(No Model.)

3 Sheets—Sheet 1.

# H. AIKEN.

## METAL SHEARS.

No. 482,113. Patented Sept. 6, 1892.

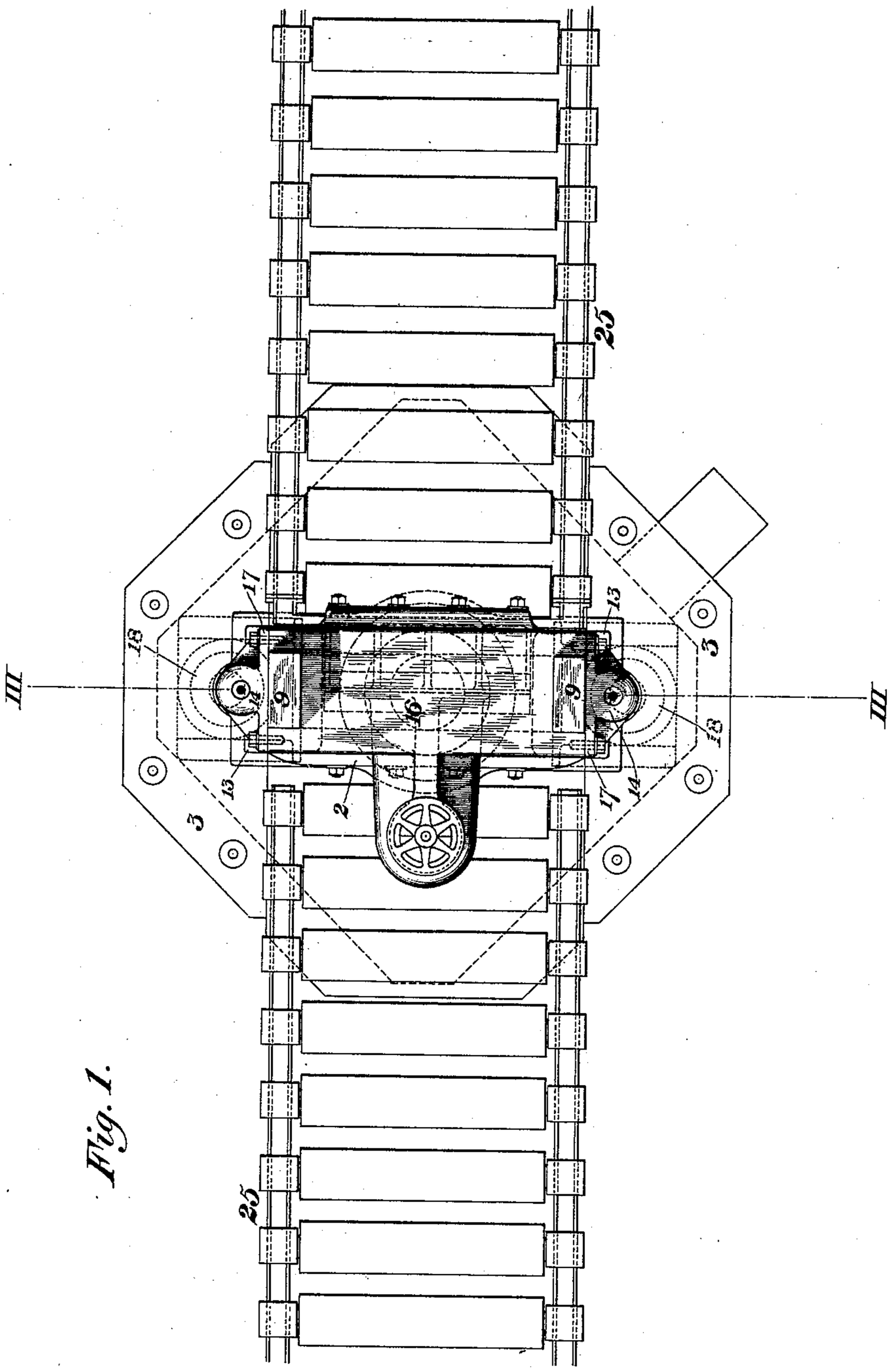


Fig. 1.

