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NOZZLE CONSTRUCTION

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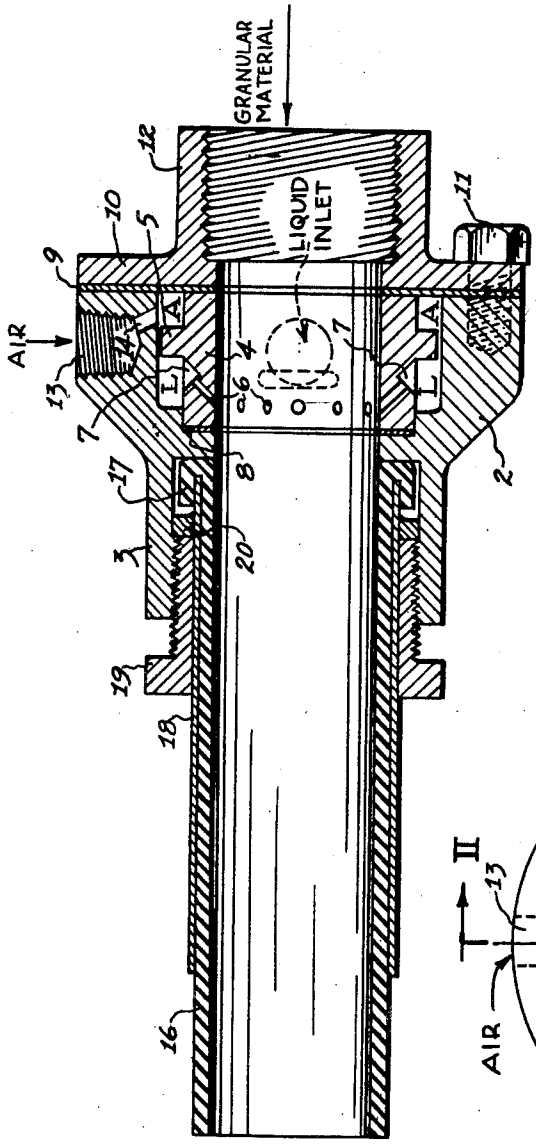



Fig. 2

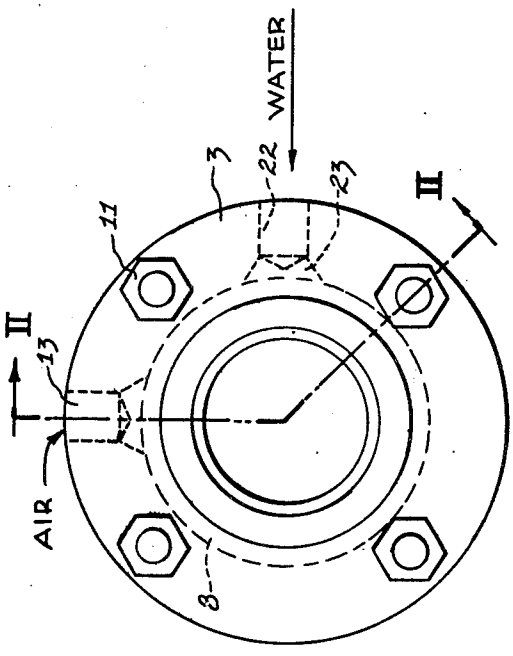



Fig. 1

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## NOZZLE CONSTRUCTION

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Projecting cement material by air has been known for a long time, and various nozzle constructions have been used having provision to add water. There is no particular difficulty with finely ground and slow-setting material. To admix water and project granular material, such as furnace-lining refractory compositions into place as for instance on a wall, involves more particular and critical conditions. Such compositions may include coarse and fine particles in mixture, and include quick-plasticizing adhesive agents when water is added, and there must be a thorough and uniform intermixing of water in such cases to give immediate development of adhesiveness in included plasticizing and setting agents if the material projected onto a furnace wall is to stick, or after having been applied is not to slump off in places. In accordance with the present invention a construction is had which makes possible the satisfactory applying of refractory compositions in the various exigencies of furnace lining and repairing conditions, cold or hot. Other objects and advantages of the invention will appear from the following description.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

Fig. 1 is an end elevational view of the inlet end of a nozzle construction in accordance with the invention; and

Fig. 2 is a longitudinal sectional view taken on a plane substantially indicated by line II—II, Fig. 1.

In general, the construction involves a body or housing having an extension screw-threaded internally, and an inwardly directed flange which provides abutments. And enclosed within the housing is a cylindrical ring having on its outer periphery a circumferential flange which coacts with the housing and provides a partition, to form two passages, and provide a small clearance at the periphery of such partitioning flange for predetermined flow from the rear passage to the forward passage, inclined openings being arranged in the cylindrical ring leading from the forward passage to the lumen of the nozzle. And, at the rear, the housing is closed and the cylindrical ring held by a closure ring having a screw-threaded extension to receive the granular material supply connection.

