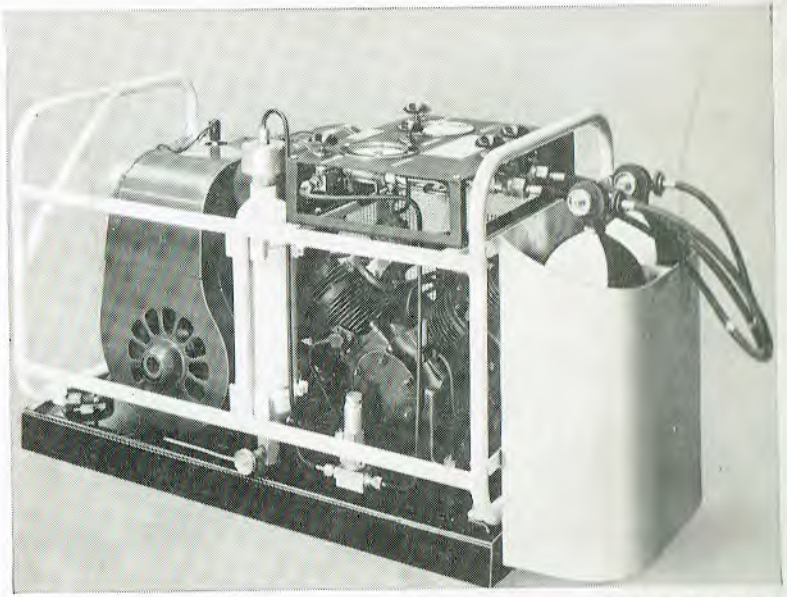

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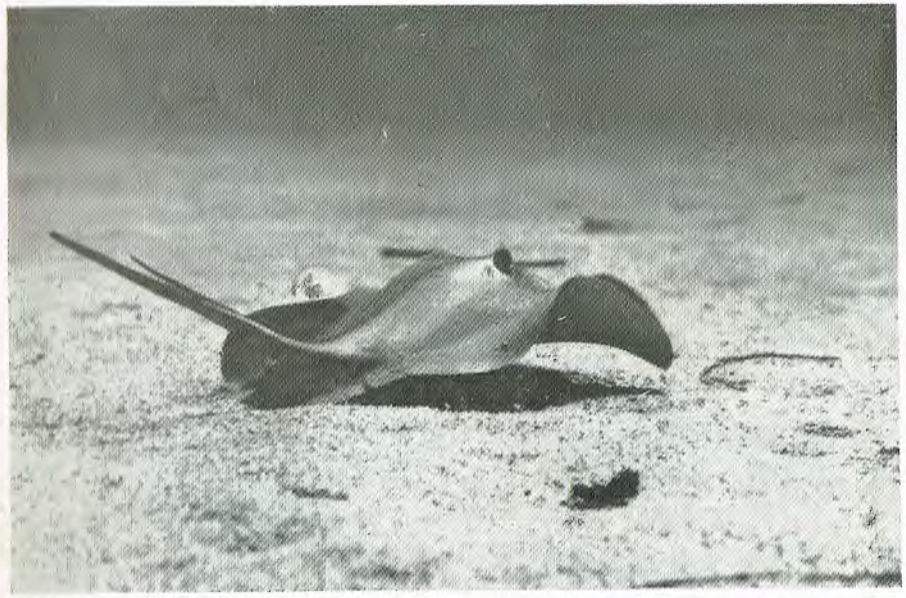
ROYAL NAVAL DIVING magazine



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Vol. 11 No. 3

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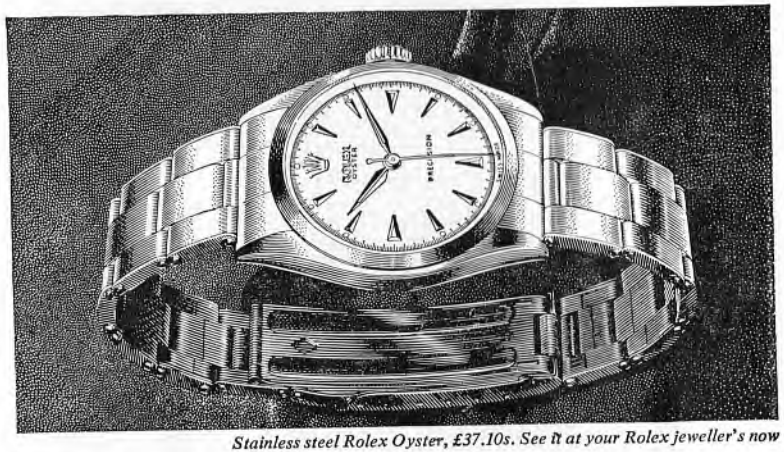

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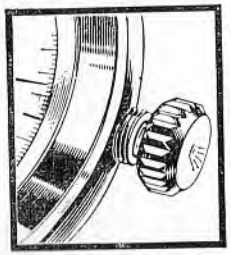

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Contents

R.N. Diving Magazine

Merry Christmas

and a

Prosperous New Year

to all our

Readers

Vol. 11 Winter 1964 No. 3

EDITORIAL STAFF

Editor .. .. P.O. V. Gibbons

Treasurer .. .. S/Lt. P. R. Park

Treasurer's Note

Due to improved sales, the magazine at the November audit finds itself reasonably solvent and it is intended to increase its size and interest value accordingly.

If all Diving Officers continue to sell at the present (or slightly higher) rate we should go from strength to strength.

The editorial staff are attempting to collect a complete set of editions to keep for posterity, but find that the following issues are missing:

Vol. 1, No's 1 and 4. Vol. 2, No's 3 and 4. Vol. 3, No's 1, 2 and 3. Vol. 4, No. 2. Vol. 5, No's 1 and 4. Vol. 6, No. 2. Vol. 7, No's 2 and 4. Vol. 8, No's 1 and 2.

If any reader has any of them and can spare them for the master record we will be most grateful and will forward a new copy of the latest magazine by return of post.

P.R.G.P.

Letters to the Editor

"IF YOU CAN'T BEAT 'EM, IGNORE 'EM"

Sir,

It was with considerable interest that I read the points made by C.P.O. Larn in his article "Sport Diving in the Naval Air Command". (Published Volume 11/2).

In the eight years between 1955 and 1963 H.M.S. *Vernon* undertook to provide diving instruction to the British Sub-Aqua Club on Sunday afternoons. In 1956 alone 202 people availed themselves of this opportunity. It is estimated that over these years more than 2,400 visitors were given displays, instruction and practical diving. It was with regret that this practice had to be stopped at the commencement of 1964 due to Naval instructional requirements.

From the above facts it should be apparent that instead of 'ridicule and contempt, a considerable effort has been made to assist the amateurs.

As regards the status of Naval Divers v. S.A.C. Divers, some most important facts must be taken into consideration. Divers in the Fleet are given an intensive and varied course. How much of this instruction is retained depends on the individual and on his diving officer. It should be remembered that Ship's Divers are not regularly employed on diving duties as are Clearance Divers. An example of the ability of one branch of the N.A.C.S.A.C. from Kalafrana was the discovery of a Phoenician galley at Xlhendi in Gozo. This intrepid band of auqanauts were supposed to be splashing about at 60 feet when they found amphorae at 180 feet. Now we all know that the Med. is clear, but not that clear. How many times has this particular club and others like it taken similar risks ? This sort of stupid bravado can only result in ridicule and contempt from professionals who, although not owning £50 worth of fancy equipment, do have a sounding line.

In conclusion it is to be hoped that the cordial relations that exist between the Clearance Diving Branch and the Sub-Aqua Clubs continue. It might even be possible to have a disarmament conference with the H.A.C.S.A.C., if their shoulders were brushed free of chips.

P.O. A. W. G. BROOKER, C.D.I.

* * *

NAVY TO THE RESCUE . . .

Sir,

Please allow me through your magazine to express public appreciation of the salvage work done at Marsalforn, Gozo, by the Fleet Clearance Diving Section of the British Royal Navy on September 14th and 16th. Three cars, a van and two motor scooters were carried into the sea at Marsalforn beach by the torential rain which hit Gozo recently. The P.W.D. managed to pull two cars out of the sea. The other car was deeply embedded in mud and shingle and could not be extricated. The van and the scooters could not be found. The owner of the third car went to Valetta to try and get help from Royal Naval Divers. After enquiries he managed to get in touch with the F.C.D. Officer at Manoel Island. Lt. Lovell-Smith was very sympathetic and promised to do what he could. This was on Friday 11th September. Next day he telephoned and said that arrangements had been made to start work the following Monday. Frogmen were on the job for two days and really tried to do what they could.

They salvaged the car, which could not be pulled by crane from shore before the divers had cleared the mud and silt around it. Unfortunately the scooters could not be found. They must be buried somewhere beneath a bank of sand and pebbles. The van was too damaged and broken up to be worth salvaging.

To Lt. Lovell-Smith and his men we say: 'Well done and thank you'.

Yours Truly,

M. MIZZI.

* * *

THANK YOU

Editor,

Perhaps a few lost friends in R.N. Diving circles will read this article if you can find room for it in your magazine, and remember that 'odd-bod' of a copper who passed through the portals of *Drake* a couple of years back, then maybe they will make a stop at Woking.

I've often wondered what the school thought of having a civvy type on course there, especially one with absolutely no naval background at all. It was a real eye-opener for me.

The most striking impression to remain for me is the occasion when being told not to pass the keel on my first ship's bottom search. As the light slowly grew brighter, it dawned on me also that ships don't come to a point at the bottom — first clanger.

Then there were the holes in the bottom of your ships, that didn't seem right to me either, but I suppose that like all the best bottoms the holes had a purpose.

The one custom I never did take to was that of eating oggies in the early hours, after a night dive, but at least I did acquire a taste for scallops.

Based on the experience gained by Surrey officers at *Drake*, Siebe Gormans, and in the police, we in Surrey have now got a diving school going for police underwater units. It is with regard to the trainees we have already had, and the many more we hope to have, that I would like to say 'thank you' to everyone concerned with the trainees visit to *Vernon*.

The value of working-up to that final day with the Navy is immense, and I'm sure is not fully appreciated by the diving types who foster us on these visits. To go away, having dived in your water (ugh), experienced a dry-dip in the 'pot', and most of all having met and talked to real naval divers, is an experience each man cherishes more than any other.

Your magazine is spreading in popularity throughout the police teams, due to the efforts of the volunteer sales promoters (I'm sure they have perches above the gate, the way they swoop whenever 'fair game' enter). Perhaps a few police D.O's will send you odd items of their experiences.

Always a welcome at Woking.

HARRY WEBB, *Sergeant*.
Underwater Section,
Police Station, Woking.

* * *

ROYAL NAVAL DIVING ASSOCIATION

IS there anything more to the Royal Naval Diving Association other than the purchase of the blazer badge and tie ?

It seems to me, and all divers I have discussed this with, that there is unlimited potential for an enterprising individual to start a Diver's Association on the lines of the E.R.A's. The idea I had in mind was the purchase of a four storey house, in Portsmouth area, and later, smaller premises at all major ports. The ground floor of this establishment would be the club rooms, a flat on the first floor could house the club manager and the other two storey's converted into self contained flats.

Money . . . The deposit for these premises could be collected from all willing divers, who on paying a sum of money would become life members, and receive a share. The rates and mortgage would be paid by tenants of the flats and bar profits.

Manager . . . This is the big problem; the ideal man would be a diver en route for pension. He would have to be dedicated to the diving fraternity (imagine the yarns and hard luck tales across the bar), have a working knowledge of bar duties and an insight into managerial problems. The success or failure would basically depend on this man.

In submitting this letter, I am hoping you will see fit to print it, and thus enable the seed to be sown

T.C.W.

The idea outlined above is basically sound but the problems are immense. If any reader has the solutions or alternative please submit them to this office. V.G.

DIVERS I HAVE KNOWN

Mrs. N. Spencer, alias Mum.

The Shot Rope . . . I wonder, to how many Divers, past and present, at home or in 'the far flung outposts of the Empire' that name conjures up memories.

Memories of 'passing out' ceremonies via the 'Horse Trough', of parties for those going out to civvy street or abroad, of sing songs with Jock Hunter or Taff Roberst, of celebrations after classes, of quiet get-togethers and of talking 'shop'.

Thinking about and writing this article has brought back many happy memories for me, fifteen years of them. For it was all that time ago that the first little band of happy warriors from '*Reclaim*', Ginger, Scants, Nobby, Doc, Jacko, etc., etc., first started the Shot Rope as the Divers Annexe. During those years how many Gingers, Lofty's, Shorties and Nobbies have come and gone, I have lost count, but they are all remembered. Many still keep in touch. Before I close and say 'Be Good' may I thank all those Divers who have always been so kind to me, especially during my recent stay in hospital, and tell them that nobody is prouder of her title than, The Divers Mum.

Sgt. Webb of the Guildford Police who is a very keen diver, recently paid a visit to H.M.S. *Vernon* Diving School and went home blushing.

It appears whilst he was discussing diving 'up at the office' he had the misfortune of being caught with his car improperly parked. His remarks when he was trying to scrape the sticky lable off his wind-screen were, 'quite an effective way this sticky label, I'll have to tell my Super'.

