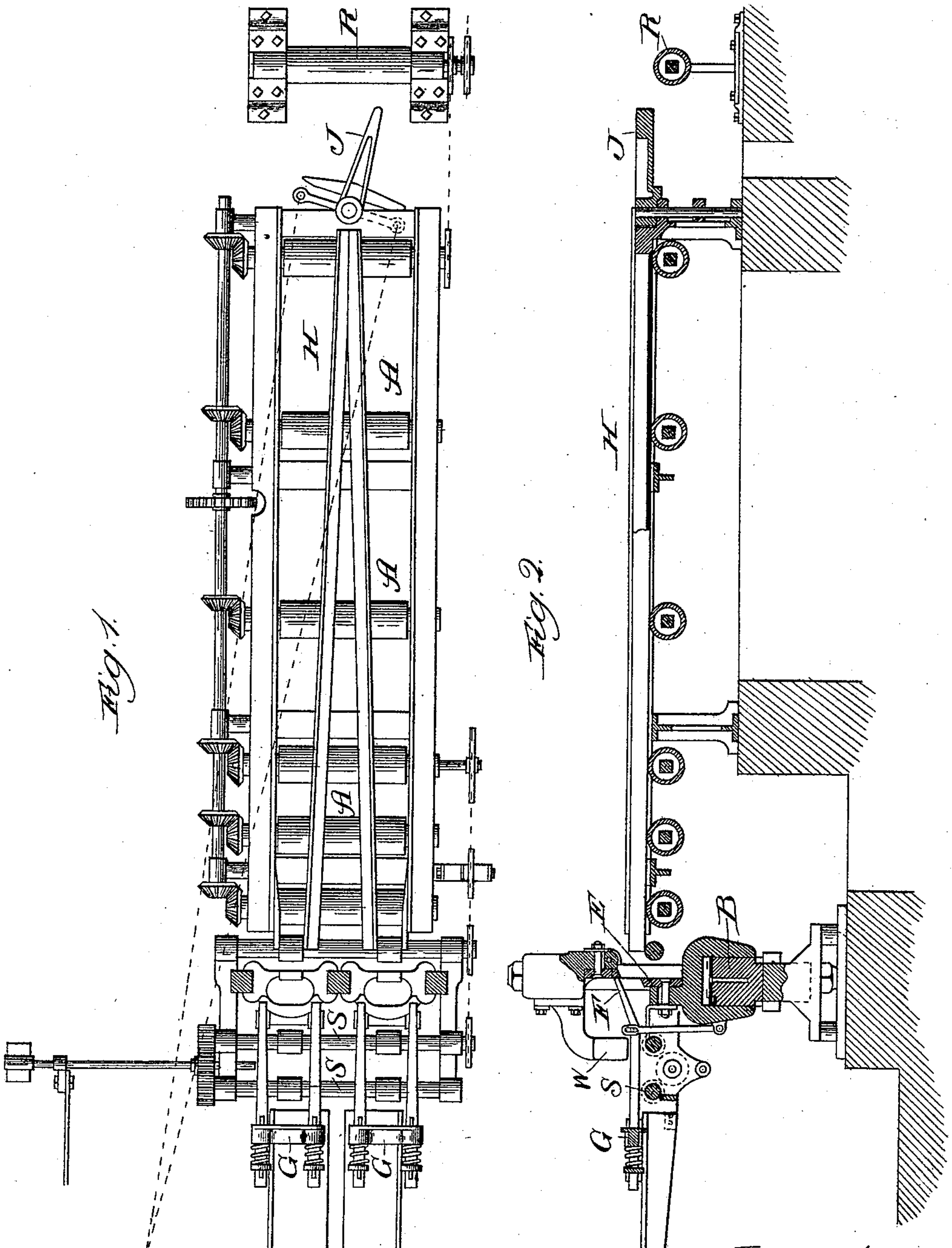
(No Model.) 3 Sheets—Sheet 1.

C. PETTIGREW, H. S. SMITH & F. H. TREAT.

SHEARS FOR METALS.

No. 455,053. Patented June 30, 1891.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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SHEARS FOR METALS.

