May 23, 1950 R. T. LEISK 2,509,154

CASTING ARRANGEMENT

Filed Jan. 25, 1947 3 Sheets-Sheet 1

Fig. 1

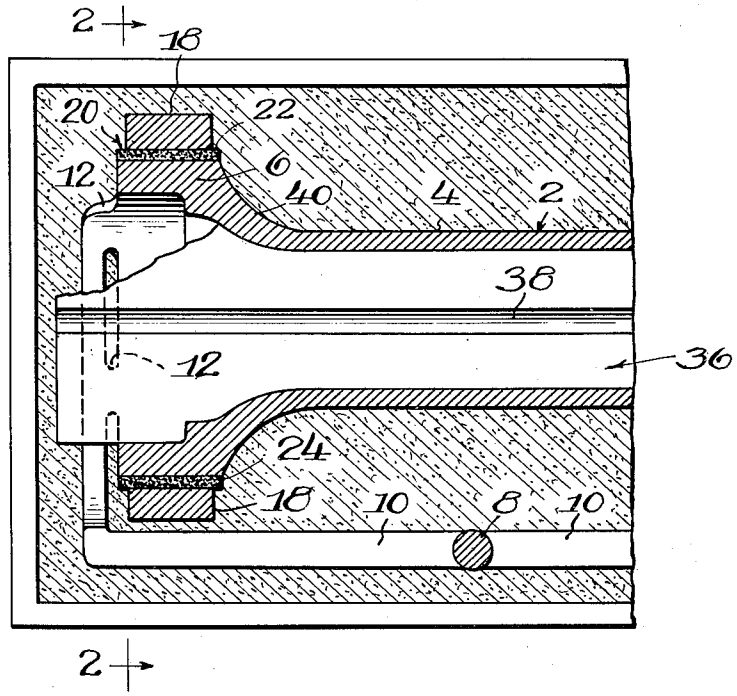
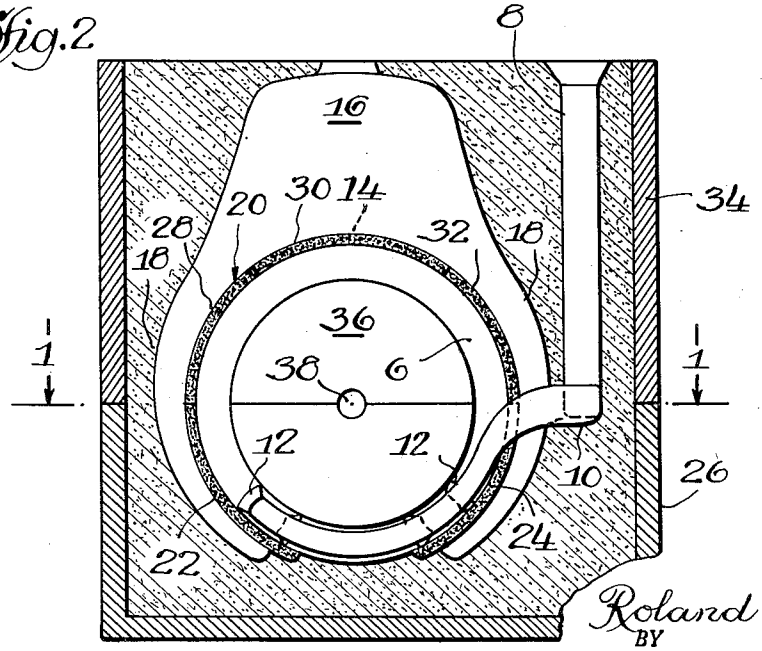


Fig. 2



INVENTOR.
Roland T. Leisk,
BY
Wm. O. B. Garner
Atty.

