

June 16, 1931.

G. A. WISE

1,809,880

METHOD AND APPARATUS FOR FINISHING ROUND BARS

Filed May 4, 1929

3 Sheets-Sheet 1

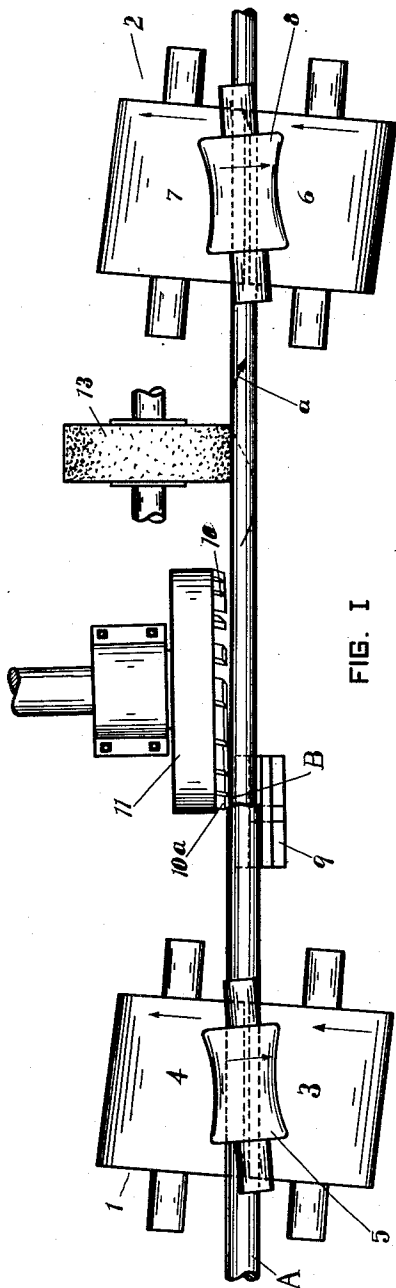


FIG. I

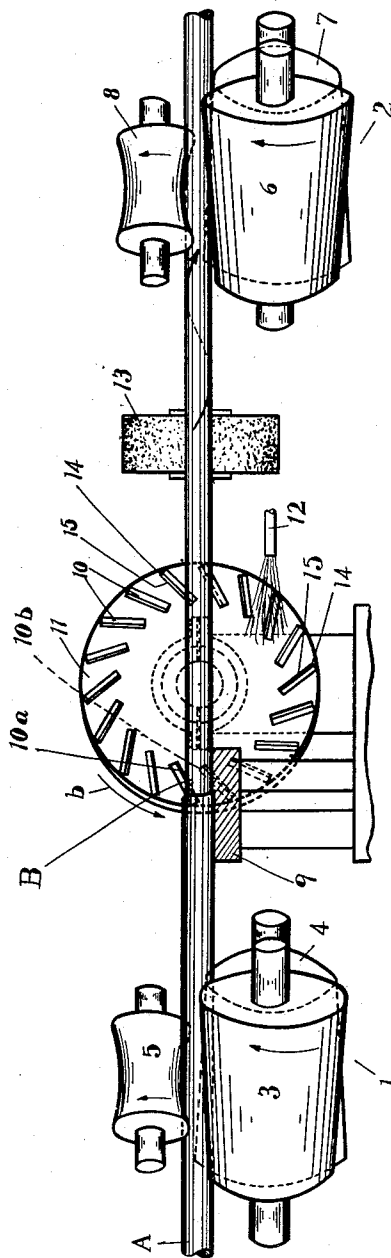


FIG. II

INVENTOR.

George A. Wise

by Christy Christy and Wharton
his attorneys

June 16, 1931.

