March 2, 1943. P. PRITCHARD 2,313,004

CASTING OF METALS

Filed Sept. 10, 1940 2 Sheets-Sheet 1

FIG. 1

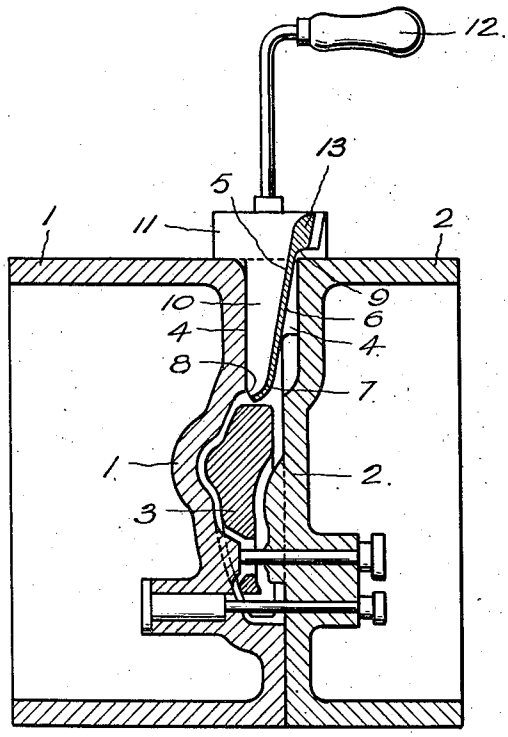
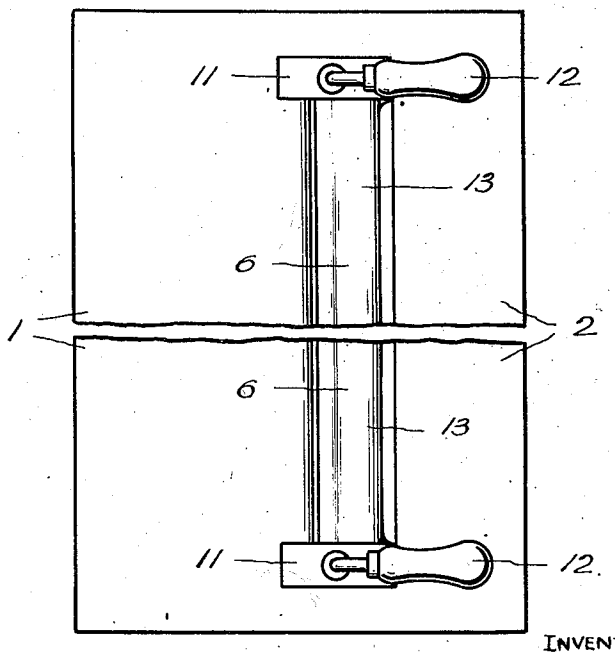


