Oct. 6, 1925. 1,556,252

J. E. SHEPHERD

STEAM OPERATED APPARATUS AND PROCESS FOR MIXING AND APPLYING PLASTIC AND OTHER MATERIALS

Filed July 5, 1923.

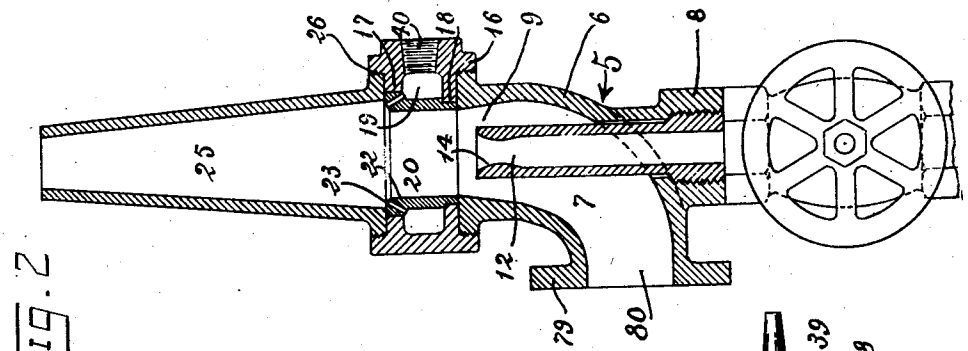


FIG. 2

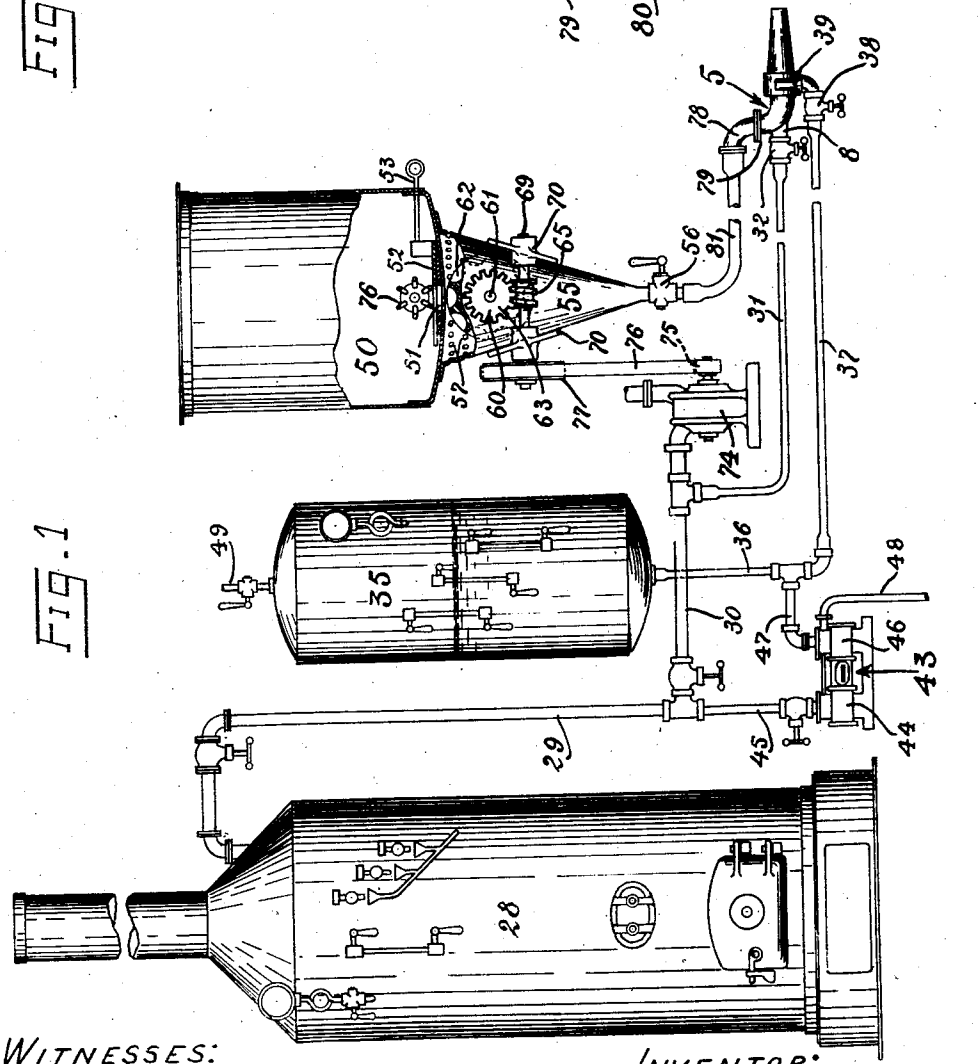


FIG. 1

WITNESSES:

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Patented Oct. 6, 1925. 1,556,252

UNITED STATES PATENT OFFICE.

JOHN E. SHEPHERD, OF CHARLOTTESVILLE, VIRGINIA.

STEAM-OPERATED APPARATUS AND PROCESS FOR MIXING AND APPLYING PLASTIC AND OTHER MATERIALS.

Application filed July 5, 1923. Serial No. 649,634.

To all whom it may concern:

Be it known that I, JOHN E. SHEPHERD, a citizen of the United States, residing in Charlottesville, in the county of Albemarle and State of Virginia, have invented certain new and useful Improvements in Steam-Operated Apparatus and Processes for Mixing and Applying Plastic and Other Materials, of which the following is a specification.

This invention relates to processes and machines or apparatus or devices for depositing and mixing adhesives, plastics, powders, liquids, and fire extinguishing and other materials, though it is noted that the invention is not limited to these materials nor to mixing nor in some respects even to depositing.

One object of the invention is to provide improvements in the apparatus and processes shown in the United States patents of Carl E. Akeley, No. 984,254, issued Feb. 14, 1911, and No. 991,814 issued May 9, 1911.

An important object of the invention is to provide an apparatus and process of this kind in which it is not necessary to use an air compressor run by steam or otherwise, thus saving a very great expense both of first cost and operation.

Another object of the invention is to provide an apparatus and process of this kind by which the plastic adhesive or the like is warmed and may be conveniently applied in cold weather.

Another object of the invention is to provide a steam operated device for applying cement and other material without the expense and trouble of superheating the steam.

