

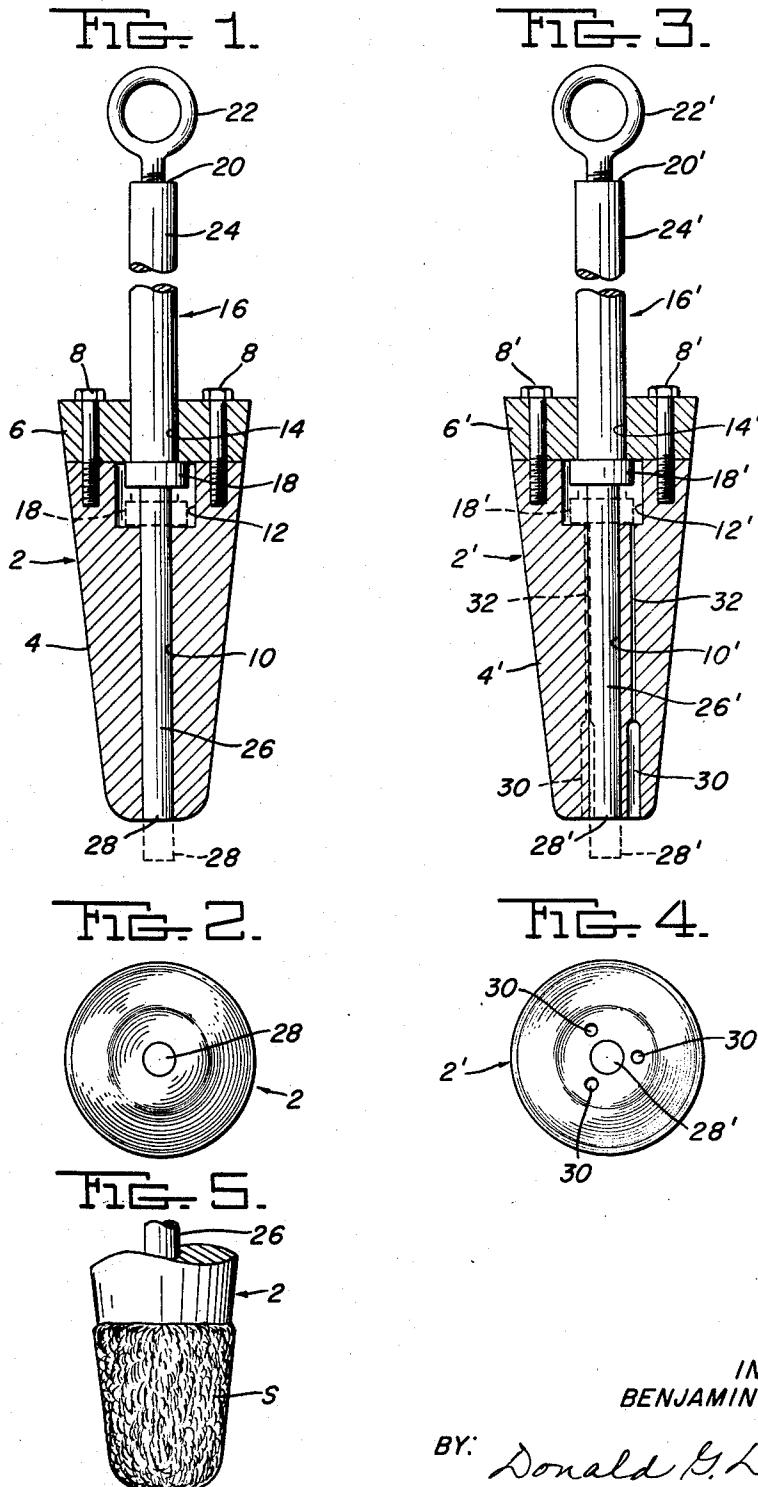
Dec. 23, 1958

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2,865,204

APPARATUS FOR DIP SAMPLING MOLTEN METALS

Filed July 20, 1956



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2,865,204

APPARATUS FOR DIP SAMPLING
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Application July 20, 1956, Serial No. 599,243

2 Claims. (Cl. 73—425)

The present invention relates generally to test sampling and more particularly to an apparatus for obtaining a solidified sample of a molten metal suitable for laboratory testing.

More particularly this invention relates to improvements in a metal sampling apparatus of the character shown in United States Patent No. 1,933,425 to C. B. Francis et al., issued October 31, 1933.

In a manner to be described, one of the principal objects of the invention is to provide improvements directed to the end of separating a solidified sample from a dip sampler body which has been immersed in a metal bath to obtain the sample.

A further object is to provide a dip sampler with means for obtaining samples in the form of pins suitable for spectrographic analysis as well as a thin-walled, fragile shell suitable for chemical analysis.

These and other objects will become more apparent after referring to the following specifications and attached drawings, in which:

Figure 1 is a vertical sectional view;

Figure 2 is an end view looking toward the bottom of Figure 1;

Figure 3 is a vertical sectional view showing a modified embodiment of the apparatus of the invention;

Figure 4 is an end view looking toward the bottom of Figure 3; and

Figure 5 is an elevational view of the sample shell produced by the invention.

Referring more particularly to the drawing reference numeral 2 designates generally the dip sampler of the invention. Dip sampler 2 is frusto-conical in shape and includes a main body 4 and a cap 6 detachably affixed to one end of the body 4 by bolts 8 to form the larger diameter end of the frusto-conical sampler 2.

