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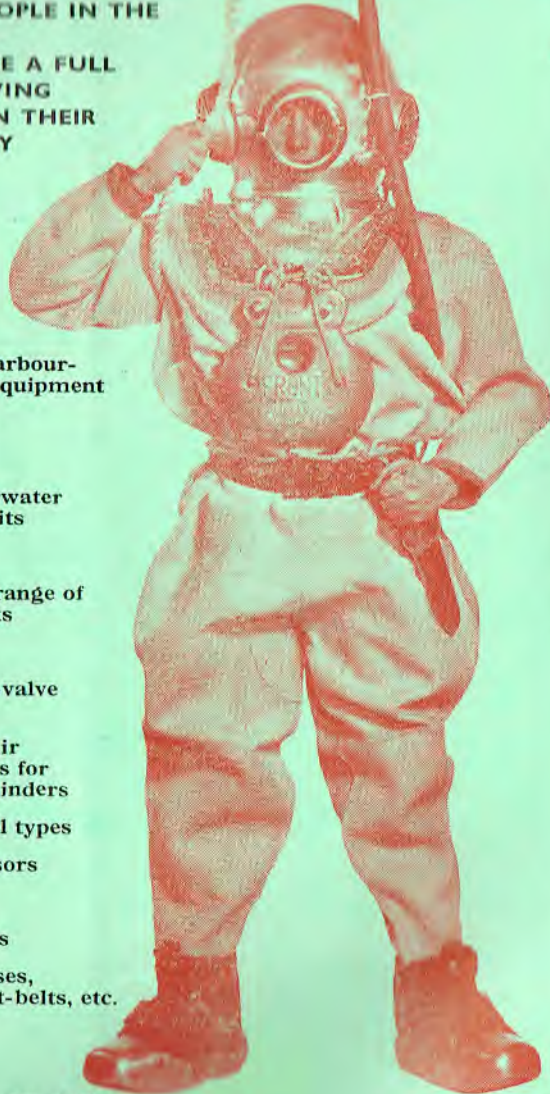
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*The Staff send to all readers  
 their best wishes for  
 a Merry Christmas  
 and  
 a Happy New Year*



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# BOOM DEFENCE AND MARINE SALVAGE IN THE ROYAL NAVY

## MARINE SALVAGE, OCEAN TOWING AND WRECK DISPERSAL

By

LIEUTENANT COMMANDER L. HACKMAN,\* Assoc. I.N.A., R.N.R.  
AND COMMANDER C. G. FORSBERG,\* O.B.E., R.N.

### Introduction.

During World War II, Marine Salvage, Ocean Towing and Wreck Dispersal were separate Admiralty departments, under a Director of Salvage (D. of S/V), Captain-in-Charge, Rescue Tugs (C.C.R.T.) and a Director of Wreck Dispersal (D.W.D.), departments which remained in being until the autumn of 1946, in order to deal with the immediate aftermath of the war when they then ceased to function as separate organizations.

The Director of Boom Defence at that time assumed responsibility for salvage requirements and ocean towing, but wreck dispersal passed initially to the Director of Operations Division who controlled a fleet of twelve dispersal trawlers to deal with the many war-time wrecks obstructing navigable channels and shipping lanes, and which were not salvable propositions. By the end of 1951, however, a large proportion of these had been successfully reduced to an unrecognisable mass on the sea-bed and the remaining tasks, most of which were repayment services for the Lighthouse Authorities, became, the responsibility of D.B.M.S. (who had assumed that title in July, 1950).

Boom Defence, Marine Salvage, Towing and Wreck Dispersal may appear to have little in common, and so far as the finer technicalities go that is largely true. Basically, however, they all require a really sound knowledge of seamanship. A number of naval and civilian officers with this essential background, who had specialized in one of these branches of the naval services, have proved themselves efficient in one or more of the others. The arrangement, involving as it does a mixed bag of naval and civilian personnel, has worked well and the combined department has achieved quite considerable success in all the varied activities it has been called upon to perform.

### Marine Salvage. World War 1.

Prior to the 1914-18 war, no specialist salvage organization was maintained in the Royal Navy. It became evident in 1915, however, that existing commercial firms were unable to cope with the many casualties resulting from intensified enemy action, and something had to be done to maintain the country's vital life-lines if we were to survive as a nation, for merchant vessels were daily going to the bottom much faster than they could be replaced by new construction. The Admiralty accordingly took over general responsibility for the salvage of merchant shipping, and the foundation of an Admiralty Salvage Section, under the Director of Naval Equipment, was thus brought about.

\* Master Mariners

By 1918 a number of fully equipped shore bases had been established and a fleet of fifteen salvage vessels was in operation. During hostilities, between four and five hundred ships, most of them badly damaged, were salvaged and returned to service. With the Armistice in November 1918 came the end of the work for which this organization had been created. Commercial salvage firms were ready and eager to avail themselves of the rewards for salvage efforts which might be offered in peace-time.

After clearing the blocked harbours of Belgium, the Admiralty Salvage Section was disbanded except for H.M.S. *Racer*, which remained in commission until 1924 to complete an important operation of bullion recovery, and all that remained of this organization, which had played so important a part in combatting the U boat menace, was a small reserve of salvage equipment to be maintained in the royal dockyards.

### World War II.

Marine Salvage faded into the background, as far as the Admiralty was concerned, until 1938 when, with war clouds looming, the lessons learned in 1914-18 were recalled to mind. Proposals were formulated and put forward by the Director of Naval Equipment for the creation of an organization to take over the responsibilities of marine salvage, on a national basis, in the event of a second major conflict. Briefly, this involved the recruitment of suitable officers and men, and the acquisition of a fleet of salvage craft and quantities of plant and machinery. In addition, a workable scheme was to be devised for utilizing and directing the resources of private salvage firms. After discussions with representatives of Lloyd's, the Board of Trade, Ministry of Transport and the Salvage Association, agreement was reached with the selected firms that they would act as agents for, and under the direction of, the Admiralty, in conjunction with the Naval Staff in the various Commands.

The new organization came into being early in September, 1939, as a Salvage Section. Rear-Admiral A. R. Dewar was appointed in November of that year to control this organization, which rapidly expanded and became fully operative in all theatres of war.

At the outset, the fleet of ships and the quantities of plant and equipment were lamentably small. However, with the construction of new-design 'Ocean' and 'Coastal' class salvage vessels, supplemented by requisitioned and converted vessels from commercial sources, a large fleet was gradually assembled. Salvage bases in support of these ships, fully equipped with up-to-date machinery and plant, were established in strategic ports, both at home and abroad. Apart from the vessels managed and operated by commercial firms, these salvage bases were manned by uniformed personnel, mainly under R.N.R. and R.N.V.R. officers.

Towards the end of 1940, the Salvage Section was detached from D.N.E. and was re-constituted as a separate department under a Director of Salvage (D.S./V.D.). In August, 1941, a Salvage Branch of the Secretary's Department of the Admiralty was formed for dealing with the financial, legal and other aspects of salvage work which were outside the operational and technical spheres, duties which are presently carried out by the Marine Salvage Section of General Finance Branch II.

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During the period of hostilities, 1939-45, some 1,500 major salvage cases arising from war casualties were dealt with successfully, all the ships concerned being repaired and brought back into service.

### The Technique of Salvage.

Marine Salvage is not an exact science and it would be a presumption to attempt to deal with it as such, particularly within the covers of this journal. The practical salvor, rather than being classed as a scientist, would be more aptly described as a 'man o' pairs'. Fundamentally, of course, he has to depend on basic scientific principles to carry out the many varied tasks which may fall to his lot.

First and foremost, however, he must be a good seaman; if he knows how to keep a ship afloat, the chances are that he will have a pretty good idea of what is necessary to restore a sunken or stranded vessel to her rightful condition of buoyancy. The practical application of his ideas and the ability to size up a particular salvage job, normally come only after long experience. Nevertheless, the more he knows of such subjects as naval architecture, ship calculations, hydrostatics, applied mechanics, etc., the better fitted he will be to profit by practical experience.

Every salvage case presents its own problems, depending on the particular features of the ship, the nature and extent of the damage, geographical position in relation to depth of water, tidal and weather conditions, etc. Broadly speaking, they can be divided into three categories:

- (i) Strandings, including vessels beached intentionally to prevent them from sinking.
- (ii) Actual sinkings.
- (iii) Casualties which are incapacitated by collisions, mechanical or structural breakdowns, fire or stress of weather, but remain afloat.

