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WATER INJECTION VALVE COMBINATION  
WITH CEMENT SPRAYING NOZZLE  
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Fig. 1.

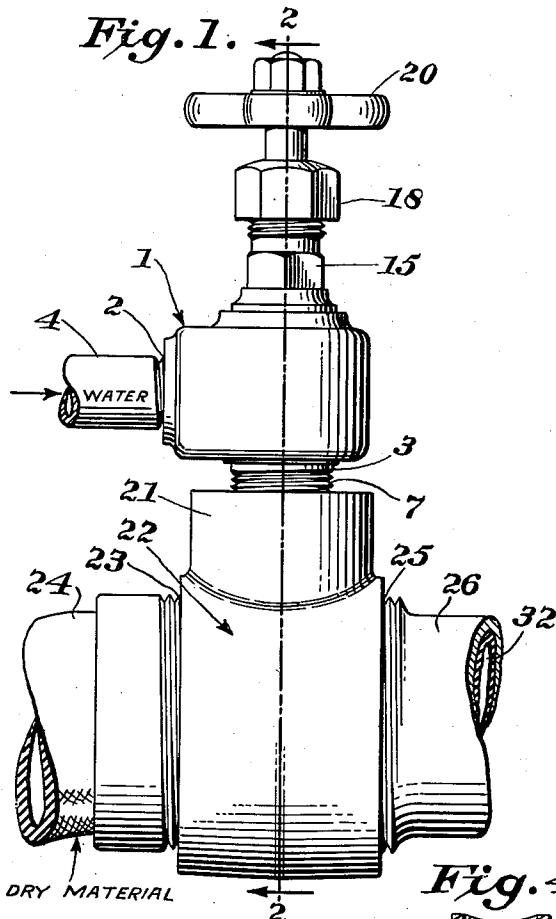


Fig. 2.

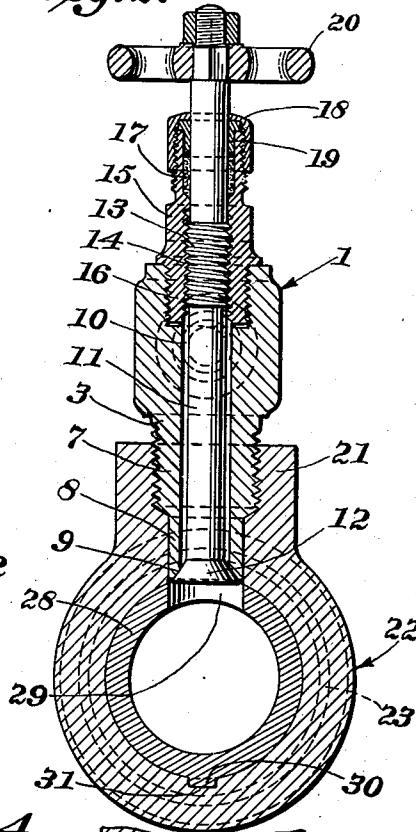


Fig. 4.

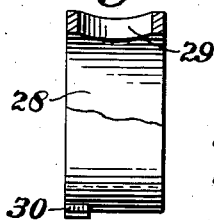


Fig. 3.

