Feb. 11, 1958 J. MacGREGOR ET AL 2,823,028

LADLE AND TRUNNION RING THEREFOR

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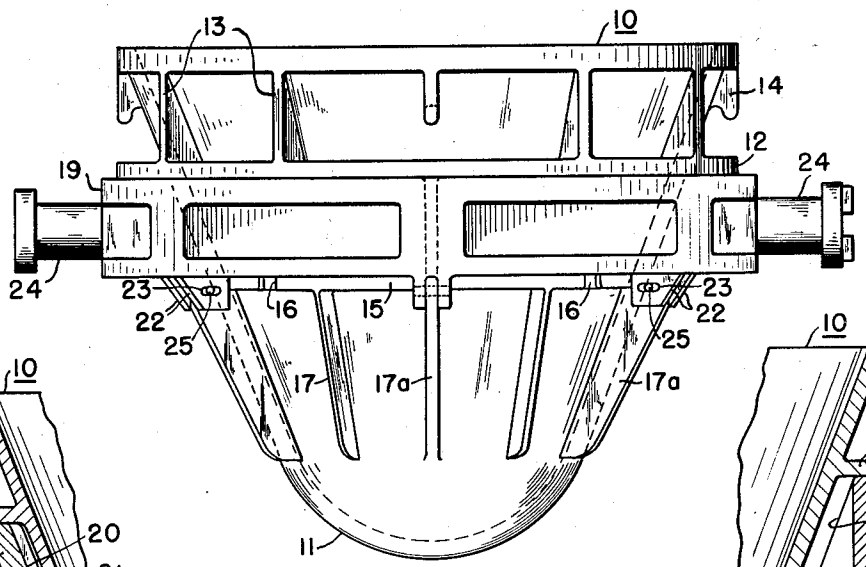

