(No Model.) 2 Sheets—Sheet 1.

P. C. McGRATH.

MACHINE FOR CASTING BALLS.

No. 563,206. Patented June 30, 1896.

Fig. 1

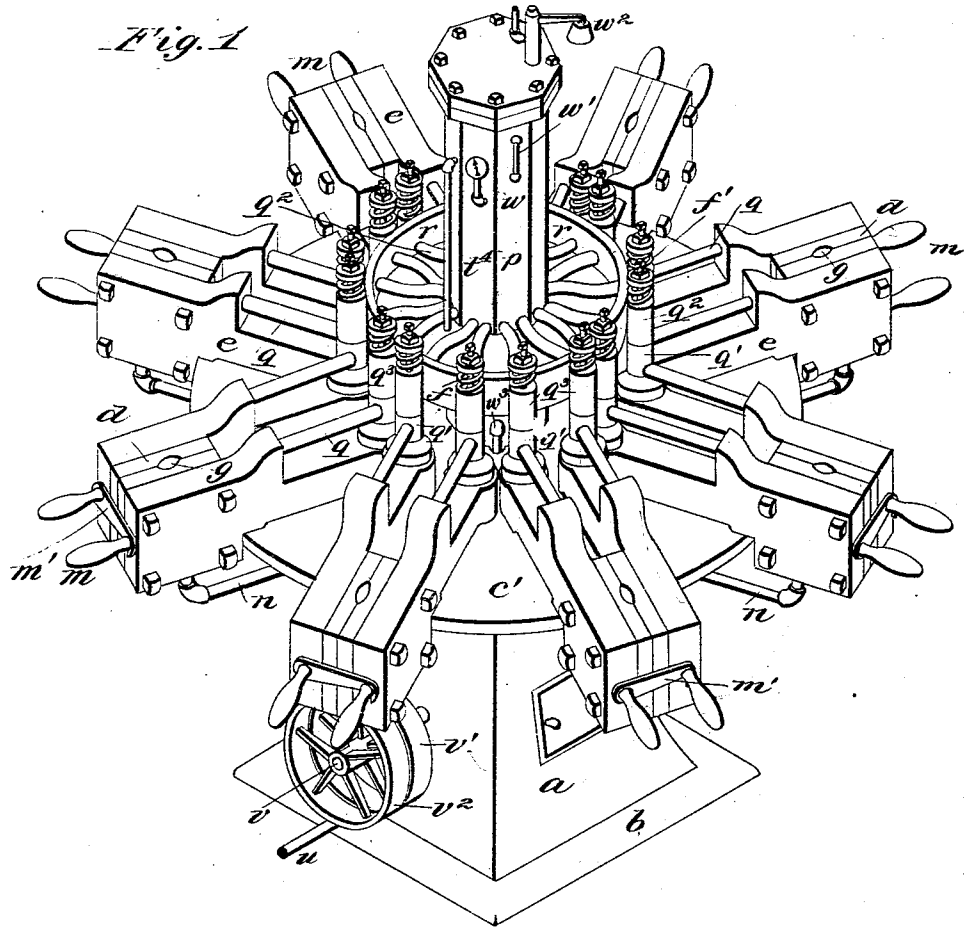
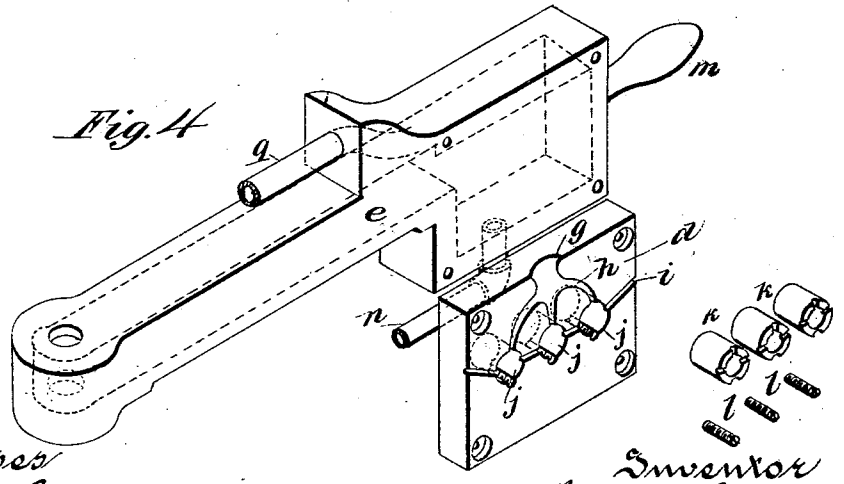


