roller is present there should be instructions to roll all macadam roads in the spring as soon as the frost is out. The management of the hauling of gravel and broken stone, the balancing of men and teams, offers a great opportunity for economy and detailed instructions on such matters are not superfluous.

It is scarcely necessary to add to what has been said above that the repair and maintenance of our highways is a business which requires trained men for its management and skilled workmen for its performance. There is no need to argue and waste oratory over the road question longer. We know it needs business management and we know that it costs an excessive amount of money under the old system. Furthermore, we know that the roads do continue poor. Happily, it has been found that all road work responds amazingly to organization and skilled supervision, nor is it necessary for a general election or overhauling of official positions to make a beginning in the improvement of repair and maintenance operations upon our highways.

FIRE CLAY TESTS.*

The term "fire clay" as it is generally interpreted has a very indefinite and elastic meaning. Usually it is applied to any clay which may be made up into wares that will withstand high temperature. This might mean any degree of heat from that attained in an open fire-place to that reached in a furnace for ore smelting. Obviously a clay suitable under the first set of conditions would not, in all probabilities, be suitable under the second. Fire-clays are frequently found associated with coal seams and in consequence miners invariably call any clay so associated a fire clay. In general this is far from the truth. The clay worker, at least, must have a more definite conception of the meaning of the term.

It is commonly accepted that the dividing line between refractory and non-refractory clays, as regards their temperatures of fusion, lies at or near 1,650 degrees centigrade, although this cannot be taken as a safe criterion for classifying refractories. It can be safely said, however, that very few No. 1 fire brick are made from clays fusing below this point. Since a high tension fusion point is the prime essential, its determination might well be made the first preliminary test.

The clay to be tested is moulded into a small "trial" the size and shape of a Seger cone (a tetrahedron or triangular pyramid about two inches high and measuring about half an inch at the base. This is placed in a vertical position on a fire-clay slab, lowered into a suitable furnace, and the temperature gradually raised until fusion has proceeded to such an extent that the sharp edges of the cone have assumed a rounded appearance and the tip has fallen over until it touches the base. The temperature at this point is recorded as the temperature of fusion.

At first this might appear as a very reliable index to the character of a clay, but upon carefully considering the facts this is found not to be the case. Clays, being mixtures of minerals rather than definite chemical compounds, have no well defined melting points. The change from the solid to the viscous state is very gradual, often extending over a period of several hundred degrees. If two clays are taken whose cones show the same temperature of fusion, it may occur that if an appreciable load be applied to each at temperatures approaching their fusion points, great difference will be noted in their failure temperatures. This is due to the difference in their periods of softening; the one having the longer softening period failing first.

To this end, a test of fire brick under load at high temperatures has been devised by Bleininger and Brown at the Pittsburg Testing Laboratory. The furnace used for this work was of special design and is described by them in detail in Vol. XII. transactions A. C. S. It is fired by means of natural gas and compressed air and it is possible to bring the temperature up to 1,350 degrees Centigrade in about five hours. The load is applied to the brick by a lever outside the furnace and is carried to the brick through a high-grade fire clay bar acting as a column. The lever is fitted with adjusting bolts by means of which it can at all times be kept in a horizontal position. The movement of the lever can be observed by the operator and is an index to the action of the brick under test. Their final recommendation is that the brick be placed on end under a load of 50 pounds per sq. in., and subjected to a temperature of 1,350 degrees Centigrade for one hour. They further recommend that a one-pound fire brick should show no other marked deformation than a shortening of not to exceed one inch in the total original length of nine inches.

Some objections might be raised to this test on the ground that the time factor at high temperature figures prominently in the failure of fire brick and that in this case the specimen is held at the maximum temperature for only one hour. On the whole, however, the test relatively approximates actual conditions of use and gives such consistent results that it is likely to become, in time, a standard test for fire brick.

The furnace used for making the actual fusions are of several different types. The "Carbon Resistance Furnace" is probably the most convenient and satisfactory of those in use. It is described by Coggeshall and Bleininger in Vol. X. Trans. A. C. S. The casing is made from a high-grade fire clay and is supported on a wrought iron plate. A wrought iron ring and the crucible complete the list of parts. An annular space between the crucible and casing is packed with carbon; a grade known commercially as "Electric Furnace Carbon." The electrical connections are made through a supporting plate below and a ring above. The heat is generated by the resistance of the carbon to the flow of current. The current from the power line is stepped down through a suitable transformer so that it is available at five volt intervals from twenty to seventy volts. With this apparatus it is possible to get sufficiently high temperatures to fuse almost any clay. With the one in use in the Ceramics Laboratory of the Iowa State College, temperatures of over 3,200 degrees Fahr. have been obtained and this limit was determined only by the failure of the crucible by melting.

Methods for the testing of fire clays and fire clay products have not yet been standardized but considering the progress that is being made in Ceramics work, it should not be long before methods for systematic examination are available.

* From the Iowa Engineer, by M. F. Beecher, B.S., assistant in Ceramics, Engineering Experiment Station, Ames, Iowa.

DOMINION STEEL CORPORATION.

The nail plant of the Dominion Steel Corporation at Sydney is being steadily enlarged and although the company has been making nails on a commercial scale only a few months it is already becoming a large factor in the market.

A galvanizing plant of modern type is in operation. The only thing needed to complete it is the installation of the permanent power

The company's wire mill is equipped not only to provide wire for the nail mill and galvanizing plant, but wire for sale as well, including wire already drawn to be made into nails. The new annealing department to supply that part of the wire market is being rapidly pushed forward to completion.