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Machinery for Working Masses of Metal.

No. 203,303. Patented May 7, 1878.

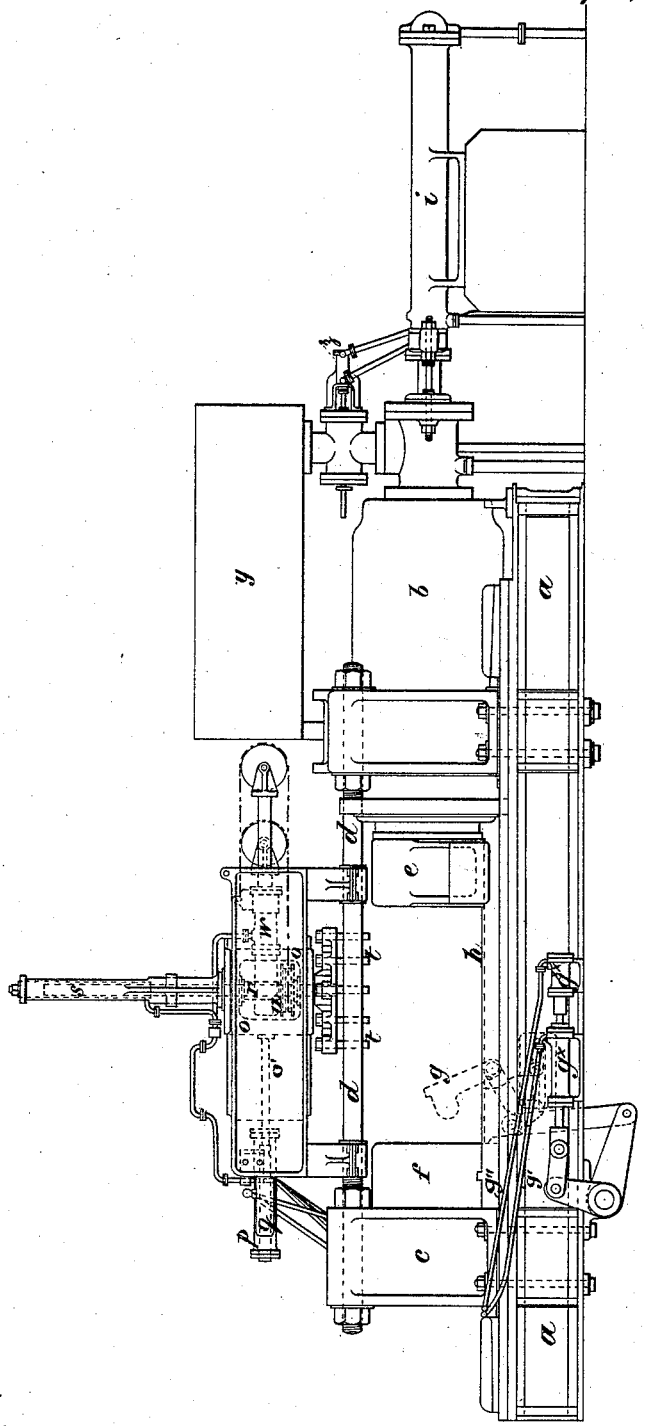

Fig. 1.