Fig. 4



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2

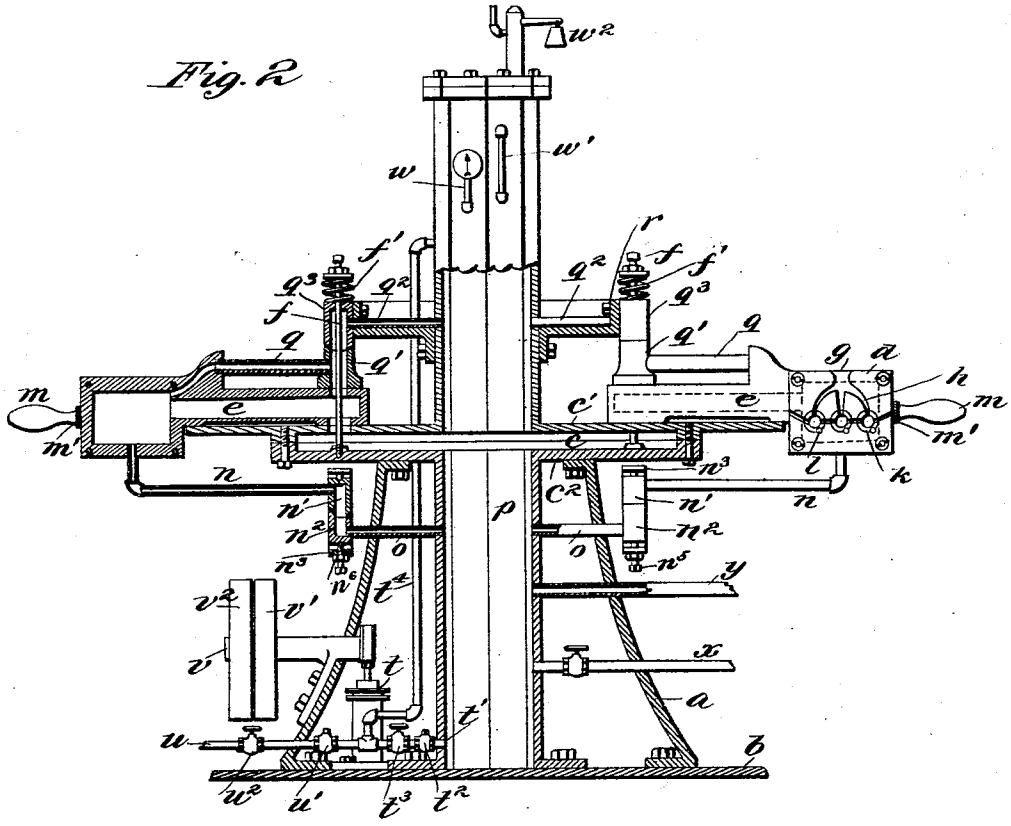


Fig. 3

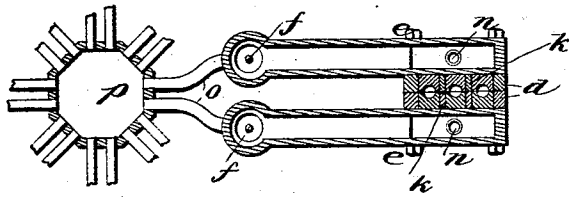
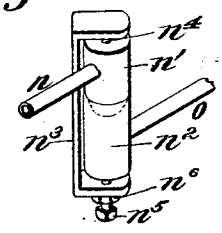


Fig. 5



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UNITED STATES PATENT OFFICE.

PATRICK C. McGRATH, OF RUTLAND, VERMONT, ASSIGNOR OF ONE-HALF TO HARTWELL A. DALRYMPLE, OF SAME PLACE.

MACHINE FOR CASTING BALLS.

SPECIFICATION forming part of Letters Patent No. 563,206, dated June 30, 1896.

Application filed March 7, 1895. Serial No. 540,870. (No model.)

To all whom it may concern:

Be it known that I, PATRICK C. McGRATH, a citizen of the United States, residing at Rutland, in the county of Rutland and State of Vermont, have invented a certain new and useful Improvement in Machines for Casting Balls, of which the following is a full, clear, and exact description.

