A. Johnson.

Rolling Mill.

No. 112,924. Patented Mar. 21, 1871.

Fig. 1.

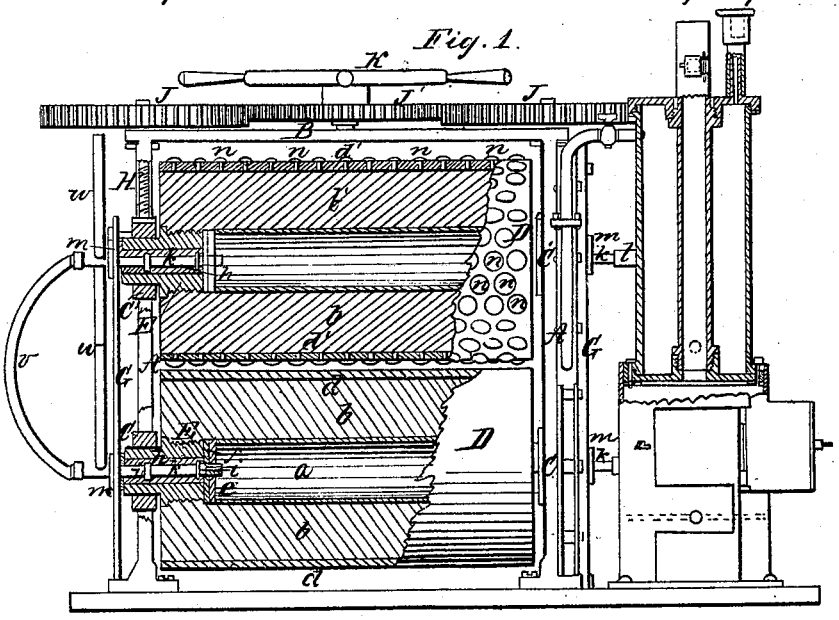

Fig. 2.

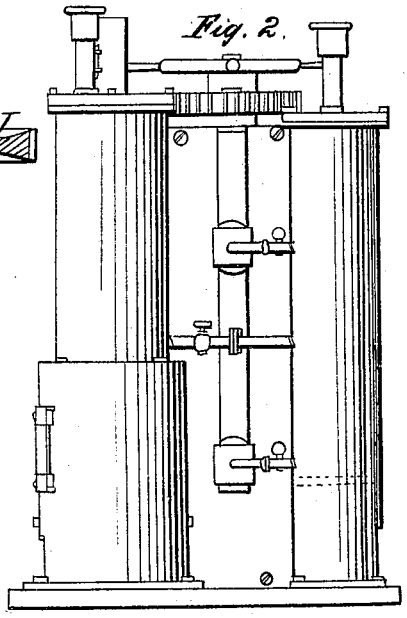

Fig. 5

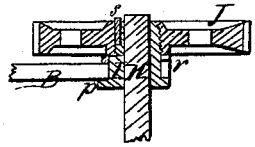

Fig. 3.

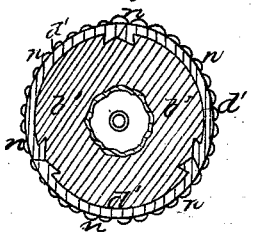

Fig. 4.

Witnesses

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UNITED STATES PATENT OFFICE.

ASA JOHNSON, OF BROOKLYN, NEW YORK, ASSIGNOR TO HIMSELF AND WILLIAM H. JOHNSON, OF NEW YORK CITY.

IMPROVEMENT IN ROLLING-MILLS.

Specification forming part of Letters Patent No. 112,924, dated March 21, 1871.

To all whom it may concern:

Be it known that I, ASA JOHNSON, of Brooklyn, in the county of Kings and in the State of New York, have invented certain new and useful Improvements in Machines for Rolling Metal; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing and to the letters of reference marked thereon making a part of this specification.

The nature of my invention consists in the construction and arrangement of a "machine for rolling metal," as will be hereinafter more fully set forth.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to describe its construction and operation, referring to the annexed drawing, in which—

Figure 1 is a side elevation of my improved machine, partly in section, including a partial vertical section of a boiler in which steam is generated for running the machine. Fig. 2 is an end view, showing the boilers which feed the cavities in the rollers. Fig. 3 is a transverse vertical section of the upper roller. Fig. 4 is a transverse vertical section through one of the roller-journals; and Fig. 5 is a longitudinal vertical section through one of the gear-wheels, by means of which the upper roller of my improved machine is raised or lowered.