Fig. 1

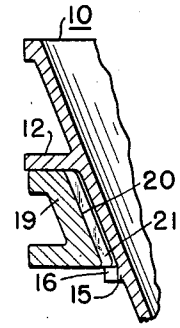

Fig. 3

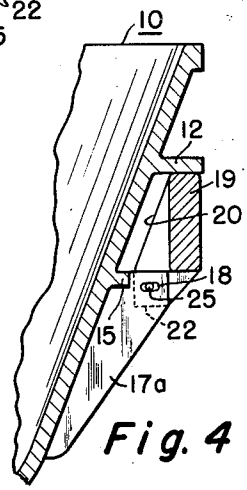

Fig. 4

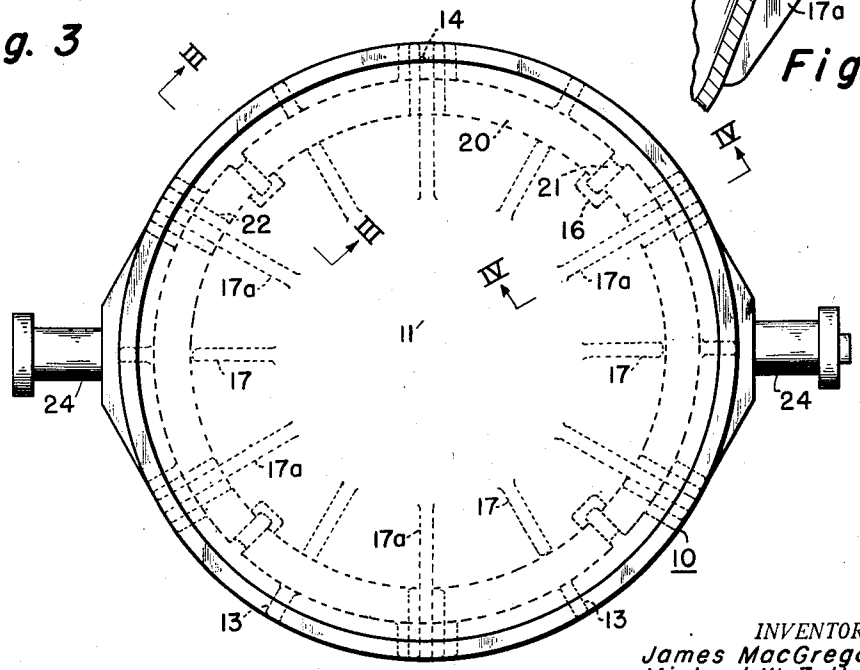

Fig. 2

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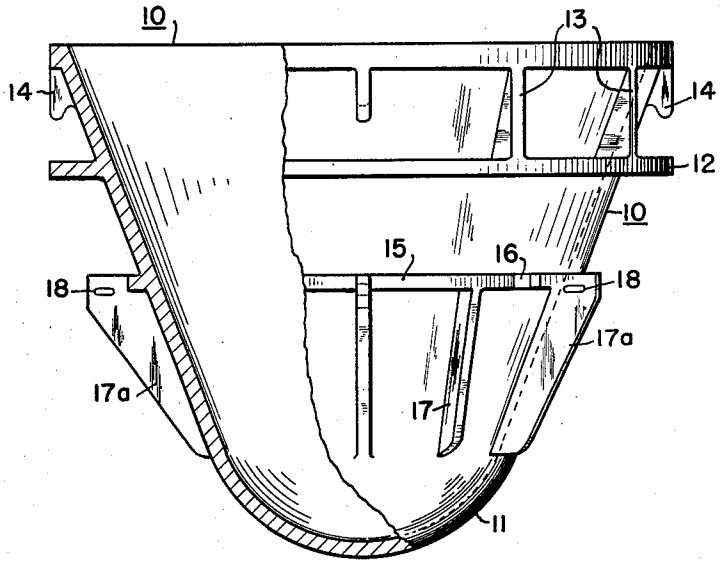

