

heating unit in an incubator for over 50 days continuously or more than 1,200 hours without any failure or servicing. This relay is capable of handling up to 500 watts. However, from past experience the writer prefers the use of a mercury type relay switch for control of powers exceeding 300 watts in order to eliminate contact difficulties.

Another model of this device made use of an "Allied" type relay (2,500 ohms). There are many other equally suitable makes available. The control tube operates such relays, whose single pole double throw contacts then operate a power control relay of the mercury tube type.

With either of the two arrangements mentioned the contact combination of the relays allows for either on or off control. The circuit will respond even with poor contact at the input. Grasping one input connection in each hand allows sufficient conductivity to operate the relays.

The complete parts, including the small high resistance control relay, can be secured at a cost of about four dollars. Needless to say the mercury or power control type of relay entails additional expense and determines the successful operation of the device where considerable power is involved.

The choice of thermoregulator to be used with this device is dictated by the sensitivity of control desired.

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USE OF SODIUM THIOLYCOLLATE IN CULTURING LARGE VOLUMES OF ANAEROBIC BACTERIA

IN many of the present problems concerning the anaerobic bacteria it is desirable to grow large quantities of various strains or species. Examples of these include the production of cells for antigenic analysis; of toxins of the tetanus or gangrene organisms, particularly when toxoid is to be prepared for active immunization; and of cultures for studies of sugar fermentation mechanisms or other physiological properties. Except for the latter problems, often the medium employed is a complex meat infusion with particles of meat, and precautions are taken to inoculate the medium immediately following sterilization, and other procedures, amounting almost to a ritual, are followed. Since some of the most important disease-producing anaerobes are among the group requiring strict anaerobic conditions for growth any simplification of the technique of culturing these organisms is welcome. In this regard the recent announcement by Brewer¹ of the use of sodium thioglycollate as a reducing agent to be used in fluid media, without vaseline or other protective seals, in the cultivation of anaerobic bacteria is of considerable

interest. This compound, a stable salt of thioglycollic acid which may be added to a medium prior to autoclaving, appears to possess advantages over other chemical agents which have been proposed.

We have been interested in the production of cells for antigenic analysis of *Clostridium oedematiens*, which is one of the more strictly anaerobic species in contrast to *Cl. welchii*. The medium used consisted of beef heart infusion broth² plus 0.5 per cent. glucose. This medium is autoclaved in 125 cc amounts in 6 oz. oval prescription bottles closed by screw caps. These are inoculated with 2.0 cc of an active meat culture. Successful transplants are possible (and failures with this group are not infrequent) only if the medium is inoculated immediately following autoclaving. With the addition of 0.1 per cent. sodium thioglycollate³ and 0.01 to 0.05 per cent. agar to this medium we have experienced no failures in several hundred transplants. Further advantage is gained by the fact that the necessity for the immediate inoculation is avoided and the medium, maintaining a reduced state, is satisfactory for those strains which have a prolonged lag phase.

Although our experience has been less extensive with these we have found the thioglycollate of value in culturing strains of *Cl. welchii*, *Cl. septicum*, *Cl. oedematoides*, *Cl. tetani* and *Cl. paratuberculosis*. These preliminary results confirm the claims made by Brewer¹ that sodium thioglycollate may have considerable value as a reducing agent, and it is recommended for trial to those engaged in problems which necessitate the culturing of large volumes of anaerobic bacteria. Further studies on specific uses of sodium thioglycollate are in progress and will be reported in later communications together with a consideration of the dehydrated medium also proposed by Brewer.

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² L. S. McClung, *Jour. Bact.*, in press.

³ Supplied by the Baltimore Biological Laboratories, Baltimore, Maryland.

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- PHILLIPS, E. G. *A Course of Analysis (Mathematics)*. Second edition. Pp. vi+361. Cambridge University Press, Macmillan. \$4.00.
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¹ J. H. Brewer, *Jour. Bact.*, 39: 10, 1940.