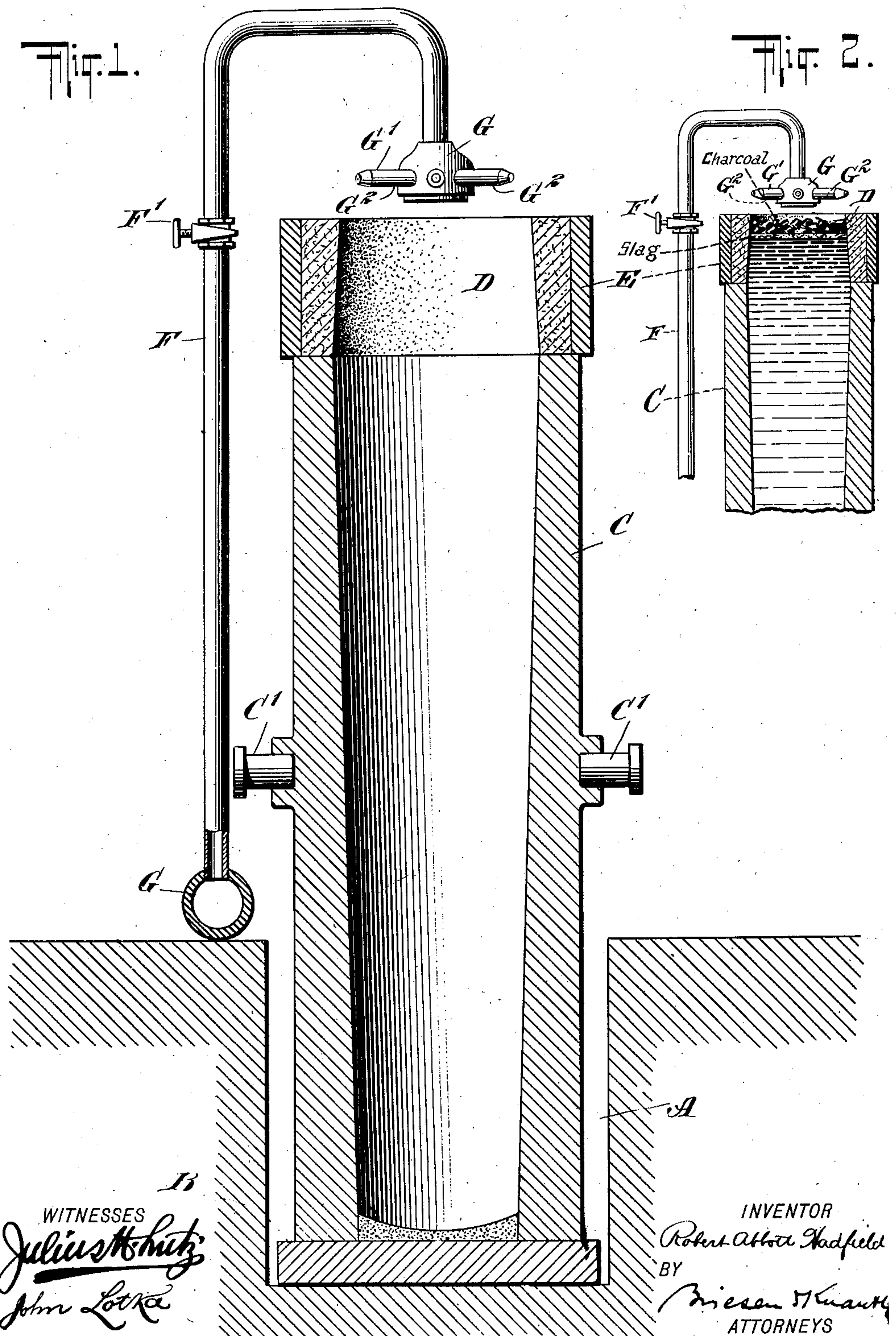


R. A. HADFIELD.
 METHOD FOR MAKING SOUND METAL INGOTS AND OTHER CASTINGS.
 APPLICATION FILED MAY 12, 1906.

933,751.

Patented Sept. 14, 1909.



UNITED STATES PATENT OFFICE.

ROBERT ABBOTT HADFIELD, OF SHEFFIELD, ENGLAND.

METHOD FOR MAKING SOUND METAL INGOTS AND OTHER CASTINGS.

933,751.

Specification of Letters Patent. Patented Sept. 14, 1909.

