No. 847,551. PATENTED MAR. 19, 1907.

F. E. CANDA.

JAIL BAR AND SIMILAR COMPOSITE METAL OBJECT.

APPLICATION FILED APR. 27 1906.

2 SHEETS—SHEET 1.

Fig. 1.

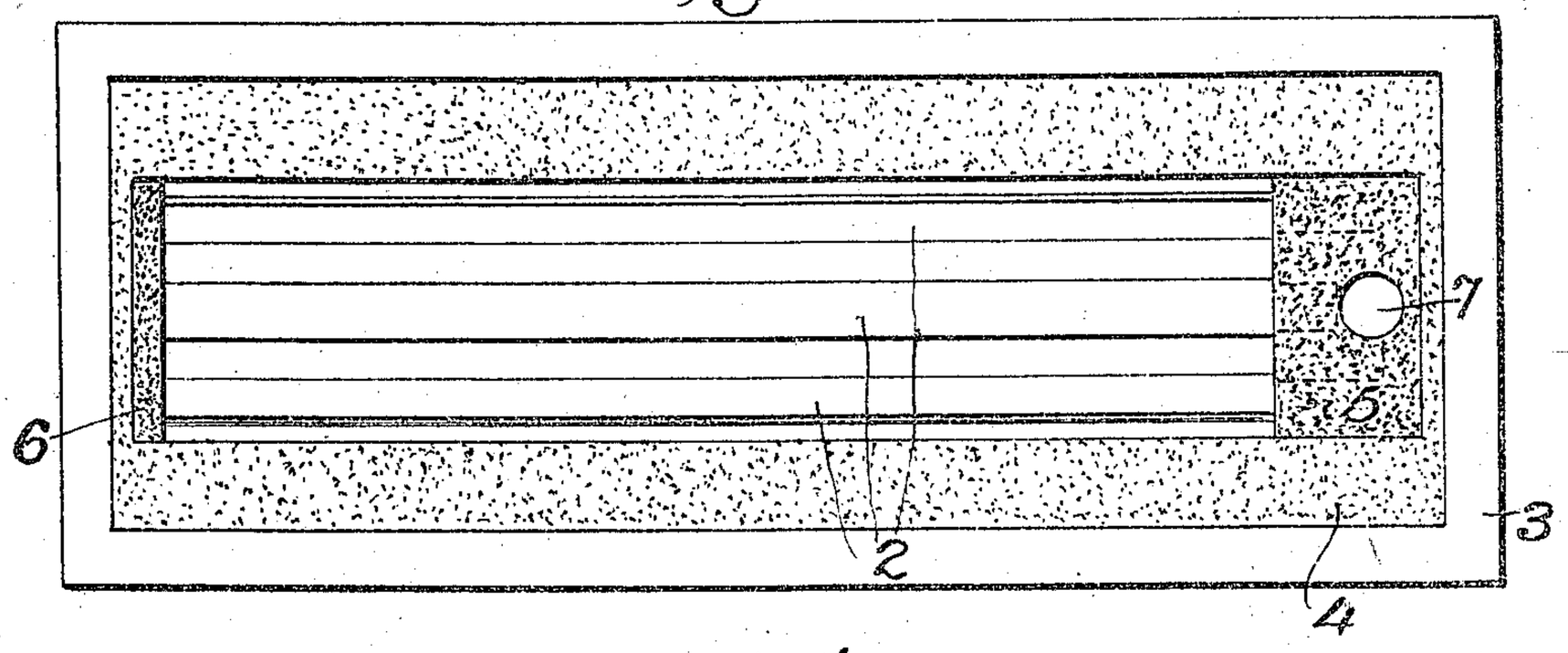


Fig. 2.

