on which said clamp is supported, and closing-dies to which the cupped blank is transferred.

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Witnesses:

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