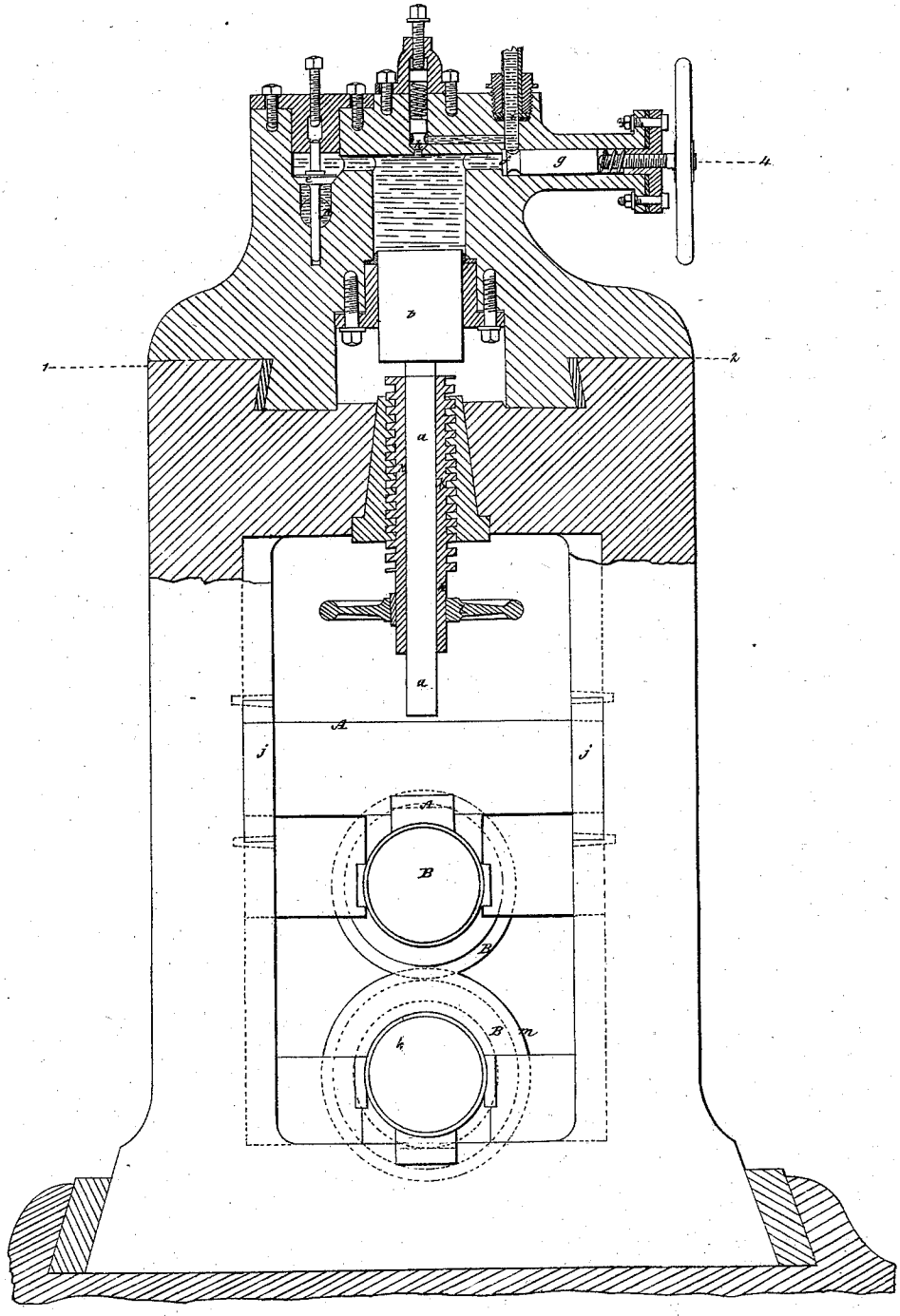
Sheet 1- 2 Sheets.

W. Clay,

Rolling Metal Bars,

No. 8,055. Patented Apr. 22, 1851.