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(No Model.)

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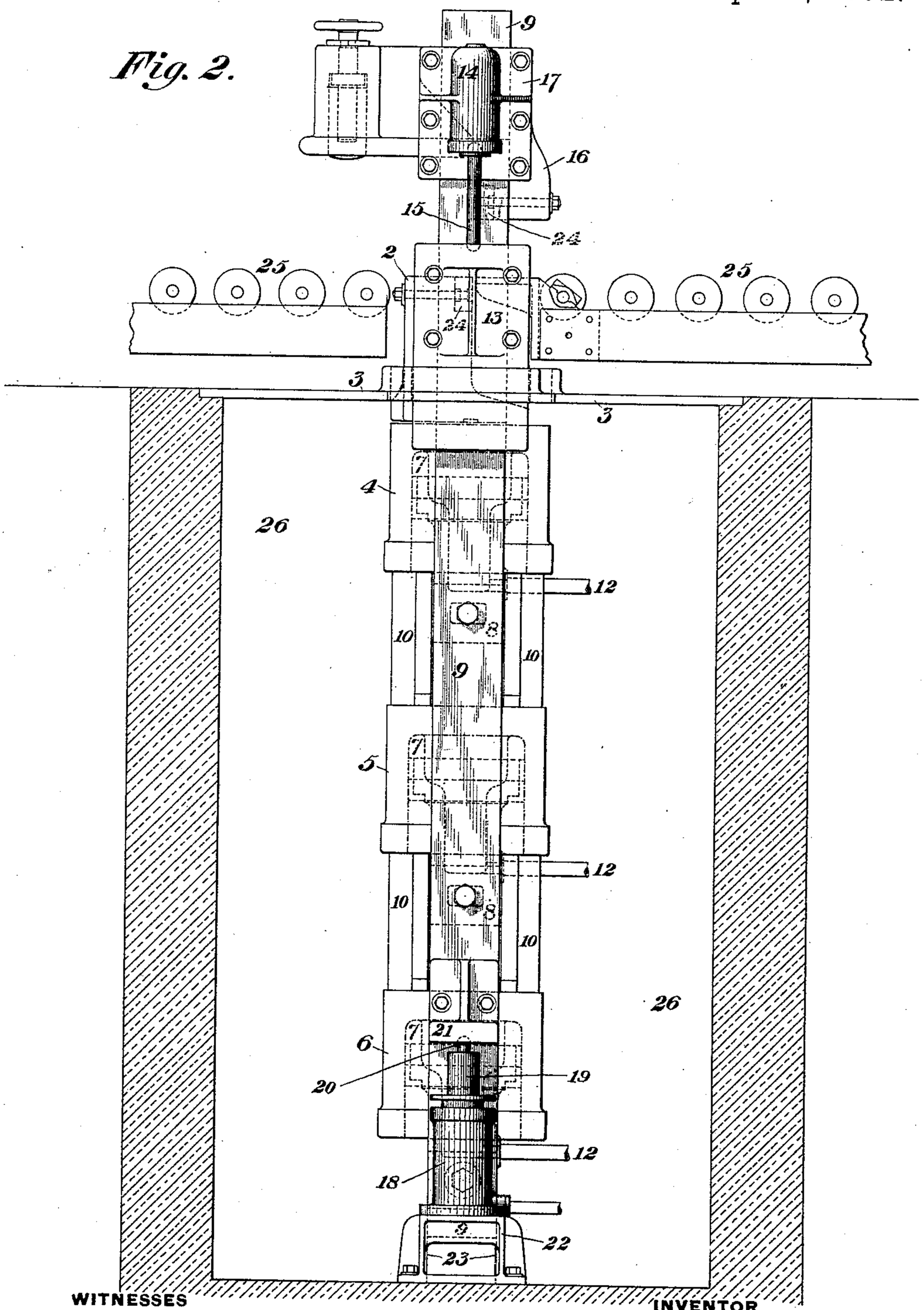
## METAL SHEARS.

No. 482,113. Patented Sept. 6, 1892.

