

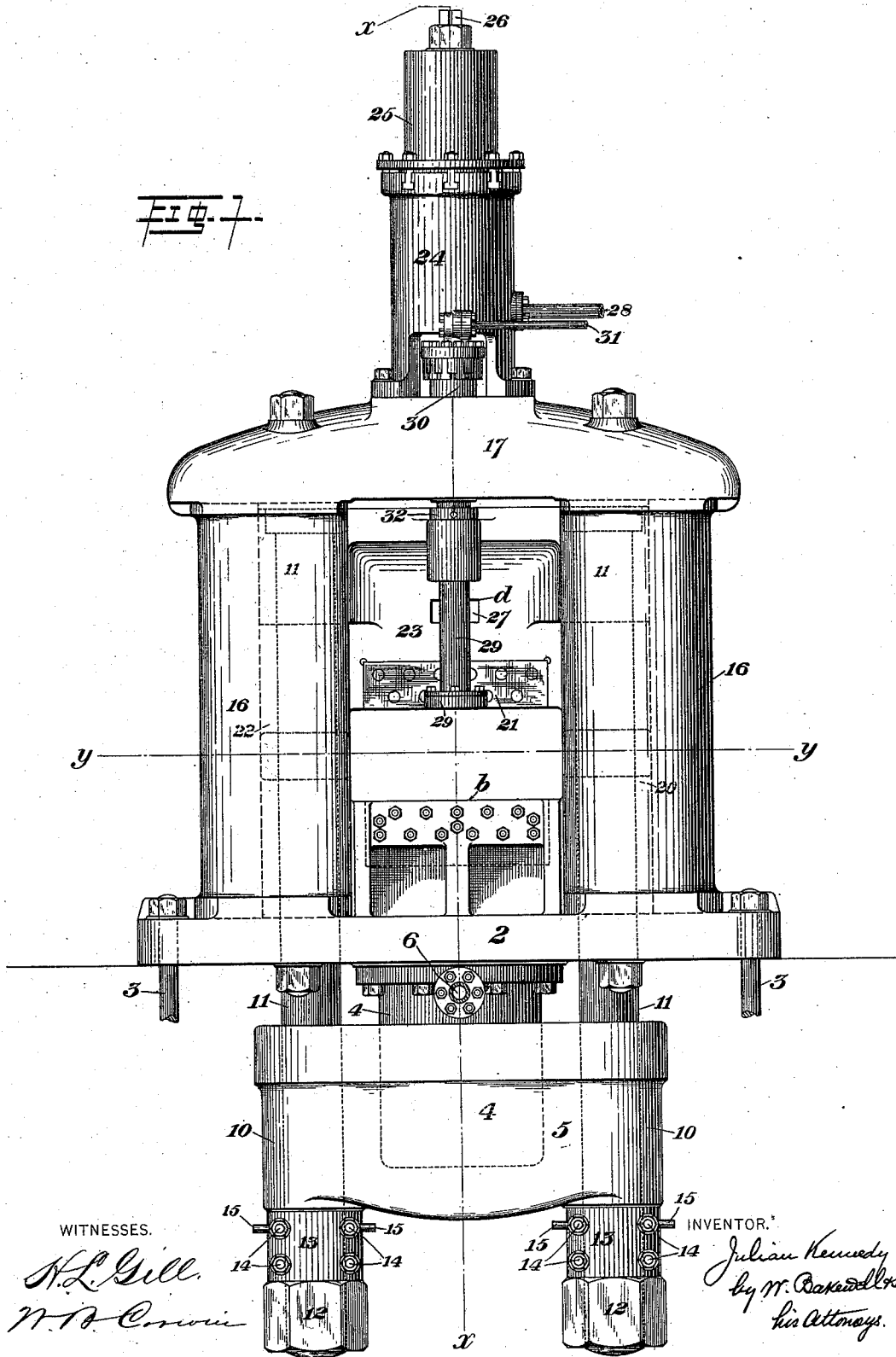
(No Model.)

