Feb. 14, 1933. M. L. DOELMAN 1,897,926.

MOLD

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Fig. 15.

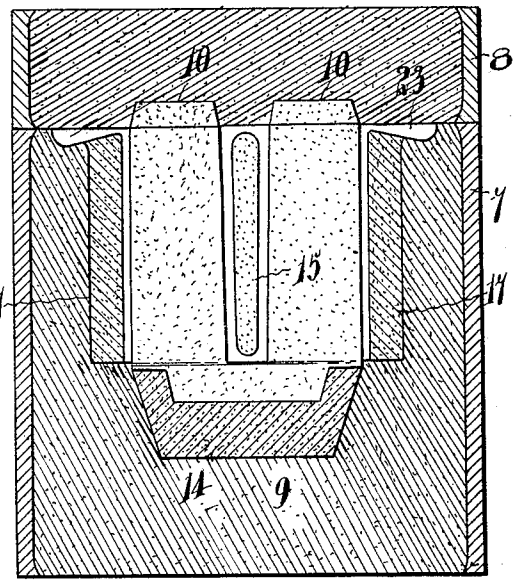


Fig. 14.

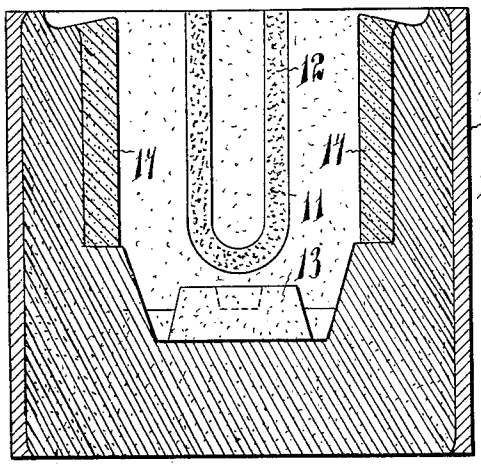
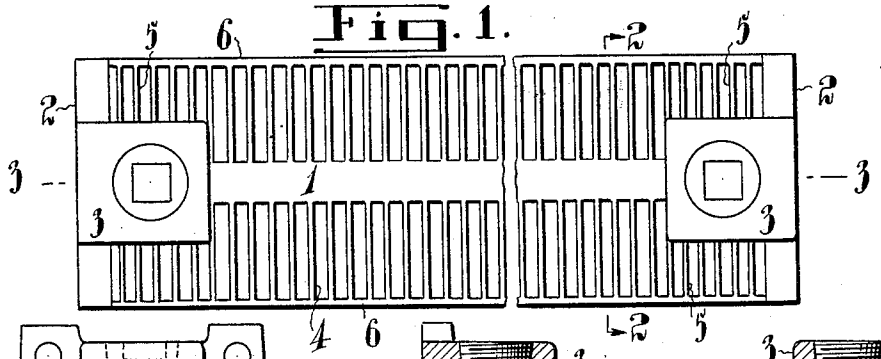


Fig. 1.



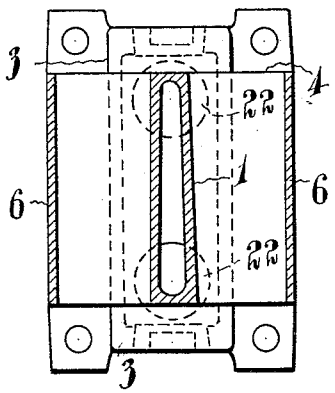


Fig. 2.

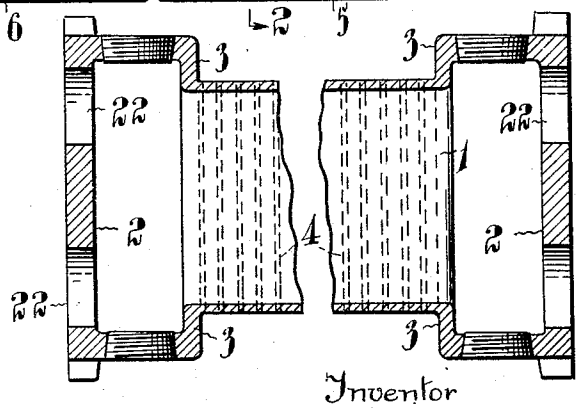


Fig. 3.

