When the gel has set, a few drops of very dilute sodium sulphate solution are placed on top of it in each limb and a potential of 200 volts d.c. is applied across the U-tube, connexion being made by means of platinum wires dipping into the sodium sulphate solution. A purple colour will then move down one limb and a yellow colour down the other, and this movement can be readily observed on the screen, especially if the screen has horizontal lines ruled across it. When the images of the moving boundaries have moved out of the field of view, the current can be reversed so that a yellow colour will move down one limb, obliterating the purple, while the yellow in the other limb will be obliterated by purple.

J. L. BUCHAN.

PERIODIC PASSIVITY OF IRON.

A convenient and effective method for the demonstration of the periodic electrochemical passivity of iron is shown diagrammatically in Fig. 2. *B* is a two-

FIG. 2.

volt accumulator; *A* an ammeter reading up to 3 amp.; *V* a voltmeter reading up to 3 volts; *R* a variable resistance of 16 ohms; *D* an electro-magnetic relay having two sets of contacts, *a*, *a'*, and *b*, *b'*, such that one of two circuits is completed according to the position of the moving arm. The coils of the relay take approximately 0.3 amp. *C*, the cell, is a 6-oz. bottle fitted with an ebonite top carrying two brass rods and having two vent holes. A platinum gauze is used for

the cathode and an iron plate ($1\frac{1}{2}$ in. $\times$ $\frac{1}{2}$ in. $\times$ $\frac{1}{8}$ in.) for the anode, these being attached to the brass rods with set screws. 85 ml. of sulphuric acid (35 ml. conc. H_2SO_4 to 100 ml. water) are placed in the bottle; the anode is then half immersed. The entire cell is maintained at a temperature of 45°–50° C. in a water bath.

Periodicity may be started as follows:

The iron anode is dipped in nitric acid (1 : 2) and allowed to dissolve freely for 10 seconds. It is then removed from the acid, washed, dried, and attached to its appropriate brass rod. The circuit having been completed, the resistance is adjusted to a point when on immersion of the electrodes in the sulphuric acid the current attains a value of 2.2 amp. This is obtained as soon as the acid has overcome the passive film due to the treatment with nitric acid. Thereupon the electrodes are removed from the warm sulphuric acid and immersed in cold saturated solution of ferrous sulphate rendered decidedly acid with sulphuric acid with the current still running; the passive condition now appears. This state is maintained for 1 or 2 minutes, and finally the electrodes are returned to the warm cell. Periodicity will begin and, under the existing conditions, will be maintained until the anode is dissolved.

An adjusting screw *E* attached to the moving arm of the relay by a spring is provided to overcome the magnetic effect produced by the coils when the anode is in the active condition; that is to say, when the amperage is 2.2 and the voltage 0.7. Further, the contact pillar *P* must be so placed that when the amperage drops to 0.3 and the voltage rises to 1.8 (the passive state) the moving arm does not touch the magnets.

In either of the conditions, passivity or activity, one of the relay circuits is completed, whereby it is possible to light up coloured lamps in an alternating manner.

J. G. N. GASKIN.

Madras Fisheries.*

IN the Administrative Report of the Madras Fisheries Department for the year ending June 30, 1930, the director, Dr. Sundara Raj, records a general improvement in almost every quarter, especially with regard to research work, in spite of the fact that the fishing season on the west coast was exceptionally bad. The Department has now at its disposal the full-sized steam trawler *Lady Goschen*, which has been remodelled and equipped with a laboratory and a whole-time biologist for research on board, and two well-furnished biological stations on shore at Calicut and Krusadai Island.

The chief aim and immediate work in connexion with the trawler is exploratory, as at present practically nothing is known of the contents and character of the seas outside the ten-mile limit. A survey will be made of the deeper water fishing grounds and the determination of the kinds and quantities of the marketable fish available at different seasons and depths together with investigations into the invertebrates, including plankton. Such research naturally involves the use of the best-known methods of capture, and drift and seine nets were on order with a motor boat for working the Danish seine net. At first the systematic survey will be limited to the

offshore belt to 100 fathoms, up to which the local fishermen with slightly improved boats and nets may be persuaded to extend their operations. The systematic survey of the deep-sea fishing grounds by the *Lady Goschen* began in 1927. During the period between Oct. 31, 1927, and March 10, 1928, she explored the extensive trawling ground within the 100-fathom line which lies to the west, south, and east of Cape Comorin, known as the Cape Comorin Bank. Details of the hauls are given in three appendices to Report No. 3, including the most important fishes and invertebrates, and three charts of the area investigated.

Researches on the Madras oyster show that it flourishes in low salinities and that the freshets in rivers, instead of damaging oyster beds as was formerly supposed, apparently provide the most favourable conditions for spawning and development of the local oyster. A field study of the extensive natural beds at Gokulapalli showed three zones; the first, which is dry for part of the summer except for a few hours during high tide, and on which are only small and yearling oysters and where much spat falls; the second, washed frequently by daily tides and exposed for much less time, where only small oysters grow as their feeding hours are limited, the size increasing with the depth, but where a good deal of spat also falls; lastly, a third zone well below the low-tide level where the oysters are large and the spat scarcely settles at all. It is

* Madras Fisheries Department. Administrative Report for the Year 1929–30 by Dr. B. Sundara Raj, Director of Fisheries. Report No. 1 of 1931. *Madras Fisheries Bulletin*, Vol. 25; 1931. Report on a Systematic Survey of Deep-sea Fishing Grounds by S.T. *Lady Goschen*, 1927–28. Report No. 3 of 1929, *Madras Fisheries Bulletin*, Vol. 23; 1931.