

R. A. HADFIELD.
METHOD OF CASTING INGOTS.
APPLICATION FILED MAY 7, 1914.

1,310,072.

Patented July 15, 1919.

Fig. 1.

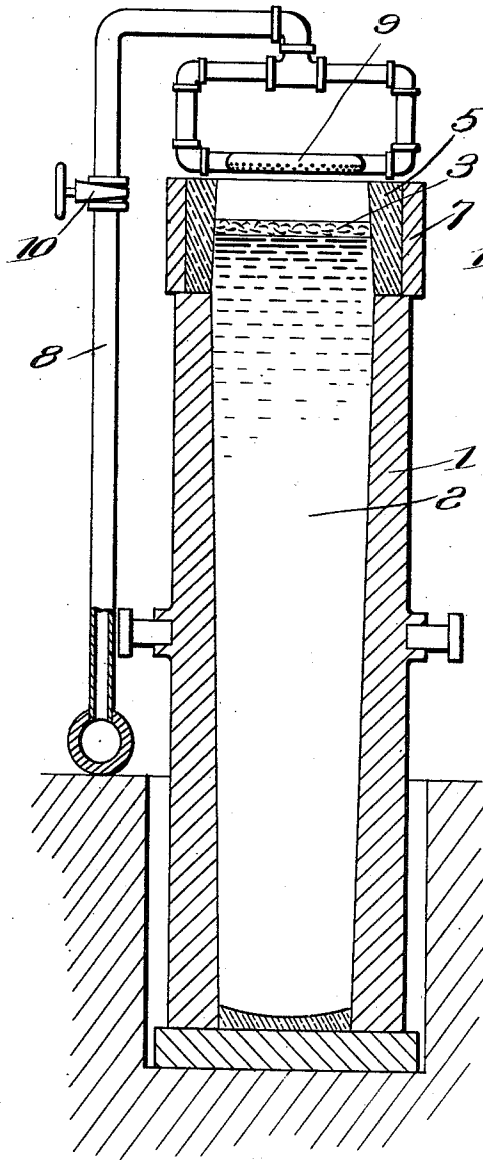
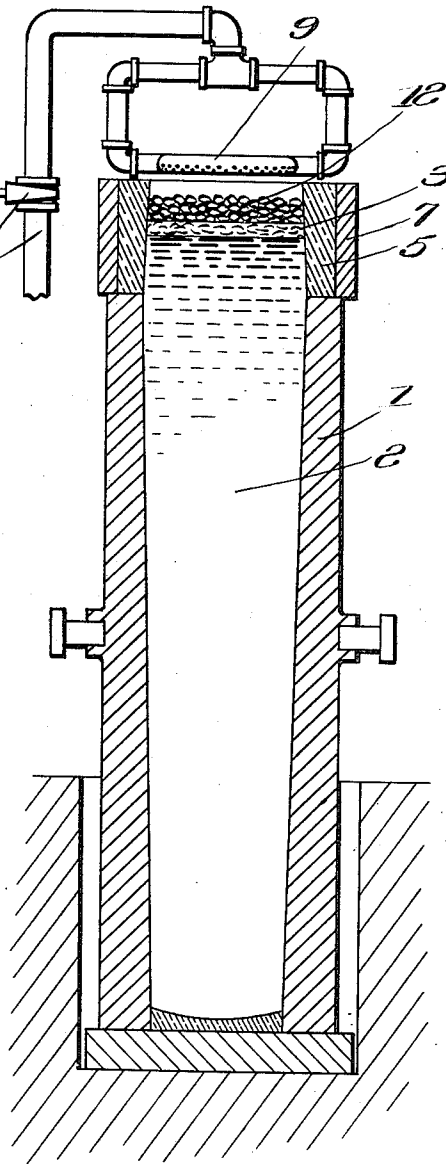


Fig. 2.



Witnesses:
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UNITED STATES PATENT OFFICE.

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METHOD OF CASTING INGOTS.

1,310,072.

Specification of Letters Patent.

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Application filed May 7, 1914. Serial No. 836,922.

To all whom it may concern:

Be it known that I, ROBERT ABBOTT HADFIELD, a subject of the King of Great Britain and Ireland, residing at 22 Carlton House Terrace, city of Westminster, England, have invented new and useful Improvements in Methods of Casting Ingots, of which the following is a specification.

