

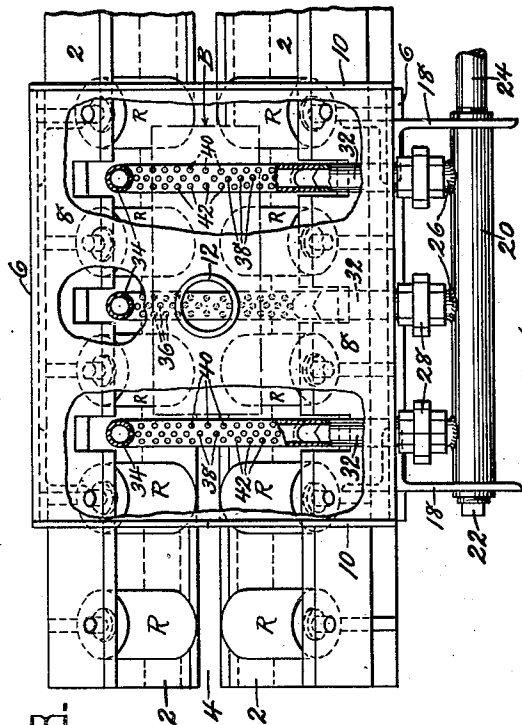
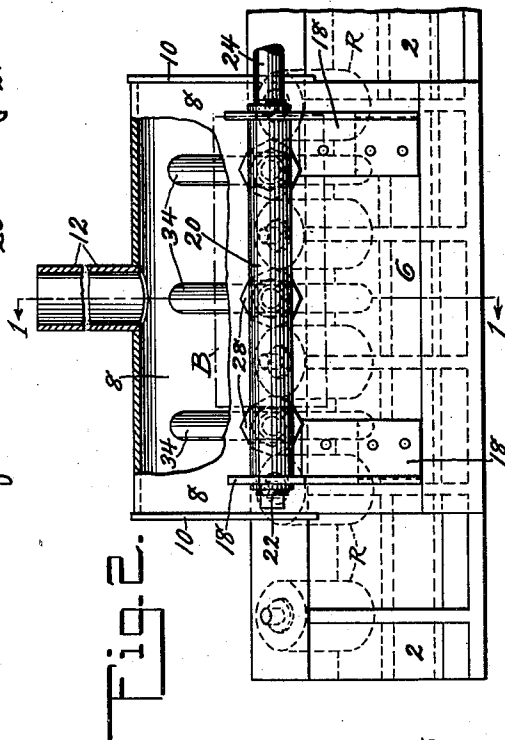
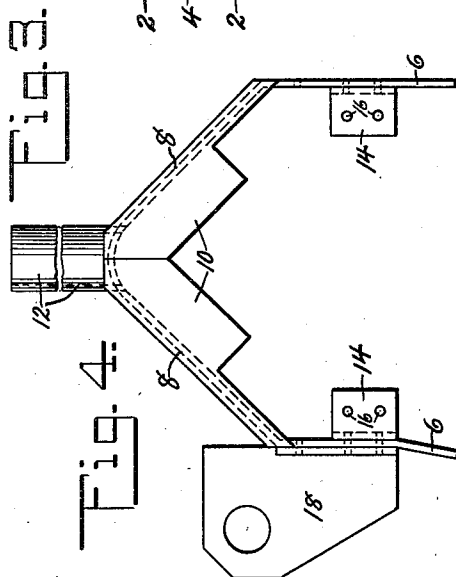
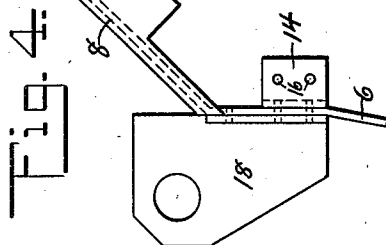
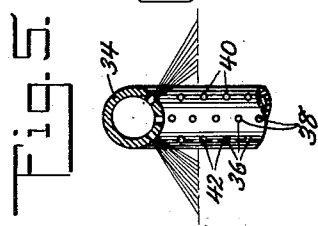
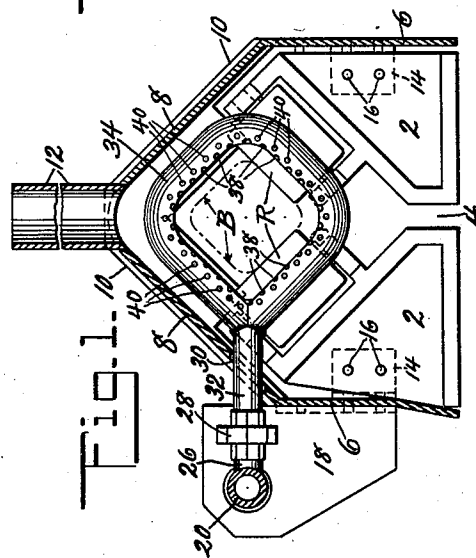
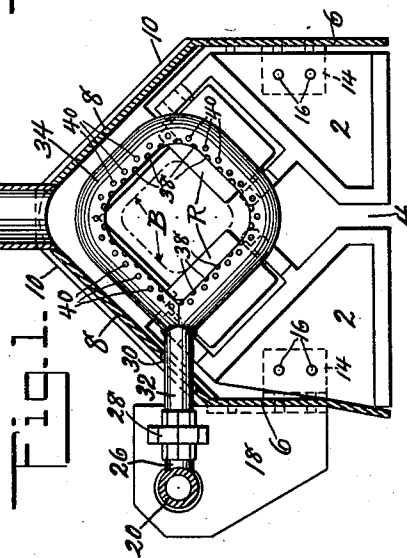
Feb. 5, 1946.

