In some cases steam was admitted from the top of the apparatus, and in other cases from the bottom. With the steam supply at the bottom, it was found that condensed water refused to drain down the vertical 1-in. tube in opposition to the current of steam, although the maximum velocity of the steam could not have exceeded 10 ft. per second.

The following set of observations, each of which represents the mean of several taken on similar conditions, will sufficiently indicate the general nature of the results:

The temperatures of the metal at distances of 1 in., 1.5 in., and 2 in. from the axis of the bar were observed by means of mercury thermometers, which were very carefully centred by small iron washers in holes filled with mercury. The hole fitting the bulb of the thermometer was 3-16 in. in diameter The other holes were 5-16 in.

It will be observed that in this particular set of experiments the temperatures at 1 in. in the metal, when calculated to agree with the assumed rate of condensation, are all too low as compared with those observed, whereas the temperatures similarly calculated at 1.5 in. are all too high. This might at first sight appear to indicate a very rapid diminution of the conductivity with rise of temperature; but after making various tests the effect was traced partly to the disturbance of the heat flow caused by the presence of the holes, and partly to differences of density of the bar in directions at right angles. The latter differences were not observable in the case of the cast iron.

The observations taken at different pressures do not indicate any marked difference in the rate of condensation per degree second. These results, so far as they go, are in agreement with the authors' previous work, but they hope to be able to obtain more conclusive evidence.

AN ELECTRICAL METHOD OF MEASURING THE TEMPERATURE OF A METAL SURFACE ON WHICH STEAM IS CONDENSING.

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PART II.

The object of the following experiments, which were made at the McDonald Physics Building with a different apparatus, was the measurement of the temperature of the metal surface itself by a more direct and accurate method. It was also desired to verify as exactly as possible whether the rate of condensation of steam at atmospheric pressure was the same as at the higher temperatures and pressures at which most of the preceding experiments were made.

The condenser used for these experiments was a very thin platinum tube, ¼ in. in diameter and 16 in. long. The thickness of the tube was only six-thousandths of an inch, and the greatest difference of temperature between its inner and outer surfaces at the maximum rate of condensation observed in the experiments could not have been greater than ¼ deg. cent.

The mean temperature of the metal itself was determined in each case by measuring the electrical resistance of that portion of the tube on which the steam was condensing. The author has had considerable experience in the employment of this method, which, moreover, is very easily applied if suitable apparatus is available.

The platinum tube was enclosed in an outer tube of brass or glass, and steam was admitted to the space between the two tubes. A steady current of condensing water was maintained through the platinum tube. The amount of condensation could be inferred by measuring the flow of water, and observing the difference of temperature between the inflow and the outflow. *In many cases the condensed water was also measured.* Applying a small correction for radiation, the two methods always agreed within one-half of 1 per cent. The pressure of the steam in the outer tube, which was never far from the atmospheric, was observed by means of a mercury column.

The conditions of the experiment as to flow of water and steam, size and length of the external tube, etc., could be varied within certain limits. The following is a summary of the more interesting results obtained:

CONDENSATION RESULTS SUMMARY. MILD STEEL BAR. WIPER REMOVED.

Condensation. Thermal Units per Square Foot Second.	Steam Temperature Observations.	Surface Temperature Calculations.	Difference, Steam and Surface.	Temperature in Metal at Distances. 1 In. Calculations.	1 In. Observations.	1.5 In. Calculations.	1.5 In. Observations.	2 In. Observations.	Conductivity, K.
	deg.	deg.	deg.	deg.	deg.	deg.	deg.	deg.	
20.0	330	303	27	208	214	154	153	113	5.84
17.8	300	277	23	193	198	143	142	109	5.66
15.4	274	253	21	179	184	136	134	103	5.81

1. With a short length of condenser and a very free escape of steam, the condensation observed was equivalent to 22.2 thermal units Fahr. per square foot per second, for a difference of temperature of 28.5 deg. Fahr. between the steam and the metal surface. This is equivalent to a rate of condensation of

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