LXVI. A STILL FOR CONCENTRATION UNDER REDUCED PRESSURE.

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IN the course of work with protein hydrolysates, it was necessary to concentrate large volumes of acid liquids at a fairly low temperature. The acidity of the solutions to be concentrated precluded the use of metal parts in the apparatus, and the solutions were prone to froth during concentration under reduced pressure in a simple still.

The apparatus to be described obviated these difficulties. Fig. 1 shows the layout of the still. The distillation vessels consist of two 2 l. long-necked flasks A_1 , A_2 (only one of these is shown in the figure), connected by the short

Fig. 1.

tubes B_1 , B_2 , to the arms C_1 , C_2 , of the stillhead D . The arms C_1 , C_2 , are of 18 mm. internal diameter and permit the free flow of the vapour to the enlarged upper portion of the tube D . This is provided with an external water-jacket E , and an internal cooler F , which extends to the bottom of the receiver G . F is located centrally in D by three glass projections (not shown). The receiver G is cooled externally by the overflow water from F which is distributed over its surface by the tubes H . In order to empty the receiver without dismantling the apparatus, it is provided with two tubes K_1 , K_2 , connected by a two-way tap to the water-pump. During normal distillation, the pump communicates with K_2 , but when it is desired to empty the receiver, the pressure in the system is

increased slightly and the tap turned to communicate with K_1 ; the contents of G can then be sucked over into a suitable receiver placed between the pump and the still.

With foaming liquids, a modified air-leak has been found very useful. The liquid to be concentrated enters continuously at L and is mixed with air from the very fine capillary M . The foam passes down the tube N , which is drawn out somewhat at its lower end. It is found that this device prevents both bumping and excessive foaming in the distillation flasks. In the case of a non-foaming liquid, an ordinary air-leak can be used, and the feed L then passes directly into the distillation flask A .

The distillation flasks and the condensing system are clamped independently, and the rubber sleeves between B and C permit small relative movements. The condensing system is also supported on the funnel I by three cork blocks (not shown).

The distillation flasks are heated in baths consisting of buckets heated by gas-rings. The large volume of liquid makes loss by evaporation unimportant at the low temperatures used.

The advantages of the still are as follows:

- (1) It is cheap and simple to construct and operate.
- (2) Owing to the free passage afforded to the vapour and to the fact that it is cooled somewhat before it passes through the more constricted parts of the system, the efficiency is high. At a water-bath temperature of $50-55^\circ$ and a pressure of 12 mm. it has a capacity of $1\frac{1}{2}$ –2 l. per hour, depending on the liquid being concentrated.
- (3) The central cooler minimises re-evaporation of the condensed liquid and the establishment of back-pressure.
- (4) The liquid to be distilled can enter and the condensate can be removed from the system without a large increase in pressure.
- (5) Frothing is minimised.