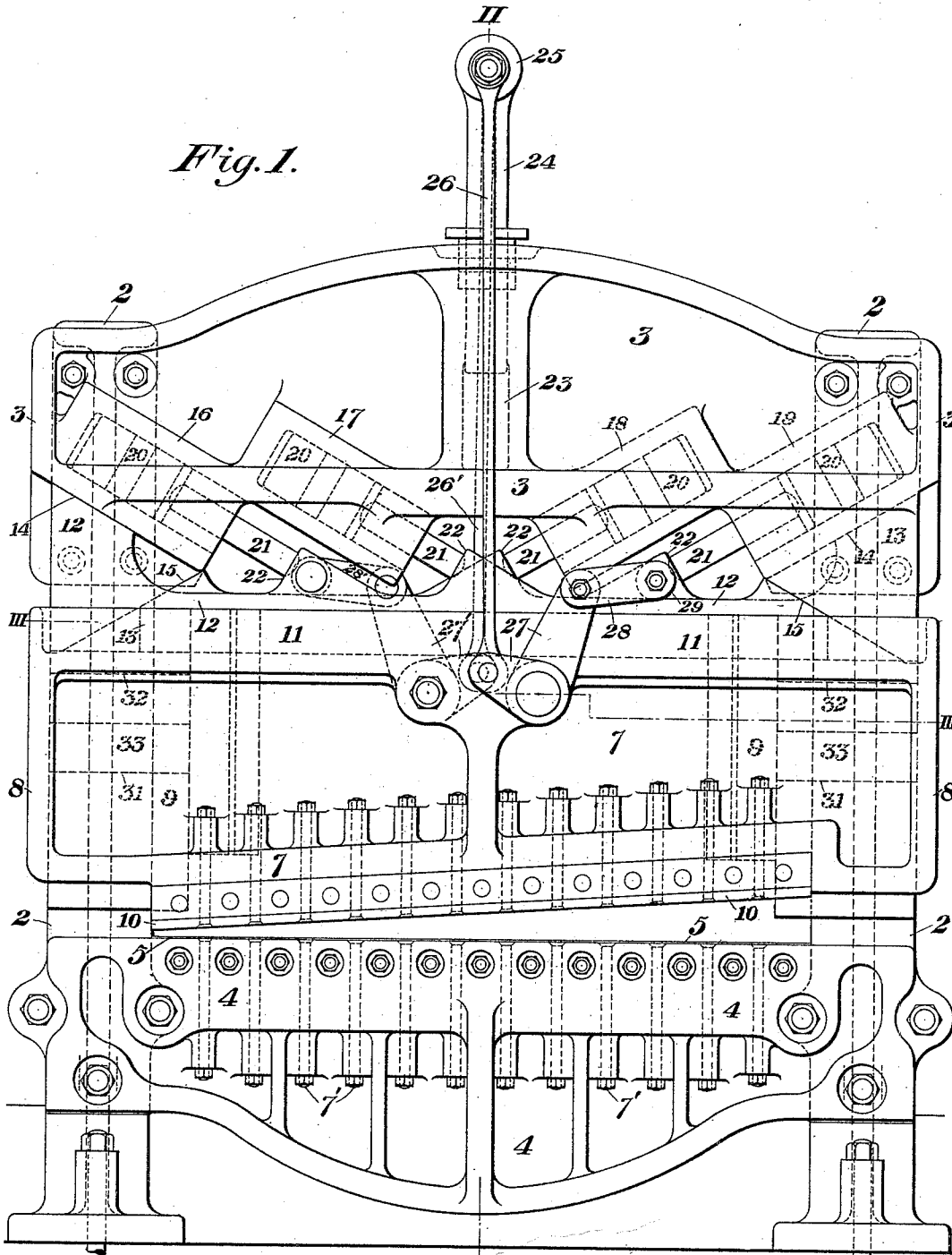


H. AIKEN,
SHEARS.

No. 448,192.

Patented Mar. 17, 1891.

Fig. 1.