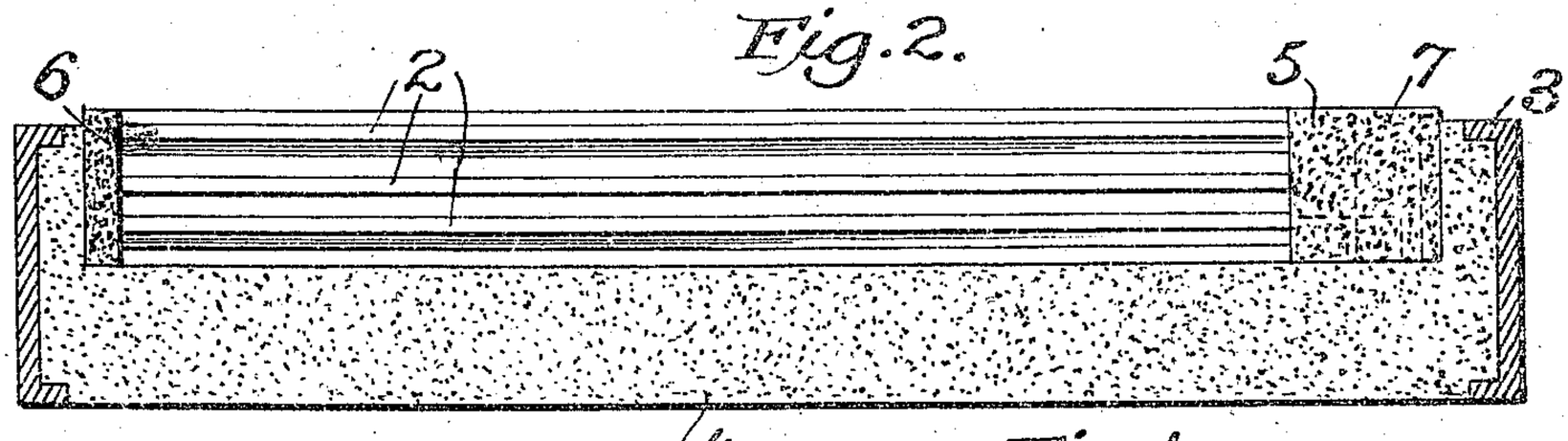


Fig. 3.

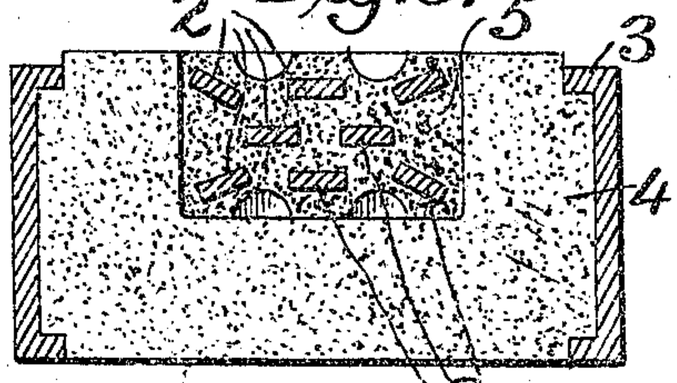
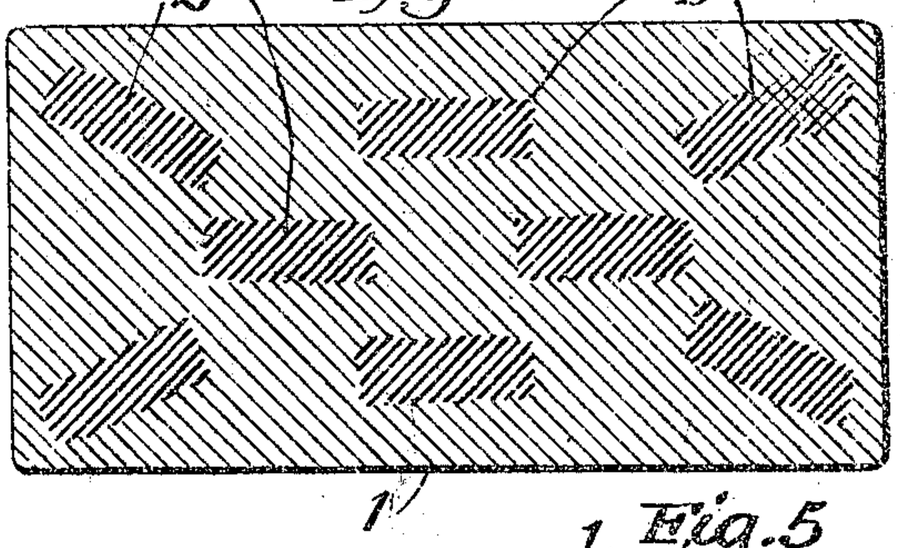


