(No Model.)

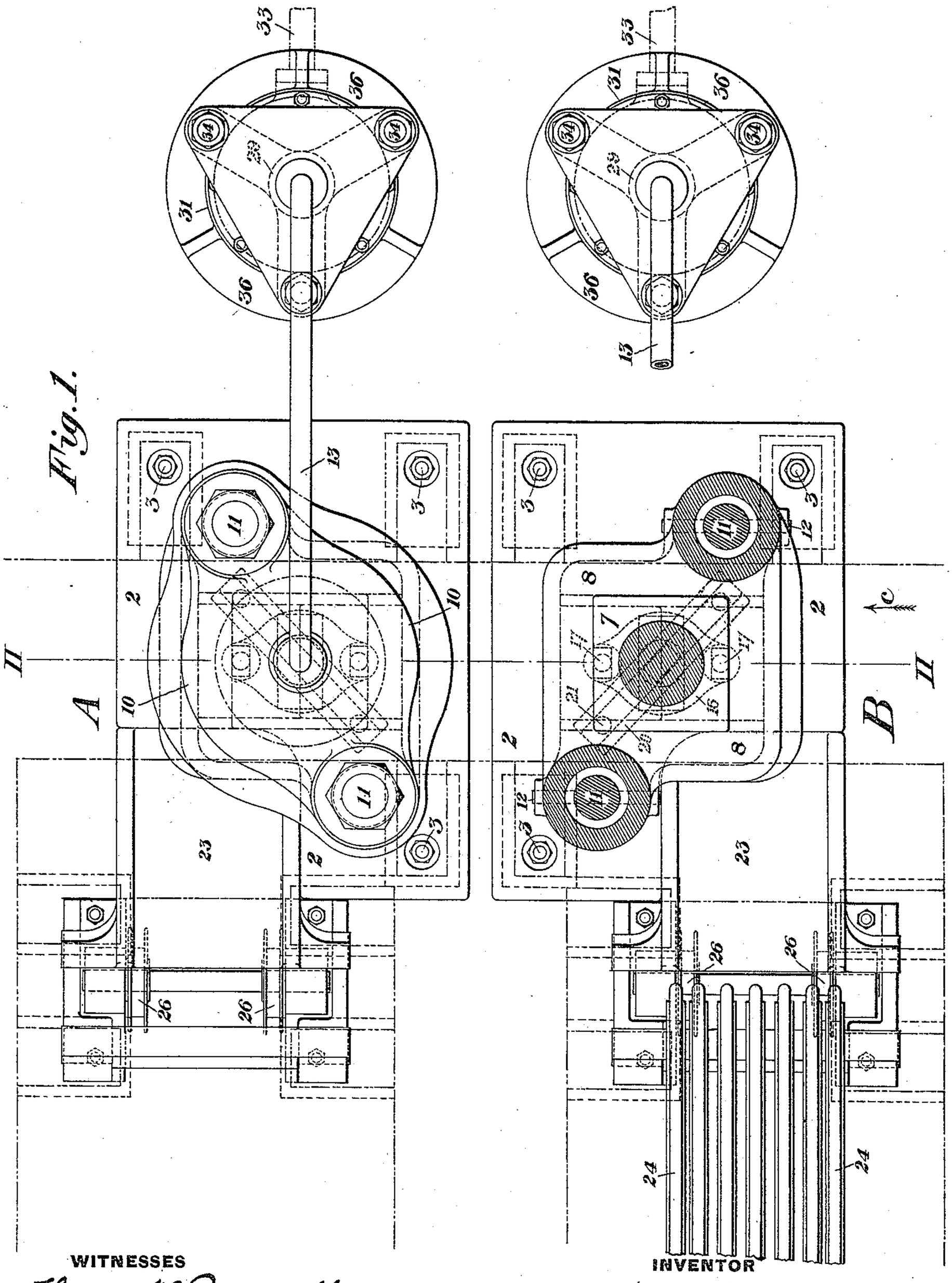
5 Sheets—Sheet 1.

H. AIKEN.

METAL SHEARS.

No. 438,339. Patented Oct. 14, 1890.

Fig. 1.



WITNESSES

Thomas W. Bakewell

N. L. Gill.

INVENTOR

Henry Aiken

(No Model.)

5 Sheets—Sheet 2.

H. AIKEN.

METAL SHEARS.

No. 438,339. Patented Oct. 14, 1890.

