Sept. 6, 1938. E. B. HUDSON 2,128,943

FORMATION OF ENCASED STRUCTURES BY DIRECT CASTING

Filed April 1, 1936 2 Sheets-Sheet 1

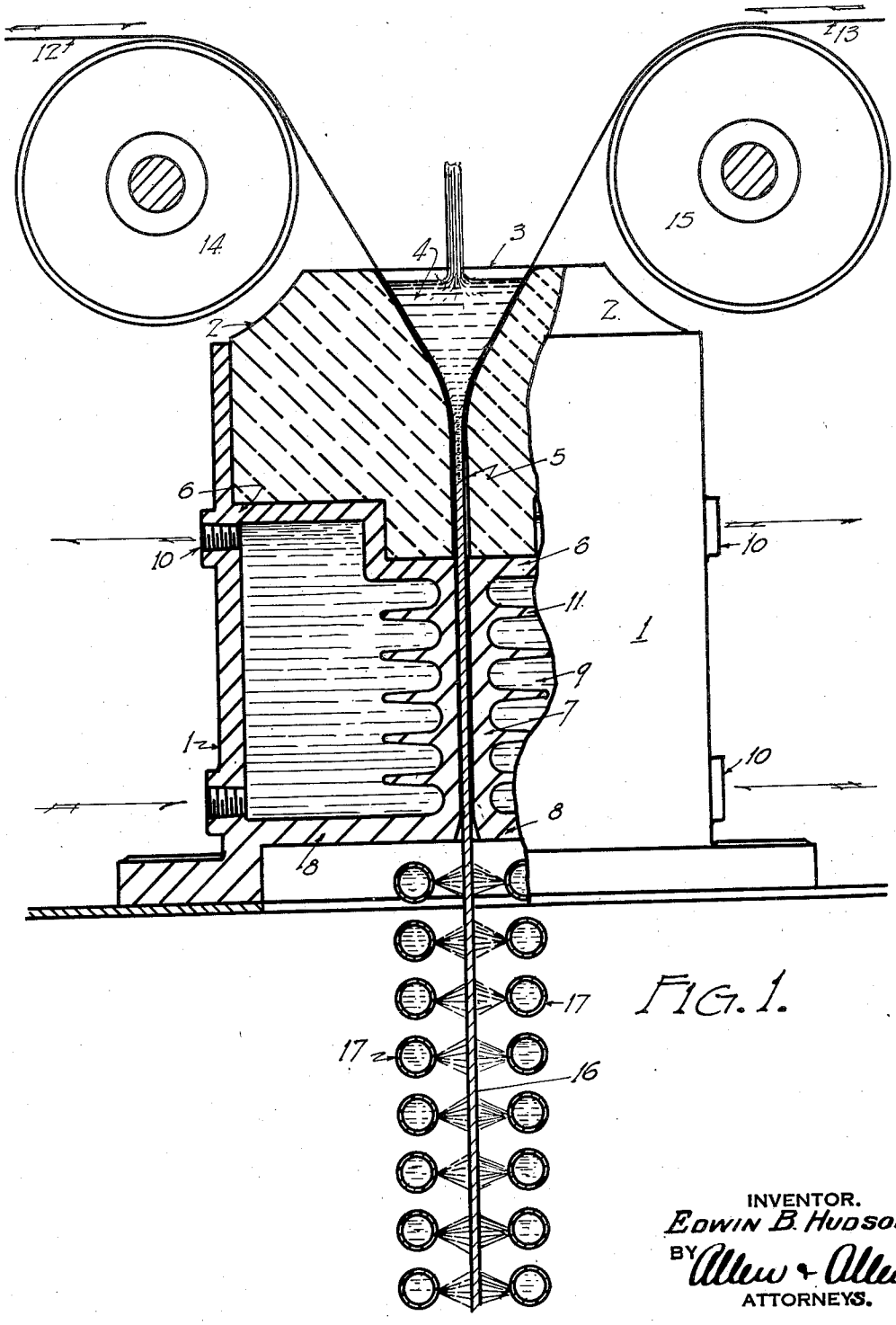


FIG. 1.