Two golfers were about to drive off when a funeral procession passed along the main road. The golfer who had teed up lowered his club, removed his hat and lowered his head until the cars were out of sight. His friend was a little surprised and said 'I didn't know you were so religious, George. It was very touching of you to do that'. 'Well', came the reply, 'It's the least I could do. I've been married to her for thirty years.

"Reclaim, 1964"

OUR last article was written prior to the annual Deep Diving trials in the Canary Isles, where, as most of the Diving fraternity knows, we carried out a series of dives from the work-up depth of as little as 50 feet, on air, to the eerie depths of 500 feet. It was Don Hodge who, as a newspaper reporter, said of these dives 'It's the loneliness that really gets you down there. There is only the magnified sound of your breathing and you listen to that real hard'.

Various yarns and ditties will be told by all who took part in the trial, but most of us felt it was a very good achievement, and hard work to boot.

On odd occasions at the deeper depths one felt one was not alone and immediately made for the safety of the chains above the S.D.C. (submersible decompression chamber). Many of us had our eyes and head going round continuously, like a radar set. A total of 14 dives to 500 feet were carried out with a few 'aches' and 'niggles', but fortunately nothing serious. Much of the credit goes of course to the divers who suffered much at R.N.P.L. during the preliminary dry dips.

The location for the diving in Teneriffe proved a difficult task. A suitable depth of over 500 feet had to be found and when found the Captain, Lt.-Cdr. Simpson, had the unenviable job of conning to a four-point mooring on a bottom where a distance of a few feet often meant several hundreds of feet difference in depth. We succeeded after much difficulty, but even so on one occasion

H.M.S. "Reclaim" under full sail

our port anchor brake and deck clench could not hold the colossal weight of the cables and we lost 14½ shackles in as many seconds.

The daily routine ran pretty smoothly and without too many snags, the one big problem being the markings of winch wires so we could accurately gauge the depth. Our only reasonably successful markings consisted of wire seizings which had to be renewed after almost every dive! The team, having to work late at night after the dives finished, were, to put it mildly, slightly 'fed up' with this but despite the offer of fags, tots, etc. as the prize for any better method, no one came up with a brain-wave. This offer is still open and 'Pat' Christmas would give his back teeth for the solution.

At weekends we secured alongside in Santa Cruz for a couple of days off. Many of the team lived ashore in the Hotel Anaga, which proved a highly successful location for team runs. The tourists enjoyed the divers rendering of old English verse such as 'Maggie May' with the Lobster song and other refined odes to follow. Mr. Williams had, on occasions, slight trouble with insomnia and found himself counting the steady pounding of feet on the ceiling above him in time to Doc Carling's many party pieces.

We were lucky to be spared to see the only Bull Fight during the six weeks we were there. Many comments were heard after the fight but mostly it satisfied the usual gory delight Matelots have for someone getting hurt. We did have difficulty though, in distinguishing 'Brum' Fowles from the bulls.

Towards the end of the trials everyone looked forward to a well earned Christmas leave. Unfortunately *Reclaim* had six days steaming ahead of her which caused us to miss the Divers' Dinner. Chief gave us our 'Pompey revs' however, and with the aid of the main sail and a temporary forsail made out of the quarter deck awning we got along at least in spirit, if not in actuality, a good deal faster.

Leave period completed we headed for Rosyth and refit. The team managed to keep in trim with weekly visits to Caledonia baths. The 15 feet seemed rather tame after the deep trials but we were grateful to get off once a week as a refit isn't the best of times onboard ship.

April came and after a few almost embarassing engine failures we sailed for Ostend for our first minesweeping exercise, The usual run of the mill diving took place in none too healthy waters and various arguments took place between us and C.P.O. Hendrickson on whether or not the canals were neat sewage.

After our two weeks stay in Ostend we left for a hopeful short stay in Pompey and having been in Scotland so long it was looked forward to by the few English speaking people on board. Once in Portsmouth we embarked on the normal procedure of bumming bits and pieces from the Dockyard, and of course fending-off the ever present Geminis from *Vernon*, paying social calls.

The Portland races were our next call, where it was said the Porltand team were going to do something that sounded like an 'Awkward' on us. It was cancelled, just as well as we were occupied with a brush up on demolitions ashore and compass swims around the rocks. Pat, 'Jack Hargreaves', Christmas was to the fore with his fishing and netting, and was endeavouring to keep his hooks off our crabs.

May, found us in Falmouth ready for another phase of Diving trials. A few sharks hung around, but no incidents occured. Rifles were manned and only fired in bordom. The Chef ditched a heap of meat and bones over the side while a dive was in progress, and he even swears he's not anti-diving or diver. A depth of 100 feet, with oxygen stops, turned out to be first schedule, and went smoothly with no throw-backs at all.

The enjoyable part of this trial being the night return to the jetty, where needless to say the Chain-locker and other neighbouring boozers took a pounding. Old friends were met from the Heli-crash team, and a hard chased class under 'Nic' Carter.

Again on the move, the ever busy *Reclaim* left for Tobermory to carry out another phase of the trials, for which, after a quiet trip to the Western Isles we anchored off-shore. We dived to 130 and 150 feet, with oxygen stops, and got the occasional ache and niggle; but with the arrival of our friend 'Doc Mackay', on one particular niggly day, we were very nearly convinced that aches were due to old age or something. While on about our friend the Doctor, may we congratulate him on his promotion, and hope it doesn't take him too far away from diving.

A dance for the ship's company took place soon after we anchored, and most, if not all ashore, showed up for it. Not quite what was expected, since a brace of bagpipes and fiddles was the band, and the entire evening was spent, by all sailors, in trying to dance unpronouncable, impossible Scottish reels. But not to be out-done the strange dances were tackled with great gusto and complete and utter chaos reigned. Quick-steps to bagpipes proved difficult to execute, unless the executers had been previously primed with a few wee nips, which just about covered the whole team.

The Tobermory trials again went well, and the 45 minutes on the bottom proved an asset to collecting Scallops, Cray-fish and Buck whelks. The Team had a few lobster pots, with varied success, Chief caught and ate the only lobster.

About this period after Tobermory trials little can be said. A short stay in Stonehaven, en route to Port Edgar, turned out to be a good run; we ran into an old friend of the branch, Jock Brown, now an ardent civvy with a yen to get a boat and go full-time fishing (and poaching by all accounts). He still refrains from too much drink, but with his wife had a wee dram in the mess.

At the time of writing, *Reclaim*, is steaming up Hardanger fiord heading for Nordheidsund, which is an out-of-the-way rock-laden town to which we are taking a dozen sea cadets for the trip, the ship's company for a 'jolly', and the team for a bit of fishing.

The team at present consists of Lt. Lafferty, C.P.O. Christmas, P.O. Gardener, P.O. Cornick, P.O. Handford, L.S. Smith, L.S. North, A.B. Fowles.

'Let's go out this evening,' the bored husband suggested, 'and have a little fun'. 'All right', returned his equally bored mate, 'and don't lock the front door if you get home before I do!'

'For twenty years,' mused the man at the bar, 'my wife and I were ecstatically happy'. 'Then what happened', asked the bartender. 'We met!'

THE SEA

PART I

THE study of the sea is known as oceanography, a recently coined word although this branch of science has been practiced for about a hundred years. The science deals with the composition of the seawater, its salts, minerals and gases; the movement of the sea, tides and currents; the composition of the seabed and the sea-shore; and life in the sea — animal, fish and plant. A study of marine climate must also be included for the weather has a direct effect on the conditions of the sea. Thus oceanography is, broadly a study for the chemist, the physicist, the biologist and the meteorologist. It will now be better understood why these articles must of necessity be of a very general nature since the writer cannot lay claim to one or even part of one of these qualifications.

It is not generally realised that the sea covers over two thirds of the earth's surface and that if it were possible to iron out all the irregularities on the earth's surface, the water would flood the land to a depth of about 2,000 fathoms. For statistical minded the sea occupies a volume of 324 million cubic miles as against the land volume of 23 million cubic miles, a ratio of 15 to 1. The deepest depth in the world, recorded is the Marianas Trench south of Japan, is over 36,000 feet deep which is about 7,000 feet greater than the height of Everest, and this is not an isolated case. There are other 'deeps' to the north of New Zealand and in the Phillippines all with depths over 30,000 feet, so capable of taking Everest. In addition great mountain chains or ridges rise from the sea-bed in all oceans some breaking surface to form islands such as the Azores and Tristian de Cunha. This immense underseas world has features which have probably remained unchanged since their formation and although covered with sediments they are basically the same. However, although development research into underwater vehicles capable of operation in depths of 20,000 feet is well advanced, these depths are of little practical interest to the diver, he is limited to the shallower waters usually associated with coastal regions.

If you trace a depth line around the coast you will find that it is not symmetrical but meanders all over the place, the distance from shore varying with the geographical location. The depth changes with the contour and gradient of the bottom, and this can be divided into three sections. Firstly from the shore to the 100 fathom line forms the Continental Shelf, from the 100 fathom to the 2,000 fathom line forms the Continental Slope and from here to deep sea-bed is the Abyssal Plain. The Continental Shelf, as the name indicates, surrounds the Continents and supports the land and generally all depths on the shelf are 600 feet or less, this depth line being taken as the seaward edge of the Shelf. Its gradient is dependent in its width and this varies considerably on different parts of the world. Off the west coast of America the Shelf is almost non-existent and the sea-bed drops away rapidly from the sea-shore, but off south west England the Shelf extends some 200 miles into the Atlantic and the gradient is a gradual one. Thus the Home Waters extended to Ushant in the south to the Faeroes in the north, and including the whole of the North Sea are within diving 'reach', the deep diving record being by co-incidence 600 feet. And for those who shudder at the thought

of a tin helmet and lead soled boots, let me assure them that techniques at present under development will soon bring this depth within the capabilities of the swimmer/diver. It is of interest to note here that Commander Cousteau's 'Conshelf' (an abbreviation of Continental Shelf) programme aims at living at 600 feet and sending divers down to work at twice this depth. The divers would thus be housed on the edge of the Shelf and swim or 'vehicle' down the Slope to the depth required.

One of the properties of the water which greatly affect diving operations is temperature and this of course varies with depth, latitude and the season. With few exceptions water temperature decreases with depth, with increases of latitude and of course is warmest in the summer months. At the equator the average surface temperature is about 88° F., making suit diving almost unbearable while in the Polar waters the temperature can drop to 20° F., the freezing point of sea-water in those regions. Around the British Isles the average is about 52° F. which is 14° lower than the average for the whole of the northern hemisphere. It is a strange fact that the water in the northern half of the world is on average 3° higher than that in the southern half so that a diver in Portsmouth enjoys warmer dips than his opposite number at Auckland Island, to the south of New Zealand, both places being on the same latitude. The sea is warmed by the sun so that we can expect to find the higher temperatures in the sunniest regions. This is generally true and we find that the sea gets progressively colder as we move away from the equator, and it warms more quickly after clear days than after dull overcast days. Water can absorb greater quantities of heat than any other substance and conversely it can lose large quantities of heat without much reduction of temperature. This is almost the reverse of the majority of solid substances including the land. If you imagine the sun shining at the same strength on two similar sized areas, one of water and one of land, the land will become hotter more quickly than the water during the day, although the water will absorb more heat in that period. Similarly when the sun has set the land will give up its heat more quickly than the water and will become colder. This property has a decisive influence on the climate, and where the land is bordered by wide oceans as is the British Isles, the climate is moderated by the sea and extremes of air temperatures are unlikely. If the oceans were as still as the proverbial mill pond, the sun's radiation would penetrate the surface layer to heat the waters below, the depth of penetration being dependent on the transparency of the water. In the clear oceanic water over 75 per cent of the heat is absorbed in the first 30 feet, and in turbid coastal waters 99 per cent. is absorbed in the same depth. So unless there is some means of mixing the water the heating would in the main be confined to the upper 30 foot layer, and diving below that depth would be a very cold business. But we know that this is not the case for the wind causes the surface waters to be stirred, the stronger the wind blows the deeper will be the effect resulting in a surface layer of water of about the same temperature.

Currents also affect the distribution for they are capable of transporting large bodies of water many thousand of miles, the temperature being dependent on the origin of the current. Currents are a form of ocean rivers produced mainly by the action of the wind. Perhaps that with which we are most familiar is the Gulf Stream. This body of warm water is the result of the South East Trade winds piling up water in the Gulf of Mexico which pour out in a north easterley direction along the Florida coast across the Atlantic to North West Europe. This warm stream travelling at the surface at about two knots, influences water conditions along the coast of Norway and as far north as Spitzbergen. In contrast to the Gulf Stream, the Labrador and East Greenland currents both originate in the Arctic regions and flow southward to bring very cold water conditions to the adjacent coastal areas. The result is plainly seen when one considers an ice free harbour in Norway in the winter, and those in Greenland and Labarador, at the same laltitude both completely frozen over.