Fig. 4.



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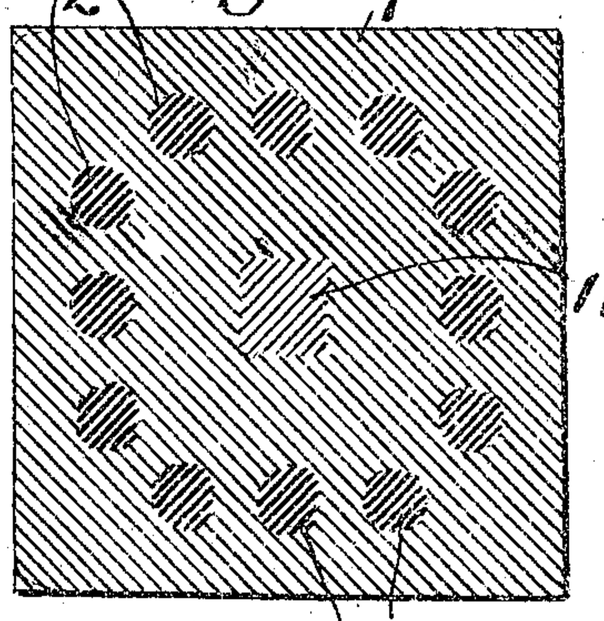

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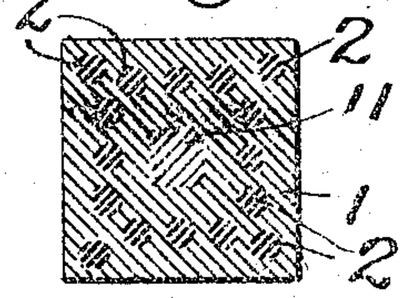
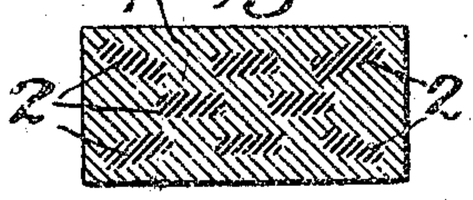


Fig. 5



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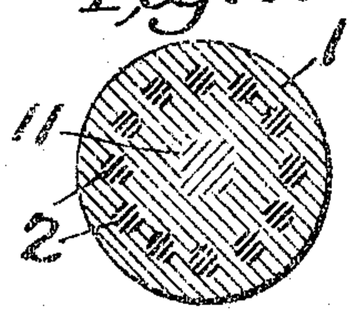

WITNESSES

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JAIL BAR AND SIMILAR COMPOSITE METAL OBJECT.

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2 SHEETS—SHEET 2.

Fig. 9.