May 23, 1950 R. T. LEISK 2,509,154

CASTING ARRANGEMENT

Filed Jan. 25, 1947 3 Sheets-Sheet 2

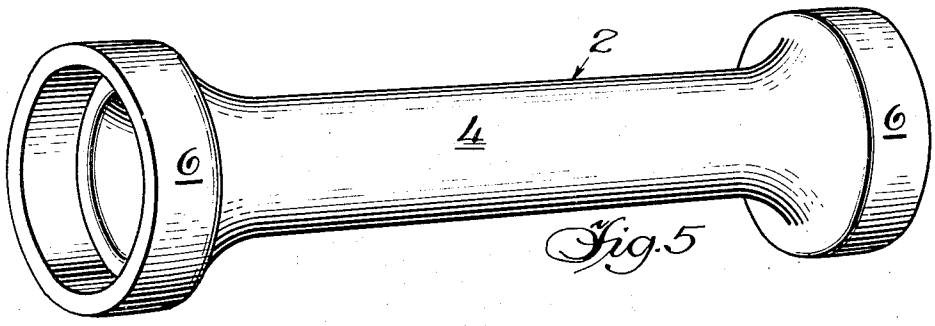


Fig. 5

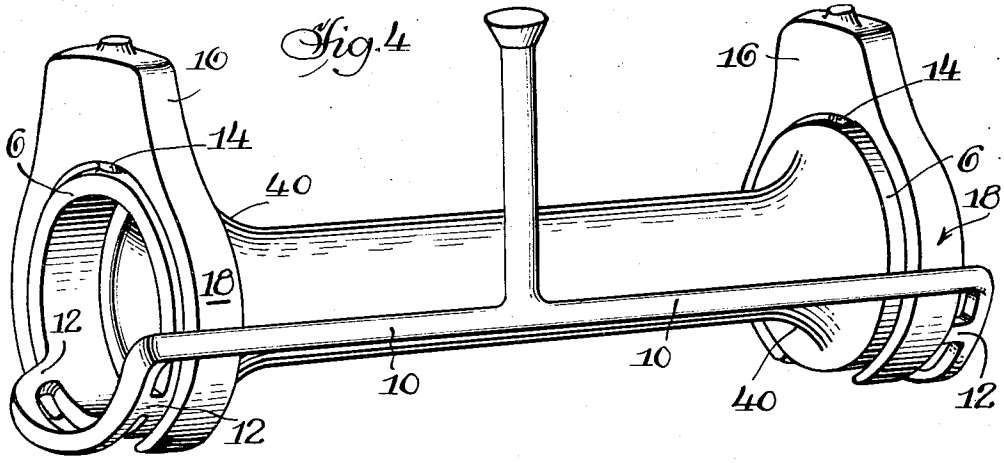


Fig. 4

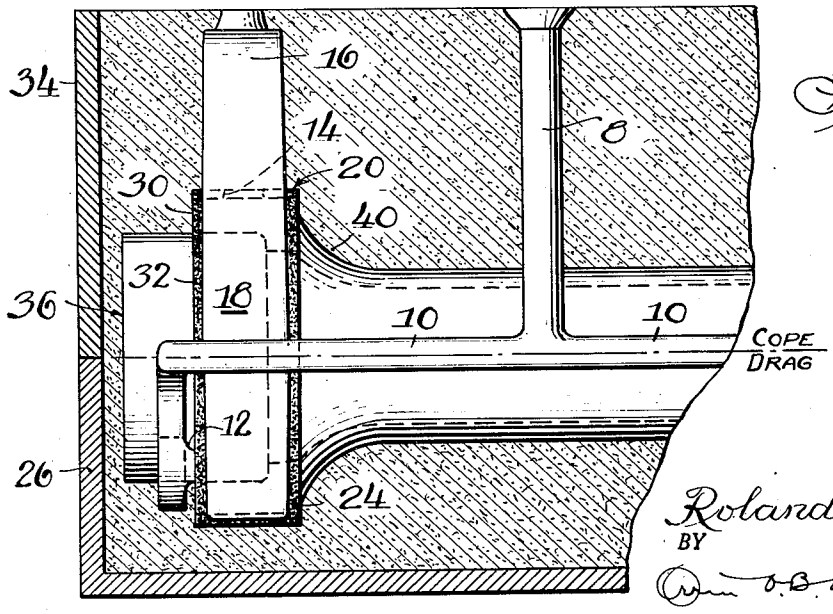


Fig. 3

INVENTOR.
Roland T. Leisk,
BY
Wm. O. B. Garner
Atty.