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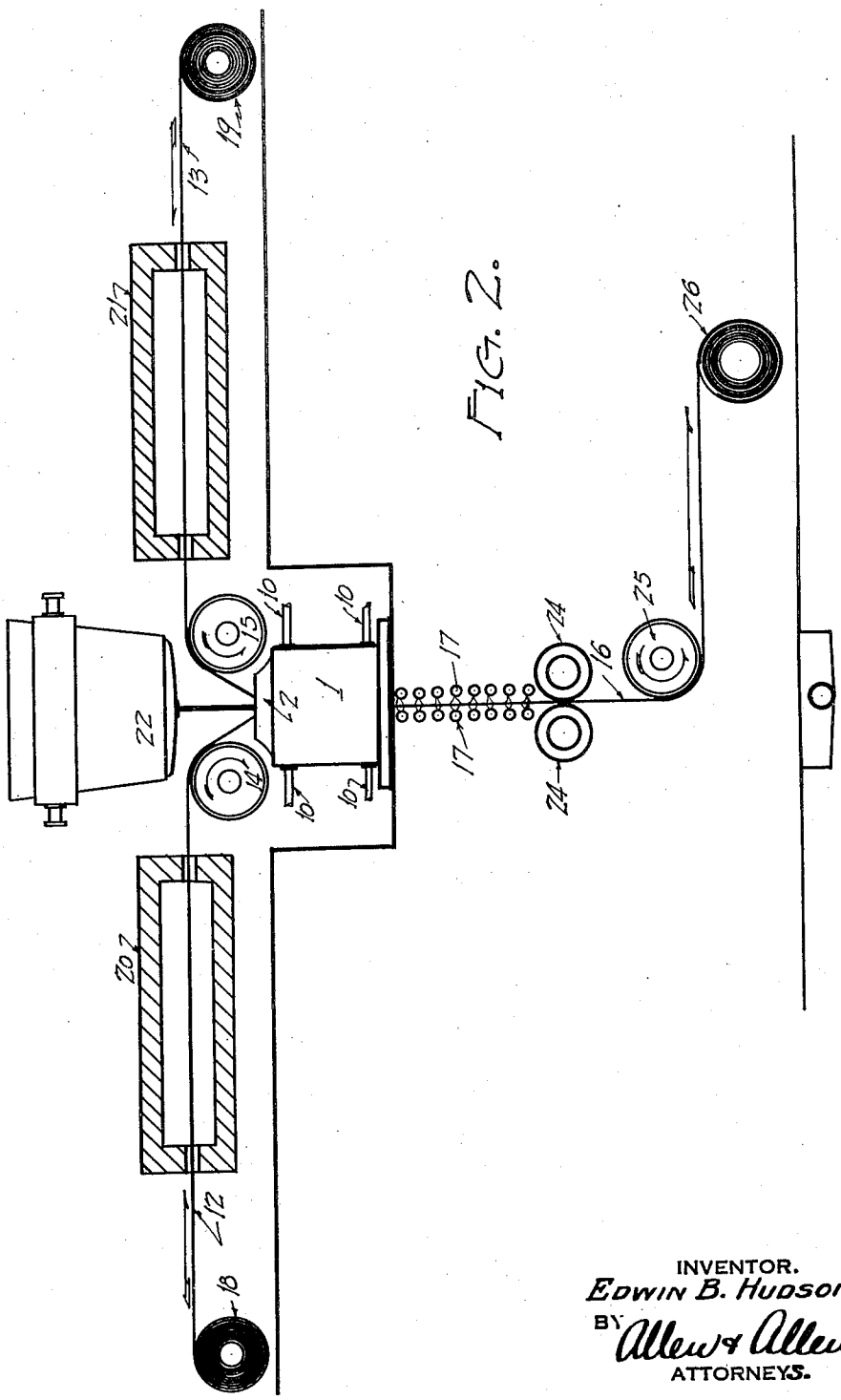


FIG. 2.

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Patented Sept. 6, 1938

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UNITED STATES PATENT OFFICE

2,128,943

FORMATION OF ENCASED STRUCTURES BY DIRECT CASTING

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

Application April 1, 1936, Serial No. 72,128

5 Claims. (Cl. 22—57.2)

My invention relates to the formation of encased metallic structures by direct casting, and while structures of the same metal may be made, yet my invention is of particular utility in the casting of metallic structures comprising different metals. I shall describe my invention in an exemplary embodiment comprising the casting of strip metal structures having a body of iron or mild steel, and facings of some protective metal, such, for example, as stainless steel, copper, or the like. The form of strip material which I shall describe is one either suitable for direct fabrication, or capable of being reduced in gauge either on the conventional hot mill, or the conventional cold mill. The metallic composite, such as the exemplary one to which I have referred, having a core or body of less expensive metal and facings of more expensive metal, is of interest in the arts, particularly in that such a strip for most uses has all of the advantages of the more expensive metal at a small fraction of the cost.

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 certain construction and arrangement of parts, and in that process of which I shall now describe the aforesaid exemplary embodiment. For a clearer understanding of the nature of my invention, reference may now be made to the drawings, wherein:

Figure 1 is an elevational view, with parts in section, of a direct casting device.

Fig. 2 is a schematic and semi-diagrammatic view showing a casting member, together with auxiliary equipment with which my process may be carried out.

