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FEEDING MEANS FOR ROUND BARS

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3 Claims. (Cl. 198—127)

This invention relates to treatment of hot-rolled bar steel, as received from a rolling mill, to produce therefrom a bar stock suitable for feeding to machine tools such as turret lathes, automatic screw machines, and the like.

The hot-rolled bar, as will be appreciated by one familiar with the art, although theoretically of circular section, actually is deformed therefrom and is not straight. Also it is encrusted with tough scale, particularly heavy if annealed; so that it is unsuitable for immediate machining, and particularly for centering in the collet of the machine tool.

Therefore it has been customary heretofore in the art to remove the scale by pickling and thereafter put the hot-rolled bar through a cold drawing process to produce sufficient accuracy of round and straightness. As is known, pickling comprises essentially dissolving by acid by submersion in an acid bath. Obviously the entire bar must have sufficient subjection to the bath to completely remove the most tenacious of the scale thereof that might be but a small portion of the whole. Also, and particularly, as the acid reaches the steel its dissolving action upon the latter being much greater than upon the scale, a very substantial amount of otherwise good metal is lost. Moreover, rinsing operations must follow the primary pickling operation, so that the pickling process is in general quite an expensive one.

It is the object of this invention to produce from the hot-rolled bar, a suitable machine tool feed stock, by novel means including a cheaper method and improved apparatus therefor. Briefly the method comprises removing the scale in a novel manner by subjecting the bar stock to a blasting operation; and thereafter, by a polishing operation, removing irregularities from the surface of the stock, including both those irregularities produced by the scale and those relatively minute and uniform irregularities resulting from the blasting operation. The novelty of apparatus pertains particularly to that for performing the scale-removing blasting operation and comprises briefly means for simultaneously advancing and rotating the bar stock while subjecting it to a relatively stationary blasting stream, and including means for controlling the advance of the stock, dependent upon removal of its scale.

In removing the scale the blasting process of this invention, as distinguished from the pickling process above described, has the great inherent advantage in that the abrasive action upon the scale is much greater than that upon the metal so that the metal itself is substantially unaffected by the blast regardless of how much the latter must be prolonged to remove all of the scale.

The exact nature of the invention together with further objects and advantages thereof will be apparent from the following description taken in connection with the accompanying drawing which shows conventionalized views intended merely to illustrate the principles of the invention, and in which Fig. 1 is an assembly view generally in plan and partly diagrammatic, illustrating the scale-removing part of the apparatus employed; Fig. 2 is a diagrammatic plan detail illustrative of the means for performing the subsequent polishing operation; Fig. 3 is a detail in elevation of a part of the blasting apparatus appearing in Fig. 1; Figs. 4 and 5 are enlarged details of the work-supporting units employed in the apparatus of Figs. 1 and 3, Fig. 4 being a typical sectional elevation as in the plane of line 4—4, Fig. 5, Fig. 5 being in horizontal section as in the plane of line 5—5, Fig. 4; and Figs. 6 and 7 are views corresponding to Figs. 4 and 5 but illustrating a modified type of work-supporting unit and of drive therefor.

With reference now to the drawing, and first with reference to Figs. 1, 3, and 4 thereof, 1 is the casing of a blasting machine having a supporting structure indicated at 2, housing nozzle means 3 served by piping 4 leading from blower means 5 driven as by a motor 6. The arrangement is such that upon operation of the motor 6 a blast of abrasive particles such as sand, steel, or like suitable material for the purpose of removing scale, is delivered by the nozzle means 3, the abrasive being entrained in an air stream actuated by the blower 5, through a recirculating path including generally delivery from the blower to the nozzle means, and return to the blower. The nozzle means is visible through a window 7 suitably located for the purpose.

What has thus far been described is blasting apparatus of a general type which will be recognized by one familiar with the art. According to my invention so far as this part of the apparatus is concerned, the casing 1 has an inlet opening 8 on one side and an outlet opening 9 on the opposite side disposed to allow passage of bar stock through the casing under the nozzle means 3 to be subjected to the blast therefrom, and the openings are provided with suitable flexible aprons or the like, as indicated, to prevent so far as possible exit of the abrasive material from the casing. Means conventionally il-