In cement gun systems which use a steam operated air compressor, the first cost and up-keep cost of the air compressor is very considerable; and the friction and inertia losses of the rotating and reciprocating parts are also considerable. However, the greatest loss and inconvenience is caused by the immense amount of work converted into heat when the air is compressed. The actual cost of this heat loss is great, and getting rid of this heat by water jackets or otherwise is costly and annoying. The greatest inconvenience of this method occurs by the intense cold generated by the air expansion at the nozzle which so chills the cement, that the nozzle freezes up or operations have to be suspended at temperatures much higher than would be the case if this heat extracting did not take place at the nozzle.

With applicant's hot fluid or steam system, these costs, losses and annoyances are avoided, and the cement mixture or other material is so warmed that nozzle freezing never takes place, and operations may be carried on during severely cold weather.

Other objects of the invention are to improve generally the simplicity, economy and efficiency of such processes and devices and to provide a device or apparatus of this kind which is durable, economical to manufacture and operate and which will not get out of order.

The inventive features for the accomplishment of these and other objects are shown herein in connection with an improved mixing and applying apparatus which, briefly stated, comprises a combining nozzle connected by flexible conduits with a steam boiler, a water supply tank, and a receptacle for dry or other material or materials.

Other objects of the invention will appear as the description proceeds; and while herein details of the invention are described, the invention is not limited to these, since many and various changes may be made without departing from the scope of the invention as claimed.

In the accompanying drawing, showing by way of example, one of many possible embodiments of the invention,

Fig. 1 is a diagrammatic side elevation of the apparatus as a whole; and

Fig. 2 is a longitudinal sectional view, partly in elevation, of the nozzle.

Referring more particularly to the drawing, my improved apparatus is shown as comprising a combining nozzle 5 fed from a steam boiler 28, a water supply tank 35 and a dry-material receptacle 50, all as will be explained.

