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W. P. COTTRELL

2,184,776

PROCESS OF MANUFACTURING CUTTING TOOLS

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Fig. 1.

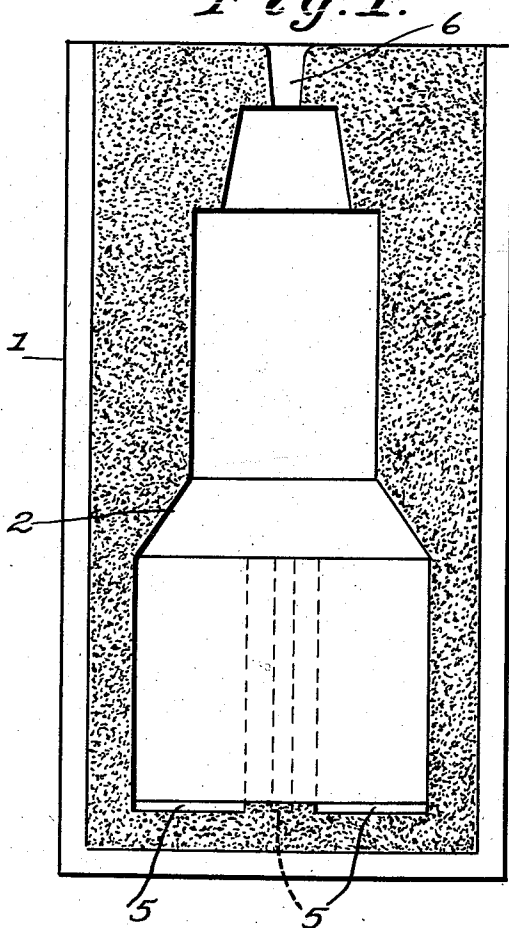


Fig. 2.

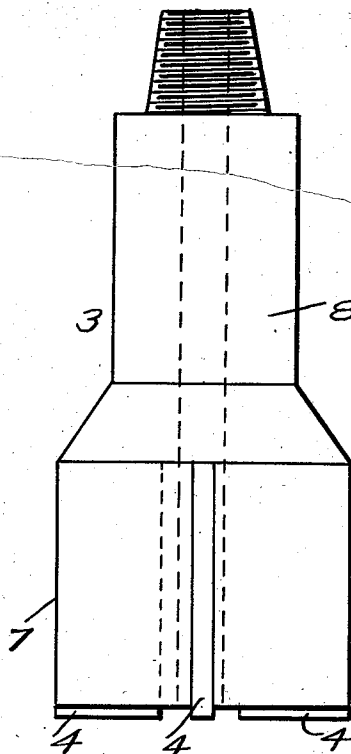


Fig. 4.

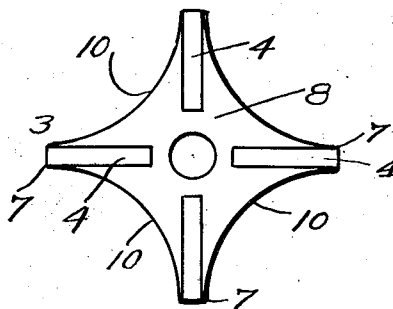


Fig. 3.

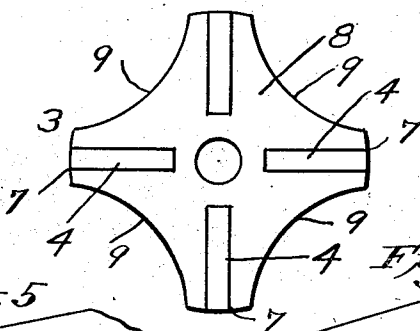
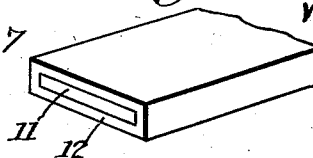
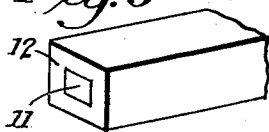


Fig. 6

Fig. 5



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PROCESS OF MANUFACTURING CUTTING TOOLS

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1 Claim. (Cl. 22—203)

This invention relates to a new process of casting a softer metal around a harder metal for the production of certain articles of manufacture, such as cutting tools.

5 The general object of the invention is to provide a novel process of casting a soft metal, such as soft steel, around a hard steel, or hard alloys of steel, or hard alloys of carbides, with or without the use of fluxes, for the manufacture of such articles as oil-well drilling tools and machine tools, the cutting edges of which tools being formed on said hard steel, alloys of steel, or alloys of carbides.

15 Another object is to provide a novel tool cast by my process.

Other objects and advantages will appear hereinafter.

In the annexed drawing forming a part of this specification I have illustrated an apparatus for practicing my process, and an article produced by my process.