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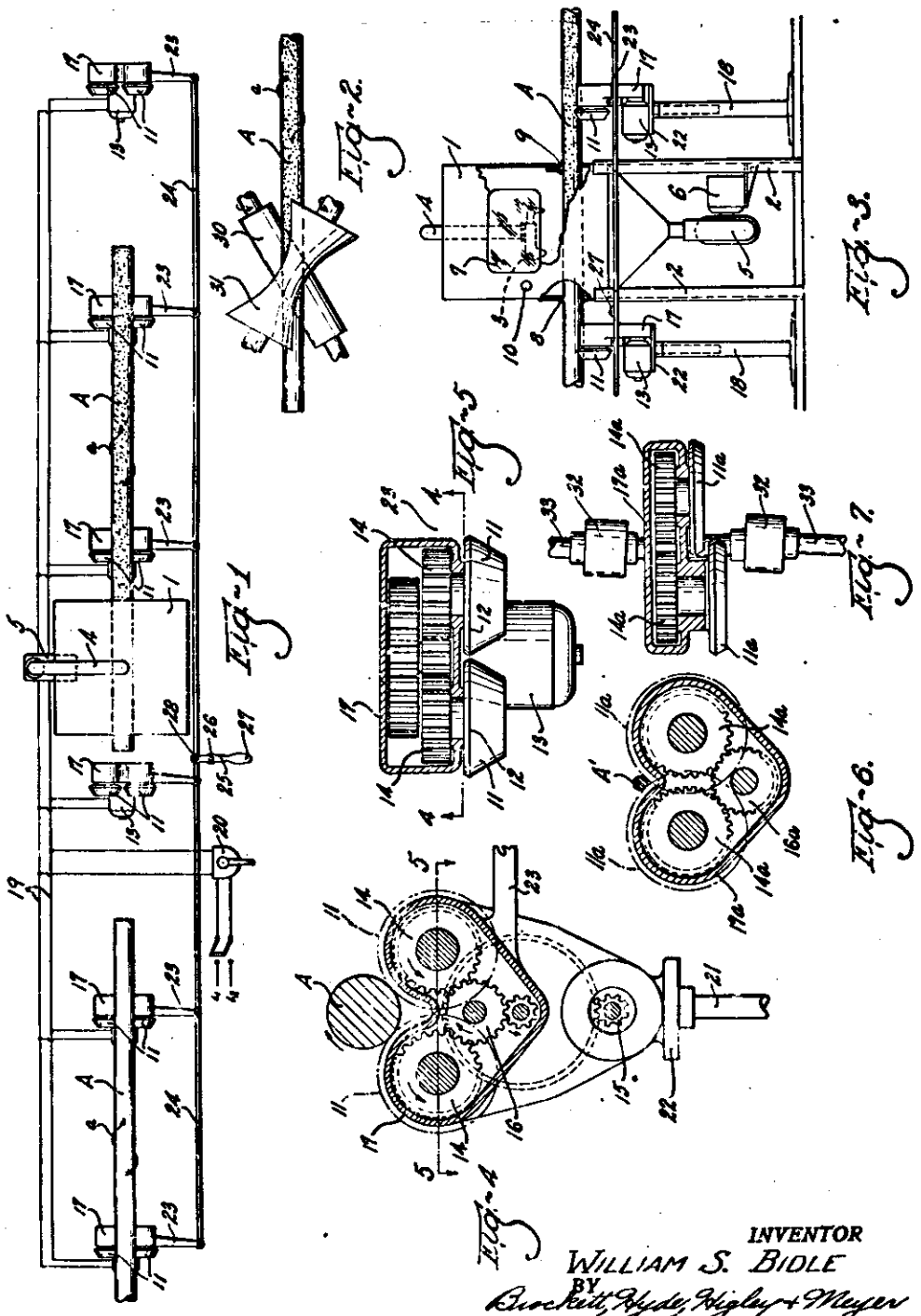

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lustrated here only as a handle 18 are associated with the nozzle means 3 for adjustment of the latter as to direction and spacing from work extending between the casing openings 8 and 9; so that an operator observing through the window 7 may properly adjust the blast stream against the work.

I provide novel means for supporting the work and causing it to be so advanced through the housing 1 that its entire peripheral surface shall be subjected to the blast stream. For this purpose I provide a plurality of rollers 11 preferably arranged in paired groups each defining a crotch and the groups arranged along the line of travel of the work to define a trough or elongated crotch adapted to receive and support the bar lengths of work as the latter advance along their path.

