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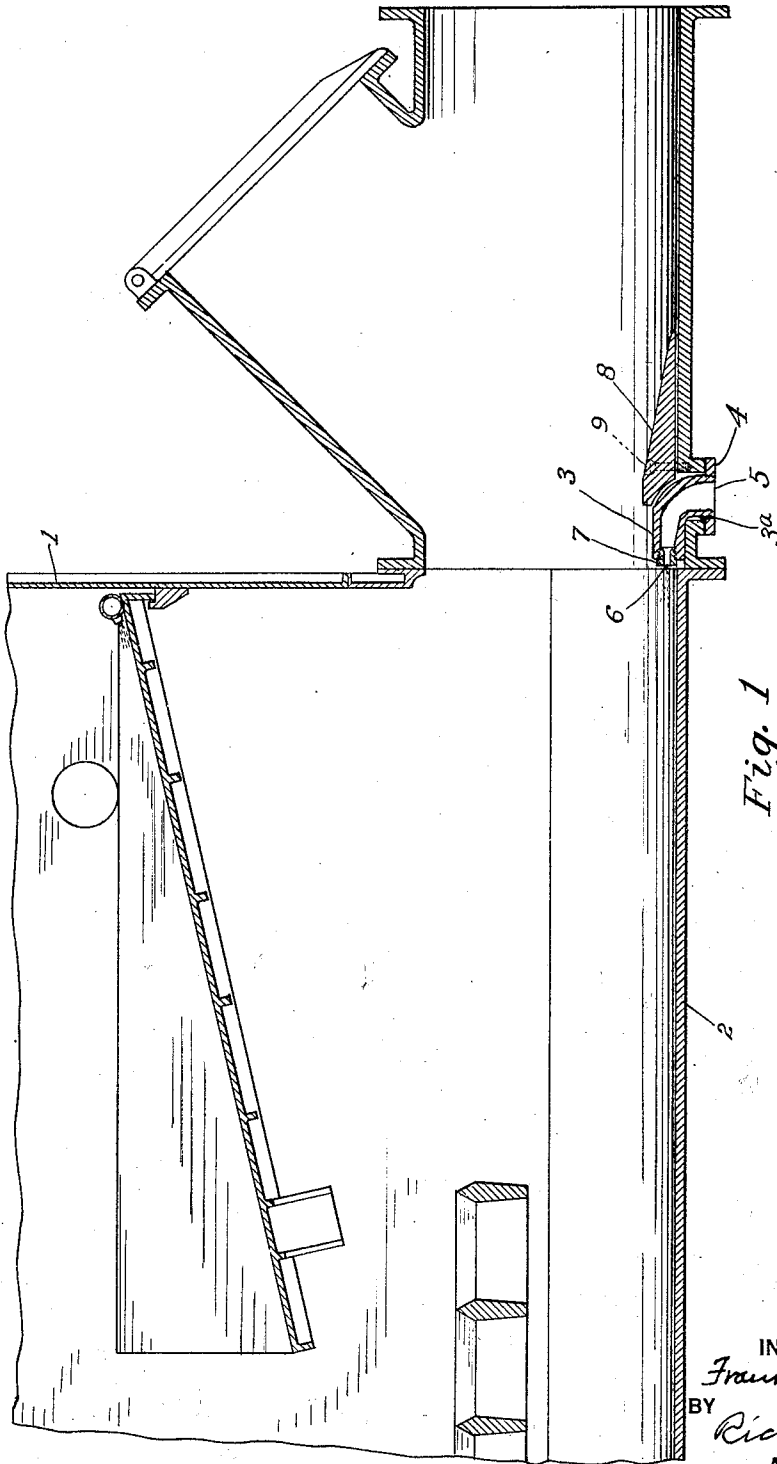
1,694,635