N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

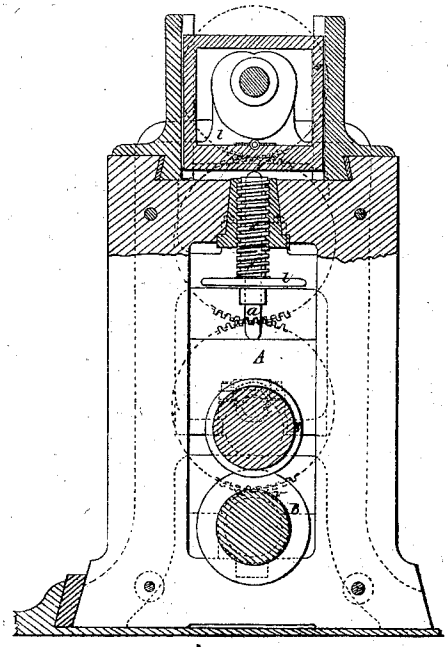
Sheet 2 - 2 Sheets.

W. Clay,

Rolling Metal Bars,

No. 8,055. Patented Apr. 22, 1851.

Fig. 5



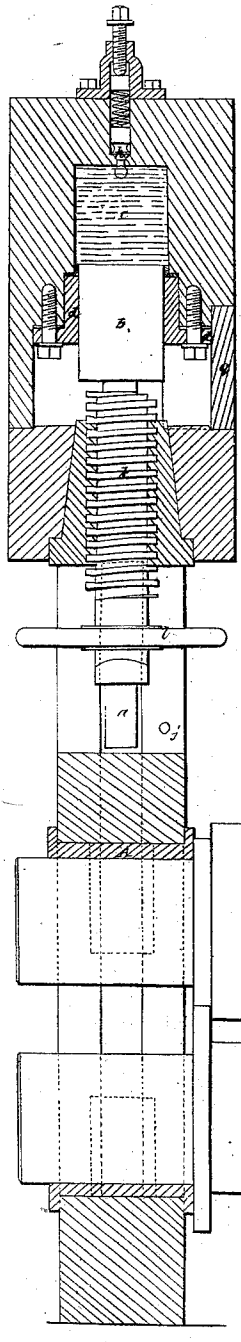


Fig. 2.

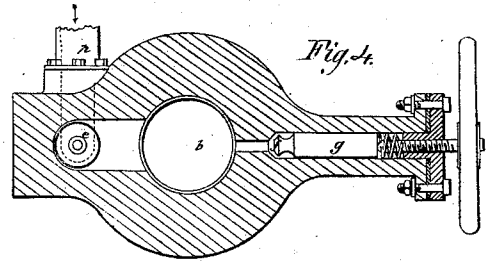


Fig. 4.

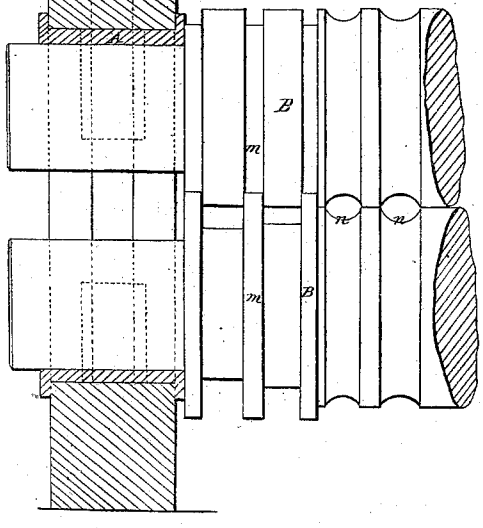
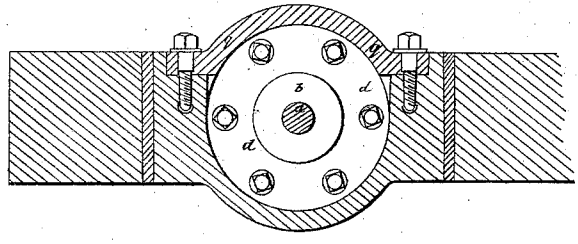


Fig. 3.



