that he had to hurry up to push at all? It would seem to me to be true in this case also that the push back on him would be the same if the cart were in the same state of strain and at rest.

If the point of view brought forward here is correct it would seem to me desirable to leave out of any elementary discussion of mechanics an "inertia reaction."

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AN ADDITIONAL NOTE ON "THE OOLITIC AND PISOLITIC BARITE FROM THE SARATOGA OIL FIELD, TEXAS"

About three years ago the writer wrote a description of some barite of unusual type from the Saratoga Oil Field, Texas.[1] Specimens of this mineral have been brought to the surface in pumping, and they have been found, in all cases reported to the writer, at a depth around 1,200 feet, indicating that they probably have their source in a definite geological horizon. At the time the above-mentioned paper was written it was supposed that the concretions of this mineral originated with the sands in which they were found but there was no definite information on the subject.

In discussing this matter a short time ago with Mr. E. G. Woodruff, he stated that at least some of these concretions undoubtedly formed in the wells after they were equipped, because they had been found reaching a quarter of an inch in diameter, in a well with a screen on the tubing, the mesh of which was altogether too small to admit a concretion of the size stated. He kindly sent the writer an assortment of specimens of various shapes and sizes from other wells in the same field as those previously described and of approximately of the same depth. Tests with the blow-pipe and specific gravity determinations show that the composition of the concretions is almost identical to that of those previously described. A number were examined for nuclei, but in most cases no definite nucleus could be found. When a nucleus is present it consists of earthy material made up mostly of clay and barite and this mass is often stained with iron ioxide which gives the center of the concentration a brownish tint.

This additional information is interesting from the standpoint of its bearing on the origin of concretions. It would appear to be practically impossible for bacteria or other low types of life, which are believed to play an important part in the origin of oölites, to exist in a liquid with such strong antiseptic properties as those of warm petroleum containing considerable sulphuric acid. It would seem to demonstrate that living organisms are not essenial to the development of oölites and that these may form where precipitation is taking place in an agitated solution, in the absence of life.

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[1] Oölitic and Pisolitic Barite from the Saratoga Oil Field, Texas,'' by E. S. Moore, *Bull. of the Geol. Soc. of Amer.*, Vol. 25, pp. 77–79, 1914.

SCIENTIFIC BOOKS

Ocean Magnetic Observations, 1905–1916, and Reports on Special Researches. By L. A. Bauer, Director, with the collaboration of W. J. Peters, J. A. Fleming, J. P. Ault and W. F. G. Swann. Washington, D. C., 1917. Carnegie Institution. Pp. vii + 447.

This large and handsome volume is the third of the series issued by the department of terrestrial magnetism of the Carnegie Institution and contains full reports of all the magnetic work of the department at sea during the past eleven years. The two preceding volumes deal with the observations on land for the periods 1905–1910 and 1910–1913 respectively.

In 1905 the wooden brigantine *Galilee* was chartered at San Francisco and fitted up for magnetic observations with the purpose of making a preliminary survey of the Pacific Ocean which was at that time "nearly a blank as regards magnetic observations." In the course of three years, this vessel cruised 63,834 nautical miles and, magnetically speaking, put the Pacific Ocean "on the map." In addition to the great number of valuable and accurate observations which were accumulated, these cruises of the *Galilee* afforded an opportunity for testing and improving magnetic instru-

ments adapted to sea-conditions, for establishing a practicable and suitable routine of observing and of checking instruments and in general for learning how to make magnetic observations at sea far more accurately and systematically than had ever before been attempted.

The "magnetic constants" of this wooden sailing vessel were smaller than those of any vessel which had been previously used for magnetic observations; but, small as they were, they necessitated many corrections and frequent "swinging the ship" to obtain the accuracy which Dr. Bauer had determined upon as the goal to be attained. This not only consumed much time, but also diminished the precision of the final results. Accordingly, the non-magnetic yacht *Carnegie* was built in 1909 in which the use of iron was almost wholly avoided; wooden pins, and bolts of copper and of Tobin bronze took the place of iron nails, the producer gas engine used for auxiliary power was constructed of bronze, and the only magnetic materials used were the steel valves, piston rings and cam-rollers. Repeated tests have shown that this unique vessel has no appreciable effect upon the instruments; and in her various cruises aggregating more than 160,000 miles, observations have been obtained with comparative ease and rapidity whose accuracy is far beyond anything which had previously been possible at sea.

The first 154 pages of the present volume give an account of the work done on the *Galilee,* while the remainder deals in the same way with the observations made on the *Carnegie.* The various instruments are fully described and illustrated, and it is most interesting to follow their gradual improvement and perfection. To the experimental physicist this is one of the most attractive portions of the report; especial mention may be made of the beautiful and ingenious marine earth-inductor described on pp. 196 et seq. A full account is given of the methods of making observations, their reduction and correction and of the system of checks and controls between the various instruments, as well as those introduced by shore observations which were made at every opportunity. The final results for each cruise are given in tabular form and no detail is omitted which might add to their usefulness.

In addition to the magnetic measurements, systematic observations were also carried out on atmospheric electricity, ionization and radio-activity; these form the subjects of the special reports with which the volume closes.

The practical utility of this great series of magnetic observations in correcting mariners' charts of magnetic variation is obvious; serious errors in the present charts have been found and their correction lessens the dangers of navigation in times of storm and fog when astronomical observations are impossible. And quite apart from this most useful result the ultimate scientific value of such a survey continued year after year, as it will doubtless be when the war is over, is very great. The earth's magnetism is one of the great mysteries of physical and cosmical science; observations on land alone cover too small an area of the earth's surface to afford an adequate basis of knowledge of the earth's field and of the intricacies of its secular variations. Continued, systematic sea observations of the accuracy of those recorded in this report form a necessary stage in the solution of the great problem; when that is obtained it will doubtless lead to a further knowledge of the sun's magnetism and may well have results of the highest significance in cosmical theory.

This volume is a monument to the well-directed enthusiasm and foresight of Dr. Bauer and to the skill and zeal of his associates. In this case as in many others the Carnegie Institution deserves the thanks of the scientific world for generously supporting and wisely forwarding work which could scarcely have been done at present by any other agency.

H. A. BUMSTEAD

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THE RELATION OF THE MALPIGHIAN TUBULES OF THE HIND INTESTINE IN THE HONEYBEE LARVA

IT has been known for nearly a hundred years that the mid-intestine of larvæ of bees