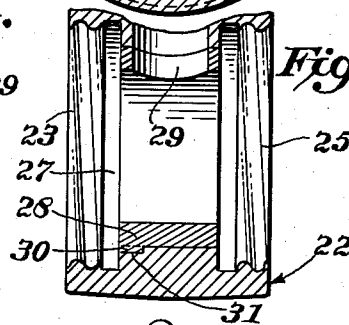
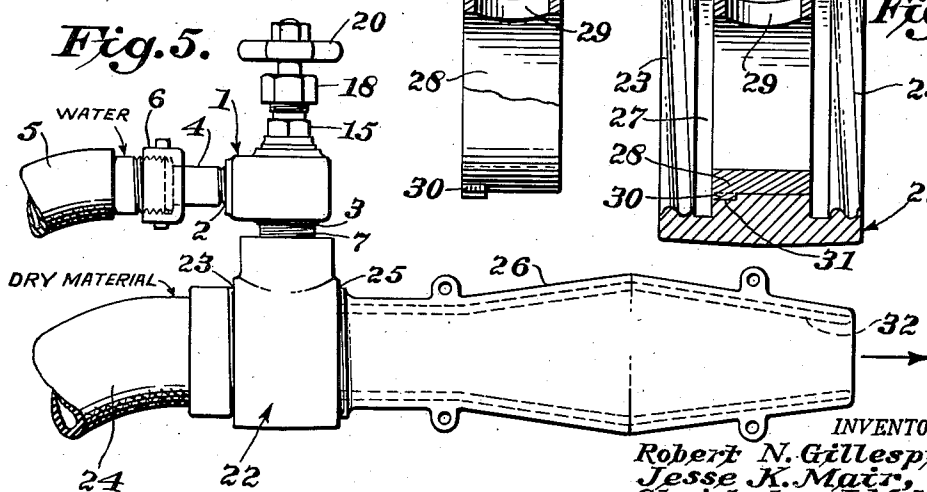


Fig. 5.



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## UNITED STATES PATENT OFFICE

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WATER INJECTION VALVE COMBINATION  
WITH CEMENT SPRAYING NOZZLE

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2 Claims. (Cl. 91-44)

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The present invention relates to cement spraying apparatus and, more particularly, to an improved water injection valve combination for hydrating cementitious material prior to spraying.

Generally, in cement spraying apparatus a mixture of cement and sand is blown by air through a nozzle against a surface which is to be coated. This mixture of cement and sand must be hydrated prior to application and, accordingly, it is necessary that small amounts of water be added to the mixture before passing from the nozzle. This is usually accomplished by surrounding the nozzle body with a water jacket and inserting within the body a brass ring provided with small perforations. In this manner, the mixture as it is blown through the nozzle body is hydrated by water ejected from the perforations. Since the ring perforations must necessarily be very small, the spraying operation frequently is stopped in order to remove silt or organic matter deposited in the holes by the water. Furthermore, poor hydration of the mixture is likely to occur since the pressure of water leaving the holes is practically zero. This drop in pressure arises from the difficulty of making the perforations small enough to supply at high pressure the very small amount of water which is actually required for the hydration.

Accordingly, it is an object of the present invention to provide a water injection valve combination which is substantially free of the undesirable operating characteristics described above.

Furthermore, since the mixture of sand and cement creates an abrasive action on the interior surface of the nozzle body, it is another object of this invention to provide inexpensive and easily replaceable means which prevent the wearing of the nozzle body itself.

These and other objects will appear more clearly from a study of the accompanying drawings in which:

Figure 1 represents a side elevation of the water injection valve combination,

Figure 2 represents a vertical sectional view of the invention with the valve stem shown in elevation, and taken on line 2-2 of Figure 1,

Figure 3 represents a fragmental sectional view of the nozzle body,

Figure 4 represents a side elevation, with a part in section of the wear ring utilized in the present invention, and

Figure 5 represents a side elevation of the invention connected to a spraying nozzle ready for use and on a reduced scale.

More specifically, the water injection valve

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combination is comprised of a valve body 1 having an internally threaded inlet 2 and an outlet nipple 3. Threaded into the inlet 2 is a short length of pipe 4 which is supplied with water under high pressure from a suitable source through a flexible conduit 5 and coupling member 6. The nipple 3 is provided with an externally threaded portion 7 and a smaller tubular end portion 8 having a valve seat 9 formed on its edge surface. Communicating with the inlet 2 and extending through the valve body 1 and nipple 3 is a fluid passage 10 in which a valve stem 11 is movably mounted. At the lower end of the stem 11 is a conical valve head 12 which cooperates with the seat 9 of the nipple 3. A portion of the stem 11 is equipped with screw threads 13 which are received by the threads 14 of the bushing member 15. The latter member is threadably secured to the valve body 1 as shown at 16. In order to prevent leakage about the valve stem 11 suitable packing 17 is placed about the stem and compressed by the threaded cap 18 and packing gland 19 fitting on the upper end of the bushing member 15. A suitable hand wheel 20 for operating the valve is fixed to the top portion of the stem 11 in the usual manner.

