At every instant, by this arrangement, a minute fresh portion of salt is introduced into the flame with the result of making a perfectly uniform light, which can be used for hours without any perceptible variation. The mechanism of the apparatus is so simple that no further description is necessary. The polariscope should be so directed toward the flame as to bring into the field of vision its most luminous part. The platinum wheels are adjustable and should be so arranged as to produce between them an unbroken yellow flame. The wheels are eight cm. in diameter and driven at a rate to make one revolution in six to ten minutes.

[CONTRIBUTIONS FROM THE CHEMICAL LABORATORY U. S. DEPARTMENT OF AGRICULTURE. NO. 5.]

IMPROVED EXTRACTION APPARATUS.

BY H. W. WILEY.

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THE apparatus for the extraction of substances soluble in ether, alcohol, etc., described in the *Journal of Analytical and Applied Chemistry* for February, 1893, pp. 65, *et seq.*, can be more conveniently operated when constructed in the manner to be described.

It is convenient to have the bath for holding the tubes made in two separate portions, K and K'. The box K can be conveniently made of galvanized iron with legs, U and U', of any convenient length, so that a lamp can be placed underneath the box.

The liquid to be used in the bath may be water or other substance of different boiling point, and should stand at the height represented by the line W. The box has a false bottom represented by the dotted line O, with circular perforations to receive the bottom of the extraction tubes, as indicated. Both sides of this box are conveniently made of glass or mica so that the operator can see the progress of the evaporation of the solvent.

This box K' is to rest lightly on K but is not fastened to it in any way. It is also conveniently made with one or both sides of glass or mica. The bottom of the box carries rubber diaphragms, perforated to receive the extraction tubes, through

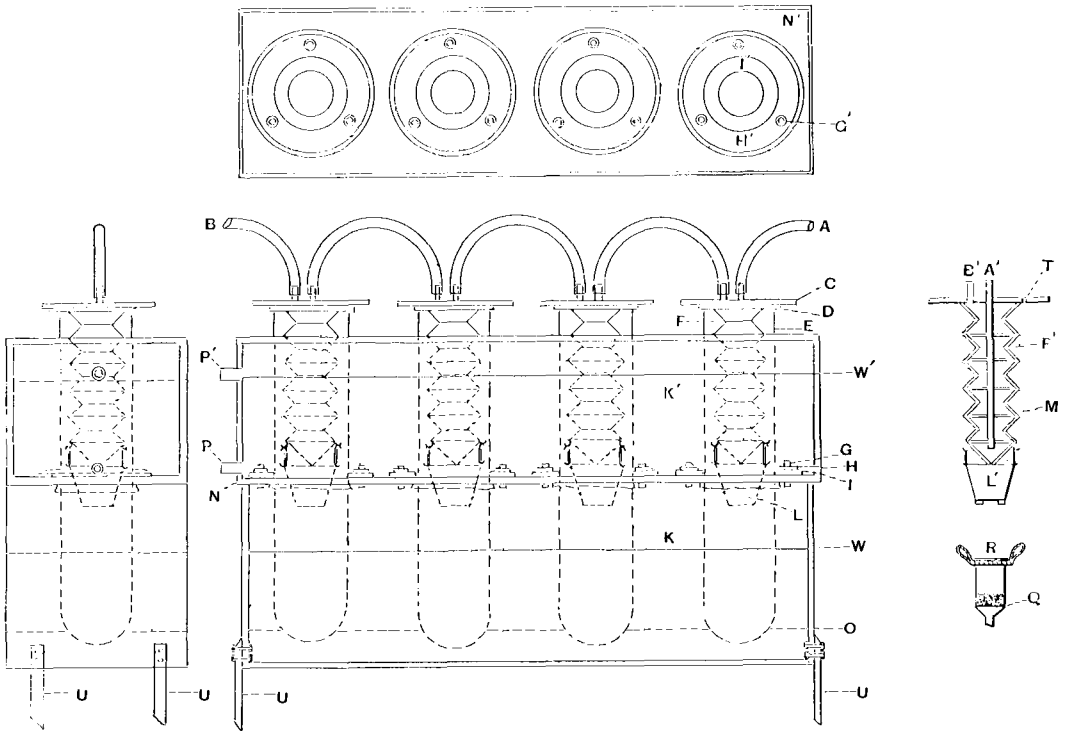
which the tubes pass water-tight. The plan of the bottom is shown in figure H′ N′ G′. The rubber diaphragms are held by two brass rings fastened together by small bolts. One of these rings is placed below the perforated bottom and one above. The perforation of the rubber diaphragms is shown at I′. An end view of the box is also shown at the left of the illustration.

