J. NUTTALL.

Machine for Straightening and Smoothing Rods and Tubes.

No. 216,967. Patented July 1, 1879.

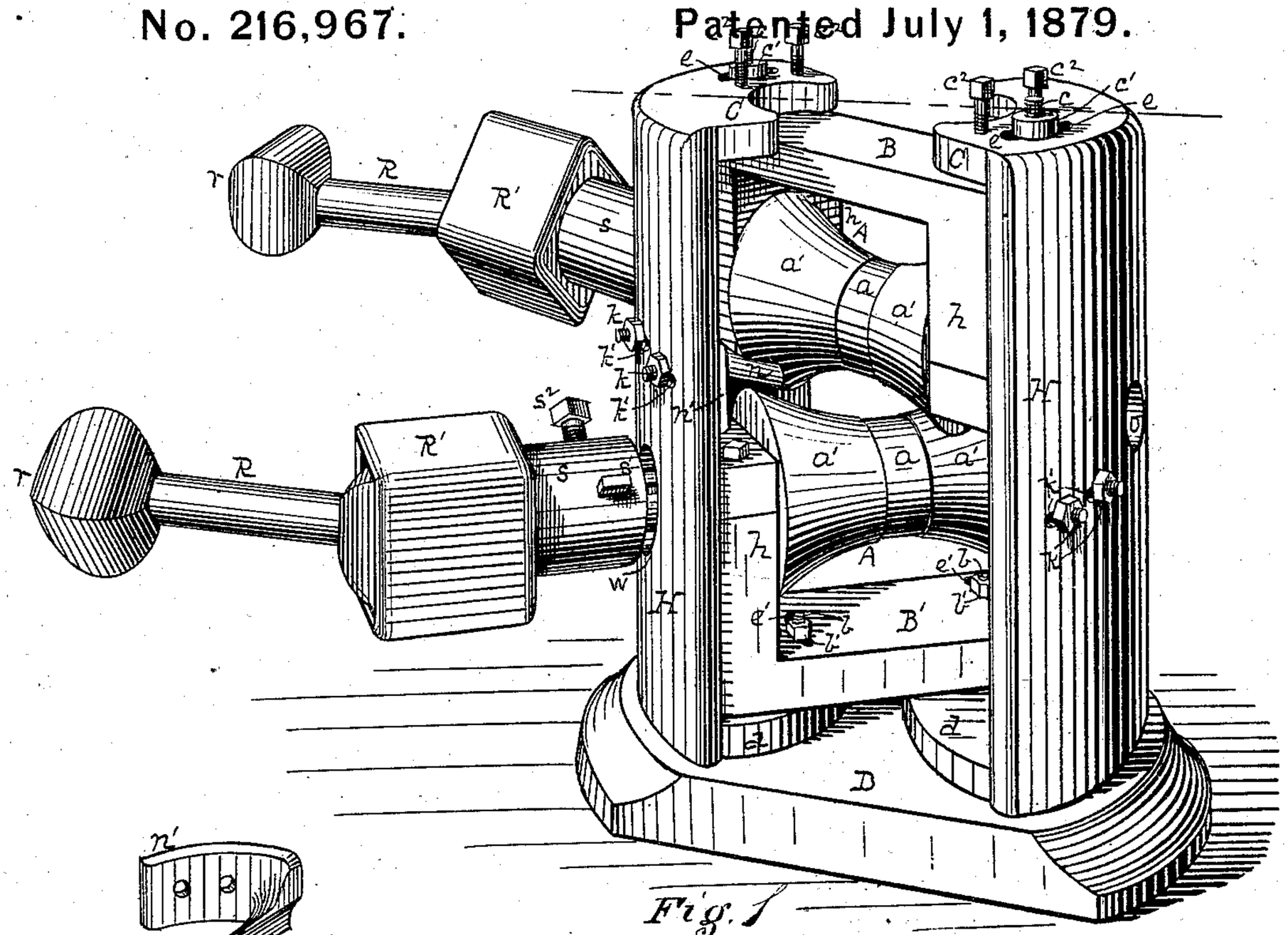

Fig. 1

Fig. 3.

Fig. 4.

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JOSHUA NUTTALL, OF ALLEGHENY, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND JOSHUA RHODES, OF SAME PLACE.

IMPROVEMENT IN MACHINES FOR STRAIGHTENING AND SMOOTHING RODS AND TUBES.

Specification forming part of Letters Patent No. **216,967**, dated July 1, 1879; application filed February 13, 1879.

To all whom it may concern:

Be it known that I, JOSHUA NUTTALL, of Allegheny city, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Machines for Straightening and Finishing Rods and Tubes; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is a perspective view of my improved machine for straightening and finishing round bars and tubes. Fig. 2 is a vertical sectional view of the same, showing, in elevation, the rod or tube operated on, and Fig. 3 is a perspective view of one of the guides employed for securing a proper feed of the tube to the rolls.

