THE SYNTHESCOPE AND ITS APPLICATION IN THE DETECTION OF ALBUMIN IN URINE.

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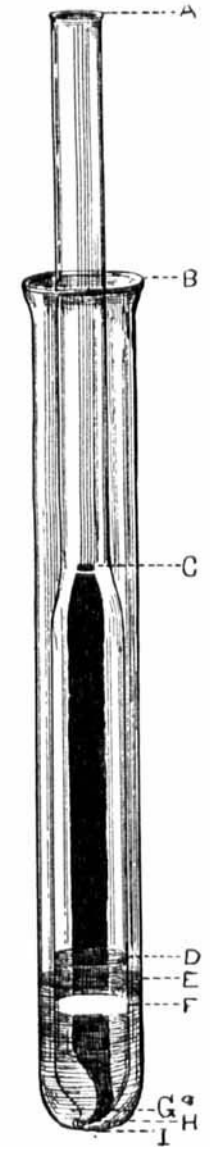

It frequently happens that when a liquid to be tested chemically is brought in contact with a liquid reagent, a peculiar appearance can be seen at the plane of contact between the two liquids. Many chemic tests are so conducted. In general, two methods have been employed for floating the one liquid upon the other, viz., by pouring one liquid down the side of the inclined test tube; and by pouring one liquid through a small funnel tube. In the former of these two methods, a definite plane of contact cannot be produced, while in the latter the production of a definite plane of contact necessitates a special funnel tube with stem of very fine bore.

The synthescope (from *syn*, together; *thesis*, place; and *skopeo*, to see—in other words an instrument for observing the visible effect of placing two liquids in contact) is a simple piece of apparatus for enabling one to make all contact tests withe ease and certainty. The size here described is designed for use with the 6" x ¾" test tube. The illustration shows the instrument in use. The test tube originally contained the heavier of the two liquids and a white precipitate has been formed at the plane of contact.

Referring to the figure, AH is the synthescope. It is made entirely of glass ½ mm. in thickness. The length from A to H is 215 mm. and from A to C is 115 mm. The outside diameter at C is 9 mm. and at D is 15 mm. The opaque black background is made of glass and covers ⅓ of the portion CH of the synthescope. The curved lower end of the synthescope is terminated by a minute orifice, the diameter of which must not exceed ½ mm. This is very important, for if the aperture at H be too large, the instrument cannot give satisfactory results.

The synthescope is used as follows: A small volume of the heavier liquid is placed in the test tube and then heated if so desired. A small volume of the other liquid, hot or cold, is now taken up in the synthescope, using the synthescope as though it were a pipette and taking care not to have a longer column of liquid in the synthescope than is in the test tube. The synthescope and its contents are next plunged to the bottom of the test tube. The finger is now removed from A. This allows the liquid in the test tube to flow into the synthescope and to form a true contact plane. In cases where a true contact plane is important, as in the contact test with nitric acid for albumin in urine, the test should be set aside about five minutes to permit faint reactions to become apparent. In cases where a slight admixture of the two liquids is desired rather than

a true contact plane, a regulated sidewise shaking of the apparatus will give the result. The partial black background permits faint clouds to be observed with facility—the observer being enabled to note the appearance by reflected light against a white background, by reflected light against a black background, by transmitted light, or partially by reflected light and partially by transmitted light according to the procedure which best fits the special test in hand.

THE DETECTION OF ALBUMIN IN URINE.

While the synthescope was designed to be used in any contact test, it finds its most frequent application by the clinician in the detection of albumin in urine. We believe that no test for albumin in urine is so readily conducted or so reliable as Heller's test carried out by the use of the synthescope. This test is conducted as follows:

Pour strong nitric acid into a 6″ x ¾″ test tube to the depth of about ¾″. Heat the test tube and its contents until the temperature has risen to about fifty (50) degrees Centigrade. No thermometer is needed. Hold the lower end of the test tube in the closed hand occasionally during the heating, and when the temperature becomes as high as it can be without causing discomfort, cease heating. Dip the curved end of the synthescope beneath the surface of the urine to be tested. Be sure that the urine is *perfectly clear*. If the urine be turbid, it must be clarified by filtration before attempting to detect albumin by any method. As soon as the clear urine has risen in the synthescope to the height of about ½″, place the finger over the upper end of the synthescope; remove the synthescope and its contents from the urine; and plunge the same to the bottom of the test tube containing the warm nitric acid. Now release the synthescope and the nitric acid will run into it, lifting the urine and forming a *sharp line of demarcation* between the urine and the strong acid. Unless the hole in the curved end of the synthescope is very small it will not operate properly. Watch that portion of the urine which is in contact with the nitric acid. If albumin be present, a white cloud will be seen either immediately or within five minutes—according to the amount of albumin in the urine. The cloud can be observed by transmitted light alone; by reflected light alone; or partially by transmitted, and partially by reflected light—according to the relative positions of the source of light, the eye and the apparatus. In this way very faint clouds may be detected.

The cloud given in the above manner, by albumin, shows no granular character—and when once studied carefully, is easily recognized thereafter. Occasionally one finds urine so rich in urates or urea that clouds are formed thereby. Such clouds are granular to the unaided eye; and may be prevented by diluting the urine with its own volume of water before making the test for albumin.

It may be remarked that Heller's test when conducted by pouring urine or nitric acid down the inclined side of a test tube is fallacious. This fallacy arises mainly from the fact that many urines contain enough mucin to give a cloud when the test is so conducted. Mucin can give a cloud only with *dilute* nitric acid and dilute nitric acid must always occur when a true contact plane is not produced. A true contact plane cannot be produced except by instrumental aid, and this aid is furnished with certainty and ease when the synthescope is employed.