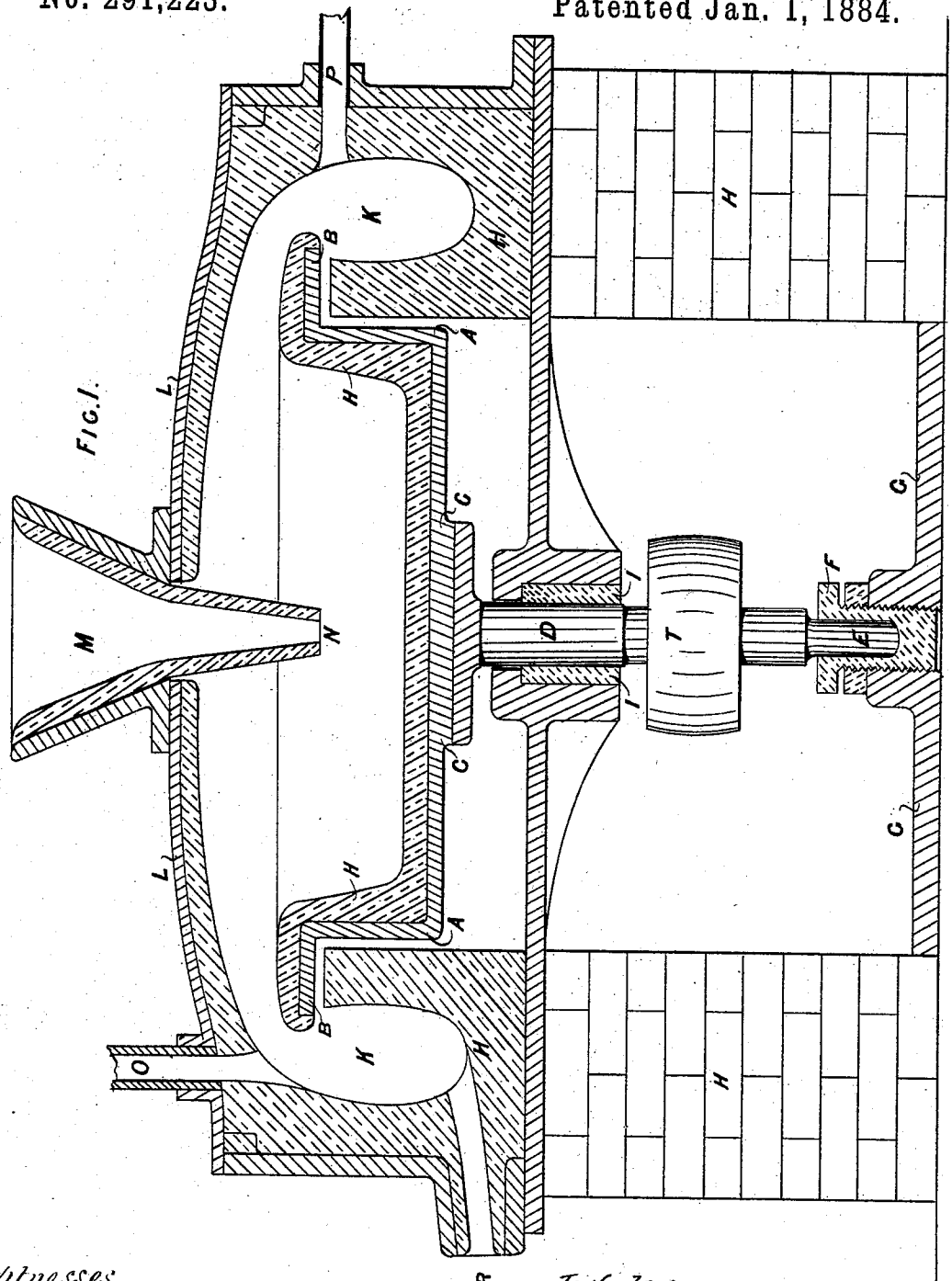
(No Model.) 2 Sheets—Sheet 1.

C. M. PIELSTICKER & F. C. G. MÜLLER.

PROCESS OF AND APPARATUS FOR THE PRODUCTION OF DENSE METAL CASTINGS.

No. 291,223. Patented Jan. 1, 1884.

FIG. 1.



Witnesses:
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(No Model.) 2 Sheets—Sheet 2.