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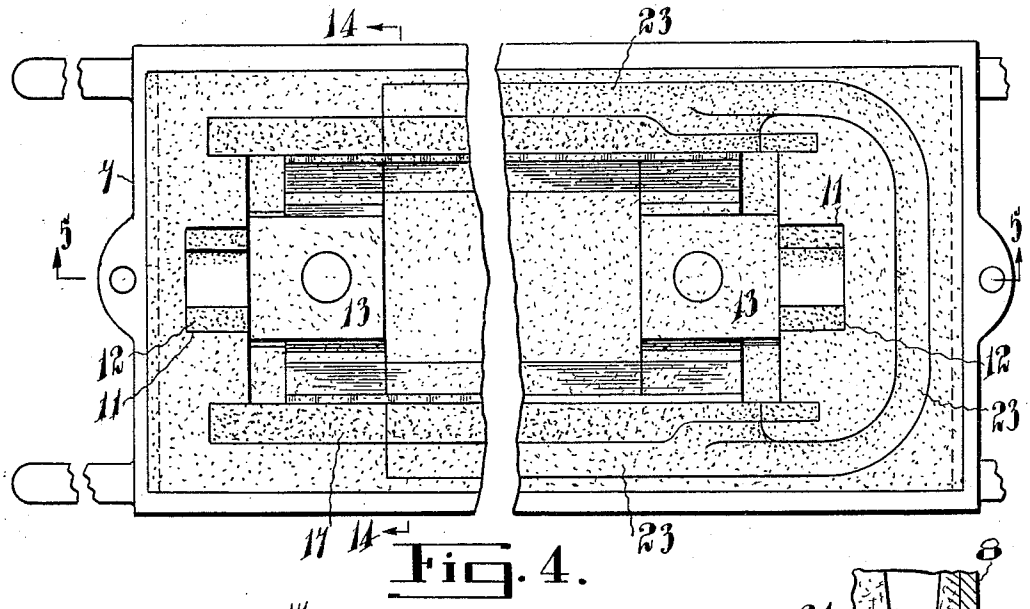

Fig. 4.

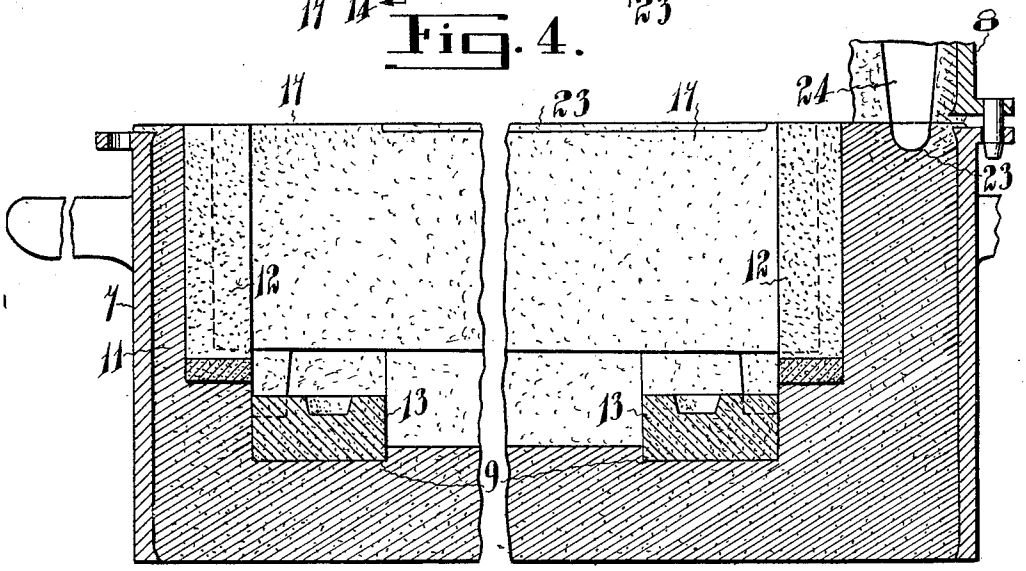

Fig. 5.

