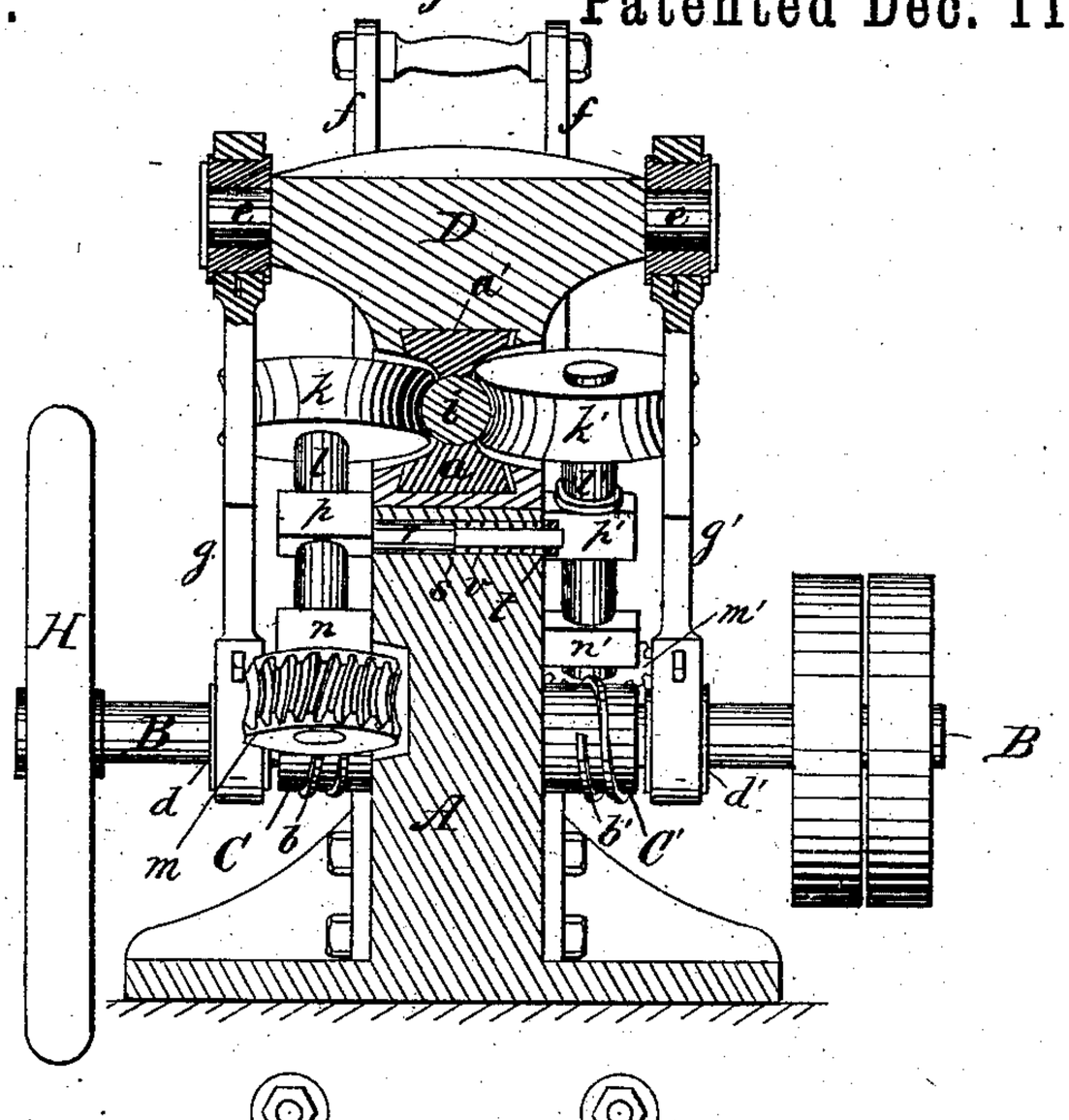
(No Model.) 2 Sheets—Sheet 1.

J. L. LEWIS.

APPARATUS FOR COMPRESSING, SURFACING, AND STRAIGHTENING BARS, &c.

No. 290,077. Patented Dec. 11, 1883.

Fig. 1.



