other material composing the concrete, is carefully proportioned by weight, the correct percentage of water is used and the whole mass is placed in a mixer and thoroughly mixed. It is then deposited very carefully in moulds or forms which, after twenty-four hours, are removed. The concrete is then moved into a storage room, shown in Fig. 3, and is there sprinkled with water three times each day. Each test piece is numbered on a card index, which tells where information relating to the test pieces can be found and also indicates the dates on which the different pieces are to be tested.

A branch of the work that should be of interest to everybody, especially the small home-builder, is the investigation of cement building blocks. Many houses are now built of cement blocks in preference to wood, because, generally, cement block construction is cheaper and better than wood, since it is fireproof, more durable and less expensive to maintain. The exterior surfaces of wooden buildings must be painted, and clap-boards must be added from time to time; but when the cement block building is finished, the surface is there once for all; no further treatment, no repairs, no maintenance are necessary.

All the cement blocks used in these investigations are mixed in the concrete block machines shown in Fig. 4. The concrete is mixed in a one-third cubic yard cubical concrete mixer and deposited on the floor of the testing room. It is then shoveled into the hollow block machines and compacted very firmly in the forms. Varying proportions of concrete, sand, and stone are used in order to determine the relative value and economy of using different mixtures. Some blocks are made of wet concrete, others of concrete very dry, and still others of concrete having a consistency medium between wet and dry. In actual practice, concrete blocks made from comparatively dry concrete are usually preferred by the manufacturers, since these blocks harden quickly and the forms may be removed almost as soon as all the concrete is placed in the machine. By this practice it is possible to use the same machine for making a large number of blocks each day, whereas, when wet concrete is used, the blocks must remain in the machine for a much longer time before they can be removed. When the concrete blocks are removed from the forms they are placed in the storage room and tested at different ages. The storage room used for concrete blocks is similar to that shown in Fig. 3. Cylinders are also made from the same concrete that is used in the blocks, and the results of tests of the cylinders and of the blocks establish a relation between the strength of the concrete in the cylinder and that of the concrete in the block.

When the blocks and cylinders are placed in the storage room, each test piece is numbered and its number is filed away on a card in a card index. Each card bears the date on which the test piece is to be tested, and the cards are filed in chronological order. This brings the current date at the front of the drawer each morning, when cards bearing the same date are taken out and the pieces are taken from the storage room and tested. The results are compiled on forms and later published in reports issued by the Geological Survey.

Conerete blocks are tested at the laboratories in two different ways: first, as shown in Fig. 5, to see how much of a centre load each block will stand. Although blocks are not actually subjected to a load of this kind in practice, the results of this test make it possible to compare the relative values of different building blocks. Second, after the block has been broken at the centre by this load, each half is placed in the testing machine and crushed, in order to find the crushing strength of the block. The results of this crushing test show how much pressure similar cement blocks will stand when used in actual building construction.

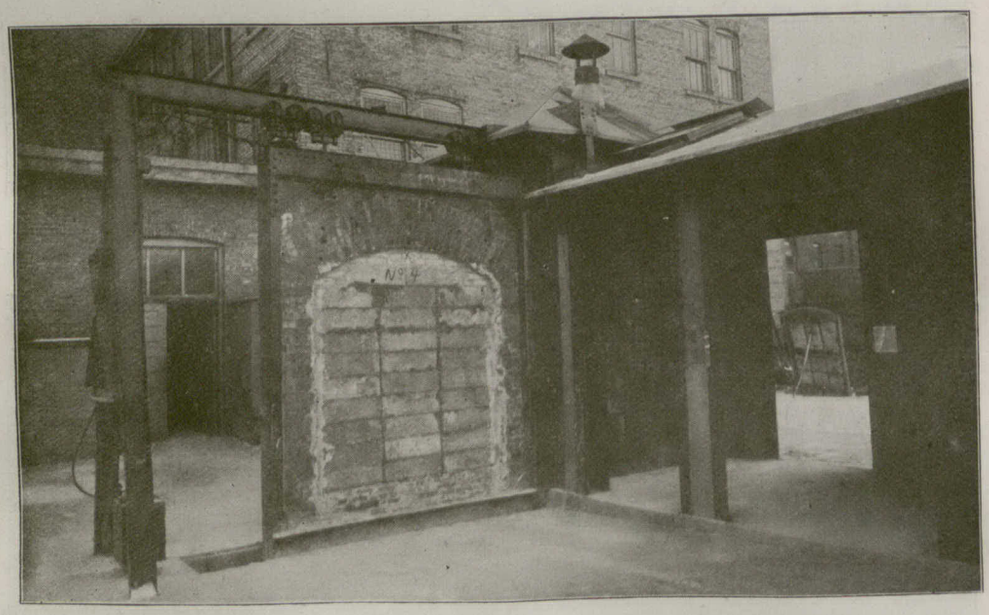

FIG. 6.—TESTING FIRE-PROOFING QUALITIES OF CONCRETE.

The art of fireproofing has been developed rapidly within the last few years, but there is still much to be done, especially in relation to the fire-resisting properties of concrete. In order to obtain information to meet these needs a series of fire tests are being carried on by the Geological Survey at the Fire Underwriters' laboratory at Chicago.

For this purpose a hanging door having a steel frame and a one-foot wall of fire brick inside of it is used. At the centre of this frame there is an arched opening of about the size of an ordinary door. For the fire tests this opening is built up successively with different materials, ordinary building brick, fire brick, hollow tile blocks, the different kinds of cement building blocks, stone, concrete and terra cotta. When the opening is filled with cement blocks, it has the appearance shown in Fig. 6. After the opening is filled a flaming gas jet is played all over the door for a long time and when the heated surface is very hot the gas is turned off and the door allowed to cool. In some tests the cooling takes place slowly, in others a stream of water is played on the door immediately after the gas is turned off in order to reproduce as nearly as possible the actual conditions in a fire.