May 23, 1950 R. T. LEISK 2,509,154

CASTING ARRANGEMENT

Filed Jan. 25, 1947 3 Sheets-Sheet 3

Fig. 7

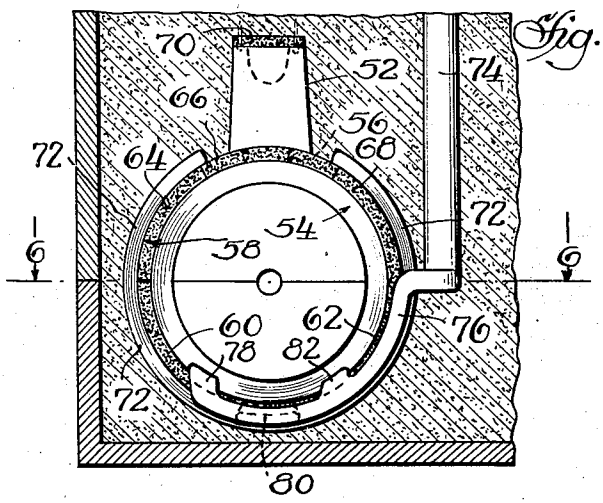


Fig. 10

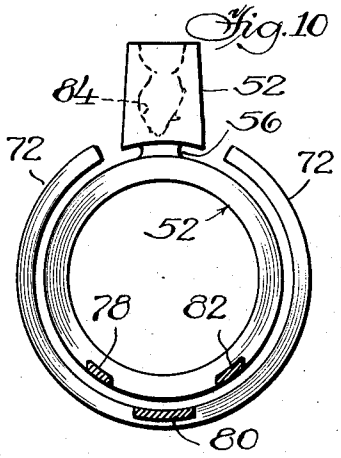


Fig. 6

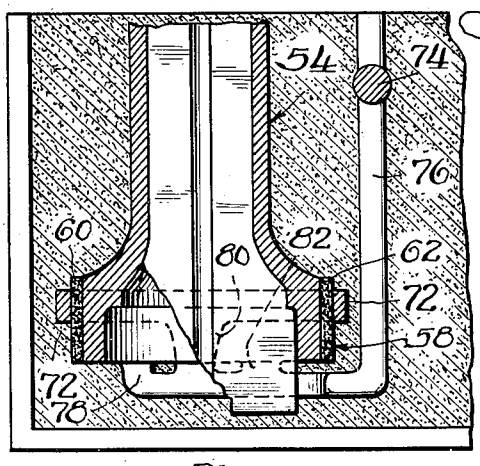


Fig. 9

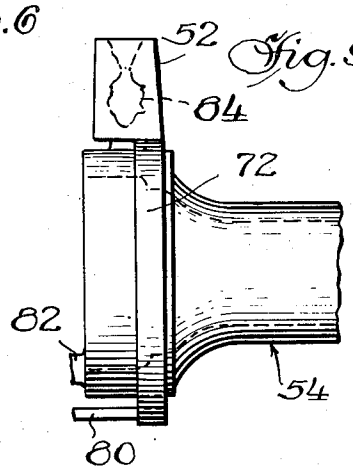
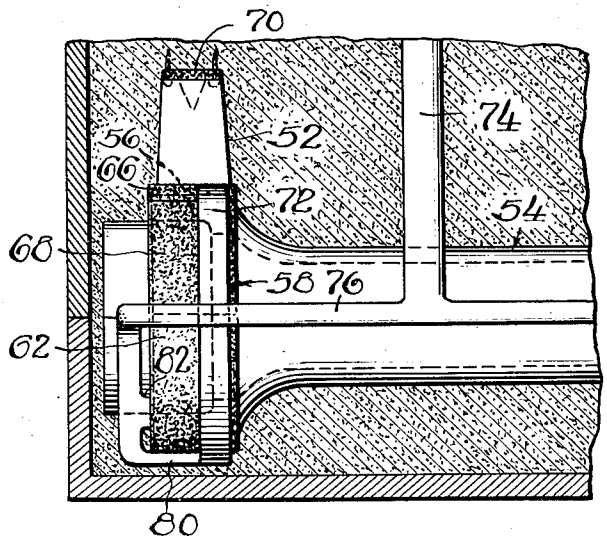


Fig. 8



INVENTOR.
Roland T. Leisk,
BY
Wm. O. Garner
Atty.