*Fig. 2.*

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(No Model.) 3 Sheets—Sheet 3.

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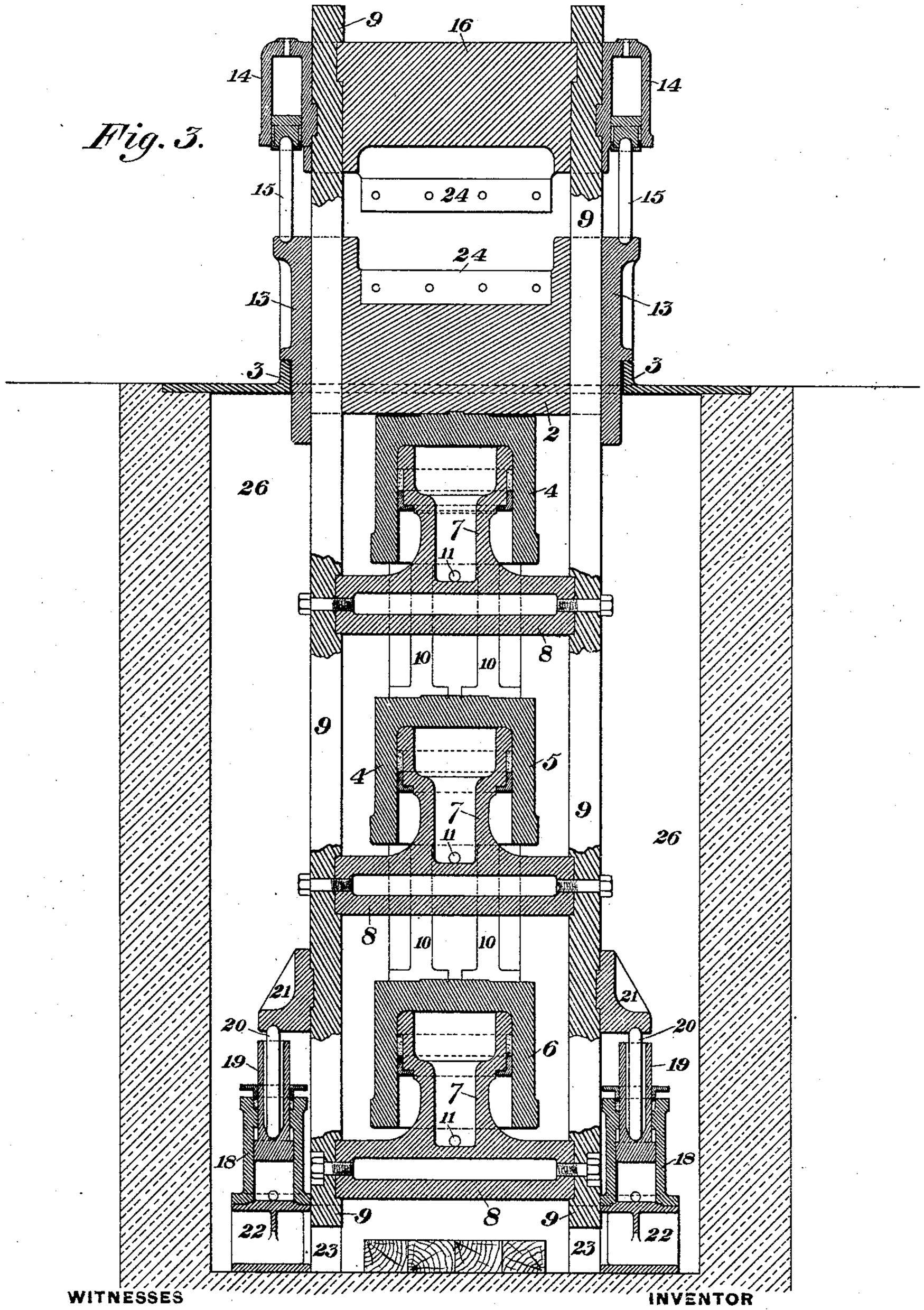
## METAL SHEARS.

No. 482,113. Patented Sept. 6, 1892.

