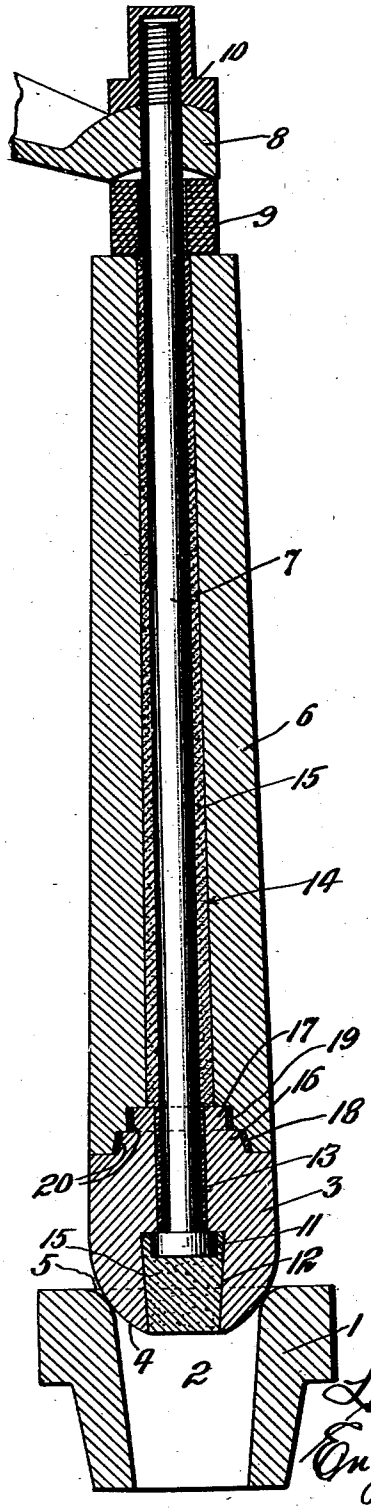
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STOPPER FOR POUR LADLES

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STOPPER FOR POUR LADLES

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5 Claims. (Cl. 22—85)

The invention relates to an improvement in stopper devices for pour ladles for containing molten metal, which is discharged from the ladles through a hole in the bottom thereof. Such ladles are commonly composed of metal and the hole in the bottom thereof through which the molten material is discharged is usually formed in a cylindrical valve seat composed of a graphite and clay composition. To prevent the molten material from discharging through the valve opening until the appropriate time, it is closed by means of a stopper head composed of a graphite composition located at the lower end of a sleeve usually composed of clay, the two parts being held in vertical axial alinement by means of a metal bolt the upper end of which is adjustably connected with a lever known as a "gooseneck" by which the stopper is operated.

A stopper of this description comprising a graphite composition head or valve proper, adapted to close the valve seat, and an elongated clay sleeve, should have at least a life coincident with a normal day's work of from six to ten hours' duration which the ladle is repeatedly filled and emptied. The molten material introduced into and discharged from the ladle is usually of a temperature of about 2500° F. Under these conditions of operation, in order that the ladle may be effective throughout the whole of a day's operations, it is necessary that no molten material reach the metal bolt holding the stopper head and sleeve together in axial alinement. However, as these devices have heretofore been constructed, the metal material does occasionally work into the joint between the stopper head and the sleeve, with the result that the metal composing the bolt is eaten away, so that not only must the stopper device be replaced but frequently the pouring of metal contained in the ladles is lost, or difficulties experienced in removing the stopper head from the valve opening.

To obviate the difficulties experienced heretofore in connection with stoppers for pour ladles, the present invention provides a stopper so constructed that the molten material in the ladle is effectively prevented from penetrating through the joint between the stopper head and the sleeve and finding access to the bolt which holds the head and the sleeve together. Another feature of the invention is the provision of a sleeve of improved construction which aids in the manipulation of the stopper as a whole and reduces the cost of production thereof. To these ends the improved stopper for pour ladles consists in the structure hereinafter fully described and particularly pointed out in the appended claims.

The preferred form of the improved stopper device for pour ladles constituting the present invention is illustrated in the accompanying drawing which is a longitudinal, vertical section through the improved stopper device. The pour ladle itself is not illustrated, it being of the usual construction and having a capacity of about 1000 lbs. of molten metal. The opening through which the molten metal is discharged from the ladle is fitted with a valve seat indicated by the reference numeral 1 and composed of a graphite or clay composition. The discharge opening 2 through the valve seat is normally closed by a stopper head 3 the lower rounded end 4 thereof being adapted to rest against the circular valve seat 5. The sleeve section of the improved stopper is indicated at 6 and is as usual composed of clay. The stopper head 3 and the sleeve 6 are held in vertical alinement by means of the metal bolt 7 the upper end of which passes through the outer free end 8 of the lever or gooseneck for operating the stopper, the proper tension on the bolt for holding the head 3 and sleeve 6 together being secured by the series of washers 9 and the nut 10. The head 11 of the bolt 7 is located in a recess 12 in the lower end of the stopper head 3 and the shaft of the bolt is smaller than the axial hole 13 in the head and the axial bore 14 in the sleeve, and these spaces are usually filled with heat resistant material composed of clay as indicated at 15.