The Labarador current in its southward passage meets the Gulf Stream to the south of Newfoundland and a temperature change of 10 to to 15° F. is experienced over a distance of less than a mile. This meeting of waters of vastly dissimilar properties results in vertical movements of the water due to the differences of density of the two currents. The colder water will sink in the lighter warmer water. Incidentally in coastal waters sudden changes of temperature are unlikely to be caused by currents but are more probably due to off-shore discharges or land flow, the latter being particularly noticeable after a heavy rainfall. When decsending to the depths another change of temperature may be experienced at the lower limit of the surface heated layer, the depth at which the sun's warmth has penetrated. In the Mediterranean in the summer months with little or no wind and constant clear blue skies, the depth is around 50 feet but in the Home Waters it will be much shallower and not nearly so marked. G.A.F.

Portsmouth Command Ex-Ped Diving Equipment

RECENTLY we acquired a number of 40 cubic feet compressed air cylinders, an assortment of demand valves, webbed harnesses, fins, masks, snorkle tubes and various other bits and pieces.

Unfortunately as the previous users had little working knowledge of this type of equipment it deteriorated, until when it was handed over, very little was in safe working order. At the moment of writing, the gear is being thoroughly overhauled, serviced and tested.

By the Spring of 1965 it is hoped to have an operational store of aqualungs and accessories. A series of rules are being constructed by the Ex-ped Officer which will be published in the near future.

Ideas are being circulated as to the best method of adopting this gear for public use. Training programmes for keen inexperienced personel will be held, with weekend banyans, excursions to good diving sites — which are out of reach in the normal run of service diving — for all interested.

A comprehensive report will be made in the next issue (Vol. 12/1) when the rules and a suggested programme have been developed. V.G.

DIVING UNDER THE ICE

IN the winter of 1962, our summer, a number of dives to depths ranging from 10 to 150 feet were made under the ice at McMurdo Sound in the Antarctic. The divers used the American S.C.U.B.A. (self-contained underwater breathing apparatus), which is an open circuit compressed air set, and wore a neoprene foam 'wet' suit for inner heat insulation and a dry suit with built-in hood and mittens for outer protection. This combination proved very successful and enabled dives of up to one hour duration to be carried out without undue discomfort. To make the dive through the ice a hut normally used for scientific observations in the polar area, was placed over a selected location for the ice hole. The ice, varying in thickness from 2½ to 6 feet, was cut and entry to the water made through a hole in the floor of the hut. A diesel oil stove in the hut maintained the temperature above freezing point so preventing the hole from icing over and of course providing a comparatively warm shelter for the diver when he surfaced. A life-line was used to enable the diver to return to the hole and to provide a means of communication. During the mid-winter months there are 24 hours of darkness so underwater floodlights were used to enable photography and visual observations to be carried out. The marine life in the water dies as the darkness decreases leaving the water exceptionally clear during the 24-hour nights. Such was the visibility that a fountain pen light was lowered to a depth of 330 feet and could still be seen. The dives were carried out by a group of young American biologists, who were engaged in other scientific work during their stay.

No, its not McMurdo Sound in the Antarctic. It's Horsea Island, Portsmouth, Winter, 1962.

Sapper Divers Help in African Lake Project

THOUSANDS of years ago when Africa's highest peak, Mount Kilimanjaro, was still an active volcano, a few miles south-east of the mountain the earth gave a final fiery belch and blew a square mile hole in its crust, and today the results of that attack of geological indigestion is known as the Chala crater.

Water-filled, and ranking as the third largest volume of water in Kenya, Chala has long been one of nature's mysteries. The source of its estimated 2,000 million gallons of pure water and its outlet have never been discovered.

With a view to tapping this huge, natural well for irrigating nearby farms and sisal estates, the Kenya Government decided to go ahead with the survey of the Lake and asked 34 Independent Field Squadron of the Royal Engineers for help.

Shaped like a huge bowl, with a sheer drop of 200 feet from the crater lip to the water level, it was impossible to get the Government hydrological engineers, geologists, surveyors and their equipment down the rock face, so the Sappers first task was to build a track.

Clinging to the crater wall like flies and working in temperatures which topped the 95 degree Fahrenheit mark, the Sappers blasted away more than 1,000 tons of volcanic rock with plastic explosive and moved another one thousand tons with pneumatic rock-breakers, picks and shovels.

For the local African population the whole operation proved to be an eye-opener. It was the first time many of them had seen Europeans stripped to the waist doing manual labour, and despite politicians claims of equality for all in the newly independent nation, one villager was heard to comment indignantly: 'This is no work for wazungu (Europeans), it is work for Africans!'

Because of the purity of the water in the crater, Government experts suspect the lake is fed by underwater streams, possibly originating in the Kilimanjaro snowfields and rain forests. To keep a check on fluctuations in the water level, the Squadron's frogment have installed a 60-foot vertical tube — 40 feet of it underwater — fitted with measuring instruments. At times the lake is said to have a rise and fall of 60 feet.

The erection of this 2 foot diameter pipe presented its own difficulties. But the squadrons 'boffins' put their heads together and eventually solved the problem of providing the divers with a floating working platform by designing and building a prefabricated raft. Built in two 7 cwt. sections the raft was lowered 200 feet by ropes from the workshop area at the top of the crater and assembled on the water. A steel girder tower with hoist was then used to lower 12-foot lengths of the level recording pipe through a trap in the centre of the raft to the frogmen under the surface. The pipe is bolted on to steel legs which are concreted into a 40-foot deep rock ledge which runs round the perimeter of the lake. Most of the lake is estimated to be about 300 feet deep. The raft was also used to aid the Sappers in building a metal catwalk from the pipe to the shore.

As well as the normal hazards of working underwater, the frogmen also had to deal with a number of inquisitive crocodiles. Small underwater explosions soon persuaded them to move to the other side of the lake, but unfortunately for two of them it was a case of 'curiosity killed the croc' — their skins are now being turned into handbags and wallets.

When the survey itself begins, radio active isotopes of Tritium — its radiation is so weak it can be stopped by a sheet of newspaper — will be dropped in a regular pattern over the lake's surface. The rate at which the radiation thins will indicate the replacement rate of the water. Geiger counter tests will be made on nearby rivers, streams and springs and from their Tritium content the surveyors will be able to find which are fed by Chala.

Though contributing to the future of Kenya's developing agricultural industry, as far as 34 Field Squadron was concerned, the project was looked upon as a training exercise. Lake Chala was classed as 'an earthquake disaster area' and the object was to test the Squadron in a speedy air move from their headquarters at Gilgil, 300 miles from the lake.

Living and working under operational conditions, the Squadron proved its men and equipment were capable of dealing with any situation despite the arduous heat conditions. Though the unit has already built roads, bridges and airfields in all parts of Kenya, Uganda and Tanganyika, including a mountain climbers' hut 15,500 feet up Mount Kilimanjaro, according to the Commanding Officer, Major M. P. Bull, this was the first time they had worked together on one project as a complete Squardon. 'It's not very often we get the chance of a project of this scale', he commented. 'There was work for nearly every tradesman.'

For the local African population the track down will bring many benefits. As well as opening up the lake for swimming and boating by tourists, it will mean that villages from nearby Taveta can use boats to net some of the millions of Talepia (a tasty white meat fresh water fish) for sale in the fish markets of Kenya and Tanganyika. 'May God go with you in your work', wished a village elder to the Sappers as he watched his fellow tribesmen bringing in the first catches.

This article, written by Alan J. Forshaw, Army Information Officer in Kenya, was first printed in *Sapper* in July 1964.

EXTRACT

THIS IS AMERICA

There are 16,500 psychiatrists registered in this country. America is burning with curiosity about herself, and each day lies down on the couch to await another incredible revelation.

The latest comes from Dr. Dietrich Heyder, Director of the Mental Health Centre of the U.S. Navy base in Norfolk, Virginia. He has been studying frogmen, and will undoubtedly break the navy's heart with his findings. For he reckon's the best frogmen 'are frightened of women and appear to need this masculine and adventurous occupation to prove themselves he-men'.

Dr. Heyder was called in to find why three out of every four sailors flop frogmen training tests. Most failures said: 'I get lonesome for my girl friend' and 'My wife wants me to drop out'.

This led the Doctor to his sensational conclusion that frogmen who fail think there is nothing like a dame whereas there was 'something lacking with the successful'.

Diving Report from H.M.S. "Vidal" during first Surveying Season—

Vidal Statistics

WE commissioned in the middle of September 1963 and after trials and a short work up (unlike the 'Grey Funnel' Line only a week long) sailed for the delights of Hamburg. We did little diving during these early stages, except down the 'Reeperbahn' and having recovered our senses somewhat, found ourselves in Oporto and not too far from the Douro vineyards. Here we had a dip, not in the vineyards but in Port Leixoes outer harbour in order to get the whole team together; it was unfortunate that the bottom was uninteresting and only one forenoon could be spent on the job.

With sad hearts we left Leixoes on the evening tide of 21st October, but we had the thought of Trinidad in three weeks time and the 70/70 rule, that is if the visibility and temperature fall below these figures scrub round the dip and earn your make'n mend under the Bosun's eager eye! The ship was undertaking an oceanographical cruise nicknamed 'Navado' which necessitated running east—west lines across the Atlantic from West Africa to the Caribbean and vice versa, stopping about every third day for a station, when bottle samples, cores, bottom photographs and secchi disc were taken as well as seismic runs when the weather permitted sending away the motor cutter. During our first visit to Chaguaramus, Trinidad, the object of which was to establish a detached survey party, we had several interesting dips, one of which took us over 120 miles of rugged Trinidad hinterland to the Serpents Mouth.

The Serpents Mouth is a narrow passage between Venezuela and Trinidad and lies in the murky delta of the River Orinoco. We had been requested by the Port of Spain harbour authorities to investigate and re-fix a wreck, the position of which differed by two or three miles on the American and Admiralty charted symbol. We were transported to our destination by a combination of Land-Rovers, punts and harbour launches and eventually anchored to windward of the wreck at 1400 after a hectic journey, which once involved pushing the harbour launch off the putty. The stem of the wreck was just visible, being low water, and it was our job to determine if it would be possible to demolish it or erect a light on it. Three divers went down and all concluded that a light was the solution. The obstruction abounded with fish but due to its location visibility was none too good. Having fixed the wreck's position by sextant and transit (it was where the Admiralty chart put it) we started the trip back, stopping off at all the requisite bars, etc. en route and finally arriving back at the ship at 2100.

The following day we had a dip in Chaguaramus Bay to determine a strong set around the jetties there. Numerous ships had had difficulty berthing due to some strange effect but nothing abnormal could be found.

After these two operational dives we had two further days away from the ship with the aqua-charger and banyan lunches; one of these we spent in Scotland Bay on the North coast of the island and the other with the Trinidad Sub-Aqua Club in Goodwills Bay on the West coast. The latter was of particularly good

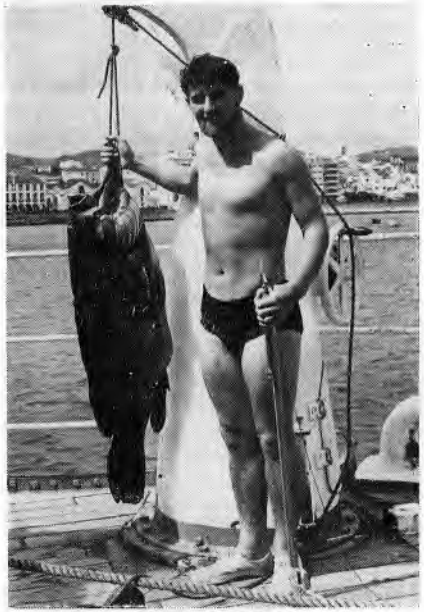
value. We had arranged our rendezvous with the Sub-Aqua Club in order to search over the wreck of a galleon lying in 60 to 70 feet. We spent the whole day absolutely enthralled by the superbly clear water and the remains of what was once a fine sailing ship. We benefitted greatly from the advice and local knowledge of the club and were very grieved to hear later that two of them, Adam Richards and Victor Abraham were drowned in a rock fall at the Guacharo caves, near Oropouche. We all send our heartfelt sympathy to their families for their tragic loss.

Our dive in Scotland Bay was also of good value with splendid visibility and many varied rock faces and ledges to explore. Here also we discovered the functional value of our portable charger, which we had specially supplied for our detached parties: it took nearly two hours to charge one set to 110 ats !

Across to Bathurst in West Africa and back saw Christmas in Trinidad and New Year in Barbados, obviously no diving, anyway the Bosun, as seems to be quite common with Bosuns', wanted his hands for painting ship. Across the vast Atlantic wastes again and back to U.K. via the Canaries for a short 'tie up' and the fitting of new equipment. During this latter period we were lucky enough to have Lt.-Cdr. Huyskens of the Royal Netherlands Navy with us to help us out in our oceanagraphical role. As many of the more staid readers will remember he gained distinction during the war by his bomb and mine disposal work underwater.

Two months in U.K. in winter is is not an ideal time for diving having just returned from the glorious conditions of the West Indies but still we divers can grin and bear it and we had two or three dips on the ships hull both in Chatham and Portland before sailing again for warmer climes, this time Spain. Running from Cadiz and Gib. we are now surveying the western approaches to the Straits having had runs in Lisbon, Azores, Cadiz and Casablanca none of which are exactly good from the health point of view.