Application filed May 12, 1906. Serial No. 316,451.

To all whom it may concern:

Be it known that I, ROBERT ABBOTT HADFIELD, a subject of the King of Great Britain and Ireland, and a resident of Sheffield, in the county of York, England, have invented certain new and useful Improvements in Methods for Making Sound Metal Ingots and other Castings, of which the following is a specification.

My invention relates to the manufacture of metal ingots and other castings, and has for its object more particularly to prevent or reduce the formation of blow-holes, pipes, cavities and the like in the upper portion of steel and other metal ingots or other castings (hereinafter referred to generically as ingots).

Various means have been proposed heretofore to accomplish the purposes which my present invention has in view, but such means have not been fully satisfactory.

The object of my present invention is to provide means for the above indicated purpose which will be convenient in practice, easy of application and comparatively inexpensive, to keep the metal in the upper portion of an ingot or other mold in the liquid condition necessary to enable it to flow and compensate for shrinking of the ingot on cooling and in consequence reduce the formation of blow-holes, cavities and the like in the ingot and the loss resulting therefrom. For this purpose, according to my invention, the metal in the upper part of an ingot or other mold is heated and maintained in a liquid condition by the combustion in contact therewith or in close proximity thereto of solid fuel, for example, charcoal, by means of a blast of compressed air which is caused to impinge on the fuel while the same is directly or indirectly supported by the metal below. To prevent carburization by contact with the burning carbonaceous fuel, and also to retard loss of heat from metal by radiation from the upper surface thereof, a layer of fusible material, for example, iron slag, having no injurious action on the metal, may be interposed between the metal and the fuel.

Reference is to be had to the accompanying drawing in which—

Figure 1 illustrates an ingot mold together with a blast apparatus suitable for the purposes of my invention, and Fig. 2 is a similar detail view of the upper portion of the mold showing the same filled.

A indicates a suitable excavation or pit in which the bottom B of the mold is set, on which is supported the mold body C having a downwardly contracted chamber and provided with projections C' which serve for the convenient lifting and carrying of the mold. At the upper portion I have shown the upwardly contracted sand head D contained in the ring E. The head D should preferably be of some non-conducting material and of a depth and diameter to suit the particular ingot which it is desired to feed with metal to compensate for shrinkage thereof on cooling. In proximity to the molding pit I arrange an air supply pipe F provided with a controlling valve F' and connected at one end with a compressed air supply main G; the other end of the air supply pipe is constructed to allow a blast of air to issue therefrom and to be projected downward into the top of the mold below, as shown in the drawing; the blast device or nozzle consists of a chamber or head G³ with a number of small pipes G' radiating therefrom, the said pipes having downwardly directed apertures G². I prefer an arrangement in which the entire supply pipe F or at least the upper portion thereof may be turned about its own axis so that the blast device G³, G' may be swung centrally over the mold, or away to the side of it when not required for use. Instead of mounting the supply pipe or a portion thereof to turn, it might be otherwise movable to and from its operative position.

After casting an ingot in the mold in the ordinary way, solid fuel is placed in the upper part or head of the mold above the fluid metal with or without the interposition of a layer of slag or equivalent protecting material which may be introduced in a fluid or powdered condition. Then the discharge end or nozzle of the air supply pipe is brought over the mold, and by opening the valve F' a blast of air is turned on and caused to impinge upon the ignited fuel below, so as to cause vigorous combustion thereof and the production of intense heat that will serve to maintain the metal in the upper part or head of the mold in a molten condition. Fresh fuel is added from time to time so long as it is necessary to maintain the heating operation. In this manner the metal at the top of the ingot can be readily kept in the molten condition necessary to largely reduce the formation of cavities,

that is, "piping" in the ingot and thereby enable a very considerable saving in metal to be effected as compared with ordinary practice, according to which a large portion of the upper part of the ingot has to be cut off.

I claim:

1. The herein-described improvement in the casting of ingots and the like which consists in casting the metal, placing solid fuel above the upper surface of the metal and directing a downward blast against such fuel.
2. The herein-described improvement in the casting of ingots, which consists in cast-

ing the metal, placing a layer of slag on top thereof, adding solid fuel above the slag and directing a downward blast of air against such fuel to promote its combustion and keep the metal in a fluid condition.

In testimony whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

ROBERT ABBOTT HADFIELD.

Witnesses:

G. H. HEMSOLL,
E. RODGERS.