Dec. 26, 1961 L. MURARSHEED 3,014,432

HOT METAL PUMP

Filed March 1, 1960 2 Sheets-Sheet 1

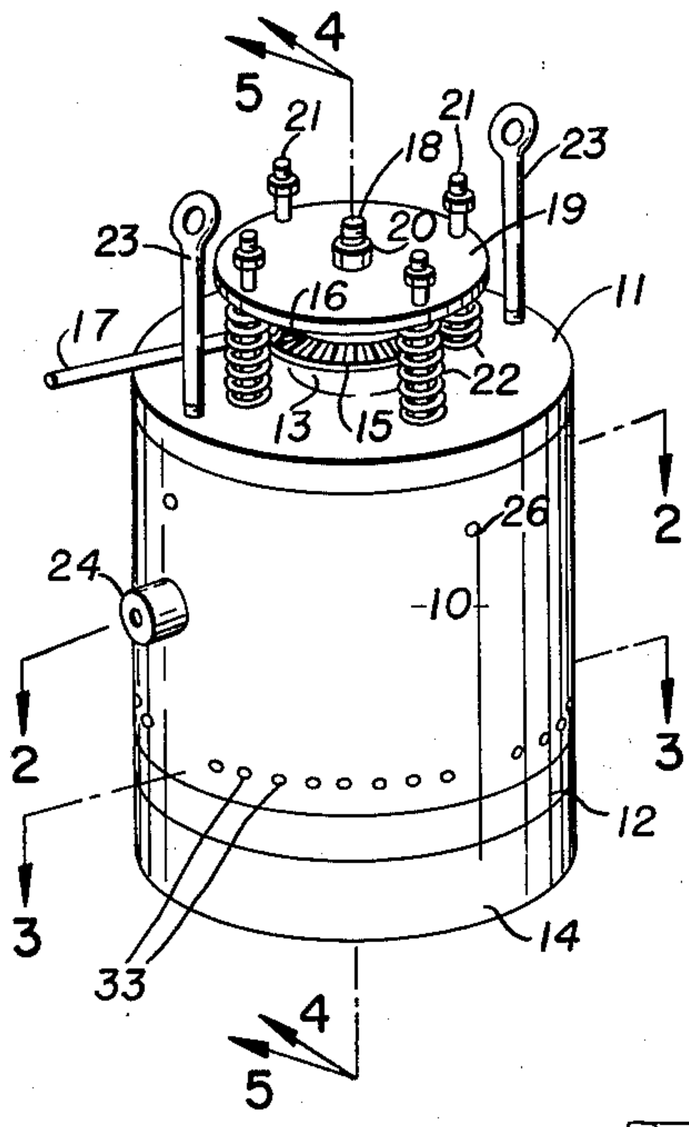