My invention relates to mechanism designed more particularly for straightening and finishing iron pipe and similar tubing, but it may also be used for straightening round bars generally, whether solid or tubular; and it consists in improved mechanism for mounting, adjusting, and driving the straightening and finishing rolls, as well as in the construction of such rolls and of guides for directing the tube or rod, as hereinafter described.

It is well known in the art of iron-rolling that if two rolls having concave working-faces be arranged side by side or one over the other, with their axes inclined to each other, an extended straight bearing is obtained between the roll-faces in a line bisecting the angle of inclination of the rolls, and that, upon the rotation of such rolls, a rod or tube lying in such line will itself be both rotated and fed forward by the action of the rolls.

In the drawings, A A represent a pair of such straightening-rolls. The particular form of their working-faces will presently be described more in detail. Each of these rolls is carried by or journaled in adjustable frames B B′, which are secured in housings H, which are supported on any suitable bed or foundation, D. The housings H have the form of segments of cylinders, or are concave on their adjacent faces, the curvature being the same in each, and they are separated from each other a distance equal to the diameter of the circle of which their inner curved faces form an arc. Both curves will then have a common center midway between them. Each housing is bolted or otherwise secured to the bed D or cast solid therewith. The frames B B′ have a length equal to the distance between the inner faces of the housings, and their ends are rounded to the same curve as such faces. The frames are thus free to turn in horizontal planes within or between the housings and be adjusted at different angles of inclination to each other, and also to be adjusted at different distances apart, as required by different sizes of rods or tubes, and in such varying adjustments the curved faces of the housings furnish secure and excellent bearings for the frames.

The lower frame, B′, is secured in the desired position or adjustment by bolts *b*, set in the base-plates *d*, and passing through slots *e′*. These slots are curved, with their centers coincident with the center of the curved faces of the housings.

By loosening the nuts *b′*, the frame may be turned in a horizontal plane to the desired position, and there secured by tightening the nuts. The upper frame, B, has bolts *c* set therein, which project up through slots *e* in the housing-cap C. The slots *e* are curved like the slots *e′*, and nuts c^1 on the bolts bind the frame against vertically-adjustable bearings c^2, which may be adjusting-screws, as shown, or any of the well-known or suitable devices for securing vertical adjustment in rolls.

By loosening the nuts c^1, the frame may be turned in a horizontal plane to the desired position and there secured; also, by raising or lowering the bearings c^2, the frame may be given the desired vertical adjustment with relation to the lower frame, B′. The rolls A A are journaled in any suitable manner in the blocks *h* of the frames, so that they receive the same vertical and horizontal adjustments as their respective frames. It has been customary to give such rolls concave faces, such that when arranged at the proper inclination to each other they furnish practically continuous straight bearings from end to end of the concavity in the line bisecting the angle

of inclination. An objection to such form arises from the fact that as the rod or tube approaches the smallest part of the rolls midway of their length there is a tendency to throw the forward end of the rod or tube to one side out of proper feeding line. This tendency is probably caused, in part at least, by the difference in size between the middle and ends of the rolls, and, the larger part moving over the tube at a faster speed than the smaller part, the tube is turned or bent aside.

By the dragging action thereon of the smaller and slower-moving sections of the rolls, I overcome this difficulty by turning down or cutting away slightly the faces of the rolls at and for a little distance each side of the central section or point, *a*, so that such reduced or cut-away sections shall take but very little or no bite upon the rod or tube passing through. As a result of this the forward end of the rod or tube in entering, and the rear end in leaving, such middle sections will not be deflected out of the proper line of feed nor be subjected to such inequalities of working as usually follow from such deflection, and this is especially important in tube-making, where a properly-shaped, well-finished, and strongly-made end is almost absolutely essential.

If so desired, such reduced or cut-away middle sections, while not having a working or reducing bite, may be so shaped as to come lightly in contact with the rod or tube, and so act merely as guides.

I have illustrated in Fig. 2 the operation of these roll-faces, in which E represents the tube or rod; *a'*, the concave end faces, which give long, straight, or approximately straight bearings, which operate to round, finish, and straighten the tube, while the central cut-away face, *a*, operates wholly or chiefly as a central guide between the end faces, *a'*. These end faces constitute, in effect, four rolls, carried by and mounted on two inclined axes, such rolls having a tapering form, concave in the direction of their length, with their smaller ends arranged toward the center, and the two in line, being separated by a reduced surface, which operates as a central guide; and while I have described these rolls as having a central cut-away face, yet I consider that four rolls constructed and arranged as described would be the mechanical equivalents of the rolls A A, and as coming within my invention.

If desired, the central sections, *a*, may be omitted, proper roll-bearings being inserted in place thereof, though I prefer to retain the same or their equivalent. Also, other modifications may be made in the construction of the rolls A A which will, in effect, give extended end bearings with an intermediate cut-away face, whereby the advantages named may be secured, and such modifications I include as a part of my invention.

