Sept. 6, 1938. E. B. HUDSON 2,128,942

DIRECT CASTING APPARATUS

Filed April 1, 1936 3 Sheets-Sheet 1

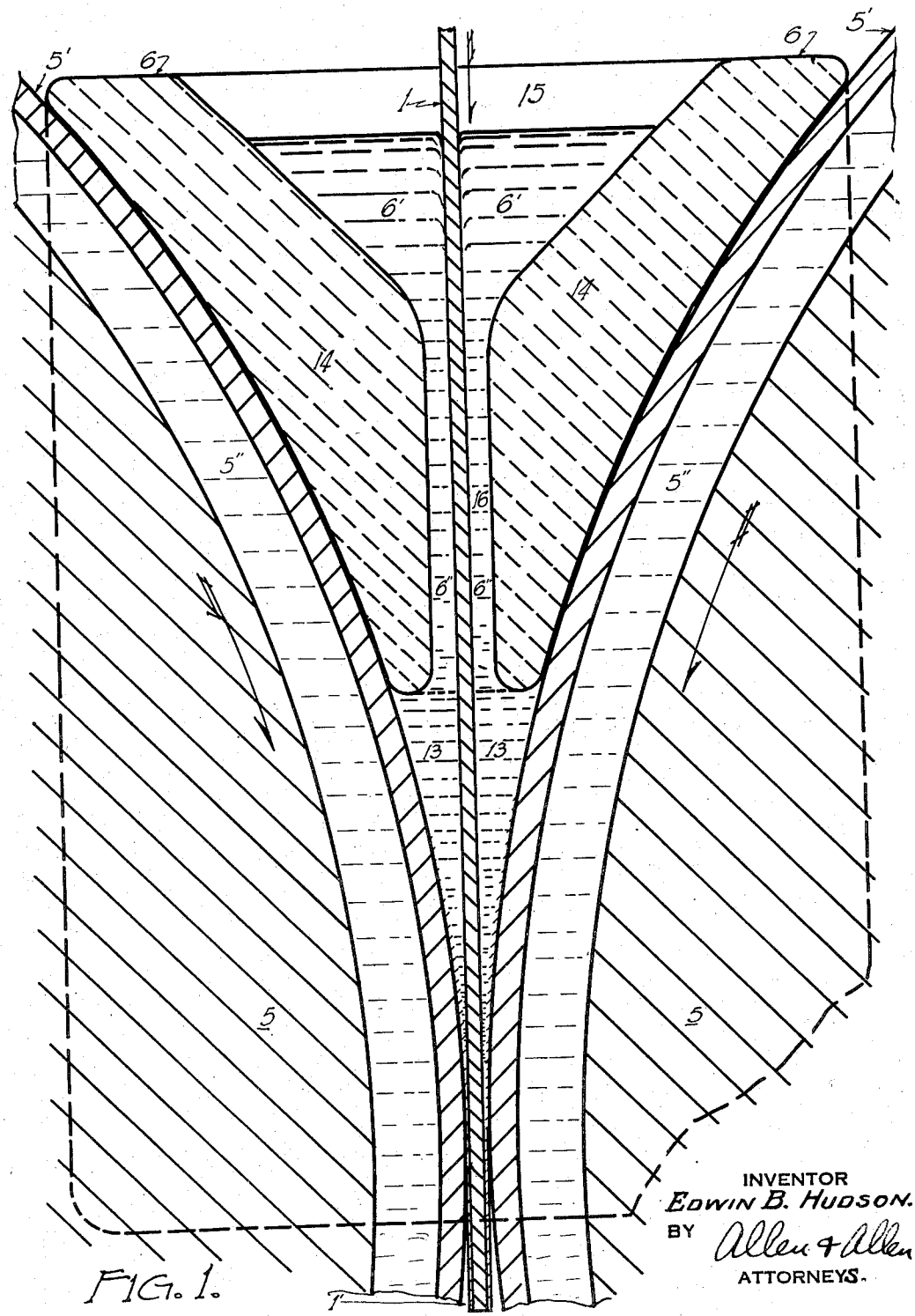


FIG. 1.