FIG. 1

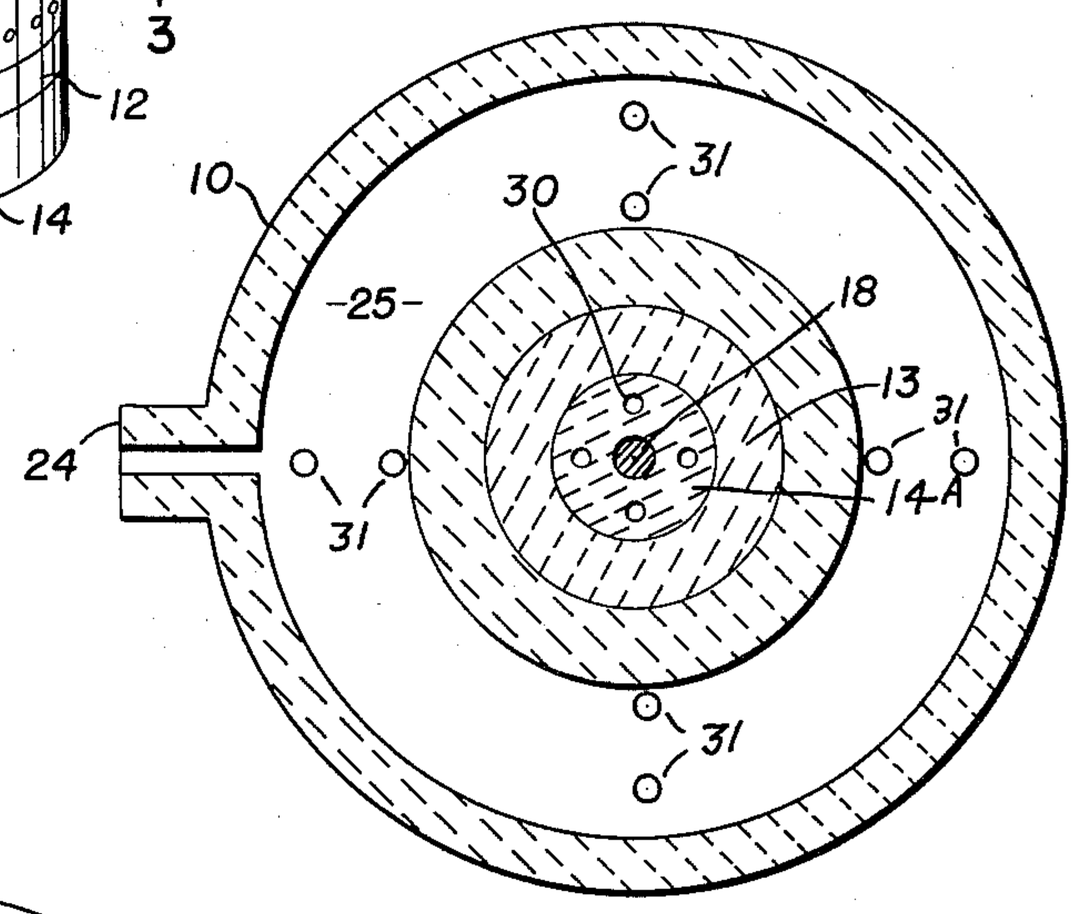

FIG. 2

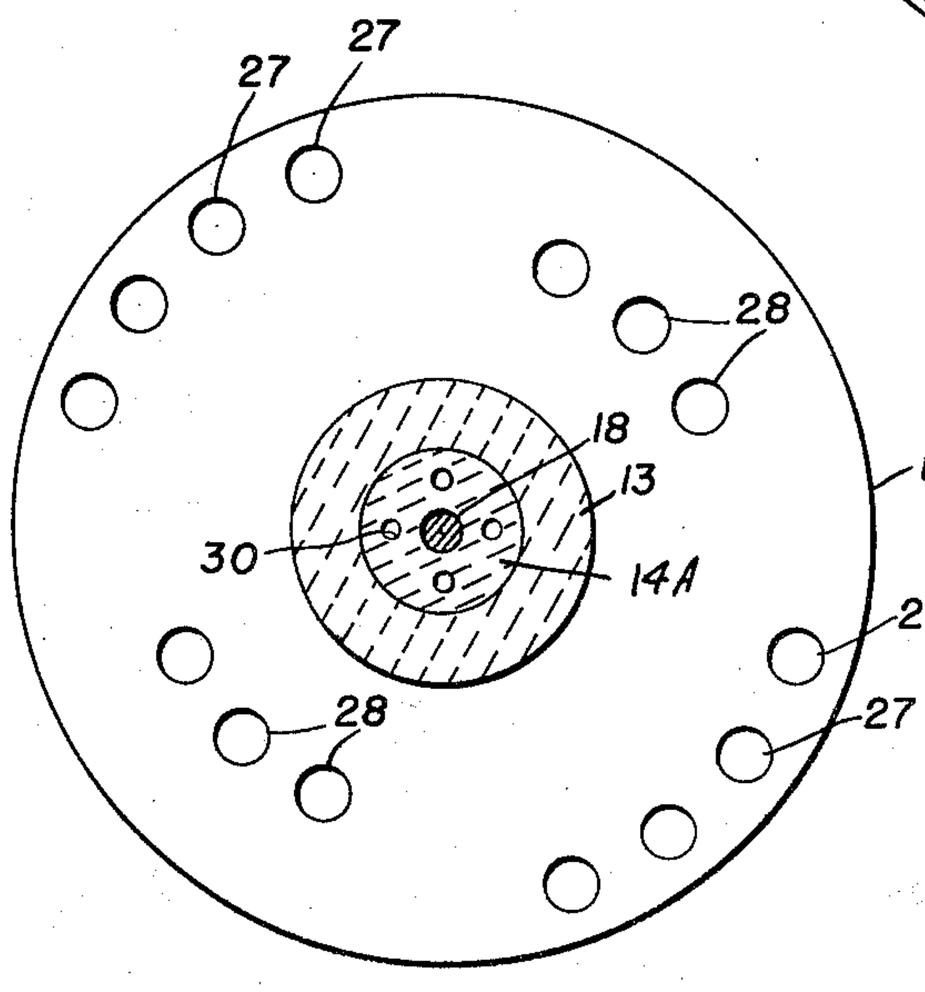