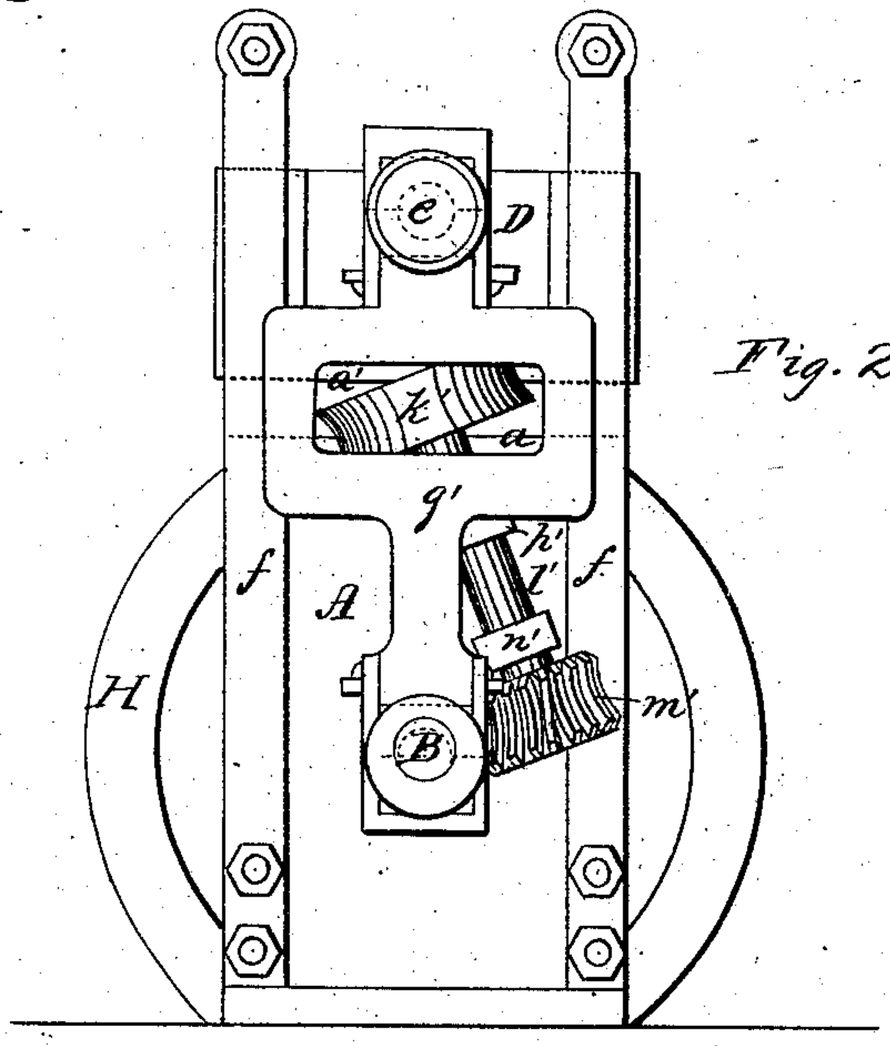


Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

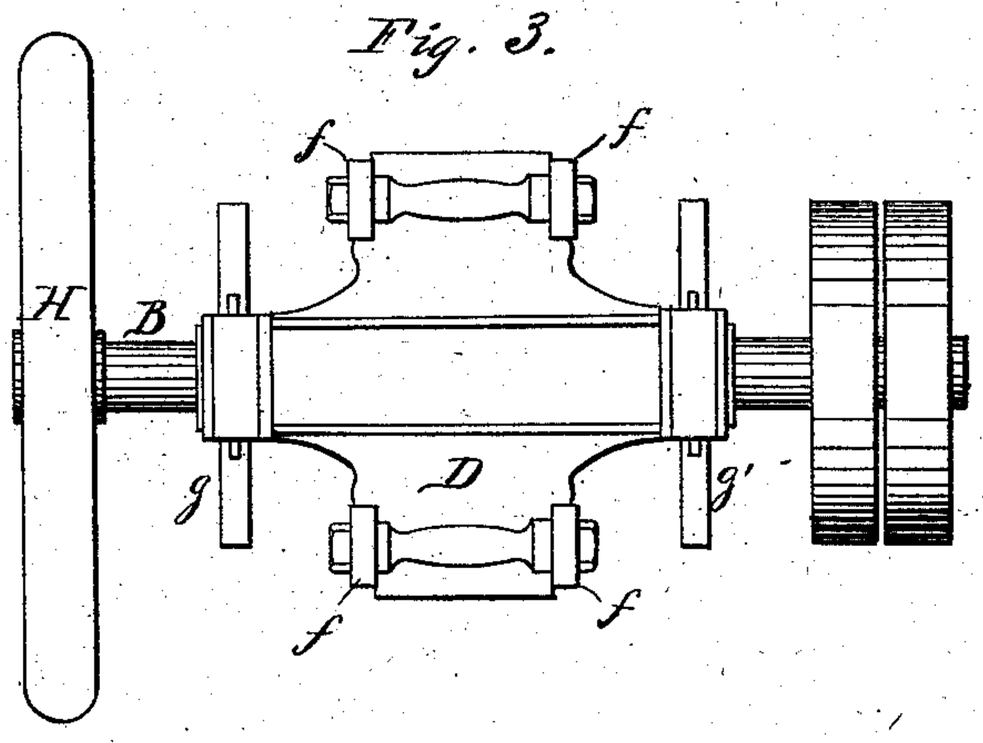
