J. KRALUND.

METHOD OR ART OF MAKING COMMERCIAL CASTINGS.

APPLICATION FILED JAN. 8, 1916.

1,238,789.

Patented Sept. 4, 1917.

Fig. 1.

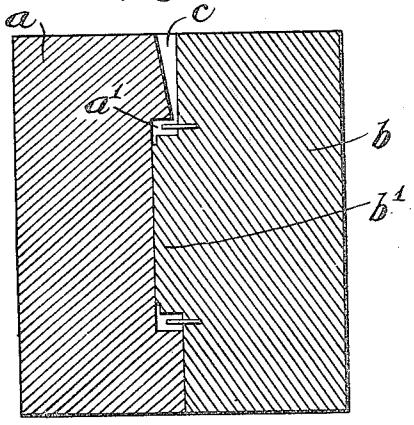


Fig. 2.

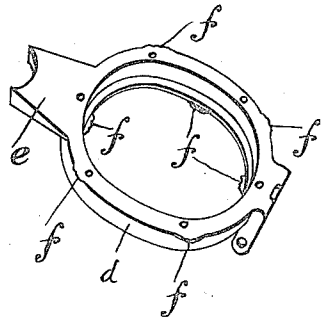


Fig. 3.

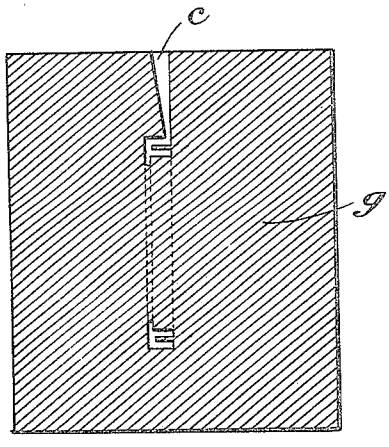
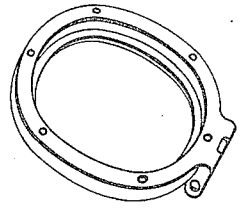


Fig. 4.



Attest:

E. Mitchell

John Kralund Inventor:
by Frank D. Wentworth
his Atty

UNITED STATES PATENT OFFICE.

JOHN KRALUND, OF BROOKLYN, NEW YORK, ASSIGNOR TO DOEHLER DIE CASTING COMPANY, A CORPORATION OF NEW YORK.

METHOD OR ART OF MAKING COMMERCIAL CASTINGS.

1,238,789. Specification of Letters Patent. Patented Sept. 4, 1917.

Application filed January 8, 1916. Serial No. 70,917.

To all whom it may concern:

Be it known that I, JOHN KRALUND, a citizen of the United States, residing at the borough of Brooklyn, in the city of New York, county of Kings, and State of New York, have invented certain new and useful Improvements in the Method or Art of Making Commercial Castings, of which the following is a specification, reference being had therein to the accompanying drawings, which form a part thereof.

My invention relates to a method or art of making commercial castings and more particularly to such a method which is especially adapted for the production of castings of large bulk, requiring no machining after completion to bring them to size, or give the desired finish thereto.

Heretofore the production of castings of the character which I contemplate producing by my method have been made by what is known as the "pressure die casting process," consisting of the injection of a molten metal into a metal mold or die, sufficient pressure being used to rapidly force the metal into all parts of the cavity in the mold or die. Such castings are ordinarily of more or less complicated design and the molds or dies used in the production of the same usually have metal partitions of small bulk and metal cores either fixed or movable about which the heated metal must flow and set. When castings are made of high fusing metals such as aluminum, aluminum alloys and copper alloys, the cost of production is materially increased by reason of the rapid destruction of the mold from the high temperatures about the partitions and cores in the mold, and irrespective of the character of the alloy, the pressure die process is limited to the production of comparatively small castings because of the tendency of the metal when setting to shrink upon the obstructions within the mold or die in a manner to have a tendency to form concealed cracks. In a small casting it is possible to handle the apparatus with sufficient rapidity to avoid these conditions, but with larger castings it has heretofore been found impossible to avoid this condition. When I refer to small castings I refer to those castings, the weight of which is from two to three pounds or less.