The object of this invention is to provide a multiplex machine for the manufacture, by casting, of the balls or spheres now so commonly used in ball-bearings; but while this is the primary object of my invention, yet I wish to be understood at the outset as realizing the fact that the invention is applicable for casting other objects than balls, and from other materials than metal. However, for the purposes of this case, I will illustrate and describe my invention as adapted for the casting of metal balls.

In my invention I make use of a pedestal upon which is affixed a table, the said table having a number, eight, more or less, molds, in each of which molds a number of balls may be cast simultaneously. In order to provide a substantially equable temperature in the molds, I connect the said molds with a cooling-chamber erected in the pedestal and provided with any suitable mediums for effecting the circulation or renewal of the cooling fluid or agent, as may be desired.

Having thus stated the principle of my invention, I will proceed now to describe the best mode in which I have contemplated applying that principle, and then will particularly point out and distinctly claim the part, improvement, or combination which I claim as my invention.

In the accompanying drawings, illustrating my invention, in the several figures of which like parts are similarly designated, Figure 1 is a perspective view. Fig. 2 is a vertical section. Fig. 3 is a horizontal section of the stand-pipe or tank and one of the pairs of molds. Fig. 4 shows in perspective one half of one of the molds disassembled. Fig. 5 is a perspective view of one form of knuckle.

The pedestal a may be mounted upon any suitable base b, and this pedestal and its base may be castings. Upon the top of the pedestal there is secured a table c. This table is hollow and fluid-tight, and it is composed of the two members c' c^2, (herein shown as parts of the stand-pipe, tank, or reservoir,) which will be hereinafter more fully described. Upon this table are mounted any desirable number of pairs of casting-molds. The various molds being alike, a description of one will suffice for all. Each pair of molds consists of two complemental flat plates of metal d, each having a hollow arm e, by which it may be pivoted to the table, a bolt f being used for this purpose, and the hollow arms communicating with the hollow table. In the adjacent faces of these mold-plates halves of the gate g, sprues h, and air-vents i are made. Openings j are made in the plates, and these openings receive the removable matrices k, each matrix being secured in its cavity by a screw l, so that, as the several matrices are defaced, they may be readily removed and renewed. A handle m is secured to each of these arms, and a hook or other ordinary fastening device m' may be applied to these handles to connect the two halves of the molds for casting purposes. A pipe n opens into each arm e and extends thence to a knuckle n', which knuckle is fitted to a stationary complement thereof n^2, the two being united by a rigid clamp n^3, having a centering-point n^4 at one end and a set-screw n^5 at the other end, the latter having a jam-nut n^6, or other suitable fastening.

The knuckle is hollow and the stationary member is connected with a pipe o, which opens into a stand-pipe, reservoir, or tank p, erected upon the base b and within the pedestal and extending up above the table c. This stand-pipe or tank constitutes a chamber or reservoir for the reception and movement of the mold cooling or heating agent. The knuckles are arranged in vertical alinement with the pivot-bolts f, so as to permit the swinging open of the molds without distorting the pipes.

In order to secure circulation of the fluid through the hollow arms, I duplicate the pipe connections and knuckles above the table, q being a pipe extending between the hollow arm and the movable knuckle-joint q', and q^2 being a pipe connecting the fixed knuckle-joint q^3 with the stand-pipe. The joint q^3 is

secured to a circular bracket r, which is mounted upon the stand-pipe, and the two joints are held together by the bolt f, which is used as the pivot for the mold-arm, a spring f' being interposed between the head of the bolt and the top of the fixed joint in order to put a tension or pressure upon the subjacent parts sufficient to allow them to turn and yet hold the parts fluid-tight, the bolts being tapped in the lower member c^2 of the table.

Instead of making both of the members of the molds pivotally movable, I may secure one of the members rigidly upon the table, and open and close the molds by the pivotal movement of the other member.

The stand-pipe or tank p is supplied with any suitable cooling or heating agent, under pressure or otherwise, and in order to secure the removal from the mold-boxes of such overheated agent, I may employ a pump t, which is connected with the bottom of the tank by means of a suction-pipe t', in which is arranged a check-valve t^2 and a stop-valve t^3. The pump is connected also with the upper portion of the tank by means of a pipe t^4.

u is the supply-pipe provided with the check-valve u' and stop-valve u^2.

v is the pump-shaft provided with the fast and loose pulleys v' v^2 for driving the pump.

The stand-pipe is supplied with a pressure-gage w, thermometer w', safety-valve w^2, and water-gage w^3.

A blow-off x may be applied to the stand-pipe. (See Fig. 2.)

