REFERENCE has already been made in our "Notes" to the Admiralty salvage operations during the war. An article in the *Engineer* for March 21 gives an account, with illustrations, of the submersible salvage pumps and engines employed in these operations. It is not always convenient to supply current from a salvage vessel, and in such cases the electric current for driving the pumps is supplied by an oil engine-driven dynamo. It is essential that the plant should be weatherproof and unaffected by sea-spray or rain. Although a dynamo which will withstand being submerged has not yet been produced, the oil-engines described in the article are capable of being covered with water without coming to any harm. The engine cannot, of course, work while submerged. The necessity for an engine of this kind arose in connection with the installation of centrifugal pumps on a wreck situated in tidal waters, which had, owing to unforeseen circumstances, to remain in position while the tide rose and completely submerged the plant. A number of these engines have been built at the Bedford works of Messrs. W. H. Allen, Son, and Co. Up to the present there are two standard sizes, one with two cylinders of 12 brake-horse-power, and the other having four cylinders giving from 46 to 50 brake-horse-power.

AT the annual meeting of the Institute of Metals, held on March 25 and 26, the fourth report to the Corrosion Research Committee of the Institute of Metals was presented by Capt. Bengough and Dr. Hudson. The publication of this investigation, which is subsidised by the Department of Scientific and Industrial Research, has been considerably delayed owing to the request of the Admiralty that the results should not be made available during the war. The report is divided into three main parts. The first is devoted to the question of the nature of the attack which takes place when metals such as zinc, copper, and aluminium, and alloys such as 70 : 30 brass, corrode in neutral or nearly neutral liquids, *e.g.* distilled water and sea-water. The second section is devoted to the consideration of the behaviour of condenser tubes in similar liquids, and variations of behaviour in different samples of tubes of nominally the same composition. The third section is an attempt to set out in some detail a statement of the practical problems of corrosion in sea-water, which appear to the authors to be very different from what is usually supposed. A preliminary account is also given of experiments carried out with the object of testing an electrolytic process of protection and a pre-oxidising process designed for the same end. The authors express the view that corrosive attack on condenser-tubes is more diverse in character and complicated in nature than has been generally supposed. The first action is one of chemical oxidation, and secondary actions are of great importance. No one single remedy is likely to be found effective for all the different kinds of attack which occur in practice. The nature of the tube used and the protective measures chosen should be dependent on the particular set of conditions.

"CO-ORDINATION of Research in Works and Laboratories" is the title of a paper by the late Mr. H. R. Constantine read before the Institution of Electrical Engineers on March 27. A scheme is outlined in which it is proposed to place under the direction of a central board all the laboratories attached to the universities, colleges, and training institutions of the country, as well as many experimental laboratories connected with private works. The board would keep full records of what each laboratory was doing, and receive all inquiries for research work to be done; it would keep a record of results published all the world over. Further, the board would be invested with power to order any laboratory to undertake certain research work, or to leave another research alone, or, indeed, to transfer, if considered advisable, part of its equipment or *personnel* to another laboratory. Finally, all discoveries would be communicated to the board, which would have power to dispose of them after consideration of the rights of the individual worker. If adopted, the scheme would apparently supersede the Industrial Research Associations established already in connection with the Department of Scientific and Industrial Research, which has had a grant of 1,000,000*l.* placed at its disposal by the Government, and has been for some time actively at work. It is also as well to point out that the research work carried on in universities and other teaching institutions is conducted not wholly for the sake of the results looked for, whether purely scientific or technical, but for the educational purpose of training students in method. Moreover, as repeatedly pointed out, the original researcher in connection with fundamental problems will not usually be willing to unfold his ideas to others, at any rate in their early stages, before they have been tested.

