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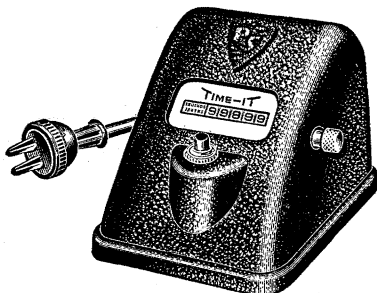
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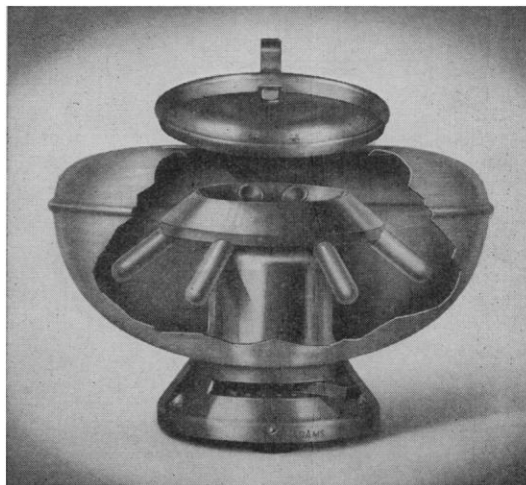
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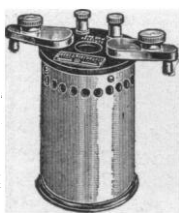
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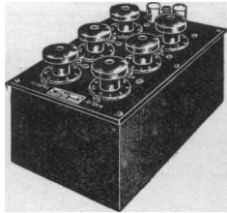
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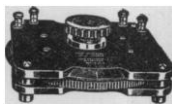




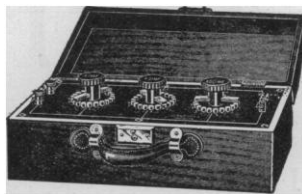
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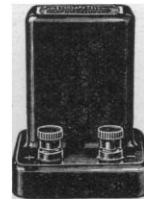
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THE NATIONAL ACADEMY OF SCIENCES

ABSTRACTS OF PAPERS PRESENTED AT THE ANNUAL MEETING¹

A hypothesis as to the origin of cosmic rays and the experimental testing of it in India and elsewhere (evening lecture): R. A. MILLIKAN, H. V. NEHER and W. H. PICKERING. The hypothesis here adopted as to the mode of origin of the cosmic rays makes possible the prediction of five definite cosmic-ray bands, each of which should reach the earth in a particular latitude, and of four plateaus of unchanging cosmic-ray intensity, these plateaus being delimited by the latitudes of entrance of the successive bands. The hypothesis rendering possible these predictions rests upon five major discoveries made by the workers in the Norman Bridge Laboratory of Physics at the California Institute of Technology at Pasadena. These discoveries are (1) that more than 60 per cent. of all incoming cosmic-ray energy is of the nature of *electron bullets* each of energy between 2 billion electron-volts and 15 billion electron-volts; (2) Neddermeyer and Anderson's discovery of the production by nuclear impacts within the atmosphere of mesotrons which carry the energy

farther down than incoming electrons alone could do; (3) Bowen's two remarkable discoveries: first, that atoms, when out in interstellar space, are able to undergo atomic transformations forbidden to them within the stars, and second, (4) that in ring-nebulae, trillions of miles away from the exciting star and therefore presumably reflecting conditions in interstellar space there are five of the atoms, namely, helium, carbon, nitrogen, oxygen and silicon, each of which is more than ten times more abundant than any other atom save hydrogen (which must be excluded from measurable cosmic-ray effects because of the smallness of its rest-mass energy), and (5) Lauritsen and Fowler's discovery in the Kellogg Radiation Laboratory that a part at least of the rest-mass energy of an atom has the power under suitable conditions of transforming itself directly into the creation of an "electron-pair." The hypothesis made in view of these five discoveries is that, while the evolution of energy by the stars is maintained, as Bethe has recently shown, by the *partial* transformation, within the stars of the rest-mass energy of hydrogen into radiant energy through

¹ Held in the building of the National Academy of Sciences, Washington, April 28 and 29.

terial suspension. As indicated, a linear relationship is obtained between the galvanometer reading and the turbidity of the solution over a range of galvanometer readings from 10 to 60.

A 32 candlepower, 6-volt lamp furnished the light source. Current for the lamp was supplied by a constant current voltage regulator. A galvanometer with a sensitivity of 1 mm deflection per 0.125 microamperes was used to record the current generated by the photonic cell. Round bottom 100×13 mm soft glass or pyrex test-tubes were used to hold the turbid solutions.

In checking several hundred of the above test-tubes it was found that only 1 in 10 gave a deviation in reading of over ± 1.0 per cent. with a constant suspension.

