Using silver silver-chloride electrodes in saline solution as a medium of contact, two laying hens were tested in their potential difference between the two sides of the abdomen. Table I gives the results of the test.

TABLE I

BIOELECTRIC POTENTIAL DIFFERENCE IN 2 LAYING HENS AT DIFFERENT STAGES OF REPRODUCTION

Hen	Date	Hour	Last egg	MV	Next egg
S	June 6	1:15 P.M.	1:00 P.M.	− 3.8	
		1:25 "		−26.6	June 7 noon
		1:35 "		−19.0	
	June 7	2:00 "	12 noon	−11.8	
	" 8	10:10 A.M.		−19.8	
		11:00 "	10:40 A.M.	−18.4	
		11:10 "		− 9.2	
		11:20 "		+41.0	June 9 noon
		11:22 "		+ 9.2	
		2:26 P.M.		− 2.6	
	June 10	3:00 "		− 1.6	
	" 14	2:30 "		− 2.1	
L	June 6	1:10 P.M.	12:20 P.M.	− 6.3	
		1:20 "		− 6.3	
		1:30 "		−51.0	
	June 7	1:40 "		−10.5	
		1:55 "		−10.5	
	June 8	10:30 A.M.	8:00 A.M.	−10.5	
	" 10	2:50 P.M.	2:20 P.M.	−54.2	June 11 1:00 P.M.
		2:55 "		−50.4	
	June 14	3:00 "		+ 4.2	no egg
	" 17	2:30 "		− 4.2	" "

The non-ovulatory potential corresponded closely to the potentials of other species (pig, man, goat and dog) and there was a violent rise in potential difference at the time when ovulation must have occurred according to Warren and Scott (1934).[2] Tests were made frequently from the moment when an egg was laid to several hours afterward, and the peak in potential was found forty minutes in one case, twenty-five minutes in another case, and thirty minutes in the third case after oviposition. In both cases the ovum was recovered, that is, both hens laid eggs about 24 hours following their high potential. Two hours after ovulation it had reached normal, non-ovulatory levels.

While these results have to be repeated on a larger scale, it is hoped that some clue will be found as to the direction of the potential in connection with the one-sided ovarian function in the hen. So far, most readings have had negative values, but not all of them.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

THERMOSTATIC CONTROL

THE few essential parts required are shown in the accompanying circuit diagram. It will be noticed that no batteries are needed, since the device is completely A.C. operated.

A dual triode tube of the 6A6 type (or equivalent) is employed with the plates and grids connected in parallel. In this circuit the tube acts as a half-wave grid-controlled rectifier. By the use of a bleeder resistor across the A.C. plate supply voltage the grid return through the thermoregulator circuit, TR, may be adjusted to such a value that the grid voltage becomes of sufficient magnitude in phase with the plate voltage to operate the relay, due to the rectified cathode current. The condenser stores sufficient energy and produces enough lag to keep the relay from chattering.

Any sensitive relay that will operate on 15 ma. or less and having from 2,000 to 5,000 ohms may be used. The circuit requires but one preliminary adjustment. Short the input (TR) leads and, starting from point A, move tap P along the bleeder resistance toward B until enough current flows through the relay coil to make it close. To insure reliability it is well to move P a little beyond this point. An alternative method is to merely insert a milliammeter in the plate lead at X and adjust P until the current reads that value specified for the type of relay used.

A "Sigma" type M relay of 2,000 ohms was used in one model of this device. It has been operating a

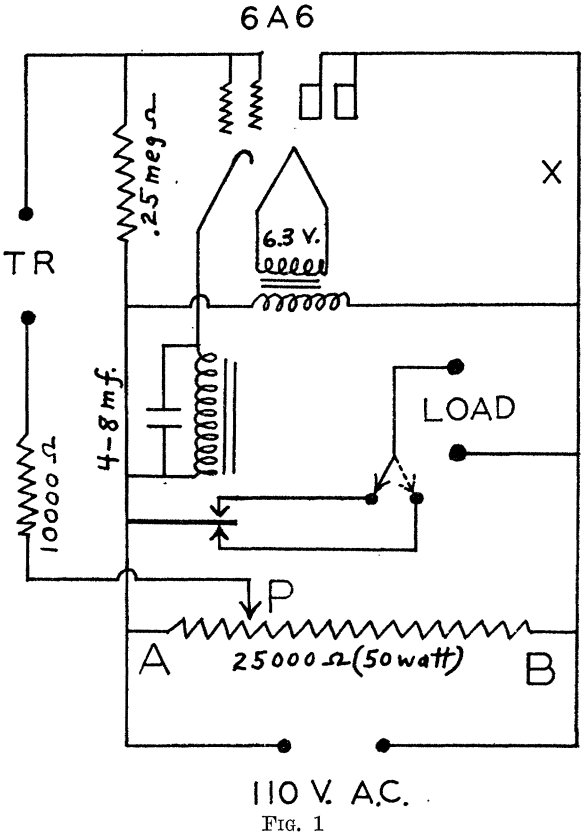

FIG. 1

[2] D. C. Warren and H. M. Scott, SCIENCE, 80: 461–462, 1934.

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 THIOGLYCOLLATE 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 Brewer[1] 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 broth[2] 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 thioglycollate[3] 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. parabotulinum*. These preliminary results confirm the claims made by Brewer[1] 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.

L. S. MCCLUNG[4]

THE HARVARD MEDICAL SCHOOL

[1] J. H. Brewer, *Jour. Bact.*, 39: 10, 1940.

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

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

[4] *Fellow of the John Simon Guggenheim Memorial Foundation.*

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