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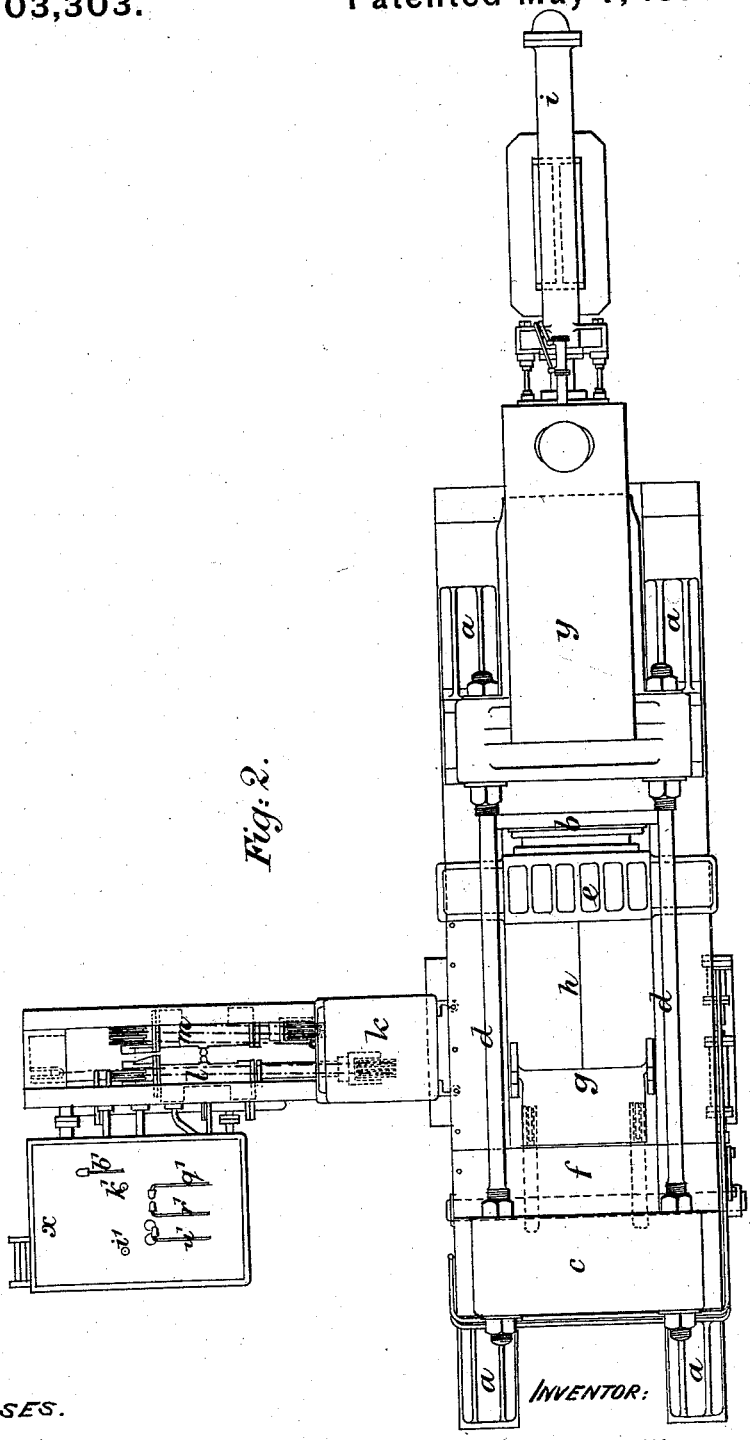

Fig. 2.

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Fig: 4.

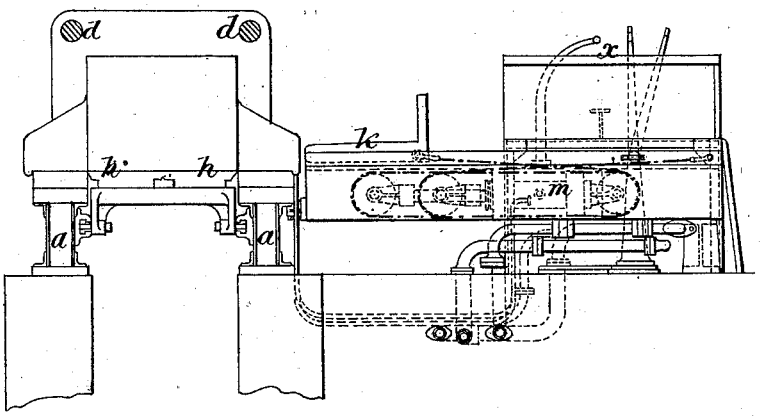
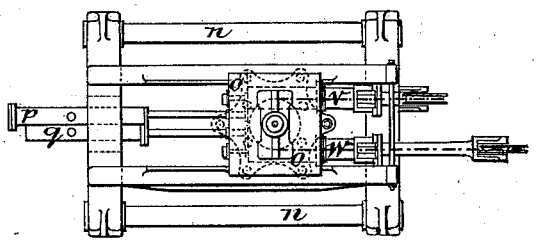


Fig: 3.



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UNITED STATES PATENT OFFICE.

PERCY G. B. WESTMACOTT, OF ELSWICK, ENGLAND.

IMPROVEMENT IN MACHINERY FOR WORKING MASSES OF METAL.

Specification forming part of Letters Patent No. **203,303**, dated May 7, 1878; application filed November 20, 1877; patented in England, June 5, 1877.

