

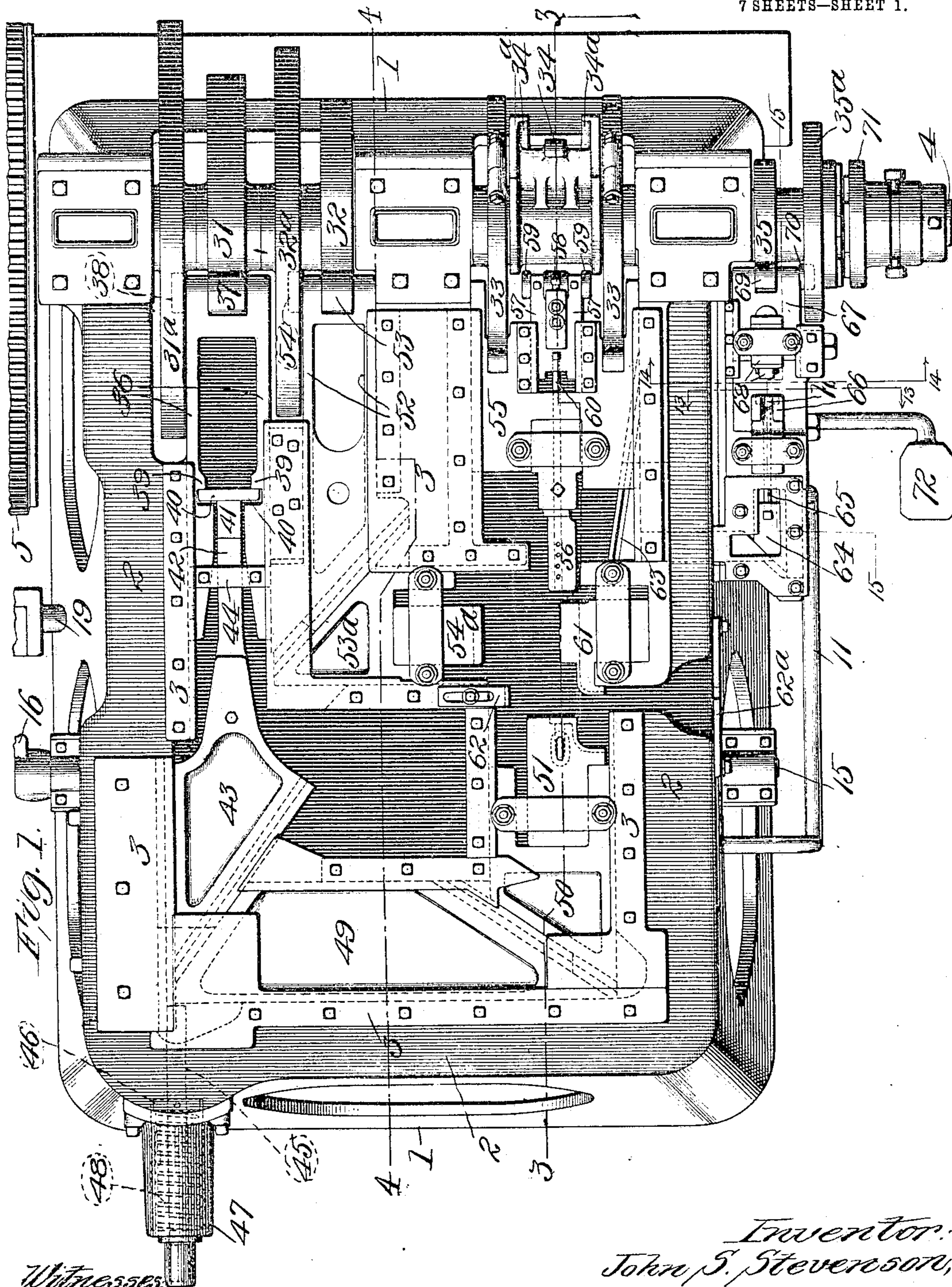
No. 787,128.

PATENTED APR. 11, 1905.

J. S. STEVENSON.
LADDER HANDLE FORMING MACHINE.

APPLICATION FILED AUG. 2, 1902.

7 SHEETS—SHEET 1.



Witnesses:
Wm. H. Scott,
G. A. Pennington.