The combining nozzle 5 comprises a body portion 6 having a large elbow-shaped chamber 7 (Fig. 2), provided with an interiorly threaded rear extension 8 coaxial with the discharge end 9 and receiving an inner nozzle tube 12 screwed in said exten-

sion and extending to near the discharge end 9 and interiorly provided with venturi contour 14 at the forward end.

A collar 16 screwed on said discharge end is provided with intermediately spaced inner front and rear flanges or webs 17 and 18 forming an intermediate annular chamber groove or passage 19. A bushing 20 in said collar forms with said groove 19 an annular liquid passage, and has its inner end fitted against said rear web 18 and the body portion 6, and is provided at its forward end with a flared flange 22 fitting in the outer web and provided with converging apertures 23 communicating with said liquid passage. A forwardly tapering main nozzle tube 25 coaxial with the inner nozzle tube 12 has a peripheral threaded inner end flange 26 screwed in the outer end of the collar 16 tight against said flared flange 22, leaving exposed said apertures 23 to admit water to the main nozzle.

Steam is transmitted to the inner nozzle tube 12 from the boiler 28 through a steam conduit formed of a valved pipe section 29, a pipe section 30 and a flexible section or hose 31 connected to and feeding steam to the rear end of said inner nozzle 12 and provided with a control valve 32 near the nozzle.

The liquid or water tank 35 is air tight and is provided with a liquid conduit comprising a liquid pipe 36 extending from its lower part and a flexible section or hose 37 leading to said liquid valve 38 connected to the outer end of an elbow 39 screwed in a tapped inlet 40 (Fig. 2) of said collar 16, for feeding liquid to said liquid passage formed by the groove 19. A steam pump 43 having its steam cylinder 44 connected by a valved pipe 45 to said steam pipe 29 has its pumping cylinder 46 connected by a pipe 47 to said pipe 36 and to suitable water or liquid supply at the inlet 48 for storing water under pressure in the liquid tank. Also water may be conveyed to the tank through the valved pipe 49; though it is noted that any other means of water supply may be used.

The receptacle 50 for cement, sand, lime or other dry material is open to atmospheric pressure at the top and has a discharge opening 51 at the bottom over which is movable a slide 52 provided with a control rod 53 passing through the wall of the tank for controlling the rate of discharge of the material. A funnel or feed chamber 55 secured on the floor of the receptacle 50 beneath said discharge opening 51 is provided with a control dry valve 56 at the bottom, and at the upper part with perforations 57 to admit atmospheric pressure. A feed wheel 60 is rotatably supported in said feed chamber by projecting shaft 61 and has peripheral pockets 62 registerable one at a time with said discharge opening. A worm wheel 63 on shaft 61 is engaged by a worm 65 fast on a counter shaft 69 rotatably mounted on brackets 70 on the outer part of the funnel. A steam turbine 74 fed from said steam pipe section 30 has a drive pulley 75 connected by a belt 76 to a pulley wheel 77 fast on the shaft 69, whereby the feed wheel 60 feeds increments of dry material into the feed chamber. A stirrer 76 above said discharge opening 51 is driven from said shaft 61 by suitable means (not shown). An elbow-joint 78 secured on a flange 79 of the dry inlet 80 of the nozzle 5 is connected to a large flexible dry conduit 81 or hose leading from said dry valve 56. The funnel 55 and feed wheel 60 are similar to that shown in the Akeley patents and need not be here further described.

The operation of my improved process and apparatus is simple and obvious. Steam in the boiler is raised to the desired pressure, say 70 pounds; the tank 35 is supplied with water through the pump 43 or the pipe 49; the receptacle 50 is supplied with cement and sand or other dry material; and the feed wheel 60 started to rotating.

Steam under boiler pressure is then passed through the steam conduit, the inner nozzle tube 12, the bushing 20 and main nozzle tube 25, whereupon by entrainment a partial vacuum is formed in the chamber 7 and also in the passage 19. Water is then admitted through the hose 37 and apertures 23 while sand is admitted through the opening 51 and inlet 80.

The water and dry material are thus fed into the blast of steam by the suction of entrainment of the steam, and the blast then forces out and applies said water and material by the force of said blast onto the wall or surface to be treated, mixing depositing and tamping them in one operation as described in said patents. In addition to these results, the hot steam heats or warms the material so that concrete or the like thus deposited has time to set before it becomes cold, thus permitting in freezing weather, operations which heretofore could not be carried on in freezing temperatures.