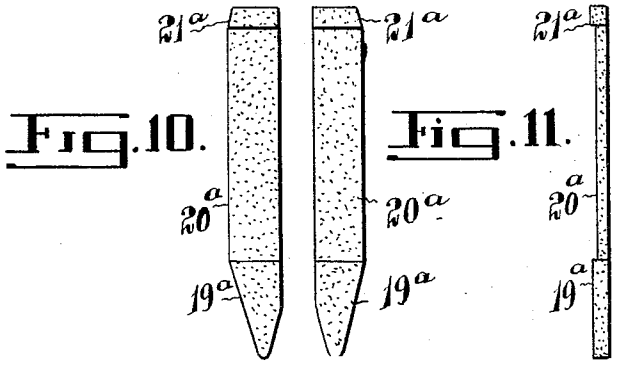

Fig. 10.

Fig. 11.

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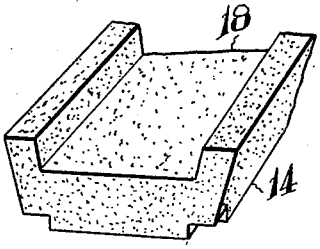
Fig. 6.



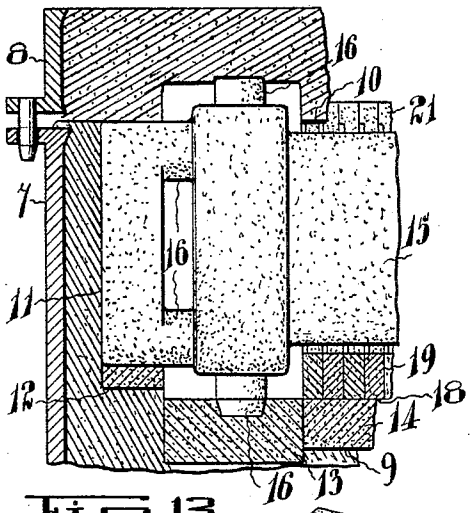


Fig. 13.

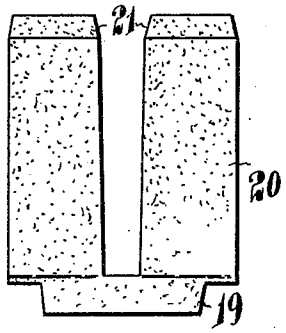


Fig. 7.

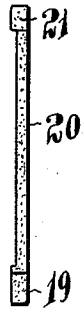


Fig. 8.

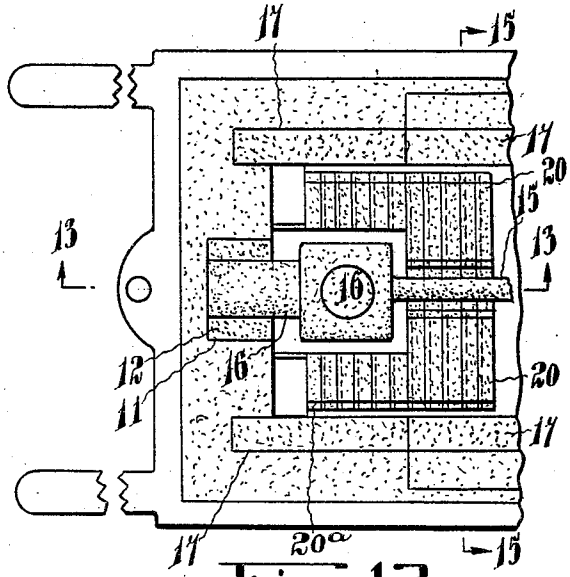


Fig. 12.

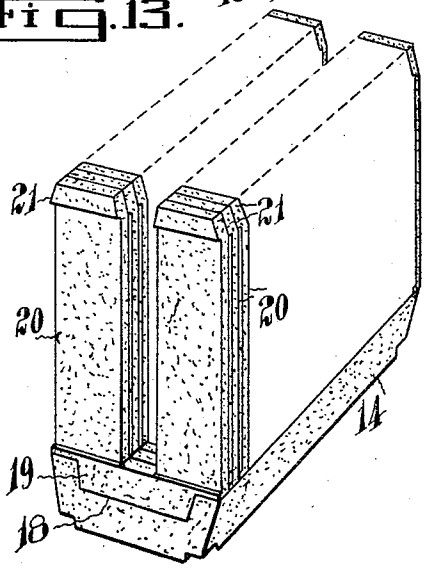


Fig. 9.