Inventor:
John S. Stevenson,
by Bakerwell & Cornwall
Attys

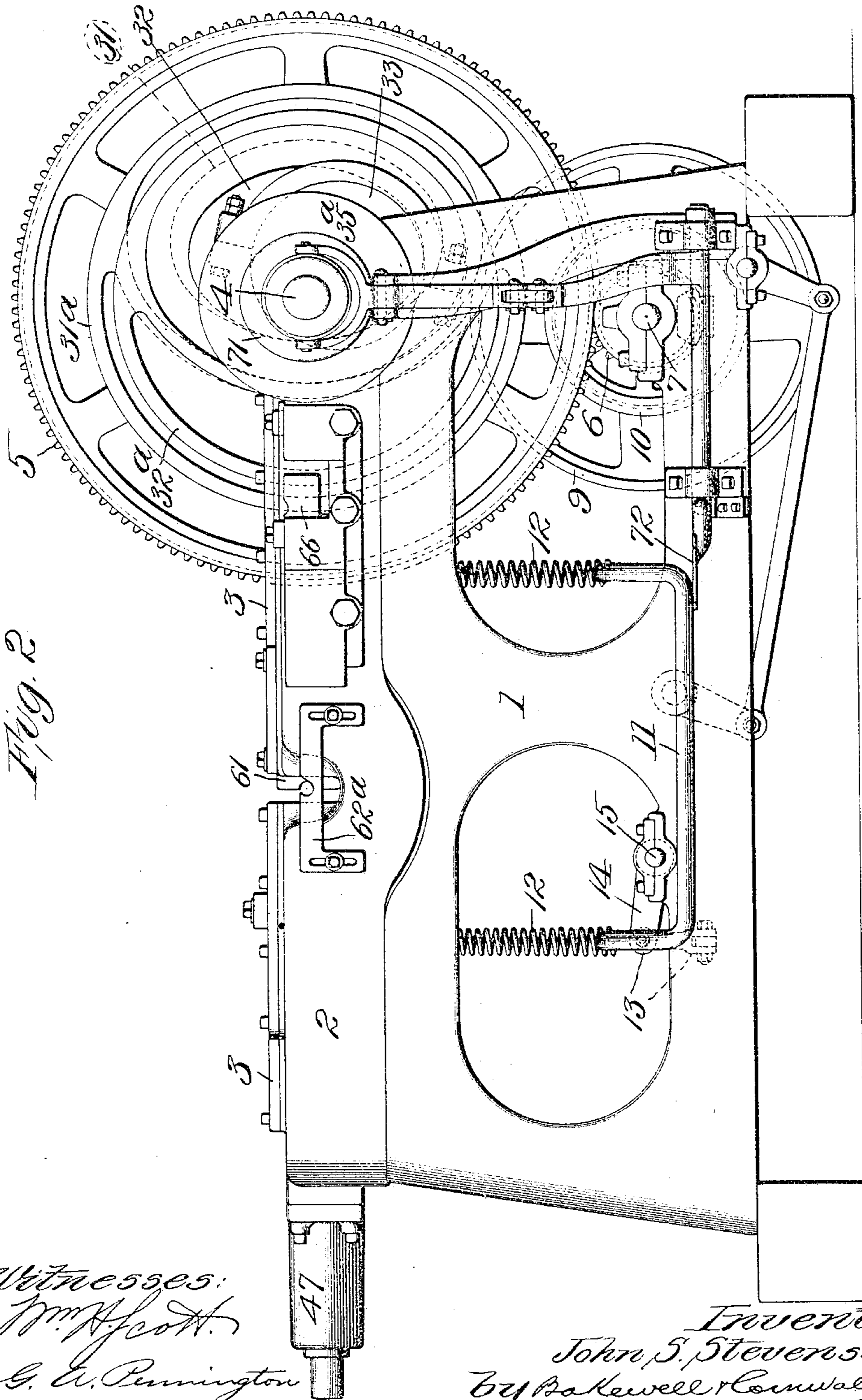
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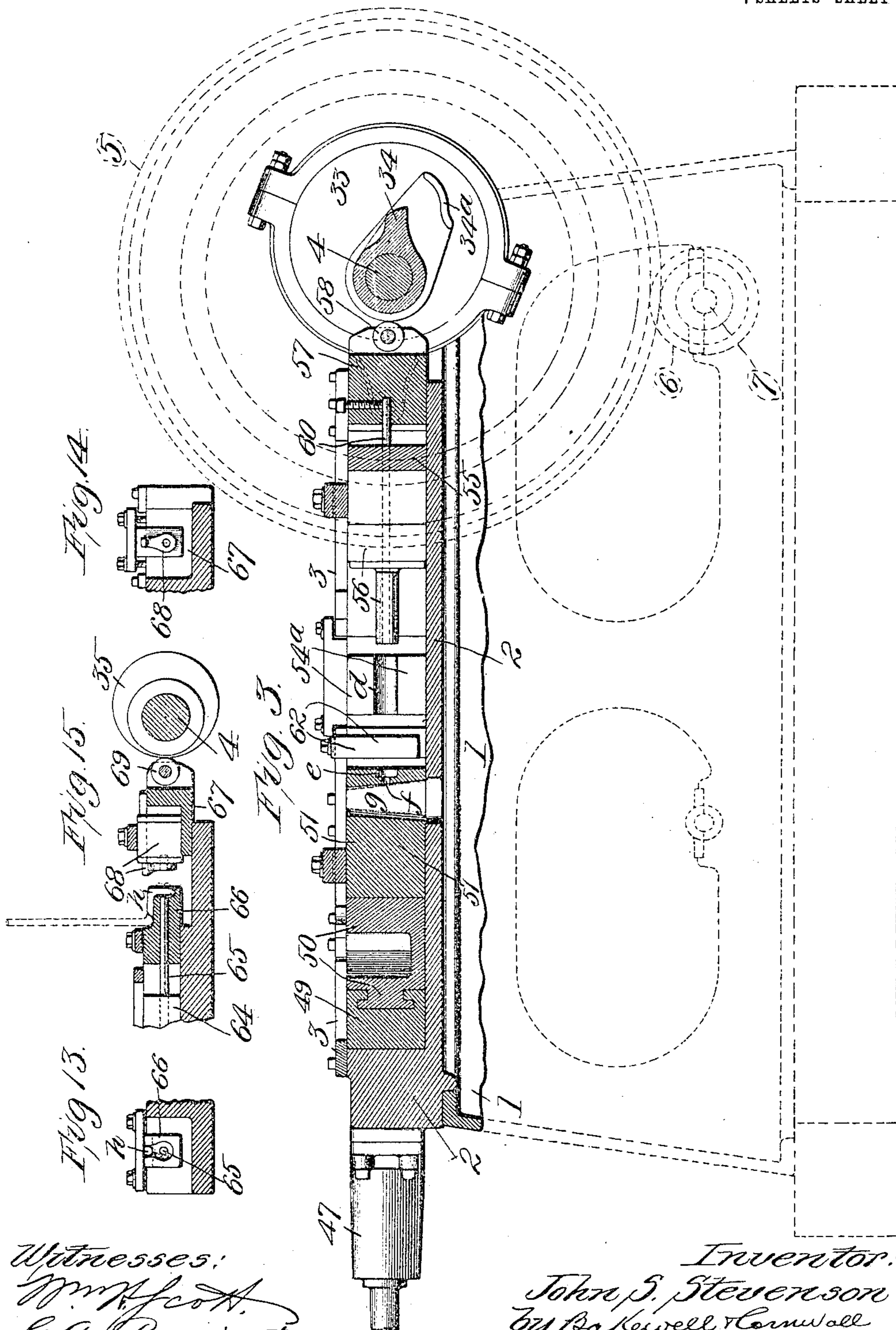
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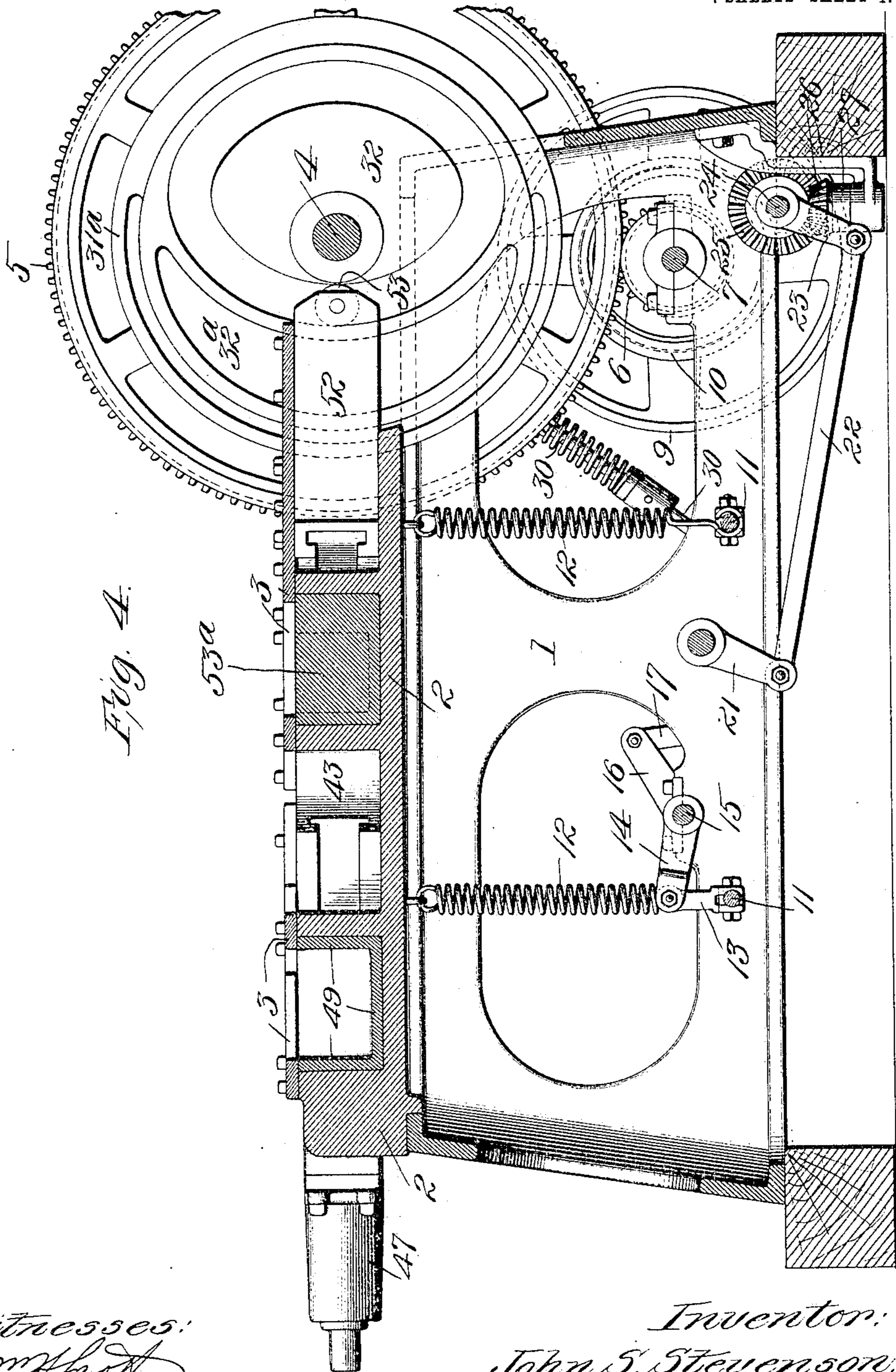
