UNITED STATES PATENT OFFICE.

ERWIN S. SPERRY, OF BRIDGEPORT, CONNECTICUT.

METHOD OF IMPROVING CASTINGS OF ALLOYS CONTAINING COPPER AND ZINC.

SPECIFICATION forming part of Letters Patent No. 694,688, dated March 4, 1902.

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To all whom it may concern:

Be it known that I, ERWIN S. SPERRY, a citizen of the United States, residing at Bridgeport, county of Fairfield, State of Connecticut, have invented a new and useful Method of Improving Castings of Alloys Containing Copper and Zinc, of which the following is a specification.

My invention relates especially to alloys containing zinc—as, for example, alloys of copper and zinc (brass) or of copper, nickel, and zinc (German silver)—and has for its object to prevent imperfections in castings made from these alloys.

In the casting of alloys containing zinc the oxidation of the molten metal while being poured into the mold is the cause of many imperfections in the castings, the difficulty being so serious as to cause great loss to manufacturers and to render many castings unfit for use. This is particularly true in the casting of plates, billets, and bars for rolling and of shells for drawing into tubes, these castings being made in metal molds. The difficulty I have obviated by my novel methods results from the fact that in pouring the stream of molten metal oxidizes with a film-like surface and carries the impurities with it into the mold, which impurities being prevented from rising to the top of the mold by the rapid cooling of the metal remain in the casting like so much dross. If the impurities are on the surface of the plate, billet or bar, they cause "spilliness," so called, which although supposed to be removed in the overhauling frequently results in scales or slivers in the finished product. If the impurities are in the metal itself, as is ordinarily the case, the lack of cohesion between the impurities and the metal causes cracks to form in the metal during rolling or drawing processes. The usual method of attempting to obviate this difficulty is to surround the stream of molten metal while it is being poured into the mold with the flame of a liquid hydrocarbon—for example, lard or fish oil—which acts as a reducing agent and reduces the oxid which forms on the surface of the stream of molten metal. This method, however, accomplishes the desired result, but very imperfectly, it being impossible to prevent more or less oxygen finding its way to the metal, either on account of drafts of air, or of air contained in the mold itself, or from the fact that if the temperature of the molten metal is not high the oxid is not readily reduced, so that this method, although almost exclusively used, leaves much to be desired. It will be understood, therefore, that the requirement is for a substance that will oxidize when brought in contact with the oxygen of the atmosphere, but will leave an oxid that is not film-forming, it being an essential requirement that this substance shall not be added in sufficient quantity to remain in the metal after it has been poured, but must all or practically all oxidize out when the stream of molten metal is exposed, as in pouring, so that the substance used will not change the quality of the alloy to any appreciable extent. Such a material I have found in metallic arsenic—an elementary substance.

I am well aware that arsenic has been combined with various other metals in the production of alloys; but its use has been for an entirely different purpose, as it has materially changed the quality of the alloy. It should be noted as an important feature of my invention that just enough arsenic is introduced into the metal to become thoroughly oxidized out in the pouring, so that no arsenic, or practically none, remains in the finished product, it being of course well understood that arsenic in any appreciable quantity entirely changes the quality of an alloy, tending to give it crystalline qualities—a condition which is followed by cracking of the metal when treated by rolling or otherwise.

The proper amount of arsenic to be introduced into the mass of molten metal to produce the desired result and entirely oxidize out, so as to leave no traces of arsenic in the alloy, must be determined by experiment for each particular alloy or for the degree of heat at which it is poured. I wish it distinctly understood that I do not confine myself to any particular percentage of arsenic, so long as the desired result is obtained and the arsenic is all oxidized out. I have found in practice that the amount of metallic arsenic required to produce the desired result varies from 0.001 per cent. to about 0.25 per cent., although the latter amount is only necessary in extreme cases. I have found, for exam-

ple, that with "high" brass (an alloy consisting of about sixty-three per cent. of copper and thirty-seven per cent. of zinc) excellent—in fact, practically perfect—results are obtained by using about 0.05 per cent. of arsenic.

It should be noted that I do not claim the deoxidizing of the metal in the crucible or furnace, for the reason that this function is performed by the zinc, which, as is well known, has strong reducing properties and leaves the metal free from any chemical admixture of oxid, all such impurities having floated to the top.

The gist of my invention lies in the use of just sufficient metallic arsenic to wholly oxidize out in the operation of pouring and results from the fact that the oxid produced is non-film forming and that it causes the molten metal to pour more like a thin oil than a melted alloy, so that the alloy will fill the mold perfectly and produce a casting free from dross and internal impurities and without slivers or scales upon the surface.

In carrying my invention into effect the copper or copper and nickel are melted in a crucible or in any suitable manner under a charcoal covering. The zinc is then added and the mass stirred and then allowed to remain in the fire until the decrease in temperature brought about by the introduction of the zinc has been restored. When the proper temperature for pouring has been reached, which may be determined by a pyrometer or in any suitable manner, the arsenic is introduced and the metal stirred and then allowed to remain for a few moments in order to permit the arsenic to thoroughly permeate the mass, after which the alloy is poured into chill or sand molds, as required.

Having thus described my invention, I claim—

The herein-described method of improving castings made of alloys containing copper and zinc, which consists in adding to the alloy while in a molten condition a predetermined quantity of arsenic that will wholly oxidize out in the pouring and then pouring in the usual manner, the resulting casting being wholly free from arsenic and without dross or scale.

In testimony whereof I affix my signature in presence of two witnesses.

ERWIN S. SPERRY.

Witnesses:
A. M. WOOSTER,
S. W. ATHERTON.