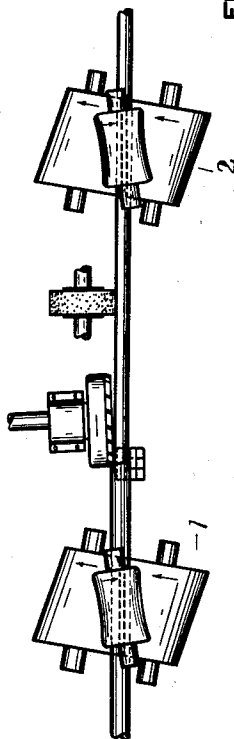
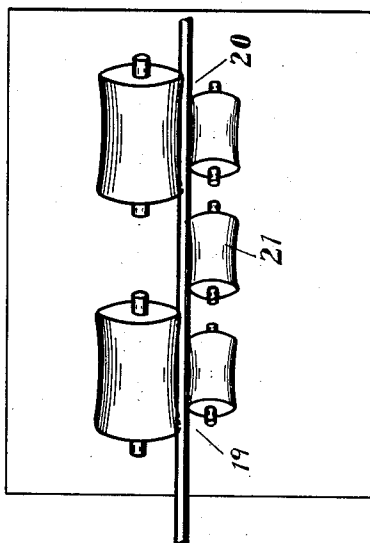
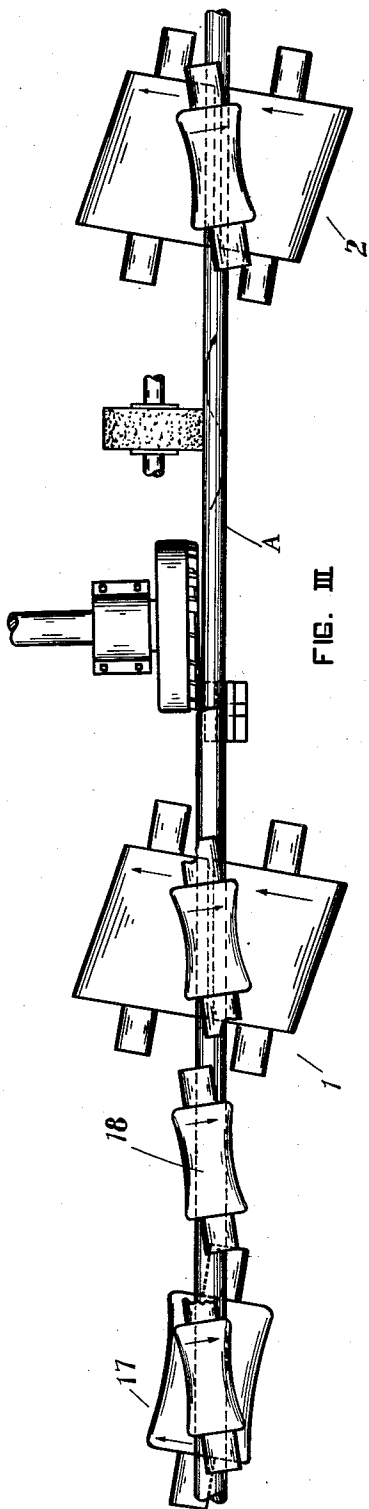
G. A. WISE

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METHOD AND APPARATUS FOR FINISHING ROUND BARS

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3 Sheets-Sheet 2



INVENTOR

George A. Wise

by Christy, Christy and Wharton
his attorneys

June 16, 1931.