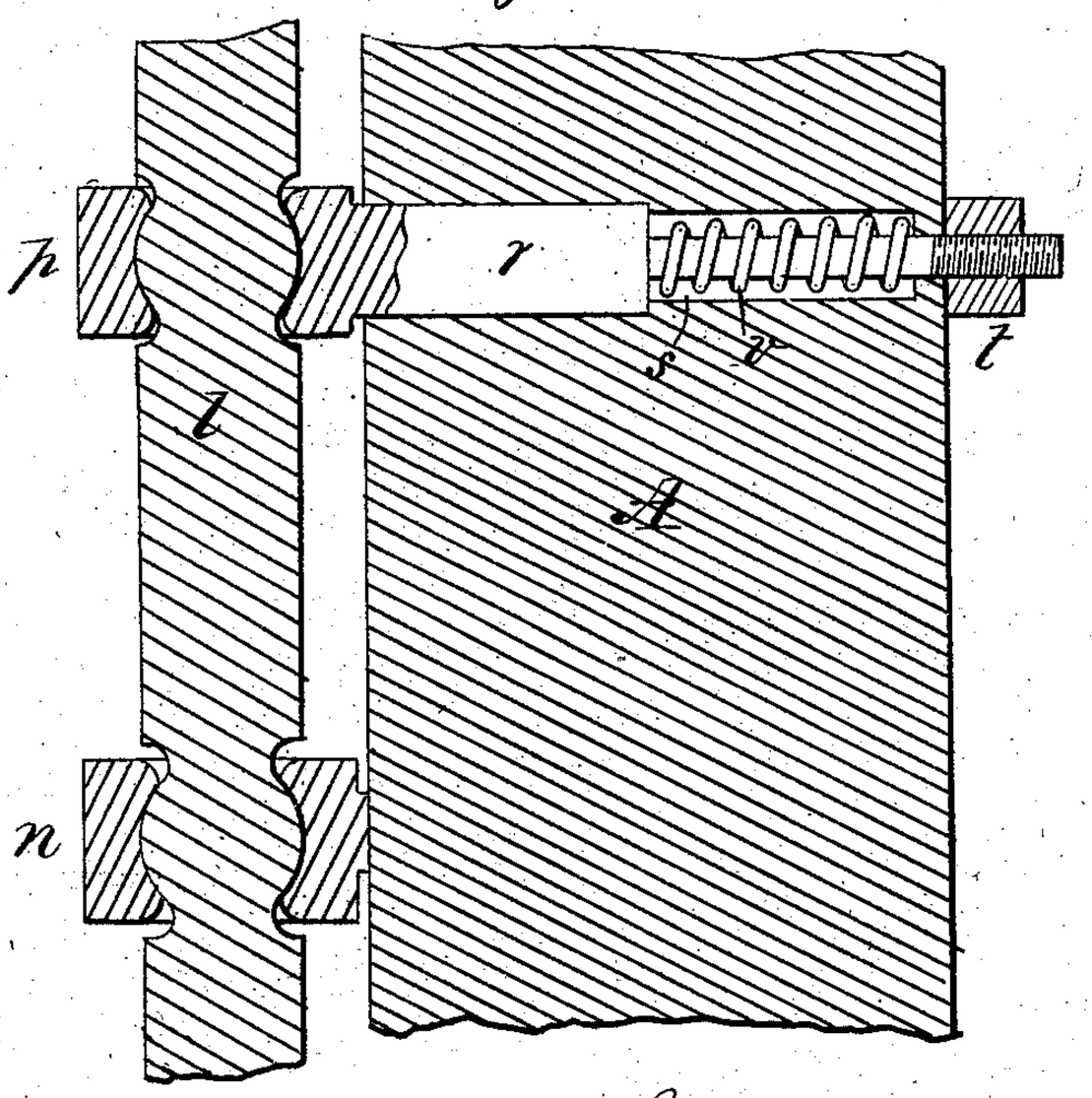


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN L. LEWIS, OF PITTSBURG, PENNSYLVANIA.

