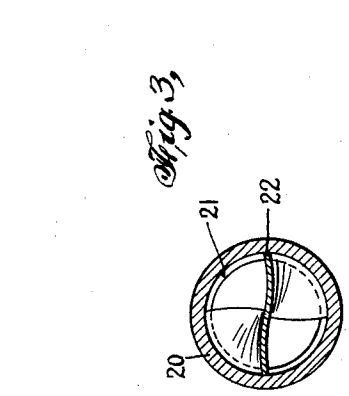
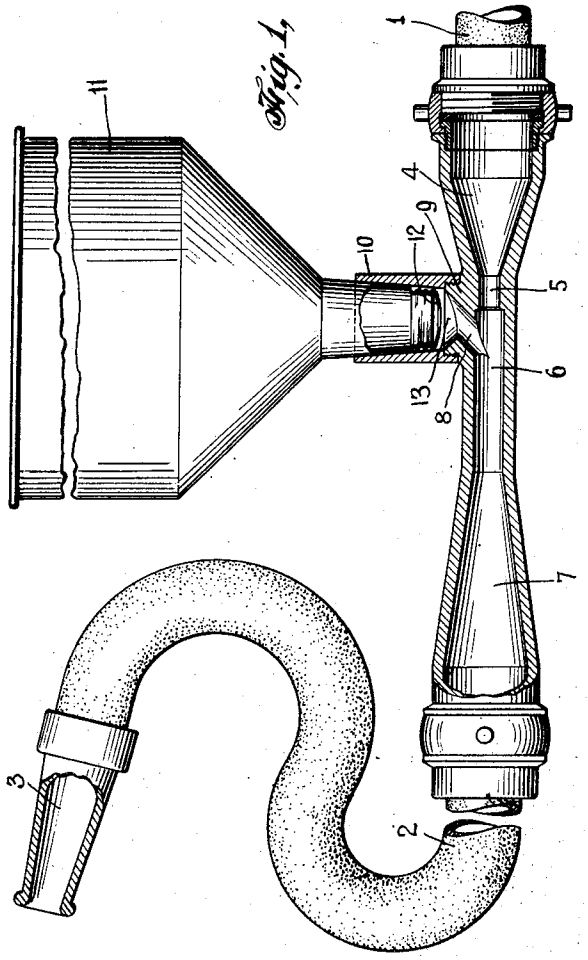
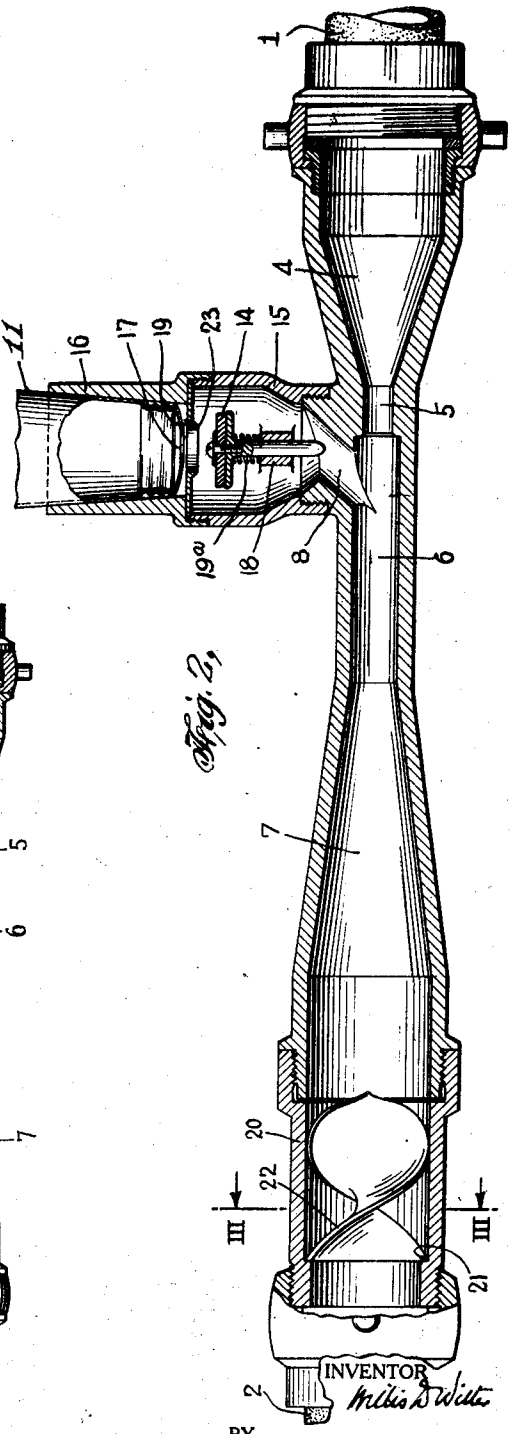
July 28, 1931. W. D. WITTER 1,816,417