This box has two exits, P and P′, so that water can be allowed to flow in a thin film over the bottom and escape at the exit P, or if the exit P be closed the water can be made to rise to the level of P′ as shown by the line W′. The outside of the test tubes can in this way be surrounded with water, or if a lower temperature be required fragments of ice can be dropped in. The object of this is to condense the vapors of the solvent which may strike against the sides of the tube and thus tend to rise to the top and escape at the intersection of the metal plate and the ground glass rim of the tube.

The baths are made of convenient size to hold four of these tubes and the condensers can all be cooled with a single stream of water entering at A and after passing through the four condensers escaping at B. A section of the condenser is shown at the right of the illustration. The water enters through A′ and passing upward round the disks M is thrown to the outside of the condenser and escapes at B′. The vent at T is left open until the vapor of the solvent has filled the interior of the apparatus, when it is closed.

The material to be extracted may be held in the perforated crucible L′ or an ordinary glass extraction tube, R, Q, with a perforated platinum disk fused into the glass at Q, and carrying an asbestos felt, can be employed. The upper part of the glass extraction tube has a little flange on it to support a looped wire, by means of which it can be hung to the hooks on the condenser in the same manner that the crucible is supported. The advantage of using glass is that the operator can see every thing which is going on in the extracting tube.

When the apparatus is to be used with ether the box K′ should be lifted up from K and the extraction tubes thrust farther through the diaphragm, until at least one of the corrugations of the condenser passes below the diaphragm. Otherwise



IMPROVED EXTRACTION APPARATUS.

the ether will be largely condensed on the sides of the glass test tubes and will run back down the sides instead of being collected on the condenser and dropped into the extraction tube. The box K', for this purpose, can be held on any convenient support. When ether is used the vent P is closed and the one at P' left open and a stream of water is made to flow into the box at the end opposite P' so that the water in K' is continually changing. This avoids any objectionable loss of ether by its escaping at the top of the apparatus.

When eighty per cent. alcohol is used for the extraction the vent at P is to be left open and sufficient water allowed to run in at the end opposite P to keep the bottom of the box K' cool. The vapor rising from the box K is condensed by this cooled surface so that it drops directly back into K. When alcohol is used the box K' should rest directly upon K.

With eighty per cent. alcohol the boiling point of water is not quite sufficient to secure a rapid evaporation of the solvent. A mixture composed of two parts of glycerol and one part of water will be found most convenient for this purpose. Inasmuch as many of the substances extracted by alcohol give up a large quantity of matter to the solvent the boiling point is therefore considerably raised and the glycerol bath is necessary in this case to secure a sufficiently rapid evaporation. To avoid any danger of bumping with such alcoholic solutions, it is convenient to add a few fragments of platinum foil.

The residues in the test tubes can be dried and weighed in the tubes or the amount of the extracted matter can be determined by weighing the crucibles or glass tubes containing the matter to be extracted. The latter method is preferable, with perfectly dry substances inasmuch as it is possible especially with ether that some bodies may be extracted from the material which are subsequently volatilized during the drying of the extract. Whenever it is desired to weigh the extract, especially the ether extract, it may be received in a small cylindrical glass vessel with flat bottom, four to six cm high and of a diameter just permitting its introduction into the extraction tube. About ten cc. of mercury are first poured into the extraction tube on which this vessel rests. The necessity of weighing the heavy

test tube is thus avoided and the extract is more easily dried in the small vessel.

This construction of the apparatus is compact, occupying but a small space; is easily manipulated, requiring but little attention, and is economical in respect of the use of gas, a single lamp being sufficient to operate a bath containing four tubes. It has the additional advantage that all parts are open to inspection so that the progress of the extraction can be watched at all times if necessary. It also has the advantage that both the extract and the residue can be weighed and thus a check on the results be obtained. The volatilization of the solvent should be so regulated as not to accumulate any liquid in the extracting tube.

ABSOLUTE ALCOHOL.

SECOND PAPER.

BY EDWARD R. SQUIBB, M. D., OF BROOKLYN, N. Y.

Read before the New York Section, June 2, 1893.

A VERY considerable experience in the manufacture of so-called "absolute alcohol" for the market up to 1884 convinced the writer that really anhydrous alcohol had not yet been obtained.

During the latter part of 1883 and the early part of 1884 the subject was investigated with care, and the results were published by the writer in the *Ephemeris* for May, 1884, **2,** 522. This paper opens with the following paragraphs, which are as true to-day as they were ten years ago:

"It appears to be very certain that no alcohol has as yet been rendered entirely anhydrous, and therefore the term 'absolute,' as applied to any yet made, is not strictly correct. For all practical purposes, however, it is a very convenient term by which to designate a rather indefinite substance, but one now applied to a great many important uses, and therefore itself growing in importance.

"It is not difficult to get alcohol practically free from all impurities, including water as one, but to free it from the last one-thousandth part of water is very difficult indeed—so difficult, that traces of this ultimate fraction of water have, so far, always been retained. Hence in considering it as absolute alcohol, it can only be regarded as being freer from all other impurities than from water, and as being more or less free from