FIG. 3

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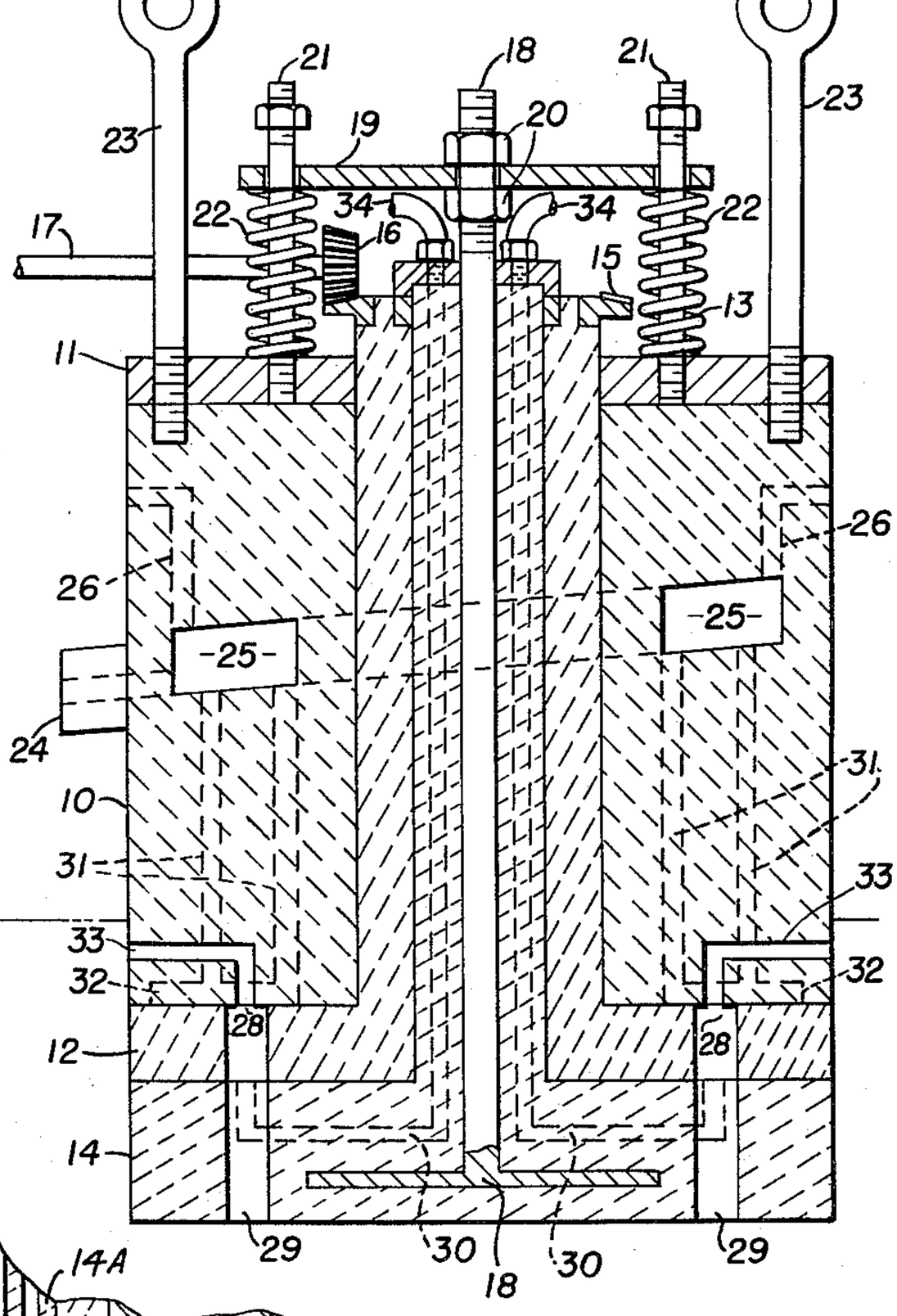
FIG. 4