WITNESSES

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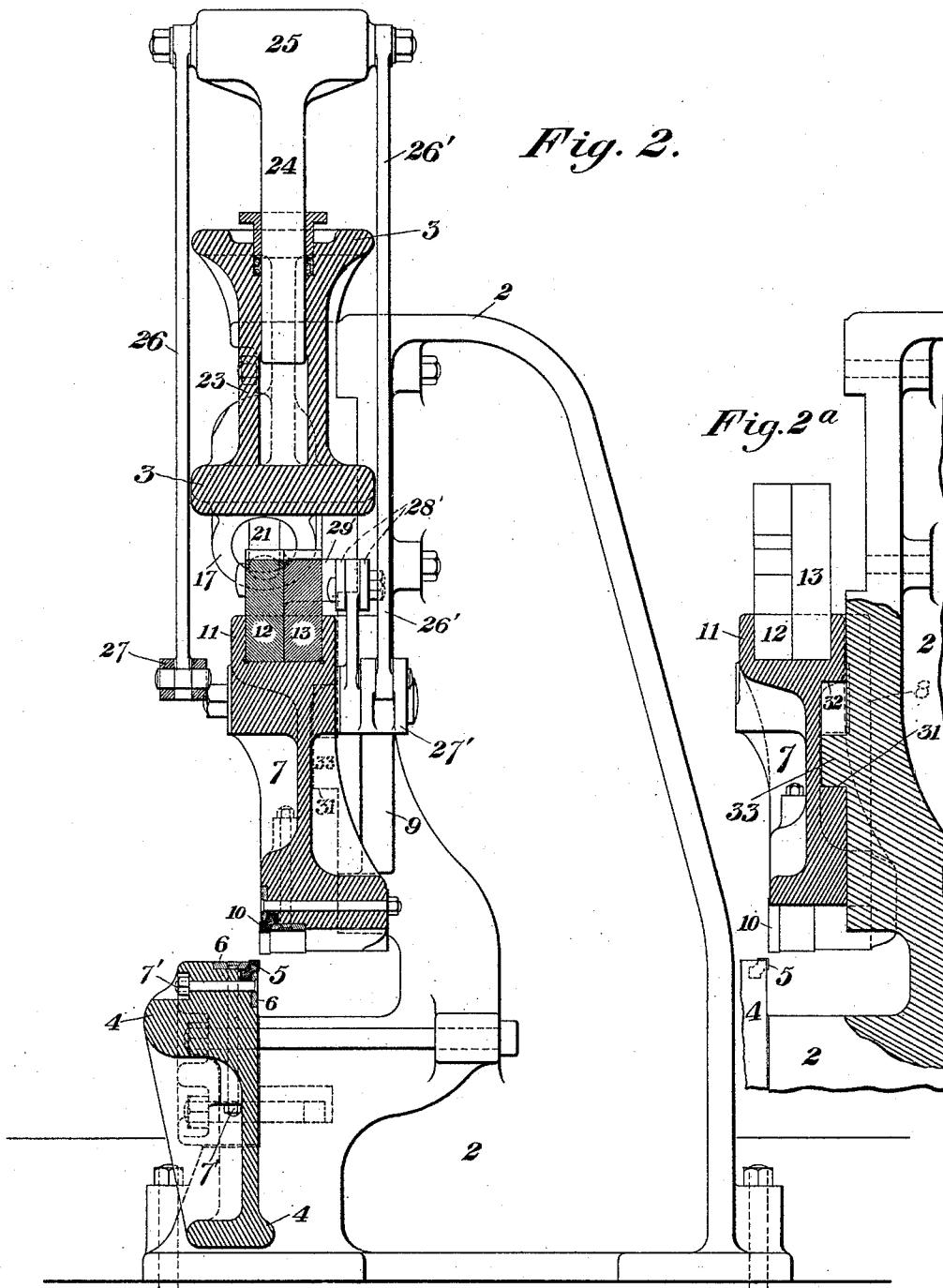


Fig. 2.

Fig. 2a

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(No Model.)

