Sept. 4, 1956 B. BANNISTER 2,761,204

METHOD OF MAKING BARS

Filed Feb. 12, 1951

FIG. 2.

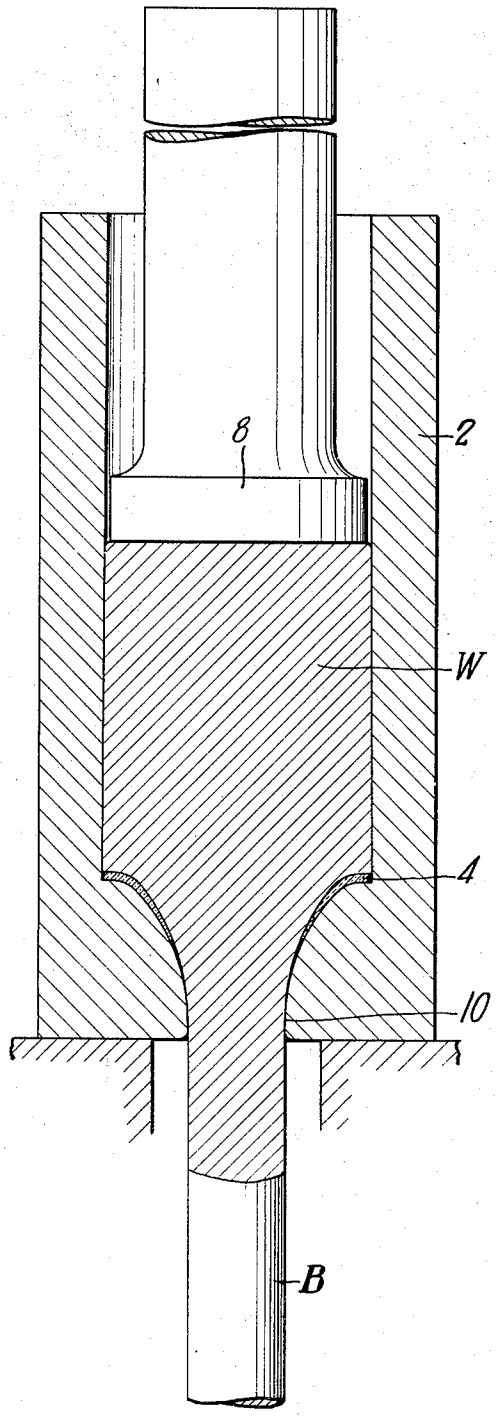
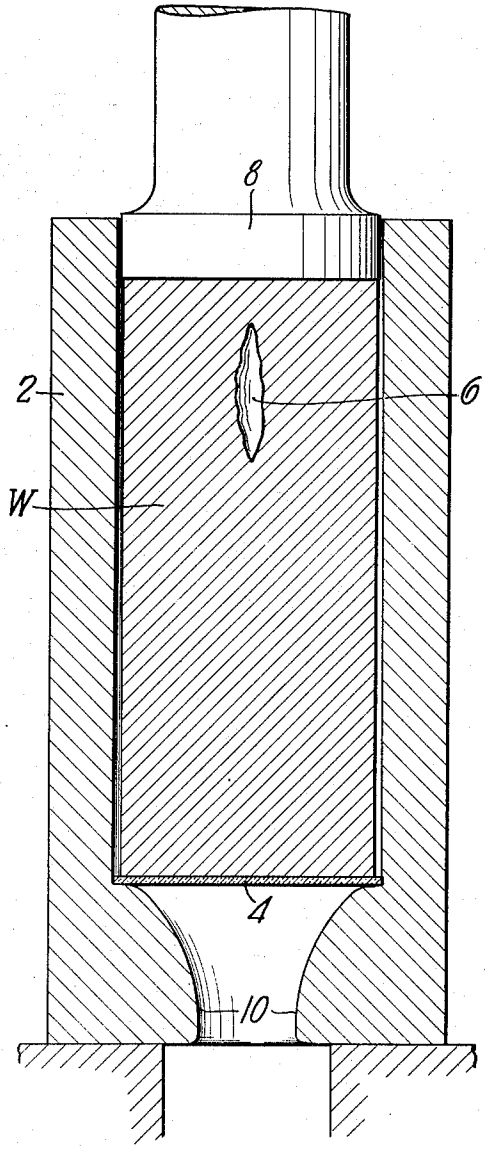


FIG. 1.



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United States Patent Office

2,761,204

Patented Sept. 4, 1956

2,761,204

METHOD OF MAKING BARS

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Application February 12, 1951, Serial No. 210,585

3 Claims. (Cl. 29—424)

This invention relates to a method of making bars and more particularly for making round bars or billets which are to be further processed into seamless tubes. The conventional method used to produce these seamless bars or billets is to cast rectangular ingots which are rolled into square blooms on a blooming mill. The square blooms are reduced to a round billet in a bar mill. The rolled bars are cut into the desired lengths, cooled and subjected to a skinning or peeling operation to remove surface defects. The bars are then reheated, pierced and rolled into seamless tubes in accordance with the usual practice. This method of making round bars is expensive and in addition the bars have surface defects caused by rolling rectangular ingots into square blooms and then to round bars. A rectangular ingot contains more surface defects than a cylindrical ingot but it is not economical to use cylindrical ingots in the conventional method because a round section is not suitable for rolling between cylindrical rolls in a blooming mill. Also in the conventional method a relatively large amount of scrap is produced because a considerable portion of the ingot containing the shrinkage void is not healed to solid metal and must be cropped off.