Patented May 23, 1950 2,509,154

UNITED STATES PATENT OFFICE

2,509,154

CASTING ARRANGEMENT

Roland T. Leisk, East St. Louis, Ill., assignor to American Steel Foundries, Chicago, Ill., a corporation of New Jersey

Application January 25, 1947, Serial No. 724,426

4 Claims. (Cl. 22—134)

1

This invention relates to the casting of metals and more particularly to the production of ferrous castings.

In the production of ferrous castings, such as axle housings for locomotive tender trucks and passenger car trucks, wherein unusually large areas of the casting must be fed by molten metal to prevent shrinkage cavities, it has been necessary according to the practices of the prior art to utilize large risers and connected pads disposed around the sections to be fed. As a result, castings of this type have been formed with large heads and pads surrounding the portions of the castings to be fed. For example, axle housing castings have been conventionally cast with immense risers and pads integrally connected to the risers and to the bell-shaped ends of the castings. This surplus metal, together with the gates, frequently weighed as much or more than the finished casting, thus affording a yield of about 40% in view of melting and foundry losses. Furthermore, longitudinal shrinkage of such castings has tended to produce hot tears at the throats formed by the juncture of the intermediate portion of the casting with the bell-shaped ends thereof, inasmuch as the riser and padding around these ends resisted shrinkage in the molding sand, as hereinafter discussed. This tendency to tearing has been customarily avoided by the use of chills in the throat at each end of the casting.

Accordingly, it is a primary object of the present invention to provide a novel method and means for economically producing ferrous metal castings and increasing yields in the production of such castings.

Another object of the invention is to provide a novel method and means for reducing the size of the riser and padding around castings such as above described.

Another object of the invention is to reduce finishing costs by eliminating integral padding around the casting.

Another object of the invention is to provide a novel method and means for eliminating hot tears in elongated castings with risers at the ends thereof.

Another object of the invention is to eliminate the necessity for chills in the throats of elongated castings with enlarged portions which must be fed by associated risers.

Still another object of the invention is to provide a novel method and means for heating a section of a casting to be fed with a riser while

2

the molten metal flows from the riser into the section to prevent shrinkage cavities therein.

Still another object of the invention is to produce sound castings with better surface conditions, thereby reducing the amount of machine finishing.

The foregoing and other objects and advantages of the invention will become apparent from a consideration of the following specification and the accompanying drawings wherein:

Figure 1 is a fragmentary plan view of the drag of a conventional sand mold with the casting therein partly shown in section along the line 1—1 of Figure 2 to disclose the central core, a portion of which is broken away;

Figure 2 is a vertical cross-sectional view through the mold taken on the line 2—2 of Figure 1 with the casting and cores shown in elevation;

Figure 3 is a fragmentary longitudinal section through the mold at the gate side of the casting which is shown in elevation;

Figure 4 is a perspective view of the unfinished casting after it has been removed from the mold;

Figure 5 is a perspective view of the finished casting;

Figure 6 is a fragmentary plan view similar to Figure 1 illustrating a modification of the invention, the casting being partly shown in section along the line 6—6 of Figure 7;

Figure 7 is a fragmentary sectional view corresponding to Figure 2 but illustrating the modification of Figure 6;

Figure 8 is a fragmentary longitudinal sectional view corresponding to Figure 3 but illustrating the modification of Figure 6; and

Figures 9 and 10 are respectively a fragmentary side elevation and a fragmentary end view of the casting shown in Figures 6–8 with the gates broken away and the cores removed.