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DIRECT CASTING APPARATUS

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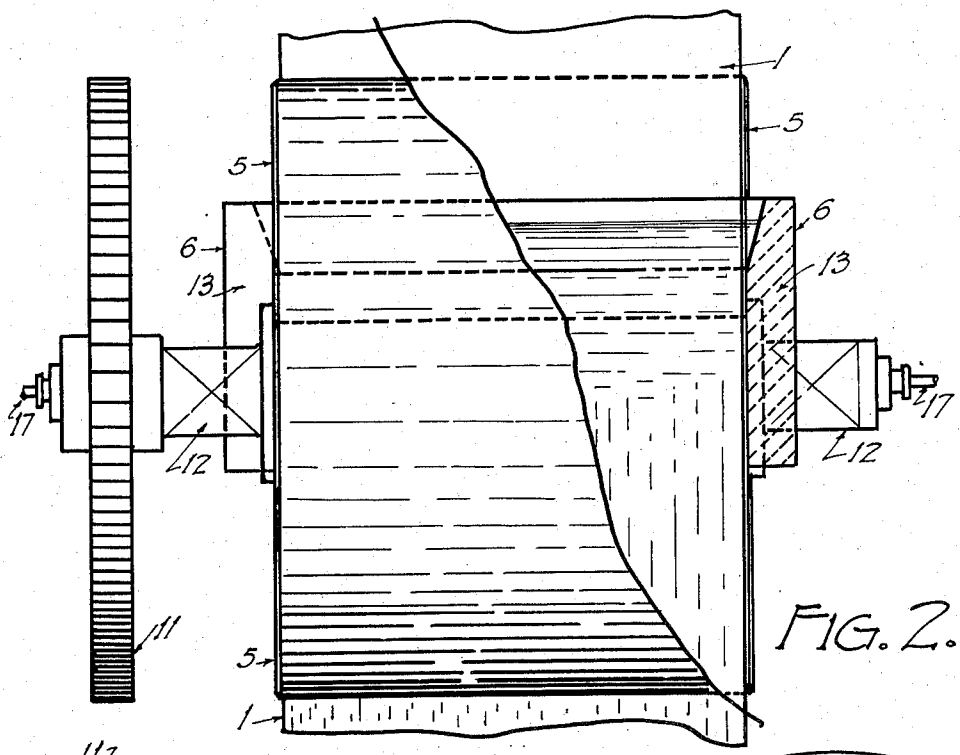


FIG. 2.

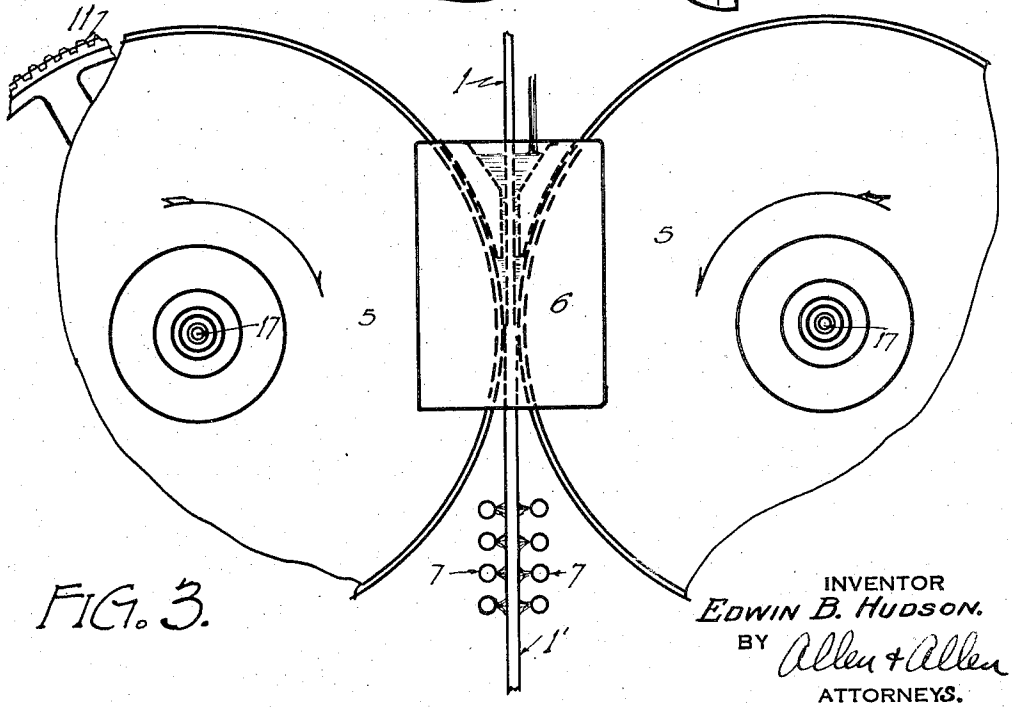


FIG. 3.