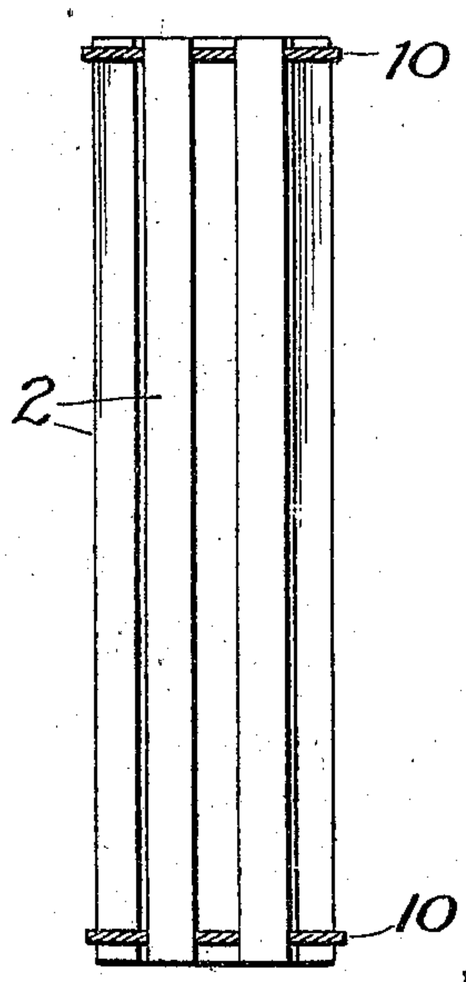


Fig. 10.