G. A. WISE

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METHOD AND APPARATUS FOR FINISHING ROUND BARS

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3 Sheets-Sheet 3

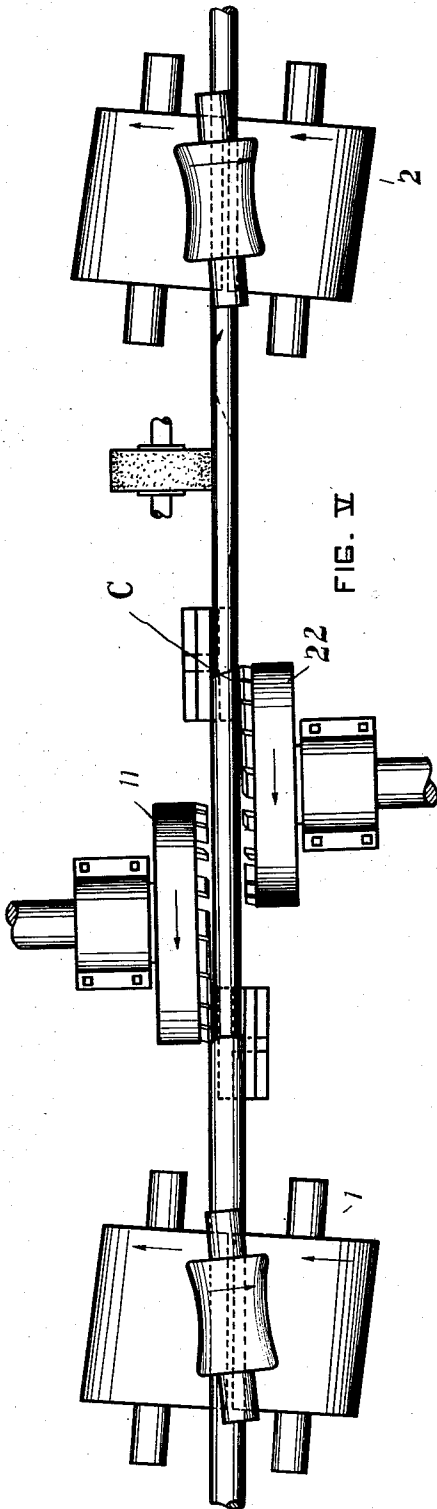


FIG. V

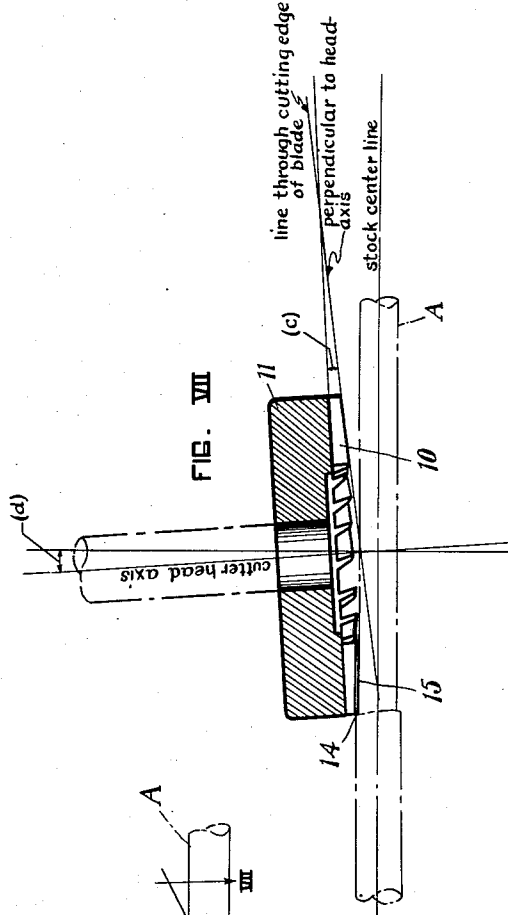


FIG. VII

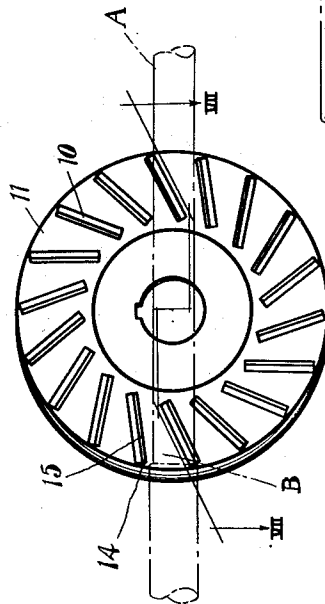


FIG. VI

INVENTOR

George A. Wise

by Christy Christy and Wharton
his attorneys

UNITED STATES PATENT OFFICE

GEORGE A. WISE, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO SUTTON ENGINEERING COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

METHOD AND APPARATUS FOR FINISHING ROUND BARS

Application filed May 4, 1929. Serial No. 380,449.

This invention relates to a method of and apparatus for reducing and finishing round bars and other round metallic sections.

In rolling mill practice round bars and other round sections cannot be rolled to an exact diameter, nor can they be rolled to absolutely true rounds in section. It is usual practice to roll the bars intentionally to a diameter greater than that desired for the finished product and machine them to the final gage.

Round sections coming from a hot rolling mill have numerous surface fissures, which result from various causes, and a certain amount of scale or other impurities on or slightly embedded in the surface of the bar.

A number of steps have heretofore been necessary in order to secure a finished bar, or other round section, free from scale, impurities, and fissures, and having a true round section with a smooth surface. There have previously been three well known methods for securing these desired results.

