550 kilom. per sec. In another case, also observed by FÉNYI (July 15th 1889), in the course of 10 minutes the ascending velocity passed through the values 72, 6, 65, 24, 154 kilometers per second; and with the prominence of Oct. 6th, 1890, in 30 minutes' time through the values 33,8, 79,8, 67,6, 72,7, 127,7 275,5, 242,3, 121, 57,3 kilom. per sec.

Considering the problem from the new point of view we see the difficulties disappear in consequence of the observation, that, properly speaking, we have not to do with velocities at all. We may speak of the velocity with which matter moves or with which a disturbance is transmitted by a medium; but neither of these cases is met with here. Wherever the whirling sets in, it results from local conditions and cannot be considered as directly transmitted from places, where whirling was going on a little earlier. Though it is true that, as a rule, the breaking of a wave begins in those parts of a surface of discontinuity, that are nearer to the Sun's axis, and from there proceeds outwards, yet this does not involve that we should have a right to call this process a transmission of matter or of motion in the direction of the vortex-cores. And where there is no transmission, there is no velocity.

When at the sea-shore a wide wave approaches and breaks, now here, then farther and farther, nobody will speak of the „velocity" with which the foam or the whirling is moving along the coast. Every body knows, that the foam, the visible token of the whirling, is successively formed at different places. Such about is the case with the prominences, the visible spots in the breakers of the solar ocean.

Chemistry. — Professor LOBRY DE BRUYN communicates a paper by himself and Mr. J. W. DITO. „*The boilingpoint-curve of the system: hydrazine + water*".

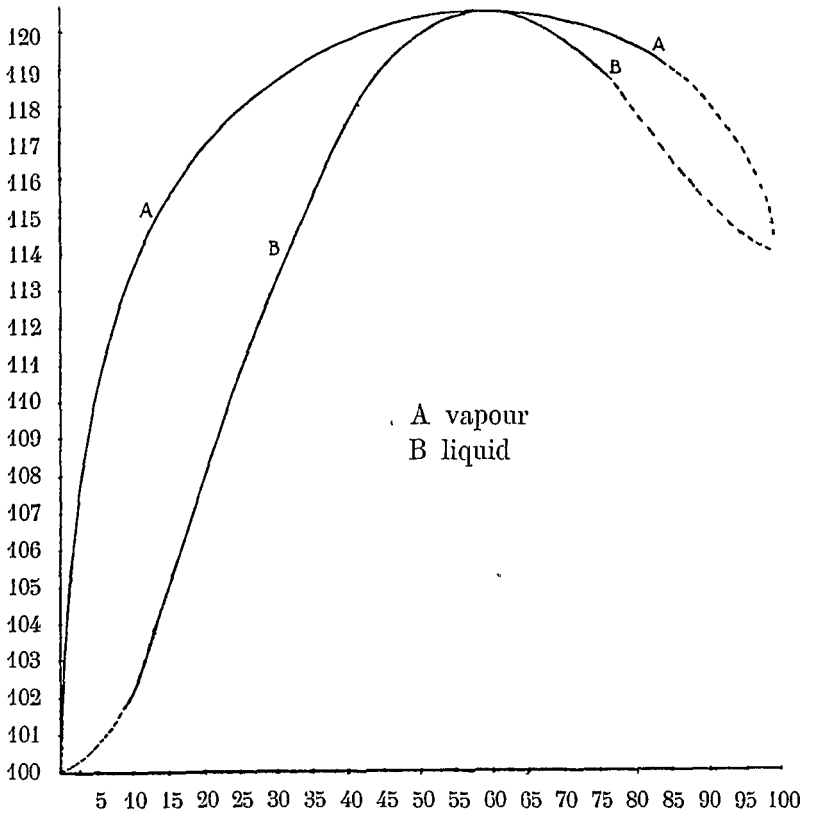
In a previous report[1]) Mr. DITO has communicated the results of determinations of the densities of mixtures of hydrazine and water; the figures showed that a maximum density corresponds exactly (or nearly so) with the composition N_2H_4-H_2O. At the end of that note it was stated that we would endeavour to determine the boiling-point-curve of the system: hydrazine + water.

We have lately been engaged with that determination; the result is given in the following table and annexed curve.

[1]) Proc. of April 19, 1902, p. 838.