AMONG forthcoming books of science we notice the following:—"Problems of Fertilisation," Prof. F. R. Lillie (*Chicago: The University of Chicago Press; London: The Cambridge University Press*); "Influenza: A Modern Account of its Pathogenesis, Symptoms, Complications, Sequels, and Treatment upon Combined Specific and Non-specific Lines," Sir T. J. Horder (*Henry Frowde and Hodder and Stoughton*); a new edition, thoroughly revised and enlarged, of "Practical Physiological Chemistry," S. W. Cole, with an introduction by Dr. F. G. Hopkins (*Cambridge: W. Heffer and Sons, Ltd.*); "Commercial Forestry in Britain: Its Decline and Revival," E. P. Stebbing; "Conifers: A Key to their Identity and Converse," C. C. Rogers, illustrated; "Tin," G. M. Davies; "Manganese," A. H. Curtis; and new and revised editions of "Heredity," Prof. J. Arthur Thomson, illustrated, and "Hydrographical Surveying: A Description of the Means and Methods Employed in Constructing Marine Charts," the late Rear-Admiral Sir W. J. L. Wharton, revised and brought up to date by Admiral Sir Mostyn Field (*John Murray*); "A Woman Doctor: Mary Murdoch of Hull," H. Malleson, and "Advance in Co-Education," edited by A. Wood (*Sidgwick and Jackson*).

## OUR ASTRONOMICAL COLUMN.

CHANGES ON JUPITER.—Observers appear to be fairly well agreed on the character of the recent variations in some of the more prominent and durable of Jovian features. The Rev. T. E. R. Phillips, who has devoted much attention to Jupiter's appearance in recent years, says that the opposition of 1918–19 will be a memorable one. To his eye "the south tropical disturbance and the hollow in the southern belt have practically disappeared, but the red spot remains quite distinct on a night of good definition." The changes which have affected this particular region of the surface have been rapid and most remarkable. Mr. Phillips employs two instruments, one a 12½-in. reflector and the other an 8-in. refractor. He regards it as likely to afford much satisfaction to observers that the red spot continues to retain a definitely elliptical outline, for the obliteration of this familiar marking would be regarded as a great loss by all students of the planet. That this object may at some future time regain its former (1878–80) conspicuous aspect is quite possible, and it should be attentively watched for changes of both shape and motion.

THE ORIGIN OF NOVÆ.—Prof. W. H. Pickering examines various theories of the origin of novæ in *Popular Astronomy* for November last. He rejects the theory of collision of star with star on the grounds that novæ are too numerous for this and that the period of brilliance is too short. The first difficulty, but not the second, is avoided by the theory of collision of star with nebula; it would probably require years, not days, for a star, even at the enormous speed indicated by the spectroscope, to traverse a nebula of average size. Prof. Pickering prefers the hypothesis of a body of small planetary dimensions falling into the star and penetrating the photosphere to some depth before it exploded. He pictures its conversion into gas as being so rapid and violent as to scatter the materials of the photosphere to a considerable distance all round, thus producing an immense, but short-lived, increase of light. He notes that he is drawing on the star's own energy for the outburst, the falling planet merely acting as the trigger. The dark and bright bands of the spectrum are explained (as on many other theories of novæ) by the outer shells of gas being cooler, and so absorbing light, while the light from the gases streaming out on the remote side of the star, having its wavelength altered by motion, is not arrested by the cool gas on the near side. Newcomb, in "The Stars: A Study of the Universe" (p. 138), suggested a similar explanation, treating the stars as hollow globes of highly heated and condensed gas; a foreign body, on falling, might break the shell, when the interior gases would burst forth. "What magnitude the outburst might assume it is impossible to say."

