(No Model.)

J. K. GRIFFITH.

TAP NOZZLE.

No. 411,519. Patented Sept. 24, 1889.

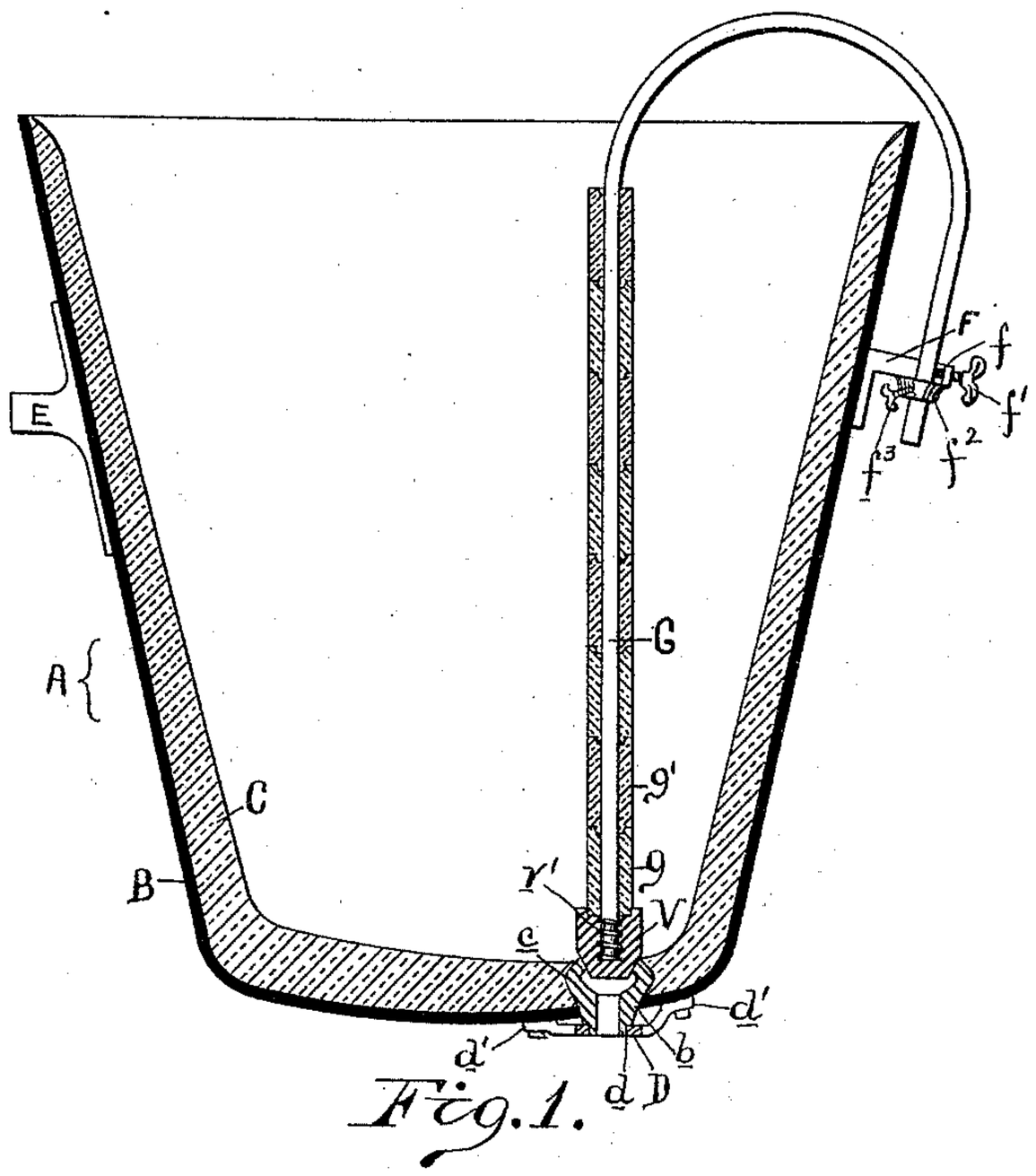

Fig. 1.