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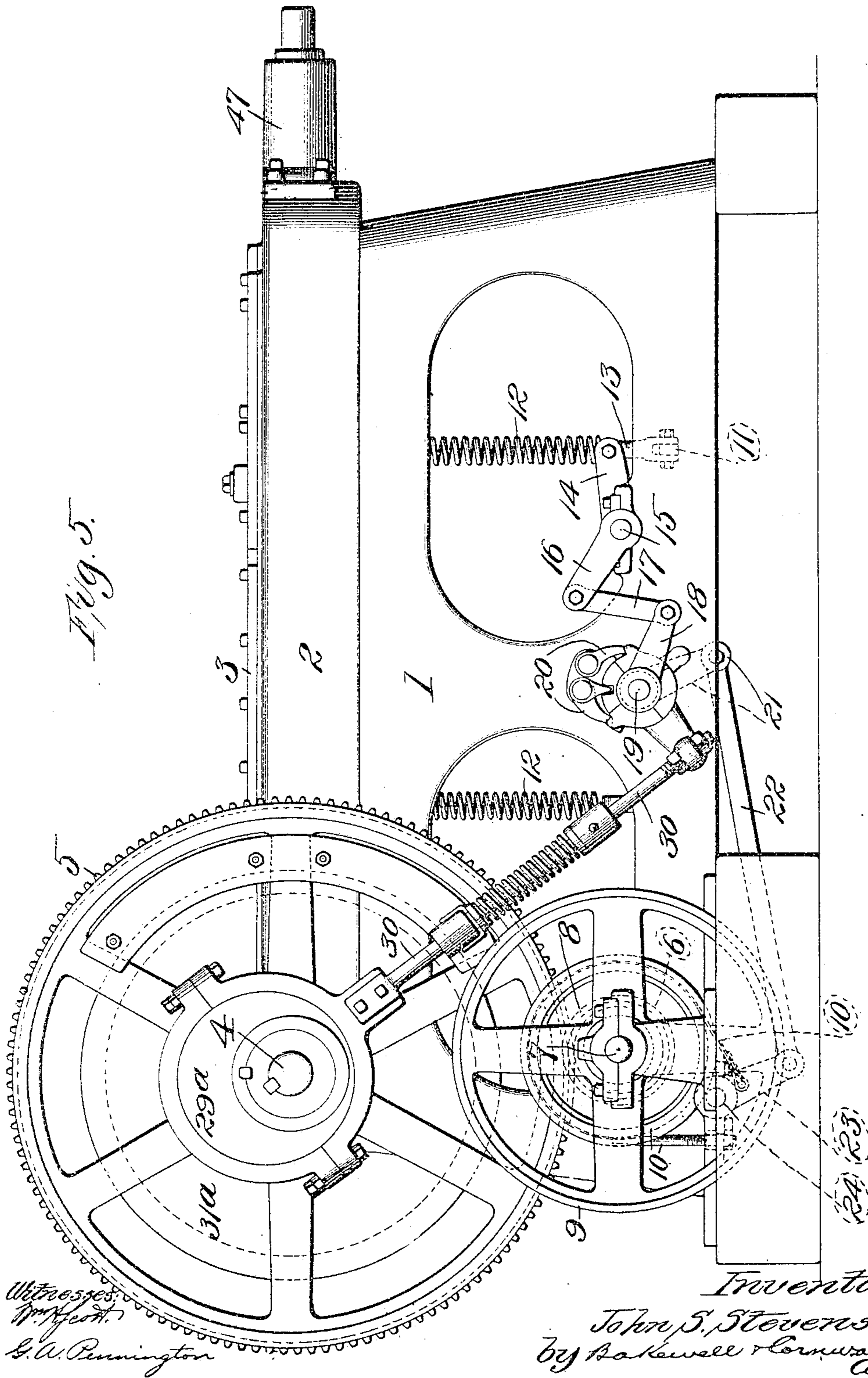
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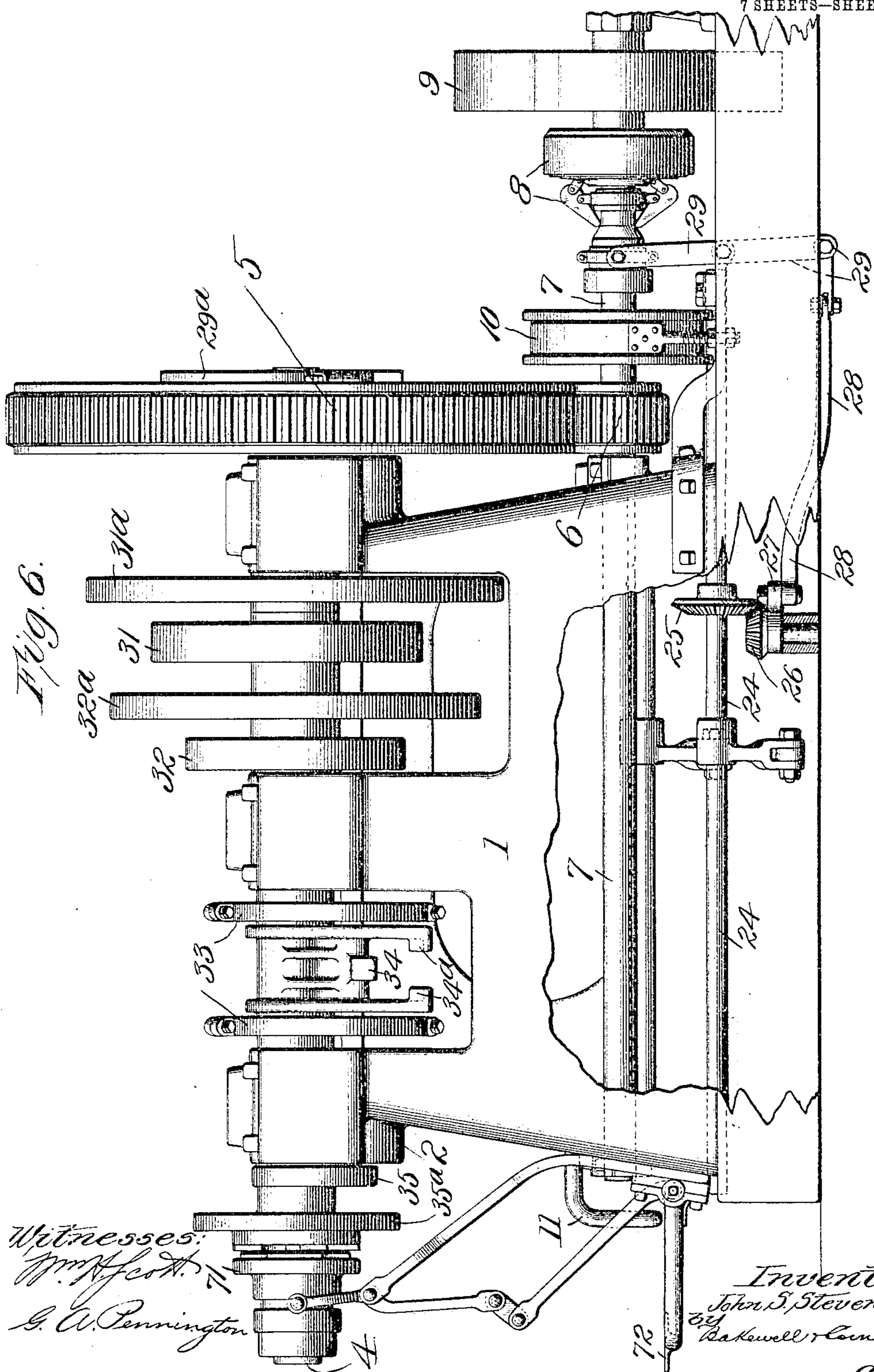
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7 SHEETS—SHEET 6.