FIRE EXTINGUISHER

Filed March 4, 1926







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Patented July 28, 1931 1,816,417

UNITED STATES PATENT OFFICE

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FIRE EXTINGUISHER

Application filed March 4, 1926. Serial No. 92,140.

The invention relates to apparatus for mixing chemicals in dry powder form with a liquid such as water, while the latter is in transit through a pipe to a place of delivery. The invention consists in the provision of means hereinafter described, whereby the operation and reliability of such apparatus are improved and certain causes of failure and improper action eliminated.

In the accompanying drawings Fig. 1 represents a simple form of the invention partly in longitudinal section.

Fig. 2 a similar representation of the preferred form of such apparatus.

Fig. 3 a larger scale detail of the feed casing of Fig. 2.

In the apparatus shown in Fig. 1 the water with which the powder is to be mixed is passed under pressure from a pipe 1 through a special form of Venturi tube and thence to a delivery pipe 2, which latter may be a hose terminating in a nozzle 3 or other suitable form of outlet. The Venturi tube is a water-conduit preferably formed with a relatively abrupt convergent entrance section 4, a two-diameter throat section 5—6 and a relatively long and more acutely divergent recovery section 7, the terminal diameter of which is about the same as the delivery pipe or hose 2 to which it is connected by a simple coupling as indicated. The narrow part 5 of the Venturi throat is about 5/8ths inch diameter, circular in section, and slightly longer than its diameter, and has an area of about 3/10ths square inches. It delivers centrally into the wider part 6 which is about 7/8ths inches diameter and also circular in section and several times as long as its diameter, its area being about twice that of the narrower part 5. These are the preferred dimensions for the tube when its maximum diameter, at its delivery end, approximates two-and-one-half inches as in the case in hand. The specific dimensions are subject to modification but it is desirable that the relative dimensions be about as stated and that the wide part of the throat be relatively long as compared to its diameter and that it be cylindrical in shape, regardless of the length of the narrow part.

The dry material to be mixed with or dissolved in the liquid or water flowing through the venturi, is admitted to the large part of the Venturi throat, through a powder hole 8 formed in the wall thereof, preferably on the top side and close to the part of smaller diameter. This powder opening is preferably of the same cross area or width as the large part of the throat, viz. about 7/8ths inch diameter and is sloped in the direction of water flow with corners rounded; no part of it has a less diameter than the wide part of the throat. It is provided with a threaded boss 9 to which the feed casing 10 is screwed. The upper end of this casing is internally tapered to receive the correspondingly tapered spout or outlet end of an open-topped hopper 11 into which the powder is charged and in which it is contained while being delivered to the water stream in the venturi.

