

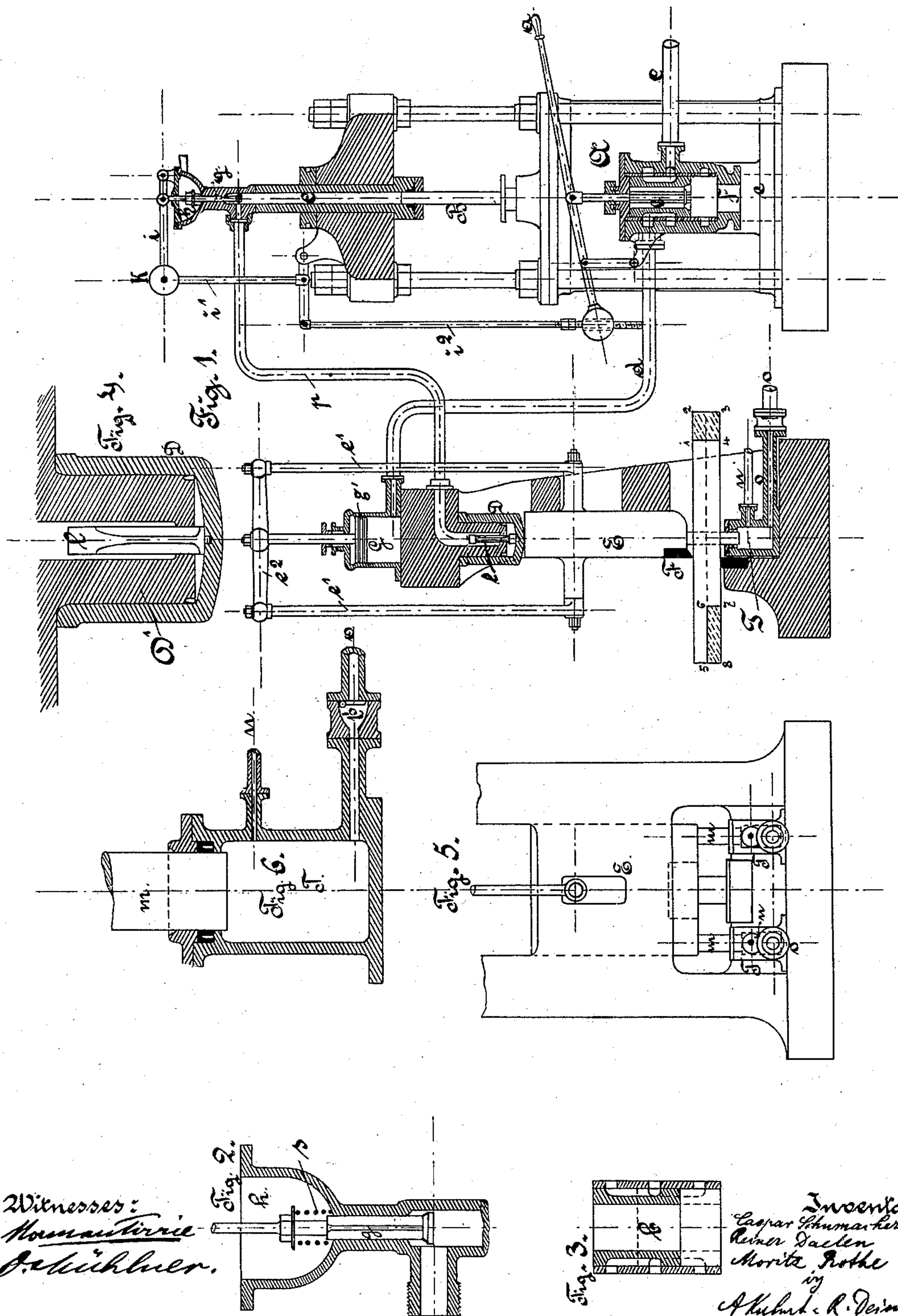
(No Model.)

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PUNCHING, SHEARING, AND SUCH LIKE MACHINE.

No. 401,795.

Patented Apr. 23, 1889.



UNITED STATES PATENT OFFICE.

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PUNCHING, SHEARING, AND SUCH LIKE MACHINE.

SPECIFICATION forming part of Letters Patent No. 401,795, dated April 23, 1889.

Application filed May 19, 1888. Serial No. 274,412. (No model.) Patented in Germany May 21, 1886, No. 37,917, and May 25, 1886, No. 38,347; in Austria-Hungary June 23, 1887, No. 24,929 and No. 2,540, and in Italy June 30, 1887, No. 21,850.