The upper end of the stopper head 3 is provided with a plurality of circular shoulders or terraces, in the present instance two, the lower shoulder 16 being in the form of a truncated cone and the upper shoulder 17 being in the form of a short cylinder smaller in diameter than the upper end of the shoulder 16. These shoulders 16 and 17 are suitably smaller than and are received within corresponding recesses 18 and 19 respectively, in the lower end of the sleeve 6. The circumferential spaces between the shoulders 16 and 17 and the corresponding recesses in the lower end of the sleeve 6 are filled with a mixture of clay or graphite composition 20. The upper faces of the stopper 3 left by forming the shoulders 16 and 17 and the corresponding lower faces left by forming the recesses in the lower end of the sleeve 6 constitute a tight joint designed to exclude metal from access to the bolt 7, but in case some molten metal should leak into this joint it is prevented from reaching the bolt by means of the packing of clay and graphite indicated at

20 filling the spaces between the shoulders 16 and 17 and their corresponding recesses in the lower end of the sleeve 6. In addition to this guarding against access of the molten material to the bolt 7 there is the usual sleeve of graphite and clay immediately surrounding the bolt. Thus by means of the new connection between the head of the stopper and the lower end of the sleeve the molten material is effectively prevented from access to the bolt.

It is desirable for the utmost efficiency in operation that the stopper device or structure be as light as possible consistent with strength and resistance to the attack of the molten metal in which the stopper device operates. It has been found that increased effectiveness is produced by tapering the sleeve 6 from its lower end where it contacts with the upper end of the stopper 3 to its upper end on which rests the series of resilient washers 9, thereby considerably decreasing the weight of the stopper device as a whole over former constructions without weakening the structure, and with increased effectiveness.

Having thus described the invention, what I claim as new is:

1. A stopper for pour ladles provided with a valve seat surrounding a valve opening, comprising a head adapted to rest against the seat to close the valve opening, one end of said head being provided with a plurality of shoulders smaller in diameter than the head, an elongated sleeve one end of which is provided with a plurality of recesses corresponding to and slightly larger than the shoulders on the head and adapted to cooperate with the shoulders when the head and sleeve are in assembled position to form annular channels, and means for holding the head and the sleeve in axial alinement, the annular channels between the shoulders and the walls of the recesses and the spaces between the holding means and the head and the sleeve being adapted to be filled with a heat resisting material.

2. A stopper for pour ladles provided with a valve seat surrounding the valve opening, comprising a tubular head adapted to rest against the seat to close the opening, one end of said head being provided with a plurality of circular shoulders of varying diameters, an elongated sleeve having at one end a plurality of circular recesses corresponding to and slightly larger than the shoulders on the head and cooperating therewith to form annular channels, and means for holding the head and the sleeve in axial alinement, the annular channels between the shoulders on the head and the recesses in the sleeve and between the holding means and the head and the sleeve being filled with a heat resisting material.

3. A stopper for pour ladles provided with a valve seat, comprising a graphite composition head adapted to rest against the seat, an elongated upwardly tapering clay sleeve, one end of the head having a plurality of shoulders and one end of the sleeve having a plurality of indented seats corresponding to and slightly larger than the shoulders and cooperating therewith to form annular channels, said channels adapted to be filled with a heat-resisting material and means for holding the head and the sleeve in axial alinement.

4. A vertically-arranged stopper for pour ladles provided with a circular valve seat surrounding a valve opening, comprising a tubular head composed of a graphite composition the lower end of which is adapted to rest against the circular valve seat to close the opening thereof, the upper end of said head being provided with a plurality of circular shoulders diminishing in size inwardly, a sleeve tapered upwardly from its lower end, the lower end of said sleeve being provided with a plurality of circular recesses corresponding to and slightly larger than the circular shoulders on the upper end of the head to form annular channels, and a bolt for holding the head and sleeve together in axial alinement, the channels between the head and the sleeve and the bolt and the head and the sleeve being filled with heat resisting material.

5. A stopper for pour ladles provided with a valve seat surrounding a valve opening comprising a head member adapted to rest against the seat to close the valve opening, an elongated sleeve member having one end interfittingly engaged with said head, means for holding the head and sleeve member in axial alinement, the interfitting engagement including a stepped formation on one of said members to provide a plurality of annular shoulders having their walls extending in the general lohgitudinal direction of said head, and the adjacent end of the other member being recessed with the wall of the recess stepped to provide annular walls corresponding to the annular walls of the stepped formation on the other member with the annular walls of the first named member slightly larger than the walls of the second named member to provide annular channels and said annular channels adapted to be filled with a heat resisting material.

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