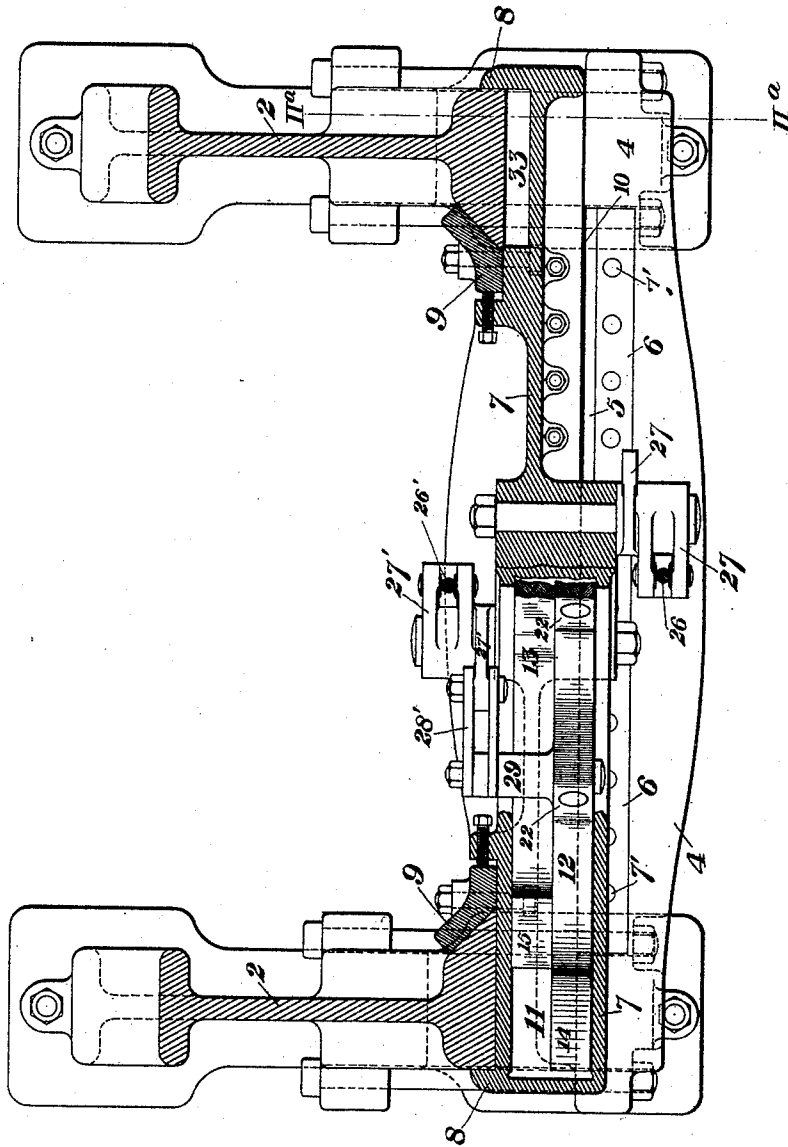
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Fig. 3.



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Fig. 6.

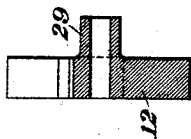


Fig. 4.

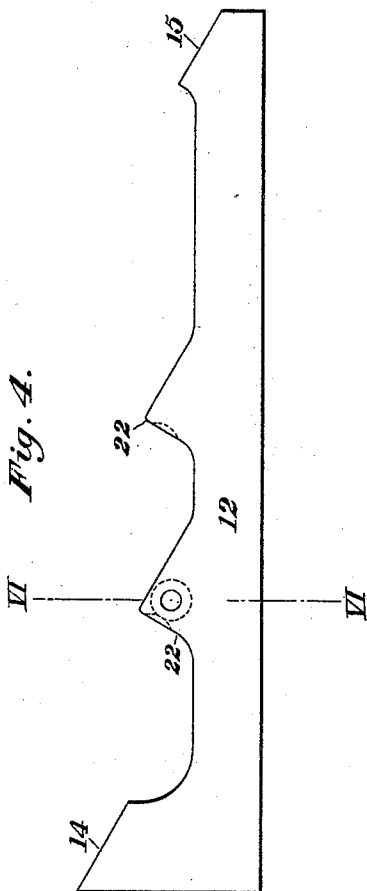


Fig. 5.



