

As a result of the Council's initiative, governmental action was taken in June last to secure federal co-operation with the governments of Saskatchewan and Manitoba in establishing a demonstration plant in the Souris coal areas of Southern Saskatchewan, to prove the commercial feasibility of carbonizing and briquetting the Western lignites for heating in domestic furnaces.

This year will see a plant established with an outlay of \$400,000 and an annual output of 30,000 tons of coal equal to the Pennsylvania anthracite and marketed in Regina or Moose Jaw at, at least, two dollars per ton less than the imported anthracite is now costing.

What Success Will Mean

The success of the initial plant, about which there can be little doubt, will lead eventually to the development of the immense and little realized latent lignite resources of Saskatchewan and Alberta, relieve for Ontario and Quebec the present coal famine through limited American supply and save to Canada the five or six millions of dollars now annually going to the United States for coal for the prairie provinces.

A systematic study of the rate of reproduction and growth of Canadian forest trees of the commercial species has been undertaken through scientific survey of some eighty square miles of an old cut-over lumber district on the Petawawa Military Reserve. The data being secured will in the course of a few years give, for the first time, the essential definite information enabling the Dominion and provincial governments to inaugurate on a scientific and practical basis a scheme of reforestation paralleling the best results obtained in the past in Europe. Our forest wealth, now in danger of exhaustion through reckless waste and disregard of adequate conservation systems, can only thus be preserved as a great and permanent national resource.

Alcohol from Sulphite Liquor

The tar fog research, initiated in 1917, has been continued with satisfactory practical results which will doubtless lead in the near future to the application to various plants in Canada of a new electrical process for the recovery of valuable by-products now lost in the destructive distillation of coal, wood, etc.

The research on sound measurements and fog signalling conducted in 1917 by Dr. Louis King, of McGill, has made further progress this year and forecasts a new type of sirens for use in the St. Lawrence River and Gulf.

Research work connected with the recovery of industrial alcohol from the enormous sulphite liquor waste of our Canadian pulp mills points to the installation of recovery plants and the production in Canada, at decreased cost to consumers of the alcohol increasingly needed for industrial purposes and as a substitute for motor fuel.

Five Millions for Research

There have been a score or more of other phases of industrial research initiated or continued during the year, each having a practical bearing on some branch of national production. More should and could be done, were trained men and money available. The Council's budget for the year has been under \$100,000.

In Great Britain parliament has recognized the need and the opportunity by creating a separate Department of Scientific and Industrial Research and has voted one million dollars per annum for five years to be expended by the Research Council. In Canada, we, too, are learning the obvious lesson taught by Germany and already adopted by British industry. The path has been blazed for replacing rule of thumb methods in Canada by scientific investigation.

The Canadian Pacific Railway has bought the King lumber mills at Yahk, B.C., an initial payment of \$100,000 having been made. The company is now engaged in building eight miles of railroad to develop its limits and to connect them with the mill at Yahk.

COMPRESSIVE STRENGTH AND MODULUS OF ELASTICITY OF GUNITE

DURING the past year the U.S. Shipping Board, in co-operation with the Bureau of Standards, has made extensive tests to determine the compressive strength and the modulus of rupture of gunite. Tests also were made this year by Prof. McKibben of Lehigh University, to determine the modulus of rupture and other characteristics. These tests are summarized in a paper: "The Cement Gun, Its Application and Uses," presented last month before the Society of Municipal Engineers of the city of New York, by B. C. Collier, general manager of the Cement Gun Co., Inc. The data following are taken from Mr. Collier's paper:—

Tests by Prof. McKibben

Tests have recently been made by Prof. McKibben, of Lehigh University, to determine the modulus of rupture of gunite, and his report shows results on slabs shot as follows:

- A. Shot horizontally at one operation, 2 in. thick.
- B. Shot horizontally at one operation, 4 in. thick.
- C. Shot horizontally, four layers, 1 in. each, 1-hour intervals.
- D. Shot horizontally, four layers, 1 in. each, 4-hour intervals.
- E. Shot horizontally, four layers, 1 in. each, 24-hour intervals.
- F. Shot vertically at one operation, 4 in. thick.
- G. Shot vertically, four layers, 1 in. each, 1-hour intervals.
- H. Shot vertically, four layers, 1 in. each, 4-hour intervals.
- J. Shot vertically, four layers, 1 in. each, 24-hour intervals.
- K. Shot vertically at one operation, 4 in. thick.
- L. Shot vertically, four layers, 1 in. thick, 4-hour intervals.

It was the original intention in making these tests to get the modulus of rupture on samples A, B, C, D and E and, therefore, provision was made to eliminate the possibility of weak material along the corners of the forms. It was further intended to use the slabs that were shot against vertical forms to make compression tests. It was found, however, that the gunite was so hard that the ordinary cutting machines would not suffice to cut it into cubes, and so it was decided to use these slabs for additional rupture tests. It will be noted from the following tests that these slabs did not show as good results as did the horizontally shot samples, and as all other evidence warrants the belief that vertically-shot gunite is slightly stronger than that shot horizontally, the assumption has been drawn that the "weak" corners which were included in the area were responsible.

Modulus of Rupture

28 days—	90 Days—
A. 617 average of 3 samples	643 average of 3 samples
B. 445 average of 2 samples	802 average of 2 samples
C. 384 average of 3 samples	766 average of 4 samples
D. 355 average of 3 samples	621 average of 3 samples
E. 210 average of 3 samples	308 average of 3 samples
F.	581
G.	494
H.	550
J.	598
K.	699
L.	590

The results were obtained by placing a knife-edge load on the centre of each slab which was supported on knife-edge supports, and the notation is made, "Every slab failed by breaking practically straight across the centre of the span."

Mechanical Analysis of Sand

All of these slabs were shot from bank sand having an average moisture content of 5.26 per cent. The mechanical analysis showed 73 per cent. passing a No. 10 sieve, 25 per cent passing a No. 40 sieve, and 2.3 per cent. passing a No. 100 sieve. The cement used was a standard brand of "Valley" cement. Tensile tests made on hand-made briquettes of this cement and sand mixed 1 to 3, gave an average tensile strength of 142 lb. per square inch. Other interesting data gathered from these tests show:—