M. S. EVANS ET AL

2,394,514

PROCESS AND APPARATUS FOR SCALING HOT METAL OBJECTS

Filed Dec. 3, 1942



INVENTORS
Morris S. Evans
Emil C. Stolberg

BY *Donald H. Rich* ATTORNEY

UNITED STATES PATENT OFFICE

2,394,514

PROCESS AND APPARATUS FOR SCALING
HOT METAL OBJECTS

Morris S. Evans, Buffalo, N. Y., and Emil C. Stolberg, Glen Ridge, N. J., assignors to American Car and Foundry Company, New York, N. Y., a corporation of New Jersey

Application December 3, 1942, Serial No. 467,694

3 Claims. (Cl. 29—81)

This invention relates to the process and apparatus for removing scale from hot metal objects and particularly from billets, blooms and rods or bars. In the past various mechanical devices such as vibrators, scrapers, etc., have been used to remove scale from hot metal objects being worked but such devices were not fully satisfactory and seldom could rapidly remove the scale from all parts of the object. The use of air jets has also been tried but these can remove only the very loose scale and can in no way touch the scale that adheres quite firmly to the object. In some portions, particularly deep draws and shell making, it is absolutely necessary that the scale be almost completely removed from the hot blank before the drawing, piercing or pressing operation. It is an object, therefore, of the present invention to provide an apparatus and a process for completely removing the scale from all sides of the blank prior to a pressing, drawing or piercing operation.

A further object of the invention is the provision of a hot metal descaling apparatus utilizing high pressure water jets so directed as to cause rapid shrinkage of the scale and a lifting of the scale from the hot metal blank.

A still further object of the invention is the provision of an apparatus using high pressure water jets projected toward the hot metal blank in a plurality of directions in order that the scale may be cracked and lifted from the blank.

These and other objects of the invention will be apparent to persons skilled in the art from a study of the following description and accompanying drawing, in which:

Figure 1 is a sectional view of the apparatus and taken substantially on line I—I of Fig. 2;

Fig. 2 is a side view of the apparatus with parts broken away to better disclose the construction;

Fig. 3 is a plan view of the apparatus with some parts broken away and others in section to better disclose the construction;

Fig. 4 is an end view of the hood or housing, and

Fig. 5 is an enlarged detail view of a portion of one of the descaling pipes.

Referring now to the drawing in detail it will be seen that the hot metal object, in this case a short billet B indicated by line and dash, is moved through the descaling apparatus upon rollers R. The rollers as shown are inclined at an angle of 45 degrees and have their axles mounted in bearings carried by brackets 2, thus the rollers enclose an angle of 90 degrees permitting the billet to be supported and centered by the rollers for movement through the apparatus. The brackets sup-

porting the rollers are spaced apart to provide a space 4 through which the scale from the billet may be washed. The brackets and rollers preferably form a part of the conveying system between the furnace and the machine which will operate on the hot billet or blank.

As clearly shown, the descaling apparatus consists of a hood having substantially vertical sides 6 merging into upwardly inclined top portions 8 which meet substantially directly above the opening 4 between the roller supporting brackets. As shown, the hood is preferably made of a single piece of metal bent to the proper contour but may be made of a plurality of pieces if so desired. In order to stiffen the housing and more fully prevent the escape of spray end plates 10 are welded or otherwise attached to the housing and cut to a contour permitting attachment to the brackets and passage of the hot metal blank. Steam formed by contact of the water jets with the hot metal blank can escape from the housing at the bottom and ends and at the top through a short pipe or stack 12. The sides of the housing have attached thereto on their inner sides angle clips 14 by means of which the housing can be riveted or otherwise secured as at 16 to the roller supporting brackets previously referred to. To one side of the housing, angle shaped plates 18 are attached and these plates are provided with openings to receive a pipe or manifold 20. This pipe or manifold is plugged at one end as at 22 for clean out purposes and at the other end is connected to a heavy pipe 24 which in turn is connected to a high pressure water source. The manifold 20 has welded or otherwise attached thereto short nipples 26 and unions 28. Directly opposite each nipple and union an opening 30 is provided in the housing and these openings will permit the passage of pipes 32. The inner ends of pipes 32 have welded or otherwise secured thereto pipes 34 conforming in general to the cross sectional outline of the hot metal blank which is to be descaled. In the present instance, since the blank is a short section of a billet, the pipes 34 are bent to define a hollow square. As clearly shown in the figures, and particularly Fig. 5, the inner portions of the pipes 34 are provided with a plurality of rows of holes 36, one row 38 is arranged substantially in the plane of the pipe loop, while other rows 40 and 42 are arranged on either side thereof and directed at predetermined diverging angles with respect to the plane of the loop. In other words, the water or other fluid issuing from the holes 36 of each pipe 34 will form curtains defining, in the present case, two pyramids having a common base and