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UNITED STATES PATENT OFFICE.

HENRY AIKEN, OF PITTSBURG, PENNSYLVANIA.

SHEARS.

SPECIFICATION forming part of Letters Patent No. 448,192, dated March 17, 1891.

Application filed December 1, 1890. Serial No. 373,173. (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 Shears, &c., of which the following is a full, clear, and exact description.

The object of my invention is to provide improved means for supplying motive power to heavy hydraulic machinery, such as shears for cutting metal, &c. The desideratum in such machines is to apply the power in such manner that the force exerted on the moving head shall be in parallel lines, and shall therefore exercise no tendency to cant the moving head in its guides and to cause it to act unevenly. The means sometimes employed to attain this end—viz., a rotatory shaft provided with eccentrics connected with the head—are undesirable in doing heavy work because of the great size and strength of which the shaft and its connections must be made in order to stand the strain of work and the correspondingly great cost of the mechanism.

My invention obviates this difficulty and affords operative means simple and cheap in construction and very effective in distribution of the power evenly to the moving head. To this end I employ a longitudinally-movable bar, which bears on or is operatively connected with the moving head at its ends at the extremes of the lines of work, with an actuating-cylinder which acts on the bar to move it so as to transmit the power to the head.

My invention also has for its object to provide means whereby, instead of using an actuating-cylinder of large diameter bearing directly on the moving head, a cylinder of smaller diameter and longer stroke can be used. It also contemplates the use of several cylinders so arranged as to be capable of conjoint use or separate use, according to the work to be done by the moving head.

My invention further relates to the employment of a cylinder or cylinders set in oblique position, with interposed power-transmitting mechanism so arranged that the power shall be transmitted partially by direct action and partly through the transmitting mechanism.

I shall now proceed to describe my inven-

tion, so that others skilled in the art may make and use it, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front elevation of metal shears embodying my invention. Fig. 2 is a vertical section on the line II II of Fig. 1. Fig. 2^a is partial vertical section on the line II^a II^a of Fig. 3. Fig. 3 is a horizontal section on the line III III of Fig. 1. Fig. 4 is a side view of one of the wedge-bars by which power is transmitted to the moving shear-knife. Fig. 5 is a top plan view thereof. Fig. 6 is a vertical section on the line VI VI of Fig. 4.

Like symbols of reference indicate like parts in each.

As shown in the drawings, the housing or frame of the shears consists of upright parallel end pieces 2, connected at the top by a cap or entablature 3.

4 is the block or anvil of the bed-knife, which extends between the ends of the frame and is rigidly bolted thereto, as shown.

5 is the knife, which may be secured in position on the anvil by cap-plates 6 and bolts 7'. The moving knife-head 7 is a frame or casting of suitable strength, which is fitted to guide-faces on the upright ends of the shear-frame, and is confined thereto by flanges 8 on the knife-head bearing against the outer sides of the guides, and retaining-plates 9, Fig. 3, bolted to the knife-head and bearing against the inner side thereof, so arranged and constructed that the knife-head shall be adapted to be moved vertically on the guides by the means hereinafter described. The lower edge of the knife-head is made at an angle to the horizontal, and the knife-blade 10 may be fixed thereto, as shown, Fig. 2. The upper part 11 of the knife-head is made of horizontal trough shape, so as to be adapted to receive two parallel bars 12 13. The shape of one of these bars is shown in detail in Figs. 4 and 5. At the surface of one end is a prominent inclined face 14, Figs. 3 and 4, and at the other end is a face 15, inclined at the same angle. These inclined faces have bearings against correspondingly inclined surfaces on the under side of the ends of the entablature. The two bars 12 and 13 may be similar in construction and form, but are set in reverse positions, so that