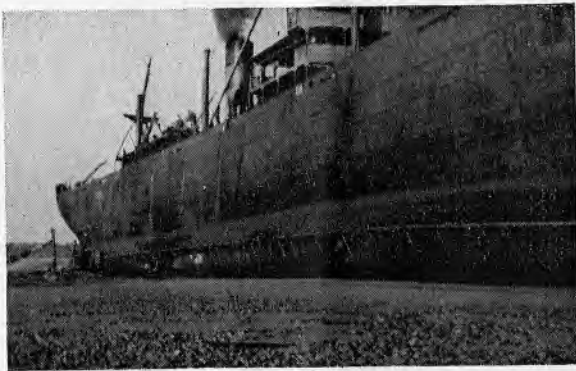
There is an almost endless variety in each of the above categories and it is as well to avoid generalizations. Some idea of the activities of the Salvage Organization, since its inception in 1939, can best be given by brief descriptions of a few notable cases.

### Strandings.

The sight of a large ocean-going ship, high and dry with a wide stretch of foreshore between her and the nearest water, is a source of wonderment to the average man. It seems almost unbelievable that such a mass of metal could be so casually treated by the elements, but to the intending salvor she becomes an intriguing problem; usually calling for all his ingenuity. He must weigh up the situation in the light of the nature of the ground, whether she is evenly or unevenly supported, and the extent of damage and recoverable buoyancy to enable her to come afloat on the highest available tides.

Such a case was that of the S.S. *Conakrian*, of some 9,000 tons D.W., torpedoed off the Scottish coast in 1942. The torpedo entered the boiler room and both this and the engine room were flooded. She remained

afloat, however, and was taken in tow by rescue-tugs, bound for the Tyne; she broke adrift in a full gale and drove ashore on the top of a spring tide, just north of Aberdeen. By the time the salvage team could commence work she had been cast far beyond the high-water mark of mean spring tides, where she listed heavily towards the seaward side. Heavy anchors were laid out to prevent the casualty driving still further up and to heave her off when ready to come afloat. This is a first essential precaution when dealing with a stranded ship. The damaged areas were then covered



S.S. Conakrian. Showing the steel piping fixed along starboard side of hull with sluicing jets directed towards the turn of the bilge.

with steel plating and framing and all portable weights removed from the ship. In this case there was no hope that the sea would come in to float her off, and something had to be done to help matters. Retaining walls were built round the ship and a novel system of sluicing, comprising a ten-inch pipe fitted horizontally on both sides of the ship from stem to

stern, with a number of jets directed to the turn of the bilge, was fabricated and secured in position. By jetting away the sand, the ship was lowered several feet into a deep bed. A channel was also cut through to the nearest point where she would float.

As soon as she was almost waterborne and on the point of coming afloat, she was hove into an upright position by mast purchases, secured to holdfasts on the shore side of the wreck. After two gales, in which part of the retaining walls was washed away, she was taken off into deep water, and proceeded under her own steam into Aberdeen some twelve months after stranding.

### Strandings on Rock.

In March 1955 the Norwegian passenger liner *Venus* (6,268 tons gross), dragged her anchor in a S.W. gale and stranded heavily on a rocky bottom in Jennycliff Bay, Plymouth Sound, where she lay broadside on, exposed to the prevalent gales, her length unsupported for several feet at various intervals.

Prompt action was taken by the Commander-in-Chief, Plymouth, with dockyard tugs to try and get her off on the next high tide, but all efforts were of no avail. D.B.M.S.'s organization then took a hand and, under the direction of the Chief Salvage Officer, Mr. C. L. Black, O.B.E., heavy ground tackle was laid out from the ship and attached to 100 ton purchases inboard.

Meanwhile, *Venus* became very lively in the heavy seas over the high-water periods, and was taking a severe pounding on the rocks. Practically the whole of her outer bottom was open to the sea and some leakage developed in the engine room. She was in a grave position and threatened to become a total loss.

There was no cargo to discharge and only some 80 tons of fuel oil that could be removed to lighten her. This was a case for compressed air; and work was at once pressed forward to clear the damaged double bottom tanks of water by blowing them out through her own damaged outer bottom plating.

Pinnacles of rock in the way of the port propellor and on the pre-visedaged refloating track were blasted away by a mixed team of civilian salvage divers and a diving party from H.M.S. *Defiance*.

Stability problems in her damaged condition gave rise to some concern. In her normal state *Venus*, with her tall superstructure and high centre of gravity, was known to have a low metacentric height. Everything movable on the boat deck, including all the lifeboats and gear, was landed to lower the centre of gravity and increase her stability. All watertight doors and portholes were closed and dead-lights screwed up; important safeguards which, surprisingly, are sometimes overlooked.



M.V. *Venus* ashore in Jennycliff Bay, Plymouth Sound.

Happily, the weather had moderated by the third day after the grounding and all was ready for an attempt at refloating on the morning tide. The double bottom tanks were under compressed air control and with the buoyancy thus regained, assisted by change of trim acquired by transference of ballast, *Venus* was hauled clear of her perilous position. On coming afloat, she at once began to 'loll' and it was apparent that she had little or no metacentric height, as had been expected. This is the kind of calculated risk which the salvor often has to take.

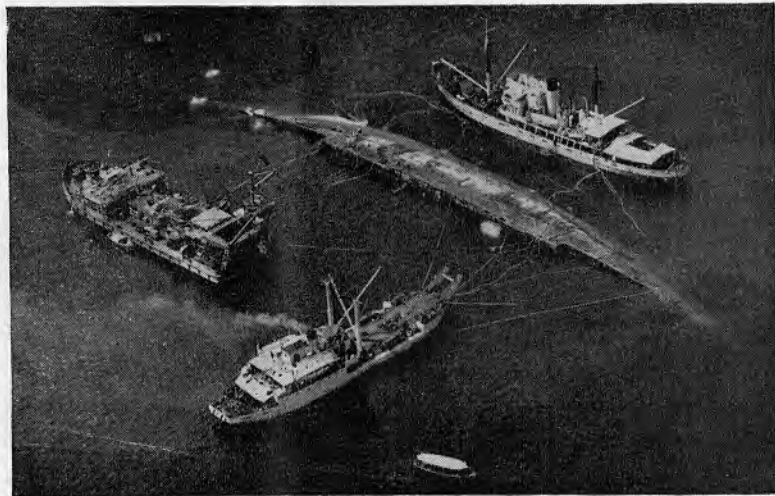
The operation was undertaken on Lloyd's Open Form of 'No cure—no pay' Salvage Agreement, and its successful culmination resulted in a handsome salvage award to the Admiralty.

### Raising Sunken Wrecks.

H.M.S. *Breconshire* (10,000 tons gross), a former Glen and Shire liner, was the victim of enemy aerial attack in March, 1942, whilst running the

gauntlet in the Malta convoys. She struggled into Marsa Xlok at the east end of Malta Island and there sank, on her beam ends, in sixty ft of water.

The wreck contained a considerable quantity of fuel oil and an assortment of cargo which included bombs and ammunition; all of which made operations hazardous and unpleasant, particularly for the divers. She was lying on her damaged port side and the first task was to remove her masts, funnel and superstructure. While this was going on a scale model of the ship was constructed in the salvage base at Valletta and tank tests were carried out to confirm calculations made on the effects of introducing air under pressure into the various available compartments of the ship.



*H.M.S. Breconshire  
Blowing tanks preparatory to raising bows and rolling her over, bottom up.*<sup>1</sup>

The general idea was to bring the bows off the bottom by blowing the forward oil cargo tanks. Then by carefully controlled blowing and counter flooding, to turn the vessel bottom up and refloat her in this condition by the injection of air into the machinery spaces and main after holds. Complete tests on the model having been made several times, always with the same desired result, the actual refloating operation was started in June, 1950, when the removal of the superstructure and sealing of necessary compartments had been completed.

Under the direction of a former Chief Salvage Officer, the late Captain O. T. Harrison, the operation proceeded without a hitch and weeks of careful planning were rewarded by the sight of *Breconshire* (albeit a pathetic one) floating on an even 'keel' with about eight ft of 'bottom free-board'.

The wreck was sold to a local firm as scrap and although her final owners later attempted complete salvage, it is understood she never again saw service.