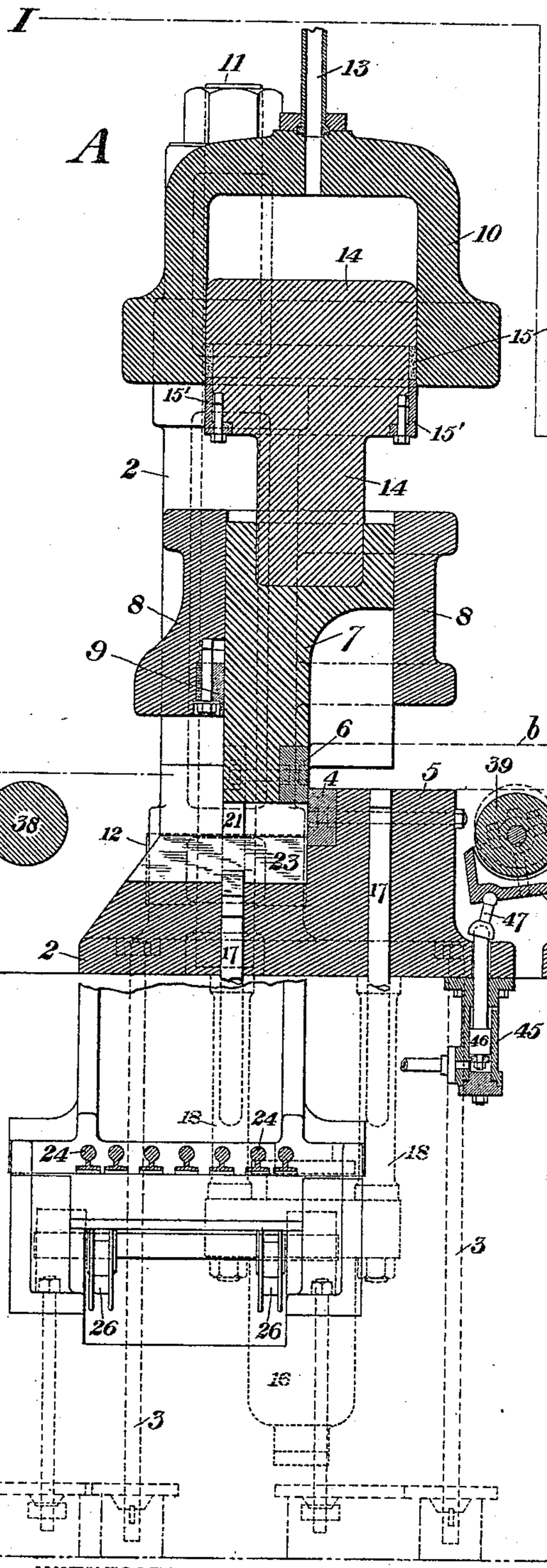
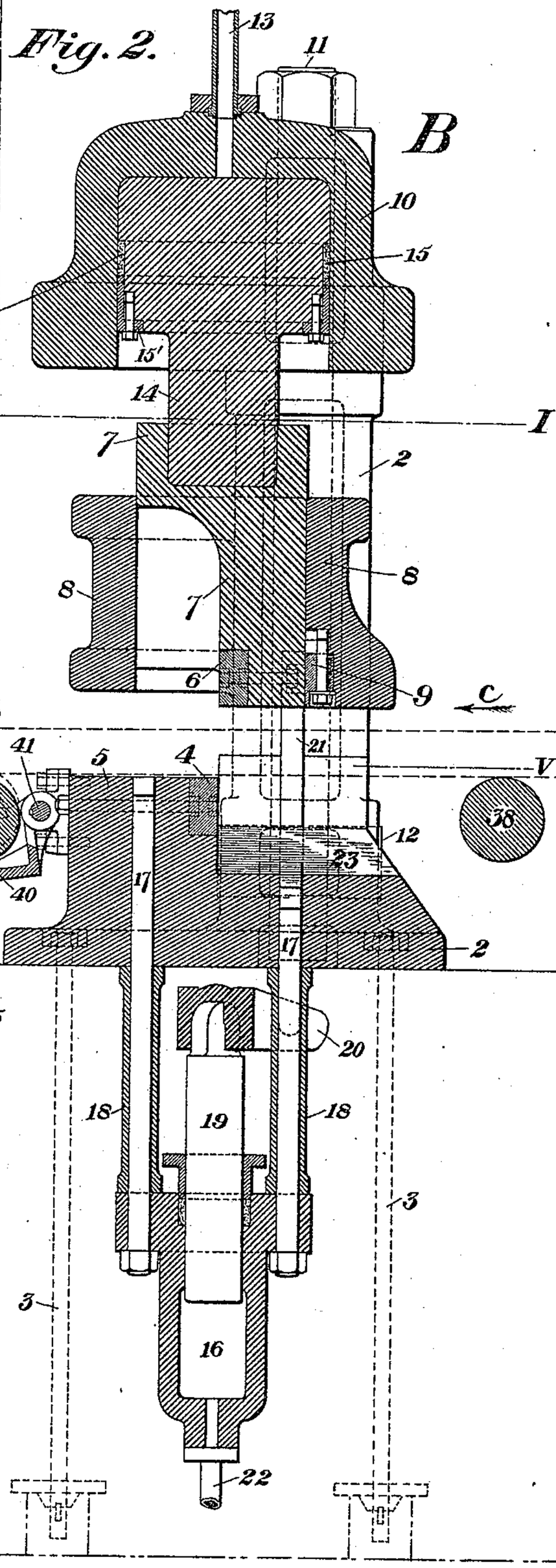