the part 14 of one shall be adjacent to the part 15 of the other, and that at each end of the entablature the inclination of the surfaces of the bars shall be in opposite directions, each having its individual bearings on separate inclined faces on the entablature. The consequence of this construction is that if the bars be moved longitudinally in opposite directions and respectively in opposition to the inclinations on the entablature, they shall exert on the knife-head a downward pressure, and that when moved oppositely to each other in the reverse direction such down-pressure shall be relieved. To transmit such motion to the wedge-bars, I employ power-cylinders 16 17 18 19, formed in the entablatures, the cylinders 16 and 17 being set parallel to each other in the vertical plane of the bar 12 and inclined at an angle toward the middle line of the shears, and the cylinders 18 and 19 being parallel with each other in a different vertical plane from the other cylinders—viz., in the plane of the bar 13—and inclined in the opposite direction toward the middle line of the shears. Each of these cylinders has a plunger 20 and a bar 21, interposed between the end of the plunger and a shoulder 22 on the bar 12 or 13. Thus the bars 21 of the cylinders 16 and 17 bear against shoulders 22 on the wedge-bar 12, while the bars 21 of the cylinders 18 19 bear against shoulders on the wedge-bar 13. As the travels of the plungers and wedge-bars are not in the same lines, I round the ends of the bars 21 and fit them in corresponding recesses on the plungers and the shoulders on the wedge-bars, so that said bars 21 are capable of lateral motion to adjust themselves to changes in relative position of parts which they connect. The four cylinders serve to force the knife-head down in the manner hereinafter described.

For the purpose of counterbalancing and raising the knife-head, I employ an upright cylinder 23, cast in the entablature and having an upwardly-projecting plunger 24, at the end of which is a cross-head 25, from which links 26 26' extend downwardly. Each of these links is connected to a bell-crank lever 27 27', and the levers are pivoted to the knife-head on opposite sides of the same. The lever 27 is connected by a link 28 with a pin set in a boss 29, which projects laterally from the wedge-bar 13 on the other side of the knife-head, and the lever 27' is in like manner connected with the other wedge-bar 12. The purpose of thus connecting each lever, not with the adjacent wedge-bar, but with the one more remote, is to place the connections so as to clear the cylinders on the entablature. Each of the cylinders 16, 17, 18, and 19 is single-acting, and each can be operated independently of the others. The cylinder 23, which serves as a counterbalancing-cylinder, is also single-acting, and in practice I prefer that the water-pressure shall be continually in this cylinder on the under side of the

plunger, so as to exert on the latter a constantly-acting upward force.

The operation of the shears is as follows: Suppose that the parts are in the position shown in Fig. 1 and that it is desired to depress the moving knife with all the force of which the mechanism is capable. The operator admits motive fluid, preferably water, into the four cylinders 16, 17, 18, and 19, thereby projecting their plungers and the bars 21. These bars, acting in an inclined direction on the wedge-bars, transmit thereto a resultant downward pressure and also move them longitudinally in opposite directions. The ratio of the direct downward pressure to the longitudinal pressure resulting from the cylinders varies of course with the angle at which the cylinders are set relatively to the wedge-bars. The action of these wedge-bars forces down the knife-head in its guides and also draws down the plunger 24 against the water-pressure in its cylinder. When the shear-knife has completed its stroke and it is desired to elevate it, the cylinders 16 to 19 are cut off from the fluid-supply and are connected with the exhaust. The counterbalancing-cylinder 23 then acts by raising the links 26, which, drawing on the bell-crank levers 27 27', elevates the knife-head and simultaneously moves the wedge-bars longitudinally in the reverse directions to those above described, thereby pushing back the plungers of the several cylinders, exhausting the water therefrom, and restoring all the parts to their original positions. In this operation of the shears it will be noticed that the wedge-bars have bearings at both ends of the shears and transmit the power to the shear-knife uniformly in parallel directions, and as there are two wedge-bars acting in opposite directions the lateral strain of each on the machine is neutralized by the other. It will also be noticed that the nature of the connections between the cylinders and knife-head is such that a given stroke of the plungers produces a motion of the knife-head of only a fractional part of said stroke, say one-half. The consequence is that I am enabled to utilize effectively and with economy of power cylinders of small diameter. This of course reduces the weight of the machine, and is otherwise very desirable. The use of the wedge-bars is also of benefit, because they secure all the advantages in uniformity of action which appertain to the operation of shears by means of two eccentrics on a rotary shaft without the great expense in cost of construction which the use of such shaft entails.