In more recent years, the case of the French destroyer *Maille Breze* provided a major problem in wreck raising. She had caught fire and sunk at her moorings off Greenock in April 1940 as a result of a torpedo warhead accidentally exploding inboard. In 1953 the Ministry of Transport and the Clyde Harbour Authorities became much concerned at the prospect of oil pollution from the wreck and the possibility of her ammunition becoming unstable with age, and it was decided to remove her.

The wreck was in thirty-six ft depth at low water and listed about seven-degrees to starboard and it was estimated that after the removal of the ammunition and the superstructure, etc., a submerged weight of some 3,600 tons would be involved. To cope with this, four lifting craft with a combined capacity of 3,900 tons were employed. These craft, normally, are secured in pairs to the wreck at low water and the lifting effort is provided by the rise of tide. When the weight is taken



*The French destroyer Maille Breze after beaching.*

the lifting craft, with the wreck suspended between them on a series of 9in circumference wire ropes, are moved into shallower water until the wreck grounds on the following high tide. This operation is repeated on successive tides until the wreck is finally beached in a depth which allows her to be repaired, pumped out and refloat.

The main problem in the case of the *Maille Breze* was the co-ordination of lift between the four craft. Once again, advance planning, calculations of stresses and test trials with scale models provided the answers. *Maille Breze*, after five separate lifts, was finally beached about a mile from her original position, in a depth of approximately two fathoms at low water spring tides. Here she was patched, pumped and refloat for towing to the breakers yard.

### Suez Canal—Clearance of Port Said Harbour.

During the Anglo/French intervention in the Canal Zone, twenty-two ships, varying in size between 100 and 4,000 tons displacement, were sunk by the Egyptians as block ships in Port Said Harbour. Of these, some were completely submerged, some had masts and superstructures only above water and others were sunk in shallow water. Six of these wrecks were clear of the main channel, but the remainder caused navigational obstructions of varying extent. At one place the channel was completely blocked except for use by very small craft. Most of the vessels had been sunk by blowing holes in the bottom plating with explosive charges to make removal particularly difficult.

In expectation of such tactics a salvage unit had accompanied the Allied Forces and on 6th November 1956, the day of the cease fire, the surveying ship H.M.S. *Dalrymple* entered Port Said and commenced a survey of the harbour. This survey proved invaluable in assessing the magnitude of the task ahead of the salvage teams.



Whatever the pleasure  
Player's complete it



Player's  
Please



*Suction dredger Paul Solente with hopper Neptune in the foreground. The two funnels of the hopper Triton can just be seen in the left background.*

The following day two salvage vessels, R.F.A. *Sea Salvor* and H.M.S. *Kingarth*, arrived and started work on opening a channel for ships of up to 25 ft draught along the west side of the harbour.

Meanwhile all available salvage craft were being mobilized and by mid-December the numbers had risen to fourteen British, three French and the two large German lifting craft *Energie* and *Ausdauer*, which had been chartered by the Admiralty and towed from Hamburg. Eleven



more salvage vessels were in the Mediterranean on their way and eight were held at Aden and Djibouti in readiness to move up to Suez. Altogether, some forty salvage ships were employed or held in readiness.

With the removal of a floating crane and the mud-hopper *Triton*, the Western Channel through Port Said was opened to ships of 25 ft draught by 24th November. This channel was increased on 30th November to a depth of 30 ft. The way was then clear for the Anglo/French salvage fleet to proceed with the clearance of the Canal proper to the south of Port Said. Since this was not made possible, work was continued at Port Said and by the 15th December an eastern channel past the main block, also with a depth of 36 ft, had been cleared.



General view of Port Said Harbour looking west. Extreme left, bucket dredger *Peleuse*; left background, *Sea Salvor* and *Salveda* working on wreck of *Paul Solente*; centre foreground, Suez Canal Company salvage craft *Pollux* sunk clear of channel; centre right, *Succour*, *Kinbrace* and *Kingarth* lifting jib of 150 ton floating crane.

ive lift to some 3 or 4 ft and in some cases the wrecks grounded before they were clear of the channel, necessitating several additional lifts and much hard work for the salvage crews.

All salvage work was suspended on 20th December until after the withdrawal of the Allied Forces on 22nd December when the number of salvage vessels was reduced to eleven, with certain support ships. These were all placed under United Nations control; their crews wore plain clothes, and the U.N. flag replaced the white, blue and red ensigns and the French flag, which had been worn by the respective naval and civilian manned ships. The two German lifting craft were released to work with the U.N. further down the Canal.

The largest of the obstructions was the suction-dredger *Paul Solente*, lying athwart the centre of the main channel. Of some 4,000 tons

Four of the wrecks removed were mud-hoppers of approximately 1,500 tons displacement and these were raised by lifting craft of the same type as was used on the *Maille Breze*. The operations were, however, made more difficult by the absence of any appreciable rise of tide. The amount of lift was therefore confined to that which could be obtained by flooding the craft down, securing to the wreck, and then pumping out the tanks. This restricted the effective

displacement, she was beyond the unaided capacity of our two lifting craft, and had suffered severe bottom damage from the explosive scuttling charges. To add to the difficulties the upper deck was completely submerged and steel cofferdams had to be constructed and placed in position over the deck openings to enable certain compartments to be pumped out, after patching by the divers. This major task was completed, under very arduous conditions, by the 16th January. *Paul Solente* was refloated on her own buoyancy at the fore end, with the two lifting craft taking the weight in way of the machinery space aft, and beached clear of navigable channels in the Avant Port.

Between 7th November, 1956 and 23rd January, 1957, when the Anglo/French salvage forces withdrew, thirteen wrecks totalling 17,000 tons were cleared, thus opening up two channels in the harbour at Port Said for the largest ships.

### Other Salvage Organization Activities.

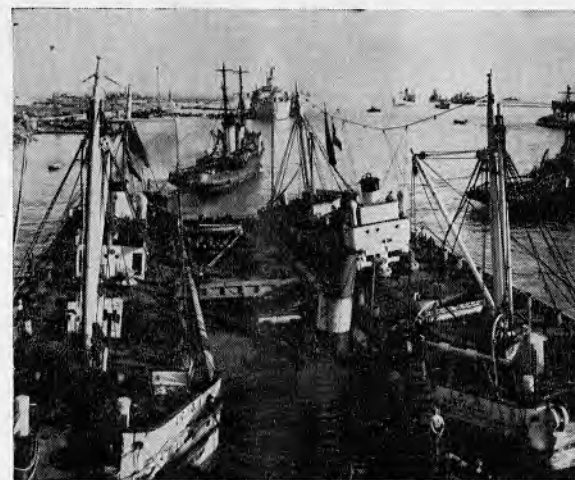
During the post-war years, in addition to pure salvage and wreck removal operations, a variety of other tasks fell to the lot of the salvage organizations.

Foremost amongst these was a happy association with the R.N.S.S. on ship target trials during the period 1947-1951. First aid salvage services and the refloating of sunken target ships after explosive trials; lowering of submarines to collapsing depth; operational requirements for atomic ray penetration tests on H.M.S. *Arethusa*; all these provided an interesting and instructive diversion from normal salvage tasks.

The recovery of aircraft from sea and bogs, and the demolition and removal of the Maunsell towers comprising the forts in the Mersey Estuary and at the Nore, are other examples of the heterogeneous nature of the organization's activities. In fact, almost any type of job which involves the practices of seamen, marine and civil engineers, the highly technical skill of divers, and a capacity for improvisation, does not come amiss to D.B.M.S.'s salvage teams.

### Ocean Towing

There is much difference between a seagoing tug and a harbour tug and equal difference between seagoing and harbour techniques. The seagoers are, therefore, looked after by D.M.B.S.



Lifting craft with mud-hopper *Triton* slung between them being towed to beaching ground in Avant Port.

and the others by Director of Dockyards. Naturally enough there can be no rigid line of demarcation and in emergencies each type 'obliges' slightly in the other's territory. Dockyard tugs occasionally do a coastal tow for us when the programme is tight, and we occasionally take on a berthing task; the Suez operation was such a case. But on the whole each type is happiest in its own specialist sphere. D.B.M.S. tugs prefer the open sea to restricted harbour work, even when it means humouring a reluctant aircraft carrier in a whole gale.

The most necessary requirements in an ocean tug are seagoing qualities, range, power and speed. These points are emphasised in the builders' description of D.B.M.S. new tug *Typhoon*. She is to be capable of long range towage in any weather, of target-towing, of limited salvage, and of assisting with berthing in fleet anchorages. She is to be classed under Lloyd's Register of Shipping to Class 100 A1 'For Towing and Salvage Services', and stiffened for navigation in ice. Her service speed in the deep condition is to be 15 knots. More economically, at 12 knots, her endurance will be 15,000 miles.

