ture are red hot or even incandescent. At the writer's suggestion the makers of some of these baths have adopted the device more than a century old, which we owe to Sir Humphry Davy, namely, the enclosing of the incandescent heater with a wire gauze envelope. This is an advantageous arrangement in baths in which the heating unit is shut off from the main cavity by walls. In baths where the heater is exposed on the floor it is sufficient merely to lay a double thickness of moderately fine mesh wire gauze over the top of the heater. The writer has experimented with baths so safeguarded by pouring ether directly on the heater, and under these circumstances there was neither explosion nor flame produced.

Another desideratum in biological laboratories for microscopic use is a powerful light of the incandescent bulb type, which will be reasonably durable. The ribbon filament bulb has been extremely satisfactory so far as supplying powerful light is concerned for use with high power objectives and particularly with binocular microscopes, in which necessarily there is considerable loss of light. The great objection to the ribbon filament bulb has been its short and extremely uncertain life. The brevity of its usefulness is due apparently to two causes, namely, the fact that the contact at the base of the bulb is made of readily fusible solder which melts on account of the heavy current used and in that way brings about disturbances which shorten the life of the bulb. This difficulty has been obviated. Another difficulty is presented by the ribbon filament itself. This in the present type of lamp is two millimeters wide and rather thin. On account of its insufficient thickness it breaks down prematurely at the points where it is inserted into the leads. It is proposed to overcome this difficulty by using a filament 50 per cent. thicker and only a millimeter and a half wide. It is hoped that with these improvements the ribbon filament bulb, which is an extremely satisfactory source of light aside from its uncertainty of life, will become more reliable in the latter respect. These improvements have been brought about at the writer's suggestion through the cooperation of the General Electric Company, Incandescent Lamp Department, and the Bausch and Lomb Optical Company.

E. C. JEFFREY

HARVARD UNIVERSITY

ON VOLUMETERS FOR SOLID BODIES

A MUCH more satisfactory volumeter than those generally mentioned in literature is one which rests on the principle of a siphon, of which the extremity outside the liquid is below that in the liquid. An inverted funnel, of mouth diameter 2.5 to 3 cms, or more (B in Fig. 1) is connected to a rubber tube (c), which in turn is connected to a glass tap (D) outside the apparatus; the wide mouth (b) of the funnel serves to break the column sharply and without gurgling. By means of the glass tap, water is sucked up to fill the siphon completely to the tap (using the tongue as valve) and then it is closed and placed in a fixed position in a stand. When the water is at rest the tap is opened to the mark (d), and after the water stops running the body is inserted in the volumeter, water again sucked up as noted above, etc., carefully replacing the tap in the same position and opening the tap to the same mark.

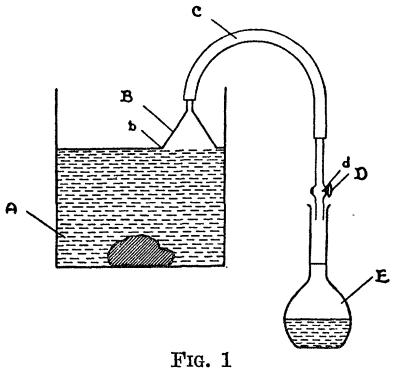

FIG. 1

By this means a volume of a liter or more, for which the apparatus is particularly recommended, may be measured to 0.1 per cent. in about 20 seconds, when the apparatus is ready for use.

Larger (or smaller) funnels may be used in the apparatus, but then greater care must be exercised to open the tap to exactly the same mark each time, for if the speed of flow of water is different after the body is inserted to before, a greater error in the volume of the body in question will result than with a funnel of the above dimensions.

In the case of larger funnels, if the speed of flow of water after the body is inserted is smaller than before it is inserted, the volume found will tend to be smaller than that of the body, and *vice versa, e.g.,* with a funnel of 14.5 cms diameter a change of speed from about 4,000 cc per minute before insertion of the body, to about 100 cc per minute after insertion gave a volume about 45 cc too low.

In the case of smaller funnels, on the other hand, (*e.g.,* one with a niche) the volume found will tend to be larger if the speed of flow is smaller after the body is inserted, and *vice versa, e.g.,* a change in the speed of flow from 1,500 cc per minute before, to about 100 cc per minute after insertion of the body gave a volume nearly 60 cc too high.