With reference now particularly to Figs. 4 and 5, the rollers 11 of each pair are disposed on parallel axes. They are of conical form, with their base circles 12 in a common plane and closely adjacent each other. Driving means are provided for at least one of the rollers of each pair and here shown as arranged to drive both rollers simultaneously, and comprising a motor 13, gears 14, one for each roller 11, and intermediate reducing gearing leading from the pinion 15 on the motor shaft to a pinion 16 meshing with both gears 14. As indicated by the arrows Fig. 4, the arrangement is such that both rollers 11 will be driven simultaneously in the same direction, so that bar stock A resting in the crotch formed by the pair of rollers, will be caused to rotate in the opposite direction.

The rollers of each pair together with their driving motor and associated gearing, are interassociated as a unit by a suitable housing frame 17 enclosing the gearing and providing bearings therefor.

As indicated Figs. 1 and 3 the work-supporting crotch-forming units, each comprising a pair of driving rollers 12 and its driving motor 13, are disposed in aligned relation as indicated Figs. 1 and 3, as each upon a base pedestal 18, the arrangement being such that the crotches of the several units are aligned, so that a single long trough or crotch is defined by the several actual crotches, the trough being disposed to position the work in the line of the openings 8 and 9 of the blasting apparatus. The motors 13 of the several units are arranged in a common circuit indicated at 19 which is subject to a controller 20 located convenient to the operator at the blasting machine, for simultaneous control of the speed of all of the motors. The motors are wired to run in a common direction, so that by manipulation of the controller 20, work A resting on any one or more pairs of rollers 11 may be caused to rotate as indicated by the arrows, Fig. 1.

It will be apparent that with the units disposed as illustrated in Fig. 1, with their rollers in planes transverse to that of the work, upon operation of the motors the work will rotate only, without advance.

In order that the work may have advanced along its axis, coincident with its rotation thereabout, I provide simultaneous adjustment of each of the roller units, about a vertical axis in the plane of its pair of rollers and therebetween. To this end each pedestal 18 is provided with a suitably disposed socket to receive a post 21 extending downwardly from the housing frame 17, here shown as integral therewith, and having an associated flange 22, by which the unit is supported on its pedestal. Each unit is provided with a lever arm 23 and all of the lever arms are connected by a link 24. A lever 25 pivoted as at 26 and having a handle 27, has connections as at 28 with the rod 24 for longitudinal adjustment of the latter; the handle 27 being located within convenient reach of the operator observing the blasting operation through the window 7 of the blasting apparatus.

By the arrangement described it will be apparent that upon shifting of the handle 27 during operation of the motors 13, all pairs of rollers 11 may be simultaneously given similar and corresponding angular relation with the work A, such that the latter will have a longitudinal component of advance in its motion on the rollers of corresponding amount for each roller, such advance being coincident with its rotational motion. If the parts be operating in the direction of the arrows Fig. 4, adjustment of the handle 27 in either direction will cause longitudinal feeding of the work in the same direction. Thus as to its longitudinal feed, the work may be stationary, be caused to advance, or even reversed should that be desired. As indicated by the shown position of the rollers in Fig. 1, the work would be rotating without advancement, but upon shifting of the handle 27 in advance direction the work would be caused to travel as indicated by the helical arrows *a*, Fig. 1.

As the work advances from one pair of rollers to the next, its forward end, if the work be not exactly straight, may strike the conical faces of the succeeding pair of rollers. These faces will act as cams so that the work will run up and onto the peripheral or base parts 12 of the rollers.

The operation of what has thus far been described will be apparent. Assuming the motor 6 of the blasting apparatus in operation and the motors 13 of the feeding apparatus also running, a piece of work A placed on the first two roller units, and resting in the crotches between their pairs of rollers, will be caused to rotate, and, upon suitable adjustment of the feed handle 27, will be caused to advance with a helical motion of its surface. The work will advance into and through the blast housing 1, under the blast nozzle means 3. The nozzle means having suitable adjustment to remove the scale from the work surface immediately thereunder, it will be apparent that by suitably proportioning the relation between advancing and rotative speed of the work, the entire peripheral area of the work will be subjected to the blast as the work progresses through the blasting apparatus. Ultimately the work will be delivered through the outlet opening 9 of the apparatus and carried along the following roller units from which it may be removed. The scale on the work may vary in amount and tenacity, but by observation through the window 7 and proper adjustment of the feed control handle 27, the operator may insure that all scale is removed without excessive blasting of any part of the work.

It will be observed that this control of the scale-removing operation has great advantage over the usual pickling method wherein pickling must be sufficient to remove scale at the point of greatest depth and yet must be uniform throughout the work, so that in the usual pickling operation considerable otherwise useable metal is destroyed. It will also be observed that the apparatus disclosed will handle bars of unlimited length provided the length be sufficient to rest simultaneously upon two roller units.