My invention relates to the casting of ingots and consists in a process whereby the crop at the upper end of the ingot is greatly reduced, and further the blow-holes, cavities and other imperfections, commonly present in the casting are largely eliminated, particularly the pipes, extending down from the upper end which are a source of seams and weakness in the completed bars, for instance in rails.

The objects of the invention are accomplished by maintaining the metal in the upper part of the mold in a liquid condition during the freezing of the metal beneath, so that the upper metal is enabled to flow and compensate for the shrinkage caused by the cooling of the metal below. By thus compensating for shrinkage, the formation of pipes, blow-holes, cavities and the like is reduced and the crop at the upper end of the ingot minimized.

I find that this is best accomplished in some instances by the use of a gaseous or liquid fuel burning in contact with a layer of slag covering the upper end of the ingot and in other instances, by the combination of such fuel with a solid fuel placed upon the layer of slag.

I find that I can use the oxy-acetylene, oxy-hydrogen, natural, or artificial gas flame, the flame produced by a fuel oil spray, or that produced by the vaporization of gasoline or the like light oil, or in fact any form of fluid fuel, or an equivalent, like pulverized solid fuel.

For the purpose of illustrating an apparatus to accomplish this end, reference is had to the accompanying drawing wherein Figure 1 shows the method of using the fluid fuel alone. Fig. 2 shows the method of using a combination of fluid and solid fuels.

The numeral 1 indicates a mold containing the ingot 2 on the upper end of which is a layer of slag 3. This upper portion of the ingot is surrounded by a non-conducting head 5 for the purpose of retarding the loss of heat by lateral radiation. In order to re-

tain this non-conducting head in place it is preferred to employ a ring or top 7 which may be cast iron, and it will be understood that the head is proportioned to the particular ingot to be cast. At 8 is a supply pipe for the fuel to be burnt and it is to be understood that this supply pipe is typical of any arrangement of fluid fuel supply and that the burner 9 is also typical of any suitable burner. The fuel supply is controlled by a suitable valve 10 which may also provide a swivel support for the burner 9 so that it may be swung in a horizontal plane.

In the form shown in Fig. 2, a layer of charcoal or the like is placed on the slag as indicated at 12. After casting the ingot a layer of slag is preferably placed upon the upper end, and the valve 10 opened so that the fluid fuel is burnt upon the upper end of the ingot, causing the production of heat sufficient to maintain the metal in the upper part of the mold in a molten condition.

The object of the solid fuel is to assist in heating and gradually to increase the heat, it being obvious that this charcoal must be renewed from time to time.

By thus maintaining the upper part of the metal in a molten condition, the formation of cavities, blow-holes, pipes and the like is greatly reduced, thus minimizing the loss due to "crop", and improving the bars rolled from the top, reducing the danger of breakage, etc.

It will be understood that the term "ingot" is here used generically to indicate various types of castings, for my invention is not limited to use merely with ingots.

What I claim is,—

1. The herein described improvement in casting ingots and the like, which consists in casting the metal, placing solid fuel on the upper end thereof, and causing a fluid fuel flame to play upon the solid fuel.

2. The herein described improvement in casting ingots and the like, which consists in casting the metal, placing a layer of slag on top thereof, placing a layer of solid fuel on top of the slag, and causing a fluid fuel flame to play upon the solid fuel.

3. The herein described process of casting ingots and the like, which consists in placing solid fuel on the upper end of the ingot and applying additional heat to the solid fuel by an external and supplementary source of heat, having the desired result as de-

scribed of maintaining the metal molten in the upper portion of the mold after casting while the metal below is freezing.

4. The herein described process of casting ingots which consists after casting, in applying heat to the upper portion of the ingot by solid fuel placed on slag on the upper end of the ingot and by supplementary external source of heat.

5. The herein described improvement in casting ingots and the like, which consists in casting the metal, placing a thin layer of a solid material on the upper end thereof and causing a fluid fuel flame to play on the solid material.

6. The herein described process of casting ingots which consists in placing slag on the upper end of the ingot immediately after it has been cast, placing solid fuel on the slag, and applying additional heat to the upper

end of the ingot by a supplementary external source of heat.

7. The herein described improvement in casting ingots and the like which consists in casting the ingots and immediately after casting applying heat to the upper portion of the metal by a plurality of kinds of fuel to maintain said upper portion molten while the remainder is solidifying, said fuels differing in character and at least one of said kinds being gaseous and projected downwardly onto the metal from above.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ROBERT A. HADFIELD.

Witnesses:

A. F. SASSEEN,
J. R. MILLWARD.