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METHOD OF TREATING STEEL BARS

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2 Claims. (Cl. 205—8)

The invention relates generally to metal working and it has particular relation to machinable steel bars and a method of manufacturing such bars.

It may generally be stated that it is well known in the art of metal working to provide hot rolled steel bars of different cross-sectional shapes for use in connection with various metal working machines such, for example, as automatic screw machines. With respect to the latter type of machine in particular, it will be understood that as a rule, the bars used are of considerable length and are progressively fed through the machine. It is of importance that the sectional dimensions of the bar be held to fairly close tolerances to avoid interference with the operation of the machine and it is also important that the surface of the bar be fairly smooth. The cost of providing such bars for this purpose naturally is a very important factor and when it is considered that there is an enormous use of steel bars of this general character and for the purposes mentioned, any reduction in cost of manufacturing the bars becomes a highly important item.

In so far as is known, the usual practice involved in manufacturing bars of the type mentioned requires either cold drawing or cold rolling of hot rolled bars produced in the steel mill wherein in either case, the hot rolled bar is cleaned of scale by treating it with a pickling solution and in connection with the drawing process, the bar also is coated with lime. Pickling of the hot rolled bar to remove the scale, and liming if effected, involves a substantial expense item. Subsequent cold rolling by passing the bar repeatedly between rollers until the desired size is obtained, requires considerable time and, therefore, is likewise expensive.

Ordinarily, in the use of either of these processes, hot rolled bars are purchased which have been pickled to remove the scale and if such bars are not used within a short time, the surface metal begins to rust.

One object of the present invention is to provide an improved process for manufacturing machinable steel bars such as generally indicated, which requires fewer operations and less time, which results in a superior product uniform and accurate throughout its length, which provides a smooth surface, and which in general involves less expense.

Another object of the invention is to provide an improved process such as above indicated which will allow storage of hot rolled bars in a manufacturing plant without removing scale therefrom until immediately before finishing the bars for use in automatic screw machines and the like.

Other objects of the invention will become apparent from the following specification and from the claims hereinafter set forth.

For a better understanding of the invention, reference may be had to the accompanying drawing illustrating generally the manner in which the invention is employed and wherein:

Figure 1 illustrates more or less diagrammatically one step in the process embodied in the present invention;

Fig. 2 illustrates another step involved in such process;

Fig. 3 is a fragmentary view in cross-section of the bar at one stage of its manufacture and as seen substantially along the line 3—3 of Fig. 1; and

Fig. 4 is a similar view of the bar at another stage and as seen substantially along the line 4—4 of Fig. 1; and

Fig. 5 is a view of the finished bar as seen substantially along the line 5—5 of Fig. 2.

Referring to Fig. 1, a hot-rolled bar, as it appears with the scale remaining thereon, is shown at 10 at the entry side of the apparatus. It will be understood that the cross-sectional dimensions of the bar in this condition are slightly greater than the cross-sectional dimensions of the finished bar to be obtained. Proceeding with the present process, the bar 8 first passes through a shot blasting machine indicated at 11 and at the same time it is rotated so that the scale is subjected to forces which efficiently act to remove the scale.

It is to be understood that this machine forcefully throws large numbers of small, hard steel shot against the surfaces of the bar and different machines may be used for this purpose. The machine 11 is rather diagrammatically illustrated and includes a drum 13 having a plurality of nozzles 14 through which the shots are directed against the surface of the bar.

For rotating the bar while at the same time supporting it for movement through the shot blasting machine, pinions 15 and 16 may be employed which have hexagonal openings 17 at their center through which the hexagonal bar 8 passes. These pinions are journaled in bearing supports 19 and 20 that are anchored on a stationary member (not shown). Suitable means may be

