ous state of the question, except in so far that he has added another microbe to the list of the possible specific germs of the disease."

This would seem to make it very doubtful whether Dr. Gibier of Paris has added any thing to our knowledge of the cause of yellow-fever.

ELECTRICAL SCIENCE.

Novel Current-Registering Instrument.

A NEW instrument for measuring the quantity of current supplied to consumers has been recently brought out by Prof. Elihu Thomson, although it seems probable that the principle on which it works was originally due to Tavener. Two bulbs are connected by a U-shaped tube, and the whole is partly filled with liquid; alcohol, for instance. The arrangement is pivoted, so that, if more of the liquid is forced into one of the bulbs, the difference of weight will cant the apparatus, and its movement is communicated through a ratchet to the hands of a registering-dial. To make this measure the current, two spirals of wire are introduced into the liquid, one in each bulb. If we suppose the instrument has been canted, the spiral in the lower bulb has its circuit made, while that of the upper spiral is broken. The consequence is, that the liquid in the lower bulb is heated, its vapor-tension increases, and part of it is driven through the U-tube. The section of the latter is very small, so that the liquid passes slowly; but in a time, depending upon this section and on the rate of heating, the upper bulb becomes the heavier, and the apparatus cants, breaking the circuit of the spiral that was previously made, and making the other. By a suitable registering system the readings may be made proportional to the current which is flowing. The current, then, is measured by its heating effect, and the instrument may be used for both direct and alternating currents. In the latter case the readings would be fairly correct if lamps only were used; but, if motors were to be run, the readings would not be proportional to the power consumed. This objection holds with all of the instruments that have yet been proposed for the measurement of the consumption of alternating currents.

THE SHORT SERIES ELECTRIC RAILWAY SYSTEM. — The Short system of electric traction differs from those ordinarily used in that the current is distributed in series, the same current passing through all of the cars on the line. Both overhead and conduit wires are used. In the latter case the wires are contained in an iron conduit, from which they are insulated by porcelain brackets. The overhead wires are supported from iron bracket-poles that arch gracefully over the track. The motors and generators used are of the Brush system. The motor is usually in a front compartment, and is geared to the front car-axle. There is a pinion on the motor-shaft, a gear on the axle, and an intermediate gear and pinion that further reduces the number of revolutions. The gears are made of steel, the pinions of rawhide held between steel plates, making an efficient and noiseless transmitting system. The front compartment (in which the driver stands), with the motor and front truck, can be made separately, and attached to any ordinary car by removing the front platform. Taken altogether, the system seems a simple and efficient one.

AN IMPROVEMENT IN SECONDARY BATTERIES. — A seemingly slight improvement in the construction of secondary batteries, and yet one that in certain cases will be of considerable value, has recently been patented by Mr. J. S. Sellon. A great difficulty and expense in the use of accumulators arises from the fact that the plates cannot be separately and easily removed. Usually, if we wish to connect a number of cells in series, all of the positve plates in each cell are connected together by lead strips, which are taken to similar strips connecting the negative plates of the next cell. The terminals of each plate are burned to the connecting-strip; and when one of the plates gives out, and we wish to renew it, we must take out the complete set of plates, cut off the one we wish to renew, and solder on another. Besides being difficult, this takes a good deal of time, and increases the cost of maintenance of the battery; it is obvious, too, that it interrupts its use. Mr. Sellon's idea is to have plates made in pairs, a positive and negative, so connected that when one of them is in one cell the other will be in another. The first and last cells have one set of single plates connected with the terminals of the external circuit. The advantages of this arrangement are, that plates can be removed and renewed without interfering with the action of the battery, and much more easily than if one of a number of connected plates had to be removed. Any improvement in storage-batteries is important at this time, when its advantages, especially for tramway-work, hang in the balance. A slight increase in efficiency will cause their adoption for street-car work, and the invention of Mr. Sellon is in the right direction.

INFLUENCE OF TEMPERATURE ON THE MAGNETIZATION OF IRON. — M. C. Ledeboer has made some interesting experiments on the magnetic properties of iron at high temperatures. Many experiments have been made on the same subject; and it has been found that up to three or four hundred degrees there is no great change in the magnetic permeability of iron, while at a red heat its magnetic properties almost entirely disappear. The necessary temperature of the iron bar used in the experiment was obtained by a spiral of platinum wire wrapped around it, separated from it by a layer of mica. Between the platinum and the iron was a small thermo-electric couple, which was used to measure the temperature of the bar. A heavy electric current sent through the platinum spiral could be regulated to give any desired temperature. The bar used was thick as compared with its length, which fact prevented any useful results as to residual magnetism being obtained. M. Ledeboer arrives at the following results: up to a temperature of about 680° the magnetic permeability remains nearly constant, after 680° the diminution is very rapid, and the iron ceases to be magnetic at 760°. This range of temperature is about that in which several curious phenomena occur, — an abrupt change in the specific heat, a change in the tortional co-efficient, etc.; and it is probable that a more complete study of iron in this region of temperature will help us to connect phenomena which seem now so different in character.

THE MORDEY ALTERNATING-CURRENT DYNAMO. — This dynamo has revolving magnets and a fixed armature. The latter consists of a number of coils of narrow copper ribbon wound on insulating-cores: they are fixed to project from the inner circumference of a metal ring which is fastened firmly to the bed-plate of the dynamo. The magnet consists of a short iron core, whose axis is the axle of the machine, and which is wound with wire supplied with current from the small dynamo used as an exciter. From each end of the magnet extend arms, which are bent until they are opposite one another, leaving only enough space between for the flat coils of the armature to pass. We thus have a number of poles of the same sign, opposite to which are poles of the opposite sign, while between the poles are vacant spaces. The action of the machine is now easily understood: as the magnet revolves, the armature coils are first opposite pole-pieces, where a number of lines of force pass through them; then in vacant spaces, where there are no lines of force. The variation, of course, produces the electro-motive force of the machine.

INCANDESCENT LAMPS IN EXPLOSIVE GASES. — Lieutenant Hutchins, U.S.N., has been experimenting on the effect of breaking incandescent lamps in explosive gases. The filament of the lamp breaks almost immediately that the glass is broken, and as soon as it breaks, of course, and cools down, the danger is over. The question was whether the breaking and cooling were so rapid that the gases would not be brought to a sufficiently high temperature to explode. With a Swan 16-candle power lamp, in a mixture of hydrogen and oxygen, the gas exploded immediately the bulb was pierced: the filament was not broken. The same result was obtained with marsh-gas. A Maxim lamp was tried in a mixture of coal-gas and air, with a similar result. Lieutenant Hutchins concludes, that, where explosive gases are allowed to collect on board ship, incandescent electric lights are dangerous.

BOOK-REVIEWS.

A Text-Book of Biology. By J. R. AINSWORTH DAVIS. Philadelphia, Blakiston. $4.

THE number of text-books of biology which have been published within recent years has been, it would seem, sufficiently great to meet all reasonable demands; and yet, after perusing this new one