RAYMOND L. LIBBY

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AN IMPROVED WATER BOTTLE FOR SMALL "CAGED" ANIMALS

INVESTIGATORS working with albino rats are constantly aware of the inefficiency of the various types of water bottles necessary for large stock cages. Containers which have an opening large enough for the animal to enter its head likewise serve as receptacles for excreta. An improvement over this type of container is the inverted bottle carrying a straight glass tube. Yet, it, too, offers disadvantages, since proper functioning depends on an equal pressure both inside and out. Thus, whenever from one third to one half of the contents are consumed, a vigorous regurgitation is initiated and continues until the container is empty. As a result of such action, the animals may go several hours without water or other liquids. The cages become and remain wet, which gives rise to obnoxious odors and contamination. This problem is particularly evident when the attendants find it impossible to keep a close check on the water bottles.

To meet the problem of inefficient water bottles for rats, an adaptable unit has been devised. The apparatus required is simple and can be put together from materials available in the laboratory. The apparatus used here has a capacity of approximately 500 cc, a number eleven stopper and 7 mm glass tubing. This improved container, schematically shown in Fig. 1, will not leak or regurgitate when properly adjusted. Tubes *C* and *D* should be of equal length when in place.

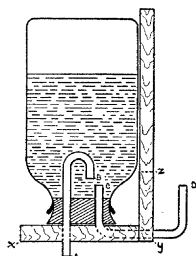


FIG. 1

This is best attained after the end *C* has been introduced through the stopper. Place the inside of the stopper along the straight edge of a

laboratory table, thus permitting the ends of the tubes *C* and *D* to rest flat against the top surface of the table. Mark both tubes at an even length from the straight edge, cut and fire polish. Tube *A-B* should be a short close bend, and the length between the center of the bend to the end of *B* from 1 to 1½ inches.

Fill the bottle, put stopper in place and invert. Tube *A-B* will serve as an air inlet. By means of the inverted siphon *C-D* the water will flow through the tube without the aid of force. However, since *C* and *D* are at the same height the water will not flow beyond *D* without additional pressure. This pressure is supplied through the air inlet tube *A-B*, whenever the animal removes the slightest amount of water. The ideal distance between *B* and *C* is ½ inch. In the event that the contents flow too freely, the distance between *B* and *C* should be shortened. On the other hand, should the supply be insufficient the distance between *B* and *C* should be lengthened. The container can be attached to the side of the cage. However, the apparatus is conveniently handled when allowed to rest on a simple rack, as shown in Fig. 1. The rack can be made from two pieces of wood nailed at right angles, and permanently fastened to the side of the cage by screws or bolts. It is necessary to saw a block of wood one quarter inch wide from the center of the rack through *xyz* for the passage of the two tubes. This will allow the bottle to slide in place, thus permitting tube *D* to enter the cage.

Through evaporation, removal of water by the animals or changes in temperature, the equilibrium is maintained. The balance is most delicate and remains constant when properly adjusted.

D. S. THORPE

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- HUNTRESS, ERNEST H. and SAMUEL P. MULLIKEN. *Identification of Pure Organic Compounds*. Pp. xvii + 691. Wiley. \$7.50.
- Social Security Board. Bureau of Research and Statistics. SAKMANN, MARIANNE, and others. *Bureau Report No. 5; An Outline of Foreign Social Insurance and Assistance Laws*. Pp. 62. \$0.15. OTEY, ELIZABETH L. *Bureau Report No. 6; Cash Benefits under Voluntary Disability Insurance in the United States*. Pp. vi + 117. \$0.15. Superintendent of Documents, Washington.
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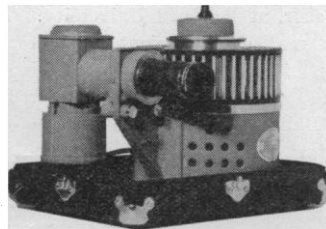
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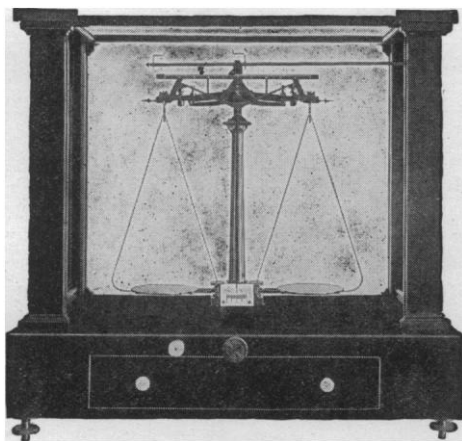
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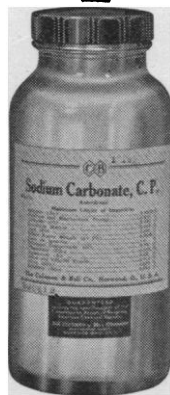
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