MICHIGAN
STATE HIGHWAY DEPARTMENT
Charles M. Ziegler
State Highway Commissioner

RUBBER COMPOUND HEATING KETTLE

CHAUSSE MODEL R-115

By

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Research Project 36 G-4 (6)

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CHAUSSE RUBBER COMPOUND KETTLE

MODEL R-115

Note that the temperature of the heat transfer oil increased from 70° at 9:00 A.M. to 310° at 9:10, at which time compound was first added to the melting tank, and that at the end of 35 minutes the temperature was at 490°. At the end of 2½ hours the addition of compound was stopped and at the end of 3 hours, total, the compound was at temperature of 400°.

Test Made With

CHAUSSE Model R-115 Rubber Compound Kettle

Using Flintseal Compound

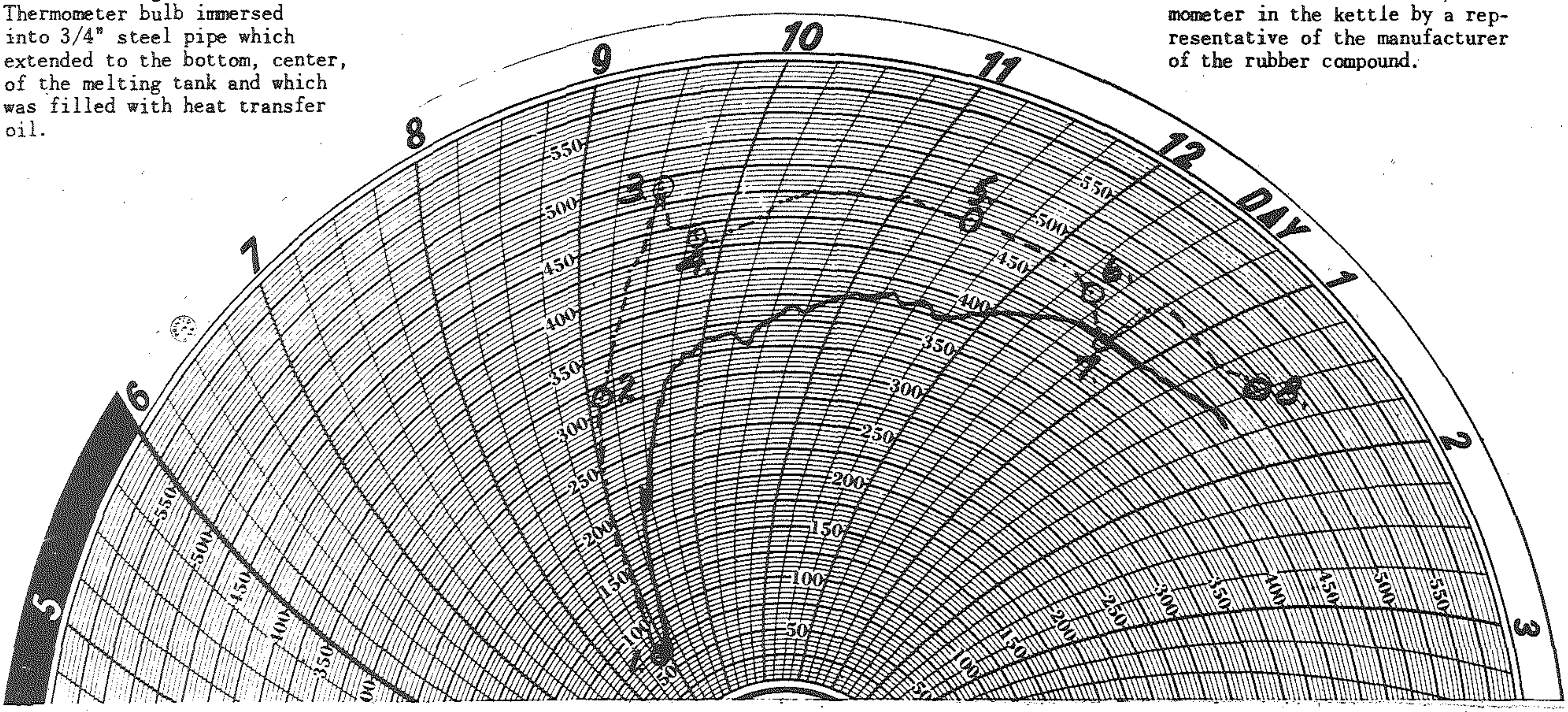
June 20, 1947

Solid Line;

