Patented June 20, 1933 1,914,587

UNITED STATES PATENT OFFICE

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

METHOD OF FINISHING ROUNDS

Application filed October 7, 1930, Serial No. 487,021. Renewed December 1, 1932.

This invention relates to a method of descaling, sizing, rounding up, straightening, and polishing solid or hollow metallic rounds by a continuous progressive and automatic operation.

As round bars and tubes come from a hot mill, or other devices producing similar material, they are not true to size, are not round, carry scale, and are not straight. The best "rounds" (which term throughout the specification and claims will be used to designate both solid bars and tubes) are therefore, as initially produced, not suitable for certain purposes which require material that is clean, straight, polished, and approximates true roundness and accurate size.

It has, therefore, been previous practice to manufacture round sections for these purposes by such methods as drawing, cold rolling, or turning and polishing. These methods are all slow and expensive.

My invention provides a rapid and economical method of producing round sections which are straight, clean and polished and which are within a narrow tolerance both as to accuracy of section and size. The method is a continuous one so that rounds are straightened, descaled, are brought closer to true section and diameter, and are polished by a continuous, progressive, and automatic operation. Rounds finished according to my method thus approximate in their qualities those produced by the slow and expensive drawing and cold rolling methods, and are more accurately straight than any drawn round sections which are straightened according to general practice.

I approximate the accuracy in section and diameter which may be obtained by drawing, and the highest degree of straightness and polish, by a method which produces finished bars at a rate many times that at which they may be produced by drawing or turning methods.

More specifically I enter the rounds initially into one or more sets of straightening cross rolls, which initially break the scale on the stock, which initially straighten it to facilitate treatment during the later stages of the process, and which serve as feeding rolls for the instrumentalities acting upon it in the later stages of the process.

These initial cross rolls pass the rounds to a steel blast for descaling and removing some of the surface metal of the stock, and through the steel blast to rounding, straightening, and polishing passes. The blast may obviously be of a suitable abrasive other than steel, steel being in general the preferred abrasive.

Because the stock is fed positively to the passes in which it is subjected to relatively great pressure for truing, it is unnecessary that bars be pointed or swaged for introduction into the truing passes. Because the stock is subjected to scale breaking and straightening before being subjected to the blast, the blast operates more efficiently in removing scale from the stock, and also if desired in removing some of the surface metal. Because the descaling and scouring of the stock is followed by a rounding and polishing, any surface abrasions or irregularities caused by the blast are smoothed out and eliminated in the final stages of the process.

It should be understood initially that my entire method is a straightening one, the stock being initially straightened for introduction to the blast, and the straightening action is progressively continued throughout its rounding and polishing.

In the accompanying drawings Figure I shows diagrammatically an arrangement of rounding, straightening and polishing rolls which may be utilized in conducting the method of my invention; Figure II is a generally similar view illustrating a varying contact surface of the rolls to produce the rounding effect; Figure III is a diagrammatic section through a blast constituting one of the instrumentalities employed in conducting my method; Figure IV is a diagrammatic plan view of a complete installation capable of conducting my method; and Figure V is a diagrammatic side elevation of such installation.

In conducting my method, the bars, or hollow rounds, are introduced into the feed-

effective pressure is greatest. In succeeding passes the effective pressure is progressively decreased in favor of a wider area of contact for smoothing and polishing.

In the installation shown, each of the sets comprises an intermediate idler roll 19, which cooperates in producing the straightening effect.

During the finishing operation it is important that the stock be maintained under a tension effective in the direction of its longitudinal travel. By placing the stock under tension from the point at which it is first gripped by two pairs of rolls, which exert a relatively high degree of pressure on it, there is no point or region in which the stock is subjected to severe pressure without the relief afforded by placing it under tension.