By the method of my invention, I am enabled to produce castings of larger bulk than is possible with the pressure die casting process, which castings as to dimensions and finish will be substantially like castings made in metal dies, the finish and dimensions of these castings, in fact, being determined by or through the agency of the pressure die casting process. By my improved method I avoid the wastage due to the destruction of the die from the high temperatures of the metal used in making the casting and am thus enabled to increase the product of a single die to a point beyond that which is now possible even when the die is used for making castings made of comparatively low fusing alloys.

I secure the desired results by the use in rotation of certain steps and practices, some of which are old and well known in the art of making dental inlays, the method or art of my invention differing from those heretofore practised in that the basis of the method or art of my invention is the production of a large number of patterns by the pressure die casting process and in a steel mold, each of which patterns will be the exact replica of every other so as to permit the production of a large number of commercial castings in all respects resembling those which result from the use of the master die with conditions used by the ordinary methods practised in the pressure die casting art.

The primary object of the invention is to produce such castings under conditions whereby the mold or die will not be injuriously affected by the shrinkage, or by the high temperatures of the metal. A further advantage of the method or art of my invention is that in the production of patterns of a material, the fusing point of which is very much lower than the fusing point of any metal suitable for use in machine parts, this material may be selected with the view of avoiding those high temperatures and that shrinkage which is injurious to the die and to the finished product. Incidentally the finished casting will not have any fins thereon, or any indications of the parting line of the die sections, since the patterns themselves may be finished to obliterate all traces thereof. By reason of the character of the material which may be used in making the patterns above referred to, there are substan-

tially no limitations upon the size of castings which may be made. In the production of dental inlays and in the production of similar articles whereby only one article is required, the conditions above referred to do not enter into the method. It is merely necessary to approximate the dimensions required in the casting and there are no cores or obstructions to be taken into consideration. In fact none of the conditions found in the dental art are present in the art of making commercial castings for machine parts used in different mechanisms. The nature of the product is different and the metals used in the commercial casting art have entirely different characteristics from those used in the dental art.

The invention consists in the method or art of making commercial castings consisting in forming a pattern by forcing molten material having a low fusing point into a metal mold or die, the cavity of which corresponds with the casting to be made, forming a mold by inclosing the pattern so made in a mass of plastic material, subjecting the low fusing material of said pattern through said plastic material to heat at a temperature sufficient to fuse the material of said pattern and causing said material to flow from within said mass of plastic material while in the molten state, thereafter filling said plastic mold with molten metal having a fusing point comparatively higher than the material of said pattern, whereby a finished casting is produced and removing the plastic material from about said finished casting; and in such other novel steps and practices as are hereinafter set forth and described and more particularly pointed out in the claims hereto appended.

Referring to the drawings:—

Figure 1 is a sectional view of a metal mold or die for making a plurality of identical patterns;

Fig. 2 is a view of a pattern made therein;

Fig. 3 is a sectional view of the plastic mold formed from said pattern; and

Fig. 4 is a view of the finished casting.

Like letters refer to like parts throughout the several views.

In the practice of my method or art, I make a sectional mold or die having sunk therein a cavity, the contour and dimensions of which correspond with exactitude to the casting to be produced. The two parts of said die in the accompanying drawings, are indicated at *a*—*b*. At *c* I have indicated the ingate of the said mold or die. This die is adapted for use in an ordinary pressure die casting apparatus, by means of which the cavity formed by the portions *a'*—*b'* of the mold sections *a*—*b* is filled with a low fusing material such as wax, or a metal alloy having a low fusing point, to form a pattern which may be used in making a mold from suitable plastic material such as plaster of Paris or gypsum. The material of which this patern is made may vary according to the temperature conditions, and the size or intricacy of the casting to be made.

The die *a*—*b* is provided with the usual vents and the contact of the molten wax or other material forced into the mold or die under pressure, with the walls of the mold or die will have a tendency to give the pattern a sufficiently hard surface to permit its handling in making the plastic mold and in finishing the pattern prior to the making of said plaster mold. This finishing consists mainly in removing any fins at the line of demarcation between the mold sections or at the vent openings therein.

The pattern thus produced in the metal mold or die and the fins thereon will have the characteristics shown in Fig. 2 of the drawings, *d* being the body of the pattern, *e* the sprue formed in making the pattern, and *f* the fins above referred to.

