very approximate equivalent in the elaborate illustrations and descriptions. He begins by showing the rigidity of flexible bodies when in motion: he then describes the behaviour of a common top by means of a balanced gyrostat, and explains the importance of giving a rotary motion to projectiles. The gymbal gyroscope and the curious movements that are connected with it are afterwards discussed, and the analogy of these movements to that of the earth in regard to precession, &c., is pointed out.

The next point referred to is the importance of balancing a rotating body, the author showing that for perfect balance not only must the axis of rotation pass through the centre of mass of the body, but it must be one of the three principal axes through the centre of mass of that body. Reference is made to the experiments of Prof. Milne, who has shown, by means of a modified seismograph, the want of balance in the wheels of locomotives.

In the last few pages Prof. Perry deals with the connection between light and magnetism and the behaviour of spinning tops, and among the experiments is Thomson's mechanical illustration of Faraday's rotation of the plane of polarization, which is performed by means of a number of double gyrostats placed in a line and connected by india-rubber joints, each instrument being supported at its centre of gravity, and capable of rotation in the horizontal and vertical planes. To many readers the book will be one of great interest, and a brief summary at the end will show them clearly the line of argument adopted throughout.

Wild Life on a Tidal Water. By P. H. Emerson. (London: Sampson Low, 1890.)

It seems rather odd that an author should talk about "wild life" when he means simply life on a house boat on Breydon Water in Norfolk. No one, however, who glances over the present volume will be disposed to criticize the title very severely, for Mr. Emerson has the art of describing even unimportant things in a way that makes them interesting. Above all, he has provided a series of thirty admirable "photo-etchings," which convey a wonderfully vivid impression of the various scenes reproduced. The photographic plates were taken by Mr. Emerson himself, but in selection of subject the majority are the result of a pleasant partnership with his friend Mr. T. F. Goodall, on whose house-boat he experienced the trials and delights of "wild life."

Arcana Fairfaxiana. With an Introduction by George Weddell. (Newcastle-on-Tyne: Mawson, Swan, and Morgan, 1890.)

The manuscript of which a facsimile is presented in this volume was found some years ago by Mr. Weddell in a box of lumber. It contains much apothecaries' lore and housewifery dating from the first half of the seventeenth century, and was used, and partly written, by the Fairfax family. In a carefully-written introduction Mr. Weddell gives all necessary information about his treasure and about the persons with whom it has been associated. The facsimile is skilfully printed, and many of the medical receipts, and some of the instructions as to the baking of meats, are very curious and interesting.

Berge's Complete Natural History. Edited by R. F. Crawford. (London: Dean and Son, 1890.)

In this volume some of the leading facts relating to the animal, the vegetable, and the mineral kingdoms are brought together. The descriptions, if not very interesting, are clear, and the reader is helped to understand them by means of no fewer than sixteen coloured plates, and over three hundred smaller illustrations.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* Nature. *No notice is taken of anonymous communications.*]

The Bursting of a Pressure-Gauge.

With reference to Mr. Smith's letter in your issue of February 5 (p. 318) respecting the bursting of a pressure-gauge, will you allow us to point out a very simple method of preventing any serious consequences from such an accident, which must occasionally occur as the gauges wear out? There should be no cast-iron in the gauge: the tube and works should be mounted on a brass or gun-metal frame. The glass covering the dial should be mounted in a ring, fitting on the body of the gauge like a cap; when the gauge is in use this cap should be removed, thus avoiding all danger from the broken pieces of glass. The gauge should then be inclosed in a brass wire cage, so that, should the tube burst, any portions of metal would be caught by the wire network, and, if not stopped altogether, would at any rate be rendered harmless.

Our *employés* are constantly using gauges for testing gas bottles, and we have always had our gauges made in this way to avoid any risk from accident. The screw valve of the bottle should not be turned on full, one complete revolution of the screw is quite sufficient; this greatly minimizes the risk of fusion caused by friction, as the cylinder would probably take a quarter of an hour to empty itself. Of course the same gauge should never be used for both oxygen and hydrogen cylinders.

3 Fleet Street, February 11. Newton and Co.

Modern Views of Electricity.

(1) The first question that I raised in my former letter was how oxygen atoms come by the negative electricity which according to Dr. Lodge they have. I find in his pamphlet, "Seat of E.M.F." (p. 50), his view stated as follows, that whatever may be the case with molecules of oxygen, at least all dissociated atoms have a certain definite negative charge. If this be so, it seems to me to follow necessarily either that all molecules of oxygen are negatively charged, or that only those which are so charged can undergo dissociation.

(2) We are then to suppose a crowd of dissociated atoms of oxygen, all having negative electrification, "straining at," *i.e.* attracted by, the zinc. And this attraction, we are told (p. 50), exists independently of actual combination between zinc and oxygen, although it has its origin in the desire for such combination. It is a mechanical force arising from chemical affinity. Such a force would, according to the kinetic theory of gases, increase the density, and therefore the pressure, of oxygen in the neighbourhood of the zinc, causing a repulsive force, in addition, as it seems to me, to the repulsion due to like electrical charges. By this means the state of the gas in the neighbourhood of the isolated zinc would become one of equilibrium. And it may be that the variations of density would take place only within a distance from the zinc too small for our means of measurement. According to the statement (p. 110) of "Modern Views," only the repulsive forces arising from electrification are relied upon as producing equilibrium. I think, however, that Dr. Lodge would not exclude other mutual repulsive forces which may exist between the dissociated atoms of oxygen. And such other forces appear to me to be necessary, in order to explain satisfactorily the phenomena which ensue when the zinc is brought into contact with copper.

(3) When contact is made, a positive charge passes from the copper to the zinc. Let us call it σ per unit of surface. That disturbs the equilibrium previously attained about the zinc, because it introduces a new force of attraction on the oxygen atoms in virtue of their negative electrification. This force will be $2\pi\sigma$ per unit of surface. In order that there may again be equilibrium, we must introduce a counteracting force $-2\pi\sigma$. Now the new attractive force calls in a fresh influx of oxygen atoms, increasing their density, and therefore increasing the negative charges per unit of surface of zinc. If we had no repulsive forces, except those arising from electrification, the charges on these newly imported atoms would, I think, have to be $-\sigma$ per unit of area of the zinc, in order to give the required force $-2\pi\sigma$. This would exactly neutralize the positive charge