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SLUICEWAY NOZZLE

Filed Nov. 12, 1925

3 Sheets-Sheet 1



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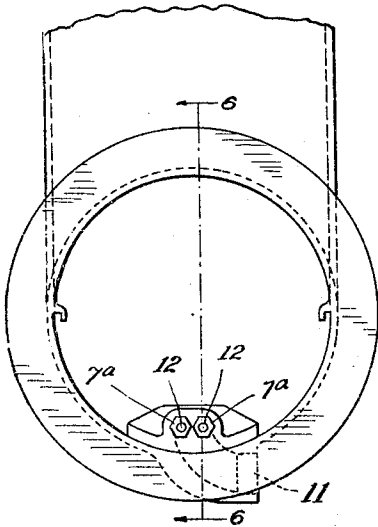


Fig. 5

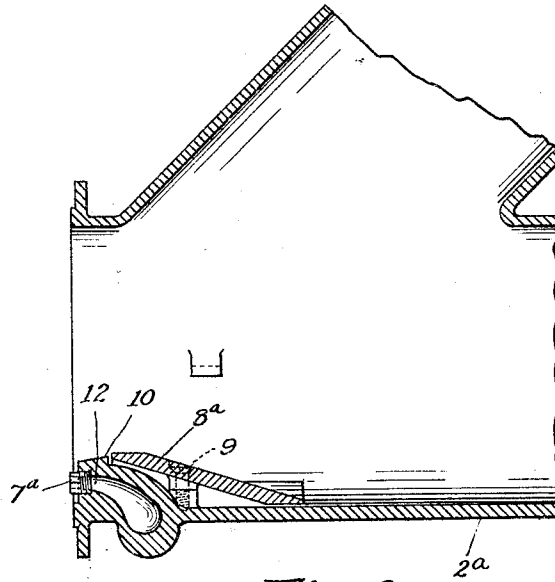


Fig. 6

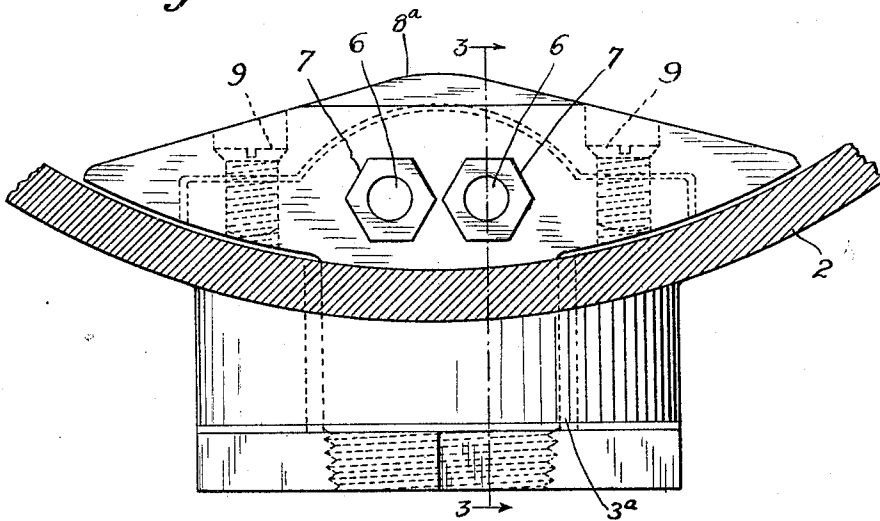


Fig. 2

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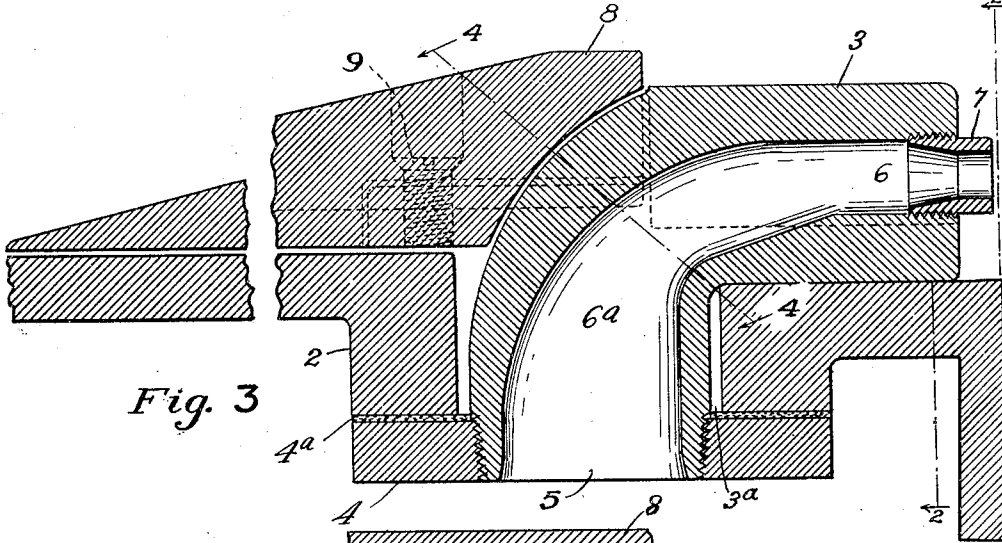


Fig. 3

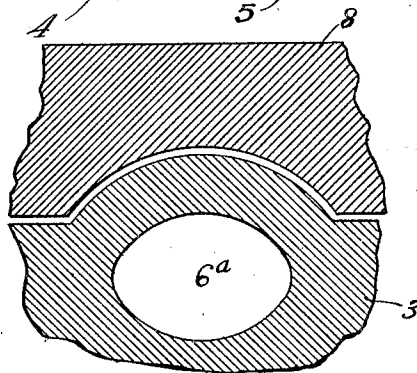


Fig. 4

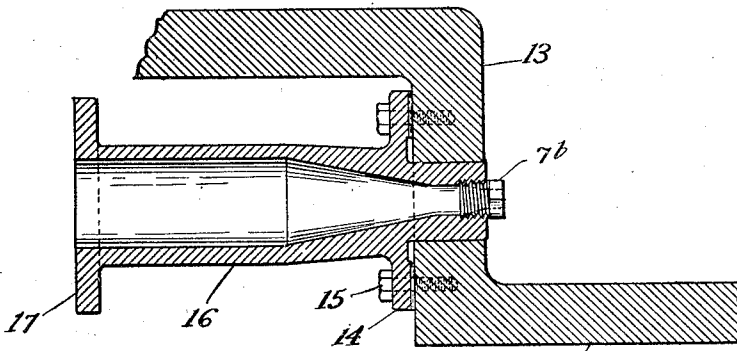


Fig. 7

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UNITED STATES PATENT OFFICE.

FRANK B. ALLEN, OF LOWER MERION TOWNSHIP, MONTGOMERY COUNTY, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO FRANK H. DUNBAR, OF CLEVELAND, OHIO.

SLUICEWAY NOZZLE.

Application filed November 12, 1925. Serial No. 68,638.

This invention relates to the art of transporting solid material and is more particularly concerned with apparatus for conveying solid material by means of fluid moving at a high velocity.

One object of the invention is to construct apparatus for conveying solid material provided with means for converting the static energy of a confined liquid into high velocity energy in a fluid stream.

Another object is to construct a sluiceway for carrying solid material which is provided with an improved means for increasing the material carrying efficiency thereof.

A further object is to construct a nozzle for discharging liquid under high pressure in a round, substantially non-spreading liquid stream.

Other objects will appear and be pointed out hereinafter.

In the drawings forming a part of this specification:

Fig. 1 is a vertical section and shows in reduced scale apparatus embodying one form of my invention and structure with which it may be associated.

Fig. 2 is an end view taken substantially on line 2—2 of Fig. 3, showing the nozzle and associated parts of Fig. 1.

Fig. 3 is an enlarged vertical section taken substantially on line 3—3 of Fig. 2.