Referring first to Figures 1–5, the invention is illustrated as applied to an axle housing casting generally designated 2 and comprising a hollow elongated tubular portion 4 with a bell-shaped end or hub 6 at each extremity thereof. The casting is shown in Figures 1–4 with a gate 8, runners 10 and sprues 12 connecting each runner 10 to the associated hub 6. Each of the hubs is connected by a neck 14 to an open riser 16 having heating pad portions 18 disposed around the hub 6 and spaced therefrom by a ring core 20. The core 20 is preferably formed of five segments, two of which are indicated at 22 and 24 in the drag 26 of the mold, and three are indicated at 28, 30 and 32 in the cope 34, as best seen in Fig-

ure 2. The center segment 30 of the cope portion of the core is preferably pasted to the segments 28 and 32 and is provided with a suitable opening accommodating the neck 14 of the riser.

A center core, generally designated 36, is also provided and is preferably formed in two halves pasted or doweled together in the usual manner. The core 36 is preferably supported at its ends in the molding sand of the drag and is provided with a longitudinal vent 38 formed by matching grooves in the adjacent faces of the two halves of the core 36.

It may be noted, as best seen in Figures 2 and 3, that the parting line of the cope and drag portions of the mold is in the horizontal plane coinciding with the line 1—1 of Figure 2; and the longitudinal axis of the casting cavity in which the casting 2 is formed lies substantially in the plane of the parting line.

In pouring the casting, the molten metal flows from the gate 8 through the runners 10 and into the sprues 12 and thence into the mold cavity to form the casting 2. The molten metal flows upwardly through the necks 14 to form the risers 16 and heating pads 18. As the molten metal cools within the mold, each hub section 6 is fed with molten metal from the associated riser 16 through its neck 14 to prevent shrinkage cavities in this section. The hub section is heated at this time by the pads 18 to facilitate feeding of the entire hub section as the casting solidifies. The finished casting is formed by breaking or burning off the necks 14 and the sprues 12, and the casting is then ground to the desired finish as shown in Figure 5.

It may be noted that according to prior art practices which have been utilized for years, the riser 16 and pads 18 have been cast integral with the hub sections 6, thereby forming immense ends on the casting. These ends have reduced the metal yield and have increased finishing costs by necessitating burning and grinding of the entire hub section. Furthermore, longitudinal shrinkage of the casting tended to produce hot tears in the throats of the casting, indicated at 40, at the juncture of the hub portions 6 with the intermediate portion 4, thereby necessitating the use of chills in the mold to prevent hot tears at these points.

According to the present invention, however, these chills have been successfully eliminated inasmuch as the relatively small riser necks yield against the thrust of the molding sand thereby reducing stresses in the throats as the casting shrinks. Thus castings of this type have been successfully produced with a lower percentage of defective castings and at much lower cost than in accordance with the prior art practices which have long been regarded as preferred techniques in this art.

Referring now to Figures 6-10, a modification of the invention is shown wherein certain additional advantages are achieved. In this embodiment of the invention each riser 52 is connected to the hub section of the casting 54 through a neck 56 extending through a complementary opening in a core 58 which is formed as a complete ring preferably having two drag segments 60 and 62 and three cope segments 64, 66 and 68. In this embodiment, the riser 52 is a blind riser, and preferably a green sand core 70 projects into the top of the riser to afford a V notch, as seen in Figure 8. This notch permits atmospheric pressure to rupture the top surface of the metal within the riser 52, thereby facilitating feeding of molten metal therefrom to the casting 54, as will be readily understood by those skilled in the art.

It may also be noted that in the embodiment of Figures 6–10 the heating pads 72 are reduced in width and are disconnected from the riser 52 so that molten metal flows from the gate 74 into the runner 76 and thence from three sprues 78, 80 and 82 into the heating pads 72 and into the hub section of the casting 54. In this connection, it will be seen from a consideration of Figures 8 and 9 that the sprue 80 through which metal enters the heating pad cavity is at the lowest point within the mold beneath the level of the sprues 78 and 82. Thus any loose sand which may be washed from the gate of the mold enters the sprue 80, thereby insuring that such sand enters the heating pad 72 rather than the casting 54. Furthermore, in the embodiment of Figures 6–10, the riser 52 is disconnected from the pad 72 so that the metal within the riser is not utilized to feed the pads. This arrangement permits a considerable reduction in the size of the riser.