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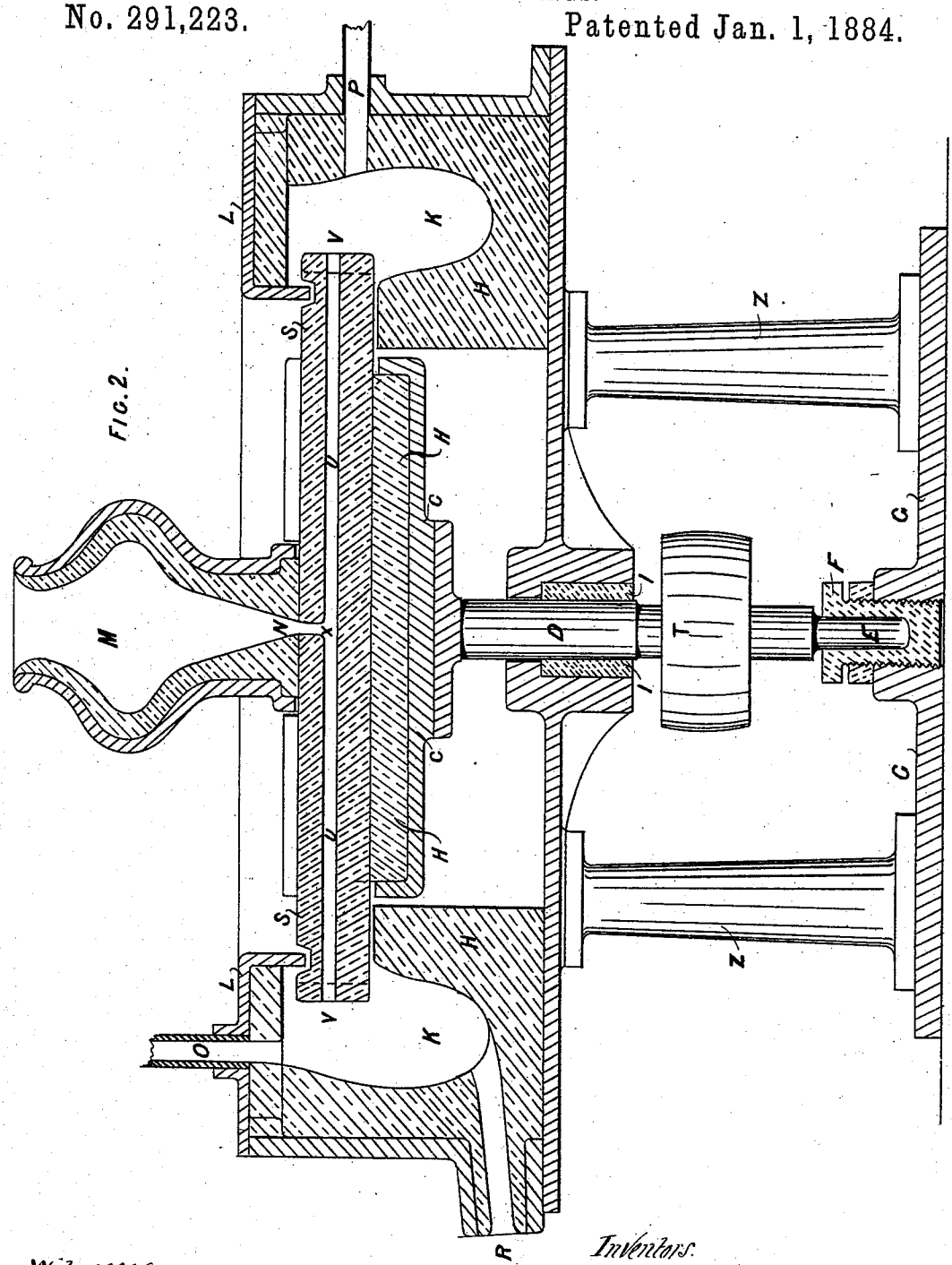
FIG. 2.



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UNITED STATES PATENT OFFICE.

CARL MARIA PIELSTICKER, OF LONDON, ENGLAND, AND FRIEDRICH C. G. MÜLLER, OF BRANDENBURG, PRUSSIA, GERMANY.

PROCESS OF AND APPARATUS FOR THE PRODUCTION OF DENSE METAL CASTINGS.

SPECIFICATION forming part of Letters Patent No. 291,222, dated January 1, 1884.

Application filed July 2, 1883. (No model.)

To all whom it may concern:

Be it known that we, CARL MARIA PIELSTICKER and FRIEDRICH C. G. MÜLLER, subjects of the Emperor of Germany, residing, respectively, at London, in the county of Middlesex and Kingdom of England, and at Brandenburg-on-the-Havel, in the Kingdom of Prussia and Empire of Germany, have invented certain new and useful Improvements in the Production of Dense Metal Castings and in Apparatus Connected Therewith; and we do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to an improved process of eliminating the occluded gases in steel and in other metal castings, which, if not separated, render the castings, on cooling, more or less porous; and it consists in effecting this separation by subjecting the molten metal to the action of centrifugal force under exclusion of air, using the apparatus hereinafter described, and forming part of this invention, or any other apparatus in which centrifugal force is used for this purpose, producing by this means not only a most minute division of the particles of molten metal, which state is the most favorable to the elimination of the occluded gases, but in one modification of our apparatus a vacuum is formed at the same time and in consequence of the centrifugal action, which greatly assists in effecting the purpose that we have in view.