An advantage incident to the use of several operating-cylinders such as I have shown is that when the shears are doing light work it is not necessary to use the full power and volume of water as when a single cylinder only is employed. Thus in doing very light work I can operate the shears by admitting water into one of the cylinders only. This will directly move one of the wedge-bars lon-

gitudinally, and by reason of the connection of the bell-cranks the other wedge-bar will be moved in the opposite direction, the other plungers following the wedge-bars without disconnecting therefrom, as hereinafter described. When greater power is desired, I may use two of the cylinders, one on each side of the middle of the machine. When still greater power is needed, three of the cylinders may be used, and in obtaining the maximum power all of the cylinders are employed, as above described. The exhaust-receptacle, into which the several cylinders discharge, is preferably an elevated tank, so that there is constantly a sufficient back-pressure of water in the cylinders to force the plungers and the bars 21 against the wedge-bars, even when the motive pressure is not in the cylinders.

In order that the limits of stroke of the knife-head in both directions may be well defined, I prefer to use stops 31 and 32 on the knife-head, Figs. 1, 2, and 2^a, between which is a stop 33 on the shear-frame, so that the motion of the knife-head both up and down is limited by the play afforded by the stop 33 to the other stops.

It will be understood by the skilled mechanic that my improved shears are capable of modification in form and arrangement of the parts in various ways within the scope of my invention.

Although in the drawings I have shown my invention as applied to metal shears, it should be understood that it is not limited thereto, but is applicable to presses and other similarly-acting mechanism.

I claim—

1. The combination, with the moving head, of an actuating-cylinder and a wedge-bar actuated by the cylinder and having wedge-bearings at both ends of the head transmitting power thereto in parallel directions at the extremes of the lines of work, substantially as and for the purposes described.

2. The combination, with the moving head, of an actuating-cylinder and a bar movable longitudinally by the cylinder and connected with the head at both ends thereof at the extremes of the lines of work, substantially as and for the purposes described.

3. The combination, with the moving head, of an actuating-cylinder set at an oblique angle to the lines of motion of the head, and interposed power-transmitting mechanism bearing on the knife-head, whereby motion of the cylinder will exert on the moving head a partial

direct force, the remainder of the force being transmitted to the head by the transmitting mechanism, substantially as and for the purposes described.

4. The combination, with the moving head, of independently-acting actuating-cylinders set at both sides of the middle of the machine at oblique angles to the lines of motion of the head, and power-transmitting mechanism bearing on the knife-head, substantially as and for the purposes described.

5. The combination, with the moving head, of actuating-cylinders and wedge-bars actuated by the cylinders and having wedge-bearings at both ends of the head transmitting power thereto in parallel directions, said cylinders being adapted to operate the wedge-bars in opposite directions, substantially as and for the purposes described.

6. The combination, with the moving head, of actuating-cylinders set at oblique angles to the lines of motion of the head, and wedge-bars actuated by the cylinders and having wedge-bearings at both ends of the head transmitting power thereto in parallel directions, said cylinders being adapted to operate the wedge-bars in opposite directions, substantially as and for the purposes described.

7. The combination, with the moving head, of a longitudinally-movable bar connected with the ends of the head, an actuating-cylinder set at an oblique angle to the lines of motion of the head, and having a bar 21, connecting its piston with the bar, and a counterbalancing-cylinder, substantially as and for the purposes described.

8. The combination, with the moving head, of longitudinally-movable bars connected with the ends of the head, cylinders acting on the bars to move them in opposite directions, a counter-balance, and levers connecting the operative mechanism of the counter-balance with the bars, substantially as and for the purposes described.

9. The combination, with the moving head, of longitudinally-movable bars connected with the ends of the head, and independently-acting obliquely-inclined cylinders bearing on the bars, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 21st day of November, A. D. 1890.

HENRY AIKEN.

Witnesses:

W. B. CORWIN,
H. M. CORWIN.