Another advantage of the modification of Figures 6–10 may be noted in that the metal enters the heating pad cavities at substantially the same rate as the casting cavity within which the casting 54 is formed. Thus the ring core is relieved of stresses which result when the casting cavity is filled first so that the ring core temporarily supports the weight of the metal within the hub portion of the casting cavity.

It will be understood that as the casting solidifies it is fed with molten metal through the neck 56 of the riser 52, the pads 72 being effective to heat the hub section of the casting so that the same cools gradually at this time, thus accommodating the feeding of the metal from the riser into the casting. As above-mentioned, atmospheric pressure ruptures the top surface of the metal within the riser 52 so that atmospheric pressure on the molten metal therewithin facilitates feeding of the casting. After the casting and riser 52 have completely solidified, as seen in Figures 9 and 10, the riser contains a shrinkage cavity, indicated at 84 from which the molten metal has been fed into the casting.

It may be noted that the invention has been described with respect to the casting of an axle housing; however, the invention is equally applicable to other types of castings wherein it is desired to feed unusually large sections or where it is desired to feed an isolated section of the casting without the use of an extra riser.

It is to be understood that I do not wish to be limited by the exact embodiments of the device shown which are merely by way of illustration and not limitation as various and other forms of the device will, of course, be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

I claim:

1. In means for supplying molten metal to feed shrinkage in a solidifying casting, the combination with a mold having a casting cavity and a communicating reservoir for molten feed metal, of a heating pad cavity adjacent to and spaced from the section of said casting cavity communicating with said reservoir, a gate having a connection to said casting cavity, said pad cavity being connected to said reservoir and extending downwardly from opposite sides thereof below the level of said connection and substantially surrounding the casting cavity.

2. A mold comprising a casting cavity having a section to be fed by a riser of molten metal, a riser cavity in said mold above said section and adapted to contain said riser, a pair of heating pad cavities connected at their upper ends to said riser cavity and extending downwardly around said section to a point below the lowest point of said section, a heat permeable sand core spacing said pad cavities from said section, said core having a smaller cross-sectional area than that of each pad, and passage means through said mold for delivering molten metal to at least one of said cavities at a point above the lower extremities of said pad cavities.

3. A metal casting mold comprising a top cope section and a bottom drag section containing a casting cavity and having a parting line along a plane substantially on the longitudinal axis of the cavity, a non-metallic core substantially annular in form and supported in said drag section as a separable unit substantially encircling a portion of said cavity, another core extending through said cavity and supported in said drag section whereby the cores define an annular section of the casting cavity, a riser cavity in the cope portion above said annular section and connected thereto through an opening in the first-mentioned core, heating pad cavities connected to opposite sides of the riser cavity and extending through both mold sections and substantially encircling the first-mentioned core, and a gate having a connection to said annular section at a point below said plane and above the lowest level of said pad cavities whereby feeding of the cooling metal in said annular section by the metal in said riser cavity is ensured.

4. A metal casting mold comprising a top cope section and a bottom drag section containing a casting cavity and having a parting line along a substantially horizontal plane passing through the cavity, a riser cavity connected to the top of the casting cavity, a gate connected to the casting cavity in the drag section at spaced points disposed at opposite sides of a substantially vertical plane passing through said casting cavity, and a heating pad cavity extending upwardly from below said points to at least the level of the connection between the riser and casting cavities, said heating pad cavity being spaced a substantially uniform distance throughout its circumference from said casting cavity and said heating pad cavity being connected to one of said riser and casting cavities.

ROLAND T. LEISK.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,456,855	Midgley	May 29, 1923
1,572,428	Grimes	Feb. 9, 1926
1,678,655	Sipp	July 31, 1928
1,716,833	Rich	June 11, 1929
1,828,271	Arnold	Oct. 20, 1931
1,938,707	Mann	Dec. 12, 1933
2,313,517	Cameron	Mar. 9, 1943
2,431,879	Mebs	Dec. 2, 1947