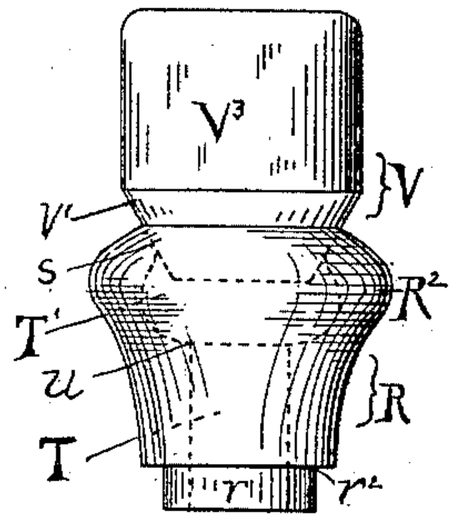

Fig. 4.

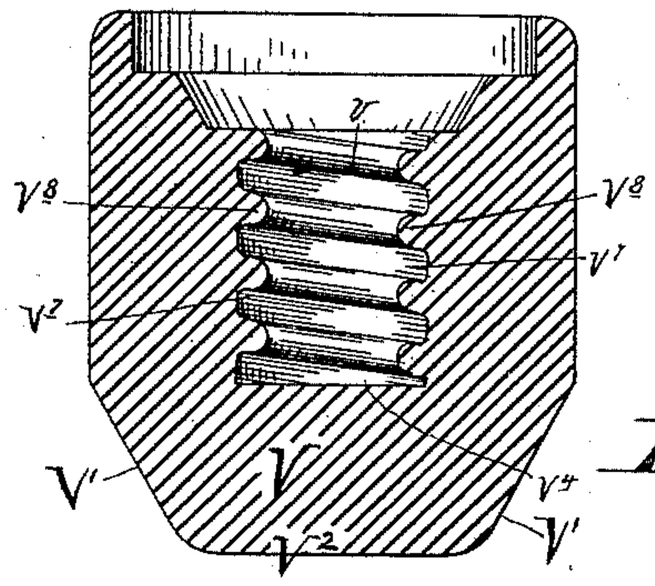

Fig. 2.

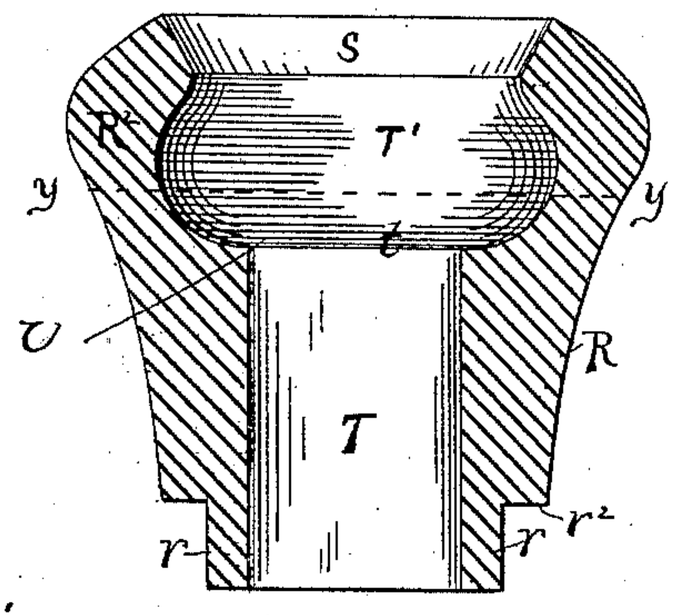

Fig. 3.

WITNESSES:
Chas A. Rutter=
Joshua Wallack, Jr.

INVENTOR
Jacob K. Griffith;
by his Attorney
H. W. Han Powell.

UNITED STATES PATENT OFFICE.

JACOB KOCH GRIFFITH, OF PHILADELPHIA, PENNSYLVANIA.

TAP-NOZZLE.

SPECIFICATION forming part of Letters Patent No. 411,519, dated September 24, 1889.

Application filed March 1, 1889. Serial No. 301,665. (No model.)

To all whom it may concern:

Be it known that I, JACOB KOCH GRIFFITH, of the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Tap-Nozzles, of which the following is a full, clear, and exact description.

My invention, while it is of use in the drawing off of many sorts of fluids from containing-vessels, more particularly facilitates and relates to the tapping of molten metal from stacks, crucibles, melting-pots, ladles, &c., and being especially adapted for use in connection with steel-founders' ladles, is hereinafter specifically illustrated in that aspect.