For purposes of keeping the temperature-equalizing agent in the reservoir or stand-pipe at the proper temperature, I may introduce through pipe y steam or any other heating or other agent appropriate to this end.

The various pipes may be of rigid or flexible material, as found advisable or convenient.

The operation is essentially as follows: Bearing in mind the fact that the machine is designed for making the so-called "chilled" cast-iron balls, as well as other castings of any other kind of metal or metals which can be made in iron molds shaped to suit the requirement of the trade, the molds are provided with appropriate matrices and assembled substantially as indicated in Fig. 1, and the molten metal introduced through the gate, whence it flows through the sprues into the various matrices, the hollow arm meanwhile being supplied with a cooling or heating agent or fluid. The molds must be kept from chilling the balls too suddenly, for otherwise they would not fill with metal, and the balls therefore would be worthless. On the other hand, if the molds were used continuously without some heat-reducing or temperature-equalizing agent they would become so hot that the castings would be improperly chilled, and in time the molds would become so hot that the molten metal would weld to the molds and thus render them useless. Now in order to keep the molds at an even temperature, the cooling or heating agent is introduced, and this temperature-equalizing agent may be kept at a proper temperature by circulation thereof or by periodical exhaustion and renewal thereof through the stand-pipe by the means described, or by any other suitable means. In any case, provision is to be made for maintaining the molds at the proper temperature for effecting the desired character of castings.

As already indicated, the invention is applicable to casting other objects than balls, and for casting objects not only of iron but also of other metals and metallic compounds and other substances.

While I have shown and described what I believe to be the best embodiment of my invention, yet I do not wish to be understood as limiting my invention to the precise details set forth, and with this understanding I will proceed now to state my claims.

What I claim is—

1. In a casting-machine, a pedestal, a hollow table thereon, a series of partible molds pivoted to said table, hollow arms applied to the said molds and communicating with the table, a reservoir erected within the pedestal to contain a temperature-equalizing agent and in open communication with the table, pipes connecting the said reservoir and hollow arms for the circulation of such agent, and knuckles interposed in said pipes in line with the pivots of the molds, substantially as described.

2. In a casting-machine, a pedestal, a table thereon, a series of partible molds pivoted to said table, hollow arms applied to the said molds, a reservoir erected within the pedestal to contain a temperature-equalizing agent, pipes arranged above and below the table and connecting the said reservoir and hollow arms for the circulation of such agent, and knuckles interposed in said pipes in line with the pivots of the molds, substantially as described.

3. In a casting-machine, the combination of a pedestal, a table secured thereto, a series of partible molds pivoted to said table and provided with hollow arms, a reservoir erected within said pedestal to contain an agent for equalizing the temperature of the molds, pipes connecting the said reservoir and hollow arms above and below the table, knuckles arranged in said pipes in the line of the pivots of the molds, and a pump connected with the aforesaid reservoir and adapted to charge and discharge the said agent relatively to the hollow arms, substantially as described.

4. In a casting-machine a stand-pipe for containing a circulating fluid under pressure and supplied with temperature and pressure indicators, a water-gage and a safety-valve, combined with a hollow table communicating with said stand-pipe, hollow-back molds pivoted to said table and communicating therewith, flexible pipes arranged above and below said table and connecting the molds with the stand-pipe, and means to effect the cir-

culation of the fluid through the stand-pipe, table, molds and pipes, substantially as described.

5. In a casting-machine, the pedestal, a hollow table, a series of partible molds having removable and interchangeable matrices arranged therein, hollow arms applied to said molds and pivoted to and communicating with the hollow table, a reservoir erected within the pedestal to contain a temperature-equalizing agent and in open communication with the table, pipes connecting the said reservoir and hollow arms for the circulation of such agent, and knuckles interposed in said pipes in line with the pivots of the hollow arms, substantially as described.

6. In a casting-machine, a pedestal, a hollow table formed of the members c' and c^2, a series of partible molds comprising mold-plates and adjacent hollow arms, which arms communicate with the hollow table, a reservoir erected within said pedestal and forming an integral or connected part of the members c' and c^2 of the table and containing a temperature-equalizing agent, pipes connecting the said reservoir and hollow arms above and below the table for the circulation of such agent, and knuckles interposed in said pipes in line with the pivots of the molds, substantially as described.

In testimony whereof I have hereunto set my hand this 2d day of March, A. D. 1895.

PATRICK C. McGRATH.

Witnesses:
M. J. FRANCISCO,
EDWARD LYSTON.