5. On a Glass Digester in which to Heat Substances under Pressure. By Dr E. A. Letts.

The objections to the use of sealed tubes are known to every practical chemist, and are a serious drawback to their employment. The chief of these are the time expended in the manufacture of the tubes, the amount of skill in glass-blowing required, the danger experienced in opening them, and above all, the fact that only a small quantity of material can be heated at one operation. Moreover, the same tube can seldom be used for more than three or four experiments, as each time it is sealed up its neck must be drawn out, and its length thus considerably decreased. These disadvantages were especially felt by me whilst preparing bromacetic acid, which was required in considerable quantities, and where as many as half a dozen tubes of bromine and acetic acid had to be heated before 100 grammes of the acid could be obtained. To obviate these objections I have had an apparatus constructed, which consists of a cylinder of glass, the walls of which are about half an inch thick. Its length is fifteen inches, its external diameter three inches, and its capacity about 600 cubic centimetres. At one end it is drawn out to a tube, whose aperture is only about one-sixth of an inch in diameter, though its walls are as thick as the rest of the apparatus. Originally this tube was provided with a stopcock, but at Professor Brown's suggestion, I have substituted a glass plate, which is ground flat, and accurately adapted to the top of the tube.

In order to keep the glass plate pressing on the tube the whole apparatus is placed in a frame, consisting of three brass wires arranged symmetrically around the cylinder, and attached by means of nuts, below, to a brass ring, and above, to a brass plate, through which latter a screw passes, which, when turned, presses on a brass plate placed on the glass cap.

As any experiments with such an apparatus would be attended

with danger, were it necessary to be in its neighbourhood, it occurred to me that an automatic arrangement might be employed to give notice that the temperature had been reached to which it was intended to subject the digester.

For this purpose I employed a thermometer with a somewhat wide tube and large bulb. A platinum wire is sealed into the bulb, and touches the mercury, whilst a brass wire passes down the tube, and is held in position by a binding screw. The two wires are connected with an electric bell, the brass wire being so adjusted, that when a particular temperature is reached the mercury touches its end, and thus completes the circuit, and causes the bell to ring.

In order to test the digester, about 200 grammes of a mixture of two-parts bromine and three of acetic acid was placed in it, and after fixing it in its frame, the whole apparatus was immersed in an oil bath and heated to 150° C., the temperature at which reaction in this case takes place. The experiment was made in a cellar, and the bell placed in a room some distance off. The gas to heat the oil bath was led by a tube from another cellar, so that it could be regulated without going near the digester. In about an hour and a half the bell rung, and thereupon the gas was shut off; and on examining the digester next day, it was found that the reaction had taken place, and that only twelve grammes of product had been lost—a very inconsiderable quantity.

As the action of bromine on acetic acid is very sudden, and accompanied by the disengagement of a large volume of hydrobromic acid, the apparatus may be considered to have undergone a very severe test, and that its efficacy for all ordinary purposes is established.

Should the digester come into general use, it will certainly save chemists much time and labour.

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