The suction effect at the powder hole 8 may be greater or less, depending upon the water velocity, the characteristics of the Venturi tube, back pressure imposed by the length of hose 2, and the size of the delivery nozzle, its elevation, etc. With incoming water at a pressure even as low as twenty-five pounds and a delivery pipe of about fifty feet in length, the suction is sufficient to draw down the powdered material in the hopper into the wide part of the throat, where it mixes with the water, and is carried thence out through the delivery pipe. The considerable length of the cylindrical throat section 6 exercises an important influence on the action just described in that the suction effect on the powder is thereby maintained more closely proportioned to the liquid velocity and the proportions of the resulting mixture more nearly constant under fluctuation of water supply or pressure, while splashing of the water into the powder hole is also avoided. The length of the section 6 should be at least twice its diameter measured from the powder hole to the beginning of the delivery entrance outlet.

In its passage from the mass of powder in the receptacle 11 to the Venturi throat the powder passes through a relatively restricted opening in a transverse wall 12 located just above the powder hole 8. This restriction forms a space in the nature of an ex-

pansion chamber between itself and the powder hole and immediately adjacent the latter. The restricted orifice is short in length such as formed, for instance, by a round hole punched in a relatively thin sheet metal disc and is of smaller diameter than the powder hole so that any lump or foreign object which can pass through it will be certain to pass also through the rest of the apparatus without clogging. In Fig. 1 the disc 12 is formed as a ferrule removably attached to the spout of the hopper so that it can be quickly withdrawn with the latter and cleared of any obstruction, with the least interruption in the delivery of the fire-extinguishing medium. The disc proper or bottom wall of the ferrule is substantially flat and forms a ledge around the hole by which the foreign objects are caught, without jamming into the opening.

The powdered chemical may be plain bicarbonate of soda or a mixture of soda and aluminum sulphate with a foaming agent such as licorice root powder or the like added to it, the proportions being predetermined, as customary in this art, so that the union of the powder with the water produces a proper foam to be delivered from the nozzle.

Referring now to Fig. 2 the general construction will be seen to be the same except that in this case the hopper support is formed of separable parts 15 and 16 and contains an upwardly or outwardly closing check valve 14. The valve is mounted in the part 15, being guided by its stem in cross-bar or spider support 18 as indicated, and is adapted to close the opening 17. Such closure occurs whenever the back pressure on the Venturi tube becomes so great as to cause the water to enter the feed casing, thus preventing the contact of the water or of any great amount of it with the powder in the hopper. Such back pressure is likely to occur at any time by the kinking of the hose 2 or by the closing of a shut-off valve at the nozzle. The opening 17 is formed in a transverse wall 19 which may be integral with the upper part 16 of the feed casing, but is shown as a separate member clamped between the sections 15 and 16. The seat face of the check valve 14, or the surface of wall 19 against which it closes, is preferably formed of soft rubber or like yielding material so that the valve may close tight notwithstanding the presence of the granulated material between it and its seat. For the same purpose a narrow ridge or edge, as indicated at 23, is also formed on one of the valve members to bear on the other member and thus promote tightness of closure; either of these features may be used without the other. In the present case this thin seat edge is formed on the disc 19 around the restricted opening 17 and adapted to bite into rubber but without cutting it. Provided the valve is of light weight it is readily closed by the upward water flow incident to the said back pressure although, if desired, a light spring 19*a* may be applied to the valve to help it to close and to sustain it lightly against its seat. The position of rest assumed by the valve when the apparatus is not in use is immaterial, provided little resistance is imposed to movement of the valve in either direction. In operation of the apparatus it is moved or held downwards (open) by the weight of the powder and the suction of the venturi and is moved or held upwards (closed) by the back pressure, assisted by the spring where such is provided. The casing section is of wide diameter and the valve is depressed far enough to avoid any obstruction of the flow of the powder. The principal restriction is provided, as in Fig. 1, by the disc or ferrule applied to the hopper spout which fits the casing 16.