3 Sheets—Sheet 1.

J. KENNEDY.
HYDRAULIC SHEARS.

No. 402,457.

Patented Apr. 30, 1889.



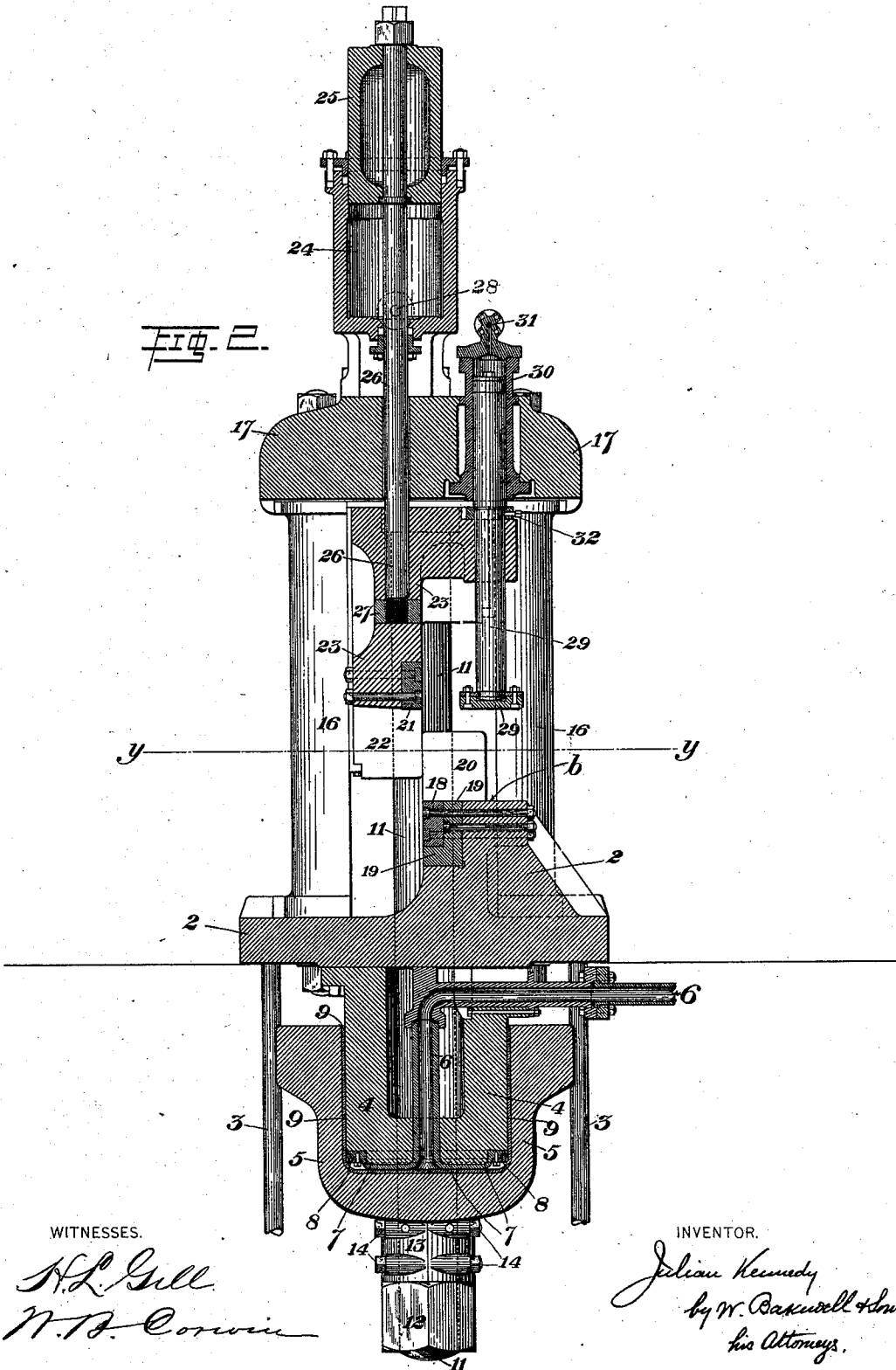
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3 Sheets—Sheet 2.