Fig. 2.



WITNESSES

Thomas W. Bakewell

N. L. Gill

INVENTOR

Henry Aiken

(No Model.)

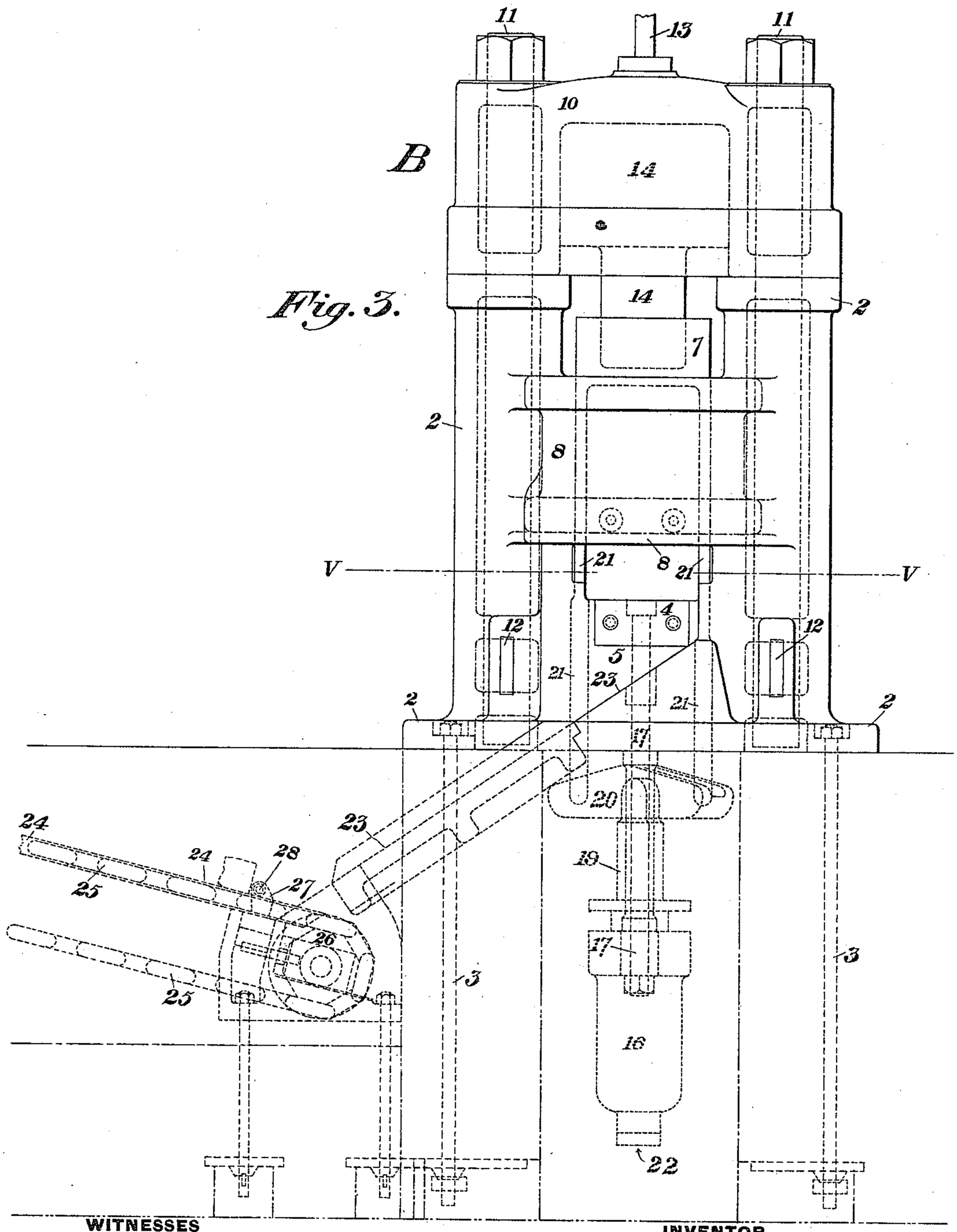
5 Sheets—Sheet 3.