It is to be noted that the shape and relative dimensions of the dip sampler 2 are important to the efficient functioning of the device of the invention. As best shown in Figure 1, dip sampler 2 is almost completely conical in shape with only a small portion of the tip of the cone cut off to form its frusto-conical shape. For uniformly good results, I have found it desirable to have the length of the dip sampler equal to approximately 2 to 2.5 times the diameter of its greater diameter end. A suitable taper of the sampler is achieved by having the diameter of its smaller diameter end equal to approximately $\frac{1}{2}$ of the diameter of its greater diameter end when its relative length is as just described.

An axial center bore 10 having an enlarged end portion forming a recess 12 adjacent the cap 6 extends through the main body 4. The cap 6 is provided with a center hole 14 which communicates with but is smaller in diameter than recess 12.

Dip sampler 2 is slidably mounted on a ram 16 which extends through the hole 14, recess 12 and bore 10. The ram is provided with a circumferential flange 18 intermediate its ends which is disposed in the recess 12. The

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diameter of flange 18 is greater than either the diameter of the hole 14 or the bore 10 but less than the diameter of the recess 12. The thickness of flange 18 is substantially less than the depth of the recess 12. The relative dimensions just described result in an arrangement whereby the ram and dip sampler are positively held together in a manner permitting relative limited axial movement of the ram and dip sampler.

One end 20 of ram 14 projects a substantial distance outwardly of cap 6 and has affixed thereto a ring or eyelet 22 for the purpose of receiving a rod or hook whereby the device may be handled from a remote position. For purposes of strength, the portion 24 of the ram 16 which extends between the ring 22 and the flange 18 may be of greater diameter than the portion 26 of the ram which extends from the opposite side of the flange 18. The length of portion 26 and the length of the flanged portion together are substantially equal to the length of the main body 4. Thus, when the device of the invention is in normal upright operating position, as shown in Figure 1, the upper surface of flange 18 abuts cap 6 and supports the dip sampler. The weight of dip sampler 2 insures this relative position being maintained when the body 4 is dipped into the molten metal. In this position, the bottom or ejector end 28 of ram 16 is flush with the smaller diameter end of body 4. If the body 4 is accidentally submerged too deeply, as discussed in more detail hereinafter, into the molten metal being sampled, the shell formed around the body 4 must be forcibly removed. This is easily done by moving ram 16 axially relative to body 4 to project its ejector end 28, as shown in dotted lines in Figures 1 and 3. The ejector end 28 then will engage and force the shell away from the body 4.

Figures 3 and 4 illustrate a modification of the invention which is similar to the embodiment of Figures 1 and 2 so that like parts are indicated by priming the reference numerals. This embodiment is characterized by a plurality of axially directed elongated recesses 30 in the submersion or smaller diameter end of body 4' which may be radially spaced around the center bore 10' and extend inwardly from the smaller diameter end of body 4'. An air vent 32 extends from the inner end of each of the recesses 30 and communicates with recess 12'.

In operation, when it is desired to obtain a sample of a molten metal the device, by means of ring 22, is suspended from a rod or hook (not shown) which is then manipulated to dip the lower portion of body 4 into the molten metal. For best results the body 4 should not be submerged beyond a point approximately midway of its length. When the body 4 has been properly submerged the shell formed therearound may be readily removed by merely shaking the dip sampler. Deeper submersion causes formation of a more tightly clinging shell which then requires the use of the ram 16 for removal. Duration of immersion determines the wall thickness of the solidified shell that will be formed. I have found an immersion time of approximately one to two seconds preferable to obtain optimum results.

After the body has been withdrawn from the molten metal, the film of molten metal clinging thereto chills rapidly in air and forms a solidified shell S, as shown in Figure 5. As explained above, shell S may be readily removed by shaking dip sampler 2 if the body 4 has not been submerged too deeply. If the body 4 has been submerged too deeply or the shell S for any reason cannot be shaken loose, the ram 16 is manipulated to speedily remove the shell S. The shell S may then be delivered to the laboratory where a specimen suitable for analysis can be easily prepared merely by shaving or

cutting-up the frangible shell S with a conventional nibbling machine. The latter operation requires approximately 15 seconds. Conventional drilling or chipping of a conventional sample would require approximately 10 minutes.

The embodiment of the invention illustrated in Figures 3 and 4 is utilized when it is desired to obtain samples for spectrographic analysis. When this embodiment is used molten metal fills the recesses 30 by static pressure when body 4' is dipped into the molten metal. This results in the formation of pin samples of the molten metal to form integral with the bottom of shell S when the molten metal in the recesses solidifies. When these pins of solidified metal are removed from the shell S, they are ready for spectrographic analysis with little or no further preparation.

The submersion or smaller diameter end of the body 4 may be rounded as shown in Figure 1, or planar as shown in Figure 3, as desired.

While two embodiments of my invention have been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. Apparatus for obtaining a solidified sample of a molten metal which comprises a frusto-conical metal body adapted to be dipped in said molten metal, said body having an axial center bore therethrough, a ram slidable in said bore with one end normally projecting outwardly of the larger diameter end of said frusto-conical body, said ram being substantially greater in length than said body, and a circumferential flange on said ram intermediate the ends thereof, a portion of said bore intermediate the ends of said body being enlarged circumferentially, said flange being disposed for limited axial movement in the enlarged portion of said bore.

2. Apparatus as defined by claim 1 characterized by said frusto-conical body having at least one axially directed recess adjacent said center bore extending inwardly from the smaller diameter end of the body.

References Cited in the file of this patent

UNITED STATES PATENTS

1,933,425 Francis et al. ----- Oct. 31, 1933