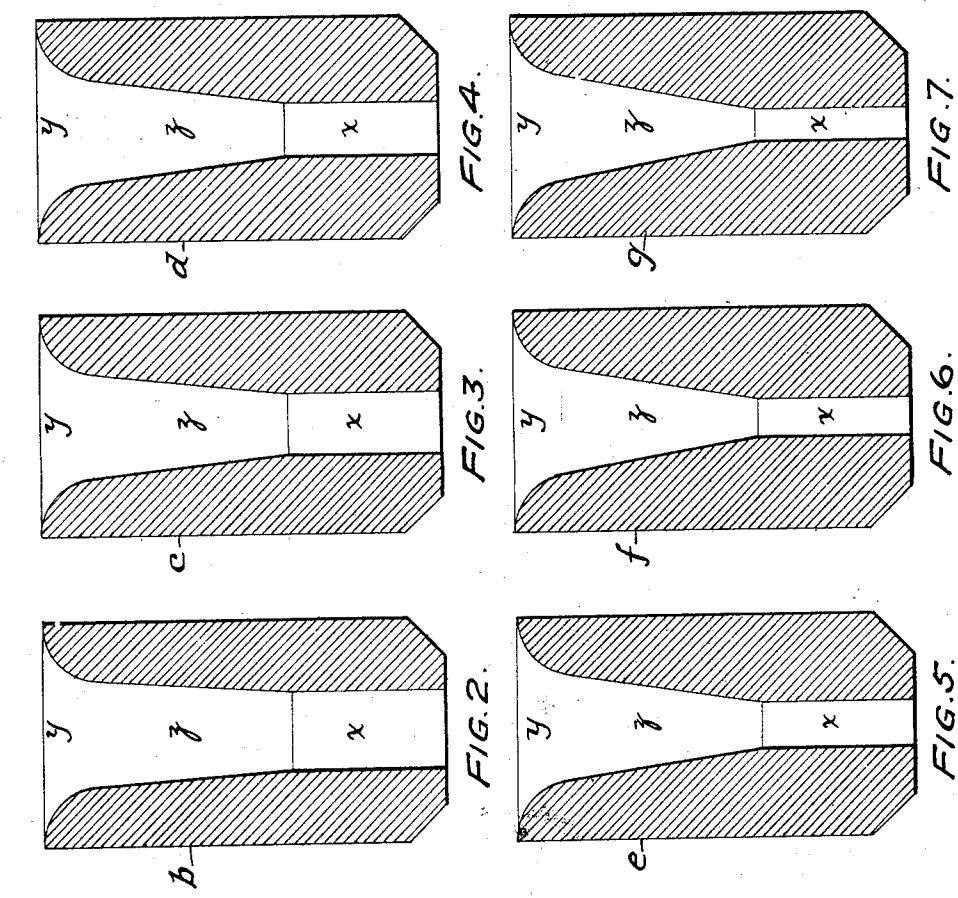
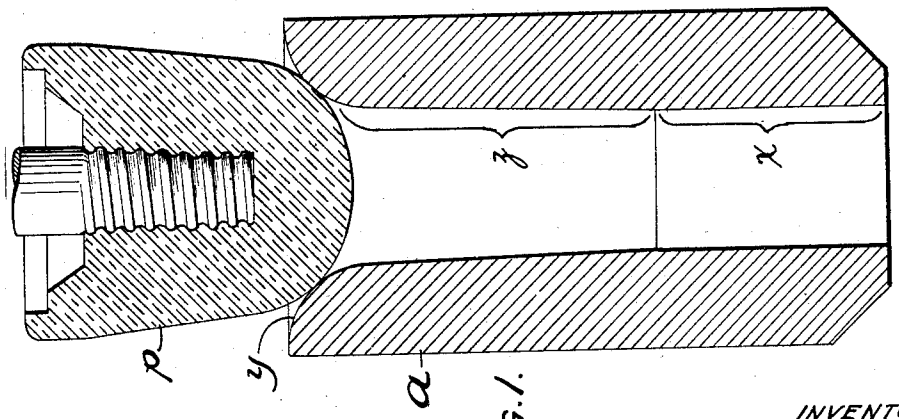
March 13, 1928. 1,662,600

J. L. COX ET AL

NOZZLE FOR LADLES

Filed Dec. 21, 1923





WITNESS:
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Patented Mar. 13, 1928. 1,662,600

UNITED STATES PATENT OFFICE.