H. AIKEN.

METAL SHEARS.

No. 438,339. Patented Oct. 14, 1890.

Fig. 3.



WITNESSES

Thomas W. Bakewell

H. L. Gill

INVENTOR

Henry Aiken

(No Model.)

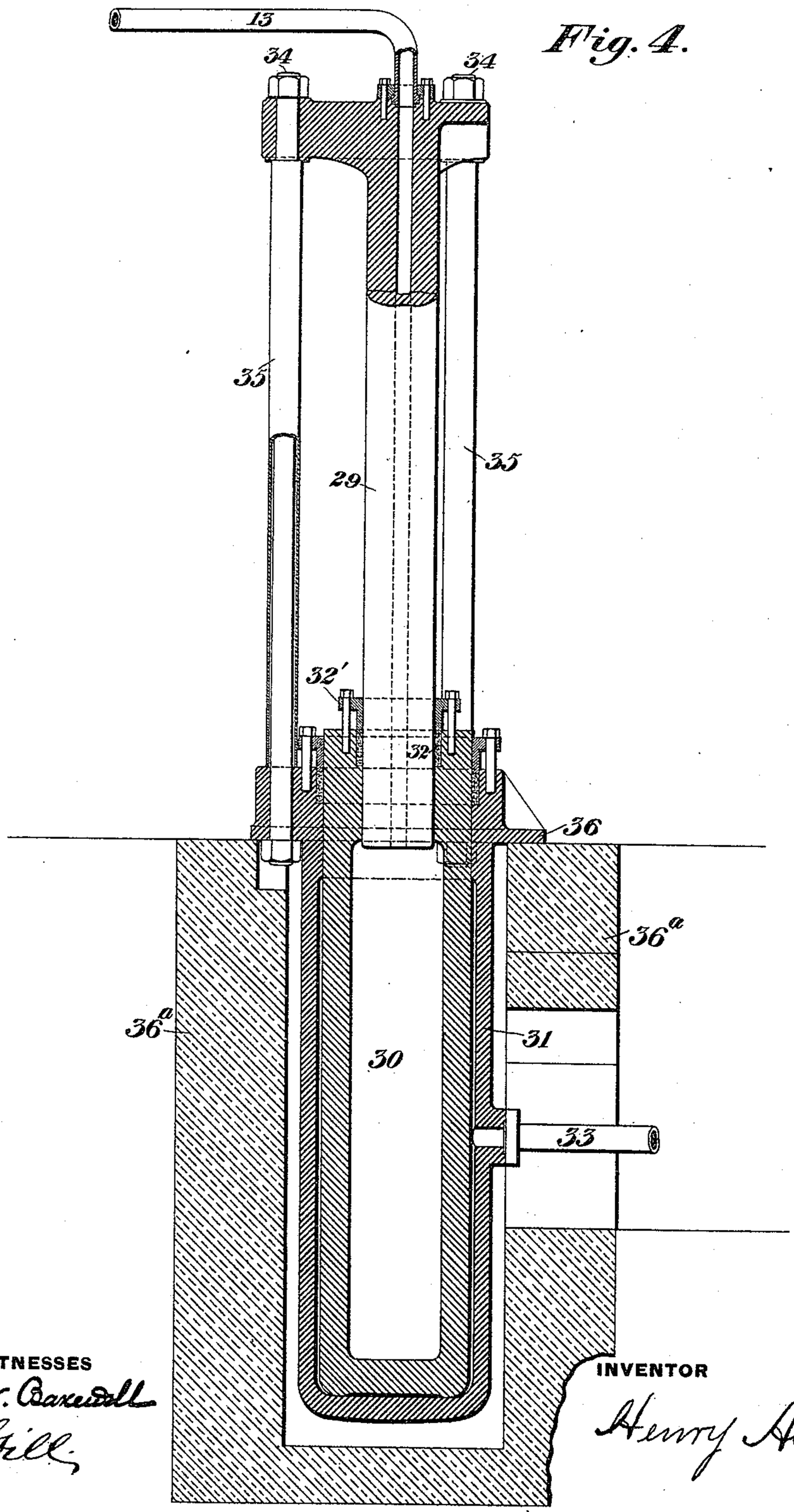
5 Sheets—Sheet 4.