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UNITED STATES PATENT OFFICE

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MOLD

Application filed December 15, 1931, Serial No. 581,258. Renewed October 31, 1932.

This invention relates to the molding of bodies provided with a series of thin closely spaced projecting ribs, such, for example, as radiator castings formed with radiating fins.

Radiators in which the walls of the waterways are provided with such fins are commonly employed in vertical air flues located against or partly in the walls of rooms to be heated, the flues serving to induce a flow of air over the heat-transferring surfaces of the radiators, and the conditions are such that to secure a maximum heat transfer from the radiator, the fins must be very thin and in perfect conducting relationship with the walls of the waterways. Owing to the difficulties met in casting such fins integral with the walls of the waterways, it has been usual to employ preformed sheet metal fins and to either cast the edges of such fins in the walls of the waterways or to provide some form of mechanical engagement. There are, however, objections to both methods, and my object is to devise a simple, cheap and effective system of molding, and means therefor, which will enable me to perfectly cast the fins integral with the waterways and of a thinness and relative length not previously obtainable commercially, and with any desired spacing.

In my co-pending application No. 519,708 I have disclosed a process and apparatus which in a large measure attains the above object and the present application is directed to certain improvements on my invention designed to facilitate production and improve the product.

In the preferred arrangement I formed longitudinal imprints in the upper and lower parts of the flask and the core sections were separately positioned with their ends received in these imprints. Intermediate of their ends, the sections were decreased in thickness, thus leaving narrow spaces into which the molten metal flowed, when the mold was poured, to form the fins. A longitudinal core to form the hollow of the waterway was positioned by end core imprints in the mold cavity and in suitable position relative thereto and the transverse core sections to define the thickness of the walls of the waterway.

In the present invention the core sections are assembled on a suitable base so that a complete core defining, in co-operation with the walls of the mold cavity, the external surfaces of the walls of the waterway and the sides of the fins may be positioned as a unit in the mold cavity.

The gating of the mold is so arranged that the molten metal, when the mold is poured, flows through the narrow spaces between the core sections on its way to the spaces for forming the walls of the waterway. The flowing metal is thus screened of dross before reaching the spaces which, when filled, form the said walls. A thoroughly sound casting is thus assured.

To ensure a well finished casting I provide liners of baked sand for the end core imprints and for the sides of the mold cavity.

Further features of novelty lie in the details of the process and apparatus as hereinafter described and illustrated in the accompanying drawings in which

Fig. 1 is a plan view of a casting made in the manner and by the apparatus described;

Fig. 2 a cross section of the same on the line 2—2 in Fig. 1;

Fig. 3 a longitudinal section, partly broken away, on the line 3—3 in Fig. 1;

Fig. 4 a plan view, partly broken away, of the drag of a molding flask ready for the insertion of the cores;

Fig. 5 a vertical longitudinal section on the line 5—5 in Fig. 4;

Fig. 6 a perspective view of part of the base for the sectional core;

Fig. 7 a front elevation of a core section;

Fig. 8 a side elevation of the same;

Fig. 9 a perspective view of sectional core assembly;

Fig. 10 a front elevation of a pair of narrow core sections;

Fig. 11 a side elevation of one of said sections;

Fig. 12 a plan view of part of the drag with the cores in place;

Fig. 13 a section on the line 13—13 in Fig. 12 showing also part of the cope;

Fig. 14 a vertical cross section of the drag on the line 14—14 in Fig. 4; and

Fig. 15 a vertical cross section on the line 15—15 in Fig. 12.

On reference to Figs. 1 to 3 of the drawings the shape of the casting to be made will be understood. This particular casting comprises a longitudinal waterway 1, headers 2, hollow bosses 3 at the inner side of the header and of less width than said headers, and narrow, closely-shaped transverse fins 4 integral with the side walls of the waterway. Preferably narrow fins 5 are formed integral with the side walls of the bosses 3. Preferably, also, the ends of the fins 4 and 5 are cast integral with thin walls 6. Openings 22 for nipple connections are formed in each header.