April 22, 1941. J. W. LEIGHTON 2,239,044

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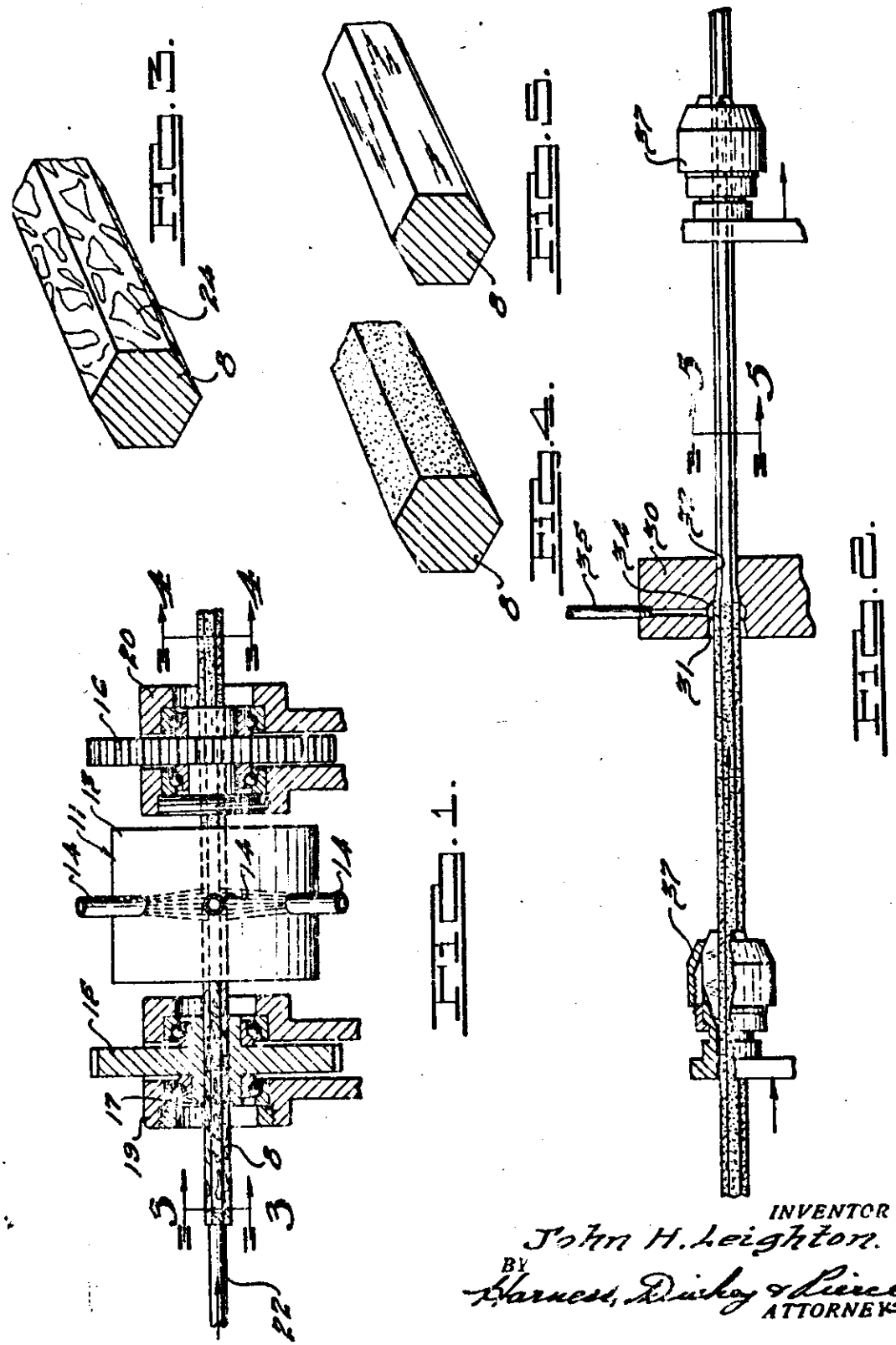

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provided for turning the pinions 15 and 16 together and thus rotating the bar, and a push rod 22 has been illustrated as the means for pushing the bar through the pinions and drum although if desired, rollers may be employed for this purpose and such rollers may be disposed at the inlet and discharge side of the apparatus.

Figure 3 illustrates the bar as it is delivered to the machine 11 and at this stage the surfaces of the bar are covered with scale, indicated generally at 24. This scale, as indicated previously, results from the hot-rolling processes employed in the steel mill during the initial manufacture of the bar from steel ingots. The bar, in passing through the shot blasting machine, is freed from this scale and an important feature of the present invention is that in directing the shot forcefully against the surfaces of the bar, numerous very small recesses or pits are formed in the surfaces and the bar in this condition is shown by Figure 4. Such pits or recesses are very shallow, small in width, and are closely arranged. It will be understood that they are not regularly arranged as one pit will overlap another pit in many instances, but the general appearance is that of a pitted formation wherein the pits are extremely numerous, small, and close together.