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N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.)

3 Sheets—Sheet 3.

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FIG. 3.

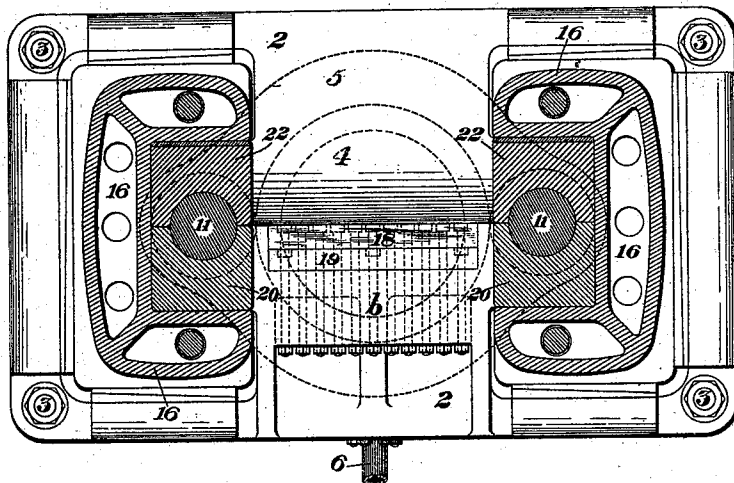


FIG. 4.

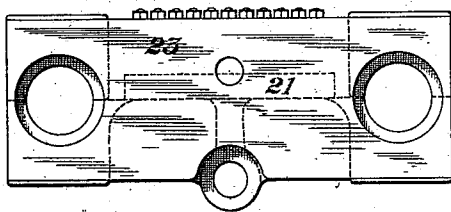
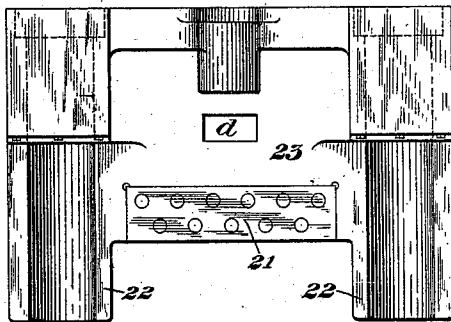


FIG. 5.



WITNESSES.

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UNITED STATES PATENT OFFICE.

JULIAN KENNEDY, OF LATROBE, PENNSYLVANIA.

HYDRAULIC SHEARS.

SPECIFICATION forming part of Letters Patent No. 402,457, dated April 30, 1889.

Application filed October 29, 1888. Serial No. 289,407. (No model.)

To all whom it may concern:

Be it known that I, JULIAN KENNEDY, of Latrobe, in the county of Westmoreland and State of Pennsylvania, have invented a new and useful Improvement in Hydraulic Shears; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a front elevation of the shears. Fig. 2 is a vertical section on the line xx of Fig. 1. Fig. 3 is a horizontal cross-section on the line yy of Fig. 1. Fig. 4 is a plan view of the top knife-holder. Fig. 5 is a front view of the knife-holder shown in Fig. 4.

Like symbols of reference indicate like parts in each.

Referring to the drawings, 2 represents the stationary bed-piece of the shears, which is secured or anchored in the floor of the mill or other suitable foundation by means of tie-rods 3. On the under side of the bed 2 is bolted a fixed or stationary piston, 4, surrounding which is a cylinder, 5, which should be made of great strength, since it has to withstand the pressure which is applied to the machine in the shearing operation. This cylinder is supplied with water or other motive fluid by a supply-pipe, 6, Fig. 2, which extends through the piston 4 from the outside thereof. In order to prevent leakage of water through the joint at the point where the pipe passes through the base of the piston, I provide the pipe with an outwardly-flaring flange or facing, 7, which fits over the base of the piston, extending to the exterior periphery thereof. At the rim of the base of the piston there is an annular recess, in which is fitted an enlarged bead or ring of the flange 7, and in an annular recess of this bead is placed a flexible packing-ring of U shape in cross-section, which packing-ring is held in place by a face-ring, 8, secured to the flange 7 or to the piston by means of bolts. The escape of water is thus entirely prevented, and the whole working-face of the piston is constituted by the facing, which may be removed and replaced when worn out, the body

of the piston serving merely as a filler for the facing.