The Azores, however provided us with excellent opportunity in clear waters once again and we spent a day spear fishing off Punta Rosto Do Cao near Ponta Delgada. We had a couple of good catches and managed to land a 62 lb grouper, Ballantyne will tell you that it is nothing to him, but then he would; a photograph is enclosed to prove it, and he still swears that it wasn't dead before he caught it!



A/B Ballantyne with his catch

Back to the U.K. at the end of August for our four month 'lie up' and some well earned leave — for some; January 1965 will find us in the Caribbean once more, this time for eight months and perhaps more time to take advantage of the very favourable conditions, which we all look forward to again. To keep tally on fellow divers Lt.-Cd.r Campbell has recently left us for the Hyprographic School, Plymouth: we hope he is enjoying life in the gloom of the Sound. Lt. Russell will be going shortly to the Orient and it only remains for me to sign off, wishing well and list the rest of the team, which are:

Sub-Lieut. C. Gobey, S.W.D.
L.S. Howe, Sh.D.
A.B. Birkett, Sh.D.
A.B. Snell, Sh.D.
A.B. Ballantyne, Sh.D.
A.B. Goodland, Sh.D.
R.E.M. Bunker, S.W.D.

C. S. GOBEY (Sub.-Lieutenant).

One-hundred and Sixty-five Diving Accidents

by

SURGEON-CAPTAIN STANLEY MILES, *Royal Navy*

THERE are very few occupations or sports which do not have some hazard, in fact it might be said that the hazard is one of the challenges which make the occupation worthwhile and the presence of any danger encourages care and perfection in techniques. The growing practice of diving is not without its risks and, as many techniques in this field are relatively new, there is still much to be learnt.

The object of this paper is to review a series of underwater accidents and see if any recommendations can be made to increase safety. Any worthwhile activity where injury or loss of life are accepted as outside possibilities should be so planned to ensure that these are kept at a minimum level. What are the accepted death and injury rates for any activity must vary considerably with the enthusiasm or profit in that particular field. Always there must be striving to reduce it and always it must be very small or the participants will be discouraged and its progress lapse.

As diving becomes established, and this is certainly true of the commercial and military diving, so techniques improve and the practice becomes safer. The following study of 165 accidents is taken without bias and covers without omission incidents which have been reported to the Royal Naval Medical School within the last five years. Diving organisations are of course always proud of their records of safety and reluctant to disclose their misfortunes; thus some of them have not contributed to this survey. On the other hand there have been many others who realise that the more publicity that is given to accidents, the more effort will be made to prevent them. Although fuller details are available, these records are presented without disclosing the individual's name, country or occupation. Reports have, moreover, been received from many parts of the world and though they may not be directly applicable to diving in this country there is a worthwhile lesson to be learnt from every one.

The accidents studied are those which may have occurred either in naval, commercial or recreational diving. Incidents of Decompression Sickness involving 'Standard' (hard helmet) divers have been intentionally omitted. These have been reported in a separate paper by Slark (1962). Table I divides the cases in appropriate groups, there being 45 fatal and 120 non-fatal.

TABLE I

Summary of 165 Diving Accidents

Cause	*Fatal*	*Non-Fatal*
Asphyxia	18	6
Anoxia	8	14
Illness in Water ...	5	10
Oxygen Poisoning ...	5	5
Syncope and Collapse	—	40
Pulmonary Barotrauma	4	4
Decompression Sickness	—	27
Shark Attack	3	—
Ear Injuries	—	7
Other Causes	2	7
	45	120

The difference in incidence between the fatal and non-fatal cases is not as great as might be expected. The non-fatal accidents owe their survival for the most part to good planning, efficient safety organisation and alert comrades.

It has not been easy to place every case into tidy groups as frequently there is a combination of circumstances which makes a decision difficult. Discrepancies will, however, be explained as the narrative proceeds.

Asphyxia

It has not always been easy to separate cases of asphyxia from those of anoxia. Generally speaking, in asphyxia, breathing has become a physical impossibility as, for example, with loss of a mouth piece under water. Anoxia, on the other hand, is a condition of a more gentle onset where a gradual fall of oxygen partial pressure in the lungs results in loss of consciousness. Of the 18 fatal cases of asphyxia, 8 lost their mouth-pieces and drowned. At least 4 of these were inexperienced divers who, when water entered the face mask, lost their mouth-pieces in attempting to expel this water and being unable to regain them, drowned, no doubt with some degree of panic. Another was pulled off when an underwater object was fouled. In 4 the life-line was inadequate or absent. Of the remainder there were 2 who died from inhaled vomit. (In both these the post mortem showed stomachs containing exceptionally large amounts of undigested and un-chewed food).

In many cases divers completely fail to appreciate the hazards of the conditions into which they are diving and may be swept away by strong tides or currents or become wedged in awkward underwater constructions or wrecks. Two typical examples concern fairly expert underwater swimmers with aqua-lungs, exploring a tunnel leading from an underwater cave. The operation was a long way from civilization and although some reserve equipment was taken this was minimal owing to the distance it had to be carried from base. As things turned out the task was much too hazardous, both men being trapped in the tunnel. The one single outstanding error was the use of a nylon tape as a life-line which parted where it had been joined with adhesive tape!

Another disaster resulted from a diver swimming along an underground tunnel and not having the slightest idea about the endurance of his breathing set. Operating alone must also be condemned as illustrated by an underwater fisherman so interested in his work that he

surfaced a quarter of a mile from land worn out, with adverse winds and currents and had no chance of getting ashore.

Six non-fatal asphyxias are alive today because — in spite of their difficulties which included entanglement in underwater objects, entry of water into apparatus, flooding of a suit through a broken face-glass, faulty breathing tube connection and a painfully tight hood which pressed on the neck with change of posture— they all had life-lines and stand-by divers and attendants were alert and active.

Anoxia

Anoxia cases frequently result from inexperienced use of closed or semi-closed circuit breathing apparatus where the oxygen content of the breathing bag fails frequently due to cylinders becoming empty. This accounted for 5 of the 9 fatal cases.

The large number of deaths of spear fishermen as a result of anoxia following hyperventilation and long underwater swims, have not been included in this series as these men do not use breathing apparatus. One death, however, occurred in a diver who, as part of his training, was practising free diving down to 33 feet following hyperventilation. After one such dive he lost consciousness on the surface, sank and disappeared. Here again adequate supervision should have saved him. Another experienced diver working on a towed bottom search lost his marker buoy. He surfaced and was seen re-tying a spare to his shoulder, but was later found dead on the bottom. In this instance the diver surfaced, opened his mouth-piece cock to atmosphere and closed his main bottles. When he entered the water again he changed the breathing cock to his mixture but forgot to open the main bottles. Another rather sad case occurred when a completely inexperienced diver borrowed from a friend an apparatus which was pretty well exhausted. He went into the water alone while the rest of the party disappeared into a cafe for tea. This was a closed circuit oxygen breathing set and the diver carried out none of the routine drill for ensuring there was oxygen in the bag. He had no life-line, no attendants and the reserve flow was not switched on. His body was found much later. There can be no worse example than this of absolute failure to observe even the most elementary precautions. Over and over again this is the same story, gross neglect of the most obvious and simple safety precautions.

In the 14 cases of anoxia in those who survived, five resulted from running out of breathing mixture before the end of the swim, one with a set which had previously been used and two who, thinking they had just enough gas left to see them through, didn't bother to go on to their emergency supply. Even in the best planned organisations gross human errors occurs and there were 4 shocking examples, three where divers entered the water with oxygen bottles filled with air and one with nitrogen. These instances occur in spite of the strictest regulations about handling and labelling gas cylinders. Until these mistakes can be made absolutely impossible, diving with mixtures of hydrogen and oxygen cannot be considered however desirable. Of the remaining cases a faulty set accounted for one and the remainder were divers practising without breathing apparatus and using the dangerous technique of hyperventilation prior to a strenuous underwater swim.

Illness in the Water

The underwater environment is an adverse and sometimes hostile one in

which man, to survive, must remain alert and fit. Anything which lessens his efficiency can be disastrous. The events described so far have been accidents, but experience has shown that equally important is illness. Just as acute medical emergencies occur on land, so will they occur in water where the chances of recovery are greatly lessened. The 5 fatal cases under this heading include 2 heart attacks, 2 acute virus pneumonias and 1 epilepsy. One of the heart attacks occurred during the dive and decompression sickness was suspected. He finally died whilst undergoing therapeutic decompression. The other of particular interest was a young man of 21 who felt ill in the water soon after entering with a closed circuit oxygen breathing apparatus. He collapsed whilst trying to climb out and fell back into the water (his life-line was insecure and pulled away at this moment). He was found about 2 hours later on the bottom at a depth of 40 feet still breathing with his set in position and, though he regained consciousness, he died some hours later with a pulmonary haemorrhage. Post mortem examination showed complete blocking of one of his coronary arteries. His survival for so long on pure oxygen at this depth indicates the value of high pressure oxygen in coronary occlusion. The 2 cases of pneumonia described are very important. There may well be changes in the distribution of air and blood in the lungs during diving which encourage the spread of respiratory infection. Though these two patients were relatively fit before entering the water one died before leaving it and the other some hours later in hospital, both with typical haemorrhagic pneumonias.

Four of the non-fatal cases had upper respiratory tract infection which would lower resistance, particularly in an underwater swimmer with the added load of a breathing set. In many cases it is quite frightening to watch a man who has left the water in this condition. There is a very rapid onset of acute respiratory distress, occasional cyanosis, cough, pain in the chest and an X-ray which shows scattered patches of dullness. Without adequate nursing, oxygen and anti-biotics, these men become acutely ill.

The lesson to be emphasized here is that in no circumstances whatever should any diver with evidence of upper respiratory tract infection enter the water until he is completely cured and it might be wise to wait for a week or so even then.

The remaining non-fatal cases consisted of 3 epileptics and 3 who dived during an epidemic of gastro-enteritis and complained of dizziness and nausea underwater. Two of the latter were very lucky not to vomit whilst underwater, though they did soon after coming ashore.

Oxygen Poisoning

Although pure oxygen is not extensively used today except by naval frogmen and in cave divers, it has the advantage of giving prolonged duration for the size of breathing apparatus. Its useful depth is limited to 25 feet, which, especially at night, may be difficult to control. For example, of the 5 fatal cases recorded, one intending to swim at 40 feet gradually reached a depth of 84 where he had a convulsion. The other stories are similar, except for one who was testing a new set in which 25% oxygen was breathed. After spending 11 minutes at 295 feet this diver had convulsions during his slow ascent, lost his face-piece and drowned.

Some of the non-fatal cases occurred in men who were trying to see just how senstive they were to oxygen. One, for example, convulsed

AMANDA BARRIE

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in a pressure chamber after 31 minutes on oxygen at 65 feet. Return to air usually produces rapid recovery. Another had a convulsion after half and hour at 50 feet and two more at 33 feet for 37 minutes and 33 feet for 40 minutes. All these are examples of the importance of keeping within the recommended limits in spite of a personal belief that one can do better. Even the accepted limit of 25 feet is by no means 100% safe, as for example in a diver who convulsed after 45 minutes hard swimming at 20 feet. In this case the convulsion may have been aggravated by the fact that only a few hours previously he had already dived on air for 8 minutes at 180 feet. Such a dive may indeed have produced some basic store of oxygen in his tissues.

Whilst on the subject of oxygen poisoning, although interest in this field is lessening in the diving world, experience of this condition is becoming of great importance in medical practice today. Hospitals are now using pressure chambers and high pressure oxygen to treat certain illnesses particularly those resulting from regional anoxia. The knowledge obtained from diving is proving of value.

Syncope and Collapse

This is rather a hotch-potch of less serious accidents. It will be seen that there are no fatal cases but 40 non-fatal. These include those cases where there is complete loss of consciousness in the water from one cause or another. In mishaps on land, little attention is paid to casual loss of consciousness and simple fainting, but in water such may be a prelude to drowning. Indeed statistics show that whereas on shore only one in a hundred accidents involving unconsciousness had a fatal outcome, the incidence in water is one in two. Thus any person who loses consciousness in the water has a 50–50 chance of drowning. For this reason alone special care must be paid to this apparently simple condition. Loss of consciousness is basically due to an inefficient supply of oxygen to the brain. Though many conditions will produce this effect there is invariably more than one predisposing factor summation of which will produce the unconsciousness. When oxygen was widely used for underwater swimming, episodes of unconsciousness were relatively common particularly in men in the early stages of training who were often frightened and always apprehensive. Such apprehension produces hyperventilation which, by washing out carbon dioxide, renders the individual most susceptible to fainting. Oxygen, too, has also been shown to lower the syncope threshold. Other factors which aggravate this and increase the chance of loss of consciousness are fatigue, exhaustion, hunger, ill-health, alcoholic hangover increased intra pulmonary pressure and emotional stress. Postural changes in water, unlike those on land, are not effective and there is no parallel in the underwater swimmer to the fainting seen on a parade ground on a hot day.

This trouble can largely be averted by the knowledge of its existence and possible causes. It is certainly very rare with air breathing apparatus though it has occurred with oxygen rich mixtures. Examples which do occur are invariably associated with gross exhaustion or stress. The realisation that water is an adverse environment to be approached with respect will also help. Coming to terms with the environment is thus the most important single preventative factor.