It is common practice to cast small ingots, allow them to grow cold, reheat to extrusion temperature, and extrude to the desired form. This practice is feasible because in such small castings inherent defects are of a low magnitude and the economics of handling such castings in any other manner are prohibitive. However, when a plain top ingot of commercial size is allowed to cool from a liquid to a low temperature an extensive shrinkage cavity is formed. The magnitude of this cavity or "pipe" is a direct function of temperature drop from the liquid state and the volume of metal undergoing this transition. Hot tops are used to minimize the extent of the shrinkage cavity in the ingot, but this is an added expense.

It is an object of my invention to provide a method of making bars direct from a commercial size cast round ingot.

Another object is to provide such a method which produces a better bar at less cost.

Still another object is to provide such a method in which a bar is made directly from the ingot as cast without any substantial loss of heat.

A further object is to provide such a method which utilizes a greater percentage of the ingot as usable bar.

A still further object is to minimize the phenomena termed "segregation" which is the separation of the low melting point inclusions in the casting from the base metal. This is accomplished by keeping the voids in the ingot as small as possible and applying the true compression and mixing effect of extrusion to the ingot.

These and other objects will be more apparent after referring to the following specification and attached drawings, in which:

Figure 1 is a schematic sectional view showing an ingot in an extrusion press prior to being extruded; and

Figure 2 is a view similar to Figure 1 showing the ingot partly extruded.

In carrying out my method an ingot W, preferably round, of steel or other metal is cast in an ingot mold. As soon as the ingot has been cast the top thereof is sealed by playing a stream of water on the top thereof to form a cap or crust which prevents air from entering as the shrinkage cavity or pipe develops. The ingot is preferably 26 inches in diameter by 6 feet in length and has approximately ⅛ inch taper per foot of length. After the top of the ingot is sealed it is stripped while very hot and placed in the conventional soaking pit to equalize the temperature throughout the ingot. After the temperature has been equalized the ingot is removed from the soaking pit and thoroughly descaled, preferably by impinging a jet of high pressure water progressively over the entire ingot surface. The ingot is then immediately charged into the cylindrical container 2 of an extrusion press. The diameter of the container 2 should be slightly larger than the largest diameter of the ingot W. Before placing the ingot in the container 2 a plate 4 of glass or glass-like material is placed at the bottom of the container 2 and the ingot may be coated with a similar material. The ingot may be wrapped with spun glass cloth in lieu of or in addition to using the glass plate 4. The use of the glass lubricant while not absolutely necessary to my method is very helpful in reducing the required extrusion pressure, increasing the life of the die, and minimizing surface defects. The ingot is placed in the container 2 preferably with the cavity 6 at the top. The ram 8 of the extrusion press is then moved downwardly compressing the ingot and forcing it out of the forward end of the container through a circular die 10 of the desired diameter. Since the ingot is subjected to pure compression during the extruding action and since the shrinkage cavity is sealed against oxidizing gases, the void 6 will be closed during extrusion so that all but a small butt or slug of the metal of the ingot will be utilized. In this way the yield; that is, the ratio of bar metal to ingot metal, is greatly increased over that of the prior practice. The bar B is preferably round and the reduction ratio is preferably approximately 4 to 1 and should not exceed 60 to 1. The product ordinarily varies from a minimum of 5 inches in diameter to a maximum of 13 inches in diameter. At no time during the above series of operations will the metal drop below a suitable extrusion temperature. The extruded section B is then sawed or sheared from the butt remaining in the container and is preferably surface conditioned by passing it longitudinally while very hot through a circular oxyacetylene torch which burns off a small amount of the surface. After this operation the bar is cut into lengths suitable for the seamless mills.

While one embodiment of my invention has been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. The method of reducing the amount of scrap in producing ferrous metal bars from a commercial size round ingot which comprises casting a round ingot having a diameter of at least approximately 26 inches and a length of at least approximately 6 feet, sealing the top of the ingot immediately after teeming, equalizing the temperature throughout the cast ingot, descaling the ingot, the foregoing steps being performed while maintaining the temperature of the ingot at least at the extension temperature, immediately placing the descaled ingot into the container of an extrusion press with the cavity of the ingot adjacent the entry end of the container, and extruding the ingot into a continuous bar while using a glass-like lubricant at the end of the ingot adjacent the die end of the container, said extrusion being carried out by mov-

ing a ram against the entry end of the ingot and forcing the ferrous metal through the die, the extruding reduction rate being between approximately four to one and sixty to one.

2. The method of reducing the amount of scrap in producing ferrous metal bars according to claim 1 in which a plate of glass-like material is placed in the die end of the container prior to placing the ingot therein.

3. The method of reducing the amount of scrap in producing ferrous metal bars according to claim 2 in which the hot extruded bar is surface conditioned by applying an oxyacetylene flame thereto.

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