*Fig. 3.*

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# UNITED STATES PATENT OFFICE.

HENRY AIKEN, OF PITTSBURG, PENNSYLVANIA.

## METAL-SHEARS.

SPECIFICATION forming part of Letters Patent No. 482,113, dated September 6, 1892.

Application filed February 23, 1892. Serial No. 422,526. (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 shows my improved shears in plan view. Fig. 2 shows the same in end elevation. Fig. 3 is a vertical section on the line III III of Fig. 1.

Like symbols of reference indicate like parts in each view.

The primary object for which I have devised my improvement is to provide shears in which the knives shall be readily adjustable, so as to adapt shear mechanism capable of cutting pieces of large section to be used, also, in cutting pieces of smaller section without the expenditure of motive fluid occasioned by the normal length of stroke of the moving knife. My invention relates to this item of improvement, and also to certain features of construction summarized in the following claims.

In the drawings, 2 represents the movable knife-head, which when at rest is supported by a frame or plate 3, as shown in Fig. 3. To actuate this knife-head, I employ a series of hydraulic cylinders set in tandem one above the other, though within the scope of the broad claims of this specification my invention is not limited to the use of a plurality of cylinders. As illustrated in the drawings, which show the construction deemed by me to be preferable, the cylinders 4 5 6 are inverted and are set upon plungers 7, which by means of (preferably integral) cross-heads 8 are fixed to parallel upright bars 9, forming a movable frame, hereinafter described. If desired, the construction may be reversed, the cylinders being fixed and the plungers made to be movable therein. Each cylinder is connected with the cylinder below by interposed distance pieces or bars 10, so that on elevating the lowest cylinder all those above must be raised also. The top cylinder of the series abuts against the moving knife-head 2. For the purpose of supplying motive fluid (preferably water) to the cylinders the plungers are made hollow and are provided with let-ports 11, connected with supply-pipes 12, which are controlled by valves. (Not shown.)

The upright bars 9, which form the frame of the shears, are not fixed to the moving knife-head, but are preferably secured loosely thereto by lateral caps 13, which are fixed to the knife-head and fit against the bars, thus serving as guides to maintain parallelism and proper relative positions of the parts, while permitting free independent motion of the frame and knife-head. The "stationary" knife-head 16 (so called because it is or may be stationary during the shearing of the metal) is fixed to the bars 9 and may be provided with cylinders 14, whose plungers 15 bear on the moving knife-head and assist in depressing the same. A convenient manner of attaching the stationary knife-head to the bars 9 is to form these parts with engaging offsets and to provide the cylinders 14 with lateral flanges 17, which fit over the bars and are firmly bolted to the knife-head. The frame of the shears, including the bars 9 and the knife-head 16, is rendered vertically movable by means of lifting-cylinders 18, whose plungers 19 are provided with links 20, fitting against brackets 21 on the bars 9. These cylinders are set on suitable supports 22, and when their plungers are projected they lift the shear-frame, causing the bars 9 to move vertically independently of the knife-head 2, raising the knife-head 16 and also raising the plungers 7. The lifting action of these cylinders may be assisted by admitting water into the counterbalancing-cylinders 14, and as a matter of convenience in practice I prefer to keep the water-pressure constantly within the latter cylinders, so that they shall serve as a constantly-acting counterbalancing mechanism. In the vertical motion of the bars 9 caused by the cylinders 18 they are guided at their upper ends by the knife-head 2 and plate 3 and at their lower ends by short guides 23.

In the operation of shearing the metal piece to be cut is interposed between the knives 24

of the upper and lower knife-heads, and water is then admitted to the lowest cylinder 6, or if greater power is desired it is admitted, also, to the other cylinders, the effect of which is to lift the moving knife-head and to shear off the piece between the two knives, the lifting power of the lower cylinder being transmitted by the parts 10 to the cylinders above. When the piece has been cut, these cylinders are connected with the exhaust, whereupon by reason of the gravity of the parts, assisted by the counterbalancing-cylinders 14, the moving knife-head and cylinders are depressed and the water exhausted from the latter.