APPARATUS FOR COMPRESSING, SURFACING, AND STRAIGHTENING BARS, &c.

SPECIFICATION forming part of Letters Patent No. 290,077, dated December 11, 1883.

Application filed November 27, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOHN L. LEWIS, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Compressing, Surfacing, and Straightening Iron and Steel Bars, Rods, and Shafts; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification, in which—

Figure 1 is a front elevation of an apparatus designed to carry out my invention. Fig. 2 is a side elevation, and Fig. 3 a plan view, of same. Fig. 4 is a detail section of part of body and feed-roller shaft with bearings.

In the manufacture of round shafts, bars, and rods of iron and steel by the usual rolling process, the structure of the finished product is found to be more or less imperfect by reason of seams, which correspond with the layers of the pile from which it is rolled, also from being rough on the surface, and more or less crooked throughout its entire length, so that if the bars are to be employed for shafts, axles, and other uses with the surface finished, heavier cutting from the surface is thereby made necessary when turning to fit it for such use. This is especially the case in round bars of, say, two inches diameter and over. Further, the usual practice of cooling the rolled product by laying it on a cooling-floor of generally more or less uneven surface, causes unequal contraction in the shafts or bars when so cooled, so that even if of reasonable straightness when thus placed for cooling, they are drawn crooked by such inequality of contraction, and so remain.

Several perfecting processes have been adapted to compensate for the foregoing defects of rolling and cooling iron and steel rounds. By one process the scale is removed after cooling, and the shaft or bar subjected to lateral compression by repeated passes between grooved rolls, which finishes and polishes it, and practically straightens it. By another process, the shaft or bar is taken, while still hot, from the rolls and subjected to lateral compression between rolls or disks, so arranged as to propel it forward while it rotates. By a third process, the shaft or rod, while still hot from the rolling, is passed between three polishing-rolls, suitably turned, and placed in such position relatively that, when the shaft or bar is passed between them in a direction lengthwise with the rolls, it will be given a rotating and forward motion, which straightens and polishes it.

The objects of this invention are to obtain the tough and close-grained product of the hammer with the rapidity and ease of the rolling process, while preserving a uniform section, and at the same time to straighten the product. Further, while effecting the above objects, to remove the scale and produce a planished surface similar to that produced by the hammer in the last stages of cooling.

My invention accordingly consists in the combinations and arrangements of devices and mechanism hereinafter fully described and claimed.

In the drawings, A designates the bed or die-block, having its face constructed to receive the lower die, *a*, whose face is concaved to nearly a semicircular groove. Bed A is set in a suitable foundation in order to be firm. A heavy shaft, B, crosses through and is journaled in bed A, and at the respective sides thereof has the collars C C′, each provided with a single worm-thread, *b b′*, as shown, respectively right and left handed. Outside each of the collars C C′ the shaft B is formed with the like eccentrics, *d d′*, whose rotation imparts a vertically-reciprocating motion to the upper die-block, D, which carries a die, *a′*, similar to the lower die, as shown. Block D has on each side a wrist, *e*, corresponding in position to the eccentrics *d d′*. Four vertical slides, *f*, retain the upper or movable die-block, D, in proper position for the vertical reciprocation which is imparted to it by the two pitmen *g g′*, attached, with the usual brasses, to the wrists *e e* and eccentrics *d d′*, as shown. A fly-wheel, H, is attached to the shaft at one end and a fast and loose pulley at the other, by which motion is imparted to shaft B from a belt. The upper die, *a′*, is thus rapidly reciprocated and acts as a hammer upon the round *i*, which rests in the lower die, *a*.