Before World War II the Dutch were preeminent in ocean salvage and long range towage. They are excellent seamen with a magnificent record of success; they have completely gained the marine underwriters' confidence and that is a certain measure of value. But having paid that well deserved tribute, it must be recognized that no amount of foreign excellence helps one's own country in war. Then, one's own resources are required to be disposed and redispensed without limitations imposed by commercial or international considerations. The Government found this to their cost in 1939 when, searching, improvising, and adjusting standards, they could produce no more than five deep-sea tugs in the whole country.

To offset as early as possible that nearly disastrous shortage, an intensive building programme was put in hand. (Later, tugs came from the overrun European countries to augment our forces.) These war-built tugs still remain the background of the national reserve. Some have been placed in reserve, some lent to the Director of Dockyards for his temporary use, and some chartered or sold to British commercial firms. Those remaining on operational sea-towing duties are comparatively few, but they make a reasonable nucleus to keep alive the doctrine and practice of ocean towing. Two such tugs are operated by Commander-in-Chief, Mediterranean, one by Commander-in-Chief, Home Fleet, and nine are allocated by D.B.M.S. to various tasks as they arise. It says a great deal for wartime designers and builders that these vessels are by no means out-dated. The commercially operated ones, for instance, are quite holding their own in a sphere which is relentlessly competitive.

The tugs operated by the Commanders-in-Chief are normally—but not always—employed within the Station limits. Those allocated by D.B.M.S. undertake tasks all over the world. In the most recent three year period for which figures are available the overall picture is interesting. Tugs have towed to and from Aden, Bermuda, Ceylon, Egypt, Simons-town, and Singapore, amongst other places. Because of heavy planned programmes there has been little opportunity for casualty work. Except on half a dozen occasions the tugs have been already heavily committed

when salvage calls have come through. During that three year period the department's tugs steamed 356,711 miles of which 213,841 miles was actual towing. These figures cover 400 operations and 849,800 tons of towed ships, which included battleships, aircraft carriers, cruisers, and floating docks.

Because ocean towing is necessarily carried out far from the public eye, little is generally known about the technique and the problems. Self evidently, the aim is to get the towed ship safely from one port to another; that means avoidance of storm, accident or structural damage to tug, tow, or towrope. Despite elephantine size the last named is often the most vulnerable of the three. For instance 'Assurance' class—smallest of the oceangoers—commonly tows with an 18 in circumference manilla rope attached to a 5 in extra special flexible steel wire, the breaking stresses of which are 77 tons and 90 tons respectively. 'Envoys,' intermediate size, and 'Bustlers,' largest size, use heavier gear. In passing it is of interest to note the size of a 'Bustler.' Length 205 ft, beam 40 ft, draft 17 ft, displacement 1,630 tons, indicated horse power 3,200. They are diesel-powered and carry a complement of 40, and are nearly as big as the destroyers and frigates they are sometimes asked to assist.

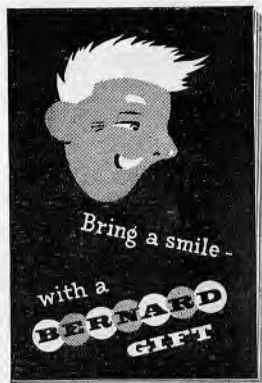
A rule of thumb method of calculating a tug's pulling capabilities in tons, is to take one hundredth of the horse power. A 1,350 h.p. 'Assurance' thus has a pull of 13½ tons, and uses towing gear the weakest section of which has a breaking stress of 77 tons. Nevertheless jerking the towing gear at the start of a tow may part it almost immediately; a 1,000 ton tug and a 10,000 ton ship sheering different ways in a seaway will do the same thing. A tow requires constant 'nursing' from beginning to end. A big catenary in the towing gear will help to avoid overstraining; so does the 'stretch' of the manilla, and the action of a spring-loaded towing hook. Most up-to-date tugs have a self-rendering winch which can be set to give way to a gradual increase of weight. All these aids, however, can be negated by too much power, helm, or impatience.

Patience is probably the greatest asset of all. It is invaluable on the bridge and in the London office. Our tugmasters—some have been nine years in one ship—are experts and it is only right to leave the vital decisions to the man on the spot. Ships staff and headquarters staff share the firm belief that safety is more important than time. Although this is quite the only sensible and seamanlike policy it does not always increase departmental popularity with other departments and authorities.

Criticism also occasionally comes from fellow seafarers. A Commanding Officer in a towed ship recently complained of the circuitous route taken. It is difficult for non-tug sailors to appreciate that a tow can 'run aground' in 20 fms of water. The catenary of the tow-rope frequently reaches this depth and, at least once, towing gear has touched bottom in 30 fms. It may actually foul the bottom and bring the tow to a standstill; otherwise it merely chafes and parts the gear in due time. (A new tugmaster not so long ago reached a record peak of unpopularity when he fouled and ruined the harbour approach 'loops' during a N.A.T.O. exercise.) Naturally it is wise to 'shorten in the tow' in shallow water,

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but shortening can be carried too far; once the gear commences to jump out of the water, parting is imminent. Thus the necessity to seek deep water on passage is urgent. But, without thought, this point may not occur to even the most experienced sailor.

In at least one other way a tug is more difficult to navigate than the largest ship. For a coastal tow a common length of towing gear is 275 fms or 1,650 ft, the tug's length may be 200 ft and the towed vessel 400 ft. Altogether this means that the tugmaster is handling a unit twice the length of the *Queen Mary*, with but a fraction of the manoeuvrability. Additionally the unit has none of a large ship's unity of purpose; frequently indeed the towed vessel seems determined to pursue a separate course from that of the tug. This lack of solidarity has only one redeeming advantage; small ships sometimes decide to make a dash between tug and tow and get safely across. A safe passage is, however, by no means assured and the uncertainty contributes little to the tugmaster's peace of mind. Within the last year a merchant vessel overtaking a tow on the high seas collided with the towed vessel, resulting in damage and loss of life.



*Typical scene of salvage operations. Two salvage vessels 'Pinned' down during a heavy lift on S.S. Gronland in Dover Harbour in 1948.*

Mention of many difficulties is no complaint; no worthwhile job can ever be free from them. The points raised have been meant to show that additional knowledge must be superimposed on sound seamanlike experience; that a deep-sea tow does not consist only of connecting a wire and ringing for full speed ahead. Even alterations of course round a cape or headland need to be pre-planned and carried out in not more than 10° steps. More abrupt alterations of course could have the towed vessel overrunning the tugs; alternatively the tugs could be girded, i.e. caught beam-on and capsized by the right-angled pull. Much can be learned

from practical experiment and it is one of D.B.M.S. duties to sift and analyse towing reports, and distribute the information throughout the service.

This is an appropriate place to speak about D.B.M.S.' other tug functions. First the important operational aspect. D.B.M.S. *allocates* the tugs and the tasks; from that moment until the tasks are completed the local Commanders-in-Chief *operate* them. This may sound confusing but in practice is not. There is a need for a collecting and co-ordinating authority and that is best done centrally at Admiralty; then with a roster of tows, priorities, and tugs, Admiralty can conveniently nominate the ships and tasks. It is also most wise for the operations to be supervised by the area Flag Officers; remote control operating from headquarters would be thoroughly unsatisfactory.

Local Commanders-in-Chief, therefore, have full responsibility for preparing the tows for sea, and for sailing and routing them. D.B.M.S. (and D.N.C.) is, however, often approached for specialist advice and is always glad to assist in this advisory capacity. Two naval officers form the entire headquarters staff so far as towing is concerned and although one officer endeavours to attend the most important towing conferences it is not always possible. It is correct that responsibility should lie locally, because of the number of purely local factors. Harbour movements, urgent disciplinary and compassionate cases, unexpected defects, provision of crews, and safety inspections, could not be attended to from headquarters without a large and uneconomical organization.

Apart from the operational aspect D.B.M.S. has other duties. His main aim is to keep ocean towing doctrine alive and thoroughly up to date. This includes progress and development of equipment as well as personnel and training. He also maintains a close interest in all commercial resources which could be useful to the country in war. In short he is advisor to the Board on all matters concerned with the practice of ocean towing.

