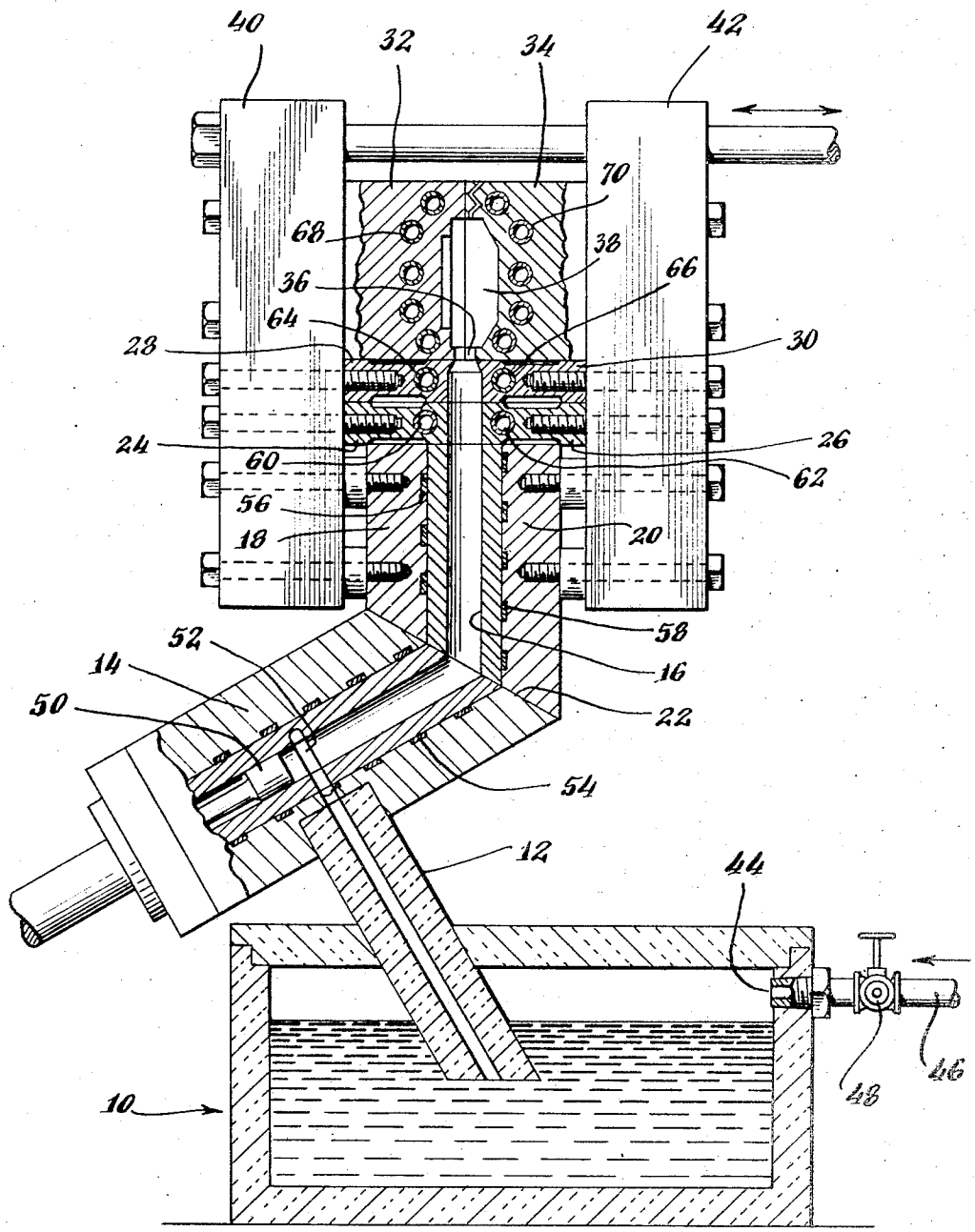
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APPARATUS FOR DIE CASTING

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APPARATUS FOR DIE CASTING

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ABSTRACT OF THE DISCLOSURE

The casting material is supplied from a furnace reservor upwardly through an inclined spout and through an upwardly and oppositely inclined charging sleeve to the lower end of a runner defined between a plurality of pairs of opposed plates, the lower ends of the lower pair of plates meeting the upper end of the charging sleeve at an inclined interface. Means are provided for maintaining the temperature of the sleeve and the pairs of runner defining plates as well as the die plates at different temperatures and the charging sleeve may be made of steel because it is automatically emptied of casting material between casting operations.