The arrangement being as shown, the upper die, *a′*, always moves a definite distance, and all its blows will reach downwardly to

precisely the same point. At the middle, on each side, the dies and die-blocks are cut away partially, to afford room for the feed-rolls, whose office is to feed the round intermittently forward and spirally between the compressing strokes of the upper die. These consist of the two grooved disks or rolls *k k'*, on opposite sides and inclining in opposite directions. They are keyed on the respective shafts *l l'*, which incline one forward and the other backward of the main shaft B, and have keyed on their lower ends the respective worm-gears *m m'*, which mesh, respectively, with the worms *b b'* on shaft B. By this peculiar mode of connection the two feed-rolls *k k'* rotate in planes inclined to each other, and the grooved faces of the rolls adjacent to the round under manipulation move in a common direction. These rolls *k k'* are adjusted so as to bear upon the round *i* with a degree of pressure sufficient to propel the round forward when the dies *a a'* are not in contact with it, and to slip on the round when the dies are compressing it, while the angular setting of the rolls *k k'* causes the the propelling movement to take a spiral direction of very low pitch.

To accommodate the various sizes of feed-rollers which may be needed, I journal the shafts *l l'* in universal boxes *n n'*, just above the worm-wheels, the bearing being spherical, as in Fig. 4, and the box corresponding. The upper part of the shafts *l l'* are similarly journaled in boxes *p p'*; but to accommodate the lateral play necessary, I set the boxes *p p'*, respectively, on a pin, *r*, which passes through a recess, *s*, in the bed A, and is secured or adjusted on the other side by a nut, *t*, a strong helical spring, *v*, holding the pin *r* in any position it is adjusted to. The play thus needed for the adjustment of the shafts *l l'* is not so noticeable as to affect the worm-wheels, as the latter are very close to the fulcrums, which are at the center of the boxes *n n'*, respectively, and, consequently, the adjustment of the rollers *k k'* does not affect the gearing. The shaft or round *i*, coming from the rolls, is fed at once into the grip of the rolls *k k'*, the weight of the round being sustained outside the machine on suitable rest rolls or wheels. The rollers *k k'* at once begin to propel the round *i* forward. When die *a'* rises, the round *i* moves under it some little distance. Then die *a'* comes down and compresses the round. When the die next rises, the round is partly rotated and simultaneously propelled forward a little, and when the die again comes down, it exerts its compressing effort in a new direction on the round, the rolls *k k'* meantime slipping on the round. By the time the round has passed through the machine the dies *a a'* have compressed it evenly in all directions, and different parts of the dies have repeatedly acted upon any given point of the round. The result is that the round is compressed after the manner of hammering, it is straightened, and has all the good qualities possessed by a hammered shaft, while it lacks the disadvantage of hammer-marks, but, on the contrary, is smooth throughout.

By dropping water on the round and the dies while operating, the scale is removed, and the product emerges with the well-known blue-black glossy surface resulting from the planishing action of a hammer finely polished by use. For a given diameter, such a shaft will have greater strength and stiffness than an ordinary rolled shaft, being denser and finer grained, while it will be much more uniform in section, and, if desired to be really perfect in section throughout, will require but a trifling cut to be taken in the lathe.

The machine operates rapidly, and will compress, planish, and straighten a very long bar, shaft, or rod throughout before the temperature of the same falls too low for the purpose.

I am aware that, broadly, the combination of angular propelling-rollers and compressing dies or hammers is not new; but I am not cognizant of any machine of this character embodying a pair of dies or hammers having their sides chambered, so that the feed-rollers project into such chambered sides and alternately grip and slip upon the bar under treatment at a point within the length of the operative limits of the dies. The result of this arrangement is that although the feed-rollers, when they slip, cause unsightly marks and unevenness in the bar under treatment, the remaining portion of the die-surfaces acts upon such marks afterward, and the bar emerges smooth and finished.

I claim as my invention—

1. In combination with dies *a a'*, the main shaft A, having worms *b b'*, worm-wheels *m m'*, respectively meshing with said worms on opposite sides of said shaft, inclined shafts *l l'*, and feed-rolls *k k'*, substantially as described.

2. The combination, with two feed-rollers rotating in intercepting planes, of two longitudinally-grooved compressing-dies having their sides chambered to expose the sides of the die-grooves to the periphery of the said feed-rollers projecting into said chambered sides, the said dies extending forward and back of the point where the die-grooves are exposed to the feed-rollers, substantially as described.

3. The combination of shaft B, having worms *b b'*, inclined shafts *l l'*, worm-wheels *m m'*, feed-rollers *k k'*, and adjustable bearings *p p'*, with the dies *a a'*, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

JOHN L. LEWIS.

Witnesses:

JOS. B. CONNOLLY,

D. E. DAVIS.