The interior of the cylinder 5 is preferably lined with a brass lining, 9, as shown in Fig. 2, and has projecting from opposite sides two strong wings, 10, Fig. 1, which are provided with vertical cylindrical holes, by which the cylinder is fitted on two vertical rods or bolts, 11. At the lower ends of the bolts 11 are internally-threaded nuts 12, which are screwed thereto, and between the nuts and the wings 10 are interposed separators or collars 13, each of which is divided vertically into two semi-tubular sections, which are held together by bolts 14. The sections of these collars are provided with projecting lugs or posts 15, which afford means by which they can be lifted by a crane or otherwise when they are removed from the bolts, as hereinafter explained.

The frame of the shears is composed of two upright castings, 16, preferably made hollow to reduce their weight, as shown in the sectional view, Fig. 3, and on the inner sides having concave guideways with rectangular sides to guide the moving shear-blade in its vertical motions. These castings are connected at the top by a bridge or cap piece, 17.

The stationary shear-knife 18, Fig. 2, is bolted to a seat or block, 19, which is set in a recess in the bed-piece 2, and at the sides of the bed-piece are vertical projections or guides 20, which extend upwardly within the lateral guide-grooves of the castings 16, Figs. 2 and 3. Back of the shear-knife 18 the bed-piece 2 is made flat, so as to form a block or rest, b , on which the metal is laid while being sheared.

The upper shear-knife, 21, is bolted in a recess at the bottom of the face of a vertically-moving plunger or knife-holder, 23, which is made of proper width to extend from one guide-groove in the upright guides 16 to the other, and from the bottom of the holder at the sides thereof are projecting posts or guides 22, Figs. 2 and 5, which work in the vertical grooves in the guides 16 and overlap the corresponding projections 20 of the bed-piece 2. The projections 22 are sufficiently separated as not to interfere with the action of

the shear-knives in cutting the metal, and they serve to brace and steady the moving knife in its action and to take up the side-thrust thereof. The knife-holder 23 is operated in its downstrokes by the hydraulic cylinder 5, which is connected therewith by vertical bolts 11, which extend up through the cylindrical cavities made in the projections 20 and 22 (formed by semi-cylindrical grooves in the meeting faces of both, Figs. 2, 3, 4, and 5) and through the upper part of the knife-holder 23, the heads *c* of the bolts being set in countersunk recesses on the top of the holder, Figs. 1, 2, and 4. The upstrokes of the knife-holder are produced by a hydraulic cylinder, 24, having a piston, 25, and piston-rod 26, which latter extends through the cap-piece 17 and through the upper part of the body of the knife-holder 23 into a recess, *d*, in the latter, in which recess it is confined by a nut, 27. A continual upward pressure, comparatively much less than the pressure applied to the cylinder 5, but sufficient to raise the knife-holder when the pressure in the latter cylinder is cut off, is applied to the cylinder 24 by water, which enters it through a supply-pipe, 28. Thus in practice I have constructed the shears so that the cylinder 5, which is forty-two inches in diameter, shall be capable of exerting a downward pressure of three thousand tons, and a constant upward pressure of one hundred tons is exerted on the piston 25, sufficient to displace the water from the cylinder 5 and to raise the knife-holder and its connected parts, whose joint weight is about fifty tons. The function of the cylinder 24 is therefore to act as a counter-balance to raise the knife-head and the cylinder 5 and their connected parts after the knife-head has been drawn down by the cylinder 5 and has sheared the metal bloom.