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7 SHEETS—SHEET 7.

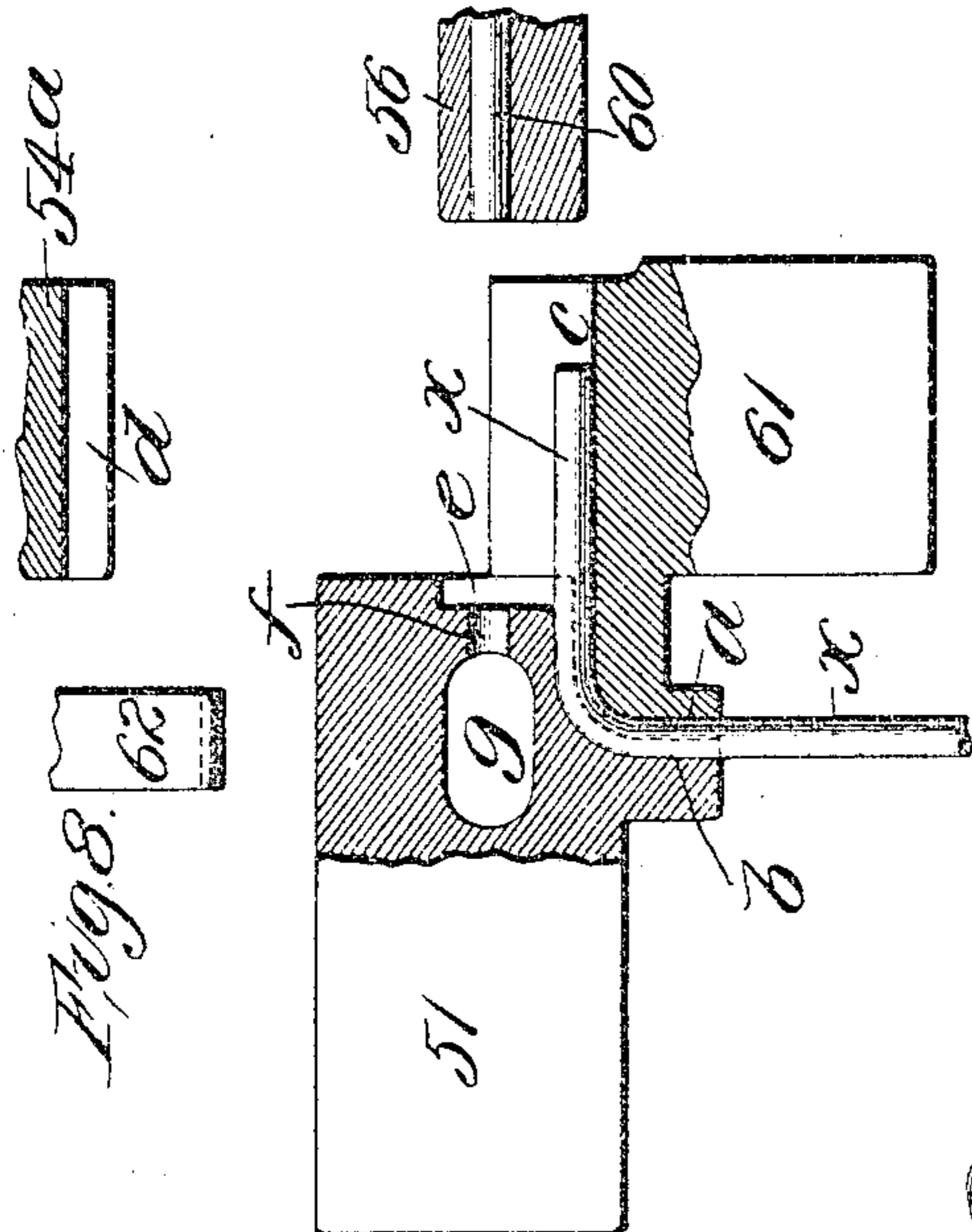


Fig. 8.

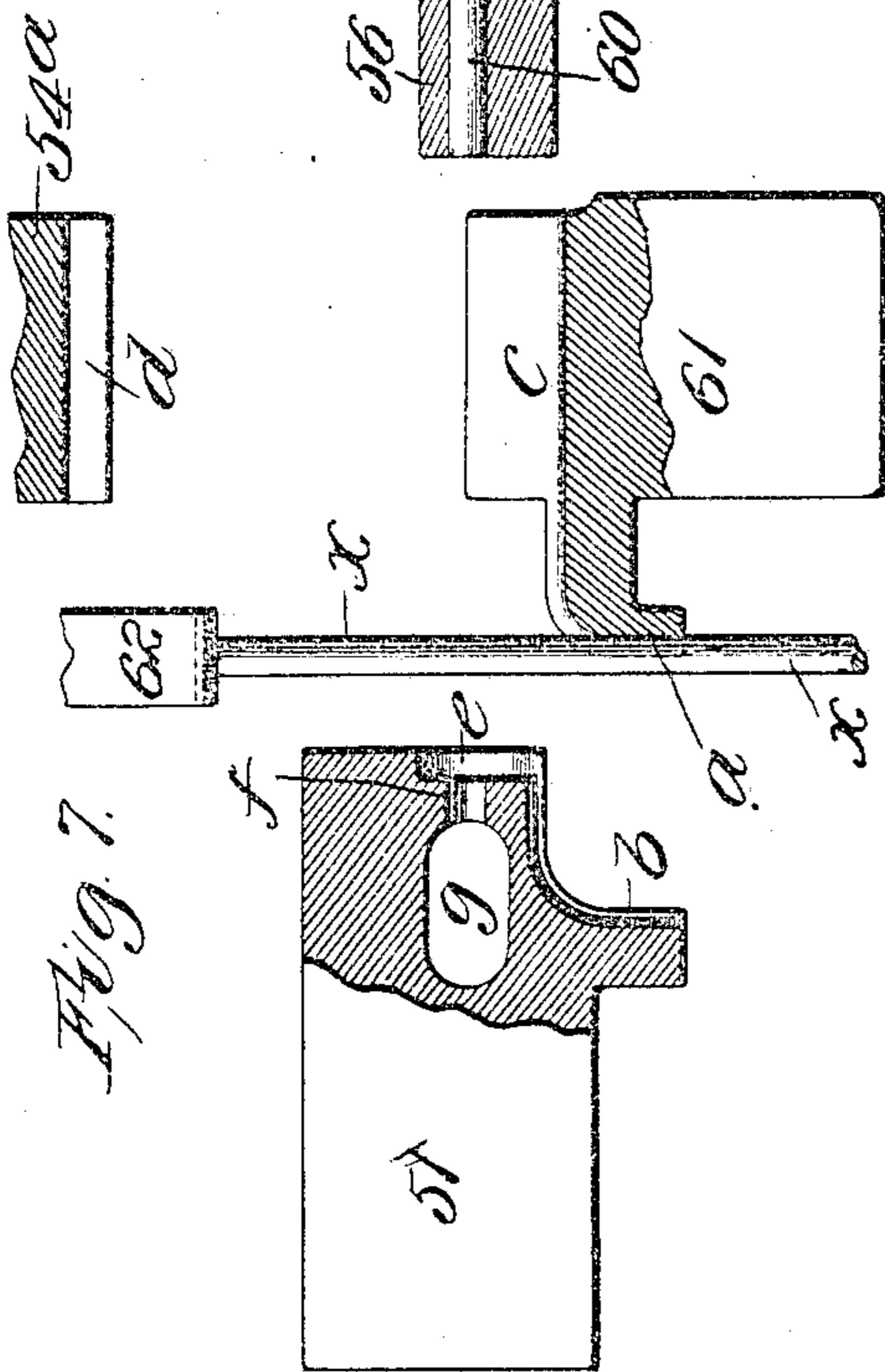


Fig. 7.