H. AIKEN.

METAL SHEARS.

No. 438,339. Patented Oct. 14, 1890.

Fig. 4.



WITNESSES

Thomas W. Baxendell

A. L. Gill.

INVENTOR

Henry Aiken

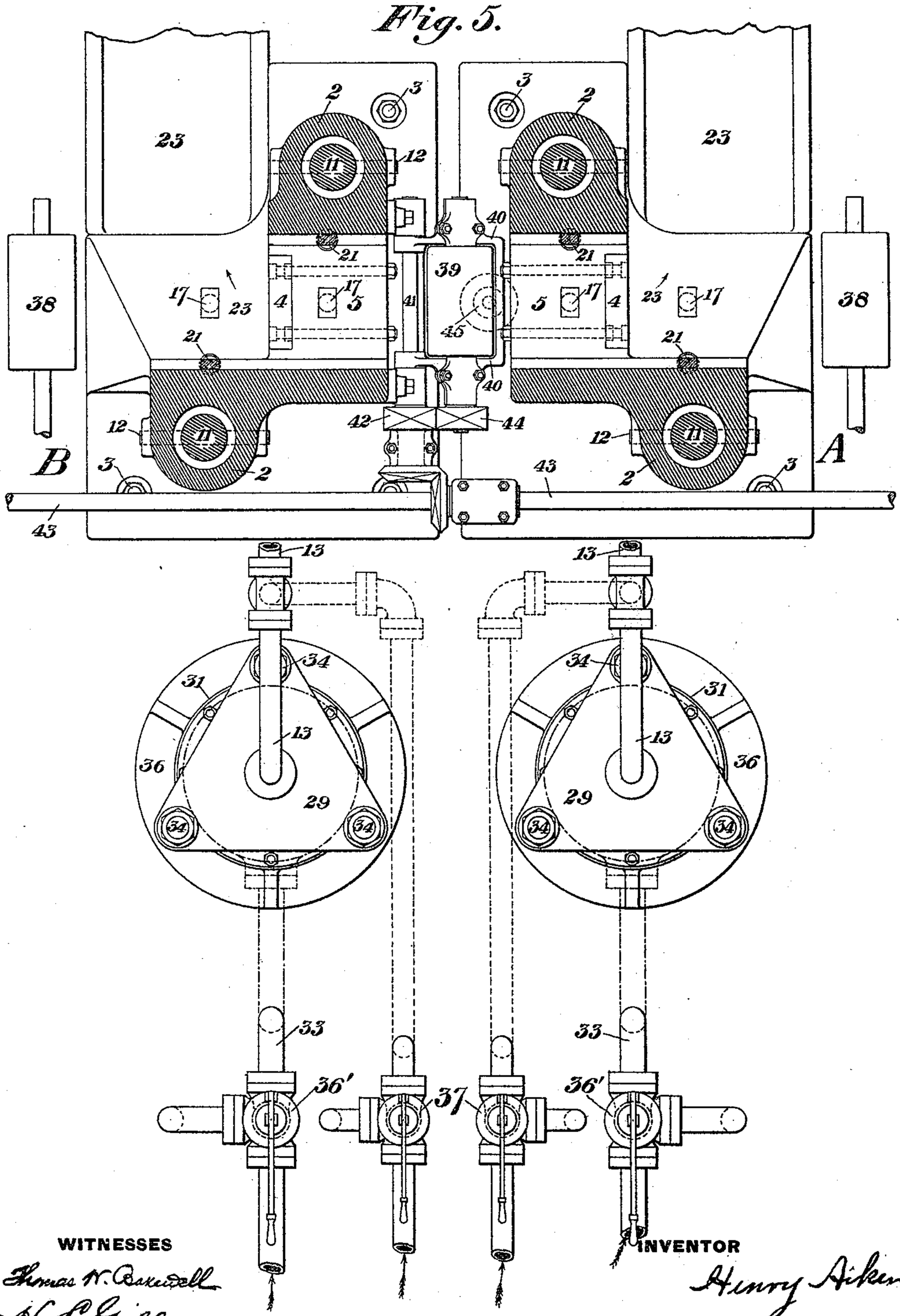
(No Model.) 5 Sheets—Sheet 5.