To all whom it may concern:

Be it known that I, PERCY GRAHAM BUCHANAN WESTMACOTT, of Elswick, in the county of Newcastle-upon-Tyne, England, have invented new and useful Improvements in Machinery for Squeezing and Working Blooms or Masses of Metal, which improvements are fully set forth in the following specification, reference being had to the accompanying drawings.

This invention has for its object improvements in machinery for squeezing and working blooms or masses of metal.

The machine is provided with a perforated table or grating, onto which the bloom or mass of metal to be treated is placed by means of a hydraulic pusher or other suitable contrivance. At one end of the table there is a powerful hydraulic ram, and at the other end a firm abutment supporting an anvil-block.

The bloom or mass of metal to be worked is compressed between the "tup" or head of the ram and the anvil-block, during which operation the scoria is free to escape, and it falls through the openings or perforations in the table.

For the purpose of turning the mass of metal to admit of its being compressed on all sides, I provide a hinged flap or trap-door in the table immediately in front of the anvil. While the compressed mass of metal is supported upon the table the trap is caused, by means of hydraulic or other gear, to incline to any desired angle. The bloom moves with the flap, and when the ram again advances it catches the bloom in the position to which it has been inclined, and subjects it again to pressure. The operation is repeated again and again as often as may be desired. The scoria finds a free outlet by the flap-opening. While the bloom is held between the tup and the anvil the flap is opened to let the scoria drop.

For the purpose also of turning the bloom end for end, or in the plane of the table, I provide a fork or such like instrument, which, by mechanism—by preference hydraulic mechanism—can be made to descend and to take hold of the bloom, and which then can be made to turn round, taking the bloom round with it. The fork, and the apparatus connected therewith, is mounted on a carriage above the table, and the carriage can travel to and from the anvil, so that it commands the whole length of the table.

In addition to the main hydraulic cylinder for actuating the ram, I provide a second smaller cylinder, for moving it when the heavy pressure is not required, and at this time a valve is opened, by which water is allowed to flow freely to and fro between the main hydraulic cylinder and a tank.

In order that my said invention may be most fully understood and readily carried into effect, I will proceed to describe the drawings hereunto annexed.

Figure 1 is a side elevation of a machine for squeezing and working blooms or masses of metal. It is constructed in the manner in which I prefer to carry out my invention. Fig. 2 is a plan of the machine with some of the upper parts removed. Fig. 3 is a plan of the parts removed from Fig. 2. Fig. 4 is a vertical section taken on the line *a a* in Fig. 2.

a a are bed-girders, to which the main hydraulic cylinder *b* is firmly fixed at one end, and the abutment *c* at the other end. *d d* are tie-bars, which also connect the cylinder *b* and the abutment *c*. *e* is the tup or movable head with which the ram working in the cylinder *b* is armed. *f* is a movable anvil-block resting against the abutment *c*. *g* is a hinged flap immediately in front of the anvil-block *f*. It serves to turn the bloom or mass under treatment, and also, by descending, to leave a free space between the outer edge of the flap and the adjacent edge of the opening in which it oscillates vertically, for the escape of the scoria over the flap-edge when thus depressed below the edge of the opening. In front of the flap *g* is the table *h*, consisting of gratings laid on transverse bars connecting the girders *a a;* or, where the flap *g* is found to afford a sufficiently free escape for the scoria, plain slabs may be substituted for gratings. *i* is an auxiliary cylinder for moving the main ram when the heavy pressure is not required. *k* is a carrier for conveying the bloom or mass of metal onto and from the table of the machine. It is so

arranged that it can slide to and fro along a girder-frame, which is fixed to the side of one of the girders *a*, and stands out from it at right angles. *l* and *m* are two hydraulic presses, by which the carrier *k* is actuated. *n n* are guides fixed above the table of the machine, and along them the saddle *o* is able to slide. It is actuated by the hydraulic presses *p* and *q*, and it carries a fork-like instrument for turning the bloom or mass of metal on the table of the machine. This instrument consists of a stem, *r*, at the upper end of which is a piston within the hydraulic cylinder *s*, carried by the saddle *o*.

By means of the cylinder *s* the stem can at pleasure be raised and lowered. At the lower end of the stem *r* there is a disk having sockets in it, in which the pins *t* are held. They are able to move freely in the sockets, and heads at their upper ends prevent them falling through. Thus, when the stem *r* is lowered so as to bring the disk which it carries down to the bloom or mass of metal, those pins which come into contact with the metal rise up out of the way, while those which fall beyond the edges of the bloom or mass remain down in their places, as they are seen in Fig. 1.