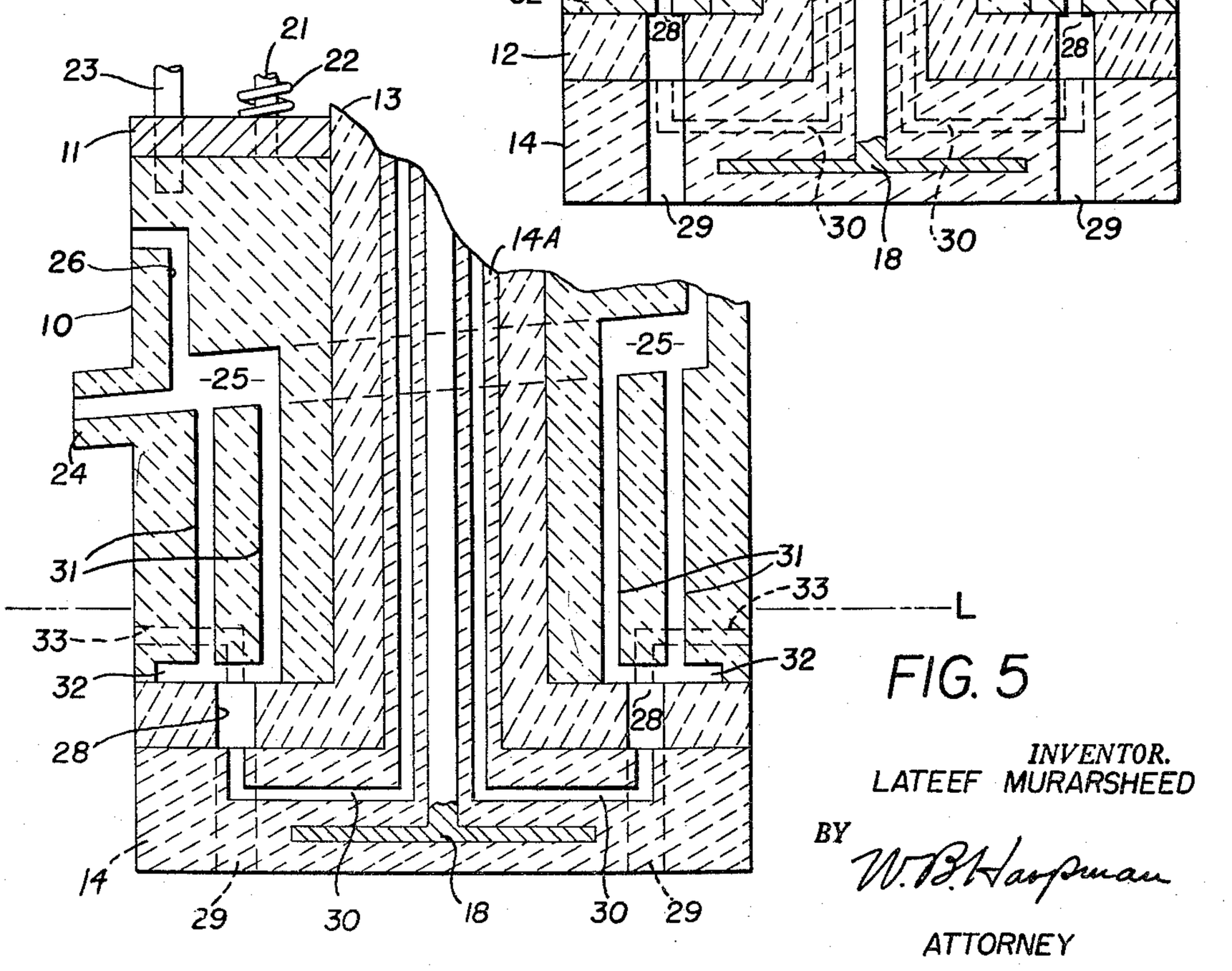


FIG. 5

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HOT METAL PUMP

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This invention relates to a pump for lifting hot metal such as molten iron, steel or linotype metal.

