Aug. 3, 1965 G. DOLENIC ETAL 3,197,824

NOZZLE BLOCK FOR LADLES

Filed July 23, 1962

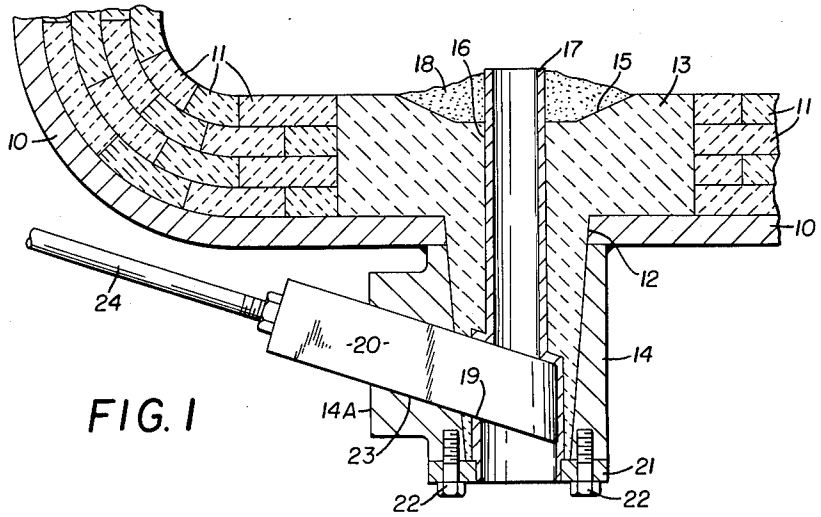


FIG. 1

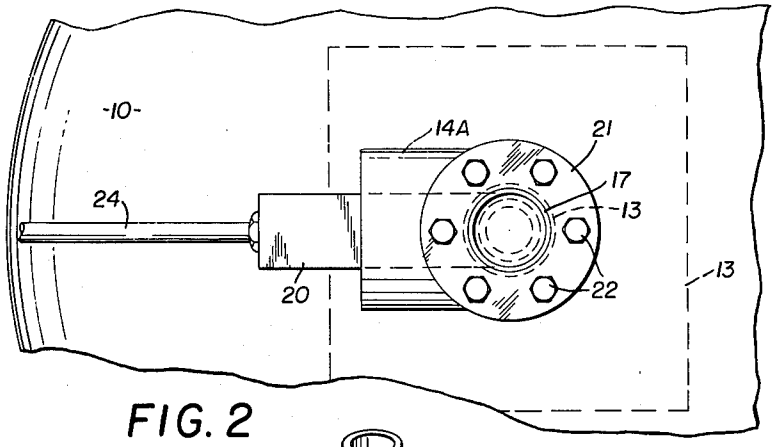


FIG. 2

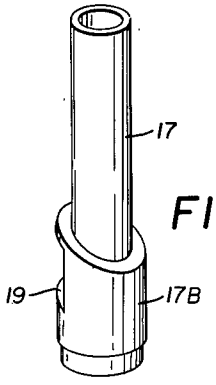


FIG. 3

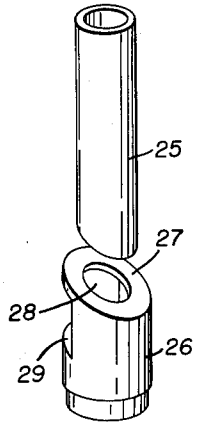


FIG. 4

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United States Patent Office 3,197,824 Patented Aug. 3, 1965

3,197,824

NOZZLE BLOCK FOR LADLES

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Filed July 23, 1962, Ser. No. 211,517
1 Claim. (Cl. 22—84)

This invention relates to an improved nozzle block construction for ladles such as are used for pouring molten steel.

The principal object of the invention is the provision of a nozzle block for a ladle and wherein the nozzle block is provided with tubular inserts or liners which may be replaced and thereby maintain the nozzle block in operating condition indefinitely.

A further object of the invention is the provision of a nozzle block for a ladle wherein a pool of sand is provided around the upper end of the pouring opening in the nozzle block and surrounding a graphite tubular insert in said pouring opening of the nozzle block.

A still further object of the invention is the provision of an improved nozzle block which may be built into a ladle with the lining brick thereof to provide a valve pouring orifice and a valve structure.

A still further object of the invention is the provision of a nozzle block having a vertical opening therethrough and replaceable liners disposed in said opening.

The improved nozzle block disclosed herein in connection with a steel pouring ladle comprises an improvement in the art and particularly with respect to our Patent No. 2,968,075 wherein a nozzle block having a valve construction associated therewith is disclosed. In the present invention a similar valve construction is utilized but the particular novelty resides in the formation of a modified form of nozzle block and particularly in the formation of the passageway therethrough in that in the present instance the passageway is defined by a tubular liner which is replaceable and which may be cross sectionally round or cross sectionally square or otherwise formed.

The principal advantage of the construction disclosed herein is in the ability of the novel nozzle block to retain its usefulness throughout many pourings by the simple expedient by replacing the liners, tubular or otherwise, defining the passageway therethrough, it being obvious that the replaceable liners are relatively inexpensive and that they may quickly be removed and replaced.