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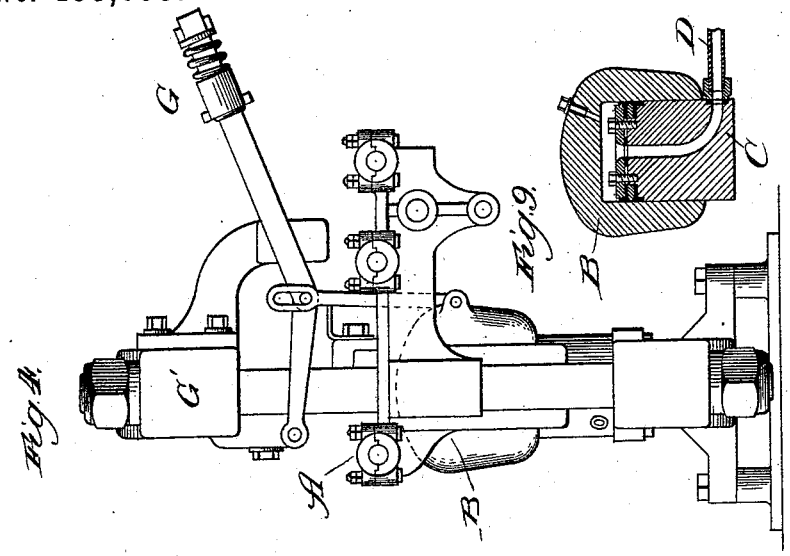

Fig. 4. Fig. 2.

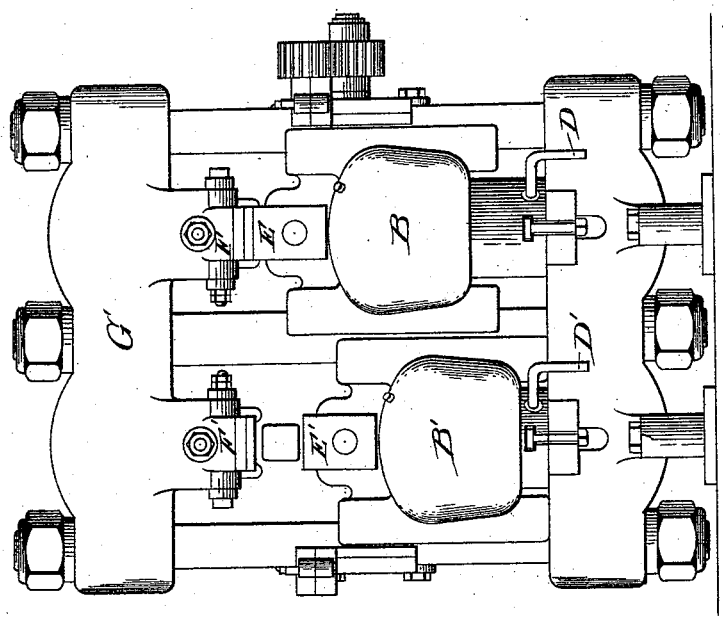

Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

C. PETTIGREW, H. S. SMITH & F. H. TREAT.

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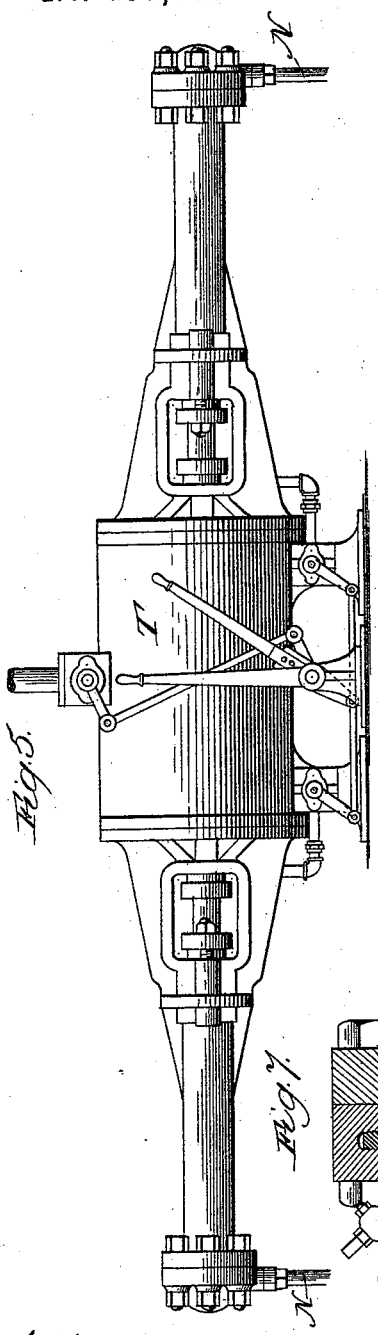

Fig. 5.