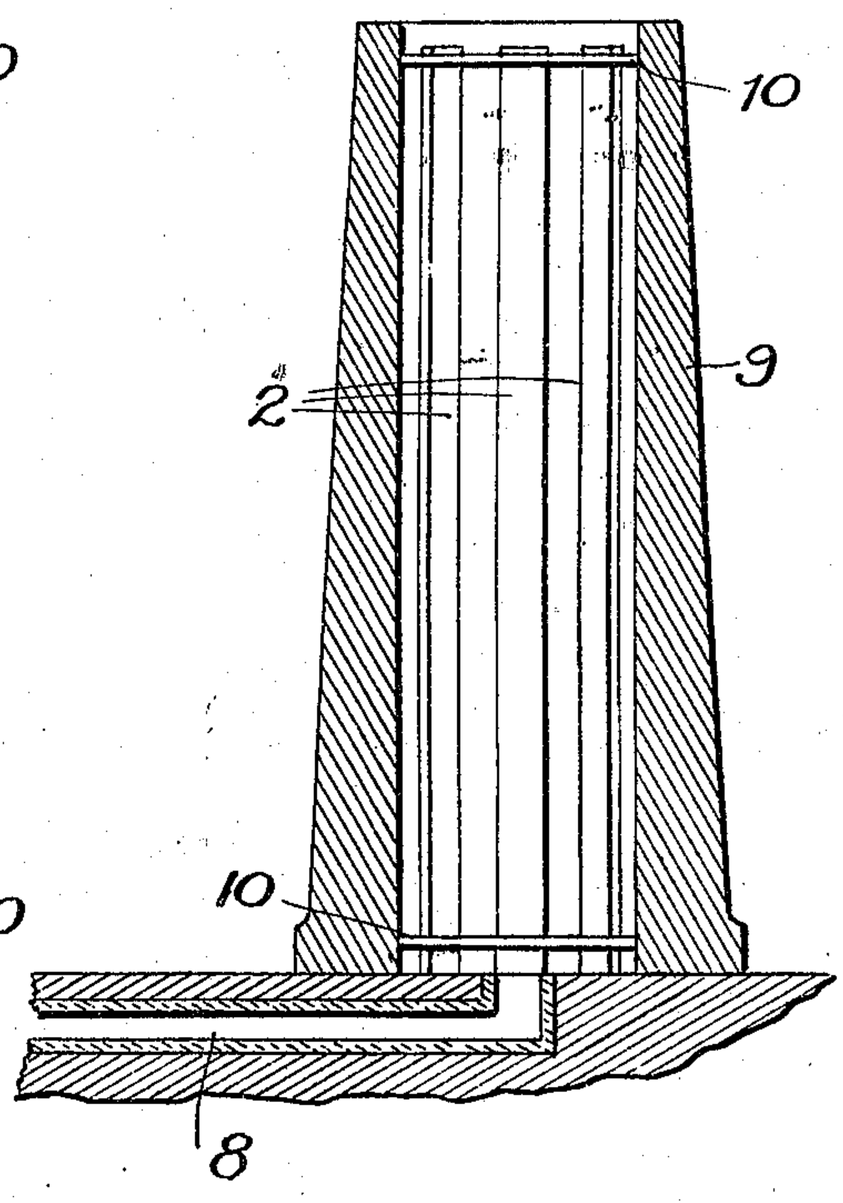


Fig. 11

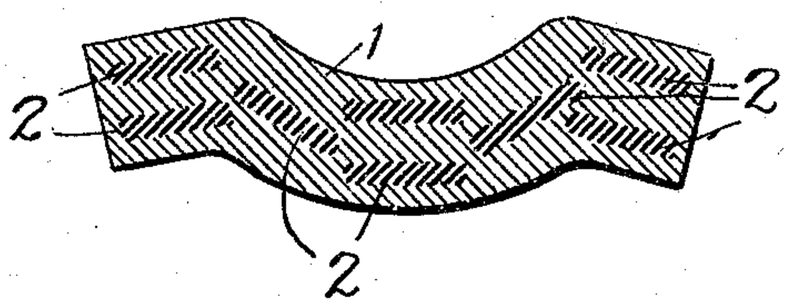
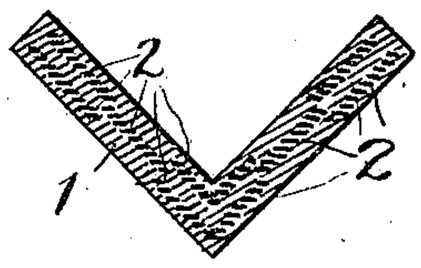


Fig. 12.



WITNESSES

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UNITED STATES PATENT OFFICE.

FERDINAND E. CANDA, OF NEW YORK, N. Y., ASSIGNOR TO CHROME STEEL WORKS, OF CHROME, NEW JERSEY, A CORPORATION OF NEW JERSEY.

JAIL-BAR AND SIMILAR COMPOSITE METAL OBJECT.

No. 847,551. Specification of Letters Patent. Patented March 19, 1907.

Application filed April 27, 1906. Serial No. 314,032.

To all whom it may concern:

Be it known that I, FERDINAND E. CANDA, a citizen of the United States, residing at New York, county of New York, and State of New York, have invented certain new and useful Composite Metal Objects; and I do hereby declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to jail-bars and similar composite steel objects, and consists in a bar comprising a plurality of hard-steel rods or cores, preferably tempered, located at salient points in the bar, surrounded by and usually completely welded into a mass of softer steel forming the body of the bar. Such bars offer many advantages. There being nothing to indicate from the outside the distribution of hard and soft bodies of metal in the interior of the bar and the hard bodies being thoroughly interspersed through the soft metal, it is exceedingly difficult, if not impossible, to bore or cut through the bar, while owing to the fact that in the process of casting the molten soft steel completely envelops each of the hard-steel bars of the resulting ingot, these hard-steel bars being nevertheless of relatively small mass as compared with the mass of the molten metal, it is relatively easy to obtain a perfect welding of the two grades of steel.

My invention consists in a metal bar comprising a plurality of hard-metal rods or cores surrounded by and preferably welded to a mass of softer metal constituting the body of the bar and throughout which said hard-metal cores are distributed.

The objects of my invention are to improve jail-bars and similar composite metal articles, to reduce the difficulty and cost of producing the same, to insure perfect welding of the two kinds of metal, to insure good quality of metal at the center, and to prevent departure of the hard-metal cores from the predetermined relative arrangement during the working of the ingots, and to increase the difficulty of boring or cutting through bars such as described.

I will now proceed to describe my invention with reference to the accompanying drawings, in which certain forms of composite bar embodying my invention are illustrated, also apparatus such as may be used in producing the same.