### **Wreck Dispersal.**

In peace time dispersal of wrecks is regulated by the Merchant Shipping Act. Put very briefly the Act states that in harbours or tidal waters under the control of harbour or conservancy authorities, those authorities are responsible for raising, removing, or destroying wrecks therein. While awaiting any of those actions, the authority is bound to light and buoy any wreck which is a danger to navigation. In open waters the Lighthouse Authorities—Trinity House, Commissioners of Northern Lights, and Commissioners of Irish Lights—have similar responsibilities. In any locality no authority has jurisdiction over Her Majesty's ships except the Crown.

Before World War II dispersal work was carried out partly by the Authorities' own resources and a good deal by contractors. Sinkings during the war rapidly overtook the capacity of this system and the deficiencies were further aggravated by Government requisition of practically all marine salvage resources. After much discussion, it was therefore

decided that Admiralty should assume responsibility for clearance of war casualties and the Admiralty Wreck Dispersal Department was set up for this purpose.

Ideally a wreck dispersal vessel is big enough to provide a reasonably steady working platform and to be reasonably self-maintained for considerable periods. On the other hand, she must be small enough to be manoeuvrable, to navigate in shoal waters, and to be economical in fuel, stores and manpower. In the earliest war days any near-suitable craft, not suitable for other tasks, was pressed into service; much later 'Isles' class trawlers were found to be excellent vessels for the purpose.

The end of the war left 428 dangerous wrecks in Trinity House waters and those left in Scottish and Irish waters brought the total to nearly 500. Had the Admiralty relinquished responsibility at this juncture it would have left the Lighthouse Authorities a quite impossible task. In addition, a clearance of 45 ft is required in peacetime to classify a wreck as non-dangerous; since less than this clearance had frequently been accepted in wartime, a great many casualties required re-treatment. The Admiralty therefore undertook to carry on the work, as agents for the Lighthouse Authorities, until it had been reduced to peacetime dimensions.

These war wrecks are still being surveyed and demolished. At the moment some eighteen wrecks—naturally of the most difficult—remain to be surveyed and treated. Despite the length of time since the end of the war new wrecks are still being discovered and old wrecks may require further treatment because of the increasing size of tankers. It was originally anticipated that clearance would be complete in less than three years. But this perhaps took no account of reduced working hours in peacetime programmes and the shrinkage of the dispersal fleet from eighteen to two for economy reasons.

Wreck dispersal, like other seamanlike operations, is almost entirely dependent on the weather. In wartime, however, it was partly offset by making use of every single minute of fine weather. In fine weather ships worked day in and day out, at all hours; they did not give leave or even enter harbour until the weather broke or until machinery or personnel was exhausted. There is, of course, no reason why wreck dispersal vessels should not share in the general fleet benefits of peacetime routine, but it does make dispersal more difficult. In some bad years—like 1956—it has been practically impossible to make progress because of the weather. And when a spell of fine weather is promised, it is frustrating to find it clashing with pre-arranged and firmly established summer leave dates.

The line of demarcation between wreck dispersal and salvage cannot always be absolutely distinct. Dispersal really means the survey of wrecks and the use of explosives to achieve a certain navigable depth of water. But if by burning off a protruding mast, davit, or stanchion, the same depth can be obtained, it would be uneconomical and unnecessary to call a salvage vessel from another task in another locality. When two separate departments existed in the Admiralty they agreed that anything requiring lifting was a salvage commitment and that anything else was wreck dispersal. This is a proper and obvious solution to avoid duplication of equipment and effort.

In 'blowing down' a ship the greater the number of depth charges which can be used simultaneously the better. That is the general rule, but there are occasions when a single well-placed charge will neatly remove a 'high spot' without blowing up another in its place. Each case must be strictly judged on its own merits; in this sort of work, more haste very truly makes less speed. Days spent on careful survey are almost invariably repaid with much interest in the end. The scale of depth-charging permissible varies with the proximity of the wreck to jetties, docks, lighthouses, and bathing beaches.

Charges are either placed in position by divers or 'swept in' on wires. Each method has advantages but the methods are complementary and not in competition. Charges can be swept in when divers cannot operate because of rough weather, bad underwater visibility, fast tidal stream or low temperature. When those conditions prevail, survey by echo sounder can considerably help the task along. On other occasions, however, a diver can accurately locate an isolated peak and recommend a method to save days in removal.

The easiest and most usual method of dispersal is to dig a 'grave' with depth charges. It is usually found that erosion has taken place on one side of the wreck and the object of depth charging is to expedite the erosion. During the war the Royal Naval Scientific Service produced data relating to the size of explosive bubble and resultant cratering in different depths of water. From that a ready-use scale was evolved to show how an area of sea bottom could be given maximum effect with minimum expenditure. As one example of efficacy, a 6,000 ton ship with 8,000 tons of cargo was lowered 18 ft by only one set of charges, a feat which is by no means a record.

On hard rocky bottoms, grave-digging is unfortunately unworkable. It is then necessary to place internal charges repeatedly in exactly the right place. Some of the ship's fittings, such as boilers, seem almost indestructible and only perseverance will pay. It is sometimes better—although very much longer—to disperse methodically from the top down and to lift the most obstinate sections for dumping elsewhere. For reasons of space much specialised data has necessarily been omitted from this article; if more detailed knowledge of techniques is required it is given in a clear and concise chapter of the *Seamanship Manual Volume III*.

One thing only is certain in wreck dispersal. That is that one cannot please 'all the people all the time.' When the Nore towers were being demolished various authorities protested against removal of prominent navigation marks. If only one single depth charge is used miles from the nearest habitation an old lady will nevertheless write to the Admiralty about her windows being broken. If—for the safety of navigators—a wreck is blown to pieces on the bottom it will be merely a day or so before local fishermen complain of tearing their nets. If on the other hand the wreck is dismantled and removed piece by piece until nothing is left on the bottom the sponsoring Authority will vigorously protest against non-essential work being charged to their account.

The Section has however only one problem which is repeatedly shelved as being too difficult. That is to remove the wreck of a small H.M. ship from a valuable and thriving oyster bed without annoying the oysters with the 'noisy noise' well known to be their particular *bete noire*.

By kind permission of *The R.N. Scientific Journal*.

## THE T.O.B.

It was early summer some time ago when I first made the acquaintance of the T.O.B. I was qualifying at the time and he was a Diver I. He would turn up occasionally at Gillingham Pier when he was doing a 'never'.

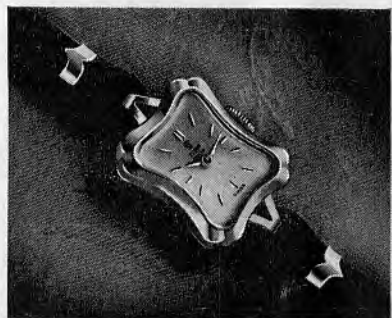
One morning I had stood fast when the remainder of the class marched off, as I had to attend requestmen. It did not take long to receive 'granted' and, as I made my own way to the school, the T.O.B. drew up alongside with his motor-cycle and side-car. 'Going to the Pier?' he enquired. 'Hop on the pillion. You can't get in the side-car as I have a drum of anti-fouling there'. Consequently, I arrived at the Diving School not long after the class. As I dismounted, I thanked the T.O.B. for the lift and saw the surprised look of the instructor. 'You've got more guts than I have, riding aboard that outfit', he said. 'Do you see how the sidecar is secured?' and on closer inspection I saw that it was lashed to the cycle with spun yarn! Needless to say I kept a weather eye on the approach of his outfit and did not accept another lift.

A few days after the incident, I was in the boat with the T.O.B. and he told me he had lost all his chickens. I offered what sympathy I could and learned that he had painted the chicken-house with the anti-fouling paint. Though it may be alright for keeping barnacles off the ship's bottom, it was a bit lethal for chicken-houses and chickens.

The T.O.B. followed me for a dip and, when he had got inboard, it was discovered that his knife was missing. Down he went again to find it, but in the Medway mud and especially as we had been exercising direction signals, the knife could not be found. 'I'll have to put you in the rattle', said the instructor to the T.O.B. 'Don't do that', was the reply, 'Give me until this afternoon', he pleaded. Sure enough when we turned to after dinner, the T.O.B. produced a Diver's Knife. 'And here', he said, handing it to the instructor, 'are three more as stand by'.

All in all he was a good chap to have about, and above all he was a grand diving 'oppo'. I can only suspect he had a relative in the Dockyard Return Store, as we were never short when mustering woollens and things that have a habit of shrinking to nothing. He got us out of many a crop while we were together at the Diving School. Whenever a diver came in from sea and joined the school after 'Barrack Joining Routine', it would not be long before the enquiry was made 'Is the (yes, you've guessed it) Thief of Bagdad (as he was affectionately known to us) around?'