Temperature of compound from recording thermometer. Thermometer bulb immersed into 3/4" steel pipe which extended to the bottom, center, of the melting tank and which was filled with heat transfer oil.

Dotted Line;

Temperature of the heat transfer oil as read on the mercury thermometer in the kettle by a representative of the manufacturer of the rubber compound.



H E A T T I M E C U R V E

PLATE I

On August 29, 1947 a new heating kettle of the oil-bath type for asphalt-rubber joint-sealing compounds was observed. This kettle was in actual field use on project No. 72-49, C1 and C2 on Highway M-46 from junction with M-19 to Sandusky, Michigan and was owned and operated by the contractor on the project. The kettle, shown below, consisted of three main

Illustration No. 1
Rubber Compound Kettle, Model R-115, designed and built
by W. G. Chausse, Manufacturer, of Detroit, Michigan

parts: (1) a vat for the joint material, agitated with a paddle type stirrer rotating on a horizontal shaft; (2) a forced circulation oil-bath using General Electric #10-C insulating oil as a heat-transfer medium; (3) a heating chamber for heating the oil by means of two manually-controlled three-inch oil burners. The joint sealing material used was Paraplastic.

Graphs furnished by the manufacturer indicate that the material can be poured within three hours after lighting the burners on the kettle. For this run, the kettle was started at 6:00 A.M., and at 8:15 A.M. the oil bath was at a temperature of over 550°F. and the charge of approximately 200 pounds of joint material, as shown by the thermometer well, was at a temperature of 440°F. This would indicate that the kettle heats rather rapidly. However, this was due to the fact that the temperature of the oil bath was carried too high through difficulty in control of the burners. This was evidenced by the oil being distilled off and condensing in the overflow pipe and by the clouds of smoke pouring from the machine, as shown below.

Illustration No. 2
Note smoke haze as a result of overheating the oil bath

The kettle provides forced circulation of the heat-transfer oil through tubes where it is heated by two three-inch oil-burners and then passed through the jacket surrounding the joint material. This provides a uniform temperature throughout the oil bath. However, it was noticed that the operators of the kettle had difficulty in controlling the temperature of the oil-bath and, consequently, that of the joint material. This seemed to be due, in part, to the fact that the operators were unfamiliar with the kettle. A large part of the difficulty in temperature control, however, seemed to be inherent in the kettle itself. The two oil-burners, shown below, are controlled manually and, for this reason

