C. B. KING AND R. A. YOUNG.

METAL BAR.

APPLICATION FILED JULY 30, 1917.

1,307,054.

Patented June 17, 1919.

Fig. 1.

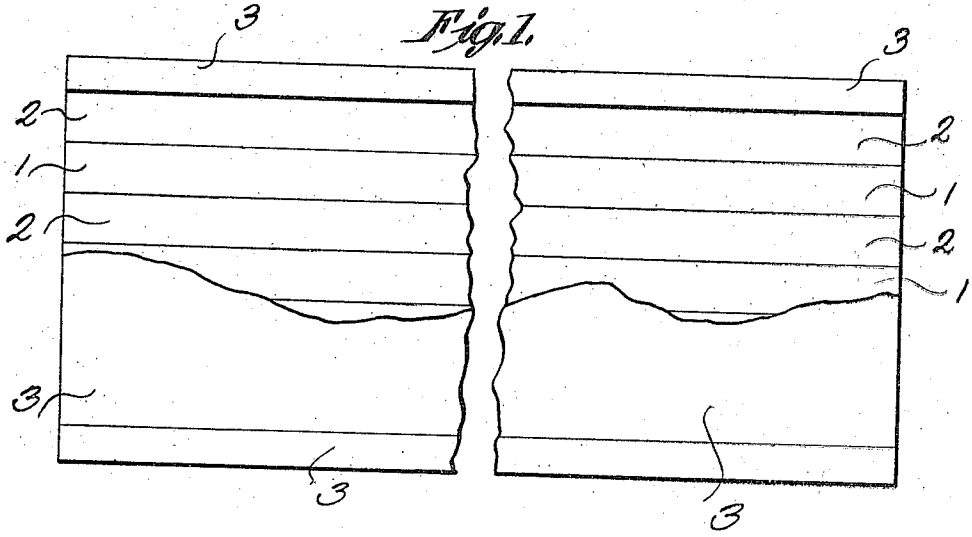


Fig. 2.

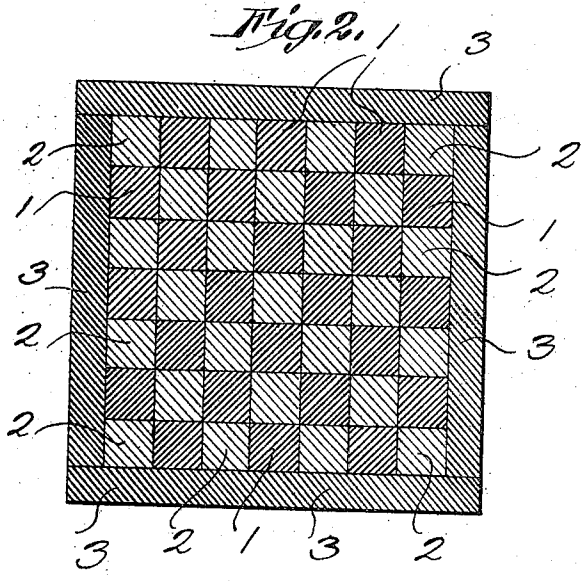
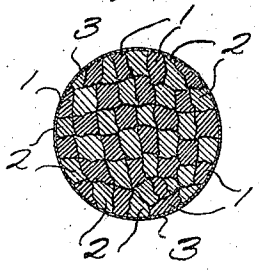


Fig. 3.



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UNITED STATES PATENT OFFICE.

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METAL BAR.

1,307,054. Specification of Letters Patent. Patented June 17, 1919.

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To all whom it may concern:

Be it known that we, CHARLES B. KING and RALPH A. YOUNG, citizens of the United States, residing at Marion, in the county of Marion and State of Ohio, have invented certain new and useful Improvements in Metal Bars, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to metal bars.

The bar of the invention is designed primarily for use in the manufacture of chains for steam shovels and similar apparatus. The service required of a steam shovel chain is probably the most severe of any to which chains can be subjected, because not only is it required to carry a very heavy load, but it is subjected, on the one hand, to very severe strains and jerks which tend to break the chain; and, on the other hand, to severe wear where it passes about the sheaves, or guides, which tends to wear away the metal and reduce the strength of the chain. Metals which are sufficiently tough and fibrous to withstand the severe shocks and strains to which the chains are subjected are soft and wear away rapidly, while metals which are hard enough to effectually resist the wear to which these chains are subjected are of a brittle, crystalline nature and are liable to break under the shock and strain to which the chains are subjected.

The object of the present invention is, therefore, to produce a metal bar from which chain links and the like can be made which will possess the necessary characteristics both to withstand the shock and the strain and to resist the wear to which the chain is subjected.

The bar itself consists of a series of longitudinally extending sections of metals of different kinds, one kind having the necessary characteristics of toughness and fibrosity, and the other having the necessary characteristic of hardness. The sections are so arranged in the bar as to distribute the two kinds of metal with substantial uniformity throughout the cross-sectional area of the bar. To produce a bar of this kind we form a pile of small bars of two kinds of metal, having the desired characteristics, and arrange these bars in the positions in which we desire to have the sections of the finished link bar arranged. The pile is then heated to a uniform welding heat and is worked in such a manner as to cause the several small bars to be welded together into a single integral bar, which finished bar may, for the sake of convenience, be termed the "link bar," although it will be understood that its use is not limited to the manufacture of chain links as the bar thus formed may, of course, be used in the production of articles or mechanical parts of various kinds. It will be further understood that the term "two kinds of metals" refers to metals with different physical characteristics and not necessarily to different metals.

