

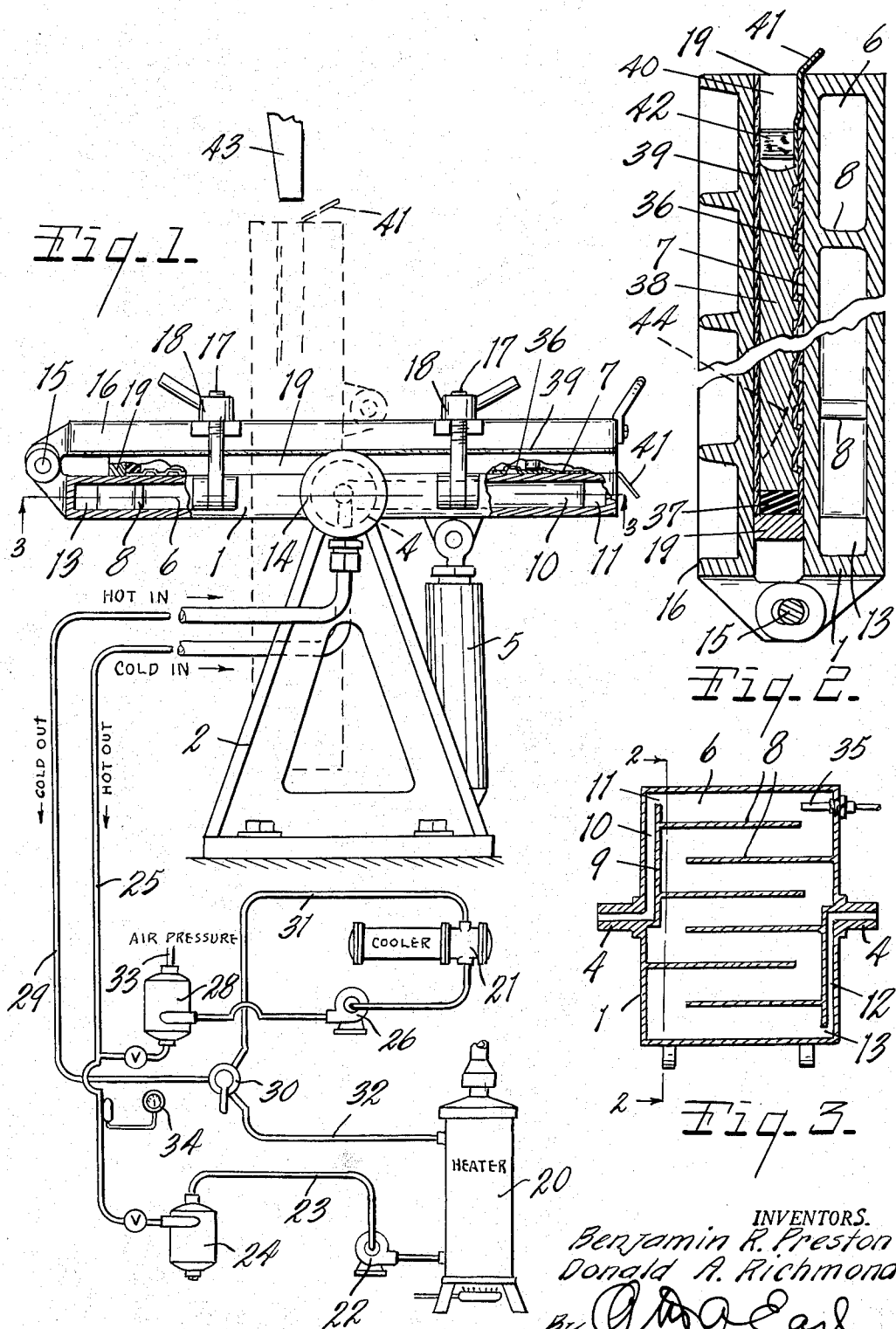
June 5, 1956

B. R. PRESTON ET AL

2,748,433

METHOD AND APPARATUS FOR CASTING PRINTING PLATES

Filed Sept. 25, 1952



INVENTORS.
Benjamin R. Preston
Donald A. Richmond
By *Charles E. Earl*
Attorney.