Pulmonary Barotrauma

One of the most devasting conditions which can effect man underwater results from rupture of lung tissue liberating air into the circulation, the pleural cavity or the retrosternal interstituial spaces, of these three forms of pulmonary barotrauma, air embolism is by far the most serious. Bubbles of air may block vessels of the cerebral or coronary circulation with rapidly fatal results. In practice this may occur when the diver is ascending through the water having for some reason abandoned his breathing apparatus. Unless he is relaxed and allows free escape of expanding air from the lungs, an increase in intra-alveolar membrane to rupture. Only immediate recompression can save life in severe cases. It is for this reason that the various Navies of the world who practice submarine escape by free ascent in deep water tanks, install recompression chambers at the water's edge. This safeguard has been amply justified. There is, however, a growing tendency amongst civilian underwater organisations to train their members in 'free ascent' without immediate recompression facilities being available. The four fatalities reported under this heading were all undergoing such training in open water from depths of 60, 35, 34 and 20 feet respectively. In two of them no compression chambers were available and for the other two the intervals before recompression could be initiated were 13 and 20 minutes.

In the four non-fatal cases reported one had an uncomplicated retrosternal emphysema which cleared up with recompression. The second case, ascending from 20 feet after abandoning a faulty breathing apparatus, experienced a brief loss of consciousness, but recovered with evidence of pneumothorax. The last was quite unusual in that during a 25 feet dive there was considerable difficulty in clearing the ears. So much so that a considerable increase in intra-pulmonary pressure resulted with possible lung damage. After the dive he developed acute pain in the feet and had the good fortune to be seen by one of his country's most knowledgeable specialists in underwater medicine. A diagnosis of air embolism of the dorsalis pedis artery was made and there was immediate response to pressure therapy.

Accidents occurring during training in submarine escape have not been included in this series.

Decompression Sickness

In naval and commercial diving, decompression sickness has for many years been an accepted hazard for which routines of treatment by recompression have been evolved and accepted. The introduction of the self-contained breathing apparatus has somewhat complicated the picture. The early sets produced did not contain enough air to enable the diver to remain in the water long enough at any depth to produce a risk of decompression sickness. In recent years, however, the number of cylinders used and their capacity has increased, so that it is now possible, in this type of diving, to be exposed to the risk of decompression sickness. This is particularly true where multiple dives are undertaken. This analysis does not include cases of decompression sickness occurring in the standard (helmet) diver, but is confined to those with self-contained breathing apparatus or the lightweight surface demand equipment.

One significant feature which underlines the increasing number of these cases in recent years is the fact that when the first 100 diving accidents of this series were tabulated a year ago there were only 6 cases of decompression sickness, whereas with the present 165 there are now 27 cases.

There is a lesson to be learnt from every case and all show a failure to use properly accepted decompression tables. Many dives were excessive in both time and depth. Others were aggravated by exercise immediately after the dive, or by delayed treatment. The most common mistake, however, was the assumption that once a Bend had occurred, all that was necessary would be to undergo the decompression schedule for the dive which had caused the Bend rather than the therapeutic schedule as laid down in the special treatment tables. Multiple dives too produced ten incidents in all of which no satisfactory routine seems to have been adopted. It is indeed unfortunate that even today there are no truly satisfactory tables for multiple dives and the only safe routines are very time consuming.

Some of the more outstanding dives which have produced decompression sickness may be mentioned:

(i) Five dives to 60 and 65 feet with an average bottom time of 67 minutes for which decompression was carried out as if each was a single individual dive. This produced a severe Bend and as there was no chamber nearby, a helicopter flight added to the patient's distress.

(ii) three 12 minute dives to 115 feet trying to salvage a sunken motor car. No decompression stops at all were used and a serious Bend involving the central nervous system developed after a delay of 3 hours. This dive elicited a comment from the expert called in for treatment that 'Such a haphazard dive deserved legal action'.

(iii) Dives to 66 feet of $3\frac{1}{2}$, $2\frac{1}{2}$ and $1\frac{3}{4}$ hours. The first of these would have been a good day's work but after the third when the diver had developed a Bend he went into the water again for 30 minutes at 70 feet and 50 minutes at 40 feet. This self-treatment which had little reason behind it naturally caused the decompression sickness to become very much worse and widespread. He too had to be flown to a pressure chamber 5 hours away where he made a good recovery on adequate treatment.

These are just typical examples of failure to appreciate the importance of adequate decompression for dives. Another aggravating fact which appears from time to time is delay in treatment, when the condition is allowed to become intolerable before help is sought. It is well known that the most minor cases of decompression sickness will recover with rest and conservative treatment. Two cases, however, were reported where these minor bends became severe because the sufferers, far from resting, spent the evening in dance halls 'twisting' their minor irritations into Bends of some severity. Such thoughtlessness not only aggravates the condition but invariably necessitates the personnel responsible for treatment being called from their beds in the early hours of the morning. In one case also an individual suffering from the aches and pains of a mild 'flu, developed Bends even though using the correct diving schedule and two others developed Bends in joints which had been injured during the actual dive.

Shark Attack

Three fatal shark attacks have been reported. It is generally believed that sharks do not attack divers underwater wearing dark suits and indeed the cases reported had in fact been wearing swimming trunks alone. One of the cases was reported from the Mediterranean where the shark menace has always been regarded as non-existent. No witness were present at the incident and the evidence is entirely circumstantial.

There is, therefore, an outside possibility of the diver having been damaged by the screws of a motorboat rather than by the teeth of a shark.

Ear Injuries

Minor troubles with ears are very common and invariably due to catarrhal conditions. sometimes temporary, causing difficulty in clearing the ears for changes in pressure. These are rarely reported and the present series includes four where the cause of the ear injury was essentially due to a badly fitting rubber hood and inefficient ear pads. Two were 'reversed ears' and one was temporary deafness following underwater explosion.

Other Causes

From time to time cases occur which do not fall into any neat classification and must be grouped together under 'Other Causes'. Of the two fatal cases, one was a diver who was killed in an underwater explosion. He was diving contrary to regulations and using a cutting torch, which was forbidden, in a compartment of a sunken ship. This compartment contained trapped pockets of air and a water surface thick with fuel oil. The inevitable explosion killed the diver instantly. It was only subsequently suspected that the reason for his irregular diving practice was the cutting away of valuable brass from the wreck for his own profit. The other fatal accident had also some connection with an explosion in that the diver was concerned with underwater blasting, losing consciousness shortly after a second dive, with paralysis of all limbs and death some weeks later. The direct connection between his work and dive is purely speculation, but underwater blast injuries very often produce a delayed affect.

The seven non-fatal cases include two instances of 'squeeze', three attributed to carbon-dioxide poisoning, one unknown and, finally, a rare occasion where a diver in a submersible chamber at 1,000 feet suddenly breathed air and lost consciousness from nitrogen narcosis.

Discussion

The main headings under which the various accidents have been classified are more-or-less the ultimate cause of the accident, but of particular importance to the diver and those concerned with his welfare, are the circumstances which are responsible for the final accident. A study of individual case histories make it possible to tabulate these predisposing factors.

TABLE II

Predisposing Factors in 165 Diving Accidents

Factor	*Fatal*	*Non-Fatal*
Inadequate Safety Precautions	25	—
Inadequate Training ...	21	95
Hazardous Diving ...	14	18
Failures of Apparatus	8	22
Illness in the Water ...	5	11
Personal Factors ...	2	31

Inadequate Safety Precautions

This applies solely in this context to the ability to remove a diver from the water should he become in difficulties and implies primarily, adequate supervision and attendance and the use of a life-line or 'buddy'-line. Absent or insecure life-lines, contrary to orders, account for six of these fatalities. Absence of life-line or adequate attendance was not a prime factor in non-fatal cases.

Inadequate Training

Quite frequently the would-be diver does not appreciate the restrictions of the new environment

and his enthusiasm may outweigh discretion. This plays a very big part in the causation of accidents. Failure to carry out the accepted routines which are recommended in all reputable organisations is the commonest cause of accidents. Inability to deal safely with a flooded face mask in the beginner may result in drowning. Faulty use of oxygen is another danger. Where decompression sickness can be treated with a simple diving schedule rather than the special therapeutic routines.

Training is of the greatest importance; it must be individual, patient and never rushed. The sea must be regarded as an unfriendly environment to be treated with respect at all times. There are many men excellent in other ways who are temperamentally unsuited to become divers. They should never be encouraged to do so and care should be taken to ensure that when they are released from diving training this is accompanied by no personal stigma.

Hazardous Diving

The very nature of diving must produce some degree of hazard. The more experienced the diver the more ready he will be to deal with such difficulties. Becoming entangled with underwater obstructions accounted for 3 of the 14 deaths and 4 were lost exploring inland underwater caves, a hazardous practice at the best of times needing extreme skill and caution. Injuries in the water may also occur, these are likely to produce incidents of decompression sickness even if correct schedules have been used. The fact that many breathing sets limit the depth and time underwater, leads to a practice of surfacing to change or recharge cylinders and doing many dives during a single day. This is a very frequent cause of decompression sickness and the available routines for multiple dives are so time consuming that many divers find them unacceptable. Where hazards to diving are known they should be avoided and if this is impossible, safety precautions and supervision should be intensified.

Failure of Apparatus

Breathing apparatus is as important to the diver as the aircraft to a flier and should be maintained with the same care. It may be wise to make the maintenance of the apparatus the responsibility of the diver who uses it. Exhaustion of the set is the frequent cause of failure. This may be due to sets being previously used without checking or lack of attention to time and pressure. Occasionally apparatus has been wrongly assembled and conexions have come adrift underwater. Examples of human error are well illustrated in 4 cases, luckily none fatal, in three of which oxygen cylinders were filled with air and a fourth with nitrogen. Perhaps the biggest single problem in the whole of diving is the need to eliminate human error.

Illness in the Water

To be safe underwater demands a high degree of physical fitness and good health. Circumstances may arise where the need to dive in an emergency or the reluctance to miss an opportunity may cause a person who is unfit to go underwater. There is ample evidence to show that even minor degrees of sickness, particularly infection of the respiratory system, do not make the individual more accident prone, but are themselves worsened by the dive. Attention to good health is therefore of the greatest importance.

Personal Factors

Though being primarily responsible in two fatal cases only, personal factors are of the utmost significance. Fortunately these are usually apparent during the training period when supervision is more or less absolute. These individuals can be advised or forbidden to continue with underwater activity. Amongst those who remain, however, there may be lapses from time to time and dives after over-indulgence in alcohol, following extreme exhaustion when hungry or over-fed, or when suffering from some anxiety or emotional stress may produce casualities.

Conclusion

Much can be learnt from the study of accidents which can increase the safety of diving as a whole. One single lesson which is apparent is that however tedious, time consuming or irksome be the rules and regulations in the best training manuals, there is no doubt whatever that strict adherence to them will reduce the accident rate by at least 75%. Provision of adequate communication and contact with the diver is at all times essential. Personal selection is also important as is the maintenance of good health. Attention to all the conditions associated with the dive is absolutely essential.

Reference:

SLARK, A. G. (1962). Treatment of 137 cases of Decompression Sickness. M.R.C. Report U.P.S. 215.

My Solent Swim

by

LT. MARTIS, *Indian Navy*

WHEN I came to England in May this year I was seriously considering an attempt to swim the English Channel. For this attempt I needed to do a great deal of practice in long distance swimming but more important, a great deal of acclimatization, as I come from a warm country and the temperature of the water around England is much colder than I am accustomed to. I could not start my practice until mid-July because I was kept fully occupied with the most difficult phase of my Clearance Diving Course, however, the daily swim off Horsea Island Lake could be considered as part of my work-up. I was quite confident about my endurance but more than a little concerned about the low temperature of the English waters.

The ideal conditions for the practice would have been those which nearly equalled the conditions in the English Channel. The experienced

long distance swimmers in the Solent Swimming Club, Portsmouth considered that three laps of continuous swimming between Southsea and Ryde, Isle of Wight would be almost equal to the swim across the Channel, and that the water temperature and tide conditions are similar.

I was fortunate to receive maximum support and encouragement from H.M.S. *Vernon*. Everyone seemed to be as interested in the venture as I was; but before I started practicing in the open sea I was required to prove my endurance. Sunday the 19th July was set for my test in Horsea Lake. I was required to swim 40 lengths of the Lake which is about 22 nautical miles. To protect my body against the cold water I covered myself completely with tallow. I commenced the swim at 1130. The temperature of the water was 62° F. Lt. G. A. M. Wookey, M.B.E. and Sub.-Lt. A. G. Lumbard acted as life-guard in turn. It needed a great deal of patience on their part to row up and down the lake in a dinghy.

At about 1400 I began to shiver, I had completed five lengths of the lake. My progress was slow but throughout the swim my speed was steady. A little later I began to experience pain in my stomach, I hoped it would subside after a while, but unfortunately it became more insistant. During my 10th lap I realized that I had to give up the attempt. Somehow I managed to complete my 10th and got ashore at 1630. By then my body had become very numb with the cold. I must have swallowed a lot of air during the swim as my stomach was full of it.