In the accompanying drawings Figure 1 is a side elevation, partly broken away, of a pile of bars ready to go to the reheating furnace; Fig. 2 is a cross-sectional view of such a pile of bars; and Fig. 3 is a cross-sectional view of a finished bar.

In carrying out the invention we may use bars of metal of any suitable kinds, having the necessary characteristics, but we have found that the best results are obtained by using specially prepared bars of metal, as in this way greater uniformity is had in the finished product, and the exact character of the metals employed is known to the chain maker who welds links, thus enabling him to so control the heat and welding operation as to secure a perfect weld. While the tough, fibrous bars of relatively soft metal, which are indicated by the reference numeral 1 in the drawings, may be of any suitable metal, we prefer to utilize, in the formation of these bars, pig iron. Pig irons have different physical and chemical characteristics. One iron will crumble or work easily under heat, and is known as "hot short." Another iron will work well under all heats but is brittle and liable to crystallize when worked cold, and is known as "cold short." By a proper blending of these two kinds of pig iron there is produced a soft, tough, fibrous iron, which is especially well adapted to our purpose. In blending these irons the desired quantities of each kind, which are usually equal quantities, are placed in the puddling furnace and subjected to a uniform heat to cause the whole mass to boil and throw off its impurities. It is then further treated and worked by the puddler to remove the slag and unite the globules of purified iron into a single pasty mass. This mass is then subjected to the action of a "squeezer," which forces the same between a corrugated steel

roll and an eccentric wall to squeeze out the slag and to weld together more firmly the small iron particles, and from which the mass emerges in the form of a "bloom." The bloom is then rolled out into a large flat bar known as a muck bar and these muck bars are cut into lengths, piled one upon the other, reheated and rolled into relatively small square bars, which are usually from $\frac{5}{8}$ inch to 1 inch square, and may be known as pig muck iron bars.

Likewise different metals may be employed for forming the hard bars, which are indicated by the reference numeral 2 on the drawings. We have found, however, that very satisfactory results are had by the use of carefully selected wrought iron scrap and steel. These materials are placed in the puddling furnace, heated and worked until the steel loses its form and becomes like iron, and the whole mass is then treated in substantially the same manner as was the pig iron above described to reduce the same to small square bars of substantially the same size as the pig iron bars, and may be known as scrap muck iron bars.

Pig iron bars and the wrought iron bars are then cut into lengths and formed into piles in which the pig iron and wrought iron bars are intermingled in such a manner as to distribute the two kinds of bars with substantial uniformity throughout the pile. Preferably the small bars of pig iron and of wrought iron are arranged alternately in the horizontal layers and in the vertical tiers. Care is taken to see that the several bars are of substantially uniform length, thus avoiding any break in the continuity of the sections of the finished bar, which would result if one of the small bars was in two or more parts. Preferably pig iron muck bars 3 are placed on two or more sides of the pile, and as shown in Figs. 1 and 2 muck bars are placed on all four sides of the pile. The pile is then placed in a reheating furnace and uniformly heated to a welding temperature, after which it is taken to the rolling mill and rolled to the diameter desired in the finished link bar, this rolling operation serving to weld together thoroughly the several small bars into a single integral link bar. This finished link bar will be made up of a series of longitudinal sections of two kinds of metal which, although they may be distorted in shape by the rolling, will occupy in the finished bar substantially the same relative positions which they occupied in the pile of small bars prior to the rolling operation, thus maintaining the uniform distribution of the two kinds of metal.

The size of the pile of small bars will vary, but in the production of a $1\frac{1}{4}$ inch link bar the pile is made substantially six inches square and is then reduced by rolling to a diameter of $1\frac{1}{4}$ inches. The placing of the pig iron muck bars about the pile of small bars is not an essential part of our method, but it is a desirable feature as these muck bars reduce to a minimum the likelihood of seams running longitudinally along the surface of the finished bar as might otherwise result from the welding of two kinds of metal, and further the pig iron mucks are very easy to weld and for this reason also their use is desirable. In the rolling process the pig iron mucks naturally thin down much more rapidly than do the small bars which are arranged within the same and they are never of the same relative size in the finished bar, and sometimes practically disappear.

It will be obvious that by our invention we have produced a metal bar possessing great tensile strength and well adapted to resist the strains and shocks to which a steam shovel chain is subjected; and which is also well adapted to resist the wear to which such a chain is subjected.

While we have shown and described one form of our metal bar and have described one method by means of which it can be produced we do not wish to be limited to the details of construction as various modifications within the scope of the appended claims will occur to one skilled in the art.

Having now fully described our invention, what we claim as new and desire to secure by Letters Patent, is:—

1. An an article of manufacture an integral bar of wrought metal comprising a plurality of longitudinally extending sections of pig iron muck and of scrap iron muck said sections being so arranged as to distribute the different kinds of metal throughout the cross sectional area of the pile.

2. As an article of manufacture an integral bar of wrought metal comprising a plurality of longitudinally extending sections formed from pig iron and a plurality of longitudinally extending sections formed from a mixture of wrought iron and steel, said sections being so arranged as to distribute the different kinds of metal throughout the cross sectional area of the bar.

In testimony whereof, we affix our signatures hereto.

CHARLES B. KING.
RALPH A. YOUNG.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."