1

2,748,433

METHOD AND APPARATUS FOR CASTING
PRINTING PLATESBenjamin R. Preston and Donald A. Richmond,
Kalamazoo, Mich.

Application September 25, 1952, Serial No. 311,406

3 Claims. (Cl. 22—58)

This invention relates to improvement in method and apparatus for casting printing plates.

The principal objects of this invention are:

First, to provide plate casting apparatus that will rapidly produce printing plates of sound character and particularly without voids and soft spots.

Second, to provide plate casting apparatus that will maintain the backing metal of the plate under hydrostatic pressure head until the entire usable portion of the plate is solidified.

Third, to provide plate casting apparatus in which the backing metal cools through the shell at the face of the plate and solidifies progressively rearwardly from the shell and upwardly from the bottom thereof.

Fourth, to provide plate casting apparatus with means for rapidly and uniformly heating and cooling the mold chamber.

Fifth, to provide a method of casting printing plates in which the molten backing metal which is cast behind the shell solidifies progressively rearwardly from the shell and upwardly from the bottom of the plate so that the metal is at all times under hydrostatic pressure as it solidifies assuring uniformly solid plates.

Sixth, to provide a method of casting printing plates which includes a novel method of heating and cooling the mold chamber to obtain uniform desirable temperatures therein.

Seventh, to provide a method of heating the mold chamber of a plate casting mold which will bring the chamber and a shell therein to a uniform temperature proper for annealing the shell prior to casting backing metal therebehind.

Eighth, to provide method and apparatus for casting printing plates which will provide plates of uniform high quality in a minimum of time.

Other objects and advantages of the invention will be apparent from a consideration of the following description and claims. The drawings of which there is one sheet illustrate an apparatus embodying the invention and with which the method may be carried out.

Fig. 1 is a side elevational view partially broken away in cross section of a plate casting mold and of heating and cooling apparatus associated with the mold, the heating and cooling apparatus being illustrated conventionally.

Fig. 2 is a longitudinally cross sectional view through the mold taken along the plane of the line 2—2 in Fig. 3.

Fig. 3 is a transverse cross sectional view through the mold taken along the plane of the line 3—3 in Fig. 1.

Fig. 1 somewhat conventionally illustrates a plate casting mold 1 tiltably supported on a suitable base 2. The mold includes a bed 3 having pintles 4 projecting from opposite sides thereof intermediate of its ends. The pintles 4 are rotatably supported in suitable bearings in the base

2

so that the bed may be tilted from the horizontal position illustrated in full lines in Fig. 1 to the vertical position indicated in dotted lines. Power means for tilting the bed such as the hydraulic cylinder 5 may be provided.

The bed 3 is chambered as at 6 with the upper and inner wall of the chamber forming the casting face 7 of the mold box. The interior of the chamber in the bed is provided with transversely extending ribs 8 which provide a circuitous path through the chamber.

One side of the bed 3 is provided with a longitudinal wall 9 extending from the lower end of the bed to the pintle and the extension and pintle co-act to form an outlet passage 10 communicating with the top of the chamber 6 through a port 11. The opposite side and end of the bed carries a longitudinal wall 12 that provides an inlet passage 13 opening between a port in the lower end of the chamber and a passage drilled through the opposite pintle. Running seals, one of which is illustrated at 14 provide fluid connections to the passages 10 and 13.

Hinged to the bottom of the bed as at 15 is a cover 16 adapted to be closed over the casting face 7 of the bed. Means are provided for clamping the cover to the bed and in the present instance clamp bolts 17 and nuts 18 conventionally illustrate this means. In casting type plates bearer strips 19 are positioned along the sides and bottom of the bed and clamped thereagainst by the cover as is common in plate casting apparatus.

Associated with the mold 1 are a heater 20 and cooler 21 for a heat transfer fluid. A hot fluid pump 22 is connected to deliver from a conduit 23, expansion tank 24, conduit 25, one of the running seals 14, and the passage 12 to the bottom of the mold chamber to deliver fluid to the bottom of the heater. A cold fluid pump 26 is connected to deliver from the cooler 21 to a conduit 27, expansion tank 28, a branch of the conduit 25, and the bottom of the chamber in the mold bed. A fluid conduit 29 is connected to the other running seal to communicate between the top of the chamber in the mold bed and a two way valve 30. The valve 30 is connected to direct fluid alternatively to the conduit 31 and the cooler or from the conduit 32 and the heater.