The principal object of the invention is the provision of a hot metal pump utilizing gas pressure for lifting molten metal.

A further object of the invention is the provision of a hot metal pump incorporating rotary valve means controlling the flow of hot metal into lifting position in the pump.

A still further object of the invention is the provision of a hot metal pump that will operate partially submerged in molten metal without being damaged thereby.

A still further object of the invention is the provision of a hot metal pump that may be positioned in a container of molten metal and used to continuously lift the molten metal out of the container.

The hot metal pump disclosed herein comprises a device for moving molten metals such as iron, and steel which metals have heretofore been handled by ladles requiring the pouring of the hot metal therefrom. The presently disclosed hot metal pump eliminates the irregular and indefinite volume of metal transferred by pouring from a ladle as has heretofore been common in the metal working industry. The hot metal pump disclosed herein utilizes gas pressure for lifting hot metal and controls the application of the gas pressure and the admission of the hot metal to the pressurized portions of the pump by a rotating valve which alternately permits gas pressure and hot metal to enter the lifting portions of the pump.

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 drawings, wherein:

FIGURE 1 is a perspective view of the hot metal pump.

FIGURE 2 is a cross section on line 2—2 of FIGURE 1.

FIGURE 3 is a horizontal section on line 3—3 of FIGURE 1.

FIGURE 4 is a vertical section on line 4—4 of FIGURE 1.

FIGURE 5 is a vertical section with parts broken away on line 5—5 of FIGURE 1.

By referring to the drawings and FIGURE 1 in particular it will be seen that the hot metal pump comprises a main body member **10** which is formed of refractory material and is capable of withstanding temperatures at which metals liquify. The main body member **10** has a cap **11** also formed of refractory material positioned on its uppermost end and a rotor **12** also formed of refractory material positioned on its lowermost end. The rotor **12** has a centrally positioned tubular stem

13 thereon which is rotatably disposed vertically in a centrally disposed cylindrical opening in the main body member **10** and extends upwardly through the top **11**. A base **14** formed of refractory material is positioned beneath the rotor **12** and has centrally disposed vertical stem **14A** thereon which extends upwardly through the tubular stem **13** of the rotor **12** and upwardly through the top **11**. The main body member **10**, the top **11** and the base **14** are assembled and maintained in stationary relationship.

The rotor **12** and its tubular stem **13** are adapted to be rotated by a ring gear **15** attached to the uppermost end of the tubular stem **13**.

A spur gear **16** positioned on the end of a drive shaft **17** imparts rotary motion to the gear **15** and to the tubular stem **13** and the rotor **12**. The base **14** has a metallic reinforcing member **18** therein, a portion of which extends vertically through the stem **14A** thereof and extends upwardly out of the top **11**. An apertured disc **19** is positioned over the reinforcing member **18**, the upper end of which is threaded and nuts **20** are positioned on either side of the disc **19**. Threaded studs **21** are positioned through other apertures in the disc **19** and engaged in threaded apertures in the top **11** coil springs **22** are positioned between the top **11** and the disc **19**. Thus, the base **14**, its stem **14A** and its metal reinforcing member **18** are suspended from the disc **19** and thereby held in operative relation against the bottom of the rotor **12** which in turn is held thereby against the bottom of the main body member **10**.

The top **11** has a pair of hanger bars **23** engaged therein, the hanger bars **23** having eyelets at their uppermost ends serving as means for suspending the hot metal pump from an overhead support as for example as necessary when the hot metal pump is suspended above and lowered into a pool of molten metal to be pumped thereby.