When the fork-like instrument has been lowered it can be rotated, and this effects the turning of the bloom or mass upon the table. For the purpose of turning the stem *r*, it is caused to pass through a square hole in the center of the chain-wheel *u*, carried by the saddle *o*, and this hole the stem fits; but it is able to slide freely through it. A chain passes around the chain-wheel *u*, and over pulleys on the heads of the rams in the presses *v* and *w*, which are carried upon the saddle, to which also the ends of the chain are attached. The turning of the fork and the bloom or mass of metal with which its prongs are in contact is effected by admitting water under pressure to one of the presses *v w*, while the water contained in the other is free to escape.

In working the machine the bloom or mass of metal is brought from the furnace and placed upon the carrier *k*, when this is drawn back to the position in which it is represented in Figs. 2 and 3. The carrier is then advanced until it is over the table of the machine, when, by admitting water to the auxiliary cylinder *i*, the ram, with the tup *e*, is caused to move forward until the metal becomes held between the tup and the anvil-block *f*. The carrier *k* now retires, and the metal is squeezed by admitting water to the main cylinder *b*, which is competent to apply a very heavy pressure. During this operation the flap *g* is so placed as to admit of the escape of the scoria, and when, in the judgment of the workman, sufficient pressure has been applied, the ram is caused to retire, and the metal is turned one-quarter round by raising the flap so as to cause the mass to fall onto its side. This done, the ram is again caused to advance and pressure applied, as before, and so the metal is pressed again and again, as often as may be considered desirable.

When it is wished to press the bloom or mass on its edges, the flap *g* is lowered to turn the metal, and in this way the metal can be turned through any small angle between the pressures, the flap being lowered more or less, according to the amount of rotation it is desired to impart to the work. The flap *g* is shown by dotted lines in two positions in Fig. 1.

When it is wished to apply endwise pressure to the bloom or mass, it is turned one-quarter by means of the fork-like turner, as already explained, so as to bring the ends of the work opposite to the tup and anvil.

When the metal has been sufficiently worked it is removed from the table of the machine by causing the carrier *k* again to come forward, when its leading edge acts as a pusher, and slides the bloom or mass off the table onto a barrow or truck placed to receive it. *x* is a platform, on which stands the workman who controls the action of the machine. He has before him for this purpose a number of lever-handles and a pair of treadles. *i'* is a lever working a slide-valve, by means of which water is admitted from an accumulator to the cylinder *i* to advance the main ram, and this valve also, when the ram is required to retire, opens a passage from the cylinder *i* to allow water to escape. The ram working in the cylinder *i* is armed with a piston, dividing the interior of the cylinder into two chambers, of which one—namely, the annular space between the ram and the cylinder—is at all times in communication with the accumulator, so that when the water is allowed to escape, so as no longer to press upon the other side of the piston the ram retires, drawing with it the main ram in the cylinder *b*, to which it is attached.

The cylinder *b*, except at the times when the heavy pressure is to be applied, is always in free communication with the cistern *y* by a passage capable of being closed by a valve worked by a small hydraulic press, *z*. *b'* is the lever-handle for controlling the ram of the main cylinder *b*. It has two duties to perform—to work the valve of the press *z*, and also the valve by which water is admitted from the accumulator to the cylinder *b* to give the pressure. The press *z* has a piston on its ram, and one end of the cylinder is in constant communication with the accumulator. By a slide-valve, which the lever *b'* operates in the first part of its movement, water under pressure is admitted to and drawn off from the other end of the press *z*, to move the ram to and fro. The pressure is admitted to the full area of the piston for the purpose of opening the outlet from the cylinder *b*, and when this pressure is withdrawn the constant pressure in the annular space causes the return of the ram and the closing of the valve.

When the lever b' is moved for the purpose of applying the pressure, its first action is on the valve of the press z, to close the communication between b and y, and then, in its further motion it moves a slide-valve, opening the communication between b and the accumulator. To take off the pressure, the lever b' is moved in the contrary direction, and the connection between b and the accumulator is first closed, and then the connection between b and y is opened. The valve worked by the press z is compound—a small slide on the back of the main valve. The small slide is moved first, and then carries the main valve with it. g^1 and g^2 are the treadles, and they serve to control the flap g. The treadle g^1, when depressed, moves a valve which admits water from the accumulator to the press $g^\times$, and, similarly, the treadle g^2 operates on a valve in connection with the press $g^{\times\times}$.

