A NEW FORM OF FAT-EXTRACTION APPARATUS FOR LIQUIDS.

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SOME years ago I devised a form of fat-extraction apparatus for solids on the principle of upward filtration, but as it presented no advantages over the now well-known Soxhlet form I did not deem it desirable to publish an account of it. A few months ago, however, I had occasion to extract some liquids with ether, and it occurred to me that the apparatus might be pressed into service for that purpose; and as it answered all my expectations, I modified it somewhat in form and have now used it in my laboratory for some six months or so. As it has been very serviceable to me, I venture to give a description of it to the Society in the hope that it may be useful to others—more particularly as it is specially adapted to the extraction of fat by the Schmid process.

The working of the apparatus will be easily understood by a glance at the accompanying diagram. The liquid to be extracted is poured into cup A so that the whole of it will run down the tube B into the bulb C, which should not be more than about two-thirds full. About 5 c.c. of ether are poured into a tared flask D, attached to the tube E by a cork in the usual way. The bulb C is then completely filled by adding ether carefully to the cup A, and the whole is adapted to an upright condenser—as with a Soxhlet tube. When the flask D is immersed in hot water, the ether vapour passes along the tubes E and F, is condensed in the Liebig's condenser and runs back by B into C, and rises drop by drop through the liquid to be extracted. The process is, therefore, continuous and automatic, and may be applied to any two non-miscible liquids, provided the solvent be the lighter.

To the Public Analyst it will, I apprehend, be chiefly of value because of its applicability to the extraction of fat from milk and its products; especially when treated by the Schmid process. For this purpose 10 c.c. of the sample under examination are measured or weighed into a little beaker, 10 c.c. of hydrochloric acid added, and the mixture gently boiled with constant stirring for two or three minutes. When cold, the mixture is poured into the apparatus as described and the beaker washed with ether and the washings added. The apparatus is then put together and the extraction allowed to proceed for an hour or so, when the whole of the fat will be found in the flask D. As there is only a small quantity of ether with the fat, the flask may be placed directly into the water-oven and the contents weighed to constancy in the usual way. The whole operation, so far as actual worth is concerned, can be performed very rapidly and with great ease and accuracy; the only error entering into the process being, so far as I have been able to ascertain, the slight solubility of some caramel-looking matter, which contaminates the fat to the extent of a milligram or two.

So far as my experience goes it appears that the extraction of the fat is more rapid

the more perfectly the milk and acid have been boiled together. Thus, when boiled for three minutes, practically the whole of the fat is removed in half an hour; whereas, when only boiled for two minutes, in one instance, 31 milligrams remained unextracted at the end of that time; while when boiled for one minute only about two-thirds of the total fat was extracted, the remainder being removed with difficulty. It would appear, therefore, that to readily extract the whole of the fat, it is necessary to boil the milk and acid together for some time, say three minutes.

The following results, obtained with four different samples of milk, and taken in this order, will give some idea of the accuracy of the process under varying conditions :—

		Schmid. Boiled with H.Cl. for 1 minute	2 minutes	3 minutes	5 minutes	Adams method. Extracted 3 hours
1.	Extracted 3 hours			2.60		2.49
2.	„ $\frac{1}{2}$ hour		3.91	4.49		
	„ 1 „		4.21	4.53		
	„ $1\frac{1}{2}$ hours		4.46	4.56		4.51
3.	„ $\frac{1}{2}$ hour		2.61	2.69		
	„ 1 hour		2.75	2.75		
	„ 2 hours		2.78	2.80		2.78
4.	„ $\frac{1}{2}$ hour	2.31			3.46	
	„ 1 „	3.33			3.51	
	„ $1\frac{1}{2}$ hours	3.49			3.56	
	„ $2\frac{1}{2}$ „	3.61				3.57

The determinations by the Adam's process were made by the use of Schleicher and Schüll's Fat-free paper, and the extraction was continued for three hours.

DISCUSSION.

Dr. Sykes pointed out that an apparatus with the same object had been recently described in "THE ANALYST," and which appeared to him to be much simpler and less fragile than the one described by Mr. Smetham. He also thought that Mr. Smetham's apparatus would be very difficult to clean, whereas the other one offered much less difficulty in this direction. The paper he alluded to was "On the Estimation of Mixtures of Saponifiable and Unsaponifiable Fats," by Hönig and Spitz, vol. xvi., p. 238.

Mr. Bernard Dyer would like to say that Mr. Smetham was perfectly aware of the existence of the apparatus referred to by Dr. Sykes; but Mr. Smetham's opinion was that his apparatus was simpler, better, and more workable. Messrs. Hönig and Spitz had happened, independently, to drop upon exactly the same principle.

The following paper was then read by the author :—

ON THE DRAWING UP OF CERTIFICATES.

By CHARLES E. CASSAL.

This concluded the proceedings of the Society.