With reference now to Figs. 6 and 7, a modified

form of work-supporting unit is illustrated, wherein the rollers 11a are disposed in spaced parallel planes so that the rollers may overlap. This arrangement has advantage in providing a shallower crotch, better adapted to receive work A' of the smaller diameters. The rollers 11a are coincidentally driven by a pinion 16a meshing with gears 14a, the gearing being mounted in a suitable housing 17a generally as before and the housing being mounted for swiveling adjustment of the unit upon a vertical center perpendicular to that of the work, as before.

In this modification means are illustrated providing a common mechanical drive for the several work-supporting units of the apparatus, as distinguished from the individual motor drive illustrated in Fig. 1. Such means comprise simply universal joints indicated at 32 and intermediate shafts 33 providing connections between the driving pinions 16a of the several units for a common drive of the latter, the nature of the connection being such as to permit angular adjustment of the units without interrupting their drive and the connection between each adjacent pair of units including two universal joints 32 and relative extensibility therebetween.

The blasting operation leaves the work cleaned of scale, with its resulting clean surface slightly but uniformly roughened by the blasting abrasive. Also the work may be slightly out of round, or off diameter, as from the hot-rolling process and scale formed therein; and will be usually somewhat out of straight.

According to my invention, therefore, after the scale has been removed, the work is subjected to an operation which smooths its surface of such irregularities, and straightens it. This operation consists simply in passing the work through a polishing machine of a type known in the art.

Such machine is here illustrated diagrammatically and conventionally only, in Fig. 2. It comprises essentially and so far as this invention is concerned, a pair of rollers, one 30 of cylindrical form and a cooperative roller 31 having a working surface in the form of a hyperboloid of revolution. These rollers are massive, and slightly spaced apart to receive the work A therebetween. Both rollers are angularly disposed with respect to the work and to each other, and each is driven as indicated by the arrows, Fig. 2. The cylindrical roller 30 bears against the work, as below the latter, at a single central point, whereas the upper roller 31 bears against the work at two points, one forward and one rearward of the point of bearing of the cylindrical roller. There is sliding motion of the rollers against the work, and means are provided for bearing the rollers heavily against the work so that the latter is powerfully squeezed therebetween. Also, owing to the angularity of the rollers, the work is given a helical advancing motion therebetween.

The result is that as the work passes through the polishing machine its surface is somewhat worked or "polished", all of the irregularities smoothed out as by flowing of the surface metal, leaving the surface perfectly smooth and the work of improved approximation to true circular section, and substantially straightened longitudinally.

After this polishing operation it will be apparent that the work has all of the necessary qualifications for use as stock for feeding to machine tools. So far as such tools are concerned, the stock is substantially as good as had it been treated by the usual slow, laborious and expensive pickling and cold drawing process above described. It will be apparent that, on the other hand, the process of my invention is not only much cheaper and equally satisfactory for all practical purposes but it is similarly very much faster.

What I claim is:

1. Apparatus for feeding round bar stock and comprising a plurality of rollers arranged in spaced pairs upon parallel axes to define a trough adapted to receive and support a bar of said stock, a motor for each pair of rollers and means connecting each motor with both rollers of its pair for their common drive, a common control circuit for said motors whereby all of said rollers may be driven in unison, each pair of rollers, with its motor and connecting means being mounted for adjustment, as a unit, about an upright axis intersecting that of said trough, and means interconnecting said units and providing for their said adjustment in unison and similarly with respect to said trough.

2. Apparatus for feeding round bar stock and comprising a plurality of rollers arranged in spaced pairs upon parallel axes to define a trough adapted to receive and support a bar of said stock, a motor for each pair of rollers and means connecting each motor with a roller of its pair to provide drive of the roller by the motor, a common control circuit for said motors whereby all of the driven rollers may have similar drive, but with yieldable characteristics in the drive between rollers spaced along said trough.

3. Apparatus for feeding round bar stock and comprising a plurality of rollers arranged in spaced pairs upon parallel axes to define a trough adapted to receive and support a bar of said stock, a motor for each pair of rollers and means connecting each motor with a roller of its pair to provide drive of the roller by the motor, a common control circuit for said motors whereby all of the driven rollers may have similar drive, but with yieldable characteristics in the drive between rollers spaced along said trough, each pair of rollers with its motor and connecting means being mounted for adjustment as a unit about a central axis, and means interconnecting said units and providing for their said adjustment in unison and similarly with respect to said trough.

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