On the accompanying drawings, Figure 1 is a vertical section through a centrifuge constructed according to the first part of our invention, and Fig. 2 is a similar view of modification described in the latter part of this specification.

The centrifuge used in this process, and as shown in Fig. 1 of the accompanying drawings, consists of a wrought-iron shell, A, having the form of a cylinder, closed at the bottom and open at the top, say eighteen inches in height and three feet in diameter, or more, in proportion, or it may be entirely molded of refractory material. This shell we propose to make with a rim, B, projecting from the open top toward the outside, say, eighteen inches in width. The shell and rim are throughout well lined with a refractory material, which may be ganister or basic in nature. The shell is to rest on its closed bottom C, and in the center of it on a solid wrought-iron shaft, D, to which it is well fastened and riveted on its outer circumference. This shaft we propose to make, say, three feet in height, and it is to rest on its lower conical-shaped end, E, in a step or bearing, F, in a heavy iron or steel plate, G, so as to easily turn on its point. About one foot above its lower end or pivot we fasten a driving-pulley, T, which is to be connected by means of a belt or otherwise with the motive power, or rotary motion may be given by means of a pair of bevel-wheels. In order to insure a longer life to the iron shell, the same may be surrounded with a water-jacket of suitable construction, which may be operated in any well-known manner. The hot water runs out continually at a point where the outer shell enters the bearings in which it rotates, as described further on, which is furnished with one or more perforations, which are continued through the brick-work for the outflow of the hot water. The whole of this centrifuge is built into solid refractory brick-work H in the following manner: Commencing from the ground, we build up the bricks so as to leave an opening for the driving-belt, or the driving-shaft connected with the pair of bevel-wheels, to pass through. A bearing of metal, I—say twelve to eighteen inches high—incloses the vertical shaft on which the shell rests just above the pulley or bevel-wheel in which the shaft is to turn air-tight. The brick-work is built up all around the shell, leaving a space of, say, one inch between it and the outside of the shell, so as not to touch or interfere with the shell at any point or in any way when rotating. The brick-work is built up till about one inch under the projecting rim of the shell and under its whole width, and then deepens into a channel, K, about eighteen inches deep and one foot wide, all around the circumference of the projecting rim of the shell. The brick-work then rises again to a height of, say, six inches, and a foot wide on its whole circumference, and built up solid from the ground. The whole apparatus and brick-work is closed on the top by a

wrought-iron cover, L, slightly convex toward the outside or otherwise, which may be lined inside with refractory materials, and which rests on the top of the brick-work, to which it is fastened and bolted so as to be air-tight. In the center of the cover a hole is left—say two inches in diameter—which carries a funnel, M, lined with refractory material, and from which a pipe or tube, N, made entirely of a refractory material, reaches some distance into the interior of the shell of the centrifuge. Another hole, O, of similar dimensions, is likewise left in the cover, between the center and its circumference, which hole is to be connected with an exhauster or aspirator for removing the atmospheric air from the inside of the apparatus at the beginning of an operation and to draw off the gases as soon as they are separated from the molten metal; or, instead of an exhauster, a blast of a neutral gas may be introduced at P from the outside of the circular channel, and an outlet provided for at the cover of the apparatus—as, for instance, at O.

In working our process we proceed as follows: The inside of the apparatus is first of all brought to an elevated temperature by means of a blast of gas and air introduced from the outer circumference of the circular channel at P, or otherwise. The aspirator or exhauster is set to work at the same time and draws off the products of combustion. The blast is then stopped and the centrifuge made to rotate with considerable velocity. The molten steel or other metal is then poured in a continuous stream into the funnel M in the center of the cover in such quantity as to completely fill the pipe leading into the center of the centrifuge, thus excluding atmospheric air. The molten metal, on arriving at the bottom of the shell A, is at once driven with great force by centrifugal force toward the sides of the shell and lays itself in a thin sheet against them, and gradually, as the centrifuge revolves, creeping up on the sides, it overflows the broad rim B and runs into the channel K of the brick-work, as described, the molten metal being thrown with great force against the outer circumference of this circular channel, from whence it is drawn off in a continuous stream through an opening and pipe, R, protruding from it, left for the purpose. The inflow of the molten metal is regulated by the outflow, and both are to be controlled by the speed with which the centrifuge is made to revolve. Only so much molten metal is to be constantly poured in as will almost instantaneously be caused to overflow into the circular channel. The faster the apparatus rotates the quicker this overflow will take place, and therefore the quicker the molten metal may be poured in.