H. AIKEN.

METAL SHEARS.

No. 438,339. Patented Oct. 14, 1890.

Fig. 5.



WITNESSES

Thomas W. Bakewell

H. L. Gill.

INVENTOR

Henry Aiken

UNITED STATES PATENT OFFICE.

HENRY AIKEN, OF PITTSBURG, PENNSYLVANIA.

METAL-SHEARS.

SPECIFICATION forming part of Letters Patent No. 438,339, dated October 14, 1890.

Application filed April 21, 1890. Serial No. 348,844. (No model.)

To all whom it may concern:

Be it known that I, HENRY AIKEN, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Metal-Shears, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan view of my improved shears, partly in section, on the line I I of Fig. 2. Fig. 2 is a partial vertical section on the line II II of Fig. 1. Fig. 3 is a front elevation of the shears. Fig. 4 is a vertical central sectional view of the apparatus for increasing or intensifying the pressure in the shear-cylinder. Fig. 5 is a sectional plan view, the section being on the plane of the lines V V of Figs. 2 and 3.

Like symbols of reference indicate like parts in each.

My apparatus comprises two shears set in proximity to each other and designed to operate conjointly in the manner hereinafter described.

My invention relates to such conjoint position and operation, and also to certain details of construction of the individual shears.

I shall first describe the construction of one of the shears and shall then describe their mutual relation and conjoint action.

Each shear is constructed as follows: The shear-frame 2 is preferably made of a strong casting, as shown in the drawings, and provided with suitable anchor-bolts 3 for holding it in place.

4 is the bed-knife, which is set in a recess on the edge of the anvil-block 5, and 6 is the moving knife bolted to the end of a knife-head 7, which is adapted to move vertically within a hollow guide 8, constituting part of the shear-frame.

9 are slide-bearings secured in place within the guide 8 and bearing on the knife-head.

10 is the inverted cylinder for actuating the knife-head. It is situate at the top of the shear-frame and is connected with the latter by tie-bolts 11, which extend through the hollow upright side portions of the frame to the base thereof, and are held thereto by keys 12 or otherwise. 13 is the fluid-supply pipe of the cylinder 10, and 14 is the plunger which works within the cylinder and is provided with packing 15, which is set in a peripheral recess on the plunger and is confined by a follower or gland 15′. The placing of the packing on the plunger instead of placing it on the cylinder I find to be of great utility for various reasons. It makes it unnecessary to weaken the cylinder by cutting a seat for the packing, avoids the increase of bending motion on the cylinder caused by putting the packing on the latter, and by reason of the motion of the packing with the plunger in the same direction with the motion of the water I find that a much tighter joint is produced with less pressure of the gland. The outer end of the plunger is contracted and fits within a socket at the upper end of the knife-head. Such contraction of the plunger not only enables it to be connected in this way with the knife-head, but also gives easy access to the packing-gland. The cylinder 10 is single-acting and is only adapted to move the knife-head downwardly.

To raise the knife-head and plunger and to displace the water from the cylinder, I employ an auxiliary lifting-cylinder 16, preferably set beneath the frame of the shears and suspended therefrom by bolts 17 and separators 18. The plunger 19 of this cylinder is provided at its upper end with a cross-head 20, from which rods 21 extend to the knife-head. The fluid-supply pipe 22 of the cylinder 16 is kept in constant communication with the source of pressure, so that its plunger, which is of small diameter, acts constantly to counterbalance the knife-head and the plunger 14 and to raise the latter parts when the pressure is shut off from the cylinder 10.

The connection of the counterbalancing mechanism with the knife-head instead of the main plunger, as in prior devices of this sort, is very advantageous because by exerting a constant pressure on the knife-head it keeps it in firm contact with its plunger and prevents all loose motion of these parts. This is one of the features of my invention, and I claim it broadly, irrespective of the precise

construction or arrangement of such counterbalancing mechanism. I intend, however, to claim specifically the described location and arrangement of the cylinder 16, since in convenience of construction and efficiency I derive substantial advantages therefrom.