The apparatus for casting the article is illustrated in Figs. 4 to 15 of the drawings. 7 is the drag of a molding flask and 8 the cope, their plane of parting being normally horizontal. In the cope and drag I form a mold cavity by means of the usual pattern which also forms core imprints and recesses for liners. In the drag is formed the longitudinal imprint 9 and in the cope the longitudinal imprints 10. In the ends of the mold cavity in the drag I form the core imprints 11. In these end imprints I position the U-shaped liners 12. In the bottom imprint 9 I position at each end a block or liner 13. Between these blocks 13 is a space in the imprint adapted to receive the baked-sand base 14 of a core assembly adapted, in co-operation with the walls of the mold cavity and a waterway core to define the walls and fins of the finished casting.

In general this core assembly is of a U-form, leaving a central passageway for the longitudinal core 15 forming the hollow of the waterway. The core 15 is shown as having its ends positioned by the liners 12 in the imprints 11. Its ends are suitably spaced from the walls of the mold cavity and are provided with projections 16 which extend to the walls of the mold cavity and from openings into the headers 2 of the casting. The upwardly extending projections 16 engage the wall of the mold cavity in the cope, while the ends of the downwardly extending projections are received in recesses in the blocks 13, which assist in positioning and supporting the core 15.

The sides of the mold cavity are formed by baked-sand liners 17.

In making up the core assembly I provide the base 14, hereinbefore referred to, with a longitudinal trough 18 at its upper side. On this base I assemble a series of transverse core sections of U-form. Each section comprises a lower end 19 fitting the trough 18, ends 21 adapted to be received in the imprints 10, and the intermediate parts 20.

The end parts being of greater thickness than the parts 20, spaces are thus formed between the latter into which molten metal may flow to form the fins.

In making up the core assembly the parts are usually coated with any suitable adhesive to assist in retaining them in place. The core-assembly, complete as shown in Fig. 9 is first positioned in the mold cavity as hereinbefore referred to. Then the longitudinal core 15 is dropped into place. Next I place in position narrow transverse core sections each comprising a lower end 19^a, an upper end 21^a and an intermediate part 20^a. The lower ends are received in the longitudinal imprint 9 in the drag beside the blocks 13 and the upper ends in the imprints 10 in the cope when the latter is put in position. In the upper surface of the part of the mold contained in the drag I form the gates 23 which are connected at one end of the mold. The gates communicate with the outer upper ends of the spaces between the core parts 20 and with the outer upper ends of the spaces between the core parts 20^a since the gates extend to the cavity in which the core sections are placed (see Figs. 5 and 15). The cope has the sprue 24 formed therein communicating with the connecting portion of the gates 23. Vents will be provided positioned and arranged as is common in the art. When the cope is positioned it will be seen that the mold cavity and the cores define the inner and outer walls of the waterway and headers, the fins, and the walls connecting the outer ends of the latter, so that, when the mold is poured, the molten metal flows inwardly and downwardly from the gates at each side of the mold and fills the spaces.

As the inside and outside surfaces of the casting are defined during casting by hard, smooth baked-sand surfaces, the result is a very smooth casting offering very little frictional resistance to the flow of fluids over its surface, which is very important when the passageways are as narrow as those illustrated.

Owing to the arrangement described for passing the molten metal to the waterway through the fin spaces, a sound waterway casting is ensured, which enables me to cut down the thickness of its walls to a minimum, which gives more rapid conduction and quicker heat transfer.

What I claim as my invention is:

1. A mold for forming a longitudinal hollow member with transverse fins comprising a horizontally divided flask having a mold cavity formed therein with end core imprints, and a bottom longitudinal core imprint; a longitudinally extending core for forming the hollow of the aforesaid member positioned by the end core imprints and spaced from the walls of the mold cavity; and a core for forming the spaces between the transverse fins aforesaid spaced from the longitudinal

core and comprising a core base fitted into the bottom longitudinal imprint, and a series of fin core sections assembled on the base and extending up from the base to the top of the mold cavity and forming spaced walls between which molten metal can flow to form the fins aforesaid.

2. A mold according to claim 1 in which the fin core sections are spaced by parts integral with the sections themselves at top and bottom forming closures for the spaces, and in which the top of the mold cavity is formed with a longitudinal core imprint in which the upper ends of the core sections are received.

