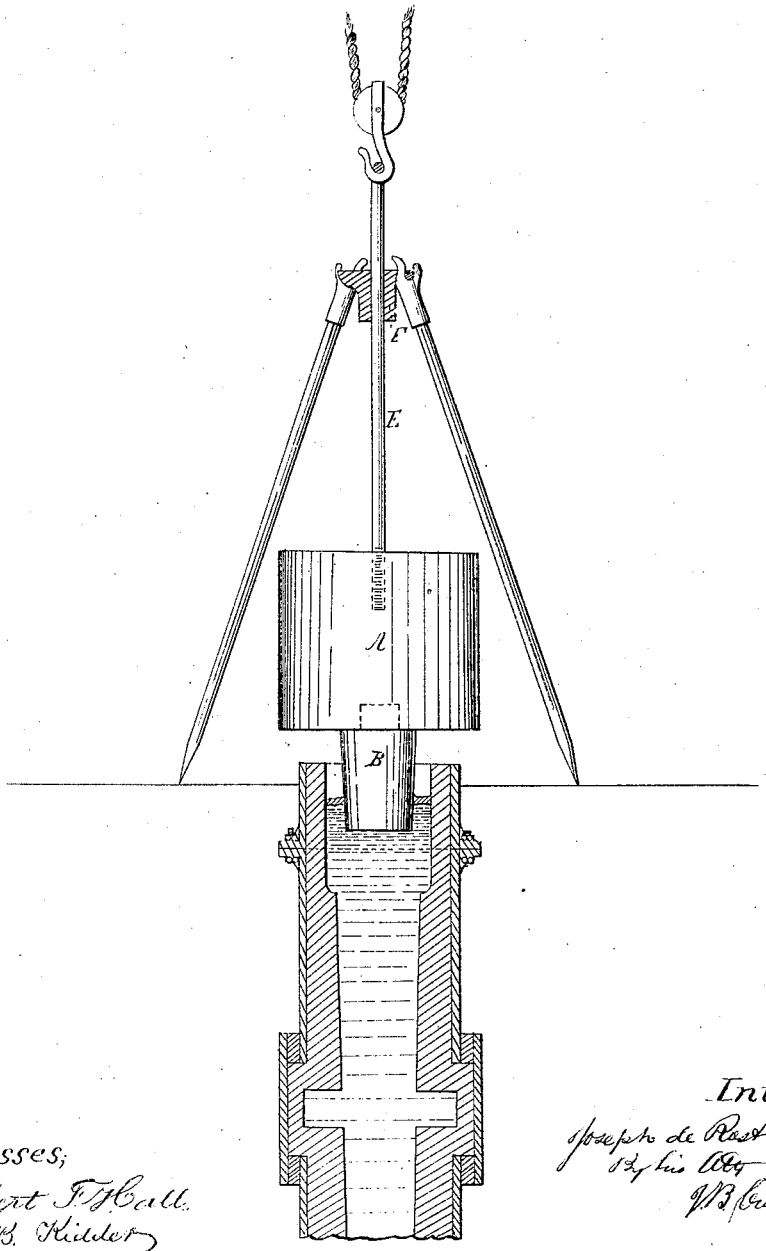
J. De Rosthorn,

Casting Ingots.

No. 45,947. Patented Jan. 17, 1865.



Witnesses;
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UNITED STATES PATENT OFFICE.

JOSEPH DE ROSTHORN, OF VIENNA, AUSTRIA, ASSIGNOR TO CLEMENS HERSCHEL, OF DAVENPORT, IOWA.

IMPROVEMENT IN CASTING MOLTEN METAL.

Specification forming part of Letters Patent No. **45,917**, dated January 17, 1865.

To all whom it may concern:

Be it known that I, JOSEPH DE ROSTHORN, of Vienna, in the Empire of Austria, have invented an Improvement in the Method of Casting Metals; and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

To better show the nature and purposes of my invention, it will be well to first enter into an explanation of the present method of casting.