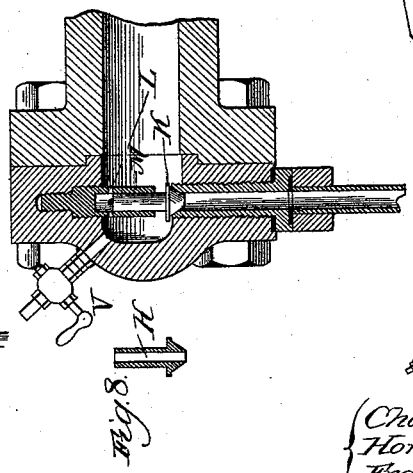

Fig. 7.

Fig. 8.

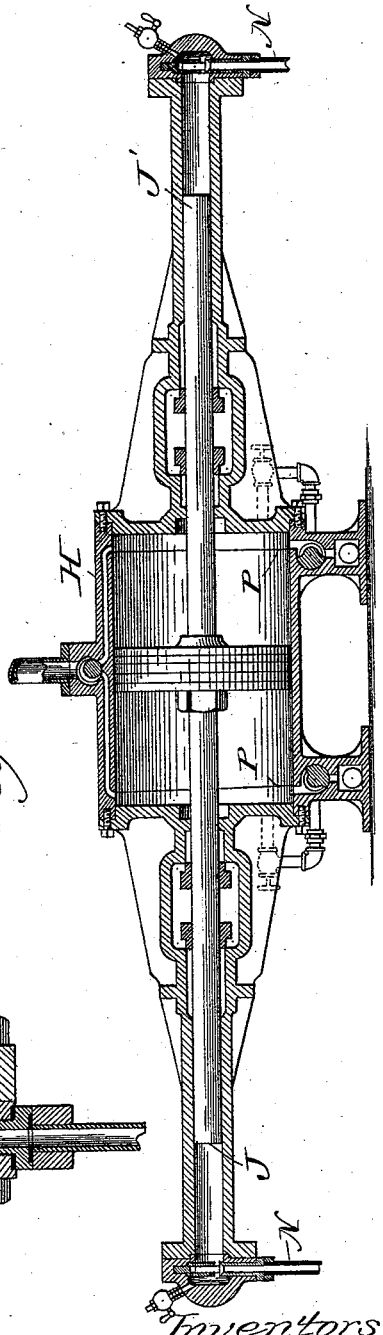

Fig. 6.

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UNITED STATES PATENT OFFICE.

CHARLES PETTIGREW, OF JOLIET, AND HORACE S. SMITH AND FRANCIS H. TREAT, OF CHICAGO, ASSIGNORS TO THE ILLINOIS STEEL COMPANY, OF CHICAGO, ILLINOIS.

SHEARS FOR METAL.

SPECIFICATION forming part of Letters Patent No. 455,053, dated June 30, 1891.

Application filed July 18, 1890. Serial No. 359,140. (No model.)

To all whom it may concern:

Be it known that we, CHARLES PETTIGREW, of Joliet, Will county, Illinois, and HORACE S. SMITH and FRANCIS H. TREAT, both of Chicago, Cook county, Illinois, have invented a new and useful Improvement in Shears for Metal, of which the following is a full, true, and exact description, reference being had to the accompanying drawings.

This improvement consists in a pair of double-acting shears for shearing hot metal alternately. The power to operate the shears is hydraulic, the water being forced to operate by steam-pressure.

Our invention will be readily understood from the accompanying drawings, in which—

Figure 1 represents a plan of our apparatus; Fig. 2, a vertical section through Fig. 1; Fig. 3, a view of the back of the shears; Fig. 4, a lateral elevation of the same; Fig. 5, an external view of the hydraulic cylinders; Fig. 6, a section through the same, showing the steam-piston; Fig. 7, a detail of the check-valve mechanism of the hydraulic cylinders; Fig. 8, a section through the hydraulic check-valve, and Fig. 9 a detailed section of the hydraulic cylinder beneath the shear-knife.

Our apparatus consists, generally, of a power transfer-table having rollers A A A, upon which the metal to be sheared is fed. This metal is delivered upon these rollers in a hot condition, and is fed to one side or the other of the partition H by means of the switch J, which is controlled by the operator, so that the metal coming in on the rollers R can be directed to one side or the other of the dividing-partition H.

