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The Waterproofing of Canvas

By SETH M. SNYDER, M.E. 1

THE waterproofing of fabrics is divided into two general classes. The first, dependent upon an airtight coating, is divided into two groups: the rubberized fabrics, which include automobile tops, policemen's raincoats and artificial leather; and the oilcoated fabrics, of which common yellow and black slickers are examples. Oilskin fishermen's coats, butchers' and industrial aprons are also oilcoated fabrics. All of these depend upon an airtight coating for their properties of resisting water. The second principal class deals with fabrics that are made waterproof by the creation of a water-repellent surface. The fabric may or may not be porous, depending on the requirements of the process.

One common method of producing a repellent surface involves closely woven fabrics. Fabrics that have been treated with metallic soaps after dyeing, are highly resistant to moisture penetration. This type of treatment does not mechanically fill the fabric, and complete success is dependent largely upon using for the process fabric that is very firmly and closely woven. The most common uses for this type are for hunting clothing, gun cases, and a few of the finer hikers' tents. The formula usually calls for soaping (with common soap) the fabrics after dyeing, and later immersing in a metallic salt, usually iron, copper or lead sulfate. Aluminum or thorium acetate or combinations of the two are very successfully used as the metal bath.

The other common method of producing such a surface involves the use of a wide range of hydrocarbon materials, to which, in some cases, pigments for color and colloidal materials for filling action are added. The common materials used include paraffine, ozokerite (an earth wax that comes from Utah), montan (a shale paraffine that comes from Germany), mineral rubber which is oxidized refined asphalt (automobile tires are now made from it), Japan wax and refined petrolatums (heavy vaseline) or solid petroleum.

The theory of waterproofing in both repellent groups is based on the creation of a surface with a minimum of tension. An interesting example of the control of surface tension can be made by treating one half of a blotter with a solution of paraffine wax dissolved in gasoline and placing a drop of water on each end of the blotter. The drop on the untreated end of the blotter is immediately absorbed while the drop on the treated part remains unabsorbed. Another interesting comparison can be made with two identical glass tumblers. If the rim of one is coated with vaseline or lard, it is possible to fill the glass considerably above the edge. If the brim of the other is coated with a solution of sugar or salt, it will be found difficult to fill the glass even to the rim without water being slowly drawn over the edge. The control of surface tension offers a method for waterproofing certain goods.

The general factory procedure for producing a repellent surface by the use of hydrocarbon materials, pigments, and colloidal materials, is to immerse the fabric in a solution of hydrocarbon waxes in a suitable solvent which is dried out by passing over heated metal cylinders or through hot drying ovens. For all the various methods of waterproofing, the fabric, which is nearly always cotton, is woven in the Southern part of United States. Each piece is about one hundred yards long. Numerous pieces are sewed together into one continuous strip for treating, but are separated later and reshipped by the finisher in the original lengths.

The methods applied for waterproofing canvas goods by producing a repellent surface allow a one-treatment process; that is, only one preparation is applied to the surfaces of the fabric.

The first step in the process is the preparation of the waterproofing compound. The hydrocarbon materials, together with colors and a solvent, are placed in mixers and heated. There are two mixers, each with a capacity of five hundred gallons. Heat is applied by passing steam from the heater house through a jacket in the bottom of each mixer. Paddles inside, driven by electric motors, mix the compounds. After thorough mixing, the compound is drained from these vats and carried (since piping would necessitate cleaning with each change of color) to the supply tank in the finishing machine. The finishing machine is about forty feet long and consists of the tension bars, the brake roll, the knife, the dryers, and the winding core. The fabric, folded on a truck, enters the machine by passing over the tension bars which take out the wrinkles. It then passes over the brake roll which holds the fabric back to keep it under tension as it passes under the knife. As the fabric passes under the knife, the hot waterproofing compound flows in a continuous stream onto it. The surplus is scraped off by the knife, passes in a steady stream off the edges of the fabric into buckets, and is returned to the supply tank. The canvas then passes over three electrically driven, steam-heated dryers, and then over the top to the opposite end where it is rolled. The distance the fabric must travel after leaving the dryers allows it to become cool enough that it will not stick together when rolled. The roll is then removed and passes through the machine again. This time the other side is treated. The four standard colors produced are buff, green, olive drab, and brown.

One of the most interesting applications of waterproof treatment of fabric is for use in manufacturing large covers for football fields. The first gridiron to be covered with waterproof canvas was in the Stadium at the Ohio State University, the cover having been delivered in the summer of 1926. The cover contained about seven thousand square yards of closely woven cotton duck that

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weighed approximately one pound per square yard before treating. After waterproofing, the strips were sewed together. About two hundred pounds of heavy linen thread were used. Due to the extreme exposure of these large canvases to mildew and rot, it was necessary to add a percentage of neutral material to prevent destruction of the fabric. The cover, by necessity, must often be rolled up wet.

Most of the larger colleges and universities now have similar covers, the largest one of which is used to cover the entire grassplot at the Yale Bowl, New Haven, Conn. This cover contains about 8,700 square yards of material. There are about ninety covers in use now. The cost of these ranges from four thousand to ten thousand dollars, depending upon the grade of fabric used. There are two methods used in removing these covers: folding, and rolling on metal cylinders. The latter method is applied at the football field at the Ohio State University.

Other common uses of their products include covers for baseball diamonds, tennis courts, trucks, boats, and barges; lining for irrigation ditches, and material for manufacturing large and small tents.

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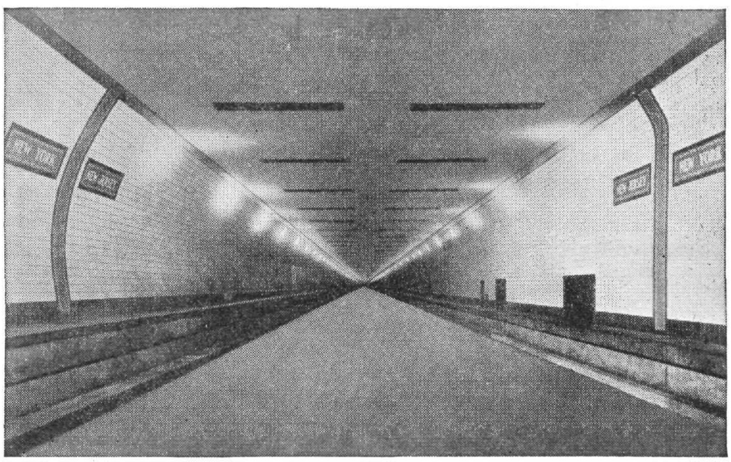

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