crete or mortar, and a few years ago results seemed to justify their use. However, many intelligent and comprehensive tests on the absorbtive and permeable qualities of Portland cement and concrete have been made, and these experiments almost universally show the same results.

Tests on the waterproofness of concrete are difficult to execute, for the constituents vary in absorptive qualities, porosity and percentage of voids. The Bureau of Standards of the United States has just finished a series of tests of the absorptive and permeable properties of Portland cement mortars and concrete, together with tests of damp-proofing and waterproofing compounds and materials. An endeavor was made to conduct these tests in such a manner as to make the results of practical value as a determination of the comparative values of these mediums. Forty different compounds were purchased in the open market and several void-filling materials were obtained for testing. A complete record of each compound is reported as to its character, chemical analysis, method of application, the result of physical tests, and noted peculiar characteristics.

The compounds are of two general classes, the waterproofing compounds for preventing the flow of water through masonry where subjected to a hydrostatic head, as in reservoirs, cisterns, tunnels, cellars, and the like; and damp-proofing compounds for overcoming dampness resulting from the capillary attraction and absorptive qualities of masonry, preventing dampness in habitations, and the disfigurement of exterior and interior surfaces of brick, stone, and concrete walls and interior plastering and decorations due to staining and efflorescence.

Two series of tests were made in the investigation, one of the waterproofing or water-resisting qualities of the compounds recommended for such use, and another of the damp-proofing qualities of other compounds so recommended to be used.

A summary of the results of the tests shows that Portland cement mortar and concrete can be made practically water-tight or impermeable to any hydrostatic head up to 40 feet without the use of any of the so-called "integral" waterproofing materials; but in order to obtain such impermeable mortar or concrete considerable care should be exercised in selecting good materials as aggregate and proportioning them in such a manner as to obtain a dense mixture. The consistency of the mixture should be wet enough so that it can be puddled, the particles flowing into position without tamping. The mixture should be well spaded against the forms when placed, so as to avoid the formation of pockets on the surface.

The addition of so-called "integral" waterproofing compounds will not compensate for lean mixtures, nor for poor materials, nor for poor workmanship in the fabrication of the concrete. Since in practice the inert integral compounds (acting simply as void-filling material) are added in such small quantities, they have very little or no effect on the permeability of the concrete. If the same care be taken in making the concrete impermeable without the addition of waterproofing materials as is ordinarily taken when waterproofing materials are added, an impermeable concrete can be obtained.

The damp-proofing tests as conducted would indicate that Portland cement mortars can be made not only impermeable, but damp-proof as well without the use of any damp-proofing or waterproofing compound. However, these tests should be interpreted with caution, as the evaporation may have been sufficient to care for the slight amount of moisture coming through the test pieces without indicating on the filter paper. Thus it cannot be stated that if a material were used which was damp-proof according to this test, if used as a basement wall, one surface being constantly exposed to moisture and the other surface in an enclosed room where there would be little or no circulation of air, that the interior surface would not appear damp and the atmosphere become saturated with moisture. The tests of coating materials as damp-proofing mediums can be considered as only preliminary, but the results, considered along with the chemical discussion, throw some light on their comparative merits. The mortar used in these tests was, perhaps, too coarse and too absorptive for a fair test. The purpose of the rough surface was to test the flowing qualities of the coating, and it would seem that many of the failures may be due to the poor or imperfect spreading and adhesive quality. Several of the compounds deteriorated and proved their unfitness for the purpose intended.

Well-graded sands containing considerable graded fine material are preferable for making impermeable concrete, but if such is not to be had, fine material in the form of hydrated lime, finely ground clay, or an additional quantity of cement will be found of value.

Where Portland cement mortar is used as a plaster coat, if sufficient cement be used and the sand contains sufficient fine material (or a fine material be added) and the mortar be placed without joints and well troweled (care being taken not to over-trowel, which may cause crazing), the coating will be effective as an impermeable medium without the use of any waterproofing compound.

As a precaution, under certain conditions, it is undoubtedly desirable to use bituminous or similar coatings, even on new work, as protection where cracks may occur due to settling of foundation or expansion and contraction caused by temperature changes. In large or exposed work it is practically impossible to prevent some cracks, but where cracks can be prevented no coating whatever is required to make the structure impermeable.

The permeability of Portland cement mortars and concretes rapidly decreases with age.

EDITORIAL COMMENT.

The Commission of Conservation have begun the publication of a monthly paper called "Conservation." The March issue, which has just come to hand, states that it will be published during eight months of the year. This bulletin will be invaluable to the press, containing as it does authoritative information on conservation matters.

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Commercial peat seems to be very nearly a realization now. The method of treatment heretofore has not been economically successful. That difficulty, however, has been overcome, and a thoroughly successful method of treating peat has been practically demonstrated at the Government laboratories near Ottawa during the last two years. All that remains now to make the immense peat bogs of the Province of Ontario available for fuel is a reasonable amount of commercial enterprise devoted to the work of development.

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Toronto has decided to build a sewage purification experimental station. The results to be obtained from the operations of such a station are very valuable, and