The stock may be placed under tension in several ways. One such way of producing the tension is the progressively increased area of contact surface of succeeding pairs of rolls. This in itself tends to produce increased speed of longitudinal travel of the stock as it progresses, and thereby places the stock under tension. Another way in which the tension to which the stock is subjected may be produced or increased is to make the rolls (in the installation disclosed each driven roll of a pair) of progressively increased diameter. That is, the driven rolls 8, 10, 12, 14, 16, and 18 are of progressively increased diameter. This progressive increase in roll diameter also results in a tendency toward progressively increased speed of longitudinal travel of the stock, and in the typical installation shown supplements the tendency toward increased longitudinal speed resulting from the progressively increased areas of contact with the stock.

As illustrated, a progressive increase in contact area in successive pairs of cross rolls is obtained by graduated roll contour to secure this result. It may, however, be obtained by a progressive adjustment of the angle at which succeeding pairs of cooperating rolls are crossed. When the rolls are contoured to give progressively increased contact surfaces, the angular adjustment may still be utilized to effect a final regulation of the areas of contact, and to accommodate for various runs of stock which differ in size.

It may be stated generally, that I take rough, unfinished rounds of steel or other material, and operating on the stock while it is cold, so treat the stock that its surface is freed from scale, and it is sized, rounded, straightened, and polished. In the case of solid rounds, or bars, the stock is then ready for immediate shipment. In the case of hollow rounds, or tubes, the finishing is complete except for possible interior scale; which, if present, has been broken and is in condition for ready removal. These results are obtained by an automatic, continuous, and rapid process, and without detriment to the qualities of the material in the rounds so treated.

It should be observed that the process eliminates the slow and laborious operations, and repeated handling of stock, encountered in producing polished, straight, round sections by the methods now in use. For example, in the cold drawing process, it is the practice that the stock be subjected to pickling baths for the removal of scale and neutralization of acid, to pointing in a pointing machine or in the drawing die, to "slushing", that is coating with a lubricant for drawing, and to drawing. After drawing, the stock must be cropped, this cropping being a machine operation which involves the discarding of a substantial amount of material. The stock is also straightened, either before or after cropping, and coated for protection against rust. In my method the equivalent of all these operations is effected during a single passage of the stock.

It is further a fact that the cold drawing step is injurious to the metal, because of the excessive severity of the working in the drawing die. My method thus in practical effect produces finished stock, physically superior to cold drawn stock.

The process may be conducted by various instrumentalities, variously arranged. For example, application of the pressure in a spiral path may be obtained by rotating the pairs of cooperating rolls about the axis of the stock, instead of rotating the stock about its own axis.

Further, when the bar is rotated about its own axis, it is possible to obtain the desired result by the application of the principles of the present process to roll installations of various types. For example I may employ a cross roll installation in which all the rolls are driven, and an installation in which all rolls are driven and are also angularly adjustable.

As concerns the intermediate pressure roll illustrated in each set of rolls herein, this may be replaced by a pair of cooperating rolls. This pair may be both driven, both idle, or one driven and one idle. They desirably, but not necessarily are so mounted that they may be angularly adjusted. They are, necessarily, so mounted that they cooperate with each other, and with the other pairs of rolls in producing a straightening effect.

It is a further important advantage of the process that the surface compression produced by the cold working of the stock results in a marked increase in the fatigue strength of the metal. This is true not only

gressively increased width, and so directing the pressure on the stock that a straightening tendency is present throughout the progress of the stock.

10. The herein described method of finishing rounds which comprises causing simultaneous rotation and longitudinal progress of the stock with the stock under tension effective in the direction of its longitudinal travel, as the stock uninterruptedly progresses exerting thereon pressure applied upon areas of progressively increased width, and simultaneously throughout the progress of the stock subjecting it to a succession of cross roll straightening steps in which the stock is acted upon by flexing forces producing a straightening bend or wave.

11. The herein described method of finishing rounds which comprises causing simultaneous rotation and longitudinal progress of the stock, feeding the stock while exerting a straightening effect thereon past blasting instrumentalities, thereafter causing simultaneous rotation and longitudinal progress of the stock under tension effective in the direction of its longitudinal travel, as the stock progresses exerting uninterruptedly thereon pressure applied upon areas of progressively increasing width, and simultaneously throughout the progress of the stock subjecting it to a succession of cross roll straightening steps in which the stock is acted upon by flexing forces producing a straightening bend or wave.