The expansion tank 28 is desirably connected to a source of air pressure as at 33 to maintain the system under pressure. A thermometer indicated at 34 indicates the temperature of the fluid being returned from the chamber in the mold bed while a second thermometer has its bulb or heat responsive element 35 positioned to indicate the temperature of the mold bed. The heat transfer system formed by the mold bed chamber, cooler, heater and conduits is filled with a liquid that desirably has the property of having a high heat holding capacity and of remaining liquid when subjected to high temperature. One desirable type of liquid is a eutectic mixture of diphenyl and diphenyloxide. Such a liquid will keep its liquid character when heated as high as 500°. By providing 20 pounds air pressure on the expansion tank 28 this liquid can be heated as high as 700° to 750° without vaporizing.

In casting a printing plate in the mold 1 the electrotype shell 36 is placed on the casting face 7. Desirably the shell is tinned as in common practice and it is further desirable that the shell shall be further annealed. The bearer strips 19 are placed around the shell and silicone rubber sealing strips 37 are placed over the bottom and side edges of the shell inwardly of the bearer strips. The cover 16 is then closed and clamped upon the bearer strips and sealing strips to hold the shell in place. This

3

leaves a casting cavity 38 behind the shell which cavity is open at the top when the mold is elevated or tilted at vertical position. Prior to closing and clamping the cover 16 an insulating panel such as press board is placed across the face of the cover as at 39. It is pointed out that the casing cavity is substantially longer than the shell and that the shell is positioned along the bottom of the cavity leaving a cavity extension 40 extending substantially above the upper end of the shell. A paper shield 41 is placed over the upper edge of the shell and extended out the top of the cavity. The shield is held to the shell by being pasted thereto or by corks 42 clamped in place by the cover.

After the mold has been clamped and elevated the pump 22 is started and the valve 30 is turned to receive liquid through the conduit 32 from the heater. The heater is operated to deliver hot liquid to the chamber in the mold bed and to heat the bed and the shell. The heat transfer liquid may be heated up to the burning temperature of the metal of the shell, which is approximately 700°, but lower temperatures between 400° and 500° also produce highly satisfactory results. The higher temperature of the bed and shell anneal the shell and the tin coating thereon but with preannealed shells this high temperature is unnecessary. After the mold and shell have reached the desired temperature as indicated by the thermometers 34 and 35 the molten backing metal is delivered into the casting cavity from a spout 43.

Immediately after the casting cavity is filled with molten backing metal the valve 30 is turned to direct liquid from the bottom of the mold body chamber to the cooler 21 and the pump 26 is started. The pump 22 is stopped. Depending upon the capacity of the cooler 21, the mold body and the newly cast plate can be cooled rapidly. The heat of the molten backing metal is sufficient to fuse the tin coating on the shell to securely bond the backing metal to the shell. The temperature differential between the hot backing metal and the cooling liquid should not be so great as to subject the shell to thermal shock but the temperature differential should be great enough to rapidly carry the backing metal through its 4° to 5° solidifying range. Desirably the backing metal is cast at between 600° to 650° and the plate is then cooled to below 570° at which temperature the backing metal solidifies. A satisfactory cycle is to heat the box and shell to 500° by liquid at 520° cast the molten metal at 650° and cool the new plate to 200° by liquid at 150°. Note that the heat transfer liquid does not need to immediately reach the temperature limits stated. For example, 500° liquid will cool 650° metal and both the liquid and metal will fall in temperature as the cooling progresses.

It is pointed out that the hot liquid for heating the mold is still at a temperature lower than the temperature of burning gases which have been used heretofore to heat similar molds. The entire mold and shell are therefore brought to a uniform temperature that is sufficient for casting without danger of burning the shell. The cooling liquid being directed upwardly through the body chamber cools the plate first through the bottom portion of the shell and progressively upward and rearward from the shell. The line of solidification of the backing metal at one point in its cooling stage is indicated at 44 in Fig. 2.