The knives 4 and 6 are parallel and are situate at right angles to the course of the metal piece as it is fed to the shears, but instead of constructing the shear-frame so that a line connecting the upright side portions thereof shall be parallel with the shear-knives, it is so constructed that such line shall be at an acute angle thereto, as shown in Fig. 1, and preferably so that a line connecting the axes of the bolts 11 shall bisect the knife-blades, thus transmitting the stress of work equally to the sides of the frames. The consequence of this construction is that the side of the frame in front of and at the end of the knives is open, and that the crop ends of the metal piece cut off by the shears can be removed from such open side. This enables me to avoid the necessity of picking up the crop end from the bed of the shears by means of a crane or tongs, and to this end I provide an inclined chute 23, which extends laterally from beneath the knives, as shown in Figs. 1 and 3. At the end of said chute is a track or way 24, leading (it may be in an upwardly-inclined direction) to a place where the crop ends may be discharged onto a car or otherwise. This way consists of a series of separated parallel rails, beneath which are endless chains 25, passing around sprocket-wheels 26 and provided with arms 27, which project upwardly between the rails and are provided with cross-bars 28. As the sprocket-wheels revolve, these bars travel in succession along the surface of the rails and carry thereon the crop ends, which are discharged on the rails from the inclined chute. By thus automatically removing the crop ends I save considerable manual labor heretofore devoted to their removal during the operation of shears.

The cylinder 10 and its water-supply ordinarily afford sufficient power to operate the shears, but in case extra power is needed, as if the metal piece should be chilled before arriving at the shears, I obtain it by the mechanism illustrated in Figs. 1 and 4.

The water-supply pipe 13 is connected with the fixed hollow plunger 29 of a cylinder 30, which is set within an outer cylinder 31 of larger diameter. The plunger is connected to the cylinder 31 by strong tie-bolts 34 and separators 35, and the cylinder 31 is supported by a flange 36 within a suitable frame or foundation 36^a. The cylinder 30 is provided with packing 32, set within an annular recess at the end of the cylinder and held therein by a follower 32′, and is movable lengthwise on the plunger 29 and within the cylinder 31, which is likewise provided with packing and follower. The fluid-supply pipe 33 of the cylinder 31 is connected with the accumulator or force-pump, by which the pressure is supplied to the main cylinder 10, and the cylinder 30 is constantly in communication with the main cylinder and is subjected to the same internal water-pressure.

36′, Fig. 5, is a valve controlling the pipe 33, and 37 is a valve controlling the communication between the accumulator or pump and the main cylinder. If it be desired to increase the pressure in the main cylinder, the valve 37 is closed and the valve 36′ opened, so as to admit water into the cylinder 31, the effect of which is to raise the inner cylinder 30 around the fixed plunger, and by reason of its smaller diameter the desired increase of pressure is transmitted thereby to the main cylinder.

I do not claim herein specifically the construction shown in Fig. 4.

Each of the two shears shown in Figs. 1 and 2 may be constructed in the manner above described, and as will be appreciated by those skilled in the art such construction, in respect to the lateral opening at the side of the shear-frame, the counter-balance, the mechanism for removing the crop end, and the intensifier, possesses many features of strength and advantage.

I shall now describe the manner in which the two shears A and B are operated conjointly to effect the cutting of the metal piece. They are set in proximity to and in line with each other, with their rear sides adjacent. (The rear side is that side of the machine on which is the anvil-block or other device by which the main part of the metal is supported during the act of shearing.)

Between the shears is a supporting-roller 39, journaled in a frame or cradle 40, which is pivotally connected by a shaft 41 to the bed of one of the shears.

42, Fig. 5, is a pinion fixed to the shaft 41 and driven by gearing from a cross-shaft 43. The pinion 42 is in gear with a cog-wheel 44 on the shaft of the roller 39, so that by revolution of the shaft 43 the roller may be driven. The frame of the roller 39 is adapted to be raised by a lifting-cylinder 45, whose plunger 46 is connected by a ball-and-socket joint 47 to the frame. The roller is raised above the level of the shear-beds, as indicated by dotted lines in Fig. 2, when the metal piece is fed to the shears, and during the cutting operation the frame with the roller is lowered to permit the piece to rest on the anvil-block. Now, in order to cut off the end of a long piece of metal, it is introduced into the shears on supporting-rollers 38 and 39, and the roller 39 is lowered to cause the metal piece to rest upon the anvil-blocks, as shown at *b* by dotted lines in Fig. 2. One of the shears A is then operated, so as to cut off the end projecting beyond its bed-knife, the metal is again fed forward in the direction of the arrow *c*, so as to bring its other end in proper

position on the bed-knife of the shear B, and the moving knife of this shear is caused to descend and to cut off the waste or crop end. When a single shearing apparatus is employed (unless inconvenient special apparatus be used) it is necessary in order to cut off both ends to turn the piece end for end before the second cut, because its end must project to the front of the shears in order to prevent the distortion of the metal which would occur if its main body were not supported by the anvil-block. Such turning of the piece is laborious and delays the operation of the shears, especially if the piece be of great length; but by employing a shearing-machine composed, as I have described, of two adjacent shears set back to back I am enabled to avoid entirely the work of turning the metal, and therefore effect economy in labor and a consequent saving in cost of the product.