With a funnel of mouth diameter 2.7 cms a change of speed from about 1,500 cc per minute to about 100 cc per minute gave a volume not even 4 cc too high.

This remarkable reversal in the dependence on the

size of the funnel mouth, of the relation between the volume siphoned over, cet. par., and the speed of flow of water, is explained by two combined and contrary effects—(a) without interference of water current at the edge of the funnel mouth (as *e.g.,* in the case of wide funnels) more water is siphoned over in the time taken for the water surface to break away from the glass when the maximum tension is exceeded, if the speed of flow of water is greater; (b) the stronger the water current at the edge of the funnel mouth the more prematurely does the water surface break away from the glass.

GUIDO M. DREOSTI
LOW TEMPERATURE RESEARCH LABORATORY,
CAPE TOWN, SOUTH AFRICA

AN IMPROVED METHOD FOR THE STUDY OF DIFFUSIBLE BACTERIAL PRODUCTS IN VIVO

CELLOIDIN capsules containing cultures of living bacteria have frequently been used by bacteriologists and pathologists in studying the action of diffusible bacterial products *in vivo*. The usual method has been to place such capsules in the abdominal cavity of laboratory animals and note subsequent pathological changes. Such a method, in which the bacteria are confined by a semipermeable membrane, has the advantage of simulating a focal infection, but, because of the fragility of the container, it has not proved to be as useful as the experimental method warrants. Home-made capsules of this type are difficult to make, and even when successfully produced they are peculiarly liable to rupture as the result of manipulation or the activity of the animal, and the results are obscured or invalidated by the sepsis which ensues.

While studying the effects of certain bacterial toxins on the leukopoietic system of the rabbit, the writer has used the above method with success, but instead of using a celloidin container, a capsule was prepared by taking two parchment dialyzing thimbles (about 1½ centimeters in diameter) of the type commonly used for purifying bacterial toxins, cutting them down to a length of 2½ centimeters, and fitting one over the other to make a capsule of the same type as the gelatin capsules used in administering powdered drugs by mouth. The two parts were rinsed out with alcohol just before fitting them together, and the capsule was then sealed with celloidin, which was hardened with water. Such capsules were filled with 5 cc of broth cultures of bacteria by means of a sterile fine gauge needle and syringe, and the needle hole sealed with celloidin. Each capsule was rinsed off in alcohol immediately before being placed, with aseptic precautions, in the abdominal cavity of a rabbit.

Only two of fifteen rabbits used in our first series were lost from sepsis, and in each case the leakage was due to the capsule being used before the celloidin cement had hardened sufficiently. If properly prepared these capsules are remarkably substantial and will withstand any amount of manipulation involved in the operation. A pure culture of virulent *Streptococcus hemolyticus* was found on opening a capsule twenty-eight days after operation, and other animals are continuing to show evidence of the viability of the cultures which they contain, after an elapse of more than two months. This method is particularly valuable in the study of diffusible bacterial products which are slow in their action, but which are capable of causing pathological changes in the host.

In our experiments we have been using Abderhalden dialyzing thimbles, but similar products which should be quite satisfactory are listed in the catalogs of a number of the American laboratory supply houses.

E. W. DENNIS
AMERICAN UNIVERSITY,
BEIRUT, SYRIA

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE ATLANTIC CITY MEETING

THE general program of the ninety-first meeting of the association has already gone to press and will be available on Tuesday morning, December 27, at the registration offices in the Municipal Auditorium, Atlantic City. This program will be a book of 225 pages and will contain the titles of over 1,300 papers on practically all topics of scientific interest.

The program of general sessions includes lectures on a wide range of subjects—mathematics, physics, chemistry, zoology, botany, sociology, engineering and medicine. The lecturers will be Dr. Franz Boas, Dr. H. N. Russell, Dr. Harlow Shapley, Dean Dexter S. Kimball, Dr. R. C. Tolman, Dr. R. W. Wood, Dr. Russell W. Bunting, Dr. Dayton C. Miller, Dr. C. C. Speidel, Dr. Mel T. Cook, and Dr. O. H. Caldwell. For titles of these lectures see SCIENCE for November 18.

General sessions of the association will be held in the Municipal Auditorium and in Haddon Hall, which will be headquarters for the association. Sessions of the sections and of the forty-one societies, in general,