Thus the partly solidified portions of the backing metal are at all times subjected to the hydrostatic pressure of the still molten metal above and behind the line of solidification. This means that all bubbles or voids in the metal will be forced to the rear and top of the plate where they can be easily removed by sawing off the top of the elongated cast plate or by planing a thin layer from the back of the plate.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. Type plate casting apparatus comprising, a mold box bed adapted to receive a type shell, a cover closable over said bed, said bed having a forced-cooling chamber

4

formed therein co-extensive with the shell receiving area thereof, a sheet of heat insulating material disposed over the face of said cover to oppose said bed, said cover being of solid material and exposed to the air on its outer side, a support for said bed and cover adapted to hold the same in alternate horizontal and vertical positions, bearer strips adapted to be positioned between said bed and cover along the bottom and sides thereof relative to the vertical position of the bed, a fluid heater, a fluid cooler, a pair of pumps connected to circulate fluid through said cooler and heater, a fluid conduit and a two way valve connecting the output side of said heater and the input side of said cooler to the upper portion of said chamber, a second conduit connected to the lower end of said chamber and having branches connected to said pumps and said heater and cooler, a thermometer positioned to indicate temperature changes in said chamber, a recirculating system being formed by said conduits, heater, cooler and chamber, an expansion tank in one of said conduits, a source of air pressure exceeding 15 pounds per square inch opening to said tank, and a body of fluid in said heater, chamber and cooler characterized by the property of remaining liquid in the temperature range of 80° to 500° F.

2. Type plate casting apparatus comprising, a mold box bed adapted to receive a type shell, a cover closable in spaced relationship over said bed, said bed having a forced cooling chamber formed therein co-extensive with the shell receiving area thereof, a sheet of heat insulating material disposed over the face of said cover to oppose said bed, said cover being uncooled except by natural radiation from its exposed surfaces, a support for said bed and cover adapted to hold the same in alternate horizontal and vertical positions, means adapted to close the space between said bed and cover along the bottom and sides thereof relative to the vertical position of the bed, a fluid heater, a fluid cooler, means connected to circulate fluid separately through said cooler and heater, a fluid conduit connecting the output side of said heater and the input side of said cooler to the upper portion of said chamber, a second conduit connected to the lower end of said chamber and having branches connected to said heater and cooler, a two way valve associated with one of said conduits to selectively direct fluid from said heater and said cooler to said chamber, a thermometer positioned to indicate temperature changes in said chamber, a recirculating system being formed by said conduits, heater, cooler and chamber, an expansion tank in one of said conduits, a source of air pressure exceeding 15 pounds per square inch opening to said tank, and a body of fluid in said system characterized by the property of remaining liquid at atmospheric pressure in the temperature range of 80° F. to 500° F.

3. Type plate casting apparatus comprising, a mold box bed adapted to receive a type shell, a cover closable in spaced relationship over said bed, said bed having a forced cooling chamber formed therein substantially covering the shell receiving area thereof, a heat insulating surface on the face of said cover opposed to said bed, said cover being uncooled except by natural radiation from its exposed surfaces, a support for said bed and cover adapted to hold the same in alternate horizontal and vertical positions, means adapted to close the space between said bed and cover along the bottom and sides thereof relative to the vertical position of the bed, a fluid heater, a fluid cooler, a fluid conduit connecting the output side of said heater and the input side of said cooler to the upper portion of said chamber, a second conduit connected to the lower end of said chamber and having branches connected to said heater and cooler, means for circulating fluid through said chamber, means for selectively directing the circulated fluid to said cooler and heater, a recirculating system being formed by said conduits, heater, cooler and chamber, and a body of fluid in said system characterized by the property of remaining

5

liquid at atmospheric pressure in the temperature range
of 150° F. to 500° F.

References Cited in the file of this patent

UNITED STATES PATENTS

672,859	Ringler	Apr. 23, 1901
821,845	Albert	May 29, 1906
915,021	Dunton	Mar. 9, 1909
1,698,624	Dale	Jan. 8, 1929

5

2,134,827
2,177,168
2,182,114
2,442,246
2,536,692
2,646,601

498,637

6

Huck	Nov. 1, 1938
Van Bolt	Oct. 24, 1939
Bungay	Dec. 5, 1939
Peterson	May 25, 1948
Miller	Jan. 2, 1951
Jung	July 28, 1953

FOREIGN PATENTS

Great Britain	Jan. 11, 1939
---------------	---------------