FIG. 2



INVENTOR
PERCY PRITCHARD
By Samuel Sciveres Jr.
ATTORNEY

March 2, 1943. P. PRITCHARD 2,313,004

CASTING OF METALS

Filed Sept. 10, 1940 2 Sheets-Sheet 2

FIG. 3

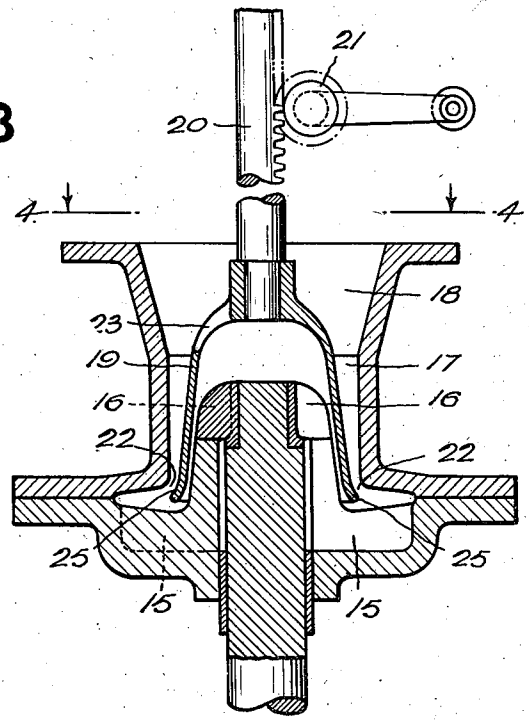
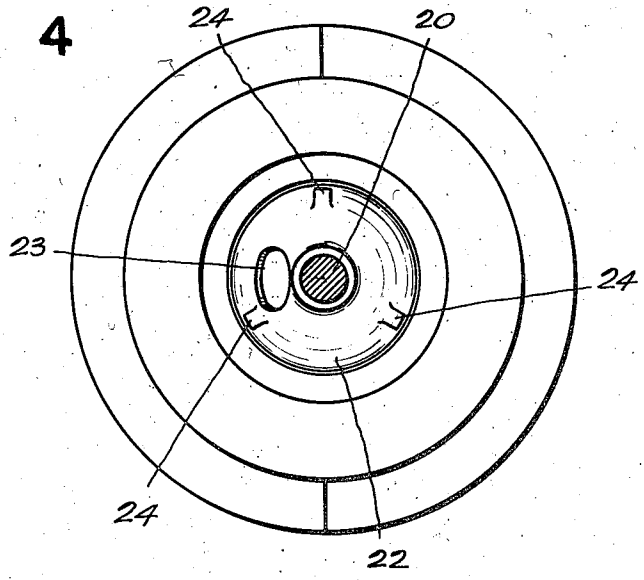


FIG. 4



INVENTOR
PERCY PRITCHARD
BY Samuel Schweser Jr.
ATTORNEY

Patented Mar. 2, 1943

2,313,004

UNITED STATES PATENT OFFICE

2,313,004

CASTING OF METALS

Percy Pritchard, Barnt Green, England

Application September 10, 1940, Serial No. 356,234
In Great Britain October 2, 1939

9 Claims. (Cl. 22—155)

In the casting of metals it is usual to pour the metal into a mould or die through an aperture or passage called a gate or runner and to provide further passages called risers into which the metal can rise and from which some of it can flow back to make up for any shrinkage or sinking which may occur in the casting. The rate at which the metal runs into the mould is largely determined by the rate at which the metal is poured and the size of gate opening into the mould.

The present invention provides improved means for casting metals whereby an opening in the mould or die is provided with a suitable baffle enabling that opening to serve both as a gate or runner and as a riser.

The baffle is preferably so arranged with respect to the mould that it causes a restriction in the flow of metal and throttles or controls it thus enabling the rate at which it flows into the mould to be predetermined.

The baffle may also be adapted to form a deflector to direct or guide the metal towards certain desired parts of the mould.

Although the invention can be applied to moulds in which there are a number of openings by providing baffles in each of the openings where control of the flow is desirable and to provide venting for the mould, I prefer to use it in combination with one large opening which due to the provision of the baffle serves as a gate and riser. This may be done by using a large chamber opening into which the baffle is inserted to restrict the flow of metal and arranging that the air from the mould or die can escape up one face of the baffle or through spaces provided in the baffle. When the mould has been filled to a predetermined level say as far as the baffle or beyond it, the baffle is removed and the gate filled with metal so that it forms a large riser for feeding in any metal necessary to make up for sinking or shrinkage. This has the advantage that the riser is filled with the metal last poured which is thus hottest and most fluid and so can the more efficiently feed back into the mould, whereas with the previously known arrangements the risers are generally remote from the gate and are filled with some of the first metal poured into the mould which may have cooled and partially set before pouring has been completed. Further due to the provision and arrangement of the baffle the rate of filling can be controlled and suited to the casting and the mould filled in such a way that progressive cooling takes place from the bottom of the casting to the riser thus ensuring the minimum of cooling stresses in the casting.

In any casting the baffle can be used to direct the metal into parts of the mould which should be filled first. Also the baffle may be so shaped as to direct a larger flow of metal to some parts of the casting than to others.