In consequence of the diminution of volume or shrinking of the metals or alloys used for technical purposes during their transition from a melted or liquid to a solid state it has always been found necessary to add a surplus of the molten metal in order that a part at least of this surplus should enter into the body being cast, and thus make up for the loss of volume by shrinkage. The above-mentioned surplus is variously called. Herein it will be termed the "riser head" or "riser." This riser is intended, however, to act in another manner also—namely, to increase the density of the casting as much as possible and to hinder its becoming porous. It does this by its inherent hydrostatic pressure, as long, at least, as there is any quantity of liquid metal in it. The higher and more voluminous the riser is, therefore, the denser and compacter the casting will be, and the better defined its exterior surface. On the other hand, the cost of the casting is increased thereby very much, and a consideration of this fact sets a certain limit to the size of the riser used. If, however, as may happen in certain cases, the expense should be considered as a secondary object and the riser given an abnormal size, nevertheless that degree of density in the casting would not be had which is attained by the use of my inexpensive method, and which consists, simply, in substituting for the hydrostatic pressure of the liquid metal in the riser a very much greater pressure produced by mechanical means, and one acting constant and undiminished all through the period of cooling, whereas the pressure of the riser constantly diminishes and becomes almost nothing at the time it is most needed. A simple examination of the process of cooling in castings is sufficient to dispel any doubts as to the truth of this assertion. After the metal has filled the mold in a perfectly fluid condition a certain length of time, it begins to cool on the outside where it comes in contact with the cold sides of the mold, and forms a crust the thickness of which increases as the cooling process advances, while inside of this crust, in the casting, as well as in the riser, there is still liquid metal exerting hydrostatic pressure corresponding to its height, and thereby increasing the density of all parts of the column in proportion to the height thereof, and of such other parts of the casting as are not too hard and cool to be affected by the pressure. The liquidity of the inside metal diminishes, however, too fast to allow the pressure to produce effect on the center of the casting, and it is soon of a thick semi-fluid consistency, in consequence of which its action as a hydrostatic column of pressure diminishes more and more and becomes finally a minimum, and this, too, just at the time when the most pressure ought to act upon the casting. Every founder or engineer knows this to be the case. In every voluminous casting the layer on the immediate outside has the greatest density, gradually diminishing in density toward the center, where it is the weakest to all tests. This evil may be very nearly removed by applying an exterior mechanical pressure during the period in which the semi-fluidity of the metal increases, and the hydrostatic pressure exercised by the riser diminishes. I use for this purpose the weight of any body—say an iron block—which presses a wooden plunger into the metal of a short riser until the casting has become perfectly cold.

To illustrate my invention we will take, for example, the casting of a light cannon—say a four-pounder. According to the usual method, a riser of about thirty-six inches in height would be used, whose weight may be about four hundred-weight—that is, about the weight of the finished cannon—and which must be cut off when the cannon has cooled. In using my method a riser of about twelve inches in height is more than sufficient. To produce the mechanical pressure a body, A, (see figure,)

of any size and of a sufficient weight, is used. At its lower end is a slightly-conical wooden body, B, having its diameter smaller than that of the riser. A rod, E, ending in a ring, is fastened at its upper end, by means of which A can be raised or guided in sinking. Around E is a guide, F, in which E can move freely up or down, and arranged to be supported on a tripod. When the mold has been filled with metal, this apparatus is brought over the riser by means of a crane or windlass and fixed in such a manner that the axis of the plunger B is in line with the axis of the riser. Having brought it into this position, the tripod is brought to the support of the guide-box F, so that now B will sink vertically, even after it has been unhung from the crane or windlass. During this time a crust has formed on the top of the riser, the formation of which may, however, be accelerated by sprinkling it with cold water. Now, the plunger B is allowed carefully and slowly to settle, and it will break through the crust and settle a litlittle into the liquid metal beneath. In doing so a little of the liquid metal will be forced up alongside of the plunger through the cracks in the crust, while its lower surface will slowly burn to charcoal. If, now, the sinking of the weight is suspended till the above-mentioned pressed-out metal has cooled, we find, singular as it may appear, that the plunger B works, as though in a stuffing-box, through the incrusted metal, and none of the liquid metal, or none of any consequence, in the inside is pressed out upon the surface, so that the action of this plunger is similar to that of the piston of a hydraulic press. Now the rod is unfastened from the crane, and the total weight of A is allowed to act, which presses the plunger very slowly and always hermetically tight, or practically so, through the crust into the liquid metal beneath, making the plunger into charcoal. The metal of the casting remains exposed, therefore, to the same constant pressure during the whole process of cooling, and attains, in consequence of this, a density and strength which no mere riser, be it ever so voluminous and high, can ever produce, because, as explained above, its action diminishes as the metal cools. Besides this, there is still the important advantage that the pressing weight can be made as great as needed—say ten times as large as could be got in using a riser, the weight of which has narrow limits, from economical reasons.

Whether, now, the plunger is of wood or any other material, whether the pressure on the same is produced by a dead-weight, by a screw, or any other mechanical contrivance, or whether, in the casting of small objects, it is produced by the immediate action of the hand of the workman, makes no difference as to the character and principle of my invention.

I claim—

The improved method of operation to increase the density and strength of metallic castings, substantially as set forth.

In witness whereof I have hereunto set my hand this 30th day of September, A. D. 1864.

JOSEPH DE ROSTHORN.

Witnesses:

E. HELLES LARKIN,

WM. M. BRIGGS.