I was very disappointed with my failure but comforted myself by wishing better luck next time.

My next practice was held on Saturday 25th July. This time I wanted to swim from Southsea to Ryde, Isle of Wight and back, a total distance of about 10 nautical miles. The temperature of the water was 60° F., here again I used tallow to protect my body against this cold. I set out from Southsea at 1030 accompanied by a *Vernon* launch manned by my course officer Lt. C. L. Lawrence, M.B.E., his wife and family. To put this swim on an official basis I had joined the Solent Swimming Club and they sent a member of the club as time-keeper, life-guard and invigilator.

The weather conditions for the swim were excellent, sea flat calm with neap tides, a slight early morning mist which later turned to brighter sunshine. Everything seemed to be in my favour and during the first two hours the sun was bright and warm, and I was getting the best of encouragement from the children in the boat, which gave me every confidence for a good swim.

It was slack water period and my progress was fairly good. At about 1230 when I was about halfway between Southsea and Ryde I began to feel very cold and to make it worse the tide had by then began to flood and I was drifting with the tide in the direction of Southampton. In order to keep my progress in the direction of Ryde pier I had to swim against the tide. My progress was very slow and many a time I was on the verge of giving up but I knew that if I did I would never attempt the swim again and besides I would disappoint many including myself. As long as my speed was more than the rate, of the tide, I continued to swim.

At about 1500 I was very numb with cold and only about 200 yards from the shore to the East of Ryde Pier. The depth of water was about five feet, the bottom sandy and I could have walked ashore had it not been for the strong tide, but my progress was almost nil. That was the last I remember. When I came

too I was in an ambulance at *Vernon* pier, time 1630. I must have been unconcsious for nearly an hour. I was taken to R.N. Barrack's Sick Bay where they gave me heat treatment for about half an hour then sent me back to *Vernon* with instructions to take a complete rest.

Later I learnt from Lt. Lawrence that when I was near the shore to the East of Ryde Pier, he noticed that my behaviour was rather peculiar and I was drifting fast with the tide, he threw a rope's end, which I am told I refused to hold.

He was quite disappointed when he realized that I could not swim the remaining 200 yards, let alone the return journey to Southsea. But he was left with no alternative but to pick me up.

I am indebted to all those who took keen interest in my venture, particularly the Captain of H.M.S. *Vernon* and the staff of the Diving Section. I tried hard but I did not succeed. Maybe I need to try harder.

* * *

By Lt. C. L. LAWRENCE

Lt. Matis actually touched bottom to the Eastward of Ryde Pier but he could not be persuaded to walk; two people were standing in the water alongside him but he did not understand who was talking to him or what they were saying. It was then that I realized his mind was a blank, and we assisted him into the launch; he could stand, but was still throwing his arms above his head as though he were swimming, and even after laying on the deck — covered with as much clothing that could be found — he still lashed out with his arms as though he was in the water.

His endurance and determination was of a very high order and full marks should be given for a very gallant attempt, but I think he was beaten by the cold of our waters.

The Birth of a Team

ON the 15th February, 1962 seven men were gathered together to form, what was to become after many changes, the Plymouth Emergency Deep Diving Team.

During the first year of life the team lived at H.M.S. *Vernon* where all the preliminary trials to 250 feet were carried out. It was during this period that the team stood by on free ascent trials in the Mediterranean carried out several interesting jobs in Scotland, and not the least of their achievements was the excellent work on screw changes.

It was on the 1st April, 1963 that the team moved to its permanent home in H.M.S. *Drake* but since then due to pressure of work and lack of deep water, have spent little time there.

The team dives from two medium gemini craft and a small gemini as safety boat. The working gemini contains all diving equipment, panel operator and assistant. The second gemini has the standby diver and attendants. The supervisor is in the safety boat. The one-man recompression chamber is always situated within two minutes by safety gemini from the diving gemini either on a suitable ship or on the shore.

The team has carried out many jobs over 30 fathoms as well as the multitude of other jobs required of any Clearance Diving Team. The most interesting operation was perhaps, the successful salvage of a Wessex Helicopter ditched in 240 feet of water, in a tideway, with a considerable swell running.

The wreck was located by A.S.V. *Barglow*, using a mine sweep, after a likely target had been found by H.M.S. *Rothesay*. The first diver went down and confirmed the contact was the Wessex. No signals could be got through to the diver so he was pulled to the surface after fourteen minutes and put on Therapeutic Table 1 (Table 5 and part A) as a precautionary measure. The second diver took down the strop and male portion of the recovering device. The third diver secured the strop to the roter head and hooked on. No signals could be got through and the diver was pulled to the surface after 20 minutes in the water. He was put on Therapeutic Table 2 (Table 5 and part B) as a precautionary measure. The cone end of the recovery device was lowered down the messenger and the last diver checked it. The wreck was lifted by *Barglow* using the $4\frac{1}{2}$ plaited nylon, the weight being transferred at 20 feet to the barboats mains. Unfortunately the tail-plane snapped on the initial lift and was never recovered

To maintain an operational depth of 250 feet a considerable amount of practice is required and regularly once a month, the team packs up and moves to Loch Fyne where the conditions are not always pleasant but diving is always possible, and those in the Far East Team, who think that they have a monolopy in sharks should join us there, where sharks and seals abound, as well of course, as other slightly more edible fish. Of an evening the team may be found refreshing themselves at the 'George' if not there, then probably one of us is languishing in our torture chamber, namely the one-man pot. Whatever the case, on return to the temperance, Miss Mac, whom many of us know, is there with a welcome, and we would like to express our appreciation and admiration for the way in which she mothers all of us and supplies the trenchermen in the team with all they can eat. No mean task I might say.

In the store in H.M.S. *Drake* the team has started a trophy wall containing mementos of operations and runs ashore, the history of items being quite interesting. The jumbo comb for example, was presented by H.M.S. *Shoulton*'s team when we were working with them off Brixham, why, I can't think!

Congratulations to our wives, all of whom have presented us with bonny babies, and to those who have left us to become C.D.I's. Our best wishes to Bill Crimmons in his future career. NEMO.

A top Soviet atom-scientist, staying at a New York hotel, was impressing the Americans by spending money like water. A waiter turned to his colleague and said: 'That Russki atom-man is getting rid of his dough like the world was going to end tomorrow'.

The second waiter went pale and said: 'Do you think he knows something ?'

A Spanish fishing boat fired a distress flare when the engine broke down. The rocket fell back and blew a hole in the boat which promptly sank.

* * *

Seen near a school, a safety-first poster: 'DRIVERS TAKE CARE—SCHOOL — DO NOT KILL A CHILD'. Beneath, in childish scrawl, was 'wait for a teacher'.

Death Lies at 43 Fathoms

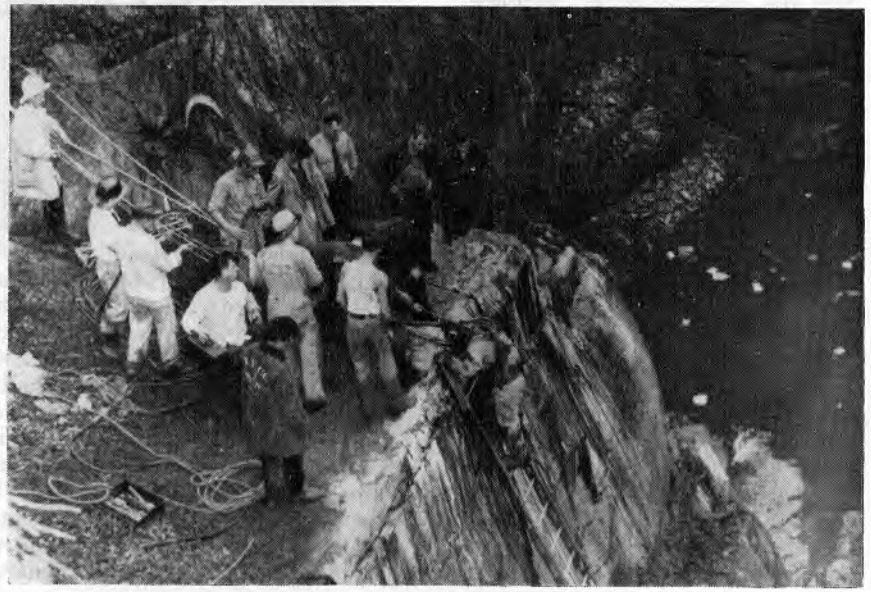
IT was approaching mid-day on Sunday 18th August 1963 when Captain Henry Suida, Chief of the Telford Diving Unit, received a telephone call from Blue Mountain Control Centre, Wind Gap, Pennsylvania, reporting on a drowning.

The Telford Unit received imediate recall, when mustered they were briefed as follows:—

A boy of 16, diving to 180 feet in an unfamiliar quarry lake, had got into difficulties, losing his regulator (demand valve) and subsequently losing consciousness. His companion, aged 17, tried to bring him to the surface. However the unconscious lad was far too heavy and eventually slipped from his rescuer's grasp.

On arrival at the scene, the Telford Diving Unit found that the quarry went down in 40 feet ledges to a depth of 257 feet, with the area at that depth being 200 square feet. As the deepest they could use their S.C.U.B.A. — single 72 cubic feet cylinders — was 202 feet, with 175 as their normal maximum, they set about preparing their Mark V gear (Standard equivalent). The gear having been prepared, checked and calibrated, J. S. Klaus, Telford's Chief Diver, was dressed and started his descent. Suddenly, at 140 feet, he reported he had no air, at the same time as the compressor supervisor reported a drop in pressure from 130 lb. to 75 lb. By this time Klaus was beginning to get pressed into his breastplate and to avoid any serious injury he was brought up. At 100 feet the pump returned to normal, so he was given stops at 30, 20 and 10 feet. On reaching surface he was treated for a minor squeeze.

Two factors now presented themselves, first, the compressor required complete overhaul; second, to carry out the job in S.C.U.B.A. necessitated pumping out the quary to reduce the depth to 175 feet. The



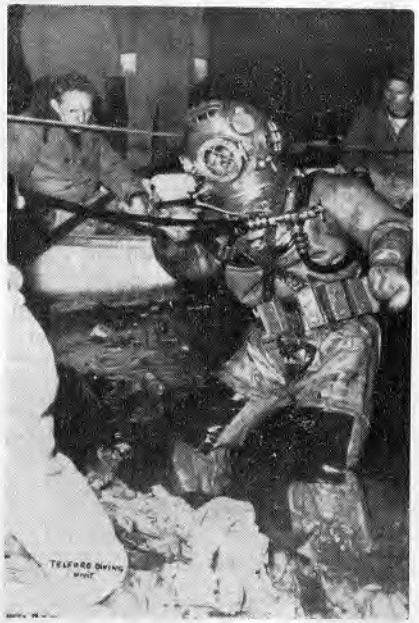
expense of the latter and the lack of power supply at the site initially prohibited this. On Monday morning, therefore, the S.C.U.B.A. divers in pairs searched the ledges to 150 feet, then swimming at that depth towed magnets and grapnels. By 0100 on Tuesday they had achieved nothing. other than the loss of several grapnels — fouled on the bottom — so operations were ceased until the following Sunday.

Arriving at 0900 on Sunday they found to their delight that preparations were being made to pump out the quarry, but also that the Federal Government was going to take over when the depth was reduced to 200 feet. However, In the meantime, the Unit carried on with towing grapnels and magnets until Monday night when, still without success, they returned to Telford.

On Tuesday a unit from the U.S. Navy arrived and took over completely. With underwater closed circuit T.V. camera's they hoped to pin-point the body, then grapnel for it. By Thursday the level was down to 216 feet but the exposed sides of the quary were now showing dangerous signs of caving in. At this stage the Navy decided that the end did not justify the hazards and difficulties of the operation, so they called the whole thing off.

Upon which the local authorities called in the Telford Unit once again. By this time the compressors had been thoroughly overhauled and the equipment checked; and on Saturday 31st August, preparations were made for Deep Diving. A jetty had to be made to take the compressor and other equipment, and the pumps had to be lowered to maintain suction. For this, heavy earth movers were employed to gouge a piece out of the side of the quarry. By midnight all was ready. At 0930 Sunday with the depth now at 207 feet the Unit commenced diving once more. Two men, Dalyrmple and Godown, made the initial dive in S.C.U.B.A. into the freezing water. When they reached bottom they found heavy silt, jagged slate and mud. As soon as it was touched, the stirred-up silt made visibility zero. After eight minutes from leaving surface, they were given the signal to surface, carrying out decompression stops on the way.