As the suction generated by the steam jet is considerable, pressure in the tank 35 is not required.

While herein I show one liquid tank and one dry material tank, the invention is not limited to this number of materials of either kind, or to materials of both kinds, or to a plurality of materials besides the steam, or to materials of the kind stated, or to steam as a heating medium.

My process and apparatus can be used with the liquid tank alone or with the dry receptacle alone, and may be used with other materials than those mentioned, such as

paint, white-wash, tar, disinfecting vapors, liquids and powders, fire extinguishing materials, and others too numerous to mention.

I claim:

1. A process comprising supplying a stream of steam; and separately adding cementitious material and water to said stream.

2. A process comprising supplying a stream of hot fluid; and separately adding dry cementitious material and liquid to said stream.

3. A process comprising forming steam under pressure; forming a blast of the steam; adding dry material to said blast; and injecting water into said blast.

4. In combination, a combining nozzle; a boiler; a steam conduit leading from the boiler and feeding steam to said nozzle; an air tight water pressure tank having a water conduit extending from its lower part and leading to said nozzle; a receptacle for dry material; and means for feeding the dry material into said nozzle.

5. A combining nozzle provided with a large body chamber; an inner nozzle tube extending coaxial to near the discharge end of the chamber; an annular liquid passage provided with forwardly converged apertures at said discharge end; and a main nozzle tube coaxial with the inner nozzle tube forward of said discharge end and into which said apertures discharge.

6. A combining nozzle comprising a body portion having a large elbow-shaped chamber; an inner nozzle tube screwed in said chamber and extending coaxial to near the discharge end of the chamber; means on said discharge end forming an annular liquid passage provided with apertures; and a main nozzle tube coaxial with the inner nozzle tube and fitting against said forward end and leaving exposed said apertures.

7. A combining nozzle comprising a body portion having a large chamber; an inner nozzle tube extending coaxial to near the discharge end of the chamber and having an inner venturi contour at its forward end; means forming an annular liquid passage and provided with apertures discharging forward of said discharge end; and a main nozzle tube coaxial with the inner nozzle tube and into which said chamber and apertures discharge.

8. In combination, a combining nozzle; a boiler; a steam conduit leading from the boiler and feeding steam to said nozzle; an air tight water pressure tank having a water conduit extending from its lower part and leading to said nozzle; a receptacle for dry material; a feed chamber beneath said receptacle; a feed wheel in said feed chamber for feeding increments of dry material into the feed chamber; and a large flexible dry conduit or hose leading from said feed chamber to said nozzle.

9. A combining nozzle comprising a body portion having a large elbow-shaped chamber; an inner nozzle tube screwed in said chamber and extending coaxial to near the discharge end of the chamber; a collar screwed on said discharge end and provided with an intermediate annular chamber groove, and having a lateral liquid inlet opening; a bushing in said collar forming with said groove an annular liquid passage and provided with apertures communicating with the liquid passage; and a main nozzle tube coaxial with the inner nozzle tube and fitting against said flared flange, leaving exposed said apertures.

10. A nozzle comprising a body portion having a large elbow-shaped chamber having an exteriorly threaded forward discharge end, and a flanged lateral dry inlet end for dry material, and provided with an interiorly threaded rear extension coaxial with the discharge end; an inner nozzle tube screwed in said extension and extending to near said discharge end and interiorly having a venturi contour at the forward end; a collar screwed on said discharge end and provided with interior threads at both ends and intermediately spaced inner front and rear webs forming an intermediate annular chamber groove, and having a lateral tapped liquid inlet opening; a bushing in said collar forming with said groove an annular liquid passage and having its inner end fitted against said rear web and the body portion, and provided at its forward end with a flared flange fitting in the outer web and provided with converging apertures communicating with the liquid passage; and a forwardly tapering main nozzle tube coaxial with the inner nozzle tube and having a peripherally threaded inner end flange screwed in the outer end of the collar tight against said flared flange, leaving exposed said apertures to admit liquid to the main nozzle.

JOHN E. SHEPHERD.