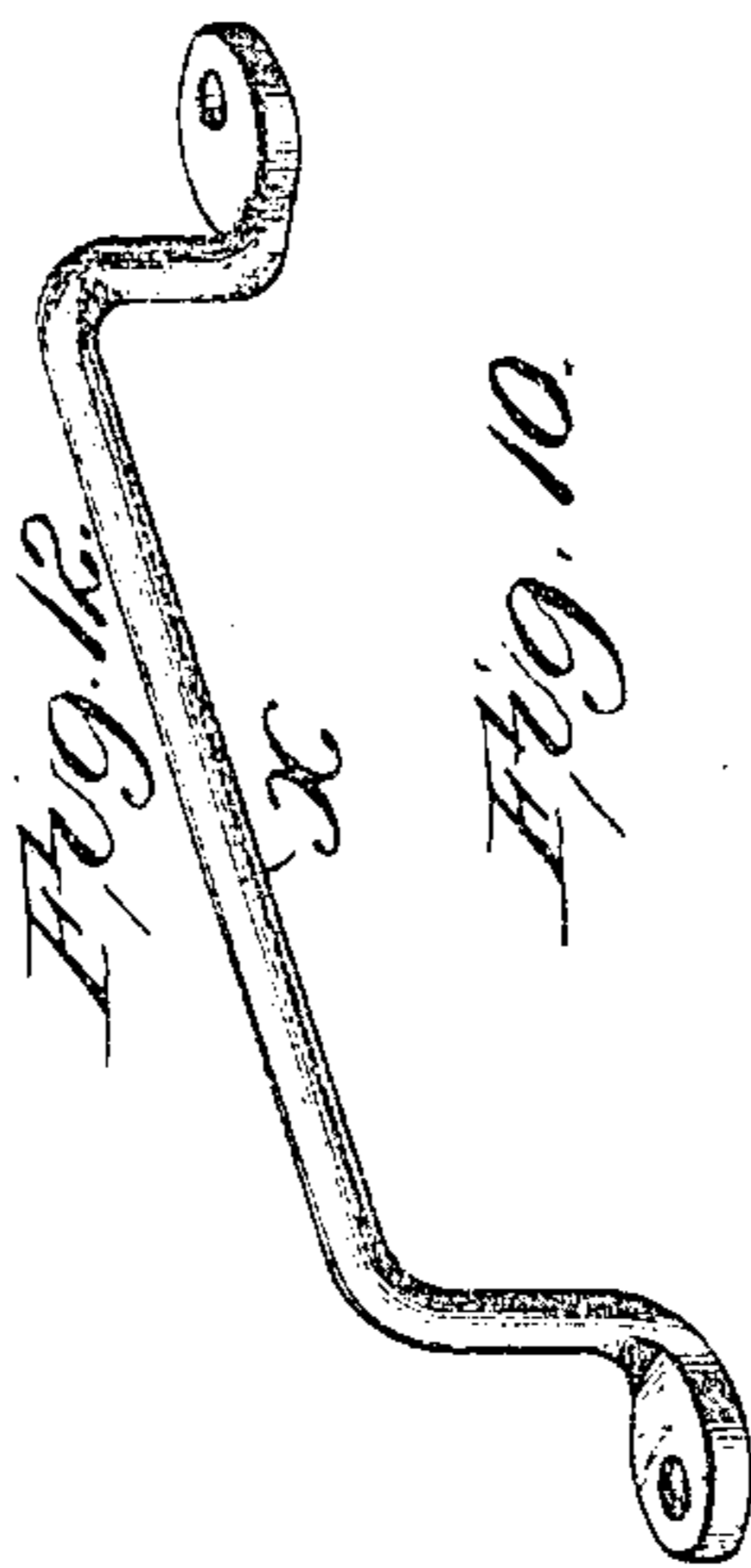


Fig. 12.

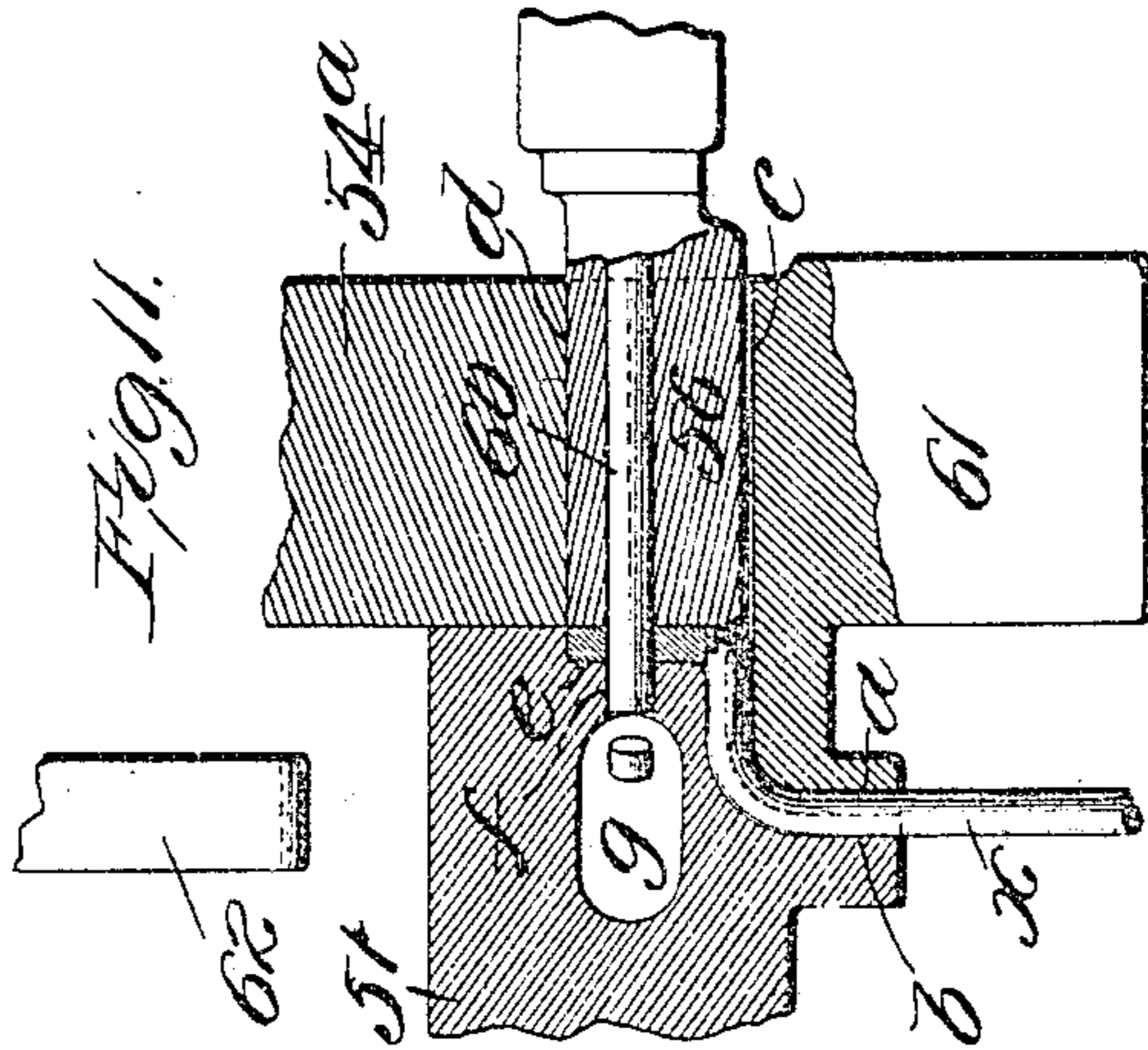


Fig. 11.