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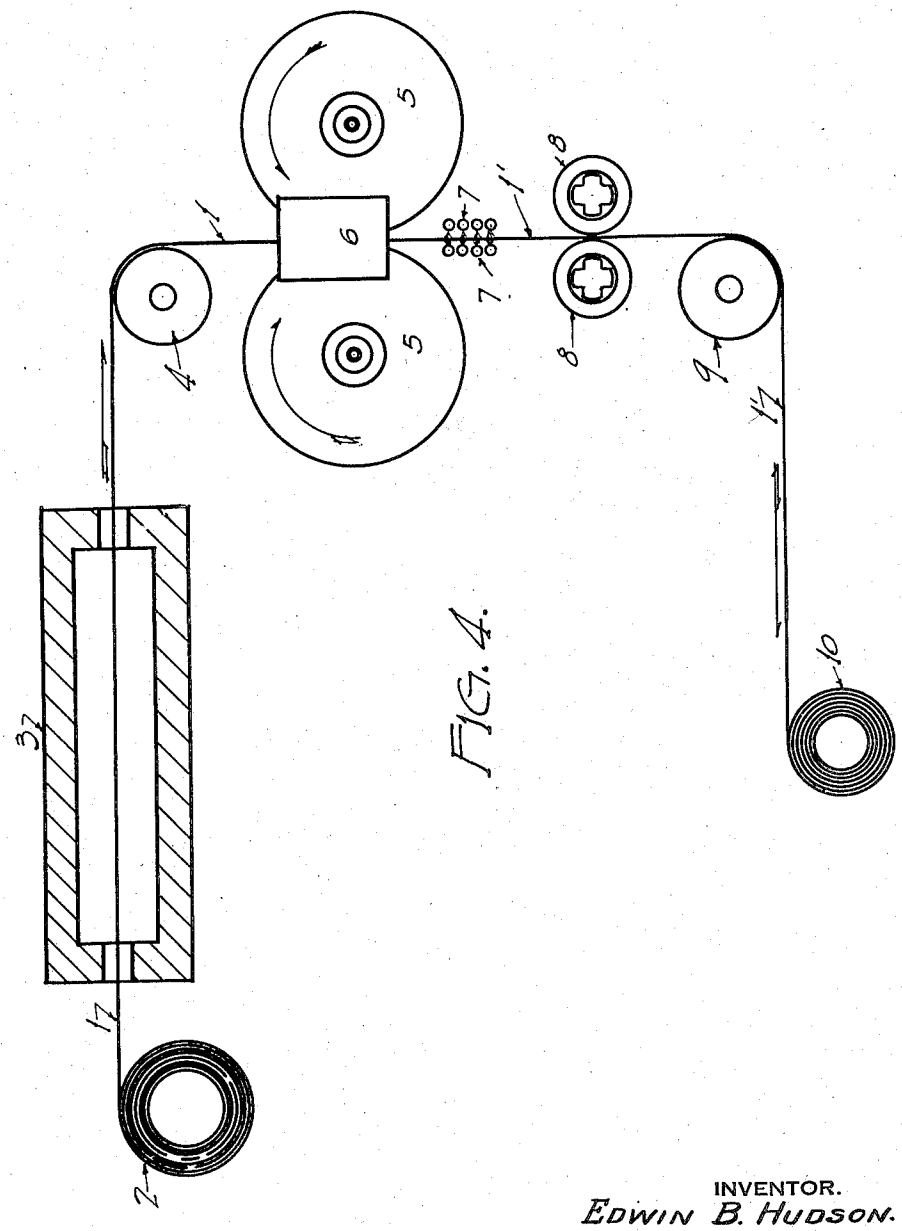


FIG. 4.

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UNITED STATES PATENT OFFICE

2,128,942

DIRECT CASTING APPARATUS

Edwin B. Hudson, Middletown, Ohio, assignor to The American Rolling Mill Company, Middletown, Ohio, a corporation of Ohio

Application April 1, 1936, Serial No. 72,127

2 Claims. (Cl. 22—57.5)

My invention has to do with the direct casting of molten metals into strip like form suitable either for direct fabrication, or for rolling or other use, and in particular to means and a method for casting a metallic composite preferably of the type in which a protective coating of relative thinness is cast upon a body metal of relative thickness. By my means and method it is possible to form a mild steel strip by way of example, and use it as a core to cast directly upon its surfaces a protective metal such as stainless steel, and especially a protective metal of high melting point. Such a bi-metal strip may be relatively thick e. g. 0.1" or thereabouts, so that it is adapted to be further reduced to final gauge by rolling either on a hot or cold reduction mill.

The various objects of my invention will be clear to one skilled in the art upon reading these specifications, and I accomplish these objects by that construction and arrangement of parts of which I shall now describe an exemplary embodiment. Reference is made to the drawings which form a part hereof, and in which:

Figure 1 shows in transverse vertical section the central portion of my casting device.

Fig. 2 shows the casting rolls in vertical elevation with certain parts in section.

Fig. 3 shows an end view of the casting rolls.

Fig. 4 shows diagrammatically one arrangement of apparatus with which my process can be carried out.