3. A mold for forming a longitudinal hollow member with transverse fins comprising a horizontally divided flask having a mold cavity formed therein with end core imprints, and a bottom longitudinal core imprint; a longitudinally extending centrally positioned core for forming the hollow of the aforesaid member positioned by the end core imprints; and a core for forming the spaces between the transverse fins aforesaid spaced from the longitudinal core and comprising a core base fitted into the bottom longitudinal imprint, and a series of fin core sections of U-form assembled on the base and extending up from the base to the top of the mold cavity at each side of the longitudinal core and forming spaced walls between which molten metal can flow to form the fins aforesaid.

4. A mold according to claim 3 in which the core sections are spaced by parts integral with the sections themselves at top and bottom forming closures for the spaces, and in which the top of the mold cavity is formed with longitudinal core imprints in which the upper ends of the core sections are received.

5. A mold for forming a longitudinal hollow member with transverse fins comprising a horizontally divided flask having a mold cavity formed therein with end core imprints, and a bottom longitudinal core imprint; a longitudinally extending core for forming the hollow of the aforesaid member positioned by the end core imprints and spaced from the walls of the mold cavity; and a core for forming the spaces between the transverse fins aforesaid spaced from the longitudinal core and comprising a core base fitted into the bottom longitudinal imprint and formed with a trough in its upper side, and a series of spaced fin cores assembled on the base and extending up from the base to the top of the mold cavity and forming spaced walls between which metal can flow to form the fins aforesaid, the parts of the cores received in the trough in the base being thickened to provide the spacing.

6. A mold for forming a longitudinal hollow member with transverse fins comprising a horizontally divided flask having a mold cavity formed therein with end core imprints; preformed U-shaped baked-sand liners fitted in said imprints; a longitudinally extending core for forming the hollow of the aforesaid member supported in the liners of the aforesaid core imprints and spaced from the walls of the mold cavity; a series of transverse parallel fin core sections positioned in the cavity aforesaid in spaced relation to one another and to the longitudinal core aforesaid, said core sections engaging the top and bottom of the mold cavity and forming spaced walls between which molten metal can flow to form the fins aforesaid.

7. A mold for forming a longitudinal hollow member with transverse fins comprising a horizontally divided flask having a mold cavity formed therein with end core imprints baked-sand blocks positioned in the bottom of the mold cavity at each end to define the under surfaces of the ends of the hollow member; a longitudinally extending core for forming the hollow of the aforesaid member, positioned by the core imprints and spaced from the walls of the mold cavity; and a series of transverse parallel fin core sections positioned in the cavity aforesaid in spaced relation to one another and to the longitudinal core aforesaid, said core sections engaging the top and bottom of the mold cavity and forming spaced walls between which molten metal can flow to form the fins aforesaid.

8. A mold for forming a longitudinal hollow member with transverse fins comprising a horizontally divided flask having a mold cavity formed therein with end core imprints; baked-sand blocks positioned in the bottom of the mold cavity at each end to define the under surfaces of the ends of the hollow member; a longitudinally extending core for forming the hollow of the aforesaid member, positioned by the aforesaid core imprints and spaced from the walls of the mold cavity; and a core for forming the spaces between the transverse fins comprising a core base fitted into the bottom of the mold cavity between the blocks aforesaid; and a series of spaced fin cores assembled on the base and extending up from the base to the top of the mold cavity and forming spaced walls between which molten metal can flow to form the fins aforesaid.

9. A mold for forming a longitudinal hollow member with transverse fins comprising a horizontally divided flask having a mold cavity formed therein; a longitudinally extending centrally positioned core for forming the hollow of the aforesaid member supported in the mold cavity and spaced from its walls; a series of transverse parallel fin core sections positioned in the cavity aforesaid at each side of the longitudinal core aforesaid and in spaced relationship to one another and the said core, said core sections engaging the top and bottom of the mold cavity and between them forming spaces into which

metal can flow to form the fins and thence to form the walls of the waterway; and a gate at each side of the flask communicating with the fin spaces.

10. A mold for forming a longitudinal hollow member with transverse fins comprising a horizontally divided flask having a mold cavity formed therein; a longitudinally extending centrally positioned core for forming the hollow of the aforesaid member supported in the mold cavity and spaced from its walls; a series of transverse parallel fin core sections positioned in the cavity aforesaid at each side of the longitudinal core aforesaid and in spaced relationship to one another and the said core, said core sections engaging the top and bottom of the mold cavity and between them forming spaces into which metal can flow to form the fins and thence to form the walls of the waterway; and a gate at each side of the flask communicating with the fin spaces at points remote from the longitudinal core.

