June 25, 1946. W. C. JARCHOW 2,402,555

APPARATUS FOR FORMING HOLLOW MOLDS

Filed July 16, 1943 2 Sheets-Sheet 1

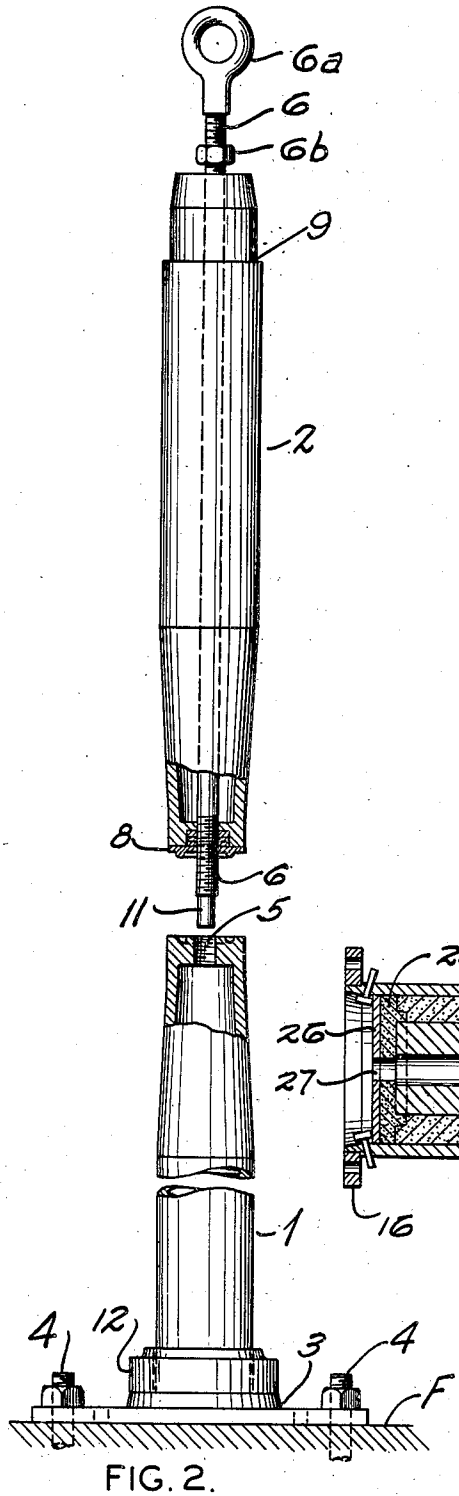


FIG. 2.

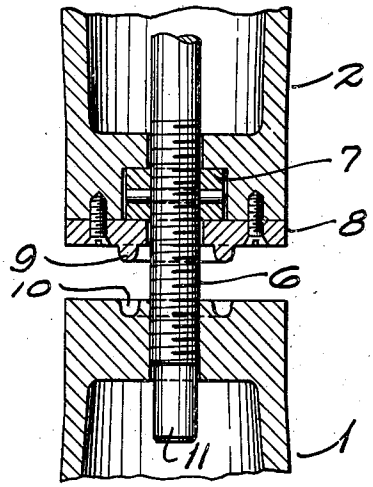


FIG. 3.