Fig. 5

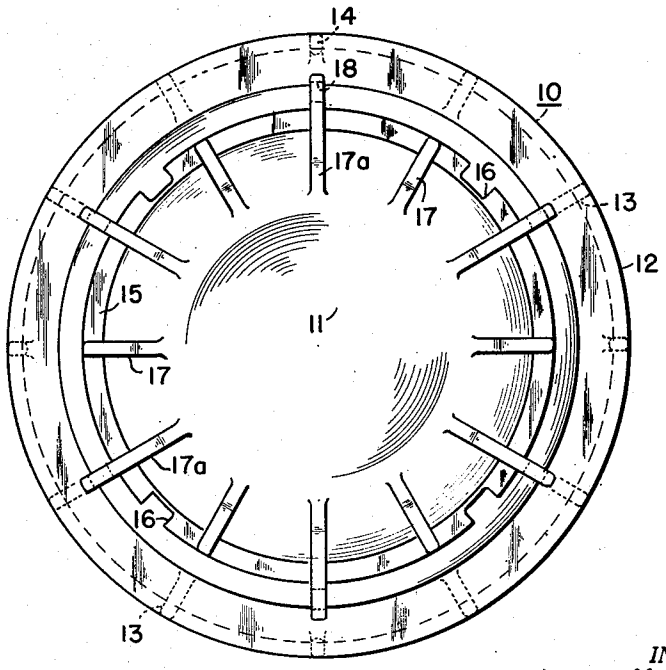

Fig. 6

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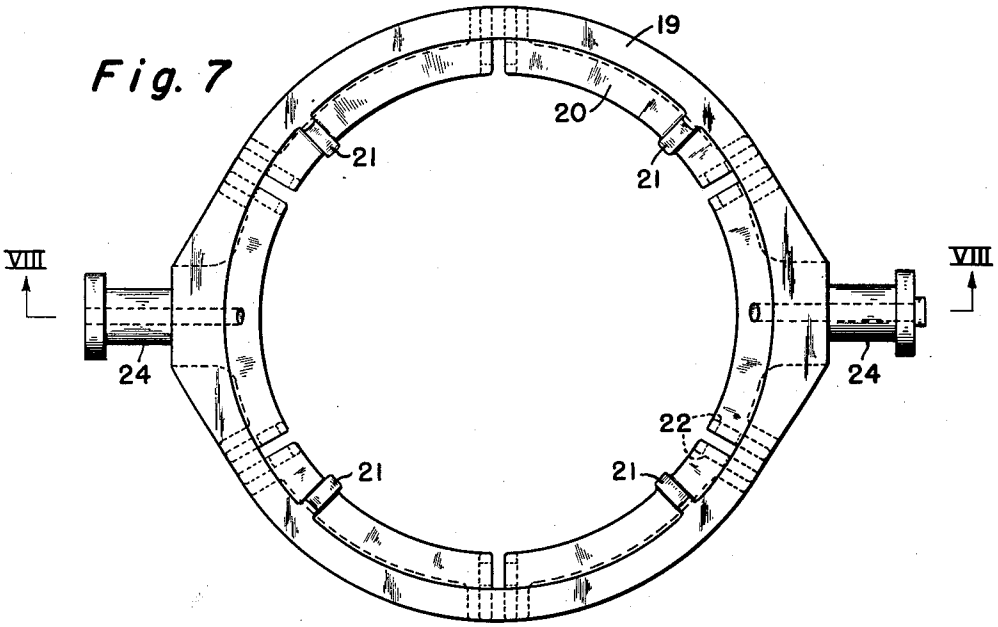
Fig. 7



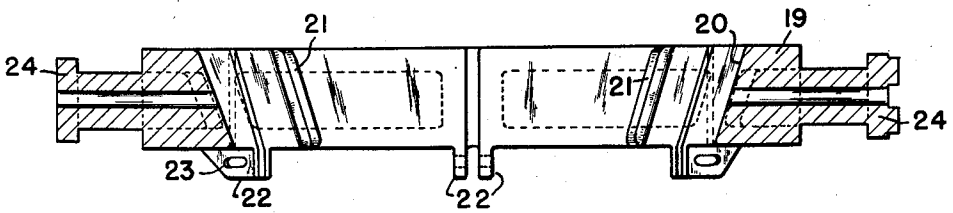


Fig. 8

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2,823,028

LADLE AND TRUNNION RING THEREFOR

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Application March 23, 1954, Serial No. 418,086

4 Claims. (Cl. 266—39)

This invention relates to improvements in a ladle and trunnion ring such as may be embodied in a cinder ladle used in the steel industry to carry molten slag from blast or open hearth furnaces to a slag dump.

Many attempts have been made to provide a satisfactory ladle and trunnion ring, but to our knowledge all are subject to certain faults. For example, in turning over a cinder ladle to pour out the molten metal, the side of the ladle over which the slag runs is much more severely exposed to the high temperature and erosion of the flowing metal. This causes an internal bulge of the ladle at this section, ultimately resulting in fracture and discard of the ladle even though the rest of the ladle is capable of substantial continued use.

It is not possible to attach rigidly a ladle to its supporting trunnion ring because the diameter of the ladle varies considerably as its temperature changes. Accordingly, the ladle ordinarily fits loosely within the ring. When the ladle is dumped by revolving the ladle and trunnion ring together about a horizontal axis, the ladle slams against the lower portion of the ring. Not only does such a repeated blow tend to weaken the trunnion ring, but at such times the entire weight of the ladle is transferred to the trunnion ring at approximately one point at which large local reaction stresses and strains are established.

The present ladle and trunnion ring obviate these faults. For example, our ladle can be rotated within the trunnion ring from time to time so that loads of slag may be poured from different sides of the ladle, thereby distributing the special wear due to pouring over the whole inner surface of the ladle. Additionally, in our ladle and trunnion ring, keys center the ladle within the ring and prevent the former from moving laterally with respect to the ring even when dumping the slag. As a result, the ladle does not slam against the trunnion ring and the weight of the ladle is distributed over substantially the entire bottom half of the ring. More importantly, the keys space the ladle from the ring so that there is very little contact between the hot ladle and the relatively cool ring. Consequently, no substantial stress or strains are set up between the ladle and the ring. In the preferred form, we also provide a band and fins on the ladle which perform the dual purpose of reinforcing and cooling it.

