given above we get $u_0 = \frac{137}{2} \times e$. That, is the attractive force between two one-quantum poles of opposite sign is $\left(\frac{137}{2}\right)^2$, or almost 5,000 times as great as between an electron and a proton!

If isolated magnetic poles were common, the universe would be quite different from what it is. Although electrons and protons which go to make up matter are very much more abundant than these magnetic poles, still there is a possibility that somewhere in the universe there may exist a new kind of substance, made up of these magnetic atoms, and containing much more energy than the matter we are familiar with. Professor O. W. Richardson discusses this possibility in *Nature* of October 3, and is of the opinion that although it would be rather difficult to create objects with the intrinsic energy of these magnetic poles, still there may be enough of them to account for such ultra-penetrating radiations that can not be explained in any other way. At any rate, cosmology will have to consider in the future the possibility of existence of these isolated magnetic poles. To the electron, proton, and photon which go to make up the universe, another entity, the magnetic pole, may have to be added. First electricity, and then light, and now magnetism have proved to be discontinuous!

ALEXANDER W. STERN

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SIMPLE APPARATUS FOR MERCURY DISTILLATION

FOR laboratories in which a considerable amount of pure mercury is used, for example, for the purpose of gas analysis, it is advantageous to have the equipment for redistillation. At the Animal Husbandry Division of the University of California in Davis we are using an inexpensive apparatus for mercury distillation which works very satisfactorily.

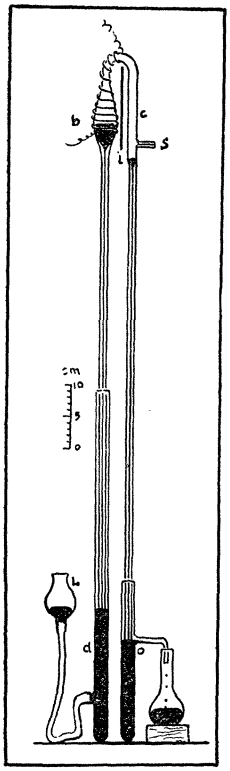

FIG. 1.

The distillation bulb of Pyrex glass b (see Fig. 1), which is 4 cm wide and 9 cm long, is connected at the top to a U tube 1.5 cm wide, which has a capillary side outlet S. The lower end of the U tube and that of the distillation bulb are each connected to a barometer tube of approximately three millimeters bore. Each of the two barometer tubes is put in a slightly wider glass tube, as shown in the sketch. The tube d on the left side contains impure mercury (which, however, is to be free of volatile contaminations) and is provided with a side outlet connected by a rubber hose to a leveling bulb L, which enables one to adjust the mercury level in the distillation bulb. The tube o on the right side contains clean mercury and has also a side outlet through which the distilled mercury overflows into a flask.

For the first start of the apparatus the outlet S is connected to a suction pump (we used an ordinary filter pump) so that the mercury rises in both barometer tubes, the impure mercury up into the bulb as shown in figure. The bulb is then heated electrically by a simple coil of resistance wire (we apply 320 watts). The wiring should begin at the height of the mercury level in the bulb. In this case the evaporation takes place only at the free surface of the mercury and there is no bumping and splashing. The wiring should be continued up to the top of the U tube, as otherwise a running back of the condensate occurs which decreases the efficiency of the apparatus. A piece of asbestos paper i protects the condenser tube from the heat of the electric coil. The cooling of the condenser by air alone has proved to be sufficient. After the mercury has evaporated for several minutes during suction the air in the apparatus is practically displaced by mercury vapor, then the outlet S is sealed. The apparatus is now ready for use *ad libitum* as it maintains its own vacuum. All one has to do is to add contaminated mercury to the leveling bulb L, to empty the clean mercury from the collecting bottle and to open the electric current in order to stop, or to close it in order to start the distillation. The apparatus does not need any further attention. It is vapor proof insofar as no hot mercury comes in contact with air. The contaminated mercury in L and d which by variations in pressure at the beginning of the distillation may get warm may be covered with water for safety. The apparatus as described distils 25 cc of mercury per hour.

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