J. HOLMES.

MACHINE FOR ROLLING TAPERING BARS OR PLATES OF METAL.

No. 48,868. Patented July 18, 1865.

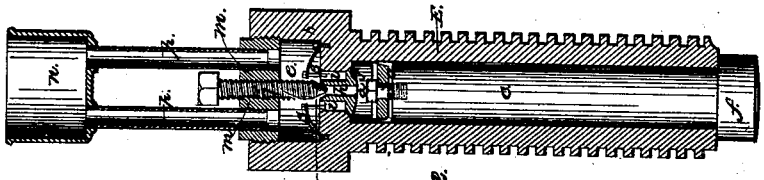

Fig. 2.

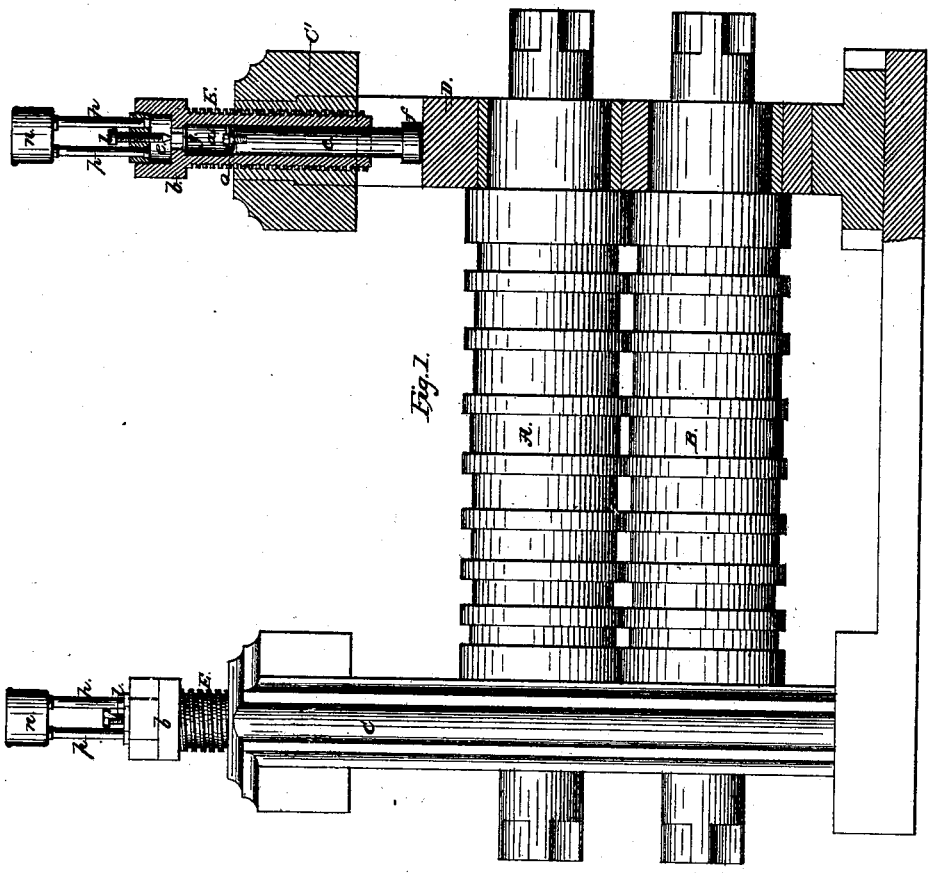

Fig. 1.

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IMPROVEMENT IN MACHINERY FOR ROLLING TAPERING BARS OR PLATES OF METAL.

Specification forming part of Letters Patent No. **48,868**, dated July 18, 1865.

To all whom it may concern:

Be it known that I, JOSIAH HOLMES, of the city of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Machinery for Rolling Tapering Bars or Plates of Metal; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front elevation of a pair of rolls set in their housings and furnished with my improvement, one of the housings and the apparatus connected therewith being in section to exhibit its construction. Fig. 2 is an enlarged sectional representation of the housing-screw and the apparatus connected therewith for enabling bars or plates of metal to be rolled tapering.

In both figures like letters of reference denote similar parts.

The object of my invention is to roll or form tapering or wedge-shaped bars, sheets, or plates of iron or other metal between a pair of parallel cylindrical rolls or grooved rolls, according to the size and shape required. In order to the accomplishment of this object it is necessary that the rolls should be so constructed and arranged that as the bar or plate of metal to be rolled and formed passes between them the rolls should gradually and uniformly spread apart, the upper roll rising from the lower one, while preserving their relative parallelism. This spreading of the rolls must be accompanied by a constant and uniform degree of pressure, because otherwise the metal would pass between the rolls without being materially affected thereby, and in fact would not be rolled. These necessary conditions cannot be secured by the use of a spring or other similar device applied to the riders of the upper and lower rolls, because as the distance between the rolls increased the force exerted by the compressed spring would also increase, so that if the bar or plate were of taper form before being passed between the rolls it would be subjected to a greater degree of pressure at its thick end than at the thin end, the pressure increasing with the thickness of the iron as the rolls separated more and more, and the result would be that instead of being rolled of taper form the bar or plate would be gradually rolled out to nearly a uniform thickness. If the plate or bar to be rolled by such an apparatus were of uniform thickness before being rolled the operation would only stretch out the metal, as is the case in rolls of ordinary construction, the springs serving a similar but not so good a purpose as the common housing-screws.