The first diver in the Navy Mark V gear, with all his 215 lb. of equipment was then prepared, and at midday entered the water. Once on the



bottom he settled down on his hands and knees to do the job by feel, his search controlled from the surface. 20 minutes after leaving surface he began his ascent, taking 40 minutes for his decompression, during which he was constantly massaged by S.C.U.B.A. divers to keep him warm. Standard divers were used for the rest of the day and on the 3rd, 4th, 5th, 6th and 7th September, during which time 9½ hours were spent on the bottom and 18½ hours on decompression. After all this effort all that was recovered was a length of line and the drowned boy's underwater torch. By this time the water level was down to 173 feet and on Tuesday 10th at 1730, down to 159 feet. Now it was time for the S.C.U.B.A. divers to take over. The first two divers were selected, left surface, and swimming a few feet above the bottom so as not to disturb the mud, they started their search. After six minutes Dalrymple located the body on a steep incline and called for slack on his life-line. While securing the line his buddy ran out of air and surfaced on his two minute emergency. Dalrymple placed the body between his legs and made for the surface, struggling hard. Having reached 75 feet with his air almost run out, he was forced to let go of the body, which fortunately remained secured to his life-line.

In the process, the leads from his electric torch fouled on the body and he found himself being pulled down. By the time he had freed himself his air had completely run out and he had to free ascent from 80 feet. The body, secured to the lifeline, was then brought to the surface. The following day was spent in dismantling the equipment and removing it from the quarry. By 2240 the last piece was loaded and the Unit once more dispersed to their homes, feeling that yet another job had been well done.

This article has been condensed from the original treatise by, S. DIMOND SMITH, D.I./C.

"CENTAUR'S" DIVING

'WHEN is the next diving trip ?' is the constant question put to *Centaur*'s Diving Officers. The 24 qualified divers have clocked up 9,186 minutes for the four months ended 15th June, 1964, an impressive total for an operational carrier. The greater part has been 'Exped' diving, although the team has successfully carried out a number of tasks. The most interesting was the sealing of R.F.A. *Tiderreach*'s propeller to the hull to enable the stern gland packing to be completely renewed. This task was carried out in a force 4 to 5 wind in Aden Roads, and to put it mildly was exciting diving, particularly when the attendant motor cutter broke loose and threatened to overturn. The R.F.A. crew at the time were being violently sick. The job took four hours of hammering steam gland packing into the gaps, placing wooden bungs in the inspection holes and final sealing by the liberal use of Henley's compound held in place by the sea water pressure.

Another amusing job was the successful recovery of a sailmaker's sewing machine at the Naval Base, Singapore. Sorry, no more on this, or the article will never be finished, except to say that the machine still works! Besides bottom searches we have a regular monthly job on the port rudder where the removeable section tries hard to remove itself — a not very important item, but a good excuse for a dive.

It is hard to know where to start when describing our 'Exped' exploits. Chief results, apart from the training aspect are the supply of crayfish to the Wardroom, and catching more fish for Sub-Lieut. K. F. Crumplin's fish tank. His 40-gallon tank holds 26 tropical fish from 12 different colourful species, caught in Singapore Mombasa and Aden. The U.K.

tele-watchers are happy again — they sit around watching the fish in full glorious colour, but no sound!

The ship has been fortunate enough to borrow M.F.V's at Singapore and Hong Kong for diving trips of up to four days duration. These have been very popular and good diving conditions have been found near Raffles Lighthouse, Singapore, and Lung Shun Wan Hoi (Rocky Harbour to you) on the east side of the New Territories, Hong Kong. The problem of the supply of h.p. air has been solved by borrowing air bottles from the Flight Deck Engineers which with care can give five S.A.B.A. recharges per bottle. Diving was also found good at Pulau Tioman and Subic Cay, but Changi, Singapore was a failure apart from providing a service to the local police by recovering the bodies of two drowned children.

Future diving prospects are unknown, but we are unlikely to find such a good spot for crayfish as Mombasa.

THE PEACEFUL DEEP

FULL fathoms ten the colours change
From richer hues to dull toned greys.
Yet, beneath the surface still there lies,
Beyond the tempest of earthly ties,
A peace of mind undisturbed,
'Cept by noise of a fishy herd.
This solemn peace is more profound
Than that upon the ground is found.
Swept to and fro in the briny deep
Softer than the deepest sleep,
Goes shadows bold drifting, cold and grey.
The diver plunges down to ask,
Garbed in rubber suit and casque,
What mysteries here can be released
From this peaceful, ocean deep.

J.H.

EXTRACT'S

Story of a Life

by KONSTANTIN PAUSTOVSKY (Harvil)

Uncle Yusia . . . was sent to Moscow to do guard duty during the coronation of Nicholas II. His particular outfit was on duty on the quay of the Moskva outside the Kremlin.

Early on the morning of the coronation he saw his men rushing down to the river bank where a violent scuffle had broken out. Clutching his sword, he hurried after them.

A terrifying creature with a copper head was rolling about in the mud, entangled in tubing. The soldiers had knocked it down and piled on top of it, and it was clumsily kicking out at them with its enormous leaden boots. One of the soldiers squeezed a ribbed rubber tube near the copper head, and the monster, giving a hoarse rattle ceased to resist. My Uncle realised that the monster was a diver and shouted at the soldier, but by the time they had unscrewed the helmet the diver was dead.

Neither my Uncle nor his men had been warned that divers from Kronstadt were that morning searching the bed of the river for terrorist's bombs. After this incident Uncle Yusia was discharged from the army.

Deep Sea Research and Exploration

Any day now the world's first deep diving scientific laboratory submarine will start its three mile journey into the depths of the Atlantic Ocean. The 'Aluminaut' which is the deep diving research and exploratory submarine designed and built by industry in America has a diving depth of 15,000 feet. This is many times deeper than any submarine has been before and almost twice as deep as where the remains of 'Thresher' lie. It will be fitted with the most modern navigational and oceanographic equipment. Sonar will be used for navigation around the peaks and mountains that line the ocean floor. High powered lights are fitted for observation, photography and television. Remote manipulators will pick up bottom samples and instruments will record oceanographic data.

There is no doubt that the 'Aluminaut' is only the forerunner of fleets of deep sea research submarines in the future. It will most certainly play a key role in man's efforts to farm the sea, mine it, and harness its energies.

The construction of the 'Aluminaut' is unique. It is an assembly of forged aluminium cyclinders each 40 inches long and 97 inches in diameter, fitted with end pieces. It has a safe diving depth of 15,000 ft., a self propelled range of 80 miles and a 32 hour routine diving time. This performance allows it to explore the very bottom of 60% of the ocean areas of the world.

The 'Aluminaut' is designed to be towed to its operational site by a depot ship which will maintain it on site.

Conventional ballast tanks are vented when submerging and the vessel takes on negative buoyancy and begins to submerge on an even keel at the rate of 3 ft. per second. It is designed to reach equilibrium at the programmed depth unaided, but ascent or descent from 500 to 1,000 feet above and below this depth can be obtained by vertical propulsion. On completion of the dive, shot ballast is jettisoned and the vessel assumes positive buoyancy, using verticle propulsion to assist in the ascent if necessary. At the surface, ballast tanks can be blown to obtain maximum buoyancy. In the event of an emergency a 4,400lb droppable keel can be jettisoned for rapid ascent.

One of the unfortunate by-products of our space age research is the general illusion that we have no new frontiers to conquer. This is of course quite untrue. Three quarters of the surface of the earth we live on is virtually unexplored, unknown, and ignored. We know more about the moon than we do about the 'bottoms' of the oceans. The liquid space of our planet is as equally challenging as outer space and almost certain to bring greater economic rewards.

It is of interest to note that the Swiss, the French and also the Japanese are actively progressing the exploration of depth. It is also sad to note that the U.K. have not yet entered the exploration race in spite of the fact that historically we are a seafaring nation.

The following is a comprehensive list of underwater vehicles throughout the World.

Vehicle	*Builder / Owner*	*Max. Operating Depth (Feet)*	*Weight (Tons)*	*Remarks*
Aluminaut	G.D./Electric Reynolds Int.	15,000	75	Launch date, September 1st 1964
Alvin	Litton Industries, Woods Hole, Oceano	6,000	15	Currently on sea trials
Archimedes	French Navy	36,000	210	Uses Hexane for buoyancy
Ashers	Univ. of Pa.	600	3·5	Archaelogy exploration
Auguste Piccard	Swiss Exploration	1,000	160	Can carry 40 passengers
Benthos V.	Lear Siegler, Inc.	600	1·9	Can carry 400 lbs. special equipment
Cubmarine P.C. 3X	Perry Submarine Builders	150	2	On lease to Westons
Cubmarine P.C. 3B.	Perry Submarine Builders	600	2·7	On lease to Westons
Deep Jeep	U.S.N. Ordnance Test Station, China Lake	2,000	—	Undergoing sea trials
Denise	Capt. J. Cousteau (French)	1,000	3·5	Can carry 1,000—1,500 lbs. equipment
F.N.R.S. — 3.	French Navy	20,000	—	
Kuroshio	Japanese Fisheries	650	11·5	Requires single cable to surface for power
Moray T.V.—1A.	U.S.N. Ordnance, China Lake	2,000	16	Sea tests
Severyanka	U.S.S.R.	600	1,500	Converted Submarine Research
Sportsman	American Submarine Co.	300	1·1	450 lbs. allowed for crew (2)
Star I	G.D. Electric Boat	200	1·2	Used to evaluate U./W. Vehicle systems
Submaray	Hydrotech Co.	300	1·6	For charter or contract work.
Trieste II.	A. & J. Picard and U.S. Navy	20,000	46	Bathyscapth, converted Trieste I
Yomjuri	Shin Mitsubishi Shipyard, Japan	2,000	35	Research on fisheries
Under Construction:—				
Deep Star	Westinghouse Elec.	12,000	9	Completion early 1965
Dolphin A.S.G.G. —555	Portsmouth Navy Yard for U.S. Navy	—	950	Experimental submarine
Under Design:—				
American Sub. Model 600	American Sub. Co.	600	1·6	Similar to Sportsman
Beaver	North American Aviation, Inc. Autonetics Div.	1,000	10	In design phase
D.R.V.	U.S.N. Ordnance Test Stn. China Lake	35,000	—	Little known

Promotions and Advancements

To C.D.II

P.O. C. E. B. Smith
P.O. R. Lees
L.S. R. Frazer
L.S. G. R. Jordon
L.S. D. E. Hodge
L.S. D. Vaughan

To C.D.*

L.S. Lewis
A.B. Bennett
A.B. Woonough
A.B. Wilson
A.B. Clark
A.B. Elder
A.B. Rhodes
A.B. Denton
A.B. Pert

Portuguese C.D.:

A.B. Gomez
A.B. Ribiero
A.B. Santos

Your Questions Answered

Two questions mainly connected with the medical side of diving:

Firstly, what percentage of cigarette smoke is carbon monoxide and if a diver failed to clear the smoke from his lungs by deep breathing at what depth would the carbon monoxide effect his reactions. The other question refers to an article published in another diving magazine. This article reported a case of explosive decompression, would you please explain this ?

In answer to the above questions: First, the traces of carbon monoxide which are present in cigarette smoke are of no immediate danger to divers. Any Co breathed into the lungs is bound to the blood passing through them, and thus after extinguishing the cigarette before diving, no Co is left in the lungs to exert a toxic effect at depth. The danger exists when Co is present in the compressed air used by the diver, in quantities possibly insufficient to be toxic on the surface but which exert a coal-gas effect under pressure.

Second: 'Explosive Decompression' is a term used to denote a very rapid release of pressure. In this case it would appear that there was a severe case of Bends in which bubbles were formed in the blood. The distinction between this and air embolism — where bubbles get into the blood from the lungs, which are damaged by failing to breath out during ascent — is difficult to make when first confronted with a case, but the basic treatment for both is immediate recompression.

Sir,

I have recently heard talk about a 'constant volume suit', could you please tell me if this suit is an adapted Mark 1, or something different ?

MR. P. WILLIAMS.

The Constant Volume suit as you describe was designed by Jacques-Yves Cousteau, and his team. The suit consists of a tight coverall of rubberized fabric, and undersuits. Incorporated in the suit are five non-return valves — one in hood, two on either ankles and forearms— these prevent air pockets, etc. The diver as he descends blows through his nose into the suit thus keeping the pressure equal to that of the water. The hood is designed with a detachable front glass and mouth-piece connection, suitable for any compressed air breathing apparatus. This suit has many advantages including warmth.

"THE LONE RANGER"

HAVING retired from the R.N. on 20th September 1963, I joined the Civil Service as an Inspector of Naval Ordnance on 18th November 1963. In June 1964 whilst undergoing training for an Inspector of Naval Ordnance I received a 'pier head jump', and was seconded for duty with the Ministry of Defence and Experimental Establishment at Pendine, Carmarthenshire, on 16th June 1964. The following is a brief history of the Establishment and an even briefer summary of the work executed there.

Functions of the Establishment

(1) To prove weapons and ammunition for the Service Inspectorates of Armaments.

(2) To provide experimental range facilities for weapon development.

(3) To maintain records of the work done.

History

The Establishment was constituted in 1853 at Hythe in Kent (well known to all Clearance Divers) and was known as the 'School of Musketry'. Even in those days trials were undertaken, as the first commandant, a Colonel G. C. Hay received a warning not to let trials interfere with the instruction of detachments under his command; this would seem to prove, if my diving memories serve me correctly, that history often repeats itself. Shortly after the Crimean War 1854, which saw the development of the Enfield rifle, a Small Arms Experimental Wing was formed at Hythe to carry out trials of Small Arms. In 1938 a Joint Services conference was held and decided to form

"The Lone Ranger"—alias the Venerable Mr. Mac

The diver is wearing an Underwater Swimmer's Dress made from rubber-proofed crimped knitted nylon, and is using SABA (Swimmer's Air Breathing Apparatus).

