

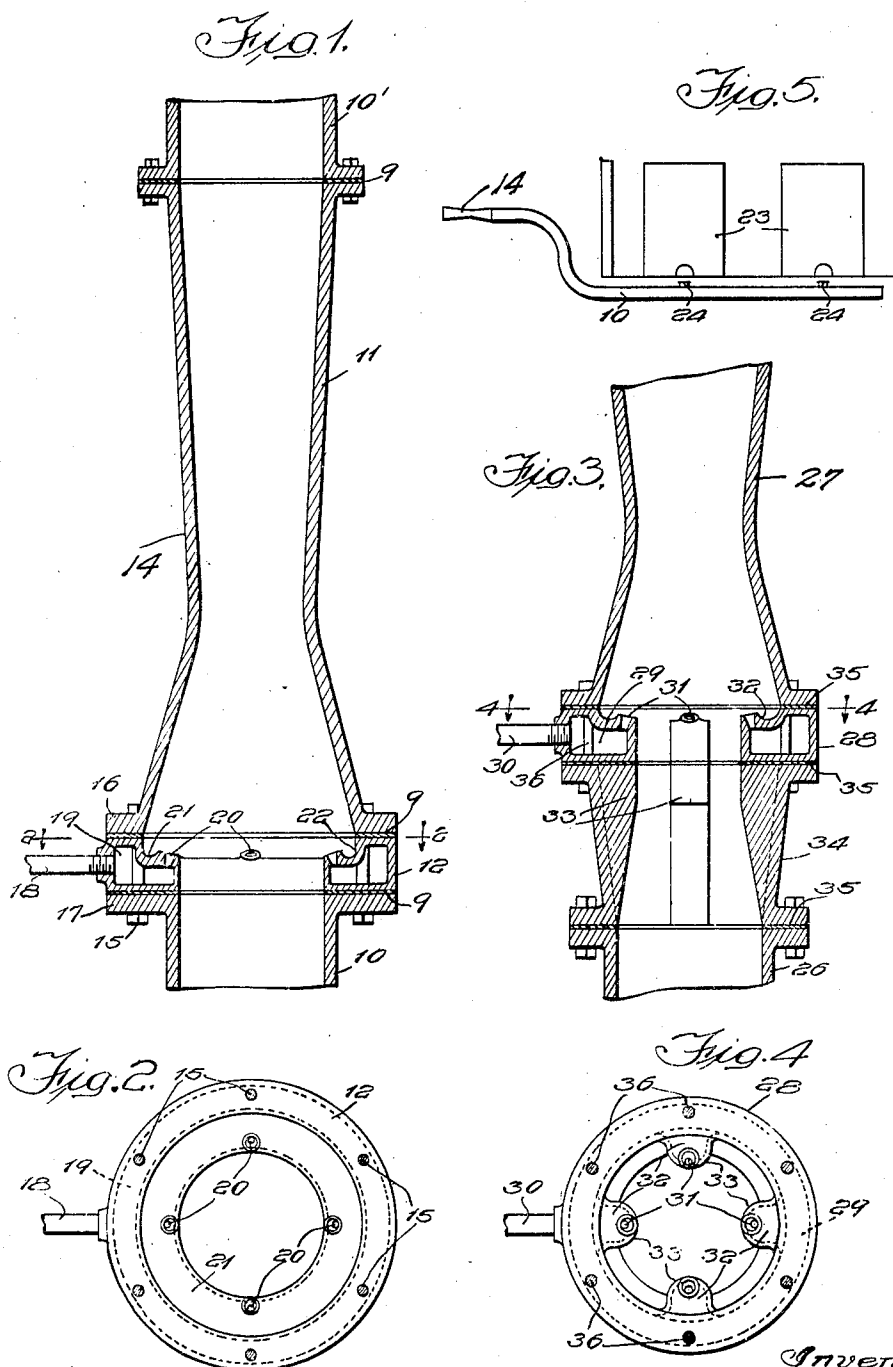
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CONVEYER

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CONVEYER

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My invention relates generally to pneumatic conveyers and has to do more particularly with devices in the nature of steam ejectors positioned at the discharge end of a conveyer pipe line for producing a high velocity air flow therethrough. The intake end of the conveyer pipe line is preferably connected with the ash pit of a boiler room, although, if desired, it may be connected with a tank or a receptacle into which ashes or similar material is dumped. By placing the ejector at the discharge end of the conveyer pipe line, the material is conveyed from the ash pit through the entire length of the conveyer line by air suction. The air suction concentrates the material in the center line of the conveyer pipe where the velocity is greatest and minimizes the wear or abrasion otherwise caused on the pipe by contact of the material. The steam ejector comprises a plurality of small nozzles so arranged as to converge and form a group of steam jets in the line of air flow and yet be protected from the abrasive contact of the material therewith. By the use of a plurality of nozzles advantage is taken of the fact that a much higher air entrainment is obtained for a given amount of steam if this steam is divided into a plurality of small jets instead of being discharged as a single large jet. By providing relatively large inlet openings for the conveyer pipes, the maximum size of such openings being determined by the cross sectional area of the most restricted portion of the conveyer conduit, large sized material may be conveyed with the ashes and discharged into a target box or similar receptacle, positioned at the discharge end of the pipe. The arrangement of the device, as described, produces silent operation in the ash pit and virtually silent operation throughout the entire system.