Referring to the drawing;

Fig. 1 is an inside face view of one half of a mold flask for casting an oil-well drilling tool in the practice of my process.

Fig. 2 is an elevation of an oil-well drilling tool cast in the mold flask illustrated in Fig. 1, in the practice of my process.

Fig. 3 is a bottom plan view of the tool shown in Fig. 2 with the soft metal body machined out between the hard cutting-edge members.

Fig. 4 is a bottom plan view of the tool shown in Fig. 2 showing the soft metal body of the tool worn between the hard cutting-edge members of the tool and leaving the cutting edges of said cutting members exposed for cutting.

Fig. 5 is a perspective of another product produced by my process, and

Fig. 6 is a perspective of the product shown in Fig. 5 after the same has been rolled or forged into a desirable shape.

In the drawing, in which corresponding parts are designated by the same reference characters in all the figures, 1 designates one half of a mold flask in which is formed one half of the impression 2 of the pattern (not shown) for casting the oil-well drilling tool 3 shown in Figs. 2, 3 and 4.

In casting the tool 3 in the said mold the impression 2 is first made in the mold by the pattern of the tool. The members of the mold flask are then separated and the pattern removed therefrom. Pieces of hard steel, or alloys of steel, or alloys of carbides 4 are then inserted in recesses 5 of the impression 2 at the lower end of said impression. The members of the mold flask

are then put together again and molten soft steel is poured into the mold impression 2 through an opening 6 in the top of the mold, which molten soft steel fills said impression and is cast around and integral with said hard metal pieces 4, thus forming the tool 3. The members of the mold flask are then separated and the tool 3 is removed from the mold. The hard metal pieces 4 are ground or formed with cutting edges 7.

After the tool 3 is cast the outer surface of the soft metal body 8 of the tool is machined between the hard metal pieces 4, as indicated at 9 to form water-circulating channels to soften the earth which is being cut by the cutting edges 7 in drilling a well, as illustrated in Fig. 3 of the drawing. The soft metal body 8 is worn away between the hard metal pieces in the use of the tool, as indicated at 10 in Fig. 4 of the drawing, leaving the cutting edges 7 of said hard metal pieces exposed from said soft metal body 8 for effective cutting operation of said cutting edges.

Each hard piece of steel 4 may be of high carbon or low carbon, or of an alloy which has welded to it tungsten, molybdenum, vanadium, titanium, cobalt, manganese, nickel and carbon, silicon or silicon alloys, or manganese silicon, etc., or any suitable combination of said metals. After the material is welded onto the face of a piece of steel 4 it is cleaned and coated with a flux. When the soft steel is cast in the mold it will be welded to said pieces of hard steel by the flux.

The pieces of hard steel 4 are manufactured into different sizes according to the tools which are to be cast in the mold.

In the manufacture of these inserts 4 I may use soft steel with a hard metal coating, or hard steel with a soft metal coating. These coatings can be put on to the inserts by electric welding so as to assist in holding or combining the hard material with the softer material cast around it. I may heat treat the inserts before using them so as to prepare them for the process. In many cases, if desirable, instead of electric welding the hardened alloy onto the inserts I may use powdered alloys of chrome, tungsten, manganese, titanium, vanadium, molybdenum, silicon and carbon. These alloys may be combined with a flux which will assist them in combining with the steel cast around them and will turn the steel touching them into a high carbide or alloy, leaving the other steel soft or softer according to the class of material used. The fluxes used in my process are fluorspar, silicon, carbon, borax, soda and the like, and may be used singly or combined in various suitable combinations.

While a flux is desirable my process may be practiced without a flux.

5 After casting the softer steel around the harder pieces of steel, with or without a flux, the article produced may be heat treated so that the carbon in the harder pieces of steel or alloys or the coating combined with said alloys will cause them to form into carbides and render them either hard or tough, according to the material used while the softer material around them re-
10 mains unchanged.

While I have disclosed my invention in a desirable form I do limit the same to such form because it may be embodied in other forms which I
15 consider within the scope of my invention.

The alloy materials which I employ in my process, such as tungsten, chrome, molybdenum, va-

nadium, cobalt, titanium, silicon, may also be made in the form of salts, in which form they are readily assimilated in steel. Examples of such salts are as follows: Tungsten would be sodium tungstate; molybdenum would be either a sodium
5 molybdate or a calcium molybdate; chrome could be a sodium chromate, etc.

My casting may be made with harder metal 11 inside the softer metal 12, and then rolled or forged to different shapes than that in which it
10 is cast, as shown in Figs. 5 and 6 of the drawing.

I claim as my invention:

The process comprising coating a piece of metal with a ferro tungsten alloy, and casting other metal to said coated piece of metal.
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