The suit is manufactured by Dunlop General Rubber Goods Division of Manchester, and the breathing equipment by Dunlop Aviation Division of Coventry.

an Inter-Services Small Arms Establishment and this was opened at Foulness as a Ministry of Supply Establishment early in 1940. With the threat of invasion imminent the Establishment moved to Pendine in June 1940 and during the War undertook firings of larger calibre weapons and unguided rockets thereby relieving some of the pressure on the Artillery Experimental Establishment at Shoeburyness. In 1948 Pendine became an experimental range for all kinds of weapons no longer being restricted to Small Arms work. The military staff which had originally been mainly recruited from the Small Arms School Corps, was now augmented by the Royal Artillery and other corps. In June 1961 the coming of age of the move to Pendine was celebrated and in those 21 years the scope of the Establishment has increased beyond the widest imagination of the founder members.

Firing Ranges

There are at present 27 firing ranges, many of these with permanent buildings and ample instrumentation facilities. Included in these ranges are the Long Test Track (3,000 feet) and the Short Trest Tack (660 feet). The two test tracks are used mainly for testing guided missile components in simulated flight and for miscellaneous trials, as for example testing aircraft ejection seats.

Present Activities

Work undertaken at Pendine can be summarised as follows:—

Proof Firings carried out on behalf of the Inspectorate of Armaments and the Naval Ordnance Inspection.

(1) Ammunition Proof up to 120 millimetres. Mortars and Anti-Tank Weapons.

(2) Pyrotechnics and Grenades.

(3) Static and Dynamic Proof of Guided Weapon Warheads.

Trials

Experimental Firings and Tests of Weapons, Equipment and Ammunition on behalf of the Ordnance Board, the Three Armed Services and the Ministry of Aviation, the Director of the Royal Armament Research and Development Establishment (Fort Halstead), the Royal Aircraft Establishment (Farnborough) and Civilian firms covering the following field:—

(1) All Small Arms, Artillery Equipment up to 120 millimetres, Mortars and Infantry Anti-Tank Weapons.

(2) Static and Dynamic tests of unguided Rocket Mortors, Heads and Fuzes.

(3) Static tests of Guided Weapon Warheads and Components.

Location

The Establishment is situated on the North side of Carmarthen Bay. It is 18 miles from Carmarthen town and nine miles from the nearest railway station at Whitland. The land area consists of a strip of coast line some six miles in length and about half a mile wide. Most of the area is composed of sand dunes, or marshy land with a foreshore strip of firm sand drying out to widths of between half and one mile at low tide. It is an ideal place for carrying out beach assault training, so how about a visit as a change from Hythe!

Pendine Sands gained fame in the 'Roaring Twenties' as a motor racing track, and even I as a 'wee' boy in the far Northlands of God's own country (Scotland) knew and read about Pendine Sands. Between the years

1924 and 1927 the wolrd's land speed record was broken five times on Pendine Sands:—

1924 ... Malcolm Campbell Sunbeam 146·16 m.p.h.
1926 ... Malcolm Campbell Sunbeam 150·87 m.p.h.
1926 ... J. G. P. Thomas Thomas (BABS) 169·3 m.p.h.
1926 ... J. G. P. Thomas Thomas (BABS) 171·02 m.p.h.
1927 ... Malcolm Campbell Napier 174·88 m.p.h.

On 3rd March 1927, Parry Thomas was killed on the sands while trying to regain the world's speed record. His racing friends buried his car in the sand dunes where it remains to this day. In July 1931 Amy Johnson (Mrs. Mollison) took off from Pendine Sands on her famous East to West Atlantic flight, the long expanse of flat sands being ideal for the unduly long take-off necessary on such a pioneering flight.

My best regards to all my friends, if any, and looking forward to seeing you at the Divers' Dinner.

Yours aye,

MAC.,

'The Lone Ranger',

Auchter Muchty Ecclefechango Go Goch.'

News Bulletin

Lifesaving Film wins International Award . . . At the 18th General Assembly of the World Medical Association, held this year at Helsinki the Royal Navy film 'Emergency Resuscitation' won the major award. Many countries were represented and in all 119 films were shown.

Much credit must be given to the Royal Naval Medical School and in particular to Surgeon Captain Stanley Miles, who was the technical advisor.

* * *

'Culdrose' Divers salvage 'Anson' Cannon . . . A cannon weighing between three and four tons was recently raised to the surface from the wreck of the 19th century H.M.S. *Anson*, at Looe Bar, Portleven, Cornwall.

The rusty barnacle-encrusted gun was brought out of the water by divers from R.N.A.S. *Culdrose*. The *Anson* (not the last of the name) sank in 1802 with the loss of more than 100 lives, and the disaster inspired Henry Trengroves of Helston to invent the rocket rescue line by means of which many seaman's lives have since been saved. Divers from *Culdrose* (during recreational diving) spotted eight of the *Anson*'s guns in two groups of four protuding from the sand on the sea-bed. The first attempt to salvage one was beaten back by the weather.

Mr. Roland Morris, of the Admiral Benbow Restaurant, Penzance owns the salvage rights from the *Anson*.

* * *

'Parascuba.' Parachute jumping with scuba equipment is catching on in a big way in the States. Its original aims were for the recovery of astronaut cannisters, demolition work and some special forces of the U.S. Army use parascuba for guerrilla warfare. Civilian groups now are using this method of getting to their diving sites. In the clear waters it enables positive and direct location of reefs and wrecks . . . (problem: How to get back).

Kingston New York . . . The launching of the 'Sea Farmer' in May this year on Jones River could add an important phase to the theory that the world's population in years to come may live off the sea. Morris Edelstein hopes to see a three-year dream come true with the gathering of Irish sea moss. If all goes well the marine farming and exploration corp. could gather up to 10 tons of moss a day. Irish moss is used in a wide variety of products . . . cheese, ice cream, custards, hand lotions, cough medicines.

* * *

Underwater Film Festival

Britain's First

An International Festival of Under water Film is to be staged for the first time in Great Britain in March, 1965. All photographs must have been exposed underwater and 50% of the films.

Gold, silver and bronze medals, prizes and special trophies will be awarded in five separate categories, and the contest will be judged by a panel of representatives from the newspaper, television and film industries in the U.K.

This Film Festival is being sponsored by *Triton*, Britain's leading journal for skin diving and marine science, and the Brighton and Worthing Branch of the British Sub-Aqua Club.

The categories concerned are: (a) black and white prints; (2) colour prints; (3) colour slides; (4) 8mm/16mm cine-films (amateur); and (5) 8mm/16mm cine-films (commercial). Special prizes will go to the best entries taken in British waters.

The Film Festival will be held at the University of Sussex, near Brighton, on March 26th, 27th and 29th, 1965.

Entries from all countries are welcomed and entry forms can be obtained from: The International Festival of Underwater Film, c/o *Triton*, 143/144 Fleet Street, London, E.C.4.

* * *

New Naval Minehunter . . . After being refitted and converted from a coastal minesweeper H.M.S. *Iveston* recommissioned on October 16th, at Devonport as a coastal minehunter. She will join the First Minehunting Squadron in December and will be based at Port Edgar in the Firth of Forth, commanded by Lt.-Cdr. Mark Ruddle, R.N. with a complement including one P.O. C.D. 1, one C.D.2 and three C.D*'s.

* * *

14th Century Wreck Located . . . Within a week of the launching recently at Portsmouth of the new Frigate *Sirus*, the wreck of what is almost certainly the 36 gun ship of the same name, sunk in action off the Island of Mauritius in the Indian Ocean.

The discovery was made by a combined group of amateur divers from H.M.S. *Mauritius*, the Naval Wireless station, the Mauritius Underwater Group and from the French Warship *Le Provencal*. Operating from a vessel of the Mauritian Naval Volunteer Force, the divers located the wreck off Grand Port. Much of the after part of the vessel was burried in mud and sand, but hull and pump housing were reported to be in a reasonable condition. While many cannons were still lying on the deck, the presence of hull fasteners and planking nails indicate that some of the hull may have broken up. To protect it from wilful plundering in the future, the wreck is to be declared an historic relic by the Government of Mauritius.

End of an Era

SIR ROBERT DAVIS, Life President of Siebe Gorman, retired in June of this year, a few days before his 94th birthday after serving for 82 years with the company. Sir Robert, an Honorary Doctor of Science of Birmingham University and a Fellow of the Royal Society of Arts, joined Siebe Gorman as an office boy of 12 in January 1882, and rose to become a chairman and managing director before being made Life President in 1959.

Inventor, author, scolar and philanthropist, Sir Robert has devoted his life to studying the physiology of respiration and to devising means of enabling man to exist in irrespirable atmospheres, both below water and on land. His work earned him the title 'the father of British Diving'.

Knighted in 1932 by H.M. the late King George V for his work on submarine escape and diving, and in 1934 awarded the Thomas Grey Prize by the Royal Society of Arts for a series of papers on 'Deep Diving and Underwater Escape'. Sir Robert is an internationally known figure in both diving and industrial safety.

Although Siebe Gorman had been established in 1819 principally as diving engineers, as early as 1879 the founder's son, Henry Siebe, in conjunction with another British inventor, H. A. Fleuss, had developed the first really practicable self-contained closed circuit breathing apparatus using compressed oxygen. The equipment was used at the Killingworth colliery in 1880.

In 1902 Robert Davis revived interest in the principles used by Fleuss and Siebe and together with Fleuss developed and manufactured the first 'Oroto' oxygen breathing apparatus, which in 1906 was adopted for use in the rescue stations of all British collieries. Modified versions of the 'Proto' remain the statutory breathing apparatus used by the National Coal Board, South African Chambers of Mines and Mining Organisations and Fire Services throughout the British Common wealth.

The early developments pioneered by Sir Robert Davis have influenced the design of self-contained breathing apparatus for the last 50 years and this is undoubtedly his greatest single contribution to the field of industrial safety.

His other contributions to industrial safety include the development of industrial gas and dust respirators, protective clothing and compressed air breathing apparatus.

In the field of diving he has been responsible for most of the developments in British diving equipment over the last 60 years, and he worked very closely with the Admiralty Experimental Diving Unit during World War II on the development of specialised equipment for underwater warfare.

Sir Robert at 94, retires possessed with the same drive and resilience which have characterized his whole life.

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Obituary

GEORGE HALLUM

It is with deep regret we have to announce the passing of 'Nutty' Hallum. Although he had been out of the service for some time he still maintained contact with us, and he, being a publican, the Diving Section were easily able to keep in contact with him.

To all who knew him, he will surely be remembered for his cheerful manner and his skylarks. One of these which I remembered was during a security exercise, some Royal Marines were to raid *Vernon* one evening and all sentries were closed up at their posts. All was quiet until 'Nutty' and another Diving character dashed across the quarter deck with 'Nutty' yelling 'come on Sarge'. Needless to say whistles blasted off everywhere, and sentries were seen running to and fro in a general state of confusion.

One of his contributions to diving, many years ago, occurred when he had a class of Shallow Water Divers at Horsea Island using Salvus. He had seven flaked out during one forenoon, this was duly reported and shortly after the Diving Section changed from Commercial to Medical Oxygen.

'Nutty' will be remembered by many of us as one of the true characters of the branch and we mourn his departure.

The fund organised by C.P.O. Foggin, raised £101.

ALFRED CHARLES BARKLEY

Those of us who were fortunate enough to serve with Able Seaman Barkley cannot help feeling shocked at the news of his untimely death. In every way, he was such a larger than life character that it is difficult to imagine that 'Flintstone' is with us no more.

Physically he was one of the toughest men I have ever known and to this was added a depth of character which knew no fear.

Apart from his tough exterior, no one who knew Barkley or had seen him either at a Christmas party or singing in the galley of a minesweeper on the roughest of days could doubt the real warmth of his personality. His overwhelming sense of fun and cheerfulness always won through to make him one of the most likeable people in any community.

At the end of his life, he was beset with a series of misadventures starting with the tragic loss of his eight month old son through meningitis. This was followed by his own temporary blindness through an embolism only to be followed in turn by an accident to his back when he was run over by a gemini dinghy. To many, these setbacks would have been too much to bear.

Our sympathy at this tragic time goes out to Mrs. Barkley and her two children, with her we mourn the loss of a good man, one whom we will not forget and whose passing leaves a gap that will never be filled.

N.W.P.

A fund has been started, to help Mrs Barkley and children. Postal Orders and Cheques should be made out to Lt. C. L. Lawrence and crossed Barkley Fund.

Royal Naval Divers' Association

For all R.N. Divers and Ex-R.N. Divers including Commonwealth Navies, the R.N. Divers Association Blazor badge now available in superior gold and silver braid at a price of 30/-.

We can also offer you the very popular divers tie, motif is of alternate underwater swimmer and divers helmet embroidered in yellow silk, choice of blue or maroon (Terylene), price 15/–.

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R.N. Diving Magazine,
H.M.S. *Vernon*, Portsmouth.

A few back numbers can be obtained at reduced rates.