To all whom it may concern:

Be it known that we, CASPAR SCHUMACHER, REINER DAELEN, and MORITZ ROTHE, subjects of the King of Prussia, German Emperor, residing at Kalk, in the German Empire, engineers, have invented certain new and useful Improvements in Punching, Shearing, and Such Like Machines Worked by Steam and Water Power, (for which we have obtained Letters Patent in Germany, No. 37,917, May 21, 1886, and No. 38,347, May 25, 1886; Italy, No. 21,850, June 30, 1887; Austria, No. 24,929, June 23, 1887, and in Hungary, No. 2,540, June 23, 1887,) of which the following is a full and clear specification, reference being had to the accompanying drawings, which form part of the specification.

Figure I shows a shearing-machine in section, part of the driving apparatus also in section, working by means of steam and water power, after our arrangement. Fig. II shows a cross-section through its center of the valve *g*. Fig. III shows a detail cross-section of the valve *b* through its longitudinal axis, which is used for directing the steam under the piston *g'*, Fig. I, for lifting the shear or punch head *E* and into the cylinder *A*. Fig. IV shows a detail cross-section through the longitudinal axis of the arrangement for regulating the movement of the shear-head *E* when it has cut through the iron. Fig. V shows an end view of a shearing-machine, showing the water-buffer *T T*. Fig. VI shows, on a larger scale, a cross-section through the center and the construction of a cylinder, *T*, which acts as buffer for the cutter-head *E*.

The construction and working of the machines illustrated are as follows:

In Fig. I, *A* is a steam-cylinder, having a piston and fitted with the rod *B*, which works as a plunger in the hydraulic cylinder *C*, and forces, when steam is introduced under the piston in the cylinder *A*, the water through the pipe *p* into the cylinder *D*, which lies on the cutter-head *E*. Both are forced down, and by this means the pressure is brought to bear direct over the shear *F*. The shear is drawn up again after the downstroke by means of the rods *e' e'*, which are connected to the cross-head *e²* of the steam-cylinder *G*, and steam being admitted under the piston *g'*. The power of this arrangement stands in inverse propor-

tion to the area of the steam-cylinder *A* and the area of the plunger *B*, or in inverse proportion of the stroke of the piston in the steam-cylinder *A* and the stroke of the cutter *F*. If, for example, a stroke of the shears is required to cut a piece of iron with a section 1 2 3 4, (see Fig. I,) so then the full stroke of the steam-cylinder *A* is required, as such a section requires the maximum stroke of the cutter *F*, and the same would be the case if the shears had only to cut through a section equal to 5 6 7 8, although only a fraction of the larger section, 1 2 3 4. In order to prevent this waste of steam and water in such a case, we make use of the arrangement as shown in Figs. II and III.

In the pipe leading from the hydraulic cylinder *C* to the pressure-cylinder *D* is a valve, *g*, provided with a filler, *h*, which is held in position by the pressure of the water and also by the spring *s*, as shown in a larger scale in Fig. II. This valve is provided with a lever, *i*, which is connected to the lever *a* of the distributing-valve *b* by the rods *i' i²*, so that by working the lever *a* the valve *g* is opened and allows water to enter the hydraulic cylinder *C* when the plunger descends.

To the steam-cylinder *A* is fastened the distributing-valve *b*, which is operated by means of the lever *a*, by which the steam entering through the pipe *c* can either be directed into the cylinder *G* through the pipe *d* or into the cylinder *A* through the steam-port *e* and out again through the pipe *f*. The working of this distributing-valve motion is as follows: When the lever *a* is in its highest position, as shown in Fig. I, steam can enter the cylinder *G* and lift the cutter *F* into its highest position. At the same time the valve *g* is opened and the water in the cylinders *C* and *D* regulates itself automatically by the inflow of water from the reservoir *h*. When the lever *a* is brought into the middle position, the entry of the steam into the cylinder *G* is shut off and the exhaust of the same opened, and the cutter-head *E*, with the cutter *F*, falls by its own weight onto the piece of iron required to be cut; but as the valve *g* is opened on the descent of the cylinder *D*, so is the pipe *p* filled with water, and then the lever *a* is brought into its lowest position and the steam led under the piston of

the cylinder A, and with it the plunger B is raised. By this means the valve *g* is shut and the full pressure brought to bear on the cutter-head E, and the downward stroke of the cutter F is completed. If the lever *a* is brought into the first or highest position, the reverse takes place.