One of such methods is the "cold drawn" process. This method includes the successive steps of pickling or sand blasting, pushing or pointing, drawing, cutting to length, straightening, (the two last named steps being interchangeable), and sometimes a final centerless grinding after the straightening step.

Another of the methods is known as the "turned" process. This method includes the successive steps of straightening, turning, cross roll polishing, grinding or other polishing step, and cutting to length.

Other known methods include an extruding method, which is used chiefly in connection with brass; and a method described and claimed in a patent to Peter B. Abramsen, No. 1,601,551, dated September 28, 1926.

With the method of the present invention the pickling operation is wholly eliminated, fissures and other surface roughness of the bar of usual occurring depth are removed; and by succeeding operations, later explained, a straight bar with a clean surface, and a true section of the desired diameter, is obtained.

By a continuation of the cross-rolling feature of the invention, accurately sized and

finished stock, suitable for use as shafting and the like, is produced.

In the accompanying drawings Figure I is a plan view showing in its simplest form apparatus for conducting the method of the present invention; Figure II is a side elevation of such apparatus; Figure III is a plan view of apparatus illustrating the use of an additional set of initial straightening rolls; Figure IV is a plan view illustrating a continuation of the process by use of added smoothing and polishing rolls; Figure V is a plan view of apparatus similar to that shown in Figure I, but comprising a second and additional cutter head; Figure VI is a front elevation of a cutter head, illustrating its action on a bar; and Figure VII is a sectional view through the cutter head taken on the line VII—VII of Figure VI.

The apparatus shown in Figure I comprises an entering set 1 of cross rolls, and a leaving set 2 of cross rolls. The entering set is composed of two conical lower rolls 3 and 4 and an upper roll 5, while the leaving set is similarly composed of two lower rolls 6 and 7 and an upper roll 8. These rolls are mounted in both horizontal and vertical alignment; and the line formed by the adjacent faces of the rolls 3 and 4 and the rolls 6 and 7 defines the path followed by the stock in its passage through the machine as a whole. The stock is desirably supported between the sets 1 and 2 of cross rolls by a guide 9 of any suitable form.

The two sets of cross rolls serve to partially straighten the stock, to feed it past other elements of the machine along a longitudinal line, and to rotate the stock about its own longitudinal axis. The final set of cross rolls also performs a smoothing and finishing operation on the bar.

In conducting the method, the bar is introduced into the entering set of cross rolls, and passes to the point at which it is gripped by and fed through the leaving set. For the purpose of the operation, the bar may be either hot or cold.

To outline the method generally, the bar A is fed longitudinally, and is rotated about its longitudinal axis in the direction of the arrow

row *a*. During its passage between the sets of cross rolls, it is acted upon by the cutters 10 set in the face of, or integral with the face of, a cutter disk or head 11. The head 11 is rotated in the direction of the arrow *b*, and is so arranged that the cutters 10 have their region contact with the bar on the side toward the entering set 1 of cross rolls. The cutter blades thus move in a direction opposite to that in which the surface of the stock moves in the region B of its contact with the cutters. This relative movement of blades and stock surface affords a maximum cutting speed for a given longitudinal velocity of the stock. The action of the cutting blades removes chips continuously around the surface of the bar, as it moves longitudinally and rotates about its own axis. This cutting operation removes the surface of the bar, thereby eliminating scale and surface defects. It also reduces and "rounds-up" the bar. The amount of reduction in diameter of the bar obviously depends upon the position in which the cutting head is adjusted and fixed. The depth to which a cut may be successively effected is relational somewhat to the nature of the material of the bar, and the temperature of the bar at the region of cutting.

In order to prevent the cutter blades from over-heating, without undesirably lowering the temperature of the bar at the point of cutting, a spray nozzle 12 is positioned to direct a cooling jet of fluid against the face of the cutting head in a region below the line of travel of the stock. The jet is preferably directed toward the entering set of cross rolls. A rotatable wire brush 13 is desirably disposed between the cutting head and the second set of cross rolls to brush off any chips, which may cling to the bar after its passage through the cutter.