Briefly, in the practice of my invention, I cast a molten metal to form the body of the product between two strips of metal which form the facings. The molten body metal is brought into contact with the facing strips in a welding zone, where the molten metal is isolated from cooling means, and where the temperature of the facing strips may quickly be raised by the molten metal to the welding temperature. In my apparatus there is a second zone where the temperature of the metallic combination, formed as I have indicated, is very quickly reduced, and the metal strip accurately sized by suitable cooling means.

A convenient embodiment of my casting device is shown in Fig. 1, and comprises a casing 1. In the upper part of this casing, there is a member 2, preferably of refractory material, and having centrally thereof an orifice of elongated form, which is widened at the top to provide a reservoir space 3 for molten metal 4. Downwardly this orifice is constricted to form a narrow, elongated throat 5, through which the metallic combination may pass as cast. The refractory member 2 is supported by partition members 6, which are integral with the elements 7, forming a constricted sizing and cooling throat. The bottom walls 8 of the housing complete, with the members aforesaid, spaces 9 for cooling fluid, which may be caused to enter and to be withdrawn from the spaces 9, through suitable connections 10 for piping. The cooling walls 7 may, with advantage, be provided with fins 11 to increase the rate of heat transfer.

In the use of this apparatus, two strips, indicated at 12 and 13, may be passed over idler rollers 14 and 15, and caused to enter the space 3 in the refractory member 2, the strips passing downwardly along the outer faces of the orifice, as shown. The molten metal 4 in the reservoir thus comes in contact with these strips while the strips are backed up by the refractory walls of the member 2, so that the heat of the molten metal very quickly raises the temperature of the strips 12 and 13 to the degree required for welding. The strips, and a portion of the body metal derived from the reservoir 3, pass down through the constricted portion 5, and into the throat between the cooling walls 7, where the composite strip is sized and solidified, and emerges as shown at 16. The metallic composite thus formed may be further cooled by directing blasts of cooling fluid against it, as from pipes 17.

In Fig. 2, I have shown the strips 12 and 13 being withdrawn from coils 18 and 19, and passing respectively, through pre-heating furnaces 20 and 21. These furnaces may be employed to raise the temperatures of the strips to that degree necessary for the perfect operation of the apparatus under conditions of a desired speed. I have shown the molten metal being delivered into the reservoir 3 from a ladle 22, or other desired container. The composite metal strip may be cooled by the members 17 to the proper temperature for rolling, as by means of mill rolls 23 and 24, either for reduction in gauge, or in order to give the strip a rolled structure. Since the strip emerges vertically from the casting device, I have shown it passing over an idler roll 25, and being coiled as at 26.

It will be understood that the operation may be made continuous by welding strip metal together, instead of using individual coils thereof, as shown at 18 and 19.

The speed of withdrawal of the metallic com-

bination 16 from the casting apparatus, may be controlled in connection with the heat of the molten metal 4, and the temperatures to which the strips 12 and 13 are raised in the furnaces 20 and 21, to give a smooth, continuous operation, resulting in the formation of perfect castings.

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. A process of forming metallic combinations by casting, which comprises passing a pair of preformed metallic strip members in converging paths to a cooling and sizing device, supporting said strips in said converging paths by means of heat insulative supporting members, providing means forming a closure between said heat insulative members at the side edges of said strips whereby to form a reservoir at said supported portions of said strips, maintaining in said reservoir a supply of molten metal and passing said strips and a portion of said molten metal through said sizing and cooling means, said insulative supporting means acting to retain heat in said preformed metallic strips as transmitted thereto by said molten metal, so that said strips are raised to a welding temperature necessary to form a firm welded joint with said molten metal prior to the time said strips and metal reach said sizing and cooling device.

2. The process of claim 1 in which the strips of metal are preheated before being brought into contact with said molten metal.

3. A direct casting device comprising a refractory member shaped interiorly to provide a reservoir for molten metal and a constricting portion, means for leading metal strips into said reservoir and along the walls thereof, so that said bath of molten metal is held therebetween, and cooling and sizing means adjacent said refractory member, through which said metallic strips and a portion of said molten metal may be passed.

4. In combination, a housing, a refractory block in said housing shaped to provide a reservoir and a constricted throat, walls in said housing, some of which support said refractory block, and others of which, in connection with said supporting walls, define a chamber holding cooling fluid, and form a constricted sizing and cooling throat for a metal member formed by direct casting, means for leading metallic strips into said reservoir and along the side walls thereof, and means for withdrawing a direct cast metallic article therefrom.

5. In combination, a housing, a refractory block in said housing shaped to provide a reservoir and a constricted throat, walls in said housing, some of which support said refractory block, and others of which, in connection with said supporting walls, define a chamber holding cooling fluid, and form a constricted sizing and cooling throat for a metal member formed by direct casting, means for leading metallic strips into said reservoir and along the side walls thereof, means for withdrawing a direct cast metallic article therefrom, and including means for pre-heating said metallic strips prior to their passage into said reservoir.

EDWIN B. HUDSON.