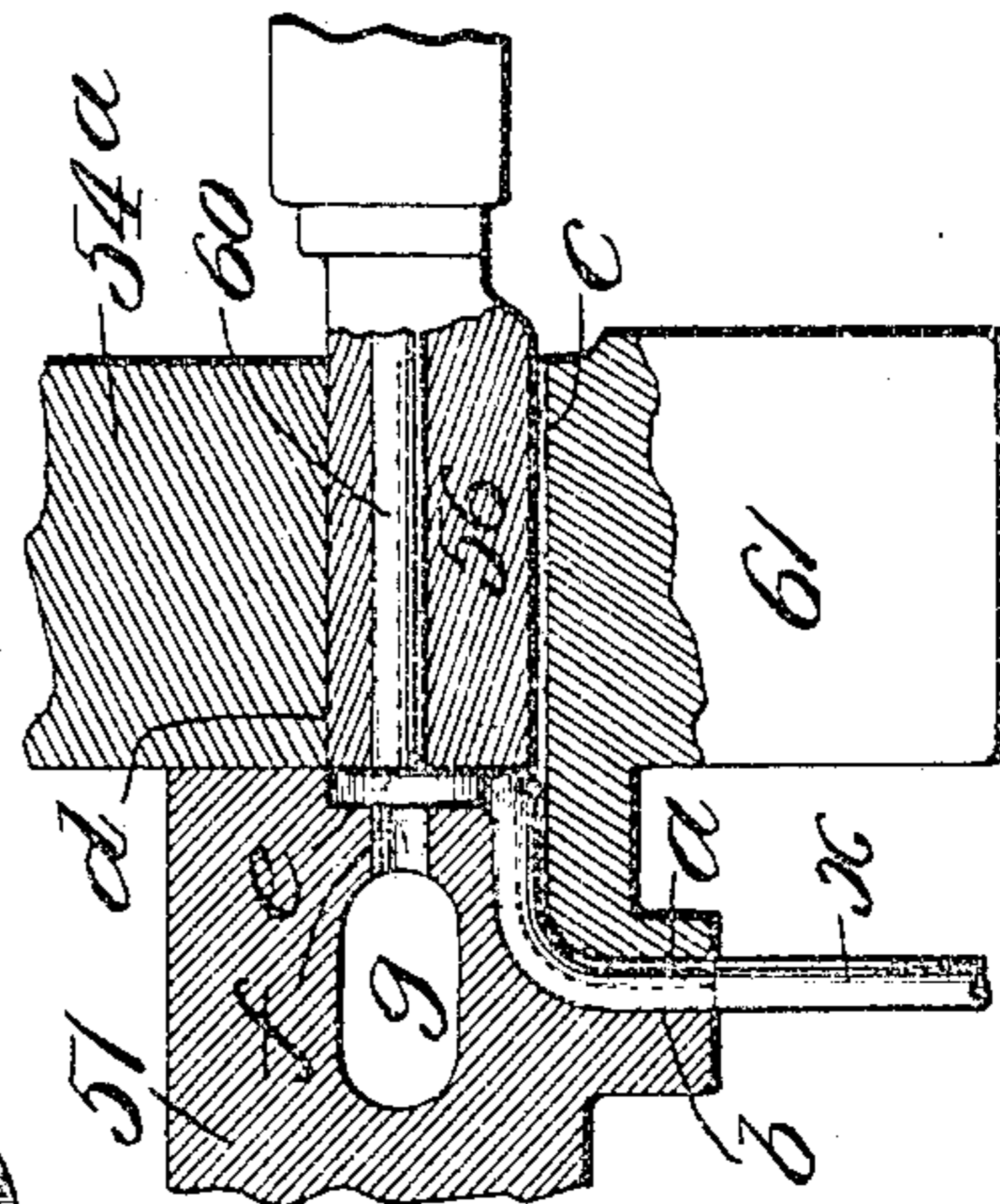


Fig. 10.

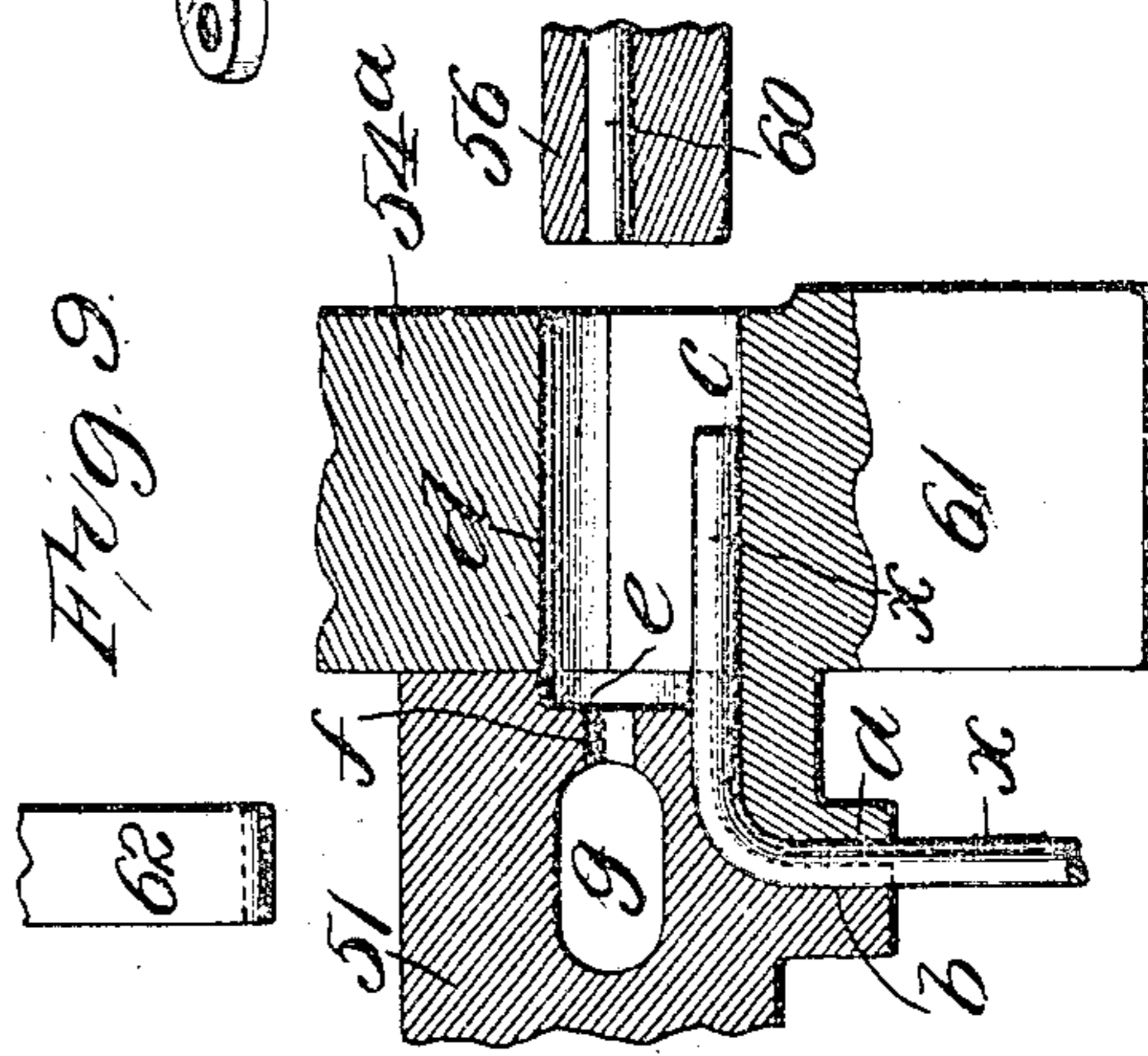


Fig. 9.

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UNITED STATES PATENT OFFICE.

JOHN S. STEVENSON, OF DETROIT, MICHIGAN, ASSIGNOR TO AMERICAN CAR & FOUNDRY COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF NEW JERSEY.

LADDER-HANDLE-FORMING MACHINE.

SPECIFICATION forming part of Letters Patent No. 787,128, dated April 11, 1905.

Application filed August 2, 1902. Serial No. 118,096.

To all whom it may concern:

Be it known that I, JOHN S. STEVENSON, a citizen of the United States, residing at Detroit, Wayne county, Michigan, have invented a certain new and useful Improvement in Ladder-Handle-Forming Machines, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a top plan view of my improved ladder-handle-forming machine. Fig. 2 is a front elevational view. Fig. 3 is a sectional view on line 3 3, Fig. 1. Fig. 4 is a sectional view on line 4 4, Fig. 1. Fig. 5 is a rear elevational view. Fig. 6 is a side elevational view illustrating the power-shaft at the right-hand side of the machine. Figs. 7, 8, 9, 10, and 11 are diagrammatic views illustrating the action of the several dies in forming the ladder-handle. Fig. 12 is a detail view showing the ladder-handle as formed upon my improved machine; and Figs. 13, 14, and 15 are detail sectional views on the lines 13 13, 14 14, and 15 15, respectively, of Fig. 1.

