used until the gauge showed the tank empty, and about this time the weather had moderated and the ice fell. In breaking loose, it tore the waterproofing off and this allowed the water to percolate through the walls and freeze on the outside—the ice collecting in chunks weighing a ton or more. When the weather moderated, this ice fell off and we found that the walls were damaged very little, and with an application of waterproofing on the inside and a coating applied to the exterior with a cement gun, the tank held water satisfactorily, and we have had no trouble with it since.

From the experience we gained, we would recommend that concrete structures of this character be coated inside and outside with waterproofing, and be allowed to cure before water is put in. Our trouble was caused, no doubt, by the concrete not being protected until it had thoroughly cured, and as there was still moisture in it when the zero temperature struck it, the water in the concrete froze, and when it thawed it left pores through which the water could escape.

The other two tanks are 53 feet high, and we have two reinforced concrete reservoirs, 55 feet in diameter, 12 feet high, built on the ground—the latter each hold 200,000 gallons and are giving satisfactory service. They are, each one, coated inside and out with waterproofing compound.

We have built reinforced concrete cinder pits, where hot cinders are dumped and then drenched with cold water. Here we find that concrete must be faced with vitrified brick, as alternate heat and cold cause it to spall. We have tried using slag as a substitute for stone in these pits, and find it an improvement, but it is not altogether satisfactory.

We have built pump houses, where the pumps are placed in a water-tight compartment below the water level on the outside.

Also, subways for passengers going from one platform to another. The one I have in mind being below the water level, so that it was necessary to waterproof against the water pressure. In this instance, we kept the water down by pumping and laid a cinder concrete base to receive the "Membrane" method of waterproofing. After the work was completed, the water developed a greater head than we had figured and some leaks developed. In repairing them we found that the cinder concrete, which was made from soft coal cinders, had not set up. We have since learned that others have had experience similar to ours, and upon testing it, we find that the soft coal cinders contain a great deal of sulphur. This is not true of hard coal cinders, and the latter are the only kind that should be used in concrete.

We have built one reinforced concrete engine house, as we are reasonably sure that this structure will be permanent, but we used a wood roof, as we felt that the escaping steam would condense on the cold concrete ceiling and drip off on the engine jackets.

We have built a reinforced concrete grain elevator for the storage of grain, and although the concrete was mixed rather wet, we had considerable trouble with dampness at times during hard, steady rains. We applied waterproofing to the outside of the walls and since that time have had no trouble from dampness.

We are now building an eight-story reinforced concrete warehouse in New York City, and do not expect to waterproof the exterior walls above the ground line in any way, for we believe that in a structure of this character that by careful mixing and careful placing and working the mass into place it can be made sufficiently waterproof of itself.

In conjunction with the Lake Shore & Michigan Southern Railway, we built a passenger station at Gary, Ind., which is practically all concrete. The building is Classic in design and the lines and shapes are the same as if cut stone was to be the material used.

During the past year we found that we could buy watch boxes and telephone booths, of reinforced concrete, cheaper than we could build them of wood, and we have now adopted the concrete ones as our standard.

In making plans for some small shop buildings, within the past year, we specified wood construction, also steel frame covered with metal lath, plastered both sides with cement mortar, making the concrete wall, approximately two inches thick, and were agreeably surprised to find that the bids for the steel frame and concrete were as cheap as the wood construction, and, of course, concrete was adopted.

In our track elevation work at Chicago, concrete is the principal material used, and the results obtained are very satisfactory, and the design and general appearance of that part of the work through the parks has been very favorably commented upon by the Park Board.

There are many reasons why concrete is chosen by the railroads in preference to other materials, some of them being as follows:—

1. Its rigidness, especially in buildings containing machinery.—Vibration in a properly constructed concrete building is negligable.

2. Its low cost of maintenance.—With a good concrete structure the maintenance should be very low, as the structural parts should last indefinitely.

3. Its fireproofness.—We consider our reinforced concrete structures so nearly fireproof that we carry little or no insurance on them. We do, of course, carry insurance on the contents.

4. Its waterproofness.—Reinforced concrete, when properly mixed, can be made practically waterproof against small pressures. It should be mixed wet and well worked into place to obtain this result.

5. And perhaps most important, is the cost.—Compared to a structural steel fireproof building, its cost is lower but it is more expensive than ordinary mill construction, and it is up to some of you to design a flexible form that will help cheapen the cost—a form that can be used over and over again and flexible enough to fit any wall or column.

There are a number of other things that you, who are making a life work of concrete in its various phases, should give consideration. It would be universally used as a wearing surface for freight house floors, passenger platforms, etc., were it not for the fact that its surface is so likely to become chipped and broken, and once broken it wears very fast. We are now making some tests with ironite worked into a rich mixture for wearing surface, and while this increases the wearing qualities, it is not as satisfactory as we would like. We also find that concrete floor surfaces dust badly, and it is necessary to resort to the use of linseed oil and shellac, or to hot silicate of soda, which eliminates the dust for a time.

Another adverse feature of concrete is contraction cracks. As concrete cures it has a tendency to crack, and this gives it the appearance of having veins, especially so where moisture has had a chance to enter through these small cracks. Where the mass of concrete is waterproofed this is a serious proposition, and we would like very much to have this problem solved, as I am sure many more buildings would be constructed with a concrete wearing surface, were it not for the fact that these incipient cracks ruin the appearance of the structure. A great deal of this is, no doubt, caused by finishing the surface with a very rich mixture—should it be necessary to patch voids in the surface we specify that the mixture should be no richer than the mass. We specify our concrete surfaces to be finished by rubbing with a concrete brick. We also find that where cracks occur the moisture entering the mass starts a chemical action which results in the surface being ruined by efflorescence.