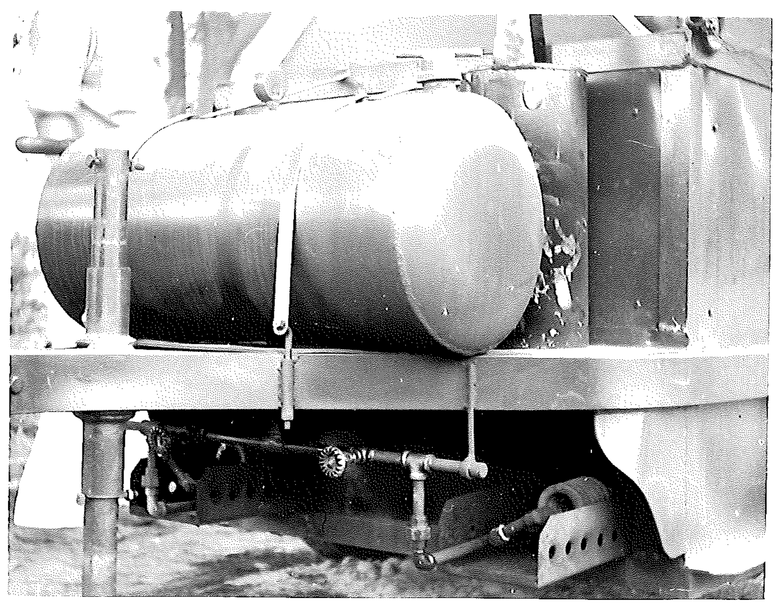


Illustration No. 3
Showing manual control for each of the two oil-burners

provide opportunity for considerable variation in temperature. Large temperature variations can also be noticed on graphs published by the manufacturer for a test made June 20, 1947 using Flintseal compound (Plate 1). One remedy for this difficulty would be control of the oil-bath temperature by using bottled gas fuel with a burner and pilot light arrangement controlled by a thermostat set in the oil jacket.

It was also noticed that the thermometer well giving the temperature of the joint material was filled with heat-transfer oil and passed through the oil jacket. On checking the temperatures, it was found that the temperatures given by the thermometer well were considerably higher than those obtained at the outlet faucet. For example:

Oil bath temperature - over 550°F.

Thermometer well temperature - 530°F.

Outlet faucet temperature - 433°F.

This is supported by the fact that samples of the material taken from the kettle meet the laboratory specifications satisfactorily as follows:

		Spec.
Penetration		
At 32°F., 200 gm, 60 sec.	46.3 cm	0.28 cm min.
At 77°F., 150 gm, 5 sec.	61.6 cm	0.45-0.75 cm
Flow	Less than 0.5 cm	0.5 cm, max.
Bond	Did not break after 2 cycles when test was stopped.	No breaks 5 cycles

Had the material actually been at the temperature indicated by the thermometer well, it would have failed both the penetration and flow tests in the laboratory. The location of the thermometer well indicates that this discrepancy is probably caused by the hot oil surrounding the thermometer well where it passes through the oil jacket. (See Illustration No. 2). The difference in temperatures may not always be as large as shown because the oil bath was at an extremely high temperature during this run. An indicated remedy would be passing the thermometer well through the cover or other place where it would not come in contact with the heating bath.

Two insulated pouring pots were provided with the kettle. These insulated pots are claimed to keep the joint material from losing too much heat when carrying the material from the kettle to the joint. However, difficulty was experienced by the operator in getting the material to flow out of the spout. This was traced to pouring the hot material into a cool pot which

Illustration No. 4
Showing pouring pot prior to use with spout completely assembled.

coagulated a layer of sticky material next to the surfaces of the pot and prevented the material from flowing freely. This was partially solved by removing the small nozzle from the pot and thus obtaining a larger opening. However, this prevented good control of the flow of material and resulted in poor joints (See Illustrations 5 and 6).

Illustration No. 5
Showing nozzle removed because of coagulation of material against the surface of a cool pot which prevented easy flow from the opening. Note the poor joint resulting.

Illustration No. 6
Poor joint at Station 432+00 near junction of M-46 and M-19

This difficulty can be remedied either by heating the pots with a torch or leaving them set on the cover of the heating kettle for a considerable time before filling. The pots should also be heated intermittently during pouring to maintain free flow.

It is also suggested that better results could be obtained with this wet-type kettle by cutting the material into long, narrow strips about two inches wide rather than in rectangular blocks, and initially charging in small amounts until a good puddle is obtained in the kettle before any large charges are added.

It is the opinion of the observer that the performance of the kettle at this time was not satisfactory. This was due partly to operators unfamiliar with the machine and partly to the difficulty previously mentioned. It would seem that the kettle could, at present, perform satisfactorily at the hands of an experienced operator. However, it is believed that the above-mentioned suggestions would greatly improve the performance of the kettle whether the operators were familiar with the machine or not.