In order to prevent endwise bending or displacement of the tube at or near the ends of the rolls, I employ guides $n\,n^1$. (Shown in detached view, Fig. 3.) The body-part n^1 is fitted to the form of the inner face of the housings, to which it is attached by bolts and nuts *k*, passing through slots *k'* in the housings, so as to be adjustable toward and from the tube E. The arm *n* is set at such angle to the body n^1 that its inner concave face, n^2, may serve as a side bearing to the tube, either through the whole or a part of the length of the arm. These guides are preferably arranged on both sides of the rod or tube and at both ends of the rolls, and, being adjustable as described, they can be adapted to rods or tubes of different sizes; and, furthermore, having smooth bearing-faces n^2, they will not mark the article passing between them, as is done when rotary guides or bearings are employed. Additional guides or end bearings are also secured by means of holes *o* made through the housings in the line of feed.

In order to adjust the rolls for tubes or rods of different sizes, the distance between the rolls must not only be increased or diminished, but also the angle of inclination between the rolls must also be varied. This can readily be done by the skilled workman, as required, by means of the devices described for effecting such adjustments. In order to drive the rolls in these varying positions and relations I make use of coupling-rods R R, one for each roll. On one or both ends of the rods are enlarged polygonal heads *r*, adapted to enter and operate correspondingly-shaped open-ended boxes or sockets R', secured to the roll-necks, which project through openings *w* in the sides of the adjacent housings. Such a socket may also be attached to the tumbling or driving shaft of the driving machinery, as presently described.

The heads *r* are preferably of proper size in cross-section to properly fill the corresponding section in the boxes, and prevent undue or excessive lost motion; also, the several faces of the heads *r* are rounded or curved endwise from the central section line, so as to converge toward both ends of the axial line of the heads. The heads may thus be rocked or turned in the sockets R', so as to bring the rod or stem either in line with the axis of the roll or inclined thereto in any direction or at any angle within about forty-five degrees, more or less; and within this range the rods will operate equally well in driving the rolls, whatever be their adjustment, without changing the position or adjustment of the main driving machinery. The rolls may therefore be driven from parallel driving-shafts, or from shafts arranged in other relations.

I prefer to use coupling-rods having heads *r* at both ends, and attach sockets R' to both the roll-necks and ends of the driving-shafts; but I consider it within my invention to use such head and socket at one end of the coupling and a knuckle or other universal joint at the other end of the coupling. As the rolls are adjusted to different angles and relations, the distance between the sockets on the roll-necks and on the driving-shaft will be varied. In order to adjust this variation within a short

range, the sockets R′ may be made deep enough to allow some range of endwise motion of the heads therein. I prefer, however, to attach one or all the sockets by sleeves *s*, which are connected to the shaft or roll-neck by longitudinal feather and groove s^1 and binding-screw s^2, or equivalent device. The sockets at each end of the couplings can thus be moved toward or from each other at pleasure.

While I have designed the coupling more particularly for driving-rolls, as described, yet it is equally applicable for driving shafting out of line, and especially when of varying inclination.

The operation of my machine will be readily understood from the foregoing description by a mechanic skilled in the art of iron-working.

I am aware that roll-coupling pins polygonal at their ends and polygonal sockets for embracing them are not new, and that such devices have been made so as, having a limited play in a rotary direction, they might operate in driving-rolls, even when arranged a little out of line; but such devices for such purpose are not altogether satisfactory in operation, partly because when the rolls are out of parallelism the strain and wear of the coupling-pins on the boxes come at the opposite ends of the pins, and partly because for every variation of angle a different-sized pin and box are required, in order to avoid too great or too little lost or slack motion.

By the use of coupling-pins having heads or ends, such as are herein described, the rolls may be arranged in line or out of line, or further out of line with each other than has heretofore been practically attainable, without any material variation in the amount of lost or slack motion—a limited amount of which is required, but too much of which is objectionable.

I claim herein as my invention—

1. As an improvement in machines for finishing cylindrical tubes and rods, consisting of concave-faced rolls arranged with their axes inclined to each other, and with a line of feed bisecting the angles formed by such axes with each other, the central reduced cut-away part, substantially as and for the purposes set forth.

2. The combination of rolls A A, frames B B′, concave-faced housings H H, having a common center midway between them, and mechanism for adjusting and securing the frames within the housings, substantially as described.

3. The improved form of coupling-pin head herein shown and described, the same being polygonal in transverse section, and with each side oval-shaped in the direction of its length, substantially as and for the uses set forth.

4. The improved form of coupling-head shown and described, the same being polygonal in transverse section and with each side oval-shaped in the direction of its length, in combination with an endwise-adjustable socket, R′, substantially as and for the uses set forth.

5. The combination of rolls A A, frames B B′, housings H H, having feed-openings *o* therein, and adjustable non-rotary side guides, *n n*, arranged and operated substantially as and for the purposes set forth.

In testimony whereof I have hereunto set my hand.

JOSHUA NUTTALL.

Witnesses:
R. H. WHITTLESEY,
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