Generally in cutting or punching hot as well as cold material the metal breaks asunder before it is completely cut through, and, in order to prevent the cutter from moving at a great velocity the moment that the iron separates, the cylinder D is provided with a rod, *l*, fastened on the bottom of the cylinder, which, as the cylinder D descends, gradually closes the entrance for the water from the hydraulic cylinder C, and as soon as the iron is cut through shuts the connection completely. This arrangement is shown in detail in Fig. IV. The rod *l* is made to fit into the opening of the fixed plunger D' of the cylinder D, having the center part slightly cut away, so as to allow of the water passing through during a certain part of its stroke; but when the cylinder D is depressed a certain distance, so that the full part of the rod *l* comes into the opening in piston D', it then shuts off the entrance of water from the hydraulic cylinder C, and so releases the cutter from further pressure, or only allows of the pressure due to the area of the rod *l*.

In cutting or punching cold iron or other metals the tearing or forcing of the pieces asunder comes about suddenly and before the end of the stroke of the cutter or punch is completed, and the cutter or punch-head receives a sudden shock on account of the rod *l* not having closed the opening in D'. In order to diminish this shock as much as possible, the cutter-head E is connected with two rams, *m m*, working in the cylinders T, which are filled with water, Fig. V, which act as cataracts. The water in the cylinders T passes out through the small openings *n* into a reservoir, and when the cutter-head is again raised water is drawn into the cylinders T again through the pipe *o*, which is connected to the bottom of the reservoir and provided with a non-return valve, *p'*, as seen in Fig. VI. These two cylinders T T can be connected together by a branch pipe, so as to work in conjunction, and the opening of the small outlet *n* can be regulated by means of a valve or cock.

In the above-described machine compressed air or water pressure in place of steam can be used. This arrangement is not only applicable to shearing-machines, as described, but also to punching, pressing, or riveting or other similar machines.

Having fully described our invention, what we desire to claim and secure by Letters Patent is—

1. In punching, shearing, and such like machines worked by steam and water power, the combination of a punching, shearing, or such like machine with a steam-cylinder, A,

with a distributing-valve, *b*, hydraulic cylinder C, and piston-rod B, the piston-rod B being fastened to a piston in the steam-cylinder A, hand-lever *a*, hydraulic cylinder D, attached to the head of the punching-machine, the said hydraulic cylinder having an automatic throttle piston-valve, *l*, and pipe *p*, substantially and for the purpose as described.

2. In punching, shearing, and such like machines worked by steam and water power, the combination of a punching, shearing, or such like machine with a steam-cylinder, A, with a distributing-valve, *b*, hydraulic cylinder C, and piston-rod B, the piston-rod B being fastened to a piston in the steam-cylinder A, hand-lever *a*, hydraulic cylinder D, attached to the head of the punching-machine, the said hydraulic cylinder having an automatic throttle piston-valve, *l*, steam-cylinder G, rods *e' e'*, and cross-head *e²*, fastened to the piston *g'*, filling-valve *g*, having its lever *i* attached to the hand-lever *a* by a rod, *i²*, and pipes *p d*, substantially and for the purpose as described.

3. In punching, shearing, and such like machines worked by steam and water power, the combination of a punching, shearing, or such like machine with a steam-cylinder, A, with a distributing-valve, *b*, hydraulic cylinder C, and piston-rod B, the piston-rod B being fastened to a piston in the steam-cylinder A, hand-lever *a*, hydraulic cylinder D, attached to the head of the punching-machine, the said hydraulic cylinder having an automatic throttle piston-valve, *l*, and pipe *p*, with hydraulic buffer or buffers T, piston or pistons *m*, non-return valve *p'*, and pipes *n* and *o*, substantially and for the purpose as described.

4. In punching, shearing, and such like machines worked by steam and water power, the combination of a punching, shearing, or such like machine with a steam-cylinder, A, with a distributing-valve, *b*, hydraulic cylinder C, and piston-rod B, the piston-rod B being fastened to a piston in the steam-cylinder A, hand-lever *a*, hydraulic cylinder D, attached to the head of the punching-machine, the said hydraulic cylinder having an automatic throttle piston-valve, *l*, steam-cylinder G, rods *e' e'*, and cross-head *e²*, fastened to the piston *g'*, filling-valve *g*, having its lever *i* attached to the hand-lever *a* by a rod, *i²*, and pipes *p d*, with hydraulic buffer or buffers T, piston or pistons *m*, non-return valve *p'*, and pipes *n* and *o*, substantially and for the purpose as described.

In witness whereof we have hereunto set our hands in presence of two witnesses.

C. SCHUMACHER.
REINER DAELLEN.
M. ROTHE.

Witnesses:

GUSTAVE ALBERT OELRICHS,
WM. D. WARNER.