Fig. 4 is a section taken substantially on line 4—4 of Fig. 3.

Fig. 5 is an end elevation of a sluiceway provided with a modified form of nozzle.

Fig. 6 is a section taken substantially on line 6—6 of Fig. 5, and,

Fig. 7 is a view similar to Fig. 3 but showing yet another modified form of sluiceway and nozzle.

In conveying solid material by means of fluid moving at a relatively high velocity, and more specifically liquid discharged under high pressure so as to have a high velocity, I have found that the efficiency and conveying capacity of such conveying apparatus depends to an unexpected extent upon the form of the nozzle employed in discharging the fluid under high pressure.

For example, I have discovered that a flat stream of fluid, particularly liquid, tends to spread or spray and consequently has a material carrying capacity which, while greater than certain forms of fluid streams is not particularly efficient. I have discovered

that a substantially round and non-spraying stream of fluid is highly efficient and is capable of carrying increased amounts of solid material with the same fluid pressure as certain other forms of streams, or of conveying more material with lower pressure than certain other streams.

Referring to Figs. 1 to 4 in which I have illustrated one form of my invention, 1 indicates fragmentarily walls joining a hopper of a fuel burning furnace with a sluiceway 2 therebeneath which has an open top to receive solid material discharged from the hopper. It will be understood that the sluiceway is of sufficient size to accommodate the material as discharged therein from the hopper and may lead to a suitable place of disposal for the solid material. At one or more points in the sluiceway I provide openings 3^a in the bottom wall of sluiceway 2 through which an elbow shaped nozzle 3 projects, for discharging fluid under pressure into the sluiceway and adjacent and substantially parallel to the bottom thereof, for the purpose of conveying solid material along the sluiceway. This nozzle 3 projects into the bottom of the sluiceway, preferably with an inlet opening 5 outside the sluiceway and with one or more outlet openings 6 inside the sluiceway, and is held in place by a nut 4 which screws onto the lower end of the nozzle 3 and is drawn up against a gasket 4^a interposed between the nut and an annular boss on the sluiceway and through which the nozzle extends. As shown, this nozzle may conveniently be disposed adjacent to an end of one of the sluiceway sections.

The passage 6^a within the nozzle is of decreasing cross section as it approaches the outlet end 6 and as shown has walls which are formed by curving surfaces substantially free from sharp projections or turns, in order to decrease to the minimum the resistance to passage of liquid therethrough. Each outlet opening 6, in this case two, is preferably provided with a perforated tubular nose piece 7 which is suitably shaped interiorly to form liquid passing therethrough into a substantially solid, round, non-spraying stream which may have any desired velocity. I have found that a nose piece having a conical shaped perforation in its rear end with side walls converging toward the front end and merging into a portion having substantially cylindrical surfaces, has given satis-

factory results. Other forms of perforations in the nose pieces or nozzles having suitably formed outlet openings and not provided with nose pieces may be employed but the illustrated construction is simple and cheap to make, easy to clean and efficient in operation.

It will be noted by referring to Figs. 2 and 3 that the nozzle 3 projects considerably above the bottom of the sluiceway 2, and it will be understood that abrasive materials in passing along the sluiceway would tend either to lodge on such projections or quickly to wear them away, thereby destroying the nozzle. In order not to impede the passage of solid material in the sluiceway and to avoid undue wear on the nozzle, I have provided a wear plate 8 disposed on the rear and top side of the nozzle and secured in place as by securing means 9, the top surface of the wear plate being suitably inclined so that solid material may readily pass thereover.