The nipple 3 of the valve body is firmly fitted into an upstanding female portion 21 of the nozzle body 22. As is apparent from Fig. 2, the opening in the nozzle body into which the nipple 3 is fitted is constructed to exactly conform to the shape of the nipple.

In addition to the female portion 21, the nozzle body 22 is provided with a threaded inlet 23 to which a flexible material supply conduit 24 is connected, a threaded outlet 25 to which the nozzle tip 26 is joined, and a passage 27 located between the inlet and outlet openings. In order to prevent wear on the interior surface of the nozzle body passage, a metallic, replaceable wear-ring 28 is snugly fitted therein. This ring member is provided with an opening 29 through its upper surface in order to admit fluid from the fluid passage 10 to the cementitious material passing through the nozzle body. In addition, a lock key 30 is formed on its lower outer surface which fits into a slot 31 in the nozzle body thereby preventing the wear ring from being forced out of position by the incoming material. As shown in Fig. 5, the preferred nozzle tip 26 is of a bulbous shape although smaller tapered tips may also be employed. In any event, the tip utilized is provided with a rubber liner 32 as shown by the dotted lines in Fig. 5.

From the above description, the operation of

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the water injection valve combination is quite apparent. The mixture of sand and cement is blown by air pressure through the supply conduit 24, the nozzle body 22, and the nozzle tip 26 out to the surface which is to be coated. In order to hydrate the mixture prior to its application, the valve-head 12 is moved off the seat 9 a distance which will give the desired degree of hydration and in this manner, water from a suitable source passes through the conduit 5, and fluid passage 10, by the valve seat 9 and through the wear-ring opening 29 into the cement and sand mixture.

It is obvious from the above that the cleaning difficulties previously encountered in water injection valve combinations have now been completely eliminated. Whereas in other devices, it has been necessary to shut down operations completely to clean out the small perforations, the present valve arrangement may be cleaned simply by turning the valve wide open for a short length of time. In addition, by the present invention, the water is injected into the mixture at a high pressure and, since the valve seat is cone shaped, practically atomized, thereby improving the hydration of the mixture and, thus, eliminating rebound waste and increasing economy of operation.

Furthermore, the insertion in the nozzle body of an inexpensive, easily replaceable wear-ring covering the area of the nozzle body which is subjected to the abrasive action of the cement and sand mixture prevents the wearing away of parts which may be difficult and costly to replace.

Having thus described our invention with the understanding that variations in the form and shape of the present development are within the scope of this invention, what we claim as new is:

1. A water injection valve combination for cement spraying apparatus comprising a nozzle body having a passage extending longitudinally therethrough, a bore in said nozzle body transverse to said nozzle body passage and in direct communication therewith, a valve body mounted in said bore, said valve body having a fluid inlet

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and a fluid passageway communicating therewith, said fluid passageway extending longitudinally of said valve body and communicating directly with said nozzle body passage to provide a single relatively large fluid opening for admission of water from said fluid inlet into said nozzle body passage without substantial reduction of the fluid pressure, an outwardly flared valve seat within said bore about said fluid opening in direct communication with said nozzle body passage, and a valve stem within said fluid passageway and movable longitudinally thereof, said valve stem having an outwardly flared end for seating engagement with said valve seat which extends into said nozzle body passage in open position so that fluid passing through said fluid opening into said nozzle body passage is deflected by the outwardly flared end and thereby sprayed into said nozzle body passage.

2. The water injection valve combination of claim 1 having a replaceable wear ring fitted snugly within said nozzle body passage, said wear ring having a transverse opening therethrough joining said fluid passageway with said nozzle body passage, and interengageable locking means on both said wear ring and said nozzle body to maintain the proper positioning of the ring within said passage.

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