In carrying on my process a pre-formed core of the body metal is first pre-heated for purposes which I shall hereinafter set forth, and then is led into a direct casting device where the molten metal with which it is to be coated is brought into association with it. This is done in such a way, however, that for a predetermined interval prior to the contact of the molten metal with the cooling devices of the direct casting machine it is brought into contact and maintained in contact with the core of body metal so as to insure a complete bond by welding.

In my apparatus I provide casting rolls 5—5 preferably though not necessarily, made with an outer shell 5' of a metal such as copper, having high conductivity for heat, the shells 5' being spaced away from the bodies of the rolls 5 by any suitable means so as to leave a space 5'' for a suitable liquid or gaseous cooling medium. The rolls 5 may be rotated at the required surface speed by means of gears 11 which are suitably driven from a source of power, not shown. The rolls 5 are suitably mounted upon journals 12 and may be made adjustable toward or away from each other for the formation of cast articles of varying width. Between the rolls I provide a refractory member indicated generally at 6, and comprising portions 13 extending beyond the edges of the rolls 5 so as to form dams, and portions 14 extending between the rolls and hollowed out centrally to form a chamber or reservoir 15 for molten metal and a somewhat constricted throat 16 as shown.

A strip of the body metal 1 may be led down through the reservoir 15 and the throat 16, into the bite between the rolls 5. The molten metal, fed to the reservoir 15 by any suitable means, comes in contact with the strip 1 in the reservoir and in the throat 16, thereby heating the strip to welding temperature, before the molten metal comes in contact with the cooled surfaces of the rolls 5, as most clearly shown in Figs. 1 and 3. Actual solidification of the coating metal on the surfaces of the strip 1 occurs at or near the bite of the rolls 5 and the distance of the surfaces of these rolls from each other at the bite determines, of course, the thickness of the article as cast.

Cooling media may be fed to the rolls 5 in any suitable way, but I prefer to do it by means of connections 17 through the shafts of these rolls.

In Fig. 4 I have shown the strip 1 being unwound from a roll 2 and being fed into and through a pre-heating furnace 3, where the temperature of the strip may be quite accurately controlled. The strip then passes over the idler roll 4 to change its movement to a vertical one and then through the direct casting machine which I have just described, wherein it receives its coating of metal. Upon the emergence of the coated strip from the casting machine, it may be cooled by being passed between jets or sprays of suitable cooling liquid or gas, which I have indicated at 7. The coated strip is indicated at 1'. In order to give the coating rolled characteristics, the strip 1' may be passed between the rolls 8 of a suitable mill. The strip may then pass under the idler roll 9 and be formed into a coil 10. It will be understood that metal structures formed in this way are suitable for reduction to gauge by hot or cold work or that they may be formed at or near the required gauge by the process I have outlined.

In the casting machine the peripheral speed of the rolls 5 is so controlled with reference to the various temperature characteristics that the composite strip is formed in a smooth, even manner and without tendency to surface defects.

The most difficult problems in connection with the formation of composite metallic structures of the character described have to do with the formation of a good welded bond. These problems are solved in my invention by the nature of the process and by the control means provided, (1) the temperature of the strip can be brought to any desired volume by the preheating furnace 3, (2) the heated strip is brought into contact with the molten metal so as to be elevated in temperature thereby and brought to a welding heat prior to the time the molten metal is solidified by the rolls 5, the refractory member 6 tending to keep the metal away from these rolls during the initial stages of the casting operation. When the combination has been formed and a good bond between the metals assured, the sizing and final solidification occurs quite rapidly in the bite of the rolls 5.

Modifications may be made in my invention without departing from the spirit thereof.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In combination in mechanism for forming metallic articles by operations involving casting, a pair of cooled rolls mounted so as to define a sizing pass, non-metallic, refractory reservoir means for molten metal having external surfaces following the contour of the rolls and in substantial contact therewith, the walls of said refractory reservoir means being of substantial thickness for keeping the molten metal in said reservoir means away from said rolls, and for retaining said metal molten, and means for passing a core strip into and through said molten metal in said reservoir means and for thereafter conducting said core strip and a portion of said molten metal from said reservoir means and through the pass between said rolls.

2. In a direct casting apparatus a pair of cooled rolls located to form a sizing pass, and reservoir means located on and in contact with said rolls above said pass, said reservoir means comprising parts extending in the direction of the axes of said rolls, the outer surfaces of said parts being shaped to follow the contour of said rolls, and the inner surfaces of said parts being shaped to provide a reservoir for molten metal and a passageway from said reservoir into the pass of said rolls, said passageway being of sufficient size to permit the leading of a strip of metal with additional metal from said reservoir through said pass, said parts of said reservoir means comprising non-metallic refractory means of sufficient thickness to isolate said reservoir from the cooling effect of said rolls so as to maintain metal in said reservoir in a molten condition.

EDWIN B. HUDSON.