The problem of maintaining appropriate valve action when the pouring passageway through the nozzle block enlarges as by melting and wearing away by the molten metal is met and uniformly satisfactory valve action is maintained and the life of the nozzle block greatly extended by the invention disclosed herein.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being the intention to cover all changes and modifications of the example of the invention herein chosen for purposes of the disclosure, which do not constitute departures from the spirit and scope of the invention.

The invention is illustrated in the accompanying drawing, wherein:

FIGURE 1 is a sectional elevation of a portion of a ladle showing the improved nozzle block in position therein.

FIGURE 2 is a bottom view of the portion of the ladle and the nozzle block shown in FIGURE 1.

FIGURE 3 is a perspective view of a unitary nozzle block liner.

FIGURE 4 is a perspective view of a two-part nozzle block liner.

By referring to the drawings and FIGURES 1 and 2 thereof, it will be seen that a portion of a ladle **10** is disclosed, the ladle being of the type for receiving molten steel from an open hearth and from which the molten metal is poured into the usual ingot molds to form ingots. The ladle **10** is lined with a plurality of refractory brick **11, 11** as known in the art and adjacent the pouring orifice **12** thereof, a nozzle block **13** is provided which is of a size and shape enabling it to be positioned partially within the ladle **10** where it forms a continuation of the refractory brick lining **11** and partially through the pouring orifice **12** and supported by a depending apertured body member **14**. The nozzle block **13** has a central annular depression **15** in its uppermost surface which surrounds a vertical passageway **16** extending therethrough. A tubular liner **17** is positioned in the vertical passageway **16** and the upper end thereof extends above the depression **15** in the nozzle block **13** and sand **18** is positioned thereabout as shown in FIGURE 1 of the drawings, to protect the outer sides of the tubular liner **17** from erosion by the hot metal in the ladle **10**.

The tubular liner **17** is preferably formed of graphite and it may be formed of one or two pieces as shown in FIGURE 1 and FIGURE 2 of the drawings. Alternately, it may be formed of several elongated cross sectional arcuate sections comparable with parts of a tube split lengthwise.

By referring to FIGURES 1 and 2 and to FIGURE 3 of the drawings, it will be seen that a unitary liner structure is disclosed wherein the uppermost portion of the tubular liner **17** defines a vertical passageway of one diameter and the lowermost portion thereof **17B** forms a tubular passageway of a larger diameter and that the portion **17B** has one side thereof cut away as at **19** so that an elongated graphite valve member **20** as seen in FIGURES 1 and 2 may extend therethrough and act as a valve in closing the vertical passageway defined by the tubular liner **17**. The lower end of the tubular liner **17** is supported along with the lower end of the nozzle block **13** by a bottom plate **21** which is secured to the body member **15** by a plurality of fasteners **22, 22**.

Still referring to FIGURES 1 and 2 of the drawings, it will be seen that the body member **14** has a sideward extension **14A** which in turn has a passageway **23** angularly positioned therein and which passageway receives the valve piece **20** heretofore referred to and which is provided with a manipulating rod or handle **24**. It will be observed that the tubular liner **17** is shaped so that the upper end of the area of increased diameter thereof is angularly positioned relative to the vertical axis of the tubular liner **17** and thereby conforms with the angular positioning of the elongated valve member **20**. In FIGURE 4 of the drawings, a two-part construction of the tubular member **17** is disposed and comprises a modification in that an upper part **25** is formed separately of graphite or other suitable material and a lower part **26** having an upper partly closed end **27**, defining a central opening **28**, is adapted to be positioned in the lower portion of the vertical opening in the nozzle block **13** as illustrated in FIGURE 1 so as to support the upper portion **25** thereon. The lower part **26** has a cutaway side area **29** for receiving the elongated valve member **20** as heretofore described.

It will thus be seen that an improved nozzle block for a metal pouring ladle has been disclosed and that the improvement comprises a nozzle block having a vertical passageway therethrough with a side opening therein and a tubular liner in either integral or in appropriate sections positioned therein and defining the pouring passageway therethrough and which tubular liner is formed

of material such as graphite that enables it to withstand the molten metal being poured. The tubular liner may be readily replaced thereby avoiding the necessity of replacing the nozzle block and its attendant loss of operating time. In the construction disclosed herein, portions of the construction forming the actual metal pouring passageway, the valve passageway and the elongated valve element are readily replaceable so that the metal pouring ladle so equipped may be used continuously with no down time for relining and replacing of the nozzle block as has always been necessary heretofore and having thus described our invention, what we claim is:

The combination of an apertured metal pouring ladle having a refractory lining and a nozzle block having a vertical passageway defining a pouring orifice, an apertured body member on said ladle about said aperture in said ladle, said nozzle block having an enlarged portion positioned within said ladle in the manner of said lining and a depending portion extending through said aperture in said ladle and into said apertured body member and defining a pouring orifice and a replaceable tubular liner disposed in the pouring orifice of said nozzle block and defining a hot metal passageway therethrough, the passageway in said nozzle block being vertical and having two

superimposed cylindrical portions one of which is larger than the other and the larger of which is adjacent the lower end of the depending portion thereof, the tubular liner having two superimposed cylindrical portions one of which is larger than the other and the larger of which is adjacent the lower end thereof and wherein the lower cylindrical portion of said passageway and the lower cylindrical portion of said tubular liner have registering openings in their respective sides for the reception of a transversely movable valve element said valve element being of a width equal to said larger cylindrical portion of said tubular liner.

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