Modern Diving Devices.

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THE rubber diving dress evolved by Siebe a hundred years ago extended the useful range of human activities to rather more than a hundred feet below the surface of the sea, and for several years engineers and physiologists have been striving in their respective spheres to double or treble this working depth. Much progress has been made, and as an example of the most advanced methods now in use we reproduce, by courtesy of Messrs. Siebe, Gorman and Co., Ltd., two illustrations (Fig. 1) of the Davis submersible decompression chamber already described in these columns (*NATURE*, March 15, p. 415; 1930) and to the British Association at its Bristol meeting last year. The diver on finishing his work ascends not to the salvage ship but to this chamber, and, clambering in, finds an attendant waiting to divest him of the helmet and lead weights; the two men close the bottom door, and the chamber, retaining air at any desired pressure, is hoisted on board the salvage ship, which is then free to manoeuvre or explode blasting charges while the diver is being slowly decompressed. Within his range the rubber-suited diver will always be supreme, but for objectives still beyond his reach another system is being developed.

Beebe and Barton (*Bulletin New York Zoological Society*, Nov.-Dec. 1930; see also *NATURE*, 126, p. 220, Aug. 9, 1930), wishing to investigate life in the ocean at far greater depths than man had ever attained, adopted a method of admirable simplicity which H. G. Wells had foreseen in one of his early short stories. They constructed a spherical observation chamber (Fig. 2) capable of withstanding the external hydrostatic pressure of 2000 feet of water, furnished it with quartz windows, a telephone, simple apparatus (including two palm leaf fans) for renewing the air vitiated by respiration, and in it they were eventually lowered to a depth of 1400 feet in the sea off Bermuda, where many interesting observations were made. Their 'bathysphere' was a single steel casting 4 ft. 9 in. in diameter and 1½ in. thick; it weighed 2½ tons in air and ⅞ of a ton when submerged. Beebe, who with his companion spent 1½ hours in it on his principal descent, seems to have been quite comfortable, and writes, "I never realised how much room there was in a sphere four and a half feet in diameter". He found that blackening the interior made it easier to distinguish objects in the dimly lit waters outside, and that something warm and dry to sit on should by no means be forgotten. Since the adventurers were breathing air at atmospheric pressure, no question of compressed air illness arose.

To combine the flexibility of Siebe's dress with the protecting rigidity of Beebe's sphere has been a dream of enthusiasts for at least fifty years, and in 1923 Neufeldt and Kuhnke in Germany produced what at last seemed to be its practical

realisation. Their steel dress, nicknamed 'The Iron Man', weighs about 800 lb. in air and has exquisitely constructed joints, watertight yet capable of movement at a depth of 500 feet under an external hydrostatic pressure of 220 lb. per square inch. The diver breathes air at atmospheric pressure, the necessities of respiration being provided for as in the bathysphere. The mechanical tongs in which the arms terminate are well seen in Fig. 3, as well as the telephone cable and steel wire by which the apparatus is raised and lowered.

The inventors soon gave ample demonstration at sea that their apparatus enabled men to descend 400 feet deep in safety, but technical opinion in Great Britain remained unsatisfied that the limbs could be moved with sufficient freedom and the tongs manipulated with sufficient accuracy to do much useful work. However, the Italian salvage company, 'Sorima', of Genoa, took up the invention and exploited it with extraordinary skill and energy in salvaging the cargoes of ships sunk at great depths during the War. Their remarkable successes, culminating in the location of the famous wreck of the *Egypt* off Ushant, are worthily described in a recent book,¹ the writer of which combines the shrewdest observation with vivid and witty descriptive powers, so that it will be read with lively pleasure by salvage engineers as well as the general public. The former will find it significant that in the hands of the Italian experts the original iron man has undergone a process of involution. At first there were twelve joints, three to each limb; next, the total number of joints was reduced to six; and finally the jointed appendages were cast off altogether, leaving the diver enclosed in a limbless rigid steel shell, where he becomes, as Scott says, "merely the directing brain of the salvage ship, which does its work by machinery under his control".