This invention relates to die casting apparatus in which casting material in excess of the amount required to fill the die cavity is returned by gravity to a supply reservoir.

An object of the invention is to provide apparatus employing a steel charging sleeve in which the sleeve is automatically emptied of casting material between casting operations.

Another object of the invention is to angularly relate a charging spout to a charging sleeve, and the sleeve to a pair of vertically extending die plates, so that a charge of material to be cast is supplied upwardly from the sleeve into a die cavity defined between the die plates.

Another object of the invention is to provide runner defining means communicating between a vertically extending gate and die cavity and an upwardly inclined charging sleeve.

In carrying out the invention I provide a furnace reservoir **10** in which material to be cast is heated and maintained in molten state. An upwardly inclined charging spout **12** supplies successive charges of material to be cast from the furnace reservoir into an upwardly inclined steel charging sleeve **14** the upper end of which communicates with a runner **16** defined between the plates **18** and **20**. The upper end of sleeve **14** and the lower end of plates **18** and **20** are inclined and meet at the inclined interface **22**. Between the upper ends of plates **18** and **20** and the die plates **32** and **34** one or more additional pairs of runner defining plates are employed. In the drawings two additional pairs of plates **24** and **26**, and **28** and **30** are employed defining runner portions **16***a* and **16***b*, the latter communicating directly with a gate **36** opening into a die cavity **38** both of which are defined between the die plates **32** and **34**.

The die plates **32** and **34**, the plates **18** and **20**, and the plates **24**, **26** and **28**, **30**, are detachably supported by platens **40** and **42**, platen **42** being movable, by known means, toward and away from plate **40** to open and close the die plates and the runner defining plates.

Any suitable means may be employed for intermittently forcing charges of casting material from reservoir **10** through spout **12** into the sleeve **14**. As shown herein, the furnace reservoir is closed except for spout **12** and an inlet port **44** through which fluid under pressure may be introduced into the furnace-reservoir at a predetermined pressure and for a predetermined period of time. Conduit **46** is shown for connecting port **44** to a source of fluid under pressure (not shown) with valve control means which may be of known kind indicated generally by the numeral **48**.

Within sleeve **14** a reciprocable piston **50** is provided, movable between a position below port **52**, in the side wall of the sleeve with which spout **12** communicates, and a position above port **52** and adjacent the juncture between the upper end of the chamber defined by the sleeve and the lower end of the runner **16**. The piston may be reciprocated by known means in timed relation to the delivery from the furnace-reservoir to the sleeve **14** of charges of material to be cast.

Electric coils **54**, **56** and **58** are shown in sleeve **12** and in the plates **18** and **20** respectively, for maintaining a charge of casting material molten while it is being lifted toward the die cavity and while the excess is returning to the reservoir from the runner and the sleeve.

The pairs of plates **24**, **26**, and **28**, **30** are shown provided with channels **60**, **62** and **64**, **66** respectively through which fluid may be run to control the temperature of said pairs of plates.

The die plates **32** and **34** must be maintained at a temperature below, and preferably well below, the melting point of the material being cast, and the die plates are shown provided with channels **68**, **70** through which fluid may be run to control the temperature of the die plates so that the temperature within the die cavity **38** will be below the melting point of the material being cast.