J.W.S.



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**ROLEX**

## FAR EAST FLEET CLEARANCE DIVING TEAM

Greetings from Lat. 22° 16' N., Long. 114° 9' E.

For those whose knowledge of navigation ends abruptly at the acceptance of a north and south pole, the above refers to that jewel in the sea, Hong Kong.

Past members of the team would wince at the word 'jewel' and though 'tis true many of its facets are a little chipped, a smashed beer bottle shines in the sun, bringing a tender reminiscent smile from one of the ungodly.

Since the last contribution to the magazine, we have been busy with shallow water divers. They descend at frequent intervals to drink our tea and sorely try the patience of the Chief. The S.W.D. (Q), who placed a slab weight inside his counterlung did not, we regret to mention, pass the course.

Apart from training would-be divers from the R.N., there have also been classes from Australian and New Zealand ships, and we met the Aussie C.D.s. Regarding sharks, Hans Hass has nothing on these boys. Instead of a twelfth-week exam., they go get a half-grown Hammer-Head apiece.

The Aussie press has noted the fact that half-grown Hammer-Heads have indeed become scarce since the institution of a C.D. branch in the R.A.N. Also realized, however, is the Hammer-Heads' appreciation of this exam. which threatens their species and they are now in the process of speeding up evolution and completely bypassing the half-grown stage. This gives C.D. instructors an added headache in finding suitable competition for the twelfth-weekers! If this problem is solved and we hear of the solution, we have no doubt 'She'll be a beaut'.

We also welcomed to the school the American U.D.T., the frogmen of the comics which, they stated, bore little resemblance to their real work. Having had a dip in our U.B.A. one of the team said, 'It was the most', an American expression which means 'jolly good'.

They use a set for their closed circuit equipment developed by the Italians, 'Perrelli' by name. After having a dip in it, one begins to appreciate the U.B.A. They also have an aqua lung which we tried and found most satisfactory. Using U.D.T. swim fins seemed hard work after our own light, short fins, but one very good point about the American flipper is that it floats. Ever lost your fins over the side?

After diving was over the inevitable happened and a savage crowd of British and American divers did tests on the amount of liquid that could be stowed inside a diver without causing dizziness plus a grave mental and physical deterioration of both mind and body. As coherent speech became impossible, three pulls on your buddy's shirt was an urgent signal for just one more shot of rye (on the rocks).

Apart from S.W.D. courses, etc., we have been able to help the police in various ways. The most recent being when a Chinese gentleman drove along the waterfront to give his car a float test, and omitted to

remove himself first. After a period of ten days in the waters of Hong Kong harbour both he and the car certainly needed a re-spray.

The team is becoming adept at clearing foul screws on the M.L. flotilla. 'Any time anywhere' is our motto. But the frequency with which a foul screw seems to occur at 0600, 1200, 1530 and on that first week-end you have had for a whole week is truly amazing.

A few weeks ago the team set off with a large 'kitty' and a great thirst for a run ashore. A ten-course meal of Chinese dishes was a highlight of the evening, followed by numerous alcoholic beverages and a conversation devoted mainly to the complete re-organisation of the diving branch. These incalculable ideas for a 'New Look' branch became wilder as the bottles were robbed of their stimulating contents. It is not until the following day, however, that one wonders if the 'Boss' really appreciated remarks on how 'you' would run the team or whether, in a sudden burst of bleary-eyed affection for the Chief, you drew a detailed plan of the store and demonstrated how his presence could be avoided for a whole forenoon.

During the evening it was interesting to note the absence of desertion amongst members of the team (Chinese girls are very attractive). Was this due to the good sense and fine morals to which every diver is addicted, or to the fact that seventy-five per cent. of the team have wives in Hong Kong?

Aside from diving, thirty cups for swimming have been won; P.O. Rose has a fine new baby; L.S. Cobb a fine new scar (appendix) and L.S. Blaylock has declared himself an outright capitalist by passing for P.O. and buying a roaring monster of a car. A.B. Burton and Wiggans were awarded, with great pomp and ceremony, the General Service Medal, much to the disgust of the Korean 'Vets' among us.

That then brings to an end news from the East. Good wishes to all the brethren everywhere in the coming year from Lt. Cdr. Warner, C.P.O. Hopewell, P.O. Rose, L.S. Blaylock, L.S. Cobb, A.B.s Burton, Wiggans, Carr and Sharpe. WIGGY.

## CIVILIANS SALVAGE SUNKEN BATTLESHIP

At the end of the summer this year, members of the inland club, Uxbridge Sub-Aqua Group, were out in strength to assist in the recovery of a battleship. The operation was spread over two week-ends with divers working in pairs and relief teams always at the ready. During the first week-end, successive surveys were made and markers planted so that a systematic coverage was ensured. Although a useful reconnaissance was carried out over a large area, nothing was spotted and finally all divers returned after their air cylinders had been exhausted.

Of course our civilian techniques are different from service techniques. For one thing we use either snorkels or breathing sets where compressed air is metered, according to the diver's requirements, through a demand valve. When diving with SCUBA's (self-contained underwater breathing sets) we make a point of operating in pairs. This is what the Americans call the 'buddy system.' The organisation is carried out voluntarily and

discipline, other than essential safety measures, is very slack; things are done because people really want to do them—at least that is the way it is in our club.

But back to our battleship story—

On the second week-end, the same systematic procedure was adopted but concentrated much more on the area in which the ship was last seen. Success was ours. The mammoth was spotted settled in the bottom with a list of 50° to starboard—now for the problem of raising. A signal was sent to the surface for more help, but whilst hurried preparations were being made to ship more equipment and help to the area, the frogmen already there were commencing the lifting operation.

Amid bright sunshine and calm waters the surface was set swirling as the once handsome vessel appeared in daylight again, at 12.03 hours precisely.

All that was left now was to bring the ship safely to shore where it was returned into the custody of the responsible authority for repairs and renovation; and this was accomplished too.

Is this a true story? Well shiver-me-timbers of course it is! But there's just one thing we ought to tell you—the battleship was an 18 in scale model of the U.S. *Mississippi*, and was recovered from 16 ft of water in a lake near Uxbridge; the owner is a young man living in Uxbridge.

Thanks for letting us on board for the yarn.

From the Publicity Officer and your maties.

UXBRIDGE SUB-AQUA GROUP.



Some of the frogmen (and frogwoman) of Uxbridge Sub-Aqua Group who took part in the search for the battleship. (Salvaged battleship in foreground.)

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## H.S.C.D.T. NOTES

Many humble apologies for our absence from these distinguished pages. Everyone has been so busy washing out beer stains between diving and sleeping that we just haven't had time.

For those to whom the title is 'foreign', the H.S.C.D.T. is caged aboard that little pleasure cruiser, *Dingley*, seen every month or so slipping into Vernon Creek by at least the middle watch security guard.

During October, London was besieged and the locals proved very tolerant towards us, even when one of our numbers was found by a patrol 'Looking for Mushrooms' in Piccadilly.

How we came to be stirring up the primaeval mud of a London dock is a mystery to the lads, but 'tis said, the Navy turned us left at Margate instead of St. Abbs Head in Scotland.

However, to the relief of all those south of the border we arrived eventually in the land of the haggis.

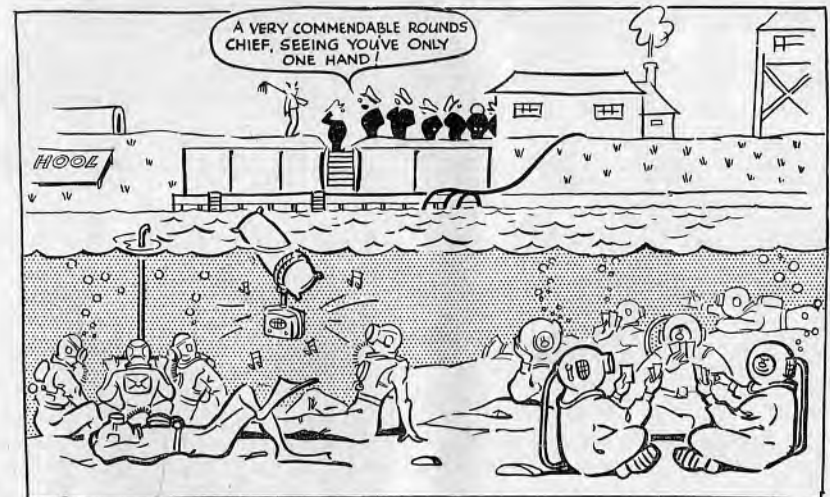
Many wet dips and clashes with rival teams, to say nothing of the Home Fleet's S.W.D's., were experienced in the shadow of the Forth Bridge. We were again uprooted and, leaving many broken hearts and a relieved B.D.O., dragged off to Inver 'G', there to fulfil such commitments as exercising the Home Fleet, picking up squids and pressing the married men's trousers before descending on *Vernon* again.