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Thus, as shown in the drawing, the body or housing 2 has an extension 3 internally threaded, and within the housing and spaced from its wall is the cylindrical ring 4 which has on its outer periphery a flange 5. This flange divides the annular space in the body into a rear passage A and a forward passage L. The outer periphery of the flange 5 is spaced from the inner periphery of the housing by a small clearance providing communication from passage A to passage L at the outer periphery. Preferably, a set of two or more interchangeable rings is used providing different clearances, as for example 0.02", 0.03", etc., so that the operator may apply the one most suitable for the particular material to be projected. From the passage L a plurality of distributed openings 6 generally 3 to 12 lead preferably at an incline in a forward direction toward the axial center of the nozzle. The cylindrical ring 4 seats by its foreward edge against a gasket 8, and at its other or rear edge the cylindrical ring is against a gasket 9 which extends peripherally to also seal the housing by the closure-ring 10 which is held to the body by a plurality of cap screws 11. The closure-ring 10 has an extension 12 which is internally screw-threaded to receive the granular feed supply connection. An inlet 13 is provided for pressure-air and by a duct 14 this communicates to the annular passage A which is formed between the closure-ring 10 and the outwardly projecting flange 5 on the cylindrical ring 4. At the outlet end is a projector pipe and while this may be a plain pipe of desired length screwed into outlet 3, with or without an adapter bushing, it is preferred to have a liner of rubber-like character 16, and this, in the form of a tube, has a cuff 17 turned back outwardly as supported by a metal sleeve 18 which has an integral ring 20; and the assembled resilient liner and support tube may thus be set into place in the extension 3. Then a screw-threaded bushing 19 screwed into the extension holds the liner and tube in assembly. This construction is found to result in a smooth and correct fitting of the cuff without damage within the housing extension.

For introduction of liquid, water or chemical solution to promote plasticizing or setting, liquid inlet 22, Fig. 1, is provided at a point spaced from the air inlet 13. This spacing assures an efficient distribution. The liquid inlet 22 communicates by an opening 23 to the passage L. It is noticed that the air under high pressure leaves the passage A in the form of a thin annular stream at the outer periphery of the flange 5, and is turned in by the outer wall of the passage to give a violent churning action with the liquid being supplied in passage L, the direction im-

posed by the initial jetting along the outer wall of the passage L causing an especially fine division or misting of the liquid before escaping through the openings 6. A very finely divided and especially uniform condition of the liquid and a uniform distribution into the stream of granular material flowing through the lumen of the nozzle is found to result.

The manner of operation is understood from the foregoing. The granular composition supplied into the lumen of the nozzle through the extension 12 proceeds to the series of openings 6 where it is thoroughly intermixed with the misted or very finely divided liquid as injected through the openings 6.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims, or the equivalent of such, be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In a nozzle for projecting granular material, a housing with an outlet extension which is internally threaded, a cylindrical ring having an outwardly-directed flange on its periphery and seating within the housing with the flange spaced by a small clearance from the inner periphery of the housing, the flange separating rear and forward annular passages, a plurality of holes through the ring from the forward passage angularly directed toward the center axis, an inlet for pressure-air to said rear passage, an inlet for liquid leading to the forward passage, a gasket sealing the edge of said cylindrical ring against the housing, a ring and holding means for closing against said cylindrical ring and housing and having an internally threaded extension, a gasket between the closure ring and the housing, a bushing to engage in the housing outlet extension, a tubular rubber-like lining therewithin, a tubular metal sleeve to support said lining externally and project within a back-turned cuff on the end of the lining adjacent the housing, and a metal ring secured to said sleeve between the edge of such cuff and said bushing.

2. In a nozzle for projecting granular material, a housing with an outlet extension which is internally threaded, a cylindrical ring having an outwardly-directed flange on its periphery and seating within the housing with the flange spaced by a small clearance from the inner periphery of the housing, the flange separating rear and forward annular passages, a plurality of holes through the ring from the forward passage angularly directed toward the center axis, an inlet for pressure-air to said rear passage, an inlet for liquid to the forward passage, a gasket sealing the edge of said cylindrical ring against the housing, a ring and holding means for closing against said cylindrical ring and housing and having an internally threaded extension, a gasket between the closure ring and the housing, a rubber-like tubular liner, a bushing to engage in the housing extension and having a tubular portion to protect the rubber-like liner externally and project within a back-turned cuff on the end of the lining adjacent the housing, and a metal ring between the edge of such cuff and said bushing.

3. In a nozzle for projecting granular material, a housing with an outlet extension which is internally threaded, a cylindrical ring having



an outwardly-directed flange on its periphery and seating within the housing with the flange spaced by a small clearance from the inner periphery of the housing, the flange separating rear and forward annular passages, a plurality of holes through the ring from the forward passage angularly directed toward the center axis, an inlet for pressure-air to said rear passage, an inlet for liquid to the forward passage, a gasket sealing one edge of said ring against the housing, a ring and holding means for closing against said cylindrical ring and housing and having an internally threaded extension, and a gasket between the closure ring and the nozzle and adjacent edge of the cylindrical ring.

4. In a nozzle for projecting granular materials, a housing with an outlet extension which is internally threaded, a cylindrical ring having an outwardly-directed flange on its periphery and seating within the housing with the flange spaced by a small clearance from the inner periphery of the housing, the flange separating rear and forward annular passages, a plurality of holes through the ring from the forward passage angularly directed toward the center axis, inlet connections for pressure-air and for liquid to the rear and forward passages respectively, a gasket sealing the edge of said ring against the housing, a ring and holding means for closing against said cylindrical ring and housing and having an internally threaded extension, and a gasket between the closure ring and housing and adjacent edge of the cylindrical ring.

5. In a nozzle for projecting granular materials, a housing with an outlet extension which is internally threaded, a cylindrical ring with combined means for partitioning two annular passages within the wall of the housing and for providing discharge from the rear passage along the inside wall of the housing into the forward passage, said means comprising an outwardly-directed flange on the periphery of the cylindrical ring leaving a small clearance all around, holes through the ring from the forward passage convergently toward the outlet, means for inlet of pressure-air and for liquid to the rear and forward passages respectively, and a closure ring for completing the rear passage and holding said cylindrical ring.

6. In a nozzle for projecting granular materials, a housing with inlet and outlet in axial alignment, a cylindrical ring within said housing having a flange on its periphery dividing off a forward annular passage and a rear annular passage but leaving a small clearance all around, means for inlet of gaseous pressure into said rear passage, means for inlet of liquid into said forward passage, and inclined openings from the forward passage convergently through said ring toward the outlet.

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