A A represent two vertically-slotted standards or housings, connected at their upper end by a bar, B, to form the frame of my improved machine. In the slot, on each of the standards A, are placed two grooved boxes, C C′, which may slide up and down in said slots when necessary, but are prevented from coming out of the standards by the grooves in their sides. These boxes form bearings for the journals of the rollers D D′ respectively—that is, the boxes C C for the lower roller D, and the boxes C′ C′ for the upper roller D′. The roller D is formed of three separate cylinders, namely, a central corrugated sheet-metal cylinder, *a*, a cast-iron cylinder, *b*, around the same, and a hardened-metal cylinder, *d*, on the outside. The corrugated cylinder *a* is made of sheet-copper, for the reason that, as water is intended to be kept constantly within the same, it will not rust or corrode. If it were not there the cast metal would soon corrode and injure the roller.

The cylinder *b* is cast around the cylinder *a* in the following manner: The cylinder *a* is placed in the center of the mold and filled with water as a central core and the iron cast around it, and between it and an outside metal cylinder, outside of which water is placed. If the cylinder *a* was round there would be no chance for the cast-iron to contract, but the cylinder *b* would necessarily crack. But the sheet-cylinder being corrugated gives for the contraction of the cast metal sufficiently to prevent the cast cylinder from cracking. The sheet cylinder *a* being filled with water, also acts as a central core to hold the cast metal in its proper place while it is being poured into the mold; or, in other words, it prevents the sheet-cylinder from bending or giving in any way from the effects of the weight of the metal around it. It is only when the cast metal cools and contracts that it gives, forcing some of the water out at the top, but still remains full of water. The outside hard-metal cylinder *d* is then turned and slipped over on the outside of the cast cylinder *b*, which is also turned smooth, and keyed on to the same, so as to remain firm on the outside of the roller. The ends of the corrugated cylinder are bored out for a short distance and a head, *e*, placed at each end of the roller within the cast cylinder *b*, and against the end of the corrugated sheet cylinder *a*. A rubber head, *f*, is placed on the outside of and against the metal head *e*; then a hollow screw, E, is screwed into the end of the roller firmly against the rubber head *f*, thus forming a steam and water tight joint around the head *e*. The outer end of the hollow screw E rests in the box C and forms the journal for the roller D. Within the hollow journal E, extending its entire length, is placed a longitudinally-bisected sleeve, *h*, which surrounds a tube, *k*. This tube is provided with collars *i i*, and the bisected sleeve *h* has corresponding grooves, as shown in Fig. 1. The inner end of the tube *k* passes through the heads *e* and *f* into the inner cylinder *a*, and it will readily be seen that the journal E, pressing against the rubber head *f*, makes the joint, where the tube passes through the metal head, perfectly steam and water tight, so that

no water or steam can by any possible means escape except through the tube *k*. The outer end of this tube passes through and is attached to a grooved head, *m*, which is placed, and may move up and down, in a slotted standard, G, placed a suitable distance from and attached to the end standard A of the frame.

Thus it will be seen that although the roller D, with its journal E, revolves with the bisected sleeve *h*, the tube *k* nevertheless remains stationary, the head *m* preventing it from being turned.

The upper roller D′ is constructed in precisely the same manner as described for the lower roller D, and is provided with the same heads, journals, sleeves, and tubes; but there are these exceptions, namely, in the outer surface of the roller: In the lower roller D the outer surface is perfectly smooth, and is attached by keys or equivalent devices; but in the upper roller D′ the surface is uneven. The segments are attached by dovetails. The outside of the hard-metal cylinder *d′*, forming the outside of the upper roller D′, is provided with a number of projections, *n n*. These projections are arranged in parallel rows running longitudinally on the roller. The projections of each row are directly opposite the spaces betweeen the projections of the adjoining rows, as shown in Fig. 1, and may be cast with the roller, if desired. These projections are provided on their under side with pins, which are inserted through holes, made for that purpose, in the hard-metal cylinder *d′*, and fastened in any suitable manner. For the purpose of facilitating the fastening of these projections on said cylinder, and also for the easier repairing of them in case some of them should get broken, I make the cylinder *d′* in sections, longitudinally, as shown in Fig. 5.

The edges of each section being provided with V-shaped flanges, pointing inward, and the cast cylinder *b′* being provided with corresponding grooves, the sections may be slid longitudinally onto the cast cylinder and held as with a dovetail.