During this trip we anchored for a few hours to carry out a short practice swim. The lads were a little off colour (red facial appendages recovering) and after the first three miles some of the older members felt the strain.

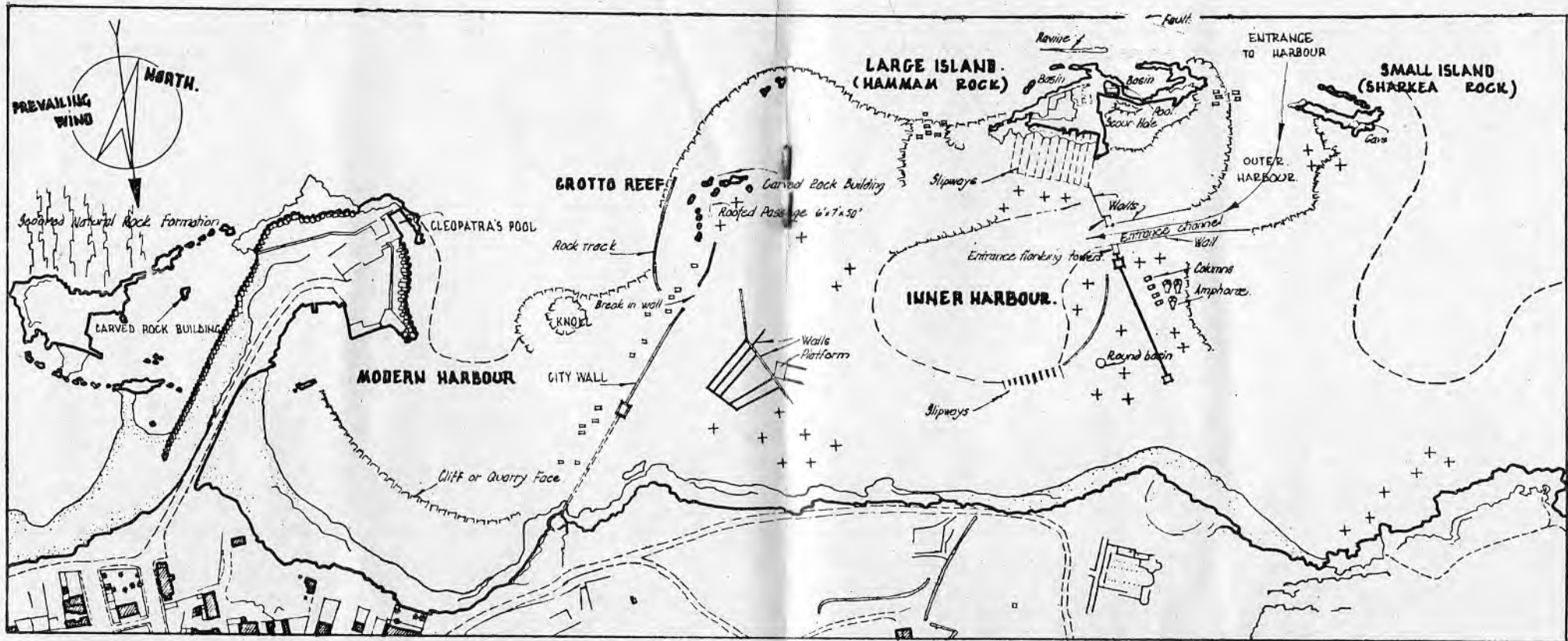
As we would like to be in print again we will not strain your readers further Ed.

So with many good wishes for a very happy and liquified Christmas, we will say cheerio till the next issue.

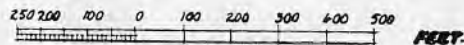
M.J.B.







SCALE : APPROX. 1/2500



**LEGEND.**

- BOUNDARY OF REEF :
- FORMER BEACH LINE :
- TRACES OF BUILDING :
- BUILDING BLOCKS :

**SKETCH PLAN OF UNDERWATER RUINS - ANCIENT HARBOUR OF APOLLONIA.**

PREPARED BY C.R.E. CYRENAICA DRAWING OFFICE, IN CONJUNCTION WITH BRITISH MILITARY SUB-AQUA CLUB. AUGUST, 1957.

**BENGHAZI MILITARY SUB-AQUA CLUB REPORT  
ON THE UNDERWATER EXPEDITION TO  
APOLLONIA, JULY, 1957**

**Aim.**

1. The aim of the expedition was to investigate underwater an area of the sea adjacent to the ruins of the ancient port of Apollonia in order to determine the extent of the original harbour and find out more about that part of the town submerged after earthquakes.

**Scope.**

2. The investigations were limited in scope by time and, therefore, covered the following at the request of Professor Goodchild:
  - (a) Checking existence of harbour walls, wharves and connections between the mainland and the two islands.
  - (b) Reconnaissance of traces of buildings under the sea and man-carved rock formations.
  - (c) Verification of a 'quarry face' now located in the modern harbour.
  - (d) Limited reconnaissance of the water to seaward of the two islands.

## General.

3. *Members.* The members of the expedition were from the Benghazi Military Sub-Aqua Club.

4. *Equipment.* All members were equipped with face masks, schnorkel tubes, and flippers. In addition the following equipment was available:

- (a) Three sets of underwater breathing equipment with spare bottles of compressed air.
- (b) A sixty-ft shot-rope marked off in fathoms, six-ft measuring rods, marker buoys and glass bottomed biscuit tins.
- (c) A rowing boat, loaned from the Libyan Army from 1300 hrs 6th July to 1300 hrs 7th July, 1957.
- (d) Miscellaneous fishing spears and guns.

5. *Time and Weather.* Intermittent swimming and diving took place from 1630 hrs. Friday 5th July to 1300 hrs. Sunday 7th July. There was a fairly heavy swell on the Friday evening, making swimming difficult and visibility poor. It was calmer on the Saturday with a correspondingly better visibility, especially in the lee of the two islands. On Sunday the weather was excellent, with only a slight swell.

6. *Fish.* There was a variety of large edible fish in the area which successfully distracted the members of the expedition less keen on archaeology. A good haul was made.

## Quarry.

7. Professor Goodchild said that the old maps showed a sort of cliff edge in the shoreward half of the modern harbour and thought it likely that this was a quarry face. The face was located and traced, the depth at the deepest part being about 20 ft from the sandy sea bottom, with the top about 6 ft under the surface. The face was of the common limestone of the area and split naturally into blocks. There was no evidence of tool work.

## Harbour Walls.

8. *East.*

- (a) From the large Christian Basilica to the main island was thought to be the alignment of the harbour wall, as two large towers, flanking a gap, seemed to indicate a harbour entrance. The alignment was investigated and a stone wall found about fifty yds from shore leading to the inshore towers. From the offshore towers is a shoal stretching to between the two islands but the western face of the shoal is dressed with well-cut blocks. This face stretches from the tower to inshore of the east tip of the large island.
- (b) There is another wall from the shore near the Basilica at an angle to the one in para. (a) above. This goes in the direction of the eastern tip of the small island but only part of the way, with some breaks.

9. *West* The group were asked to investigate a wall thought to join the western tower of the town wall, located at the waters edge, with a reef to be seen about 200 yds off shore. This was done with success and the wall traced for about 120 yds. There is then a break where it has been washed away (blocks are scattered to leeward) and then the reef appears underwater at a depth of about 10 ft. The water becomes shallower until parts of the reef protrude above the surface. The wall traced was 8 ft wide of two blocks width.

## Reef.

10. On reaching where the reef, mentioned in para. 9, breaks the water, it was found that it had been carved by man into large and small rooms. Also, centrally placed was a roofed corridor, 6 ft high by 7 ft wide and stretching some 40 ft. Most of the roof had been damaged. The rocks, although worn, were unmistakably worked with tools. This grotto was a beautiful place with bright colours and fascinating shapes, in which swam large bream and parrot fish.