Heretofore among smelters and metallurgists the ladles from which molten materials are drawn off or "tapped" from below (as distinguished from those which pour their contents over their edges or lips) have been customarily equipped with a vent-nozzle and spile-plug at their lower part. These nozzles, consisting of a composition of graphite and fire-clay or other suitable refractory material, are commonly fitted and secured to such vents as a bushing in the shape of short cylindrical tubes with stout walls and a concave or saucer-like upper end. Into this cavity of the nozzle's upper end, which generally lies about flush with the inner surface of the ladle which it penetrates, the convex or correspondingly-fashioned male end of a stopper or spile plug, of similar refractory material, on being thrust down through the charge by an operating-rod finds a seat, and thereby they effect a closure and cut-off, or else, as desired, by lifting the spile-plug with the rod they allow the contents of the ladle, &c., to run out through the nozzle. The spile-plug rod, which is generally of iron, is usually protected from the charge through which it passes by a luting or tube of fire-clay, &c.

Now this apparatus, while it has the merit of extreme simplicity, is frequently inadequate to accomplish its end, for portions of the charge dribble off and escape by reason of the generally imperfect seating of these plugs upon the nozzle, if not by reason of absolute failure on the part of the workmen to hit the nozzle's breech with the spile-plug, the latter being an accident, which is all the more likely to happen, as a considerable retraction of this plug is necessary to afford a gateway whose area shall correspond with the area of the nozzle's tube-cavity, and thereby assure the issuance of a solid stream from it. Moreover the chilling of the molten mass—such as steel (and especially the softer sort of steel)—when it comes in a thin stream into contact with the comparatively cool walls of the nozzle, tends to solidify and stick small particles or layers of it thereto, and these not only arrest other layers and interrupt the flow by damming up about the outlet, but they often prevent the fair seating of the spile-plug upon the nozzle's saucer-like breech end and impair its cut-off action. Erosion of the nozzle's body is another familiar source of leakage, for with materials whose melting-point is at a high degree of temperature any lack of homogeneity in the the spile-plug's seat is quickly sought out and attacked by the molten material as it rushes out over it.

Now the chief object of my present invention is to devise a tap-nozzle which will obviate such difficulties to a great extent if not entirely; also, to devise one which will not only be capable of more frequent use than has heretofore been the case, but also of being used substantially as an ordinary spile-plug and nozzle, should its improved valve-seat be broken away, &c., thus affording an additional margin of safety to the charge which it may control.

Broadly speaking, I carry my invention into practice by developing the edges about the saucer-like breech of an ordinary nozzle upward, outward, and inward into a dome by an integral wall of such moderate thickness that its interior surface may be kept substantially at or near the melting-point by the molten charge, while the upper part of the dome thus formed is pierced by an opening into which the spile-plug can seat as a valve. The preferred contours are an oblate spheroid for the dome, and for its opening a circular orifice whose sides preferably flare outward to each other at an angle of sixty degrees, while the spile-plug's sides are, as it were, built out by an integral extension into a cone frustum adapted to center, register,

and seat in the opening as a valve before its lower and substantially ordinarily-formed lower end comes into contact with the now inclosed saucer-like cavity of the nozzle's breech aforesaid.

Reference now being had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts throughout the several figures, they will be found to illustrate my invention, as follows:

Figure 1, in side elevation and median cross-section, shows my invention in association with a steel-founder's ladle; Figs. 2 and 3, similar sectional side elevations, but on a larger scale, of my improved spile-plug and nozzle, respectively; Fig. 4, a vertical side elevation, on an intermediate scale, of structures shown in Figs. 2 and 3 when mutually seated.

