power of useful energy per 7,250 B.T.U. supplied, shows that the temperature at which the jacket water is discharged, has a marked effect upon the efficiency of the engine. This is graphically illustrated in Fig. 2 and, though there appears to be considerable variation in the efficiencies of the various engines when the jacket water is discharged at a relatively low temperature, the curves for the various engines all point to a maximum engine efficiency when the jacket water is discharged at a temperature at 180 degrees to 190 degrees Fahrenheit. Above 180 degrees the improvement in efficiency is very gradual, as it is at this temperature that the generation of steam in the jackets usually begins to become serious. With well designed and proportioned jackets, however, the jacket water may be safely retained in the jackets until a temperature of 190 degrees Fahrenheit is reached, but beyond such temperature it is very questionable whether any appreciable increase in efficiency is attainable.

The temperature of the jacket water supply is of secondary importance, as its only effect upon the efficiency of the engine is that the cooler it is the less jacket water is required—that is, the greater the possible temperature range—but as a temperature range of from 105 to 115 degrees Fahrenheit furnishes the maximum economy in fuel consumption under ordinary conditions, no material benefit is derived by having the jacket water supply cooler than 70 or 75 degrees Fahrenheit, other than reducing the mean velocity of the supply through the jackets. This, in the average case were the water is used over and over, is conducive to additional expense rather than to economy, as cooling facilities have to be greater than when the water is returned to the jackets at a higher temperature.

The operating engineer has discovered that certain benefits are to be derived by discharging the jacket water at higher temperature than was formerly considered good practice for the engine tests from which the data of Table I was collected, cover a period of some ten or fifteen years, the tests in which the jacket water was discharged at a relatively cool temperature, having been made in the late nineties while those tests in which the jacket water was discharged at the higher temperatures being of comparatively recent date—all tests having been made according to good practice at the time they were made, and to ascertain the best efficiencies of the engines rather than as studies of the effect of jacket water temperatures.

MEXICAN PETROLEUM OUTPUT.

The development of Mexico's petroleum industry is shown by the following statistics of output of crude oil in the past six years: 1907, 1,000,000; 1908, 3,481,410; 1909, 2,488,742; 1910, 3,332,807; 1911, 14,051,643; and 1912, 16,500,000 barrels.

The Canadian Pacific Railway Company, who have invited tenders for two 600 ft. high-speed Atlantic liners, have placed an order with Denny, Dumbarton, Scotland, for two auxiliary steamers of 375 ft. length.

The International Road Congress, which will be held this year in London, England, June 23rd to 28th, will bring together the leading men from practically every country identified with highway construction and maintenance. This is the third Congress of the kind to be held, and is the first to be held in an English-speaking country. The first Congress was held in Paris, France, and the second in Brussels, Belgium. These Congresses are held every three years.

PRESERVATION OF RAILROAD CROSS TIES.

In rather extensive experiments carried on by the United States Forest Service in the preservation and use of cross ties, the following results were secured and deductions drawn:—

Zinc chloride is an effective preservative for ties subjected to the severe conditions under which the experimental ties were laid, as a result of which 87 and 92 per cent. respectively of these ties were serviceable after seven and one-half years. A fairly heavy impregnation of zinc chloride is advantageous. Treatments by the Burnett and Wellhouse processes, made at Somerville, with two per cent. zinc chloride solutions and average absorptions of 0.35 and 0.33 pounds of dry salt per cubic foot of wood, resulted in only 45 and 47 per cent. respectively of serviceable ties after seven and one-half years' service. Similar treatments made at Chicago with a 4 per cent. solution and average absorptions of 0.42 and 0.57 pounds of dry salt per cubic foot resulted in 87 and 92 per cent. respectively of serviceable ties after the same length of service.

A light injection of creosote apparently adds to the effectiveness of zinc chloride treatments. The Allardyce treatments, made at Somerville, show 81 per cent. of serviceable ties, while treatments made at the same plant with zinc chloride alone show only 45 per cent. of serviceable ties after seven and one-half years. Beaumont oil in combination with zinc chloride also produced an effective treatment.

Treatment with preservatives will not yield good results unless the ties are sound in the first place and the treating is properly done. This is strikingly shown by the treatments of zinc chloride and English creosote. These ties were probably injured by over-steaming during the treatment.

The experiments seemed to indicate that ties treated with zinc chloride suffered more mechanical wear than untreated ties, and from this it would appear that the zinc chloride treatment weakens the wood. This result was also noticed on the creosoted ties, in one experiment, but in another, on ties which had been treated with about fourteen pounds of creosote per cubic foot, examined two years after placement in track, approximately two per cent. were slightly affected with decay, and about twelve per cent. of those treated with zinc chloride, but on inspection of a number of ties which were more or less split, it was found that the exposed portions of the ties appeared thoroughly sound and well treated, and it seems probable that the greater part of them were slightly affected with decay at time of treatment, and only two ties could be found showing any rail wear, and this was so slight as to be negligible.

In general, however, these experiments, carried on with seven different railroad organizations, show that in many cases the life of ties can be doubled or even trebled by proper treatment, but to secure this result, the ties must receive a first-class treatment of a good preservative and must receive a liberal and not a skimping treatment.

Ties with low decay resistance, such as loblolly pine, hemlock, tamarack and beech, if laid untreated, should not be tie-plated, as they will decay before they will wear out, even without the tie plates, and, this being the case, the tie plates are a useless expense and do not prolong the life of the tie. However, the increased resistance to decay caused by proper treatment makes it highly desirable to protect the ties from deterioration from mechanical sources, and this is particularly true of ties with low crushing strength.

Practically all radium-bearing ores mined in Canada and the United States are sent to Europe for the extraction of the radium.