By making the baffle movable in a gate or riser of varying size or by moving the baffle or part of the baffle relatively to the side of the gate it is possible to vary the restriction of the aperture and thus the rate of flow of metal into the mould as pouring proceeds.

From the foregoing it will be clear that the use of a baffle or other restricting means in accordance with the invention enables the flow of metal into the mould to be controlled as desired to suit the casting which is being produced. The metal can be made to flow quietly and evenly into the mould and can be directed towards certain parts of the mould. Further since the rate of flow into the mould is made almost independent of the rate of pouring, the factors of skill and judgment on the part of the operator are minimised. Thus to a large extent the conditions of the casting operation are predetermined and so can be selected as being those best suited for the particular casting which is to be produced.

While the invention may clearly be used for the casting of any castable metals in sand or other moulds or metal dies, two constructions showing the invention applied to die casting apparatus are illustrated in the accompanying drawings by way of example.

Figure 1 shows a cross section of a die and a baffle for casting the cylinder head of an "in line" engine.

Figure 2 shows a plan view of the apparatus shown in Figure 1.

Figure 3 shows a cross section of a die and a baffle for casting a cylindrical article having projecting fins.

Figure 4 shows a plan view of Figure 3.

In the accompanying drawings Figures 1 and 2 show a metal die consisting of two parts 1 and 2 for casting a cylinder head from an aluminium alloy. The head is for a multi-cylinder "in line" engine and is of the usual form with a water cooling space in its interior. 3 is the sand core for forming this space. The head is cast standing on edge vertically that is to say in a position in which its main plane which when in use is horizontal, is arranged vertically in the die. The combined riser and pouring gate into the die consists of a rectangular chamber opening 4 ex-

tending substantially the full length of the casting. The baffle 5 which is inserted in this chamber is made of cast iron and is shaped somewhat like a scoop, since it consists of a plate of metal 6 having its lower edge 7 cranked to form a deflector so that at the bottom of the chamber 4 which forms the riser it comes adjacent one side of the mould leaving only a restricted space 8 which forms the controlling aperture. The size of this aperture 8 is chosen to give the required rate of flow to suit the castings. From its lower edge the sheet 6 inclines upwards and comes close to the opposite side of the riser at the upper surface leaving a narrow space 9 for the escape of air and gas. The deflector is stiffened by the longitudinal member 13 and the end edges of the deflector are shaped to form sides 10 and it is provided with lugs or cross beams 11 which rest on the die and support it, handles 12 to facilitate its insertion and removal and lugs which locate it correctly with respect to the gate in the die to give the correct control aperture to restrict the flow as desired.

Liquid metal is poured in and is directed by the baffle to one side so that it flows down the left hand side round the core 3 and up the right hand side. The air in the die is pushed in front of the metal and flows out up the back of the baffle and out through the space 9. When the die has been filled up to the baffle or beyond it, the baffle is removed and the gate filled with metal so that it can act as a feeding riser and a head for collecting any impurities.

Due to the fact that the metal flows round the core in one direction any dust or dirt there may be in the die will be pushed in front of the metal and so round and up into the riser or head which is afterwards cut off. Also the controlled rate of flow due to the restriction makes it possible for the metal to be run into the mould slowly and steadily thus avoiding turbulence and reducing the risk of oxide inclusions in the casting. Further the air in the die is given ample time and space in which to escape from the die thus avoiding risk of air bubbles being trapped by the metal or of the air disturbing the metal. During the cooling of the casting the metal in the chamber 4, which being the last poured in is hottest and most fluid, forms a feeding head or reservoir of liquid metal along the whole length of the casting ready to flow in to make up for any sinking or shrinkage in the casting as it occurs.

