

though of course this order can be reversed by changing the order of the battery wires at the two main binding posts.

A further accessory to the stand, not shown in the illustration, is a small pocket compass set in the base to serve as a galvanometer, to show whether or not the wires from the battery are attached to the stand in the right order. The compass is surrounded by at least two turns of wire connected with the main binding posts and controlled by a suitable switch to prevent a short circuit. It is only useful when the battery is at a distance or in another portion of the building, and the battery wires do not happen to be marked. Of course, it must be determined by experiment, in which direction the needle swings when the current is traversing the stand in the proper direction, and a little mark put on the glass of the compass to show this. I have constructed one stand with such a galvanometer. It is also well to mark the positive binding post on the base, and the set of binding posts for the anodes. This can be neatly done with a small piece of paper gummed to the board.

A stand of the size here illustrated, should not cost over five dollars, including the labor; it should be made of hard wood, and the binding posts should be "sounder posts."

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### A MODIFIED AIR-BATH.

BY F. P. VENABLE.

Received January 10, 1898.

THIS air-bath is a modification of the one devised by Habermann.<sup>1</sup> The modifications serve to give a wider application to his bath and a publication is made of them to draw the attention of American chemists to the advantages of Habermann's idea rather than to make any claim for special originality in them.

The cut will make the construction and the use of the bath clear. A glass bell jar is provided with a knob for handling and three tubulures. One of these is for the introduction of a thermometer. The remaining tubulure on the top serves as a vent for gases and the one in the side provides for an air-current. Either or both of them may be closed with stoppers if it is so desired.

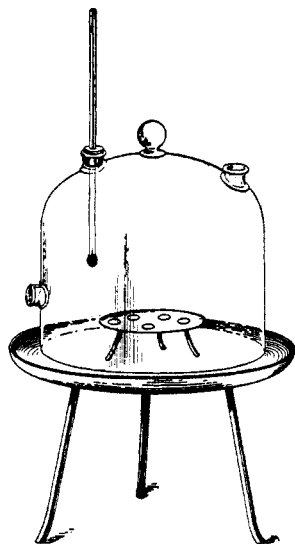
<sup>1</sup> *Ztschr. angew. Chem.*, 1897, 202.

This bell jar may be placed on the sand of a bath or better upon a ring of asbestos board on a sheet-iron pan or upon an iron plate. The object to be heated may be placed upon a tripod—a triangle or such a porcelain support, with perforations for crucibles, etc., as is frequently used in desiccators.

The advantages over the ordinary copper air-bath are :

1. Cheapness. A bell jar of ten inches diameter costs less than a third as much as the copper bath of the same dimensions.

2. Cleanliness. There is no corrosion from acid fumes. Incrustations upon the sides and roof of the jar are easily seen and removed so that there is no risk of their falling back into the



dishes or casseroles. It will then be especially useful for the drying down of acid solutions in the separation of silica.

3. The operation of drying can be watched.

4. The only part requiring renewal is the iron pan or plate and either one of these is very cheap. The burning out of the copper bottom of the ordinary air-bath is of distressingly frequent occurrence.

5. Any warm plate may, by this bell jar, be turned into a drying-bath in which the temperature can be watched and

regulated by increasing the thickness of the asbestos board or by other means.

I am strongly convinced of the wide application and general usefulness of this modified drying apparatus.

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CONTRIBUTIONS TO THE CHEMISTRY OF ZIRCONIUM, No. 8.

**SOME PROPERTIES OF ZIRCONIUM DIOXIDE.**

BY F. P. VENABLE AND A. W. BELDEN.

Received February 14, 1898.

THERE are so many misstatements as to the properties of zirconia in the literature of chemistry that we think it well to publish the results of our study of this body.

1. *Specific Gravity*.—The following values have been given: 4.30 (Berzelius), 4.90 (Berlin), 5.50 (Sjögren), and 5.45 (Hermann). Our determinations were made with quite pure material and yielded as a mean 5.489.

2. *Solubility*.—The strongly ignited zirconia is practically insoluble in all acids except hydrofluoric. In this it is readily soluble on heating. If soda is present along with the zirconia, as sodium zirconate, the mass is not dissolved, probably owing to the formation of sodium zirconium fluoride. The statement is frequently met with that zirconia is soluble in sulphuric acid. This is based upon observations of Berzelius and his directions are that the zirconia must be finely powdered and heated with a mixture of two parts sulphuric acid and one part water until the sulphuric acid volatilizes. Our experiments would show that it is quite insoluble in concentrated sulphuric acid and when the directions of Berzelius are followed out this dilute acid dissolves only 6.72 parts to the 1,000 parts of acid. Neither concentrated nor dilute hydrochloric acid nor nitric acid seem to have much action upon it.

Prolonged heating with sodium carbonate effects very little change in zirconia. It is only sparingly dissolved. Berzelius must have made use of a carbonate carrying some hydroxide in the experiments in which he speaks of dissolving the zirconia by means of sodium carbonate.

Again, half a gram of zirconia (finely powdered) was fused for nine hours with twenty grams of microcosmic salt.