The metal, while being sheared, is held on the block *b* by means of a gag or presser, 29, which consists of a vertical plunger of a small hydraulic cylinder, 30, set in a recess in the cap 17 and actuated by a water-supply pipe, 31, which is connected with the same pressure-reservoir which supplies the cylinder 5. The plunger 29 passes through a projecting portion of the knife-holder 23, and is connected therewith by a vertically-adjustable collar, 32, on the plunger, which rests upon a recessed surface on top of the knife-holder. The gag is by this collar prevented from moving downward more rapidly than the knife-holder, and is so connected therewith that the lifting of the knife-holder shall carry the gag with it also.

When the metal is placed on the block *b* and the water-supply is turned on to operate the cylinder 5, it also enters the cylinder 30 and forces down the gag 29 upon the metal, and as both cylinders have a common water-supply the pressure on the gag varies with the pressure on the moving knife-holder. Thus when the piece to be sheared is large

and requires a great pressure to shear it the pressure on the gag which holds the piece in place is correspondingly great, and when the piece to be sheared is light and requires less pressure to shear it the pressure on the gag is correspondingly less. There is thus an automatic correlation of the forces exerted on the gag and shears, and this forms an important part of my invention.

The operation of the shears in shearing metal is as follows: The metal to be sheared is laid upon the block *b*, and the valve is opened to admit water under pressure to the supply-pipes 6 and 31. This forces the gag 29 down upon the metal, and also forces down the cylinder 5, drawing with it the bolts 11 and the knife-holder 23, in so doing overcoming the resistance of the cylinder 24. When the shear-knife 21 has come into conjunction with the knife 18 and has completely sheared off the metal, the valve of the cylinder 5 is moved so as to cut off the water-supply and to put the cylinder into communication with the exhaust. The pressure in the cylinder 24 then automatically raises the knife-holder 23 by means of the piston-rod 26, and the sheared metal may be removed from the block *b*, the gag being raised by engagement of the moving knife-holder with the collar 32.

As regards the work of the shears in shearing the metal, the construction which I have described is of great advantage in respect of the overlapping of the portions 20 and 22 of the knife-holders, which affords great strength and steadiness of motion to the parts. The advantages resulting from the operation of the gag and the main cylinder by a common pressure-supply I have already noted. The machine also possesses other features of advantage which relate to the facility of repair of the main cylinder and piston.

When the shears are intended to be used for heavy work, the parts must be of great weight, and are therefore hard to remove and to adjust. Thus in shears which I have built on this pattern the cylinder 5 weighs thirty-eight thousand pounds, each of the bolts 11 is fifteen inches in diameter, each of the nuts is about one thousand pounds in weight, and each of the collars is of about the same weight.

In the practical working of the shears the packing of the piston often needs to be renewed or repaired, and to do this the cylinder must be altogether removed from the piston, so as to expose the base of the latter. To do this by unscrewing the nuts 12 and dropping the cylinder would involve considerable labor in handling and readjusting the nuts, and it is to lessen this labor that I employ the split collars 13. I make use of them in the following manner: When it is desired to expose the base of the piston 4, I first bring the cylinder 5 into a position somewhat lower than that shown in Figs. 1 and 2, and then by means of suitable jacks or blocks I support the cylinder from below. I then cut off the

water-supply from the cylinder 24 and exhaust the water from it. The effect of this is to cause the knife-holder 23 and the bolts 11 to drop, while the cylinder 5, being supported as just described, remains stationary, and as the bolts drop the collars 13 are separated from contact with the wings 10 of the cylinder. The bolts 14, which hold the parts of the collars together, are then loosened, and the divided sections may be removed by a crane, the suspending-chain of which is hooked onto the pins 15. Water is then admitted to the cylinder 24, so as to raise its piston and to draw up the nuts 12 into contact with the bottom of the wings of the cylinder 5. The jacks or supports are then removed from beneath the piston, and the cylinder 5 can then, by exhausting the water from the lifting-cylinder 24, be lowered sufficiently to expose the base of the piston 4 and to enable the packing on the latter to be conveniently repaired or renewed. When this is done, the knife-head and the bolts 11 are again drawn up by the lifting-cylinder 24, so as to bring the cylinder 5 on the piston 4, the cylinder 5 is then blocked or jacked up, as before, the knife head and bolts 11 again lowered so as to separate the nuts 12 from the wings 10, and the sectional collars are replaced on the bolts above the nuts. The advantages of this feature of my invention in saving the handling of heavy pieces of metal will be appreciated by those skilled in the art. It also dispenses with the necessity for disturbing the adjustment of the nuts 12, and in this regard is a material saving of labor.