12. The herein described method of finishing rounds which comprises subjecting the stock to scale cracking pressure, passing the stock with the scale broken thereon past blasting instrumentalities while rotating the stock about its longitudinal axis, thereafter causing simultaneous rotation and progress of the stock under tension effective in the direction of its longitudinal travel, as the stock progresses exerting uninterruptedly thereon pressure applied upon areas of progressively increasing width, and simultaneously throughout the progress of the stock subjecting it to a succession of straightening steps in which the stock is acted upon by flexing forces producing a straightening bend or wave.

13. The herein described method of finishing rounds which comprises subjecting the stock to scale cracking pressure so directed as to exert a straightening effect on the stock, passing the stock with the scale broken thereon past blasting instrumentalities while rotating the stock about its longitudinal axis, thereafter causing simultaneous rotation and longitudinal progress of the stock under tension effective in the direction of its longitudinal travel, as the stock progresses exerting uninterruptedly thereon pressure applied upon areas of progressively increased width, and simultaneously throughout the progress of the stock subjecting it to a succession of cross roll straightening steps in which the stock is acted upon by flexing forces producing a straightening bend or wave.

In testimony whereof I have hereunto set my hand.

GEORGE A. WISE.

June 20, 1933. G. A. WISE 1,914,587

METHOD OF FINISHING ROUNDS

Original Filed Oct. 7, 1930 2 Sheets-Sheet 1

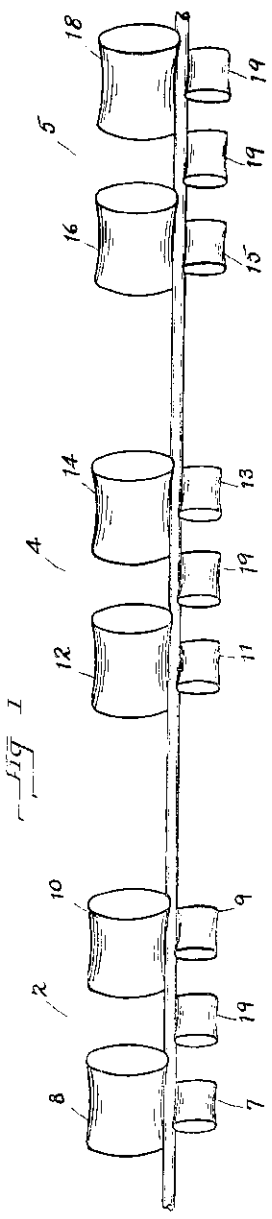

Fig I

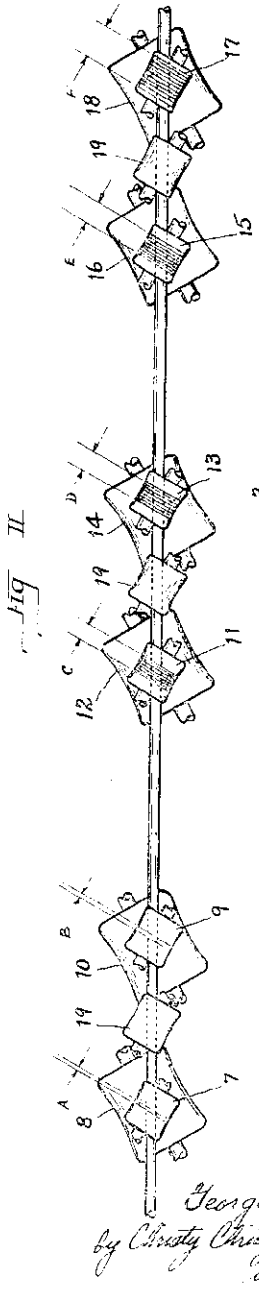

Fig II

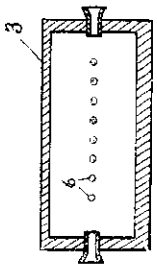

Fig III

INVENTOR
George A Wise
by Christy Christy and Wharton
attorneys