

Incomplete solution may, of course, take place if the flux is unsuitable, or if the heating period is too short. This can not occur when the asphalt cement is produced in a single distillation process from an asphaltic petroleum, but such an asphalt cement is subject to the same danger of decomposition, coking, etc., as those prepared from hard asphalts and flux.

Where an asphaltic petroleum is distilled down to a very hard consistency and then fluxed back, there is very considerable danger of decomposition due to overheating, even if the distillation is carried on with care. This is not the case, however, if, as provided in standard specifications, the asphalt be not carried down in the refining process to a penetration which is lower than 30 at 77° F.

Paragraph 9 of the sheet asphalt specifications adopted by the American Society of Municipal Improvements, October 14th, 1915, which describes in general terms the methods to be followed in fluxing a hard asphalt, is quoted below. The note appended thereto is an explanatory note of my own and does not appear in the specifications. It should be borne in mind in connection with this quotation that the specifications also contain clauses to the effect that the refined asphalt and flux must be of such a character that they will combine to form an acceptable and approved asphalt cement complying with the requirements of the specifications, and that these re-

quirements and the methods to be followed during the fluxing operation are the same in the case of asphalt cements prepared at the refinery and asphalt cements prepared at the paving plant.

Preparation:—The asphalt cement shall be composed of refined asphalt, or asphalts and flux, where flux is required, of the character elsewhere herein specified and must be of a suitable degree of penetration.

"The proper proportions of the refined asphalt, or asphalts, and flux, shall be melted together at a temperature between 275 and 400 degrees F., and thoroughly agitated by suitable appliances until they are completely blended into a homogeneous asphalt cement. Thereafter the asphalt cement must not be heated to a temperature exceeding 350 degrees F. If the asphalt cement contains material that will separate by subsidence while it is in a molten condition it must be thoroughly agitated before drawing from storage and while in use in the supply kettles. Excessive agitation with steam or air which will injure the cement must not be used.

"The refined asphalt or asphalts and flux comprising the asphalt cement shall, when required, be weighed separately in the presence of the authorized inspectors or agents of the Engineer."

Note:—The provision permitting a maximum temperature of 400 degrees F. during the fluxing operation is intended to cover the use of hard asphalts, such as Grahamite, etc., which require heating to a high temperature in order to effect complete solution of them in the flux. Once this solution is complete, the temperature is then required to be dropped to a maximum of 350 degrees F.

THE EXPORTATION OF ELECTRICITY.

WHEN the Parliament of Canada placed upon its statute books the unfortunate act permitting the exportation of electricity, many far-sighted Canadian statesmen and economists protested, fearing that it would be far more awkward to stop the exportation than to start it. Ontario now needs the power that is being exported at Niagara, and the licenses to export may have to be curtailed, and eventually even abolished. The people of Canada are only now realizing the truth of the statement by the Canadian section of the International Waterways Commission that "It is very little advantage, indeed, to this country to develop power which is to be transmitted to the United States."

The mere generation of the power in Canada adds but a trifle to Canadian industry or welfare. Its benefits are negligible. It is the use and application of the power within Canada that adds to the comfort and profit of Canadians. With these facts in mind, and in view of the difficulties that the Ontario Hydro-Electric Power Commission is now experiencing in obtaining sufficient power to supply its requirements, it is interesting to review an article by Arthur V. White, a Toronto consulting engineer, which appeared in *The University Magazine* as far back as October, 1910. As both the article and the author's note that followed it have a direct bearing upon the present problems that face the Ontario and Dominion governments, they are reprinted here in full:—

Have the people of Ontario, while contemplating the disposal of Canadian water powers, considered fully to what extent their own future power, heat and light may depend upon their retaining control of these water powers?

Ontario is dependent for its supply of coal, especially hard or anthracite coal, upon the United States, and few events would prove more disastrous for the people of that province than to be deprived of this necessity. Even if coal were brought from either the Atlantic or Pacific

coasts, the costs and difficulties of transportation would add much burden to the Ontario consumer.

It is important that Ontario—as well as other provinces of Canada—should be in a position to command, as far as possible, a continuous supply of coal from the adjacent coal fields of the United States.

If the people of Ontario entertained any apprehension that their supply of hard coal might be greatly increased in cost, interrupted, or entirely cut off, they should yield their best support to any efforts put forth by the governments to keep the assets of that province in such a condition as would establish a working basis upon which a *quid pro quo* could be given in exchange for those commodities which it is necessary to import. The question, then, first to be considered is, What are the possibilities that Canada may at some future time suffer from a cutting off of the United States coal supply; and then, what are the means within our power which may assist us to make it worth while for the States to continue to export some of their coal to Canada?

It has been a policy of many countries to prohibit the exportation of certain natural resources which are essential to their own welfare, and such policies are being more and more adopted. Take, for instance, the phosphate rocks, so valuable as an agricultural fertilizer. Formerly the United States permitted all-comers, so to speak, to avail themselves of its phosphate beds. But suddenly it was forced home to the United States government that in the very near future the people of the United States would require their own phosphate beds. Thus, discussing this subject, President C. R. Van Hise, of the University of Wisconsin, says:—

"During the summer of 1908 the attention of President Roosevelt was called to the fact . . . and it was urged that the Western phosphate lands now owned by the Government should be withdrawn from private entry until such time as legislation could be secured to permit their exploitation upon a lease system, containing a clause preventing the exportation of the phosphate. Later, the matter was again pre-