By referring now to FIGURE 2 of the drawings, it will be seen that the main body member **10** has a pouring spout **24** extending from one side thereof and that the pouring spout **24** has a passageway therein communicating with an annular passageway **25** formed within the main body member **10** and positioned in inclined relation thereto as best seen in FIGURE 4 of the drawings. Vents **26, 26** extend upwardly in the main body member **10** from the annular passageway **25** and outwardly to communicate with the exterior of the main body member **10** as may be seen in FIGURE 4 of the drawings.

By referring now to FIGURE 3 of the drawings, a plan view of the rotor **12** may be seen and it will be observed that it is provided with two annularly positioned rows of circumferentially spaced openings, the outermost annular row of openings being indicated by the reference numerals **27, 27** and the innermost annular row of openings being indicated by the reference numerals **28, 28.**

By referring now to FIGURE 4 of the drawings, it will be seen that the base **14** has a pair of arcuate shaped openings **29, 29** extending vertically therethrough and in vertical registry with the inner row of openings **28, 28** in the rotor **12**. A second pair of arcuate shaped openings extending vertically through the base **14** are not visible in the section comprising FIGURE 4 as they are positioned on an annular center line corresponding with the annular center line of the annular row of openings **27, 27** in the rotor (see FIGURE 3), which are not visible in the section comprising FIGURE 4. The arcuate

shaped openings 29 in the base 14 permit hot metal to flow upwardly therethrough and through registering openings 28, 28 in the rotor 12. The base 14 and its central vertical stem 14A have a plurality of gas passageways 30, 30 therein which passageways 30, 30 extend downwardly through the stem 14A of the base 14 and outwardly through the base 14, radially thereof, and then upwardly on the annular center lines of the annular rows of openings 27, 27 and 28, 28 in the rotor 12.

The main body member 10 has a plurality of vertically positioned hot metal passageways 31, 31 circumferentially thereof and communicating at their uppermost ends with the annular passageway 25. The vertically positioned hot metal passageways 31, 31 are circumferentially spaced in the main body member 10 so that their lowermost ends, which are joined in common openings 32, are in vertical alignment with the gas passageways 30, 30 in the base 14. Secondary vents 33, 33 are positioned in the main body member 10 and extend vertically from the bottom surface thereof and then outwardly to communicate with the exterior thereof. The bottommost portions of the vents 33, 33 register with the annular rows of openings 27 and 38 in the rotor 12.

Still referring to FIGURE 4, it will be seen that the uppermost ends of the gas passageways 30, 30 communicate with tubes 34, 34 which in turn extends to a source of gas under pressure.

Operation

In operation a source of rotary motion (not shown) is applied to the drive shaft 17 which causes the gear 16 to engage the ring gear 15 and rotate the tubular stem 13 and the rotor 12 which actions causes the annular rows of openings 27, 27 and 28, 28 to move into and out of registry with the arcuate shaped openings 29, 29 in the base 14 and the openings 32, 32 in the main body member 10 which communicate with the hot metal passageways 31. Gas under pressure is delivered through the tubes 34 to the gas passageways 30, 30. The device is positioned in molten metal with the lower portion thereof submerged, the level of the molten metal being indicated in FIGURES 4 and 5 by the broken line "L." Molten metal flows upwardly through the arcuate shaped openings 29 in the base 14 and into the openings 27, 27 and 28, 28 in the rotor 12 and into the vents 33, 33 in the lower portion of the main body member 10. The rotor 12 revolves moving the molten metal in the openings 27, 27 and a 28, 28 out of registry with the arcuate shaped openings 29, 29 in the base 14 and out of registry with the vents 33, 33 in the main body member 10 and into registry between the gas passageways 30, 30 in the base 14 and the openings 32, 32 in the main body member 10 which communicate with the hot metal passageways 31, 31 and 25 therein. The gas pressure from the gas passageways 30, 30 moves the molten metal out of the openings 27, 27 and 28, 28 in the rotor 12 upwardly into the openings 32, 32 and passageways 31, 31 in the main body member 10 and this action is constantly repeated as the rotor 12 turns so that a continuous flow of molten metal rises in the hot metal passageways 31, 31 and flows into the annular hot metal passageway 25 where it flows by gravity out of the pouring spout 24.