An object of my invention is to provide a device for introducing steam or other fluid under pressure into a conduit of the type referred to in such a manner as to produce the maximum possible pneumatic pressure for a given amount of fluid introduced, and hence will have a high degree of efficiency.

Another object of my invention is to provide improved jet means for directing ash through the conduit, which means comprise a plurality of nozzles and permits a large saving in the amount of steam or other fluid required. A further object of my invention is to provide a plurality of nozzles which will direct a plurality of jets of steam or other fluid under pressure into a tubular conveyer, the nozzles being so disposed as to be protected from abrasion and injury by the material passing through the conveyer.

A feature of my invention is the provision of steam nozzles so arranged that the air flowing through the device may circulate around the nozzles, whereby an increased entraining action is obtained and the nozzles are also protected from abrasion, and a still further object is to provide in a device of the kind described a construction wherein the air currents are most effective as carriers of material. I also have found that increased efficiency may be obtained by tapering the nozzles so as to permit the fluid to expand while passing therethrough and by directing the fluid jets through a restricted tube of the Venturi type hereafter referred to as a compression tube.

The invention is particularly adapted to convey abrasive material such as ashes and it is an object of the invention to provide a device comprising a plurality of units capable of easy and separate replacement, and in which the most expensive unit takes the form of a nozzle manifold and is so positioned as to be protected from direct impingement and abrasion by the material conveyed.

In such devices as heretofore constructed it has been found that the admission of an occasional relatively large body of the material to be conveyed, tends to choke or clog the compression tube at its restricted opening and still another object of the invention is to provide a conveyer so constructed as to minimize clogging or chcking.

Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the description herein given. To this

end my invention consists in the novel construction, arrangement and combination of parts herein shown and described and more particularly pointed out in the claims.

5 Referring now to the drawings forming a part of the specification and illustrating certain preferred embodiments of the invention:

10 Fig. 1 is a longitudinal sectional view of a compression tube embodying my invention, certain parts of the associated conduit being shown fragmentarily;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1;

15 Fig. 3 is a view similar to Fig. 1 showing another embodiment of my invention;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3; and

20 Fig. 5 is a view showing diagrammatically a system of tanks and a conduit in which the device of my invention is positioned.

Referring first to Figs. 1 and 2, the numerals 10 and 10' indicate sections of a tubular conduit for conveying finely divided 25 solid material. Interposed between the sections 10 and 10' of the tubular conduit is a compression tube 11. Gaskets 9 are positioned between the conduit sections 10 and 10' and the compression tube 11. The tube 30 11 and an annular manifold member 12 together form an ejector device generally designated by the numeral 13. The compression tube 11 takes the general form of a Venturi tube having its restricted portion 14 sufficiently small to produce the necessary pneumatic pressure to induce a flow of air 35 through the conduit of which the sections 10 and 10' form a part, whereby material such as ashes or the like is conveyed through 40 the conduit and is large enough to permit the maximum sizes of the particles of ashes, cinders, etc., to travel therethrough without clogging.

The compression tube 11 of the ejector 45 device 13 is secured to the annular manifold member 12 by means of the bolts 15, this manifold member being disposed between a flange 16 of the tube and a flange 17 of the conduit 10. The entire nozzle manifold 50 member 12 lies outside of the inner periphery of the conduit section 10 and thus is withdrawn from the path of travel of the material and is not subject to abrasive action by the material conveyed. A tubular member 18 communicates with the manifold member 12, being screw threaded to connect 55 with an aperture 19 formed therein, or connected by other suitable means. Formed in the annular manifold member 12 is a plurality of nozzles 20. It will be seen that the nozzles 20 expand in internal diameter from the manifold member toward the compression tube 11 and that these nozzles converge 60 toward the center of the tube and also are so disposed as to discharge in the general di-

rection of the flow of material within the conveyer. It will also be seen that an annular shelf 21 is formed between the nozzles 20 and the inner wall 22 of the manifold member and that the nozzles are disposed substantially flush with the bore of the conduit 10. 70

In operation, ashes, cinders, or other relatively finely divided material are drawn from ash pits or receptacles 23 into the conduit 10 through openings 24. The size of the openings 24 is so limited as to prevent material from entering the conduit 10 which could not readily pass the restricted portion 14 of the tube 11, and thereby the probability of clogging of the conveyed material is eliminated. 80