11. A mold for forming a longitudinal hollow member having headers at opposite ends thereof and laterally projecting fins at opposite sides thereof, including a longitudinally extending core having a relatively thin and substantially flat elongated body for forming the hollow of the aforesaid member and having enlargements at opposite ends thereof for forming the headers, and a series of vertically disposed fin cores having portions respectively spaced beneath and upon opposite sides of said elongated body between said enlargements, the upper and lower ends of said fin cores being thickened and arranged in abutting relation so that spaces are provided between the intermediate portions of said fin cores into which metal may flow to form the fins.

12. A mold for forming a longitudinal hollow member having two series of spaced laterally projecting fins, one series at each side thereof, including a longitudinally extending core having a relatively thin and substantially flat elongated body for forming the hollow of the aforesaid member, and a series of vertically disposed fin cores having portions respectively spaced beneath and upon opposite sides of said elongated body, the upper and lower ends of said fin cores being thickened and arranged in abutting relation so that spaces are provided between the intermediate portions of said fin cores into which metal may flow to form the fins.

13. A mold for forming a longitudinal hollow member having headers at opposite ends thereof, and spaced fins projecting laterally from opposite sides of said member and headers, including a longitudinally extending core having a relatively thin and substantially flat elongated body for forming the hollow of the aforesaid member and having enlargements at opposite ends thereof for forming the headers, said enlargements being provided at the top and bottom thereof with projections for forming openings into the headers, and a series of vertically disposed fin cores having portions respectively spaced beneath and upon opposite sides of said elongated body and enlargements, the upper and lower ends of said fin cores being thickened and arranged in abutting relation so that spaces are provided between the intermediate portions of said fin cores into which metal may flow to form the fins.

14. A mold for forming a longitudinal hollow member having headers at opposite ends thereof, spaced fins projecting laterally from opposite sides of said member and headers, end walls at the outer ends of said headers, and side walls extending between said end walls at the outer edges of said fins, including a longitudinally extending core having a relatively thin and substantially flat elongated body for forming the hollow of the aforesaid member and having enlargements at opposite ends thereof for forming the headers, a series of vertically disposed fin cores having portions respectively spaced beneath and upon opposite sides of said elongated body and enlargements, the upper and lower ends of said fin cores being thickened and arranged in abutting relation so that spaces are provided between the intermediate portions of said fin cores into which metal may flow to form the fins, means cooperating with the upright outer edges of the fin cores to provide spaces in which the metal may flow to form the side walls aforesaid, and means cooperating with the last mentioned means and with said fin cores and enlargements to provide spaces in which the metal may flow to form the end walls aforesaid.

15. A mold for forming a longitudinal hollow member having headers at opposite ends thereof and spaced fins projecting laterally from opposite sides of said member between said headers, including a longitudinally extending core having a relatively thin and substantially flat elongated body for forming the hollow of the aforesaid member and having enlargements at opposite ends thereof for forming the headers, and a series of vertically disposed substantially U-shaped fin cores straddling the elongated body between said enlargements, the upper and lower ends of said fin cores being thickened and arranged in abutting relation so that spaces are provided between the intermediate portions of said fin cores into which metal may flow to form the fins.

16. A mold for forming a longitudinal hollow member having headers at opposite ends thereof, and spaced fins projecting laterally from opposite sides of said member and headers, including a flask having a mold cavity formed therein with end core imprints and a bottom longitudinal core imprint, a

longitudinally extending centrally positioned core for forming a hollow of the aforesaid member and having enlargements at opposite ends thereof for forming the headers, said enlargements being positioned by the end core imprints, and a core for forming the spaces between the laterally projecting fins aforesaid spaced from the longitudinal core and including a core base engaging the bottom longitudinal imprint, and a series of fin core sections assembled on the base and extending upwardly therefrom to the top of the mold cavity at each side of the longitudinal core and enlargements and forming spaced walls between which molten metal may flow to form the fins aforesaid.

Signed at Toronto, Canada, this 12th day of November, 1932.

MYRON L. DOELMAN.