R. C. BECKER.

COMPOSITE STEEL BAR.

APPLICATION FILED JULY 26, 1910.

1,005,142. Patented Oct. 10, 1911.

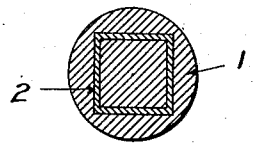

Fig. 1.

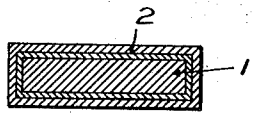

Fig. 2.

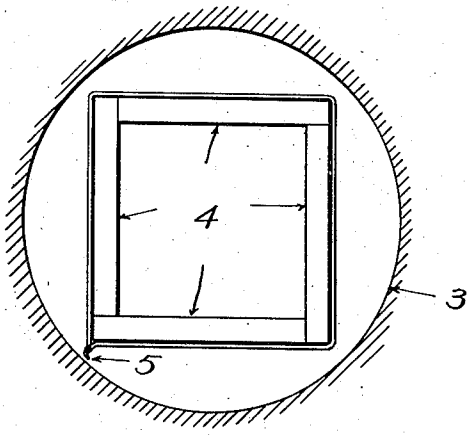

Fig. 4.

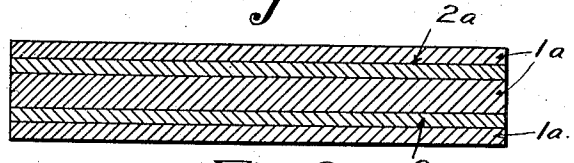

Fig. 3.

WITNESSES

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UNITED STATES PATENT OFFICE.

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COMPOSITE STEEL BAR.

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To all whom it may concern:

Be it known that I, ROBERT C. BECKER, a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Composite Steel Bars, of which the following is a specification.

This invention relates to composite steel bars having a very hard core and a softer body.

The object of the invention is to provide a bar of the character specified which has greater tensile strength than bars of a similar character heretofore made, which is self-hardening and is tool proof in its natural state without special hardening treatment, which can be readily worked under heat without the necessity of annealing prior to working or hardening after being shaped, which requires no straightening after shaping or working, and one in which the temper or hardness cannot be drawn or destroyed.

The bar described is of particular value for gratings of windows, doors, corridors and other places where it is desired to keep persons in, as in the case of jails, prisons or the like or to keep persons out as in the case of bank and deposit vaults and the like.

Generally stated, the invention comprises a composite bar consisting of a body of relatively soft steel of high tensile strength, having embedded therein a core, preferably of rectangular hollow form, composed of high carbon manganese steel which is self-hardening, whose temper cannot be drawn, and having a high tensile strength.

In the accompanying drawing Figure 1 is a cross section through a round bar showing my invention applied thereto; Figs. 2 and 3 are cross sections of flat or rectangular bars also embodying the invention; and Fig. 4 is a sectional plan view illustrating the mold and pile or fagot for casting the ingot from which the round bar is formed.

The body 1 of the bar may be soft steel of any desired composition, such as heretofore used in jail bars and the like. Embedded in this relatively soft body is the core 2, which preferably will be of rectangular form, preferably square in a round body, and in a rectangular bar of the same general cross section as the bar, as shown in Fig. 2; or a flat bar may be made of alternate laminæ or layers of soft steel 1^a and hard steel 2^a, as shown in Fig. 3. This core is formed of an alloy or composition which is self-hardening, has high tensile strength, and from which the temper cannot be drawn. It is a steel high in the carbon and manganese content. I have found that for the best results the carbon content should vary from 1.30 to 1.40, and the manganese content from 13 to 15 per cent. of the whole. These proportions, however, may be varied within considerable limits, and particularly may the manganese content be varied, good results being possible with only 5 per cent. of manganese, and it may be as high as 25 per cent., although the quantity of manganese will necessarily be kept as low as practicable on account of its higher cost. A very considerable percentage of manganese, however, is necessary in order to render the alloy self-hardening and so that its hardness or temper cannot be destroyed.

The phosphorus and sulfur content of the steel will be kept sufficiently low to overcome brittleness, preferably being kept below .10 of one per cent.

The quantity of the total bar formed by such hard alloy or manganese steel may also vary, but preferably about 12½ per cent. of the total weight of the bar will be sufficient. On account of the high cost of the alloy as compared with soft steel, the quantity of such alloy will necessarily be kept as low as possible without sacrificing the efficiency of the bar. For instance, a hollow rectangular shell of 1/16 of an inch thickness is sufficient to stop any drill, saw or other tool known at the present time. Preferably the core is of rectangular form as shown in Figs. 1 and 2, or at least in continuous laminæ as shown in Fig. 3, so as to prevent a small drill from passing through, as would be the case if the core were in the form of separate small rods or wires between which a small drill could be passed to weaken the bar, after which it could be broken.

The bar described can be very conveniently formed by placing in a mold 3 a pile or fagot of rectangular form, formed from plates or bars 4 of the special manganese steel alloy described, which fagot or box pile can be tied together by ordinary wire 5 and placed endwise in the mold, and the soft steel then poured into the latter. The ingot so formed can then be reduced by ordinary rolling to the desired size and shape. When forming flat bars the mold will preferably be of substantially rectangu-

lar cross section, although this is not absolutely necessary.

The alloy or composition of the core is such that it is tool proof in its natural state, that is, as it comes from the rolls without further treatment. It can be readily worked under heat, such as is necessary in forming the tenons or ends of the bars, and other shaping, and these heated portions need not be treated to harden the metal, but the bar when thrown aside and allowed to cool, naturally takes on the desired hardness. Since special hardening is dispensed with, the usual step of straightening the bars after hardening is also dispensed with. Neither is it necessary to anneal the bar prior to forging the tenons, or performing other shaping operations thereon. In fact, the temper of the bar cannot be drawn, as is the case with practically all composite steel bars having a core of ordinary tool steel. The bar also has a much greater tensile strength than prior bars having cores of tool steel, it having been demonstrated that it can be bent while cold to an angle of 180 degrees with a sledge hammer without breaking.

What I claim is:

1. A composite steel bar comprising a body of relatively soft steel having extending longitudinally therein a portion composed of self-hardening non-annealable steel alloy.

2. A composite steel bar comprising a body of relatively soft steel having extending longitudinally therein a portion composed of hard manganese steel having a manganese content such that the steel is self-hardening and non-annealable.

3. A composite steel bar comprising a body of relatively soft steel having extending longitudinally therein a portion composed of hard manganese steel whose carbon content is in excess of one per cent. and whose manganese content is in excess of five per cent.

4. A composite steel bar comprising a body of relatively soft steel having extending longitudinally therein a portion composed of hard manganese steel whose carbon content varies from 1.3 to 1.4 and whose manganese content varies from 13 to 15 per cent.

In testimony whereof, I have hereunto set my hand.

ROBT. C. BECKER.

Witnesses:
F. W. WINTER,
JAS. L. WELDON.