A suitable mold of plastic material is then formed about said pattern including the sprue *f* thereof, which sprue is allowed to extend through the wall of the plastic mold so as to form an ingate for the fluid metal and at the same time permit the escape of the material of the pattern. When the plastic material has solidified or set sufficiently, it is subjected to a heat at a temperature slightly above the fusing point of the material of the pattern, this metal when melted escaping through the opening formed by the sprue *f*.

If wax be used for the pattern, a portion thereof might be absorbed by the plastic material but this would not in any way, affect the casting unless it were to close the pores sufficiently to avoid any possible granular surface effect. When a low fusing metal is used instead of wax, no such condition is present.

When the plaster mold has been thus made, metal having the desired properties for a finished casting is poured or otherwise introduced into this plastic material, as by means of a pressure die casting apparatus in which metal is cast under very low pressures, the ordinary die casting method of die pressures being impracticable with a mold as fragile as the one above referred to. After the casting has been thus made the plaster mold may be broken to permit the drawing of the casting.

The rapidity with which a large number of patterns may be made, and the small wastage of the material of which said patterns are made, make it commercially practicable to produce castings by this method providing such castings are of sufficiently great bulk. The method, however, is not particularly adaptable to the production of

small castings by reason of the relatively greater expense as compared with a pressure die casting.

By reason of the fact that the pattern is finished before the plaster mold is made therefrom, practically no finishing of the completed casting is required excepting the removal of the sprue, and of any plaster confined within the openings in the casting. By using a plaster mold the shrinkage of the metal is of secondary importance since allowance for such shrinkage is ordinarily made in making the metal mold or die, and the plastic entering into the mold in which the finished casting is made does not possess sufficient resistance properties to injuriously affect the casting.

In making complicated castings, it is sometimes necessary to apply slight pressure to the molten metal while it is flowing into the plaster mold.

While in the practice of my method or art, all of the steps above referred to are essential in producing satisfactory commercial castings, that step which is of primary importance being the first step, or the production of the patterns in a metal mold or die, since this step permits any desired multiplication in the number of such patterns without variation in the dimensions and surface conditions of the pattern. As stated above, the pattern may be made either of wax or of a low fusing metal, the latter being preferable where the design of the casting is at all intricate, or possesses projections of small dimensions, which might readily be broken from the pattern in finishing the same and making the plaster mold therefrom.

It is not my intention to claim broadly the making of a plaster mold about a fusible pattern and the evacuation of said mold by subjecting it, and the pattern therein contained, to a temperature which will fuse the pattern. What I desire to claim is a method utilizing these old practices, and in conjunction therewith the dominant and essential step of preparing the pattern in a metal mold, which step is essential in the production of commercial castings by reason of the necessity for the rapid production of accurate patterns, each of which is an exact replica of every other.

In making commercial finished castings, it is necessary to produce the same in large numbers and hence the rapid production of patterns, the design and surface characteristics of which coincide with those desired in the finished castings, is of primary importance.

Having described the invention what I claim as new and desire to have protected by Letters Patent is:—

1. The method or art of making commercial castings consisting in forming a pattern by forcing molten material having a low fusing point into a metal mold or die, the cavity of which corresponds with the casting to be made, forming a mold by inclosing the pattern so made in a mass of plastic material, subjecting the low fusing material of said pattern through said plastic material to heat at a temperature sufficient to fuse the material of said pattern, causing said material to flow from within said mass of plastic material while in the molten state and thereafter filling said plastic mold with molten metal having a fusing point comparatively higher than that forming said pattern whereby a finished casting is produced and removing the plastic material from about said finished casting.

2. The method or art of making commercial castings consisting in forming a pattern corresponding in contour with the casting to be made and having an integral sprue thereon, by forcing molten material having a low fusing point into a metal mold or die under sufficient pressure to insure the filling of said mold or die and the desired density in the pattern, forming a mold by inclosing the pattern so made in a mass of plastic material, subjecting the low fusing material of said pattern through said plastic material to heat at a temperature sufficient to fuse the material of said pattern, and causing said material to flow from within said mass of plastic material while in the molten state and thereafter filling said plastic mold with molten metal having a fusing point comparatively higher than that forming said pattern whereby a finished casting is produced, and removing the plastic material from about said finished casting.

In witness whereof I have hereunto affixed my signature in the presence of two subscribing witnesses, this 23d day of December, 1915.

JOHN KRALUND.

Witnesses:
A. S. HUNKELE,
F. T. WENTWORTH.