JOHN L. COX, OF PHILADELPHIA, AND RADCLYFFE FURNESS, OF JENKINTOWN, PENNSYLVANIA.

NOZZLE FOR LADLES.

Application filed December 21, 1923. Serial No. 681,937.

In the manufacture of steel and some other metals, the ladle into which the molten metal is poured from the furnace is provided with a discharge orifice, in which is secured a nozzle adapted to be closed by a plug. The nozzle and plug are of heat-resisting material, such as fire-clay or plumbago and clay. The inner wall, forming the passageway of the nozzle, is convexly flared at its upper end in approximately the form of a quarter circle in vertical section. The bottom of the plug has an approximately hemi-spherical shape. The plug, when seated, has a tangential circumferential contact with the nozzle, the line of contact intersecting radii which, preferably, are approximately at an angle of about forty-five degrees to the axis of the plug.

It is customary to use nozzles of different internal diameters so as to provide for different rates of pour. Frequently different sized plugs are provided for the different sized nozzles. There may be either one plug for each nozzle, or one plug may serve (say) for two nozzles with some more or less objectionable variation from the ideal line of engagement.

The object of our invention is to provide a set of nozzles adapted for different rates of pour but all adapted, also, to be sufficiently closed by the same size plug, thereby dispensing with the necessity of providing plugs of different sizes.

We accomplish the specified object by providing a series of nozzles of uniform external shape and size, but of different internal diameters at their lower ends or discharge mouths and of uniform diameters and contours at their upper, flared, plug-receiving ends. Preferably, and more specifically, the lower part of each nozzle is of uniform internal diameter for a substantial portion of its height (preferably between one-third and one-half of its height), while above the lower portion the internal diameter gradually increases toward its convexly flared upper end. Each nozzle, therefore, may be said to have a passageway that is cylindrical in its lower portion, convexly flared at its upper end, and of frusto-conical form between its upper end and its lower portion. The internal diameters of the lower portions of the several nozzles are all of different, the diameters and contours of the upper ends of all the nozzles are alike, while the connecting frusto-conical portions of the several nozzles are of uniform diameters at their upper ends but of different diameters at their lower ends.

In the drawings, which show the preferred and described embodiment of our invention:

Fig. 1 is a vertical sectional view of that nozzle of the set which has the largest pour opening, with a plug positioned to close its upper end.

Figs. 2 to 7 inclusive are vertical sectional views, on a reduced scale, of the remaining nozzles of a set.

We have lettered the respective nozzles of a set, which are arbitrarily assumed to be seven in number as *a*, *b*, *c*, *d*, *e*, *f* and *g*. Taking any one of the nozzle passageways, it will be observed that its lower portion *x* is of uniform diameter, that its upper end *y* is convexly flared, and that between its upper end and its lower portion, it is of frusto-conical shape, converging more or less from the flared upper end to the lower cylindrical portion, as shown at *z*. The nozzle with the discharge mouth of greatest diameter may be assumed to be of the same internal diameter, below its flared upper end, throughout its height, but it is preferred, even in the nozzle of greatest diameter, that its passageway should converge slightly from its flared upper end and toward its lower end. All of the nozzles are adapted to be sealed equally well by a single size of plug *p*.

Having now fully described our invention, what we claim and desire to protect by Letters Patent is:

1. A nozzle for a ladle having a passageway which in its lower portion is of cylindrical shape and which above its lower portion is of frusto-conical form and of substantially greater length than diameter, the mouth of the nozzle above its frusto-conical portion being convexly rounded and adapted to be engaged by a plug.

2. A nozzle for a ladle having a passageway which at its upper end is convexly rounded, which for a limited distance above its lower end is cylindrical, and which, between its cylindrical portion and its convexly rounded upper end, is tapered for a distance greater than the length of said cylindrical portion.

3. A nozzle for a ladle having a through passageway which at one end has a flared

mouth adapted to be closed by a plug the portion of the passageway at the other end of the nozzle being of cylindrical shape and of any desired diameter less than the diameter of the narrowest part of the flared mouth, the portion of the passageway connecting the flared mouth and the cylinder portion being of frusto-conical form and of greater length than diameter and having a degree of taper dependent on the diameter of the cylinder portion of the passageway relative to the diameter of the narrowest part of the flared mouth.

In testimony of which invention, we have hereunto set our hands, at Philadelphia, Pa., on this tenth day of December, 1923.

JOHN L. COX.
RADCLYFFE FURNESS.