If it be desired to increase the distance between the shear-knives, so as to adapt the shears to cutting pieces of larger section, water is admitted into the cylinders 18. The plungers 19 are thereby projected, and these, acting on the brackets 21, raise the bars 9, and thus elevate the knife-head 16, increasing the gap between the knives. The only work done by the cylinders 18 is to lift and support the shear-frame. The strain of the work of shearing is taken up entirely by the bars 9 and knife-head 16, the actuating mechanism being contained within these parts. Hence the capacity of the cylinders 18 need not be greater than that required for lifting the shear-frame. In the drawings I show the parts of the shears as they are when the frame is lifted so as to separate the shear-knives to their widest extent, and in this case the full stroke of the cylinders is employed in shearing the metal. When the frame is lowered by exhausting the water from the cylinders 18, the gap between the knives is diminished and a much shorter stroke of the cylinders will suffice to do the work. The advantages derived from this ready adjustability of the shears are very considerable, especially when the principles of my invention are applied to large shears capable of doing heavy work, where the necessity of lifting pieces of small section by the moving knife, so as to bring them into contact with the stationary knife, would entail serious practical disadvantages. In Figs. 1 and 2 I show the shears arranged in connection with feed-tables 25, by which the metal piece is carried to the knives, the shear-frame being set for convenience in a pit 26 below the level of the mill-floor.

It will be understood that my improved shears are capable of modification in various ways without involving a departure from the principles of the invention as stated in the broad claims of this specification, since I desire to cover, broadly, as of my invention any shears or similar mechanism in which the shear-frame and stationary knife are movable, so as to increase and diminish the gap between the knives.

I claim—

1. In metal-shears, the combination of knife-heads and an actuating-motor, a machine-frame movable to separate the knife-heads, and a motor for so moving the frame, substantially as and for the purposes described.

2. The combination of a stationary head, a machine-frame, an actuating-cylinder, a moving head actuated by the cylinder, and mechanism which acts on the machine-frame and is adapted to move the same, with the stationary head, to vary the gap between the heads, substantially as and for the purposes described.

3. The combination of a stationary head, an upright machine-frame fixed thereto, a moving head held by the frame and movable independently thereof, an actuating-cylinder carried by the frame and adapted to actuate the moving head, and lifting mechanism acting on the frame and adapted to lift the same to vary the distance between the heads, substantially as and for the purposes described.

4. The combination of a stationary head, an upright machine-frame fixed thereto, a moving head held by the frame and movable independently thereof, an actuating-cylinder carried by the frame and adapted to actuate the moving head, a support independent of the machine-frame, which supports the moving head when in its bottom position, and lifting mechanism acting on the frame and adapted to lift the same to vary the distance between the heads, substantially as and for the purposes described.

5. In metal-shears, the combination of the moving knife-head and actuating-motor, a stationary knife-head, and a lifting-cylinder adapted to lift the stationary head to vary the width of the gap between the knives, substantially as and for the purposes described.

6. The combination of a machine-frame composed of upright bars, a head carried thereby, a moving head movable within the frame, motors comprising cylinders and plungers set in series in the frame, with their stationary parts supported thereby, and lifting mechanism by which the frame can be moved vertically, substantially as and for the purposes described.

7. The combination of a stationary head, an upright machine-frame fixed thereto, a moving head held by the frame and movable independently thereof, an actuating-cylinder carried by the frame and adapted to actuate the moving head, lifting mechanism acting on the frame and adapted to lift the same to vary the distance between the heads, and a counterbalancing-cylinder fixed to the frame and bearing downwardly on the moving head, substantially as and for the purposes described.

8. The combination of a machine-frame, knife-heads, one of which is fixed to the frame, motors comprising cylinders and plungers set in series in the frame, and a frame-lifting motor, substantially as and for the purposes described.

9. The combination of a machine-frame composed of upright bars, a head carried thereby, a moving head movable within the frame, an actuating-cylinder carried by the frame, guides for supporting the frame, and a lifting-cylinder connected with the frame and adapted to lift the same, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 16th day of February, A. D. 1892.

HENRY AIKEN.

Witnesses:
JAMES K. BAKEWELL,
H. L. GILL.