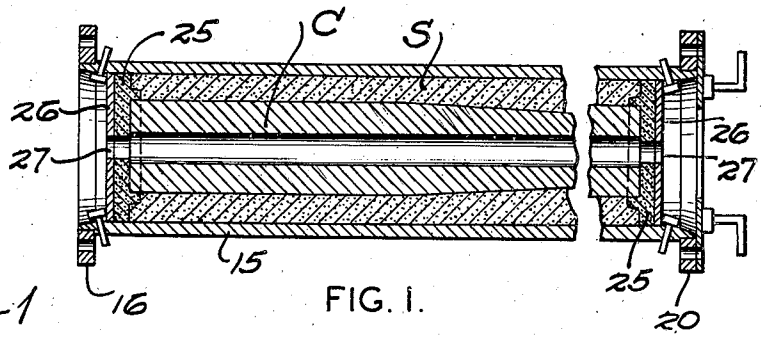


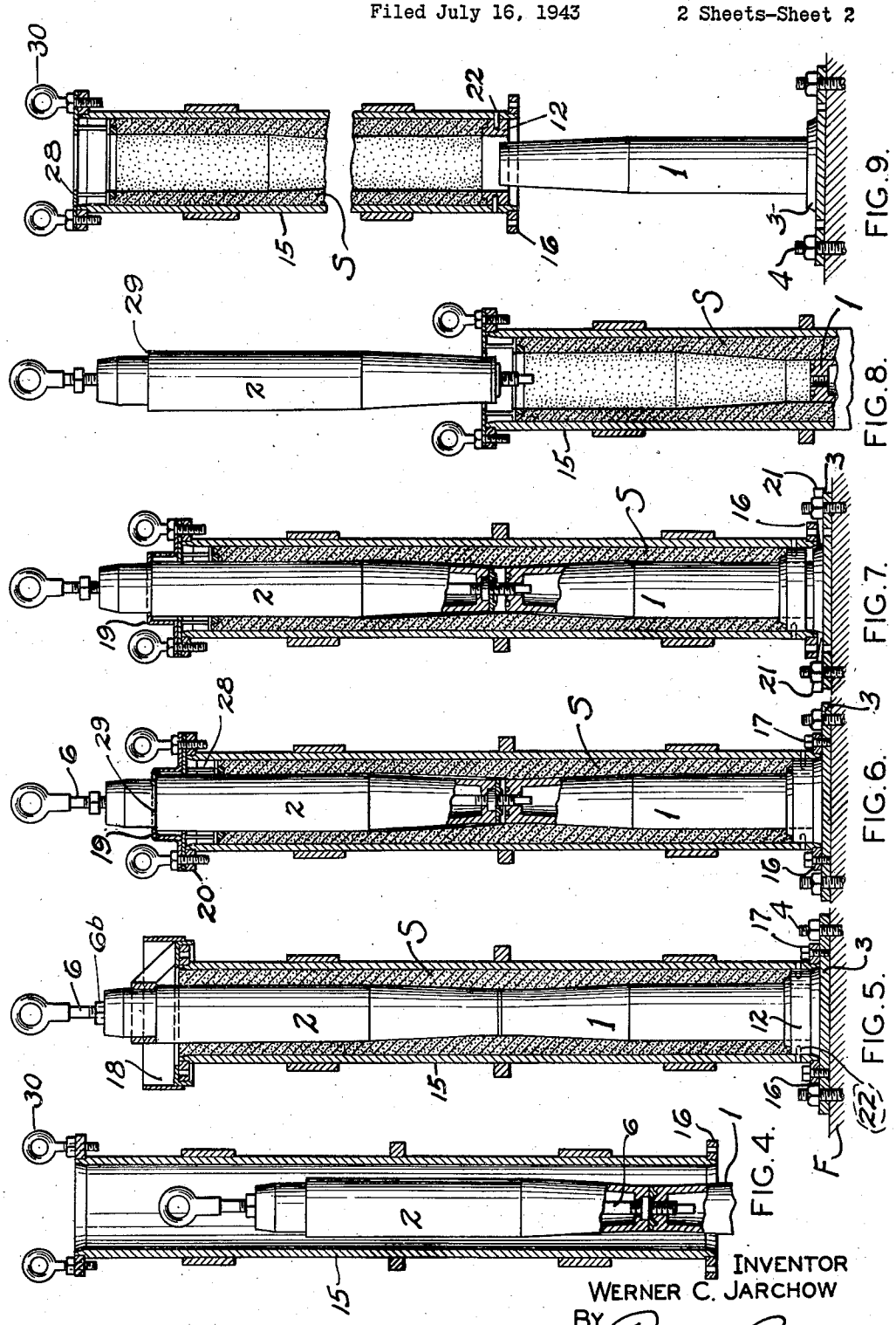
FIG. 1.