In the said drawings, Figure 1 shows a top view, and Fig. 2 a vertical longitudinal section, of a horizontal mold such as may be used in forming my improved composite bar. Fig. 3 shows a transverse section showing the hard-steel bars in place in the mold preparatory to pouring. Fig. 4 shows a transverse section of a completed ingot for making flat bar, illustrating the arrangement of the hard cores after the casting; and Fig. 5 shows a similar section of the same ingot after it has been rolled down to the final bar, showing how the hard-steel cores preserve in the final product substantially the same arrangement as in the ingot when first cast. Fig. 6 shows a transverse section of an ingot such as may be used for round bars, and Fig. 7 shows the same after it has been rolled down. Fig. 8 shows a section of a square bar, illustrating the preferred arrangement of hard-steel cores in such bars. Fig. 9 shows a sheaf of rods as used in a vertical mold. Fig. 10 shows a vertical section of a vertical ingot-mold with a sheaf of hard-steel rods therein prepared for casting and illustrates how said rods may be held in place in such a mold during the casting. Fig. 11 shows a transverse section of an ingot for making angles, and Fig. 12 a section of the completed angle-bar.

Referring first to Figs. 5, 7, 8, 11, and 12, showing sections of completed bars, said bars consist of a mass of soft steel 1, through which are interspersed at regular intervals hard-steel rods or cores 2, welded to the mass of soft steel, so as to constitute therewith a unitary mass of metal. I aim to so distribute these hard-steel cores 2 that while their mass relative to that of the soft steel is small the spaces between them are too small to permit the passage between them of a drill of effective size, and a person attempting to drill or cut through them will be practically certain to encounter at least one, and probably more, of the hard-steel bars early in the work. The difficulty of making a tool cut the hard and preferably tempered steel is well recognized. Indeed, if such steel be properly hardened or tempered it is practically an impossibility to cut it.

In the case of square and flat bars, as shown in Figs. 4, 5, and 8, I preferably locate

some of the cores 2 in a geometrical figure or approximation to a geometrical figure near the central portion of the bar and place other cores in the corners of the bar, all of said cores being so spaced that the distance between the several bars is substantially the same and very small. In the case of round bars, as shown in Figs. 6 and 7, I commonly arrange the cores 2 in a circle. By means as hereinafter described I am able to preserve the original relative arrangement of these cores during the working down from the ingot to the finished article. Figs. 1, 2, and 3 illustrate one form of mold which may be used in casting ingots for these bars, the particular form of mold shown being adapted for casting ingots for flat bars, such as shown in Fig. 4.

Numeral 3 designates the ordinary flask, 4 the sand filling thereof, and 5 and 6 sand cores at the ends of the mold-space, said cores having in them sockets for the reception of the ends of the hard-steel rods 2 and core 5 having also runners and gates for the introduction of the molten metal. In practice I assemble a plurality of these molds one upon the other after first placing the rods 2 in place therein, the runners 7 of all the molds in communication, and so pour a whole pile of molds at once. However, this is an unessential detail of the process, adopted merely for convenience. It is obviously possible to pour the molds singly.

Instead of using a horizontal sand mold, as in Figs. 1 and 2, I may use an ordinary metal ingot-mold 9, as shown in Fig. 10, said mold placed upright, as is customary, upon the pouring-table 8. In such case the bars 2 are assembled and held in their proper relative positions by frame-plates 10, which may be simply plates of boiler-iron punched with holes properly arranged to receive the rods 2. In such a case the sheaf of rods for each mold will be assembled by means of their plates 10 before placing them in the mold, and then the entire sheaf will be placed in the mold as a single article. Whatever be the type of mold employed and whatever the arrangement of the rods 2 therein the molten metal when it flows into the mold immediately surrounds all of the rods 2, and because of its high temperature (the melting-point of low carbon or soft steel is higher than that of high carbon or hard steel) and the pressure produced by solidification and contraction in cooling will weld perfectly to the rods 2, welding the entire ingot into a unitary mass. This welding is greatly facilitated by the relatively small mass of the rods 2 as compared with that of the cast metal and by the fact that the molten metal surrounds all parts of the rods 2. After casting the ingot produced (first reheated or submitted to a "soaking" heat, if necessary) is worked between rolls in a press by drawing through a die or in any other suitable or convenient manner to reduce the ingot to final form. This working helps to perfect the welds if by chance any be defective and also condenses the metal, removing all porosity and piping. Because the rods 2 are welded to the soft steel they are bound to extend uniformly with it and to preserve substantially their original relative relation and approximately their original form even in the final product. After working and after such machine-work, if any, as may be required has been done upon the bars they are hardened or tempered in the well-known way and are thereafter substantially proof against the action of tools.