The plate of metal which is to be rolled between the rollers D D′ should first, as usual, be heated red hot, and then, when passing between or through the rollers, the projections *n n* come down upon it and, so to say, knead the metal, pressing and spreading the metal in every direction outward from each projection. In rolling metal between smooth rollers the spreading of the metal is just one way and must be continued from one end of the metal to the other; while with the projections *n n* on my improved roller the result is very different. The sides of these projections may be made any desired size, and fitted as close together as desired, leaving as much or little room between them to accomodate the outward pressure of the metal around each projection as is required to prevent its clogging up before the rollers, as when the roller both have a smooth surface. Then there is no place for the metal to go except to be scraped by the rollers from one end of the sheet or piece of metal to the other, which is not the case when one of the rollers has an uneven surface, as herein described. But the metal is thoroughly kneaded together, the scale broken up, and the metal thoroughly intermixed, manipulated in such a manner as to make the metal much more solid, tougher, and better every way, and may be bent one way as well as the other, as the grain runs one way as much as the other, which is not the case when rolled with smooth rollers. But, by running it through between two smooth rollers last, after it is down to its proper thickness, to merely smoothen its surface; then, by heating it in the open air, to anneal the metal and give it any desirable shade of color, the metal is finished and is worth about twice as much as when rolled with smooth rollers. The hollow rollers D D′ are kept constantly full of water for the purpose of keeping them of an even temperature, and thereby prevent their unequal expansion when the red-hot metal is passed between them.

The distance between the rollers D D′ is regulated or adjusted by the following means: To each of the upper journal-boxes C′ is attached a screw, H, which passes upward through a screw-sleeve, I, as shown in Fig. 7. This sleeve is screwed onto the screw H and passes through a hole or opening in the end of the connecting-bar B of the frame, said sleeve having at its lower end a collar or flange, *p*, which bears against the under side of the bar B. Around the sleeve I, on the upper side of said bar B, is placed a washer, *r*, to keep the gear-wheel J up from said bar. This wheel J is then screwed down on the upper end of the sleeve I and keyed fast thereto. Now, by turning this wheel the sleeve also turns, but as it is not capable of any motion up or down, the screw H will, of course, be raised or lowered, carrying with it the box C′. By use the collar or flange *p* on the sleeve I will, of course, wear more or less, and cause the sleeve to play up and down in the bar B. This is then readily remedied by taking out the key *s*, which fastens the wheel J to the sleeve, and screwing down said wheel till this play is taken up, when the wheel is again keyed fast. The two gear-wheels J J are connected by means of an intermediate gear-wheel, J′, provided with a hand-wheel, K, so that both ends of the roller D′ can be raised or lowered at the same time by merely turning said hand-wheel. The rollers are also connected together by gear-wheels, and a pipe or pipes, *l*, connect from one to the other.

The machine for rolling metal, as constructed, to be operated, and the water fed by any suitable engine and boiler or boilers; and in the drawings I have represented an upright boiler connected with a supplementary-feed or supply-boiler to feed the water to the interior of the rollers.

I do not wish to be understood in this application as claiming any particular engine,

boiler, or boilers to operate the rollers or to feed the water thereto, as I may use any such that are applicable therefor, or I may operate and feed the water to my rollers by any means preferable; hence I disclaim the boilers and feed apparatus shown in the accompanying drawing as any part of the improved metal-rolling apparatus in this patent, inasmuch as I have made a separate application for Letters Patent thereon.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A pair of rolls, of which the surface of one is smooth and that of the other studded over with hemispherical protuberances, substantially as described.

2. The construction of rolls, for rolling metal, of an inner solid or tubular cylinder, and an outer shell composed of a series of removable segmental plates or staves studded on their convex surfaces with protuberances, and attached to the outer surface of said cylinder, substantially as described.

3. The construction of rolls, for rolling metals, of an inner solid or tubular cylinder, and an outer shell composed of a series of removable segmental plates or staves studded on their convex surfaces with the projecting heads or rivets, screws, or bolts, of which the shanks pass into or through said plates, substantially as described.

4. The construction of rolls, for rolling metal, of an interior tube of sheet metal corrugated longitudinally, an exterior shell of plain metal, and an intermediate cylinder of cast metal, the inner sheet-metal tube being retained in place by the shrinking of the cast metal upon it, and the outer shell being attached to the cast intermediate portion by keys or otherwise, substantially as described.

5. In combination with the journal-bearings of the hollow rolls, constructed as described, the connecting-tube *v*, substantially as and for the purposes herein set forth.

6. The combination of the hollow removable journal E, rubber head *f*, metal head *e*, bisected sleeve *h*, and tube *k*, with a hollow metal roller, all substantially as and for the purposes herein set forth.

7. The combination of the tube *k* with collars *i i*, and the grooved bisected sleeve *h* with the removable journal E and a hollow roller, all constructed and arranged substantially as and for the purposes herein set forth.

8. The combination of the tube *k*, grooved head *m*, slotted standard G, journal E, a hollow metal roller, and the journal-bearing C, all substantially as and for the purposes herein set forth.

9. The combination of the screw H, screw-sleeve I, with flange *p*, washer *r*, key *s*, and wheel J, all constructed and arranged substantially as and for the purposes herein set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 16th day of February, 1871.

ASA JOHNSON.

Witnesses:

C. L. EVERT,

EDM. F. BROWN.