In Figs. 5 and 6, I have illustrated a modified form of nozzle and means for assembling the same in a sluiceway. In these figures, 2^a designates a fragmentary portion of a substantially round sluiceway. The nozzle 10, as shown, is formed integrally with the bottom of the sluiceway and has an inlet opening 11 and one or more outlet openings 12 inside of the sluiceway. A source of fluid under pressure, not shown, may be attached to the end of the nozzle outside of the sluiceway. The outlet end of the nozzle 10 is provided with a nose piece 7^a of substantially the configuration described above in connection with Figs. 1 to 3. The nozzle is protected by a wear plate 8^a disposed on the rear side of the nozzle and secured in place in a sluiceway by any suitable means, such as securing means 9. It will be understood that the wear piece of not only Figs. 1 and 3, but also of Figs. 5 and 6 has substantial engagement with the sluiceway along its side edges and rear end so that solid material will have little or no tendency to become wedged between the sluiceway and plate.

In Fig. 7, I have illustrated a further modified structure embodying my invention. In this figure, the sluiceway 2^b is formed in the riser 13 of certain of the steps of the sluiceway bottom and is provided with a nozzle 16 which extends through the riser of the sluiceway being attached by a flange 14 and suitable means 15, and which is provided with suitable means, such as a flange 17 at its outer end to connect up with a suitable source of fluid under pressure. A nose piece 7^b of substantially the same configuration as has been previously described is fitted in the outlet end of the nozzle. By reason of the steps formed in the sluiceway and the disposition of the nozzle to project through the riser part of the step, the wear plates of the preceding modifications may be dispensed with, it being

understood that the material passing along the sluiceway will move over the top of the nozzle and down over the step where fluid from the nozzle will engage with it.

The foregoing detailed description of my invention has been made for the purpose of enabling those skilled in the art to practice the invention and not for the purpose of limiting my invention to the details shown and described. The scope of my invention is defined by what is claimed.

What is claimed is:

1. In combination with a solid material carrying sluiceway, a nozzle in the sluiceway having an outlet opening inside of the sluiceway, and disposed adjacent and parallel to a wall of the sluiceway, a nose piece for the outlet opening of the nozzle provided with a substantially round tubular perforation, and a wear plate in the sluiceway disposed rearwardly of and in wear protecting position with respect to the nozzle.

2. In combination with a solid material carrying sluiceway, a nozzle in the sluiceway having an inlet opening exterior to the sluiceway and outlet openings within the sluiceway and disposed adjacent and substantially parallel to a wall thereof, and nose pieces in the said outlet openings having perforations formed to provide a plurality of substantially solid, round, non-spraying streams of fluid travelling at high velocity when liquid under pressure is passed therethrough.

3. In combination with a solid material carrying sluiceway, a nozzle in the sluiceway having an inlet opening outside of the sluiceway and an outlet opening inside of the sluiceway, and disposed adjacent and parallel to a wall of the sluiceway, a removable nose piece for the outlet opening of the nozzle provided with a substantially round tubular perforation, and a wear plate in the sluiceway disposed rearwardly of and in wear protecting position with respect to the nozzle.

4. In combination with a solid material carrying sluiceway, having an opening in the upper portion thereof, means disposed in the lower portion of the sluiceway for forming a high velocity stream of liquid, said stream having a high conductive capacity for solid materials, the said means including a nozzle having a substantially cylindrical outlet passage, means for discharging into the nozzle liquid having high kinetic energy, and a removable nose for the outlet opening of the nozzle provided with a substantially round tubular perforation, whereby a substantially non-spraying stream fluid of high velocity may be injected into the sluiceway adjacent and parallel to one of the walls of the sluiceway, and a wear plate in the sluiceway disposed rearwardly of and in wear protecting position with respect to the nozzle.

5. In a device for conveying solid material,

a sluiceway, a nozzle integral therewith having an inlet opening outside of the sluiceway and an outlet opening inside of the sluiceway, and a removable nose-piece secured to the 5 nozzle. and an outlet opening inside of the sluiceway, a removable nosepiece secured to the 10 nozzle, and means for protecting the exterior of the nozzle from the material passing through the sluiceway.

6. In a device for conveying solid material, a sluiceway, a nozzle integral therewith having an inlet opening outside of the sluiceway

In testimony whereof I hereunto affix my signature this 7th day of November, 1925.

FRANK B. ALLEN.