Fig. 2 also illustrates a further improvement which may be in the nature of an attachment to the device and adapted to be applied to the outlet end of the Venturi tube. This consists of a short casing 20 threaded at one end to connect with the Venturi outlet and at the other with the usual hose coupling. This casing is slightly larger in internal diameter than the outlet of the venturi and is provided with a shoulder 21 on its male-threaded end. A flat strip of metal 22 twisted say one-and-a-half turns or less, is fitted within the casing, thrusting at one end against the shoulder 21 and confined therein by the male end of the venturi and so that it is held against rotation. Obviously the effect of this twisted center partition is to impart a violent swirling to the mingled water and powder, thus increasing the turbulence so that it is promptly and more thoroughly dissolved in the water. The thickness of the partition represents a negligible resistance to the outflow which, of course, should be as free as possible.

I claim:

1. In apparatus for mixing solid chemicals with water, a Venturi tube having a two-diameter throat and a chemical entrance hole at the junction of the two diameters through which chemicals are drawn into the water by water-produced suction, a hopper to supply said entrance hole, a transverse wall between said hopper and the hole, said wall having a restricted opening of less cross area than the entrance hole and less than the wide throat part and being quickly removable.

2. In apparatus for continuously mixing solid chemicals with a water stream, the combination with a casing constituting a water passage adapted to create suction a branch passage of a diameter substantially equal to that of the water passage at the junction of the two passages, said branch terminating in a tapered end portion, an open-ended chemical hopper having a ta-

pered spout fitting said end portion and quickly removable therefrom, a transverse element constituting a partition between the water stream and the interior of the hopper, a hole in said element of a diameter less than that of the said passages and through which solid material from the hopper is drawn by suction into the water stream, said element being so located with reference to the casing and hopper as to be exposed to view for clearing the hole therein of any obstruction on the removal of the hopper.

3. In apparatus for continuously mixing solid chemicals with water, the combination with a casing forming a water passage designed to create suction, a valve chamber having an outlet connected with the region of suction of the water passage, a chemical hopper having its bottom end connected with said chamber and constituting the inlet thereto, said hopper being open at its upper end to permit the outflow of powdered chemicals therein through said bottom end, and a valve in said chamber movable to one position to permit free flow of said chemicals through the chamber into the water stream and to another position to shut off communication between the hopper and the water passage, said valve being so balanced as to occupy said second position whenever a water flow toward the hopper is established in the valve chamber.

4. In apparatus for continuously mixing solid chemicals with a water stream, the combination with a casing constituting a water passage adapted to create suction, a lateral passage constituting a chemical entrance hole leading to the suction region of the water passage, a removable chemical hopper arranged to discharge into said lateral passage and a ferrule member attached to the outlet end of said hopper so as to be removed with the same, said member having an opening therethrough of less diameter than that of the said lateral passage, for the purpose described.

5. In apparatus for continuously mixing solid chemicals with a water stream, the combination with a suction-producing water passage, a valve chamber connected therewith, a chemical hopper arranged to discharge into said chamber, a transverse partition extending across the entrance to said chamber, said partition apertured to permit the passage of the chemicals therethrough and having a ridge upstanding around said aperture on the under side of the partition, and a valve in said chamber having a yielding surface adapted to cooperate with said ridge to close the diaphragm aperture.

6. In apparatus for mixing solid chemicals with a water stream, a Venturi tube having a convergent entrance portion, a cylindrical throat portion, delivering into a cylindrical throat portion of larger diameter and a divergent recovery portion, the combination of a chemical entrance passage extending vertically through the tube wall at the end of said large diameter throat portion which is adjacent said small diameter portion and a delivery conduit for the mixture connected to the end of said divergent portion.

7. In apparatus for mixing solid chemicals with water, a Venturi tube having a convergent entrance portion, a narrow throat portion discharging into a wider substantially cylindrical throat portion at least twice as long as wide, and a divergent recovery portion, in combination with a chemical entrance passage to said wide cylindrical portion entering the same close to the junction therewith of said narrow throat portion, and a delivery and mixing conduit connected to said divergent portion.

In testimony whereof, I have signed this specification.

WILLIS D. WITTER.