This invention relates to a new and useful improvement in machines for forming ladder-handles of that character which are extensively used upon railway rolling-stock to enable the train crew to climb up or down the sides or ends of cars. These "ladder-handles," as they are termed, have heretofore been formed in the blacksmith-shop or by the use of a forge-machine, but in any event the operations have been tedious and expensive.

It is the object of my invention to produce a machine which will produce ladder-handles rapidly and at small expense. In operation the rods from which the handles are formed are first heated in an appropriate furnace, preferably located near the machine, and which furnace has a capacity for a number of such rods. A helper is preferably employed in addition to the operator who feeds the rods to my improved machine. This helper attends to the heating of the ends of the rods,

which are previously cut to the proper length, and when the rods are heated sufficiently the operator places the heated end in the machine and at one stroke the heated end is bent and upset to form the perforated securing-eye of the ladder-handle. The handle with its end so formed is removed from the machine and subsequently the opposite or straight end of the rod which has been operated upon is heated and treated in a similar manner, the two operations, one for each end of the handle, forming a completed handle ready for use.

The machine shown in the accompanying drawings is provided with means whereby the operator can have the machine make a stroke to form one end of the handle, after which the machine automatically stops to await the introduction of another heated rod. However, under favorable conditions the machine can be continuously operated, the rods being fed thereto in rapid succession, so that at every operation of the machine one end of the handle is formed, in which event the capacity of the machine is limited only by the ability of the operator to feed the rods thereto.

My invention consists in the construction, arrangement, and combination of the several parts, all as will hereinafter be described, and afterward pointed out in the claims.

In the drawings, 1 indicates the frame of the machine, which is preferably a casting appropriately shaped and of such height as to place the bed within convenient reach of the operator.

2 indicates the bed of the machine, which is also preferably a casting, said bed being provided with ways in which are slidingly mounted plungers for coöperating with and driving the several dies. These plungers are held in position by straps 3, bolted or otherwise secured to the bed for well-understood purposes.

4 indicates the driving-shaft, which is provided with a gear 5 on one end, with which gear coöperates a pinion 6. (See Fig. 6.) This pinion is mounted on a counter-shaft 7, which is provided with a clutch mechanism 8 and a pulley 9, said pulley being driven by a belt (not shown) from any suitable source of

power. Counter-shaft 7 is also provided with a band-brake mechanism 10, by which the machine is brought to a position of rest after a single operation. This power-shaft is controlled by the operator depressing a treadle 11, (see Fig. 2,) which treadle if held depressed will cause the machine to operate continuously. However, if it is desired that the machine shall operate once and then automatically stop treadle 11 is depressed and released before the single operation is completed. The manner in which the treadle controls the power-shaft may be that commonly employed in punching and other machinery, and therefore I do not wish to be understood as limiting my invention to the use of the particular devices shown. However, I will briefly describe the construction of my controlling devices. The treadle 11 is substantially U-shaped, the cross-bar thereof being located at the front end of the machine. The legs of this U-shaped treadle extend into the framing 1 and are pivoted to the back wall thereof, as shown in Fig. 4. Springs 12 are connected to these legs to hold the treadle normally in an elevated position. A link 13 is connected to one leg of the treadle and to a rock-arm 14 on a rock-shaft 15. This rock-shaft, as shown in Fig. 5, is provided with a rock-arm 16, connected by a link 17 to an arm 18, loosely mounted on a shaft 19. This arm 18 is provided with a hub portion having projections cooperating with pawls 20, whereby when the arm 18 is rocked these pawls are thrown out of engagement with the hub of the arm 18, so as to release the band-brake and at the same time throw the clutch 8 into operative position. This is accomplished through the medium of a rock-arm 21 on the shaft 19, which is connected by a link 22 to an arm 23, to which arm 23 one end of the band-brake is connected. Arm 23 is mounted on shaft 24, which shaft is provided with a miter-gear 25, meshing with a pinion 26. This pinion 26 is conjoined to an arm 27, which arm is connected by a link 28 to one end of a lever 29, said lever having its other end connected to a sliding member of the clutch mechanism 8. The purpose of the eccentric 29^a and its rod 30 is to automatically throw the pawls 20 out of engagement with the projections on the arm 18 when the treadle 11 is held depressed. I do not herein claim the construction and arrangement of this pawl mechanism and its associate parts, as the same are well known in machines where it is desired to have them operate once and then automatically stop upon the release of the treadle, but when the treadle is held at rest to operate continuously until the treadle is released.

The power-shaft 4 referred to is mounted in appropriate bearings at the right-hand side of the machine and has arranged upon it driving-cams and recovering-cams operating the several moving parts of my machine. Driv-

ing-cam 31 operates a series of plungers for moving the first or initial bending-die into operative position. Driving-cam 32 operates a series of plungers for moving the second or lateral die into position after the first-mentioned die is at home. Driving-cams 33 are for moving the upsetting-plunger into position to form the head on the handle after the first and second mentioned dies are at home. Driving-cam 34 operates a plunger-rod to pierce the head on the ladder-handle and form the opening therein for the reception of a securing bolt or screw. This plunger-rod is operated when the dies and plungers above referred to are momentarily in an operative position upon the formation of one end of the ladder-handle, and driving-cam 35 operates an auxiliary mechanism for finishing up the formed end of the ladder-handle in the event that fins or feather-edges are left thereon. Recovering-cam 31^a cooperates with the plungers of the initial die to recover the same. Recovering-cam 32^a cooperates with the plungers connected to the secondary die to recover the same. Cams 33 being in the form of eccentrics and having straps embracing them, are recovered by said straps, and consequently need no special recovering devices. 34^a indicates recovering-cams for the plunger-rod which forms the opening in the head of the ladder-handle, and 35^a is a recovering-cam for the auxiliary finishing device. All of these driving and recovering cams are constructed so as to operate at the proper time with respect to each other, the order of their operation being hereinafter described.

36 indicates a plunger having mounted in one of its ends a roller 37 for cooperating with the driving-cam 31 and a roller 38 for cooperating with a cam-groove in the side face of the recovering-cam 31^a. This plunger is bifurcated and provided with shoulders 39 on its inner faces, against which bears a frangible plate 40.

41 indicates a block bearing against this frangible plate, said block being interposed between said plate and a head 42 of a plunger 43. This head 42 is held in proper position with respect to the plunger 36 by means of straps 44, so that lost motion is avoided.

The purpose of the construction just above described is to provide a breakable drive for the plunger 43. If too much resistance is offered to the movement of plunger 43 under the action of cam 31, this resistance will be concentrated at a central point upon the breakable plate 40, and as power is applied to the ends of said plate through the lugs 39 it is obvious that said plate will carry a load only up to the limit of its strength, and if the imposed load exceeds the strength of the plate the plate will be broken and the plunger 36 will be driven while the plunger 43 remains at rest. The straps 44 in this instance move away from the head 42.

Plunger 43 is provided with a rod 45 at its outer end, which has a collar 46 secured to it, said rod passing through a spring-housing 47, mounted upon the bed. A spring 48 is interposed between the collar and the end of the housing, which spring, when the plunger 43 is moving under the action of the driving-cam, is compressed, the power stored therein being utilized to assist in recovering the set of plungers connected to plunger 43 in the retracted movement thereof.

Plunger 43 has its outer end inclined and provided with a T-shaped groove for receiving a T-shaped projection on the correspondingly-inclined end of a plunger 49, operating substantially at right angles to the plunger 43. The opposite end of plunger 49 is inclined and also provided with a T-shaped groove for receiving a T-shaped projection on the inclined end of the die-carrying plunger 50.

51 indicates the die carried by plunger 50, said die being the initial bending-die, before referred to.

52 indicates a plunger having rollers 53 and 54 at one end for cooperating with the driving and recovering cams 32 and 32^a, respectively. The opposite end of this plunger 52 is inclined and provided with a T-shaped groove for receiving a T-shaped projection on the beveled end of a die-carrying plunger 53^a, operating substantially at right angles to the movement of plunger 52. This plunger 53^a carries a die 54^a, which is the die hereinbefore referred to as the "secondary" die.

55 indicates a cross-head to which the straps of eccentrics 33 are pivotally connected, said cross-head carrying a plunger 56 at one end.