It will be observed that the arcuate shaped openings 29, 29 in the base 14 conform in width and length to the arrangement of the groups of openings 27, 27 and 28, 28 in the rotor 12, and that they are positioned through the base 14 so that they are in registry with the groups of openings 27, 27 and 28, 28 in the motor 12 when the groups of openings 27, 27 and 28, 28 are in registry with the vents 33, 33 in the main body member 10.

It will thus be seen that through the application of rotary motion to the rotor 12 and the supplying of gas under pressure to the tubes 34 of the hot metal pump a resulting pumping or lifting action of the molten metal is obtained which efficiently transfers the hot metal from

the lowermost base portion 14 of the hot metal pump to the pouring spout 24 thereof.

It will also be seen that due to the arrangement of the groups of openings 27, 27 and 28, 28 in the rotor 12 four pumping cycles per revolution of the rotor 12 are obtained and it will be observed that the number of openings in the rotor 12 as well as the number of groups of such openings may be varied in forming hot metal pumps of varying capacities.

It will thus be seen that a hot metal pump has been disclosed which meets the several objects of my invention and having thus disclosed my invention, what I claim is:

1. A hot metal pump comprising a body member having at least one hot metal passageway therein, a pouring spout on said body communicating with said hot metal passageway, a base positioned below said body member in spaced relation thereto, at least one gas passageway in said base communicating with the upper surface thereof, said body member having at least one opening positioned vertically therethrough on a vertical line extending through said gas passageway and into said hot metal passageway, a rotor rotatably positioned between said body member and said base and having its upper surface engaging the bottom of said body member and its lower surface engaging the top of said base, a portion of said rotor extending out of said main body member and mechanical means for rotating said rotor thereby, at least one opening in said rotor in a position for registry with said vertical opening in said body member and with said gas passageway in said base, said base being positioned relative to said body member with said gas passageway in vertical alignment with said vertical opening therein, said base having an opening therethrough circumferentially spaced with respect to said gas passageway therein and in alignment with said opening in said rotor.

2. The hot metal pump set forth in claim 1 and wherein said portion of said rotor extending out of said body member comprises a central hollow stem positioned in a centrally disposed opening in said body member.

3. The hot metal pump set forth in claim 1 and wherein said portion of said rotor extending out of said body member comprises a centrally disposed hollow stem positioned in a centrally disposed opening in said body member, and wherein said base has a vertical stem thereon positioned in said hollow stem of said rotor, a supporting structure on the top of said body member engaging said stem of said base and urging it upwardly against said rotor and said body member.

4. A hot metal pump comprising a body member of refractory material having a central vertical opening therethrough and an annular hot metal passageway therein, a pouring spout on said body member communicating with said annular hot metal passageway, said body member having secondary hot metal passageways therein extending downwardly from said annular hot metal passageway to the bottom of said body member, a plate positioned above said body member and means resiliently supporting said plate on said body member, a rotor having at least one vertical opening off center therein arranged for registry with said secondary hot metal passageways in said body member, a hollow stem on said rotor positioned centrally thereof and extending upwardly through said central vertical opening in said body member, a base positioned beneath said rotor, a secondary stem on said base centrally thereof and extending upwardly through said hollow stem of said rotor, said secondary stem being attached to said plate, a ring gear on the upper end of said hollow stem of said rotor and mechanical means for imparting rotary motion to said ring gear for rotating said rotor, said base and said secondary stem thereof having at least one gas passageway therein, one end of said gas passageway terminating on the upper surface of said base off-center thereof and in vertical alignment with said off center opening in said rotor, the other end of

said gas passageway being located at the upper end of said secondary stem, said base having at least one vertical opening therethrough off center with respect to said secondary stem and in alignment with said off center opening in said rotor.

5. The hot metal pump set forth in claim 4 and wherein a reinforcing member having a vertical section is disposed within said base and secondary stem and the upper end of said reinforcing member extends out of the upper end of said secondary stem and is adjustably secured to said plate.

6. The hot metal pump set forth in claim 4 and wherein coil springs are positioned between said body member and said plate for resiliently mounting said plate and urging said plate and said secondary stem and said base in one direction.

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