In cases where the ingot contains at the center a large mass of cast metal excessive piping tends to occur unless means be taken to prevent, due to the metal solidifying first at the outside (and this outer solidification is hastened by the relatively cool rods 2 near the outside) and then tearing apart the metal at the center as it solidifies, and if an ingot having large cavities in its center be worked there may be distortion of the rods 2 or change of their relative arrangement. To obviate this, in such cases I introduce in the central portion of the ingot-mold a rod or bar 11, preferably of soft steel or wrought-iron. This bar 11 fills the center of the ingot, insuring a good quality of metal there, and also hastens the solidification of the molten metal near the center of the ingot, thus so reducing the trouble from piping that in practice no trouble is experienced, and the metal in the finished bar is dense throughout, and the bars 2 preserve their original relative arrangement.

I do not claim the process of forming the compound jail-bars or other articles herein described in this case, as such process is claimed in another application for Letters Patent filed February 18, 1907, Serial No. 357,853.

What I claim is—

1. As an article of manufacture, a composite metal object comprising a body of metal of one degree of hardness having interspersed through it, a plurality of cores of metal of a different degree of hardness, each completely surrounded by the first-mentioned metal.

2. As an article of manufacture, a composite steel object comprising a mass of soft steel having interspersed through its interior, a plurality of cores of harder steel each completely surrounded by the soft steel.

3. As an article of manufacture, a composite metal object comprising a body of metal of one degree of hardness having interspersed through it, a plurality of cores of metal of a different degree of hardness, each completely surrounded by the first-mentioned metal and welded thereto.

4. As an article of manufacture, a composite steel object comprising a mass of soft steel having interspersed through its interior, plurality of cores of harder steel each completely surrounded by the soft steel and welded thereto.

5. As an article of manufacture, a composite metal object comprising a body of metal of one degree of hardness having interspersed through it, a plurality of cores of metal of a different degree of hardness and approximately outlining a closed figure including the central portion of said object.

6. As an article of manufacture, a composite steel object comprising a mass of soft steel having interspersed through its interior, a plurality of cores of harder steel and approximately outlining a closed figure including the central portion of said object.

7. As an article of manufacture, a composite metal object comprising a body of metal of one degree of hardness, said body of polygonal section, and having interspersed through it, a plurality of cores of metal of a different degree of hardness together approximately outlining a closed figure including the central portion of said object, and other cores located in the corners outside of the figure so outlined.

8. As an article of manufacture, a composite metal object comprising a soft-steel body of polygonal section, having interspersed through it, a plurality of cores of hard steel together approximately outlining a closed figure including the central portion of said object, and other hard-steel cores located in the corners outside of the figure so outlined.

9. As an article of manufacture, a jail-bar comprising a soft-steel bar having interspersed through its interior, a plurality of cores of harder steel each completely surrounded by the soft steel.

10. As an article of manufacture, a jail-bar comprising a soft-steel bar having interspersed through its interior, a plurality of cores of harder steel each completely surrounded by the soft steel, but placed close together and approximately outlining a closed figure including the central portion of the bar.

11. As an article of manufacture, a jail-bar comprising a soft-steel bar of polygonal section, having interspersed through its interior, a plurality of hard-steel cores each completely surrounded by the softer metal, but placed close together and approximately outlining a closed figure including the central portion of the bar, and other cores in the corners of the bar.

In testimony whereof I affix my signature in the presence of two witnesses.

FERDINAND E. CANDA.

Witnesses:

ALPHONSE KLOH,

H. M. MARBLE.