In Figures 3 and 4 of the drawings the invention is shown applied to the die casting of a hollow cylindrical article having projecting fins at 15 around its lower surface and also a number of internal fins at 16 formed by a sand core below the closed top of the cylinders. The shape and sections of the article make it almost impossible to cast it satisfactorily by the previously known gravity methods. The upper part of the die has a large cylindrical bore 17 for forming the upper part of the article which is continued upwards and increased in diameter at 18 to facilitate feeding and pouring and to form a feeding head. The baffle consists of a hollow bell shaped member 19 which can be raised and lowered by a rack 20 and pinion 21. Suitable means are provided for supporting and operating the pinion and for guiding the rack, but for simplicity these are not shown. Lugs 24 ensure that the bell is correctly located with respect to the die opening. When the baffle 19 is lowered into the cylindrical bore 17 in the die the annular space 22 between the outer periphery of the lower part of the bell and the cylindrical bore forms the controlling aperture. In this position the bell or baffle controls the rate of flow and due to its flared lower lip 25 directs the metal out towards the extremities of the fins. If desired the flow can be increased by slightly lowering the bell or decreased by slightly raising it relatively to the lower edge of the cylindrical bore in the die. The air expelled from the die rises up the interior of the bell and escapes through one or more sighting holes 23 in the top of the bell. As the molten metal rises in the die the baffle or bell is gradually raised keeping below the level of the molten metal until ultimately it is clear of the die and the whole of the filling aperture or gate 18 is filled with metal which since it is the last to enter is the hottest and being liquid can feed in to make up for any shrinking which may occur in the casting.

I claim:

1. Improved means for casting metals comprising a mould apparatus having a single large chamber opening located in advance of and communicating with the part of said apparatus where the casting is made, and a removable baffle plate in said chamber dividing it into a pouring gate for the metal entering the mould on one face of said plate and a vent on the opposite face thereof, said plate being shaped and arranged in relation to one wall of said chamber opening to restrict the rate of flow of the molten metal, and having a deflector lip curved toward said wall to direct molten metal toward certain parts of the mould, said chamber opening also forming a riser from which the last poured molten metal will serve to feed the casting as the latter shrinks after pouring.

2. Improved means for casting metals as claimed in claim 1, wherein means are provided for adjusting the baffle while the metal is being poured into the mould in order that the rate of flow of the metal into the mould may be varied.

3. Improved means for casting metals comprising a mould, a pouring chamber opening leading to the mould, a baffle plate dividing said chamber and enabling the space on one side thereof to serve as a pouring gate, a core in said mould and a deflector lip on said baffle to direct the metal flowing through the gate into the mould to one side of the core, a second space in said chamber on the other side of said baffle plate, said second space communicating with the mould opening on the opposite side of said core to that to which the incoming metal is deflected.

4. Improved means for casting metals, comprising an enclosed mould apparatus, a chamber opening in said apparatus in advance of and communicating with the part of said apparatus where the casting is made, a bell-shaped baffile arranged in the chamber opening and being of such size that the space around the exterior of the lip of the bell forms the gate for the inflowing metal and the space in the interior of the bell forms the riser, the bell having an opening therein for the escape of gases.

5. Improved means for casting metal as claimed in claim 4 having means for adjusting the bell relatively to the chamber opening in the mould.

6. Improved means for casting metals as claimed in claim 4 having means whereby the bell may be completely withdrawn from the mould.

7. Improved means for casting metals as claimed in claim 4 in which the bell is mounted

on a shaft provided with rack and pinion gear for manipulating it.

8. Improved means for casting metals comprising a mould or die having a single large chamber opening for the flow of metal into the mould, a removable bell-shaped baffle in said chamber having a curved lip forming with the wall of the mould a flow space whereby the rate of flow of the metal into the mould can be controlled by axially moving the bell relatively to the mould, said bell having an opening in its wall whereby its interior face in conjunction with the opening in the mould serves as a riser, and means for adjusting and bodily removing said bell-shaped baffle from the mould.

9. Improved means for casting metals comprising a mould apparatus having a single large chamber opening located in advance of and communicating with the mould, a removable baffle plate dividing said chamber into a pouring gate and a vent, said plate terminating in the chamber, said baffe plate being provided with a deflector lip adapted to direct molten metal towards certain parts of the mould.

PERCY PRITCHARD.