I do not limit myself precisely to that form of my invention which I have shown and described, since the details of construction and the arrangement of the parts may be varied by the skilled mechanic. For example, an obvious mechanical change is the use of a stationary hydraulic cylinder, 5, and arranging the piston thereof so that it shall be movable downwardly. This would involve no other material change in the arrangement of the parts, so far as the bolts 11, the nuts 12, and separators 13 are concerned, except that they would be connected with the piston and not with the cylinder.

I do not claim herein the use of the removable separators 13, nor the construction of the lining or facing of the plunger 9 and of its water-connections, since these are embodied in a separate application for Letters Patent filed February 11, 1889, Serial No. 299,394.

What I claim is—

1. An improvement in hydraulic shears, which consists in the combination, with the moving shear-knife and the hydraulic cylinder by which it is actuated in the act of shearing, of a gag or holder having a hydraulic cylinder which is connected with the same power-supply which supplies the cylinder of the shear-knife, whereby the pressure applied to the gag is proportioned to the pressure ap-

plied to the shear-knife, substantially as and for the purposes described.

2. An improvement in hydraulic shears, which consists in the combination, with the moving shear-knife and holder and its actuating-cylinder, of a gag or holder and the cylinder by which it is moved in the act of shearing, and a projection or collar which connects the gag and knife-holder, whereby the gag is supported and lifted by the ascent of the knife-holder, and the knife is permitted to descend independently of the gag after the latter has engaged the metal to be sheared, substantially as and for the purposes described.

3. An improvement in hydraulic shears, which consists in the combination, with the moving shear-knife and the hydraulic cylinder by which it is actuated in the act of shearing, of a gag or holder having a hydraulic cylinder which is connected with the same power-supply which supplies the cylinder of the shear-knife, whereby the pressure applied to the gag is proportioned to the pressure applied to the shear-knife, the said gag passing through the knife-holder and being provided with a projection or collar which affords means whereby the gag is raised in raising the knife-holder, substantially as and for the purposes described.

4. An improvement in shears, which consists in the combination of the two shear-knives and their holders, and guideways by which the moving holder is guided, said shear-knife holders being provided with portions at their ends which are situate in the guideways, and which overlap each other and brace the moving holder in the act of shearing, substantially as and for the purposes described.

5. An improvement in shears, which consists in the combination of the two shear-knives and their holders, guideways by which the moving holder is guided, said shear-knife holders being provided with portions at their ends which are situate in the guideways, and which overlap each other and brace the moving holder in the act of shearing, a hydraulic cylinder for operating the moving knife-holder during the act of shearing, and bolts which extend from the cylinder in recesses between the meeting faces of the knife-holders in the guideways and are connected with the moving knife-holder, substantially as and for the purposes described.

6. In hydraulic shears, the combination, with the moving shear knife or holder and the cylinder by which it is moved in the act of shearing, of a gag or holder connected with the moving parts of the shear-knife, the said connection being loose, whereby the gag is restrained during the descent of the knife, and the knife is permitted to descend independently of the gag or holder after the latter has engaged the metal to be sheared, and a cylinder for actuating the gag, substantially as and for the purposes described.

7. In hydraulic shears, the combination,
with the moving knife-head, of a stationary
plunger and movable cylinder situate below
the same, and vertical bolts connecting the
5 cylinder with the knife-head, whereby the
descent of the cylinder will draw the knife-
head with it, and a second cylinder for rais-
ing the knife-head and the first-named cyl-
inder, substantially as and for the purposes
10 described.

In testimony whereof I have hereunto set
my hand this 24th day of October, A. D.
1888.

JULIAN KENNEDY.

Witnesses:

W. B. CORWIN,
H. L. GILL.