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TREATMENT OF SURFACES UNDER WATER
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Fig. 1.

Fig. 2.

Fig. 3.

[Diagram of treatments of surfaces under water with labeled parts: a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z.]
TREATMENT OF SURFACES UNDER WATER.

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Figures 2 and 3 are similar views showing other embodiments.

In all of the figures a indicates the actual spraying nozzle which is supplied with a material such as concrete, to be sprayed in the known manner by means of piping by the action of compressed air. The construction of the spraying nozzle is in detail substantially based on knowledge obtained when spraying in air and is known to all those experienced in the art.

In Fig. 1 m indicates a surface which is to be treated with the stream ejected from a, which for example may be a wall surface which is to be provided with a concrete coating under water. If it were desired to use a spraying nozzle under water in the manner which is usual in spraying in air, the water would immediately act on the spray which is leaving the front end of the nozzle a and immediately reduce the speed of flow considerably and also act upon the material which is being sprayed, for example completely destroying the concrete.

According to the arrangement shown in Figure 1 the front part of the nozzle is surrounded by a bell b provided with a hollow annular space c which is open at the front edge of the bell. The space c is covered by a tubular extension d to a pipe not shown through which compressed air or other liquid under pressure can be supplied there-to.

When the device is in operation the compressed air supplied at d will act as a truncated conical stream against the surface m (as indicated in the drawings by dotted lines) and forms around the nozzle a an annular curtain or screen, which retains the space within the same free from water. This action can be accelerated in that when the operation with the nozzle a is first started only compressed air is supplied to this nozzle. During further operation the fine annular stream of compressed air ejected from c will suffice completely to prevent the disturbing action of the water on the stream of material ejected by the nozzle a. The concrete mass or other material sprayed from the nozzle a will be deposited on the surface m in the same manner as when the operation is effected in air.

Instead of forming the hollow space c at considerable distances from the nozzle as illustrated, it may be arranged close there-
to in such a manner that the stream of compressed air closely surrounds the stream of material to be sprayed. It is also not always necessary for the front edge of the bell to project a considerable distance beyond the front edge of the nozzle.

In the arrangement shown in Figure 1, a stream of compressed air is shown of which the diameter is reduced towards the wall surface, but in the construction shown in Figure 2 a stream is provided which is enlarged in diameter in the form of a bell. The annular hollow space \( c \) is in this case formed between an inner bell \( b' \) and an outer bell or casing \( e' \). The supply of compressed air is effected through the tubular extension \( a' \). For the purpose of adjusting the outlet area from the hollow space \( c' \) the casing \( e' \) is movable on the screw thread neck of the bell \( b' \) and can be secured in position by means of a lock nut \( k \). The nozzle is shown at \( a' \) and the surfaces to be covered at \( m' \).

The hollow space between the nozzle \( a' \) and the bell \( b' \), in the arrangement shown in Figure 2, is connected by means of passages \( f \) with a hollow space \( g \) formed by a cap nut \( k \), to which a supply pipe is connected. According to the conditions of working compressed air, for example may be supplied in order to render the space between the nozzle and the bell \( b' \) free from water more quickly. By connecting the pipe \( i \) to a pump it is also possible to form a vacuum inside the bell. Through the pipe \( i \) and passages \( f \) it is also possible to supply solid, liquid or gaseous substances which co-operate with the stream ejected from the nozzle \( a \), for example for accelerating the setting, hardening, adhesion, or drying of the mass applied to the wall surface \( m \).

The arrangement shown in Figure 3 has substantially the same parts as the arrangement shown in Figure 2, including the nozzle \( a' \) and the bell composed of the inner and outer casings \( b' - c' \) spaced apart to form the annular chamber \( e' \). Compressed air is supplied to this space from an annular chamber \( g' \) formed within the cap nut \( b' \), by means of passages \( f' \). The annular chamber \( g' \) has a pipe \( d' \) for connection with a source of supply, and the surfaces to be coated is indicated at \( m' \). The enlargement of the annular stream of compressed air ejected from the space \( c' \) is not so rapid as in Figure 2. The passages \( f' \) are arranged in various inclined directions so that the compressed air supplied through the pipe \( d' \) can more effectively keep the interior of the bell free from water.

The invention is not limited to the particular examples of construction hereinbefore described and illustrated. Anyone skilled in the art can in view of the above construction make the necessary modifications according to the purpose in view without departing from the scope of the invention. For example, the nozzle may be so constructed that the mass ejected therefrom is not sprayed as a closed stream but reaches the wall in a sprayed or distributed form. It is also possible to supply through the compressed air pipes other gases which for example exert a more effective action on the stream of material from the nozzle.

I claim:

1. The method of retaining under water surfaces free from water during the treatment thereof with a spray, which consists in encircling the spray with an annular shield or curtain of gas under pressure movable laterally with the spray and impinging the surface around the impingement of the spray.

2. The method of retaining under water surfaces free from water during the treatment thereof with a spray, which consists in encircling the spray with an annular shield or curtain of gas under pressure movable laterally with the spray and impinging the surface around the impingement of the spray, and driving out the water within the curtain or screen.

3. A device of the class described, including a spraying nozzle, means for encircling the nozzle with an annular screen or curtain of gas under pressure, including a substantially bell shaped member mounted on the nozzle and extending at its open end beyond the same, the wall of said member chambered, and having an annular outlet at the free edge of the bell, and means to connect the chamber with a source of gas under pressure, a second chamber in connection with the bell delivering within the same by a plurality of outlets, and means for connecting said chamber to the source.

4. A device of the class described, including a spraying nozzle, means for encircling the nozzle with an annular screen or curtain of gas under pressure, including a substantially bell shaped member mounted on the nozzle and extending at its open end beyond the same, the wall of said member chambered, and having an annular outlet at the free edge of the bell, and means to connect the chamber with a source of gas under pressure, the bell adjustable longitudinally of the nozzle.

In testimony whereof I affix my signature.

ARTHUR MAUTERER.