CELESTIAL SYSTEMS.—The Memoirs of the College of Science, Kyoto University (vol. iii., No. 7), contain a paper by Shinzo Shinjo and Yoshikatsu Watanabe on the angular momenta of celestial systems. The authors examine all the binary and multiple systems for which sufficiently accurate data are available (including eclipsing variables). They show that the resulting momenta are confined within tolerably narrow limits, and exceed several hundredfold the angular momentum of the solar system. In studying the possible origin of angular momentum they examine the case of a spherical swarm of meteorites, and show that, for a given mass, the larger the individual meteorites the greater the probable momentum. To produce the momentum of the solar system they conclude that the individual meteorites must have been about 20 km. in diameter. The size would require to be much larger to satisfy the conditions of the binary systems. It is conjectured that swarms with the largest meteorites would condense into two or more nuclei, those with medium-sized meteorites into single orbs which would afterwards divide into two, those with meteorites 20 km. in diameter into planetary systems. In the case of dust-swarms or gaseous nebulæ, the number of constituents is so immense that the resulting angular momentum is infinitesimal. While the paper does not give a complete system of cosmogony, it sheds fresh light on some of the stages of the process.

## *COTTON-SEED BY-PRODUCTS.*

ON February 5, at the Royal Society of Arts, Mr. Ed. C. de Segundo read a very interesting and suggestive paper on "The Removal of the Residual Fibres from Cotton-seed and their Value for Non-textile Purposes." Mr. de Segundo explained that there are two main classes of cotton-seed, viz. the bald, black, or clean seeds, such as Egyptian, Sea Island, Brazilian, etc., of which practically the whole "lint" is removed by the process of "ginning," or separating the lint or textile fibre from the seed; and the white, woolly, or fuzzy seeds such as American, which are still covered with a short white "fuzz" or lint after ginning. Indian cotton-seed is really of the latter class, though the fuzz remaining on the seed is much shorter than in the case of the American.

To deal with these two classes of seed, two different methods have been adopted. The black seeds are crushed whole, and the residue after extraction of the oil is pressed into cattle-cake. The white seeds are first "delinted," which removes part of the short fuzz left on the seed after ginning, the machine used being practically the same as the saw-gin used for the ginning itself. The short fuzz or "linters" thus removed is used for guncotton, blotting-paper, waste, etc. The seed is then "decorticated," a process of separating the hull, with the fuzz still remaining on it, from the kernels or meats. The latter are then crushed alone, and the oil is taken out in a much purer form than is possible under the whole crushing process, because the presence of the hull or shell gives a darker colour to the oil. Incidentally, the process afterwards required to remove this dark colour gives the oil a slightly bitter taste, which made the value of such oils distinctly lower than those got by the decorticating process. The crushed kernels give a very fine residual product known as cotton-seed meal, which has recently been attracting particular attention because it has been shown to possess very high qualities as human food. Its protein and fat contents are very high, and mixed with potato- or wheat-flour it produces a most valuable form of food.

As it happens, the two processes above described have come to be known as the British and American processes respectively, because the British crushers have only had the opportunity of handling the Egyptian and Indian cotton-seed products in large quantities. The bulk of the American crop has, naturally, always been handled in the States. The Indian crop known as Bombay seed has always been imported into this country and crushed whole without previous delinting, because its seed-lint was scarcely long enough to be worth removing, and its presence in the cake (though it took long to convince the users of it that this was true) did no material harm if properly handled, while it gave a much bulkier, and therefore cheaper, cake.

The two improvements with which Mr. de Segundo has been connected are, first, the production of a machine which, after ginning and delinting in the ordinary way, takes a further quantity of "seed-lint" from the seed. This seed-lint is of considerable commercial value for many non-textile purposes, such as paper-making, artificial silk, explosives, and cellulose acetate, the peculiarity of the process being the very clean and pure condition in which it delivers the lint. Its removal also adds to the value of the seed for crushing purposes, saves freight by reducing its bulk, and minimises the danger of heating, and hence the risk of fire by spontaneous combustion. The second improvement is a process of removing the last vestige of fibre from the hulls after decortication, thus taking two further by-products out of the last residue of the former process. It was the first of these improvements that was mainly dealt with in the lecture.

The importance of these processes to the cotton industry is certain to be very considerable. There are many new areas in the British Empire where cotton is being developed, such as Uganda, Nigeria, and parts of the Sudan, where the woolly seeded varieties have been found the most suitable, but the seed has never been fully utilised because the crops were comparatively small, and the cost of handling