A limbed suit is still held in reserve, but one infers that, after years of experience, those best qualified to judge have found that the amount of work that can be done by this sort of apparatus does not justify its cost and complication. The observation chamber on which the Sorima now relies differs externally from the bathysphere in being of tapered cylindrical form, and, as a protection in the hurly-burly of salvage work, possessing a buoyancy chamber by which the occupant can cause it to float to the surface in case of breakage of the supporting cable.

It is odd that such a simple method, and one requiring so little strength or skill in the diver, has not been used before; often it is desirable for engineers to inspect submerged structures, and many of them, from a sense of duty, have acquired enough of the technique of the rubber suit to be able to go under water, but it is very difficult for anyone not thoroughly practised in diving to make a critical inspection: tides sway the tyro about,

FIG. 1.—The Davis submersible decompression chamber. On the left, the chamber is slung in mid-water ready for the diver's ascent. On the right, the diver is entering the decompression chamber, which, until the lower door is closed, acts like a diving bell. The attendant has removed the diver's helmet and disconnected his air-pipe and breast rope.

he flounders and, stirring up the mud, obscures his own vision, his breathing is laboured and the discomfort so great that judgment is apt to be hasty; moreover, for elderly men the thing is impossible. The same man in a suitable observa-

which used to lead the world in diving, will not be the last to divert some of her marine biologists from determining salinities and measuring herrings

FIG. 2.—Section of the bathysphere. A, swivel for attaching cable to sphere. B, stuffing box through which electric cable enters sphere. C, electric cable, containing two wires for the telephone circuit and two for the electric lights. D, telephone. E, searchlight with beam focused through window I'. F, oxygen tank ready for use with valve attached—one dial showed the amount of oxygen remaining in the tank, the other the rate of discharge. F', reserve oxygen tank. G, tray containing soda lime for absorbing carbon dioxide. H, tray containing calcium chloride for absorbing moisture. I, main observation window, 6 in. in diameter. I' and I'', windows for searchlights. The windows were discs of fused quartz 3 in. thick and 8 in. in diameter.—From *Bull. New York Zoo. Soc.*, vol. 33, No. 6. By courtesy of Mr. William Beebe.

tion chamber could be travelled by overhead tackle from one end of the work to the other without the least exertion. Beebe was surprised to find what misleading information his nets had been giving about the distribution of the bathypelagic creatures, and it seems certain that under-water observation will sooner or later be used in solving practical fishery problems; it is to be hoped that Great Britain,

FIG. 3.—Neufeldt and Kuhnke's 'iron man' articulated shell.

to going under water and watching the reactions of fish to the baits on a long line, or even to being towed along in the mouth of a trawl to see what proportion of fish dodge it and how they may be circumvented.

¹ *Seventy Fathoms Deep: with the Divers of the Salvage Ship Artiglio.* By David Scott. Pp. 288 + 32 plates. (London: Faber and Faber, Ltd., 1931.) 12s. 6d. net.

Diet and Disease.

REFERENCE has already been made in these columns to certain recent dietary surveys^{1, 2}. From such researches it is possible to enlarge our knowledge of the types of diet which different peoples or individuals may find adequate, to point out in what respects diets in common use may fail to satisfy accepted standards, in certain cases to correlate prevalent diseases with a particular type of diet and, by means of additions to the food supply, to confirm the results of the survey and

indicate how the diet may most simply be improved. A recent report by Orr and Gilks is of great interest, since the investigators find a marked correlation between diet and physique and general health.³

The survey was carried out on two tribes living in Kenya, the A-Kikuyu, who are agriculturists, and the Masai, who are pastoralists. The Kikuyu diet consists chiefly of cereals (maize or millet), tubers, plantains, legumes, and green leaves. Only the women eat green leaves in any quantity; more-