The high air velocity and suction in the conveyer pipe line or conduit is caused by the discharge of steam from the tubular member 18 into the manifold 12 and its escape through the nozzles 20. The escaping steam takes the form of a plurality of jets converging on the axial line of the conduit section 14. The converging jets cause air to travel at a high velocity from the conduit section 10 to the section 10' on the general principles governing the operation of ejector devices. I have found that pneumatic pressure is greatly increased and a higher efficiency is obtained by using a plurality of 85 nozzles 20 instead of a single nozzle, provided these nozzles are so arranged as to deliver inwardly directed steam jets converging on the axial line of the restricted portion 14. 90 95 100

By spacing the nozzles 20 away from the side walls of the tube 11 by means of the shelf 21, the nozzles are substantially self-cleansing, inasmuch as eddies of air are set up, on all sides thereof making it practically impossible for the material flowing through the nozzle to abrade and injure the surfaces of the nozzles. 105

Referring now to the embodiment of Figs. 110 3 and 4, the numeral 26 represents a section of a tubular conduit substantially similar to the conduit 10. Interposed between two sections of the conduit 26, only one of which is shown, is a compression tube 27 substantially similar to the compression tube 11. 115 Secured to the inlet end of the compression tube 27 is an annular manifold member 28 into an annular orifice 29 of which is threaded a tubular member 30. The manifold member 28 is substantially similar to the manifold member 12, the orifice 29 therein communicating with the interior of the tube 27 by means of nozzles 31, these nozzles being substantially similar to the nozzles 20 of the embodiment shown in Figs. 1 and 2. 120 The nozzles 31 are formed in lugs 32 projecting inwardly from the side walls of the manifold member. An annular member 34 is positioned between the conduit 26 and the manifold member 28. The annular mem- 130

ber 34 expands outwardly in the direction of the manifold member 28. The forward end of the member 34 and the main body of the member 28 have their inner peripher-
 5 ies substantially coincident and of larger diameter than the inner periphery of the conduit 26. Gaskets 35 are suitably posi-
 10 tioned between the annular members 28 and 34 and also between the members 28 and 34 and the compression tube 27 and the tubular conduit 26 respectively. Bolts 36 are provided to fasten the annular members 28 and 38 together and to the compression tube 27.

15 A plurality of tapered lugs 33 are formed on the inner face of the member 34 in alignment with the lugs 32 in which the nozzles 31 are located. The lugs 32 and 34 project inwardly so that their inner edges are in the
 20 line of travel of the material discharged from the conduit 26. The lugs 32 and 33 have a curved periphery preferably taking the form of a cylinder. This construction offers a minimum of interference to the pas-
 25 sage of air and material and permits the maximum entraining effect of the air as it passes the nozzles 31 as well as avoiding abrasive contact of the conveyed material with either of the members 28 or 34. The
 30 shape of the member 34 is such as to form a guard protecting the lugs 32 on which are disposed the nozzles 31.

In the operation of the device shown in Figs. 3 and 4, the material fed into the
 35 tubular conduit 26 flows past the sides of the lugs 33 and also past the sides of the lugs 32 in which are disposed the nozzles 31. It will be seen that the nozzles 31 by reason of their being spaced inwardly from
 40 the side walls of the manifold member 28 are enabled to entrain air on substantially all sides thereof and thus not only is the flow of material through the conveyor facilitated but it is made impossible for material
 45 passing through the device to impinge on the nozzles and abrade them.

The outlet end of the annular member 34 and the inlet end of the compression tube 27 preferably have the same diameter as the
 50 manifold member 28, thereby forming an expanded chamber in which the lugs 32 and 33 are positioned without restricting the discharge area.

Having thus described my invention, it is
 55 obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence I do not wish to be understood as limiting myself to the exact form, construc-
 60 tion, arrangement and combination of parts herein shown and described or uses mentioned.

What I claim as new and desire to secure by Letters Patent is:

65 1. In a device of the kind described, a

manifold member having a plurality of nozzles projecting from the side walls thereof so that a current of material may flow past said nozzles on a plurality of sides thereof, said nozzles expanding in diameter, and a
 70 tubular member associated with said manifold member, said tubular member having a restricted bore into which said nozzles discharge.

2. A conveying conduit of the kind de-
 75 scribed, one section of said conduit having a constricted bore intermediate its inlet and outlet ends, a second section of the conduit positioned adjacent the inlet end of said constricted section and having an enlarged
 80 bore, a plurality of longitudinally extending lugs mounted on the inner face of said enlarged bore section and a nozzle mounted on the forward end of each of said lugs, said nozzles being directed towards the
 85 longitudinal axis of the constricted bore section.

3. In combination, a conveying conduit having a restricted bore section, a manifold member having a plurality of converging
 90 nozzles projecting inwardly of the walls of said member, said nozzles expanding in diameter and so directed as to discharge into said restricted bore section.

4. In combination, a conveying conduit
 95 having a restricted bore section, a manifold member having a plurality of lugs projecting inwardly from the side walls thereof so that a current of material may flow past said lugs on a plurality of sides thereof, a plurality of nozzles mounted one on each
 100 of said lugs and directed to discharge along the axial line of said restricted bore section.

In testimony whereof, I have hereunto
 signed by name.

EDGAR B. TOLMAN, Jr.

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