N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM CLAY, OF CLIFTON LODGE, COUNTY OF CUMBERLAND, ENGLAND.

IMPROVED APPARATUS FOR ROLLING TAPERED METALLIC RODS.

Specification forming part of Letters Patent No. 8,055, dated April 22, 1851.

To all whom it may concern:

Be it known that I, WILLIAM CLAY, of Clifton Lodge, in the county of Cumberland, engineer, a subject of the Queen of Great Britain, have invented Improvements in Machinery for Rolling Iron or other Metals; and I do hereby declare that the following is a full and exact description of my said invention.

My invention of certain improvements in machinery for rolling iron or other metals is designed to produce by the process of rolling bars of taper forms—as, for instance, wedge-shaped bars or conical bars. The tapering of metal bars I effect by allowing one of the shaping-rollers to recede gradually from the other as the rolling operation goes on, and thus enlarge the space or distance between the rollers, whereby the metal, in passing between them, is made to assume a gradually-increasing thickness, either in a wedge, conical, or other form, according to the shape of the grooves cut in the rollers.

My invention consists in the adaptation to rolling machinery of pistons bearing against confined columns of water or other non-elastic fluid, the ends of the piston-rods maintaining or affording the means of keeping the bearings of the rollers from shifting their positions, excepting as the columns of water are allowed to relax their resistance by a slow and gradual escape of the fluid from the cylinder or chamber through an adjustable valve. The apparatus I have arranged for this purpose is shown in the accompanying drawings, in which—

Figure 1 represents a vertical section taken transversely through the head of one of the standards wherein the bearings of the journals of the rollers are mounted, showing the piston, its rod, and appendages, with the column of water against which the piston bears, and the valve whereby a small quantity of the fluid may be allowed gradually to escape. Fig. 2 represents a partial front view of the rollers, the bearings, and part of the regulating apparatus in the head of the standard, being shown in section. Of course it will be understood that two such standards support the ends of the rollers. Fig. 3 is a horizontal section taken on the line 1 2 of Fig. 1, showing the parts inverted or as seen from below; and Fig. 4 is another horizontal section taken on the upper side in the line 3 4 of Fig. 1, showing the entrance and exit valves of the chamber of water and the means of working or regulating the exit-valve. In the rolling-mills usually employed for rolling bar-iron the rollers are generally mounted in fixed bearing or bearings, which, during the operation of rolling, are rendered immovable by being maintained in their places by strong screws or bolts.

In my improved machinery or apparatus the ends of the bearing A of the upper roller are let into grooves in the standards, as in ordinary rolling-mills, in such a manner as to admit of their sliding up and down therein, in order that by so sliding the parallel distance between the rollers may be allowed to change. The rising of the bearings with the upper roller is regulated and governed by piston-rods *a*, which rest on the tops of the bearings, the upper end of the piston-rod being connected to the solid piston *b* of the hydraulic cylinder or water-chamber *c*, as shown in Figs. 1 and 2. This cylinder *c* is filled with water or other non-elastic fluid or liquid, and is furnished with leather or other suitable packing for the purpose of preventing any leakage of the water. The packing is kept in its place by a metallic ring or plate, *d*, which is firmly secured to the body of the cylinder by strong screw-bolts. The cylinder is supplied with water from any convenient source by a lateral tube, *p*, (shown in Fig. 4.) through the rising feed-valve *e*, the construction and operation of which will be clearly understood by referring to the drawings.

f is the exit-valve, through which, when partially open, the water is allowed to escape from the chamber *c* on pressure being applied to the lower end of the rod *a*, by which pressure the piston *b* will be made to rise and partially to expel the water, as will be the case when a bar of iron is passed between the shaping-rollers B B. The valve *f* is constructed in such a manner that the opening for the discharge of the water may be regulated with the greatest exactness by merely advancing or receding the plug *g*, worked by the screw at its back end, and the effect of which will be to open or close the valve to any extent that may be required. There is a slight spring behind the plug *g*, which is merely intended to push it forward and close the aperture of the valve when the upward pressure of the piston is not in action, as will be the case when the rolling operation is suspended. An additional valve, *h*, is also

made to communicate with the exit-passage *i*. This valve, however, is always kept closed by a strong spring, as shown, and will never allow any water to escape this way from the cylinder, except when any extraordinary pressure takes place, at which time the power of the spring will be overcome, and, by yielding, prevent the machinery from being too greatly strained.