The accompanying drawings disclose a presently preferred embodiment wherein:

Figures 1 and 2 are side and plan elevations, respectively, of the assembled ladle and trunnion ring;

Figures 3 and 4 are sections of Figure 2 on the lines III—III and IV—IV, respectively;

Figure 5 is a side elevation, partially in section, of the ladle alone;

Figure 6 is a bottom view of the ladle;

Figure 7 is a plan view of the trunnion ring alone; and

Figure 8 is a section of Figure 7 on the line VIII—VIII.

Referring to the drawings, our ladle includes a substantially frusto-conical container **10** open at the larger end and having a closed bottom portion **11** in continuation of the sides. A flange **12** extends outwardly from the container adjacent the open end to form a seat on the underside thereof. Ribs **13** reinforce the flange, and there are handling hooks **14**. A band or second flange **15** externally encircles the container **10** below the flange **12** and has spaced apart slots **16**. Fins **17** extend down the sides of the container from the band **15** and fins **17***a* project outwardly beyond the band and have oblong openings **18**.

The trunnion ring includes an annulus **19** having a sloping inner surface **20** substantially conforming with the shape of the frusto-conical container **10**. Keys **21** project radially inwardly from the surface **20**, while a plurality of lugs **22** are arranged in pairs about the lower periphery of the annulus **19**, the lugs of each pair having aligned oblong openings **23**. Each pair of lugs border a slot in the sloping surface **20** as shown in Figures 7 and 8. The ring turns about opposed trunnions **24**.

In use, the container **10** is so placed within the annulus **19** that a fin **17***a* passes between the lugs **22** of each pair. The flange **12** rests on top of the annulus **19** which thereby carries the weight of the ladle. The keys **21** pass through the slots **16** in the band **15** and center the container in the annulus as shown in Figure 3. The keys prevent relative side movement of the container even when the assembly is pivoted. In the same manner, the keys **21** also space the container from the annulus so that the walls of the container are free to expand and contract independently of the annulus. Accordingly, stresses and strains in the side walls of the container are avoided. Pins **25** driven through the aligned openings **18** and **23** of the fins **17***a* and lugs **22**, as shown in Figure 4, keep the container within the annulus. Even though the container **10** expands and contracts diametrically during use, the oblong openings **18** and **23** still accommodate the pins without shearing them. During this time, the fins **17** and **17***a* perform the dual functions of reinforcing the lower half of the container, as well as rapidly cooling it.

From time to time, the ladle may be rotated within the trunnion ring by pulling the pins **25**, raising the ladle slightly, and turning it so that each fin **17***a* engages a different set of lugs, thereby distributing the wear on the container and prolonging its life.

While the foregoing disclosure describes a presently preferred embodiment, it is understood that the invention may be practiced in other forms within the scope of the appended claims.

We claim:

1. A trunnion ring for a ladle having fins adapted to be stationed below the trunnion ring, including an annulus having a sloping inner surface, stationary keys integral with and projecting from said surface for contacting and centering a ladle placed therein and spacing the ladle from the annulus, a plurality of integral lugs arranged in downwardly projecting pairs about the lower periphery of the annulus and adapted to receive and be fixed to a fin of the ladle, and trunnions mounted on the exterior of the annulus.

2. A ladle and trunnion ring therefor, including a cone-shaped container, a first flange affixed in outwardly extending relationship from the container to form a seat, a second flange integral with and encircling the container below the first flange, said second flange having vertically extending slots in its outer periphery, fins attached to and extending down the sides of the container below the second flange, at least some of the fins having openings, an annulus adapted to engage the first flange, integral stationary keys on the annulus adapted to pass through

the slots and space the container from the annulus, lugs projecting from the annulus adjacent the fins, some of said lugs having openings which are in alignment with the openings in the fins when the ladle is properly positioned in the annulus, means to detachably fasten the lugs to said fins through the openings, and trunnions mounted on the annulus.

3. A ladle and trunnion ring described in claim 2 wherein said annulus has vertically extending slots in its inner surface, said fins being so spaced such that they pass through said slots in the annulus.

4. A ladle and trunnion ring described in claim 2 wherein said lugs are arranged in pairs and straddle the fins.

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