The shear-knives are mounted upon hydraulic cylinders, which travel upon fixed hydraulic pistons, as shown in detail in Fig. 9. They are pressed upward by water-pressure, and are returned to their lower position by the weight of the cylinder. The movable shear-knives E E′ are alternately operated, while the fixed knives F F are mounted in the frame G′, in which the rest of the parts of the shears are also fixed. Beyond the shear-knives are the rollers S S, which convey away the billet or cut metal after it leaves the shears. Two automatic stops G G are provided, hinged in the frame and alternately raised, together with the hydraulic shears, to allow of the onward movement of the cut metal. The operating-cylinders are shown clearly in Figs. 5, 6, and 7.

The steam-cylinder H is provided with a piston operating two plungers or rams J J′, which force the water through tubes N, communicating with tubes D beneath the hydraulic cylinders. The steam is admitted alternately to either side of the steam-cylinder by any suitable arrangement of valves which may be controlled by the lever T. The exhaust-ports are not placed quite at the end of the cylinder, so that a steam-cushion is formed there in the space shown at P to prevent the piston striking the cylinder-head.

The hydraulic pump cylinders are provided with peculiar check-valves K, which have a central longitudinal opening through the stem, which stem slides in the casing M, the said casing being provided with a small aperture or apertures L. The result of this is that the water only gradually escapes downward to the hydraulic rams, passing only through apertures L; but on the return of the plunger J the check-valve rises, allowing the free flow of the water. The same water is constantly used, and any leakage can be filled by an attendant through the cock V.

In order to prevent the lifting of the metal while being cut, a guard-bracket W is provided to hold down the outer end of the metal while shearing.

The operation of our apparatus can now be readily understood. The metal is switched to one or the other channels by the switch J when it is fed forward against the gage-stop G, which, its shear-knife being down, is in the path of its motion. As the shear E rises and severs the metal, the gage-stop is removed from its path of motion and the rollers S feed it forward to its destination. These rollers may be continuously operated or only operated when it is desired to remove the metal.

The important advantage of having two shears acting as indicated is that in this way the hot metal, which is constantly being forwarded in the operation of steel-making, can

be handled by one set of shears without delaying the previous mechanism, whereas if a single set of shears were employed they might not be able to operate fast enough to dispose of the oncoming metal. By the arrangement shown one set of shears is cutting the metal while the other is receiving the same, thus permitting of a practically constant movement of the severed metal. This result is of course accomplished by having two bars of metal, one being fed to each set of shears.

What we regard as our invention, and desire to secure by Letters Patent, is—

1. A duplex billet-shear having two pairs of alternately-acting shear-knives, each operated by a single-acting hydraulic cylinder, in combination with a double-acting steam pumping apparatus connected at the ends of the pump with said hydraulic cylinders, whereby each movement of the steam-piston thereof causes a corresponding movement of the shear-knives in opposite directions, one pair to close and the other to open, substantially as described.

2. In combination with the knives of a billet-shear, a movable gage-stop, and mechanism for setting the same in the proper position to stop the infeeding movement of the piece being sheared from when the knives are open and automatically moving said stop away while said knives are closing to allow the free exit of the billet after it is severed, substantially as described.

3. In combination with the knives of a billet-shear, the lower one of which is movable, a guard-bracket to prevent the lifting up of the billet as it is being cut off, substantially as described.

4. In combination with a duplex billet-shear, a feeding-table having the rollers constantly revolving, and a switch for switching the metal alternately to said shears on a constantly-revolving table, substantially as described.

5. The combination of duplex hydraulic billet-shears with a steam-cylinder operating two water-plungers alternately, the said plungers alternately forcing the water-pressure to one or the other of the billet-shears, substantially as described.

6. The combination, in billet-shears, of a steam-engine connected with a water plunger or piston, the cylinder of said engine being extended beyond the exhaust-ports, thereby cushioning the piston, substantially as described.

7. The combination, with hydraulic shears and water-plunger, of a check-valve having a small opening therethrough, which permits the gradual passage of the water to the shear-cylinder and its ready return therefrom, substantially as described.

8. The combination, in duplex hydraulic shears, of a feeding-table having revolving rollers, two shears located at the ends thereof, each provided with an automatically-movable gage-stop, a partition over said table and separating the shears, and a switch by which the incoming metal is fed to either one of said shears at the will of the operator, substantially as described.

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