Amount of mixture and barometer.	Temp.	Number mols. of N_2H_4 on 100 mols.	
		liquid.	vapour.
	102 2	9.4	0.18
300 grm. 755 5 ↓	104.6	14.2	
"	105.9		1.6
"	107.45	19 5	2.7
"	109 15		3.9
"	111.0		6 2
"	114 95	34 0	13.8
"	117 95	41.7	25.0
85 gr. 768 0	118.6	42 9	30 3
"	119 2	45.2	34 9
"	119.8	50 3	41 7
38 gr. 770.8	120 2	51.8	44.6
"	120.35	53 3	48 75
"	120.45	54.8	52 8
"	120 5	56.0	53 5
	[120°5	58.5	58.5]
771 1	120.45	62.5	
"	120 25	65 8	72
"	119 9	68.3	75.5
"	119 5	72.7	81
"	119.25	73.6	83 7
50 gr. " ↑	118.8	76	

It should be observed beforehand that the figures obtained, particularly those relating to the mixtures rich in hydrazine, cannot possess that accuracy attainable with other mixtures. In the first place free hydrazine is a costly substance; working with a large quantity such as is required for the accurate determination of a boilingpoint curve, therefore, leads to not inconsiderable expenses. Moreover, free hydrazine and its mixtures with little water (also the hydrate $N_2H_4.H_2O$) are very hygroscopic and also easily oxidisable by the oxygen of the air. During the volumetric determination of the amount of



hydrazine in the liquid and condensed vapour, it was impossible to avoid contact with the atmosphere. The operation was carried out in such a manner that each time after distilling off a certain quantity (10—20 c.c. in the case of the greater concentrations), two portions (3—4 drops) of the condensed vapour and residue were simultaneously collected in tared weighing bottles containing about 5 c.c. of water. On account of the many weighings a certain time necessarily elapsed between the taking of the samples and the titration and, considering that the bottles also contained a little vapour of hydrazine mixed with air, this must have excercised some influence. This explains why the agreement between the various duplicate determinations often left much to be desired; in one case a discrepancy occurred amounting to 2 mols. per 100. Finally, another source of error is found in the fact that on account of the many weighings and titrations, the determinations had to be done on different days, so that the distillations were conducted under different barometric conditions.

Notwithstanding this, the results allow of the construction of a curve, the regular course of which is a guarantee that the figures observed

express the entire phenomenon with a certain amount of accuracy. As already stated, more correct results can only be obtained by repeating the experiments with larger quantities of hydrazine [1]).

Our experiments have led to the interesting result that hydrazine-hydrate does not at all represent a chemical compound $N_2H_4.H_2O$ with a constant boilingpoint of about 120°, as hitherto believed. This however is not surprising, particularly after KNIETSCH's experiments on the system sulphurtrioxide + water [2]). The tendency of SO_3 and H_2O to enter into combination is greater than that of N_2H_4 and H_2O. As the boilingpoint curve of the system sulphurtrioxide + water shows a maximum not belonging to the compound H_2SO_4 but to a mixture of 98,5 % of H_2SO_4 and 1,5 % of H_2O, it is not at all surprising that in the system hydrazine + water the maximum does not correspond with the composition $N_2H_4.H_2O$. It is seen from these figures that a liquid boiling at 119°.8 and having the composition 50 mols. N_2H_4 + 50 mols. of H_2O yields a vapour containing about 42 mols. of N_2H_4 and 58 mols. of water, while a vapour of about the composition $N_2H_4.H_2O$ is given off at 120°.4 by a liquid containing about 54 mols. of N_2H_4 and 46 mols. of water.

From the course of the curve it appears that a maximum boiling-point of about 120°.5 corresponds with a liquid with about 58 mols. of N_2H_4. The experiment has shown that a mixture of about 58.5 mols. of N_2H_4 and 41.5 mols. of H_2O has a constant boilingpoint of 120°.1 at 760 m.m. In the table 120°.5 therefore corresponds with 771 m.m.

The course of the first half of the curve plainly shows the phenomenon observed by CURTIUS namely, that on boiling dilute solutions of hydrazine the distillate consists at first almost exclusively of water, although the boilingpoint has very sensibly increased. It may be assumed that the same thing happens in the reverse case of much hydrazine and little water; for reasons stated we have not been able to ascertain this.

One of us (DITO) is already engaged with the determination of the viscosity of the system: hydrazine + water; while with the co-operation of Professor ERNST COHEN experiments have already been started, several months ago, on the electrolytic conductivity of the same system and of solutions of salts in hydrazine [3]).

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[1]) Ber. **34**, 4088 (1901).

[2]) CURTIUS states that concentrated solutions of hydrazine attack glass when boiling at ordinary pressure. We did not notice any such action of even highly concentrated solutions on our glass fractional distilling apparatus and condensing tube.

[3]) Recueil **15**, 179.