After the bar passes the cutting head, it enters the second set of cross rolls. This set of cross rolls, in addition to serving as feeding (by a pulling or drawing action) and straightening means, tends to smooth and polish the surface of the bar. In order to secure the most favorable results, the cutting head should be mounted to permit the blades to contact the stock in one fixed region only. With this in view, it should be noted that the cutter head 11 is not mounted on an axis perpendicular to the longitudinal axis of the stock, but that it is mounted angularly thereto in a horizontal plane. This permits two blades, as for example 10*a* and 10*b*, to contact the stock in the region B. It should be further noted that the cutting blades are so arranged in the head 11 that the points 14 of their cutting edges, which are farthest removed from the center of rotation of the cutting head, first contact the stock. The remainder of the cutting edges of each blade follows through to smooth the surface be-

neath the initial cut made by the points of the blades, as said. The form of the cutting faces or edges 15 of the blades are such as to compensate for the inclination of the cutting head itself. For this purpose the faces 15 are inclined to be of less height adjacent the outer points 14, the inclination being equal but opposite to the inclination of the face of the cutting head with respect to the longitudinal axis of the stock. That is, the angle (*c*) equals the angle (*d*), as indicated in Figure VII.

Figure III illustrated a modified arrangement of elements to conduct the present method. In case the bars are unusually crooked, or are hard to suitably straighten and feed through the elements before described, a pair of contoured cross rolls 17, and an idler roll 18 may be positioned to function in conjunction with the entering set 1 of rolls. It is obvious that a pair of contoured cross rolls, similar to rolls 17, may possibly be substituted for the sets 1 and 2 of conical and contoured rolls.

Figure IV illustrates a further step which may be included in the method; that is, subsequent to the passage of the bar through roll set 2, it may be fed through other suitable straightening and finishing elements. These additional elements are arranged in a combination heretofore known in the art, which comprises two pairs of contoured cross rolls 19 and 20 between which is mounted the idler bar flexing roll 21.

If a relatively great reduction in the stock diameter is necessary in working certain metals, or if it is found more practical to put a bar through two light cutting actions instead of a single heavy cutting action, the arrangement illustrated in Figure V may be employed. This arrangement comprises a cutting head 22 in addition to the other elements described supra, and it will be noted that the additional head is mounted on the side of the bar opposite to that engaged by the cutter head 11. The cutter head 22 is inclined and rotated, similarly to the head 11, to permit the cutting edges of its blades to move oppositely to the surface of the stock. That is, the blades of the head 22 engage the bar to remove metal in the region C similar to the manner in which the cutting blades of the head 11 move in the region B.

Bars acted upon by the method and apparatus of the present invention have smooth clean surfaces having practically no fissures. It should be particularly noted that the cutting and rolling action removes irregularities of sectional contour, and produces a bar which is a true round. The production of this latter effect is initiated by the first set of cross rolls, is largely affected by the cutting operation, and is completed in the subsequent cross rolling of the stock.

I claim as my invention:

1. In apparatus for reducing and truing round metallic sections the combination of means for feeding a bar longitudinally and simultaneously rotating it about its longitudinal axis, and a cutting head having a face with cutter blades arranged to contact the bar, the cutting head being angularly inclined to the line of travel of the bar, and the cutting edges of the blades being inclined to the face of the cutting head by an angle equal to that at which the cutting head is inclined to the line of travel of the bar.

2. The method of finishing a round metallic section which consists in feeding such metallic section to straightening instrumentalities, causing such straightening instrumentalities to effect helical movement of said section past a surface-removing tool, and effecting the continuation of such movement of the straightened and surfaced section through a set of polishing rolls.

3. The method of finishing a round metallic section which consists in feeding such metallic section to straightening instrumentalities, guiding the section after it leaves such straightening instrumentalities, causing such straightening instrumentalities to effect helical movement of said section past the guides and past a surface-removing tool, and effecting the continuation of such movement of the straightened and surfaced section through a set of polishing rolls.

4. In apparatus for reducing and truing a round metallic section, the combination of means for straightening such metallic section, which means are adapted to effect a helical movement of the section in the general direction of its longitudinal axis, a surface-removing cutter adjacent the path of travel of said section as it leaves such straightening means, which cutter includes a blade and is rotatable to move the blade against said helically moving section, and rolls for the polishing of said section when it has passed said cutter, which polishing rolls are adapted to continue the helical movement of said stock.

In testimony whereof I have hereunto set my hand.

GEORGE A. WISE.