The apparatus disclosed herein may be used for casting aluminium, in spite of its steel charging sleeve **14**, because the molten aluminium does not stand in the sleeve between charging cycles. Whatever the material being cast, its temperature will be maintained above its melting point while travelling within sleeve **12** and the portion of the runner defined by plates **18** and **20**. The temperature of plates **24**, **26** and **28**, **30** are reduced below the temperature of the plates **18**, **20** to reduce the heating of the die plates by conduction from plates **18**, **20**.

In the casting of zinc, for example, the temperature within furnace-reservoir **10** may be maintained at approximately 1200° F. The hardened steel sleeve **14** and the plates **18** and **20** may be maintained at a temperature within the range 900° F.–1000° F. The pairs of plates **24**, **26** and **28**, **30** may be maintained at temperatures within the range 600° F.–700° F. And the die plates **32**, **24** may be maintained at a temperature within the range 400° F.–500° F.

The apparatus described herein has the advantage that it may be employed for casting metals of widely different melting points. It supplies the charges of material to be cast to a die cavity gate aligned with the parting line of the die plates, and eliminates the goose neck charging sleeves and the gates extending through die plates at right angles to the parting line, customarily employed in the casting of zinc and other low melting point metals. It may be employed, with its steel charging sleeve, even for casting high melting point metals, because of its gravity return of the excess of each charge of material between successive casting cycles.

There has thus been provided, apparatus in which the above mentioned objects are attained in a thoroughly practical way.

What I claim is:

1. Die casting apparatus comprising, a pair of die plates defining between them a die cavity, a second pair of plates interposed between the sleeve and the die plates respectively, and defining between them a runner communicating between the sleeve and the die cavity, support means for the plates including movable means to close and open the pairs of plates respectively, an upwardly extending charging sleeve having a port in its side wall,

a charging piston reciprocal within the sleeve from a position below the port to a position above the port, means for heating the sleeve and the runner defining plates to keep casting material molten while it is within the sleeve and runner, a reservoir of molten casting material to be cast, a spout extending upwardly from the reservoir to said port, and means for intermittently forcing a charge of material from the reservoir into the charging sleeve while the piston is below the sleeve port.

2. The die casting apparatus claimed in claim 1 in which means are provided for heating the sleeve and the second pair of plates forming the runner with which the sleeve communicates.

3. The die casting apparatus claimed in claim 1 in which at least one additional, or third, pair of plates is interposed between the die plates and the said second pair of plates, said third pair of plates defining between them a runner portion communicating between the runner portion defined by the second pair of plates and the die cavity, and means for providing a temperature differential between the second and the third pairs of plates.

4. The die casting apparatus claimed in claim 1 in which the sleeve is inclined relative to the parting line between the die plates, and the upper end of the sleeve and the lower ends of the second pair of plates are inclined and meet at an interface which is angularly disposed relative to a horizontal plane.

5. The apparatus claimed in claim 1 in which the sleeve communicates with the runner portion defined by the second pair of plates, the sleeve being angularly disposed relative to the parting line of the second pair of plates, and the lower ends of second pair of plates being inclined providing an inclined interface between the lower ends of said second pair of plates and the upper end of the sleeve.

6. The apparatus claimed in claim 1 including means

for heating the second pair of plates and the sleeve to a temperature of from 900° F. to 1000° F.

7. The aparatus claimed in claim 1 including a third pair of plates interposed between the die plates and the second pair of plates, and means for cooling the third pair of plates to a temperature intermediate the temperatures of the die plates and the second pair of plates.

8. Die casting apparatus comprising, a reservoir of molten material to be cast, said reservoir being closed except for a spout, and an inlet port through which fluid under a predetermined pressure may be introduced into the reservoir for a predetermined period of time, a pair of die plates defining between them a die cavity, second and third pairs of plates defining different portions of a runner leading to the die cavity, a charging sleeve extending upwardly and disposed for communication between the reservoir spout and the runner and having a port extending through its side wall, the said spout extending upwardly from the reservoir to said port, and a plunger reciprocal within the sleeve between a retracted position below the said port to an extended position above said port, and means for controlling the temperatures of the pairs of plates to maintain a temperature differential between them.

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