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APPARATUS FOR FORMING HOLLOW MOLDS

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APPARATUS FOR FORMING HOLLOW MOLDS

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3 Claims. (Cl. 22—98)

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The invention relates to the molding and casting art, and more particularly to the formation of a mold for centrifugally casting a hollow tubular object having an inner periphery converging lengthwise of the object from its ends towards its middle as, for example, a railway vehicle axle.

The main object of the invention is to produce a mold with a smooth interior periphery throughout its length, avoiding crevices or ridges as might result at the parting of separable flasks.

Another object is to form a mold in a single flask member for centrifugally casting hollow tubular castings of the class referred to above instead of producing such castings in a flask comprising a plurality of sections, as a one piece flask is desirable on account of the high speed at which the flask must revolve in the machine for the centrifugally molding process and for properly balancing the flask while being revolved in the molding machine.

Another object is to simplify and bring to a minimum the expense of forming a suitable mold for an object of the class described, and this is accomplished by providing a two-part pattern that can be removed from the ends of the single flask.

In the accompanying drawings illustrating a selected embodiment of the invention—

Figure 1 is a longitudinal section through a completed mold showing the same in the horizontal position in which it is placed and rotated prior to the introduction of molten metal during a centrifugal casting operation. The metal is shown in the form assumed when the casting operation is finished, i. e. when the metal has congealed. Most of the right hand half of the mold and casting are broken away. It will be understood that this part is a duplication of the left hand half.

Figure 2 illustrates the pattern for the mold, the same being formed in two parts which are shown in an upright position in which they will be placed as they are about to be assembled to form the mold.

Figure 3 is a detail, drawn to an enlarged scale, of the adjacent portions of the two parts of the pattern during initial assembly.

Figures 4–9 illustrate successive steps in the formation of the mold and the separation of the same from the patterns.

The pattern corresponds in contour to an axle and comprises two main sections 1 and 2 (Figure 2). The lower section 1 includes a flanged base 3 whereby the section is secured to the foundry

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floor F by studs 4. A centering ring 12 is slid over section 1 and rests upon base 3. The upper end of section 1 has an axially disposed hole 5 threaded to receive the lower end of a draw rod 6 which is rotatably, but nonslidably, mounted in upper section 2 (Figure 3) by a collar 7, pinned to the rod, and confined in a shouldered recess in the pattern section by a keeper and centering plate 8. The opposing faces of plate 8 and section 1 are provided with annular male and female elements 9 and 10 respectively cooperating with rod 6 to align the patterns axially of each other. Rod 6 extends through the pattern and has an eye 6a at its upper end for a crane hook (not shown). Any suitable means such as a steel bar (not shown) may be inserted in the eye 6a to rotate the rod 6.

The first step in the forming of the mold is to suspend section 2 over section 1 as shown in Figure 2, lowering section 2 until the guiding tip 11 on rod 6 enters hole 5 in section 1, then rotating rod 6 to feed the same into section 1 until the sections are assembled, as shown in Figure 4. A nut 6b may then be turned on rod 6 to tightly clamp the upper part 2 of the pattern to the lower part 1.

Then a tubular flask 15 is lowered over assembled pattern sections 1 and 2 until a base flange 16 on the flask rests upon the base flange 3 of the lower pattern section to which it is bolted by studs 17, as shown in Figure 5, the flask being centered relative to the mold by ring 12. Pins 22 are then inserted through openings in the flask and ring to hold them assembled although, if desired, ring 12 may have been assembled with flask 15 before either the ring or the flask is lowered over pattern lower section 1.

A sandhopper 18 is then applied to the upper end of flask 15 and sand S is discharged and rammed into the space between the pattern and the flask wall surrounding the same until the flask has been filled. Then hopper 18 and the surplus sand are removed and a beader 28 and a yoke 19 (Figure 6) applied and bolted to the upper flange 20 on the flask. (The beader forms the proper contour at the top of the sand mold for the insertion and fitting of an end core 25, see Figure 1, after the mold has been removed from the pattern and the beader 28 removed from the mold.)