In detail, A is an ordinary steel-founder's ladle, of which the shell B, the refractory lining C, vent-orifices *b c* in said shell and lining, respectively, removable nozzle clamp-plate D, (having an annular opening *d* and screw-attaching spider-feet *d' d'*, &c.,) maneuvering-lugs E, and post F, with its slot *f*, and binding-screw *f'* for the spile-plug rod G are all, like said rod and its fire-clay guard-sheath, consisting in this case of the spigot and socket-jointed cylinders *g g'*, &c., old and well-understood devices. I prefer to unite the rod G to the spile-plug V by means of a screw-engagement, as indicated in Fig. 1 and more clearly displayed in Fig. 2. The central rod-aperture *v* terminates blindly and has a plane base v^4, square to its axis, and a female screw, preferably of sharp pitch and coarse square groove v^7, and rounded wire-threaded lands v^8, which afford all expeditious means of attaching it both concentrically and firmly to the rod when the latter is, as shown in Fig. 1, provided with a corresponding square end and male screw *v'*, and it is also a more secure and direct method of attachment for the spile-plug and rod than that shown in Ostrander's United States Patent No. 117,918, of August 8, 1871, for, while the undercut central cavities of Ostrander's spill-plugs do not penetrate them from end to end, these cavities, as he invariably contrives them, being adapted to conform to concentric T-headed rods, do not introduce either the screw or bayonet catch cam principle. Indeed the liability of bursting the walls of the spile-plugs, by reason of their friable nature, has heretofore practically prohibited contrivances embodying any wedging action between the engaging parts, whereas my device, as above described, relying upon the reaction between the screw-threaded and flat terminal surfaces for binding the plugs to the rods' ends, confines "grouting" to such merely as may be necessary for protecting the rod from the action of the molten charge, instead of also calling upon it, as Ostrander's device does, as agent in securing the rod from backing off from the plug when assembled for use, the use being safe in his case only after the grouting has "set," instead of almost instantly, as with my sort of attachment. Otherwise, save for its additional valvular surface V' between its ordinary spile-plug end V^2 and its main cylindrical body V^3, the spile-plug may, even in my preferred form for it, be of the ordinary style and material. Its size and proportion depend upon the nozzle, with which it is intended to operate conjointly. So, too, the main body R, with nozzle-neck *r*, annular shoulder r^2 for clamp-plate D to bear against, and the tubular orifice T, (see Fig. 3,) may be said to be old, or substantially the same as those portions in ordinary nozzle-bushings for vents; but the extension of the main body R into the dome-walls R^2, surrounding the preferably-spheroidal recessed cavity T', which lies between the conical and outwardly-flaring valve-seat S at its crown and the usual saucer-like breech-cavity, designated U, and comprised between the dotted line *y y* and the inner end *t* of the tube-cavity T' aforesaid, are, on the other hand, new and salient features of my device.

The operation of these parts is almost self-evident from their preceding description; but for the sake of clearness I will add that the bushing is fitted into the vent substantially as shown in Fig. 1, with its dome exposed somewhat to the charge, the influence of which heats through its walls, and by keeping them hot prevents not only the incrusting of the valve-seat itself, but also to great extent any fouling of the inclosed cavity T and secondary valve-seat U; also, that the length of the cone-frustum of the plug V, its angle, and the size of the orifice which it plugs are preferably, as shown in Fig. 4 by dotted outline, such that it is not necessary to retract said plug wholly from without the dome-wall R^2 in order to afford an annular opening between it and its adjoining seat S whose area shall afford a capacity for escape to the molten charge, which at least equals and may exceed that of the outlet-tube T itself, for by this simple means I contrive that the workmen need never loose the guiding relation afforded to the plug by the valve-seat itself in bringing the plug back to a cut-off position; and this, if preferred, a hanking-collar f^2, provided with a binding-screw f^3, may more fully assure, as shown in Fig. 1, in connection with the rod G and post F.

A striking advantage which flows from the use of my invention, especially when applied in its preferred form to metallurgical ladles, lies in the fact that, by reason of the comparative thinness of the wall of the dome in which the valve-seat is formed and the heating and softening thereof by the molten metal as it rushes out over this seat in its escape, the scoring and erosion above alluded to in the seat can be quickly obliterated or neutralized by rubbing or pressing the spile-plug valve upon it as part of the act of cutting off; but,

concluding with a general statement that my hereinbefore-described nozzle-bushing may be used conjointly with many other known forms of valve-plugs beside that above described as the preferred one without departing from the purview of my present invention, I hereby declare that,

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a tap-nozzle, a tubular vent-bushing having at its breech or inner end a recessed enlargement of its cavity surrounded by dome-shaped walls and crowned by an orifice provided with a valve-seat, substantially as and for the purposes hereinbefore described.

2. In a tapping-nozzle, the combination of an inwardly and centrally tapering plug-valve and a tubular vent-bushing having at its breech or inner end a recessed enlargement of its cavity surrounded by dome-shaped walls and crowned by an orifice provided with a flaring seat for said valve, said valve and orifice being so proportioned that when the valve is only partially lifted out of the orifice they may afford a gate having an area of escape at least as great in capacity as the delivering capacity of said bushing's nozzle, substantially as and for the purposes hereinbefore described.

3. In a tapping-nozzle, the combination of a tubular vent-bushing having at its breech or inner part two valve-seats separated by a dome-wall surrounding an enlarged cavity, the whole formed integral, and a spile-plug valve having a surface adapted to normally register and fit in the former of said seats, but on the dissolution of the wall of said dome to register and seat in the second thereof, substantially as and for the purposes hereinbefore described.

JACOB KOCH GRIFFITH.

Witnesses:
CHARLES H. WEISS,
JABEZ GATES.