It will be appreciated that removal of the scale by the shot blasting step in the process is inexpensive and that it may be effected quickly. Moreover, it can be readily effected at any time and the bar, as it leaves the shot blasting machine, is ready for further use without delay. Rust and scale are removed immediately before any further steps in the process and this is distinctly advantageous since subsequent rusting is avoided.

The pitted bar now is passed through a die 30 having a conical entry 31 and a reducing portion 32 which acts to reduce the diameter of the bar to that desired and to provide a very smooth surface. An annular groove 34 is provided in the entry 31 and communicates with a lubricant line 35. Lubricant is conducted to the surfaces of the bar just before it enters the reducing portion 32 and this lubricant flows over the pitted surfaces and lodges in the pits or recesses. In this manner, the lubricant is carried into the reducing portion 32, from which it follows that during reduction of the diameter the surfaces of the bar efficiently are lubricated and this is very important if the reducing action is to be practical.

The bar may be initially pushed through the die 30 by means of a pushing collet 37 that grips the surfaces of the bar and after the bar passes sufficiently beyond the discharge end of the die, one or more additional collets or jaws devices may be employed for drawing the bar through the die. By using collets at both sides of the die, the bar may be extruded or it may be drawn or it may be moved through the die by a combination of drawing and extruding forces. The advantage of the extruding process is that there is less tendency for variation in the diameter of the bar due to the fact that the finished construction is not subjected to tensile forces although usually the tension forces required do not reduce the dimensions beyond permissible tolerances.

This process permits bringing hot-rolled bars with scale thereon into the manufacturing plant and the storing thereof until ready for use. As demanded, these bars may be passed through the apparatus shown and subjected to the process described and may thus quickly be conditioned immediately before their use in automatic screw machines. Pickling and liming are eliminated and little time is required in passing one of the bars through the shot blasting apparatus and in removing this bar to the reducing apparatus and reducing its dimensions to those desired. Fewer operations are thus required in handling the bar and the expenses of conditioning it are reduced very substantially. This reduction in expense necessarily is reflected in a lower cost in screw-threaded products produced from the bar and when it is considered that enormous quantities of screw threaded products are produced from bars, the total benefit derived from this process, particularly in the way of a reduction in cost, becomes a most important item.

Although only one form of the invention has been described and illustrated in detail, it will be apparent to those skilled in the art that various modifications may be made without departing from the scope of the appended claims.

What is claimed is:

1. The method of treating steel stock to obtain an elongated bar of accurate and uniform cross-sectional dimensions and in condition to be delivered or fed to a metal working machine such as an automatic screw machine, which comprises providing an elongated bar of rolled steel slightly larger in cross-section than the finished bar to be obtained, forcefully directing small solid particles against the surface of the bar to remove scale and also to form closely related, small recesses or pits in such surface adapted to retain a lubricant, applying fluid lubricant to the pitted surface immediately adjacent to a reducing die in such manner that the lubricant will be held in the pits as they enter the die, and forcing the bar through the die with the pits retaining the lubricant to reduce the sectional size of the bar to a smaller size uniform and accurate throughout the length of the bar and to eliminate the pits or recesses and provide a smooth surface.

2. The mehod of treating steel stock to obtain an elongated bar of accurate and uniform cross-sectional dimensions and in condition to be delivered or fed to a metal working machine such as an automatic screw machine, which comprises providing an elongated bar of rolled steel slightly larger in cross-section than the finished bar to be obtained, moving the bar in the direction of its length, forcefully directing small solid particles against the surface of the bar as it is moved so as to remove scale from such surface and to form closely related small recesses or pits in such surface that are adapted to hold lubricant, applying fluid lubricant to the pitted surface during continued movement of the bar and at a point immediately adjacent to a reducing die in such manner that the lubricant will be held in the pits as they enter the die, and forcing the bar through the die with the pits retaining the lubricant to reduce the sectional size of the bar to a smaller size uniform and accurate throughout the length of the bar and to eliminate the pits or recesses and provide a smooth surface.

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