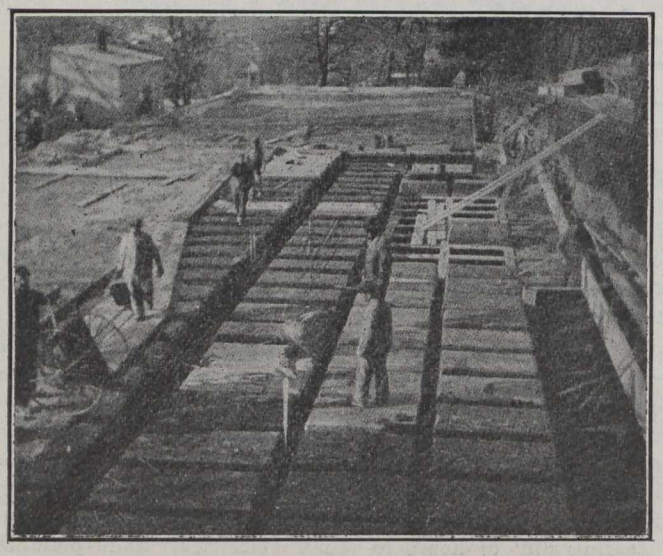
Field methods must take the place of laboratory methods, without serious loss of quality in results. The system employed at the University of Wisconsin has been found practical, economical and effective, and for buildings intended for ordinary use more satisfactory than the "mill type" of construction. In competition it has been found less expensive where the requirements of the specification for the steel



Pouring a concrete floor on the movable forms. At the left the joists and girders are completed, ready for the floor sheet. In the center the steel shows in the girder. At the right a space is still to be covered with the forms.

and other elements forming a necessary part of good construction have been conserved. This has been put to proof by obtaining alternate propositions on the same work, imposing only the requirement that the steel shall be strained not to exceed a certain amount, that spaces shall be provided for pipes, etc., and that the ceilings shall be flat.

Other systems approach the practical values of this one in some degree, as for instance that one where hollow tiles are used in place of the wood cells. Where but one building is to be constructed the cost of the cells might excel the cost of the tile. Where the building is of several storeys, or in buildings of large enough area so that one part can be constructed before another, thus permitting the repeated use of a reasonable number of cells, the cost of the tile would probably exceed the proportionate cost of wood cells. The tiles serve no useful purpose except as forms between which the beams are cast, and their weight adds to the dead load of the floor construction. In either case a floor sheet must be placed on top, and the ceiling must be furred to receive piping and other accessories. Of course, such pipes may be buried in the floor sheet, but there is serious objection to this. It is done in most fire proof buildings, but the expense of repairing damage in case of leakage of water, gas or electrical current is made very heavy on account of it. Changes also are very expensive and difficult, and it is safe to say that every building will be changed over a number of times before it becomes obsolete.

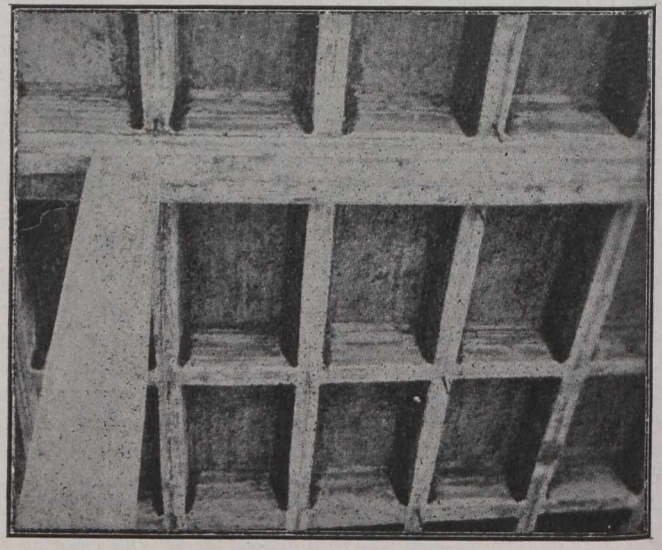
The system or design of the floor construction in use at the University of Wisconsin consists of an arrangement of narrow beams spaced at about three feet centers and braced by cross beams at six and one-half feet centers. The beams are formed by employing a series of wooden boxes, with slightly flaring sides and ends, laid face down upon a system of supporting planks upheld by shores. The intervals between the boxes or cells being filled with concrete constitute the beams and cross braces of the floor. The concrete is reinforced with steel after calculations made by the Dean of the Engineering Department of the University.

Upon the beams a floor sheet is poured, reinforced with steel wire fabric and finished with a wearing surface of cement and granite "fine stuff."

The reinforcing steel consists of round rods enclosed in loose stirrups. In the girders the rods are bent according to the best practice. Straight rods are used in the joists with counter flexure rods over the girders. In the cross braces small single rods are placed. The stirrups are of the U form, but to secure correct spacing and holding, several stirrups are bent from a single rod forming a unit series. These have been found very convenient on account of stability and resistance to drifting, falling and other annoying peculiarities of single stirrups. Mild steel has been employed in all work. High tensions have been prohibited, as well as calculated tension in concrete. This may be conservatism, but is no doubt wise. The effort of the architect has been to simplify and reduce the cost of work and to retain the good elements of old-fashioned constructive systems; to provide reasonable means of access to parts for repair and changes and to bring back the forms of surfaces on the interior of buildings which long custom has found most suitable and agreeable.

In detail of work it has been found that two rods in each beam are more convenient than one, although theoretically very narrow beams closely spaced and containing each a single rod would be ideal.

The rough way in which concrete is now mixed and cast, the danger of imperfect castings and the liability of



Ceiling of shop and storehouse building showing concrete joists and cross-bracing, and one main girder. The bolts extending out of the joists are for attaching line shafts.

damage to concrete in stripping forbid the use of very slender parts at present. For private house work the concrete floors of to-day are probably excessive in strength. Refinement in the false work and casting will come in time, however, and it is to be expected that future constructions will be very much lighter and less expensive.

By the system described spans from twelve to twenty-six feet have been successfully cast at the University during the past two years. It is proposed to cast beams of twenty-eight feet span this year. These will require joists eight inches wide on the bottom, fourteen inches deep, and ten inches wide on top. With a spacing of 3 feet 4 inches from center to center of joists the amount of concrete employed