The operation being continuous, the whole apparatus may be of moderate dimensions.

We wish it to be understood that we do not confine ourselves to this one form of centrifuge and apparatus only, our invention being based upon the action of centrifugal force for the purpose of eliminating gases from molten metal, whatever the form of the centrifugal apparatus may be, whether its sides be solid or perforated, or whether it be merely a disk or table rotating at high velocity under exclusion of atmospheric air, onto which the molten metal runs, and from which it is thrown off by centrifugal force against the outer side of the circular channel, in which it collects, as described, and from where it is drawn off for casting.

Another form of apparatus, which we have found to answer our purpose particularly well, is shown in Fig. 2 of the accompanying drawings. In this apparatus the centrifugal action is assisted by a vacuum formed at the same time and in consequence of the centrifugal action. We propose to construct it in the following manner:

The vertical shaft D, as above mentioned, carries on its upper end an iron circular table or disk, C, well lined with refractory material H. Across its diameter we place and well fasten a radially-perforated disk, S, which may be easily exchanged for a new one when used up, and is also made of refractory material. This disk is furnished with one or more radial perforations, U, running through its entire length. A funnel, M, is placed accurately into the center of the disk, and communicates at its lower outlet, N, with the radial perforations U of the disk S, it being particularly observed that the section of the outlet of the funnel is smaller than the sections of the radial perforations in the disk taken together.

In working the apparatus, care is taken to keep the funnel M constantly filled with molten metal up to a certain extent, so that the outlet N is quite filled and no atmospheric air may be drawn in. On the table C being set to rotate with great velocity, a sucking action is produced at the outward openings, V, of the radial channels U of the disk S, in consequence of which a vacuum is formed at the center X of the radial channels U. The streams of molten metal passing through the radial perforations U are broken up, and the occluded gases are separated therefrom in the form of small bubbles and enabled to escape. The molten metal, on escaping at the outward openings, V, of the radial channels U on the like circumference of the rotating table, is thrown with great force against the outward circumference of the surrounding circular channel K of the brick-work, broken up or atomized, and any gases, which may still have been occluded in the molten metal, are here finally set free and eliminated.

The whole apparatus may be made movable, and, on account of its moderate height, may be filled directly from the converter or the usual casting-ladle.

The disk S can be brought to the required temperature by introducing a gas and air blast through the funnel M and from the sides of the circular channel at P, giving an outlet for the products of combustion and gases by means of the opening O in the cover L of the

apparatus. With a rotating table of, say, twenty-four inches diameter, four revolutions a second are sufficient.

The whole apparatus may be made a movable one, and instead of building up the brickwork from the ground, which carries the circular channel, the latter may rest on an iron bottom plate, G, and be carried on four or more iron columns, Z.

We are aware that it is not new to submit molten metal in a finely-divided condition to the action of a vacuum for the purpose of eliminating its gases, and we therefore do not claim the same broadly, our invention consisting in the special method and means herein described and claimed.

Having fully described our invention, what we desire to claim and secure by Letters Patent is—

1. The herein-described process of eliminating gases from molten metal, which consists in subjecting the same to centrifugal action in a substantially-closed chamber, and at sufficiently high speed to separate the particles and liberate the gases by throwing the molten metal against the walls thereof.

2. The herein-described process of eliminating gases from molten metal, which consists in subjecting the same to centrifugal action at sufficiently high speed to separate the particles and liberate the gases while in a substantially-closed chamber by throwing the molten metal against the inner wall thereof, and at the same time maintaining a partial vacuum therein by the action of the centrifuge.

3. A device for atomizing molten metal by centrifugal action, which consists of a centrally-pivoted receiver provided with means for being mechanically rotated, and supported within an air-tight bearing, a chamber inclosing said receiver and formed with an annular circumferential trough having inlet and outlet passages, and a funnel extending from the exterior to the interior of the receiver, as set forth.

4. A device for atomizing molten metal by centrifugal action, which consists of a centrally-pivoted dish-shaped receiver provided with means for being mechanically rotated, and supported within an air-tight bearing, a chamber inclosing said receiver and formed with an annular circumferential trough having inlet and outlet passages, and a funnel extending from the exterior to below the edges of the dish-shaped receiver, as set forth.

5. The herein-described apparatus, consisting in the combination of a rotating shell, A, with the surrounding circular channel K, a cover, L, and the funnel M, resting in the center of said cover, by means of which funnel the molten metal introduced into the shell A is, by means of centrifugal action and under exclusion of air, thrown against the sides of the circular channel K, and thereby atomized and the gases set free, as described.

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FRIEDRICH C. G. MÜLLER.

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Witnesses to the signature of Friedrich C. G. Müller:

FRIED. ZIMMERMANN,
AUGUST EIME.