It will be understood that, so far as this feature of my invention is concerned, the mechanical construction of the shears may be varied in many ways and shears of other types employed, since I desire to claim, broadly, the use as a single machine of the two shears arranged substantially as I have described.

I claim—

1. An apparatus for shearing metal, consisting of the combination of two adjacent shears, each having an anvil-block, and a moving knife operating in conjunction therewith, said shears being set with their anvil-blocks opposite to each other, whereby a metal piece may be fed longitudinally to the shears and its opposite ends cropped off without turning the piece, substantially as and for the purposes described.

2. An apparatus for shearing metal, consisting of the combination of two adjacent shears, each having an anvil-block and a moving knife operating in conjunction therewith, said shears being set with their anvil-blocks opposite to each other, whereby a metal piece may be fed longitudinally to the shears and its opposite ends cropped off without turning the piece, and feed-rollers leading from the shears, substantially as and for the purposes described.

3. Metal-shears having shear-knives, a frame having two uprights set at an acute angle to the plane of the knives, leaving open the side of the frame at the end of the knives, and a chute leading from the open side of the shears, substantially as and for the purposes described.

4. Metal-shears having shear-knives, a frame having two uprights set at an acute angle to the plane of the knives, leaving open the side of the frame at the end of the knives, substantially as and for the purposes described.

5. Metal-shears having shear-knives, a frame having two uprights set at an acute angle to the plane of the knives in such position relatively thereto that a plane connecting the uprights shall bisect the knives, substantially as and for the purposes described.

6. In metal-shears, the combination of a knife-head, a motor situate above the knife-head and comprising a cylinder and plunger, the movable element of which acts on the knife-head, and a counterbalancing-cylinder situate below and bearing on the knife-head, substantially as and for the purposes described.

7. In metal-shears, the combination, with the shear-frame, of a motor comprising a cylinder and plunger, the movable element of which has a reduced outer portion, and a knife-head on which said reduced portion has a bearing, substantially as and for the purposes described.

8. In metal-shears, the combination of the cylinder, a plunger projecting therefrom, a knife-head having a socket in which the plunger is fitted, and a counter-balance, substantially as and for the purposes described.

9. In metal-shears, the combination, with the shear-frame, of a motor comprising a vertically-acting cylinder and plunger, a moving knife-head on which the movable element of the motor has a bearing, a counterbalancing-cylinder set beneath the machine-frame, a cross-head, and rods extending upwardly therefrom to the knife-head for raising the same, substantially as and for the purposes described.

10. In shearing mechanism, the combination, with the actuating-cylinder and its water-supply pipe, of a pressure-intensifying cylinder connected therewith and operated by water-pressure, substantially as and for the purposes described.

11. In shearing mechanism, the combination, with the main cylinder and its valve-controlled water-supply pipe, of an intensifying-cylinder connected therewith, a water-supply pipe 33, for actuating the intensifying-cylinder, and a valve controlling the water-supply pipe 33, substantially as and for the purposes described.

12. In metal-shears, the combination of an inverted actuating-cylinder having a plunger, a knife-head against which the plunger bears to force it downward, and an upwardly-acting counterbalancing-cylinder acting on the knife-head, substantially as and for the purposes described.

13. An apparatus for shearing metal, consisting of the combination of two adjacent shears set in line, an intermediate supporting-roller, and lifting mechanism therefor, substantially as and for the purposes described.

14. An apparatus for shearing metal, consisting of the combination of two adjacent shears set back to back, an intermediate supporting-roller, a frame therefor pivotally connected to one of the shears, and lifting mechanism, substantially as and for the purposes described.

15. An apparatus for shearing metal, consisting of the combination of two adjacent shears set in line, an intermediate supporting-roller, lifting mechanism therefor, and driving-gearing connected with the intermediate supporting-roller for rotating it, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 10th day of April, A. D. 1890.

HENRY AIKEN.

Witnesses:
THOMAS W. BAKEWELL,
W. B. CORWIN.