The yoke opposes an upwardly facing shoulder 29 on the pattern upper section. Upon unscrewing the draw rod, pattern sections 1 and 2 are forced apart and pattern upper section starts to move through the mold. This movement con-

tinues until shoulder 29 engages yoke 19, whereupon studs 17 are removed and continued unscrewing of rod 6 results in further elevating the pattern upper section and in elevating the flask, including its flange 16, and mold, as a unit so that the parts assume the position shown in Figure 7.

Wedges 21 are then inserted between pattern base 3 and flask flange 16 to form a temporary support for the flask on base 3, yoke 19 is removed, rod 6 unscrewed further until it is freed from pattern lower section 1, whereupon pattern upper section 2 may be lifted bodily from the mold (Figure 8) by a crane hoist, for example.

Then flask 15 is hoisted bodily with the sand mold, by the eyebolts 30, which is supported by ring 12 (Figure 9), to free the mold from pattern lower section 1. The flask and mold are then transferred to a centrifugal casting machine, where it is disposed horizontally (Figure 1), ring 12 and beader 28 are removed from the flask, cores 25 and cover plates 26 are applied to the ends of the flask and mold, and molten metal is poured into the mold through the central opening 27 in the core and plate as the flask and mold are rotated.

Using the apparatus and following the successive steps as described above effects a simple formation of a sand mold with its sides converging inwardly from the ends whereby an elongated hollow casting C is formed of smaller outer diameter at its center than at its ends, and the casting is free from ridges because of transverse parting surfaces.

The apparatus, as illustrated and described above, is arranged primarily for vertical disposition of the patterns and flask, but it would be feasible, and with some molds it might be preferable, to arrange the patterns and flask on an incline or horizontally, supporting the patterns at their ends and supporting the flask on the patterns or on its side, the pattern connecting rod and the parts associated therewith functioning in substantially the same manner as described above.

The axial disposition of the pattern and mold and other details of the construction may be varied without departing from the spirit of the invention, and the exclusive use of those modifications coming within the scope of the claims is contemplated.

What is claimed is:

1. Apparatus for forming an elongated cylinder-like foundry mold comprising an elongated pattern section supported at its lower end, another elongated pattern section supported at its lower end on the first-mentioned section, an elongated flask surrounding both of said pattern sections and detachably secured to the lower portion of the lower section, and a member extending longitudinally through the upper section and operable from the upper end thereof and engaging the lower section for forcing them apart longitudinally of the flask and moving the upper section through mold sand rammed in the space between the upper section and the flask, when the flask and lower section are secured together, and opposing elements on the flask and upper section normally spaced apart vertically but interengageable, when the sections are separated and the flask is detached from the lower section, to raise the flask with the upper section.

2. Apparatus for forming an elongated cylinder-like foundry mold comprising an elongated pattern section disposed vertically and supported at its lower end, another elongated pattern section disposed vertically and supported at its lower end on the upper end of the first-mentioned section, an elongated flask surrounding both of said pattern sections and supported on the lower section, and a member secured to the upper end of the flask and opposing an upwardly facing element of the upper section, whereby lifting the upper section will raise the flask and mold relative to the lower section.

3. Apparatus for forming an elongated cylinder-like foundry mold comprising an elongated pattern section disposed vertically and fixedly supported at its lower end, another elongated pattern section disposed vertically and detachably supported at its lower end on the upper end of the first-mentioned section, an elongated flask surrounding both of said pattern sections, detachable means for securing the lower end of said flask relative to the lower end of said first-mentioned pattern section, a device operable from the upper end of the pattern upper section for engaging the pattern lower section and forcing said sections apart, a device applicable to the upper end of the flask for engaging the upper end of the upper section, whereby movement of the latter by said device will raise the flask and support it from the pattern sections, and means for temporarily supporting the flask in raised position relative to the lower section while said device and the upper section are removed from the flask and the lower section.

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