By my invention I accomplish the desired result by giving to one of the rolls of the pair a gradually yielding but constantly equal pressure, the rolls being capable of yielding to the pressure caused by the passage of the metal between them, the upper one rising up, so that instead of the actual pressure on the metal being diminished the pressure is retained at a constant and uniform degree by the uniformly increasing space between the periphery of the upper and lower rolls. The result of this application of a constantly yielding pressure sustained at a uniform degree by the separation of the rolls is to cause a bar or plate of iron of uniform thickness to be gradually rolled to a taper shape, or a bar or plate which was originally tapering or wedge-shaped to be stretched out without losing its taper. The degree of taper to be given may by the use of my apparatus be regulated at pleasure, as hereinafter described.

In the drawings, Fig. 1, A is the upper and B the lower roll. C C are the housings, in which the rolls are set in the ordinary manner, and D is the rider, placed above the journal of the upper roll in both housings. E is the housing-screw, similarly constructed and inserted through a female screw in the top or arch of the housing; but the lower extremity of the screw itself does not, as is usual, rest upon the top of the rider D.

The screw E has a cylindrical cavity, *a*, extending of uniform diameter from the lower extremity to about the level of the under side of the screw-head *b* of the screw.

In the cavity or chamber *a* is inserted a solid plunger, *c*, the diameter of which is equal to that of the cavity in the screw, being turned to fit it accurately, but not so as to prevent its motion in the chamber *a*. The lower end of the plunger is of larger diameter than the up-

per part, so as to prevent a broader bearing on the rider D.

At the upper end of the plunger *c* is a leather packing, *o*, to prevent the escape of any water with which the cavity of the chamber *a* is filled from passing below the top of the plunger.

The screw E has threads cut in it which screw into the housings in the usual way, so that by raising or lowering the screw the extreme height to which the upper roll may be raised is regulated at pleasure to suit the thickness to which it is desired to reduce the thicker end of the tapering plate or bar.

In the head of the screw is a cavity, *e*, of larger diameter than the chamber *a*, the cavities *a* and *e* being connected by a passage of smaller diameter than the cavity *e*, in which passage is seated a valve, *g*, which opens downward, as shown in Fig. 2. The valve *g* is broadest at the bottom, and has wings *i i*, which serve to center the valve and allow water to pass down between them and around the valve, when it is lowered from the upper cavity, *e*, to the lower cavity, *a*, and is held up against its seat by two or more slight springs, *s s*, which have sufficient tension to hold up the valve to its seat when the pressure above and below the valve is equal.

In the center of the valve *g* is a small opening, *h*, extending through it, the top of this opening *h* being funnel-shaped to receive the conical point *k* of the screw *l*.

The screw E works through a screw cap or plug, *m*, inserted into and closing the mouth of the cavity *e* in the head *b* of the housing-screw E. The tapering point of the screw *k* is never screwed down so as to touch the valve *g*, as that would depress it and prevent its closing, but it enters the funnel-shaped orifice of the opening *h*, so as to contract or enlarge the passage.

Through the cap *m*, on top of the head of the housing-screw E, water is admitted into the cavities *e* and *a*, either by means of a small reservoir, *n*, with pipes *p* opening into the cavity through the cap *m*, or in any other convenient method, it being immaterial how the water is supplied, provided it is admitted into the cavity *e* above the valve *g* with some slight degree of pressure.

The operation of the apparatus just described is as follows: The upper and lower rollers being in contact, as shown in Fig. 1, the housing-screws E are raised until the distance from the bottom of the plunger-head *f* (when the plunger is forced upward into the screw) to the top of the rider D is equal to the extreme height to which the upper roll is to be allowed to rise. The plunger *c* is then allowed to descend (which it will do by its own weight and the pressure of the water above it) until its head *f* rests on the rider D, as shown in Fig. 1. Water will then descend through the open valve *g* into the chamber *a* above the plunger *c*, and when the chamber is full the springs *s s* will close the valve. The operation of rolling is commenced by passing the metallic bar or plate between the rolls, which forces the rolls apart, raising the upper roll and its riders. This forces upward the plunger *c* in the two housing-screws; but as the plungers cannot rise without forcing the water out of the chamber *a* above the plunger the water passes up through the narrow orifice at the top of the central opening, *h*, in the valve around the conical end *k* of the screw *l*. This opening being small the water can only be discharged from the chamber *a* slowly, and as the chamber *a* is gradually emptied the piston *c* rises and the upper roll, A, also rises, and as the passage of water through the orific *h* is of uniform rapidity the roll A rises uniformly and without any diminution of the actual pressure exerted by the rolls on the metal passing between them.

It is important to adjust the screw *l* in both housings, so that the roll A will rise equally rapidly at both ends, which adjustment can be readily made. By the means just described the metal passed between the rolls is made tapering, owing to the gradual but uniform separation of the rolls, as hereinbefore described.

If it is desired to increase the degree of taper produced by the rolls on the metal plate or bar which is being rolled, it is done by turning the screw *l* so as to increase the size of the orifice of the opening *h*. So in like manner the degree of taper is diminished by reducing the size of the orifice. As soon as the plate or bar of metal has passed through the rolls the upper roll, A, drops onto the lower one, and the rider D and plunger *c* also descend to their first position, when, the valve *g* opening downward, the chamber *a* is instantly refilled, and the valve *g* then closes and the apparatus is ready for a repetition of the operation.

The peculiar advantage of my machine for rolling tapering bars or plates is that the whole apparatus for causing the gradual separation of the rolls is situate within the pressure-screws *o o*, so that there need not be any peculiar construction of housing, my improvement being applicable to housings of any ordinary description.

What I claim as my invention, and desire to secure by Letters Patent, is—

The use of the plunger, water-chamber, and valves, constructed and arranged substantially as hereinbefore described, situate in and forming part of the pressure-screw of rolling-mill housings, for the purpose of rolling tapering metallic bars or plates.

In testimony whereof I, the said JOSIAH HOLMES, have hereunto set my hand.

JOSIAH HOLMES.

Witnesses:
JAMES ADAIR,
CHARLES A. HOWE.