57 indicates an auxiliary cross-head having rollers 58 and 59 mounted in one end thereof, which rollers cooperate with the driving and recovering cams 34 and 34^a, respectively. This auxiliary cross-head carries a plunger-rod 60, which extends through an opening in the plunger 56.

61 indicates the stationary die, mounted in the bed-plate of the machine.

62 indicates an adjustable stop or guide plate cooperating with the end of the rod to be formed, said stop determining the amount of metal bent in between the dies to be subsequently upset to form the head of the ladder-handle.

62^a indicates a notched plate secured to the bed-plate of the machine, in the notch of which the rod to be operated upon is received when its heated end is introduced into the machine to be operated upon. The cross-head 55 is provided with an inclined T-shaped groove on one side, into which fits the T-shaped projection 63 of the driving-plunger for the auxiliary finishing device. The opposite end of this driving-plunger is inclined and provided with T-shaped groove for receiving a T-shaped projection on the inclined end of a plunger 64, movable at right angles

to the plunger 63. This plunger 64 carries a plunger-rod 65, which operates through the stationary die-block 66, said die-block being designed to receive the finished end of the ladder-handle for purposes hereinbefore explained.

67 indicates a plunger carrying the finishing-die 68. This plunger is also provided with rollers 69 and 70, which cooperate with the driving and recovering cams 35 and 35^a, respectively. As it is not desired to operate this finishing device at every operation of the main machine, I provide clutch member 71, which cooperates with the cams 35 and 35^a, which clutch member may be thrown into and out of operative position by means of a foot-treadle 72 and connected levers, as shown in Fig. 6.

It is obvious that instead of providing the particular plungers mentioned with the T-shaped grooves and T-shaped projections, respectively, these grooves and projections could be transposed on the several parts; further, that other forms of sliding connections and interlocks between the parts which move at angles with respect to each other could be employed. The purpose of interlocking these angularly-movable parts with each other is to enable their recovery after operation. I am also aware that in the transmission of motion as herein shown and described there is some loss of power due to the large area of the cooperating inclined faces and friction incident thereupon; but this loss is compensated for by the directness in the application of power to the dies, which is necessary by reason of the fact that these dies must fit close together and be held in such close relation during the time that the metal is being upset. While it is possible to use levers to move the dies to and from their respective operative positions, such levers are liable to spring or yield during the upsetting action of the metal, so as to form fins at the joints of the ladder-handle. While I have contemplated the employment of levers as a means of transmitting motion to the several dies as coming within the scope of my invention, yet I prefer the construction shown because of its positiveness, ease of adjustment, and small liability to get out of order.

Referring now to the diagrammatic views of Figs. 7 to 11, inclusive, I will describe the action of the dies upon the rod X. I will assume that the rod is of the desired diameter and length and also that the end to be formed has been heated before the rod is subjected to the action of the dies. Upon being introduced into the machine the rod is first dropped into the notched plate 62^a and then into the groove of the stationary die 61, after which it is moved up against the stop 62. The treadle 11 is now operated, and the first action thereof is to move the initial bending-die 51 into the position shown in Fig. 8, wherein it will be

seen that the groove *b* in said die 51 has received the bar X, said groove *b* registering with groove *a*, and, further, that the end of the rod has been bent laterally into the recess *c* of the stationary die 61. The next step is the moving into position of the lateral die 54^a, whose groove *d* registers with the groove *c*, as shown in Fig. 9. The plunger 56 is now moved into position, said plunger fitting snugly in the grooves *c* and *d* and upsetting the end of the rod and forcing the same into the matrix *e* in the die 51, which gives shape to the head of the ladder-handle. This die 51, as shown, is provided with a channel *f*, leading into a discharge-opening *g*, opening through the bottom of the die. Channel *f* is located substantially in the center of the bottom of the matrix *e* and in alinement with the plunger-head 60. Any surplus metal in the matrix will find a path of escape through this channel *f*; but it is intended in the formation of the ladder-handle that only a sufficient amount of metal will be bent in the die-recesses as will be used up in the formation of the head and shank of the handle. When the plunger 56 reaches its home position and the head and shank of the handle are formed, the plunger-rod 60 is operated, so as to pierce the head and form an opening therein, which opening is designed to receive a securing bolt or screw when the ladder-handle is attached in position on the car. The metal punched out of the head by the plunger rod or punch 60 will drop through the opening *g* into a suitable receptacle placed thereunder. As shown in Fig. 3, the driving-cam 34, which operates the punch 60, has a very short face, as the movement to be imparted to the punch-rod is relatively slight. It will also be observed in this figure that the recovering-cams 34^a are so located as to act in withdrawing the punch-rod 60 immediately after it has completed its work. This is necessary, as the punch-rod must be inserted through the head and withdrawn from the head before the head is released by the other dies.

In the event that a fin or feather-edge is left on the head, made as above described, due to an overflow of the metal in any of the crevices in the dies, the head can be inserted into position in the recess *h* of die 66 in the auxiliary finishing device. When in this recess, the die 68 moves up into position to flatten out any projecting fins, and the plunger-rod 65 passes through the opening in the head, but in an opposite direction to the movement of the punch-rod 60 through said head. This punching of the opening from opposite sides of the head and the action of the flattening-die 68 produces a smooth finished head having an opening therein, the edges of which head and said opening being free from fins.

I am aware that many minor changes in the construction, arrangement, and combination of the several parts of my device can be made

and substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

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

1. In a machine of the character described, a rotatable shaft, a recessed stationary die having an offset-forming face, a cooperating movable die operatively associated with said shaft and having a complementary offset-forming face, said last-mentioned die also having a matrix in its end face, a connecting-passage leading through said matrix and movable die, a supplemental movable die, means operable by the shaft for imparting movement to the last-mentioned die at right angles to the movement of the first-mentioned movable die after the same has been placed at home, a plunger, a punch passing longitudinally through said plunger into said connecting-passage, and means for operating said plunger and punch.

2. In a machine for forming ladder-handles, the combination with a stationary die, of a die for bending the rod at its joint or offset, said bending-die also having a matrix for the shank and head of the handle, a housing-die which is moved into position after the rod is bent to form the offset joint referred to, an upsetting-die which forces the metal into the matrix in the first-mentioned die to form the head and shank of the handle, and a punch-rod carried by the upsetting-die for punching an opening in the head of the handle after said head is formed.

3. In a ladder-handle-forming machine, a fixed die having an offset-forming face, a plurality of movable complementary dies cooperating therewith, and movable at substantially right angles to each other, a common operating-shaft, means on the shaft for operating the dies at relatively different times, all of said dies being provided with coincident recesses, an upsetting member adapted to travel in the coincident recesses of a plurality of said dies and cooperating with said dies and a punch-rod adapted to be projected through said upsetting member and through one of said movable dies.

4. In a machine of the character described, a relatively fixed die-section, having an offset-forming face, a movable complementary die having a cooperating offset-forming face, and an aperture therein, a second movable die, said second movable die and the stationary die having channels in their opposing faces, means for operating the dies, an upsetting-plunger adapted to travel in said channels of the dies, a punch adapted to travel through the plunger into the aperture of the first-mentioned movable die, and means for operating the plunger and punch after the movement of said dies.

5. In a machine of the character described, the combination with forming-dies, a main op-

erating - shaft, instrumentalities associated therewith for operating the dies, a stationary finishing-die, a punch-rod passing through said finishing-die, means operated by one of the forming-dies for driving said punch-rod, a movable companion finishing-die, and means operatively associated with the main shaft for driving and recovering the movable companion finishing-die.

6. In a machine of the character described, the combination with a stationary die, of a die for bending the rod at its joint or offset, said bending-die also having a matrix for the shank

and head of the handle, an upsetting-die which forces the metal into the matrix into the second-mentioned die to form the head and shank of the handle, and a punch-rod carried by the upsetting-die for punching an opening in the head of the handle after said head is formed.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 24th day of July, 1902.

JOHN S. STEVENSON.

Witnesses:

WM. H. SCOTT,
ANTON EKSTROM.