When the treadles are allowed to rise the valves permit the escape of water from the presses, and the flap g descends by its own weight and that of the parts in connection with it. The press $g^{\times\times}$ is employed when the power of the press $g^\times$ is insufficient, and when in use it presses against a stem projecting from the rear of the ram of the press $g^\times$, which ram is connected with an arm on the axis upon which the flap g is fixed by an arrangement of levers. (Clearly seen in Fig. 1.) k' is the lever-handle by which the carrier k is controlled. It works a slide-valve, and, according as it is moved in one direction or the other, it admits water from the accumulator to one or other of the presses l m, and allows it to escape from the other.

The connection between the rams of the presses and the carrier is, by chains, connected to the carrier, and passing over pulleys on the heads of the rams and over other fixed pulleys, as the drawings show. o' is the lever-handle by means of which the motion of the saddle o along its guides is produced. It operates a slide-valve in connection with the cylinders p and q, the rams of which are attached to the saddle, the one directly and the other through a stem extending out from its rear end. r' is the lever-handle for controlling the fork-like turner. It acts on a valve, which admits water to the press s to lift the fork, and allows the water to escape when the fork is to descend, which it does by its own weight. w' is the lever-handle for controlling the turning of the fork, which it does by working a valve admitting water to the presses v and w. Jointed pipes connect the presses on the saddle with the stationary pipes leading to the accumulator.

In place of employing two levers to work the main and auxiliary presses b and i, one lever-handle may serve to admit water from the accumulator to the smaller cylinder, and, when it is moved farther, also to admit it to the larger cylinder, having first caused the valve in connection with the tank to be closed. The movement of the handle in the other direction then allows the water to escape from both cylinders, and admits water under pressure to the other side of the piston in the small cylinder to draw back the ram.

In some cases I interpose movable blocks between the tup or head of the ram and the metal to be compressed. The faces of such blocks may be of any desired form. I can also move these blocks when they are required into their places by means of hydraulic or other gear, which serves also to remove them again when they are no longer required.

In some cases I provide the table with two lateral abutments to limit the spreading of the metal when exposed to pressure. These abutments may be formed on the anvil-block.

In place of using a large and a small pressure-cylinder, a single cylinder may be employed, and in connection with it two accumulators or suppliers of water under pressure, the pressure of one supplier being much lighter than that of the other.

Instead of having a perforated table or grating, I may introduce a series of hinged flaps, like the one at the end of the table. One of the chief merits of the arrangement is getting rid of the scoria readily, and being able to work the ball or blooms openly, and not in confined spaces or boxes, so as to let the scoria freely off.

Instead of turning the bloom over by means of a flap, I can do so by means of prongs worked by hydraulic rams and arranged in or about the anvil-block.

All the movements of the machine can be commanded by one man from the platform on which he stands.

Having thus described the nature of my said invention and the manner of performing the same, I would have it understood that I claim—

1. The combination, substantially as hereinbefore set forth, of the supporting-table, the anvil against which the metal is compressed, and the flap for turning the metal and allowing the escape of scoria.

2. The combination, substantially as hereinbefore set forth, of the supporting-table upon which the metal is openly worked, the anvil, the compressing-ram, mechanism for turning the metal sidewise, and mechanism for turning the metal endwise, such mechanisms being and operating substantially as described.

3. The combination, substantially as hereinbefore set forth, of the supporting-table, the carriage or saddle above said table, the fork carried by the carriage, mechanism for reciprocating the carriage lengthwise of the table, mechanism for adjusting the fork vertically, and mechanism for turning the fork, such mechanisms being and operating substantially as described.

4. The combination, substantially as hereinbefore set forth, of the supporting-table upon

which the metal is worked, and the hydraulic pusher and carrier, constructed and operating substantially as described.

5. The combination, in machinery for squeezing and working blooms and masses of metal, of the hydraulic pusher, the hydraulic compressing-ram, the flap for turning the metal sidewise, the fork for turning the metal endwise, the platform for the attendant, and mechanism, substantially such as described, controlled by levers and treadles upon said platform, whereby all the moving parts of the machine can be controlled by a single workman, as set forth.

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