with the vertices directed away from each other and located substantially on the center line of the hot metal blank. That is, the common base of the pyramids will be defined by the curtain formed by the jets issuing from holes 38, while the four sides of one pyramid will be defined by the jets issuing from holes 40 and the four sides of the other pyramid by the jets issuing from holes 42. Considering each pipe loop separately, it will be seen that as the billet approaches the loop the approaching end will be subjected first to the concentrated jets issuing from holes 38 of row 40. As the billet progresses the jets together with the billet end will define a series of truncated pyramids of decreasing heights. In other words, the jets will in effect move outwardly from the center of the billet toward the edges while being directed at a constant angle to the billet end. As the height of the truncated pyramid approaches and becomes zero the curtain formed by jets issuing from holes 38 of row 38 will wipe directly across the end of the billet. In the meantime the billet end will have moved out from contact with the jets of row 40 but the sides will then be subjected to these jets directed at a predetermined angle toward the rear of the billet as it progresses through the apparatus. Then as the billet progresses the sides will be subjected to the jets of row 38 directed perpendicular to the sides. Immediately following this the jets of row 42 will strike the sides of the billet and, as clearly shown, these jets are directed at a predetermined angle toward the sides of the billet and in the direction of travel of the billet, assuming, of course, that the billet is traveling from the right toward the left of the figures as shown. As the billet starts to leave the zone of one loop 34, the rear end will first be subjected to the wiping curtain formed by the jets of row 38, followed by the angular action of the jets of row 42 as they converge toward the center of the billet during its progress past the apparatus.

It will thus be seen that each end of the billet must move through a pyramid defined by high pressure jets, thereby subjecting every portion of the ends to a plurality of jets acting in a plurality of directions. Each side of the billet is likewise subjected to a plurality of jets acting in a plurality of directions, thus it becomes almost impossible for any particle of scale to be so attached to the billet surface as to prevent its being lifted from the surface by one of the angular jets; that is, a particle of scale might have its forward edge tight and jets from rows 40 and 38 might not be capable of lifting it but the jets from row 42 could readily lift the particle from the billet. In actual practice, billets at approximately 2300 degrees Fahrenheit were passed through the apparatus with the jets formed by water under approxi-

mately 1400 lbs. per square inch pressure. High velocity water jets acting in their multi-angular directions, coupled with the rapid shrinkage of the billet surface, effectively remove all scale from the sides and ends of the billet or hot metal blank. Any scale that might be tight on all edges to ordinary descaling devices would be torn loose due to the violent surface shrinkage and flushing action of the multi-direction high pressure jets. In other words, the jets serve the double function of chilling the billet surface to crack scale and lift it from the parent metal. Furthermore, the chilling and flushing action is aided by the explosive action of steam generated through the forcing of water particles under the scale at extremely high velocities. As shown in the present instance, the billet moves past three sets of pipes but this number is purely illustrative as is also the example of temperatures and fluid pressures. It is to be understood that various modifications and rearrangements of parts other than those shown and described may be made and all such modifications and rearrangements of parts are contemplated as will fall within the scope of the appended claims defining our invention.

What is claimed is:

1. A process for removing scale from hot metal blanks, consisting in establishing curtains formed by high velocity fluid jets directed to inclose opposed pyramidal areas having a common base, and rapidly passing the hot metal blanks through said areas whereby the scale and metal surface only is chilled and subjected to the scouring action of the high velocity jets.

2. A process for removing scale from a hot metal blank, consisting in establishing a plurality of high velocity fluid jets directed at a plurality of angles to each surface of the blank and in the direction of travel of the hot metal blank and rapidly passing the hot metal blank through the jets whereby the scale is chilled and lifted from the metal by the fluid jets.

3. Apparatus for removing scale from a hot metal blank, consisting of conveyer means for the blank, a hood inclosing part of the conveyer, pipes within the hood and conforming approximately to the cross-sectional contour of the blank, means supplying high pressure fluid to said pipes, and holes formed in said pipes and directed toward each surface of the blank as it moves through the hood, said holes being so arranged as to direct high velocity jets of fluid inclosing opposed pyramidal areas having a common base and vertices located substantially on the longitudinal center line of the blank.

MORRIS S. EVANS.
EMIL C. STOLBERG.