In introducing into my improved machinery a mass of iron between the shaping-rollers—say for the purpose of producing a wedge-formed bar having parallel edges—I employ a pair of rollers of the ordinary kind having the grooves and flanges, as shown at *m m m m* in Fig. 2. The mass of iron being about to be introduced between the rollers in the first groove, I open the valve *f* by withdrawing the screw behind the plug *g* to such an extent as will allow the escape of water from the chamber *c* in a small current, regulating the opening for the intended discharge according to the required taper of the bar to be formed, the required extent of which opening will readily be found by the experience of the workman. The operation of rolling now proceeding, the pressure of the metal passing between the rollers will cause the bearings of the upper roller to rise and force up the piston-rod *a*, in doing which the piston will be made to rise in the chamber *c;* but the ascent of the piston being resisted by the non-elastic fluid in the chamber *c*, the escape of water through the valve *f* and outlet *i* must take place to allow of the ascent of the piston, and consequently the separation of the rollers. According, therefore, to the rate of the escape of water will the taper or inclined shape of the bar to be produced be determined.

It will thus be seen that by my improved apparatus the process of rolling metals is carried on much in the usual manner, except that by means of opening the valve more or less the escape of the water from the chamber will allow the upper roller to rise, and consequently give the requisite tapered form to the bar under operation, according to the rapidity with which the water is allowed to flow out of the chamber. As I do not intend to confine myself to any particular forms of bars to be produced by my improved machinery, it is not necessary to describe more precisely the shapes of the rollers. I will therefore only add that by forming the grooves of the rollers in elliptical shapes, as at *n n* in Fig. 2, I am enabled by the gradual rise of one of the rollers and repetitions of the rolling operation to produce bars of conical figures.

It is sometimes desirable to roll a bar taper or wedge formed for a portion of its length and level for the remainder of its length. For this purpose it will be necessary to allow the upper roller to rise to a certain distance only, and then to stop. This I effect by means of adjusting-screws *k k*—one over each bearing of the rollers—similar to those heretofore used, except that it is through the axes of these adjusting-screws, forming guides, that the piston-rods *a* pass, as shown in the drawings at Fig. 1, and it will therefore be understood that when, by the escape of the water from the chamber, the bearings of the rollers have been allowed to force up the piston-rod and the piston a certain determined distance, then the upper edge of the bearing A of the top roller will come into contact with the under side of the adjusting-screw *k*, beyond which it cannot rise; and as the bearing will for the time become fixed the bar of iron under operation will, for the remaining portion of the process, be rolled parallel. The adjusting-screw *k* passes through a hollow screw made in a socket fixed in the frame, and the screw can easily be raised or lowered, so as to limit the rise of the bearing A by merely turning the hand-wheel *l*, attached to its lower part.

It may be as well to observe that the standards or housings may be of any convenient known pattern, and that a lever or other known balance may be used with advantage to support the roller in its rise and fall. A portion, also, of the head of the standard in which the piston works is made removable for the purpose of getting at the piston and packing when required, as will be seen at *q q* in Figs. 2 and 3.

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

1. Permitting the rollers to recede from each other by means of the hydraulic apparatus constructed and arranged substantially as described.

2. The adjustable screw *k*, Figs. 1 and 2, in conjunction with the apparatus claimed above, whereby bars of metal are enabled to be rolled taper for a portion of their length and parallel for the remaining part thereof.

In witness whereof I, the said WILLIAM CLAY, have hereunto set my hand this 8th day of November, in the year of our Lord 1850.

WILLIAM CLAY.

Witnesses:
J. W. MOFFATT,
FRED. WALKDEN,
Clerks to Newton & Son, 66 Chancery Lane, London.