HAND AND MACHINE PLACED MORTARS

ABSTRACT OF AN ADDRESS WHICH WAS DELIVERED BEFORE THE TORONTO BRANCH OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS, DECEMBER 15th, 1916, AND ILLUSTRATED BY MOVING PICTURES AND SLIDES.

By BRYAN CHEVES COLLIER, M.Am.Soc.C.E.,
Chief Engineer and General Manager, The Cement-Gun Co., Inc.

IT has always been the policy of the engineering profession to develop ways by which machines could supplant the hand methods of previous days, since it recognizes—perhaps more clearly than any other profession—the necessity of providing against the continually decreasing supply of labor. It thus took up with avidity the use of concrete mixers, with the result that over 300,000 of these mechanical appliances have been manufactured and sold in the last twenty-five years. The same is true in the case of the pneumatic drill, the pneumatic painting machine, and a number of similar contrivances, in very many of which compressed air has proven itself the flexible and powerful medium for accomplishing the desired results.

It very frequently happens, however, that although engineers are those most vitally interested and affected by these improvements, the inventions do not emanate from engineers, and the device to which the writer calls attention is an example of this, since not only was its origination by a man not connected with engineering, but also its first use was one in no wise related to engineering.

In 1908 Carl E. Akely, who is widely known not only for his lectures and writings on the big game of Africa, but also for his exhibits of those animals killed and mounted by himself, was engaged in mounting, for the Field Museum of Natural History in Chicago, a herd of elephants that had been shot by his wife and himself. In preparing the plaster of paris frame upon which the skins are stretched, he felt the need of some more flexible and easier way of doing this than by hand, with the result that he turned to compressed air and hit upon the expedient of forcing his dry material to the nozzle of a hose by pressure, and having it meet a stream of water at that point, thereby securing hydration and deposit coincidently, so that the mortar not only could be sprayed on in a thin coat, but could be built out to such thickness as was necessary. The success was so marked that Mr. Akely and his associates saw the advantages to be gained from the principle, and the result has been the development of the device now known under the trade name of the Cement-Gun. Its use, however, has not been limited to the application of cement mortars. It has proved its adaptability in the depositing of mortars made of lime, plaster of paris, fire clay, magnesite, etc. It is of interest that Mr. Akely was recently awarded the John Scott Medal of the Franklin Institute for this invention. (In 1816 a Scotch chemist named John Scott died in Philadelphia and left to that city $4,000, the interest on which was to be used to pay the cost of an annual award of medal to "ingenious men and women who had made inventions that are of benefit to mankind.")

The machine as now used, is identical in general type with that first built by Mr. Akely. It consists of two hoppers separated by a cone-shaped valve operated by a lever, with a similar valve in the top of the upper chamber. The operation is based on the ordinary principle of a caisson with the upper chamber as the "locking-in" chamber, and the lower the working chamber. In this way, with the upper chamber opened to the outside atmosphere, the lower can still be held under pressure thereby assuring continuity of operation. In the lower chamber there is a conical-shaped feed wheel with pockets on the periphery, which wheel revolves by being driven by an air-motor connected with a shaft to which it is keyed. As this wheel revolves these pockets are brought underneath an additional jet of air admitted through a "goose-neck" which acts in a dynamic capacity in addition to the static pressure, and forces the dry material through an outlet valve and the distributing hose to the nozzle.

This nozzle is a chambered affair with needle holes in the inner walls through which the water is admitted to the stream of dry material, thereby accomplishing the purpose originally devised of having the hydration take place coincidently with the deposit, ensuring the full chemical action. The writer would call attention to a feature in connection with the deposit. When the material is forced under pressure against a surface, there is a considerable rebound, and if an examination be made of this rebounded material, it will be found that it is almost entirely free from cement. This means that the cement has adhered to the surface as a matrix of neat cement into which the particles are driven by the pressure of those following. The result of this is that a mortar of exceedingly great density and of absolute imperviousness is produced.

TESTS OF HAND AND MACHINE-PLACED MORTARS IN IRRIGATION DITCH, LOS ANGELES, CAL.

Front Section Built by Hand, Rear by Machine.

Trench Excavated Along the Ditch.

Filling Trench to Apply Hydraulic Head.