## Other Buildings.

11. Following our discovery of the grotto in the reef, traces of buildings were discovered around it on the eastern side and between it and the shore on the eastern side of the sunken wall. Some were of unusual dimensions, one being nearly fifty yds long with two walls 4 ft wide, about 25 ft apart. Various towers exist, but debris, sea worn and coral encrusted, obscures much detail.

## Reef and Large Island.

12. The grotto reef is joined to the large island by a natural rock formation, but there is a gap containing a few squared blocks.

## Large Island.

13. The large island is fairly well known. On its lee side there are eight shipways carved and partly constructed out of rock. They are each 19 ft wide and about 60 ft long and one central one is reinforced with central longitudinal walls. Only about 15 ft length is out of the water now. At the head of the shipways is an area cut out of rock, with a ventilation shaft and an alternative exit to the top of the rock. The cave has a sandy bottom, depth unknown.

14. At the east end of the island where the rock is cut 'L' shaped, there are deep holes in the sea that reach to about 30 ft. These holes appear to be natural, as a result of scour. On the seaward side appears two large basins whose purpose or origin is difficult to discover. There is also a square cut pool about 3 ft deep where the rock narrows.

## Small Island.

15. The small island is connected underwater to the large island by a shallow shoal mentioned in para. 9(a). The island is cut so that at the western end is a thick wall, and a bulge at the eastern end. On the seaward side is another basin. On the leeward side there are traces of wharves and docks and a cave with a sort of bench carved out inside.

### Seaward of Island.

16. In two hours diving to the seaward of the island nothing of interest was found except a ravine about 40 ft deep and a shelf or fault, both of which may have been the result of earthquakes.

### Objects.

17. There was a disappointing lack of small objects to be found on the sea bed. This is perhaps not surprising when one realises the force of the tides and the sanding up that has occurred. A few amphorae, and a completely worn head, about 8 ins long, were found.

### Conclusions.

18. It would be premature from such slight data to show any definite conclusion, but the following deductions appear fairly certain.

- (a) From the western tower the city wall stretched to Grotto Reef. This was connected by mostly natural rock formations to the Large and Small Islands. The Grotto Reef itself may have been a fortified building.
- (b) There was an outer harbour and an inner harbour entered through the gap between the two towers.
- (c) The Large and Small Islands appear to have housed workshops and ships' stores.
- (d) The old harbour was considerably smaller than it now appears and was quite shallow, maybe not more than a fathom.

### Suggestions for Further Inquiry.

19. The expedition should be considered as not more than a useful reconnaissance and the following suggestions are made:

- (a) that another investigation should be carried out with a small party of surveyors to check alignments and position of traces of walls and buildings discovered.
- (b) That the sand in the cave on the Large Island be excavated and sifted.
- (c) That the areas under the sea to the west and east of the area mentioned in this report be reconnoitred.

### Historical Note:

APOLLONIA—Ancient port founded by Greeks about 500 B.C. to serve the city of CYRENE. The port went into a decline with the rise of power of BARCE and its port TEUCHIRA.

Jews, who became a powerful faction in N. Africa, revolted in 114-115 A.D. and destroyed a lot of CYRENE and APOLLONIA. Later port ravaged by VANDALS, slightly restored by BELISARIUS. Earthquake completed damage, and harbour and part of the town sunk about 10 ft down into sea.

The Arab conquest saw the final demolition of all buildings, and very little is left now.

## LAND OF THE SHINING RIVER

Since taking over the Scottish Command Bomb and Mine Disposal Unit in July from Pete (Messervy not Oxygen), we have visited most of the outposts of this far-flung empire. We have travelled approximately 10,000 miles by land, sea and air as they say in 'In Town To-night'. Magazine articles are meant to be non-technical, so in this one I hope to tell you about some of the interesting places we have visited in the course of our travels. First of all I should like to make it quite clear that I'm not acting as an agent for the Scottish Tourist Board.

### Caithness.

Recently, we had to deal with an object washed ashore in Dunnet Bay which is in the north-east of the county of Caithness. We flew to Wick and did the remainder of the trip by police car. During the journey we passed John o' Groats, a focal point for tourists, being the northernmost tip of Great Britain and 855 miles from Land's End. We also saw the Castle of May, the Scottish home of the Queen Mother, and it is certainly the ideal place to enjoy a holiday far from the maddening crowd. Great prosperity has come to Caithness in recent months with the building of the atomic plant at Dounreay. It is said that labourers can earn up to £30 per week and shot firers in the tunnel up to £40 per week. On Saturday nights, Wick, which was a fairly quiet town, now seems more like Dawson City in the era of the gold rush. So if you are prematurely axed in the near future the answer would seem to be 'Go North Young Man, Go North'.

### Isle of Arran.

Arran is situated off the South West Coast of Scotland in the Firth of Clyde. We have visited it twice in the past month to deal with mines washed ashore in the Lochranza area. Like most islands on the west coast of Scotland, it is seen at its best in the autumn, with the browns of bracken and the reds and gold of the fading leaves making a wonderful myriad of colour. It is good agricultural country, especially for potatoes, and most gardening enthusiasts will know of 'Arran Banner' and 'Arran Chieftain', varieties. The hillsides abound with deer, many of which we saw, especially at night. There is even said to be a white deer roaming the island, which is indeed a rarity. Most of the land originally belonged to the Duke of Montrose whose ancestral home is at Brodick Castle. On the east side of the island two prominent beacons mark the famous 'Measured Mile', which is used by all Clyde built ships for measuring their speed during full-power trials. The highest peak on Arran is called Goat Fell and, in the 1880's, this was the scene of a notorious murder. Two men called Laurie and Rose set off to climb the Goat Fell and when they got near the summit, Laurie pushed Rose over a precipice, stole his belongings and hastened to the mainland where he was later arrested and brought to trial. At the time of the trial children sang this little ditty to the tune of the well-known Salvation Army hymn;—

'I do believe, I will believe,  
That Laurie did kill Rose,  
That on Goat Fell he shed his blood,  
And stole away his clothes.'

Enough of this for the present but it is hoped in the future to write more articles about 'God's Own Country' (Haggis Land, to you Sassenachs). Meanwhile, congratulations to Lt. Cdr. Franklin on the arrival of a new candidate for the nose clip and best wishes to Chiefy Foord on his return to the 'Bush'. Greetings to all in *Vernon*, wishing you lots of 'Houghmangandie' and 'Lang May Yer Lums Reek'.

Yours aye, MAC.

### THE ROVINGS OF 'RECLAIM'

On completion of the N.A.T.O. minesweeping exercise in July, we sailed from Harwich to Newcastle for the B.M.A. Conference.

We arrived on Friday, 12th July, a stormy day, with a nasty ponderous swell from the east. It was a relief to get inside the breakwater, where we were boarded by the pilot.

The ten mile sail up the Tyne was a new experience for most of us. It brought home very forcibly how much this country depends on ships and sailormen. Not only were ships of every nation loading and unloading, but quite a huge programme of building and refitting was under way. The incessant, nerve shattering clatter of rivetting machines was with us all the way to our billet, near the town bridge.

An interesting sight was a large fleet of trawlers from behind the Iron Curtain sheltering from the North Sea gales. According to newspaper

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reports, quite a few of the crews took the opportunity to seek political asylum. About a hundred years ago a gentleman from much the same part of the world was also granted asylum. We are still suffering from his philosophy. His name? KARL MARX!

A very pleasant few days were spent in Newcastle. Most of the ship's company visited the B.M.A. Exhibition. Many of the exhibits were gruesome and it was difficult for the layman not to retch on seeing them. At times it was a pleasure to stagger white-faced into the normality of the Diving Exhibition and drink deeply from a handy bottle of oxygen!

The diving side was under the personal supervision of Dr. Taylor from R.N.P.L., and great credit is due to the R.N.P.L. staff for a magnificent effort. Interest was stimulated among the doctors and the numbers visiting *Reclaim* grew to sizeable proportions each day. All our medical visitors were most interested, not only in the medical side of diving, but, being boys at heart, the practical side too.

On Tuesday we were honoured by a visit from the Lord Mayor of Newcastle and the Lady Mayoress. He very kindly arranged for a number of the ship's company to see the Harlem Globe Trotters give an exhibition of basket-ball, which was thoroughly enjoyed by those who went.

Next day, our mission successfully accomplished, we sailed for Portsmouth, where we arrived on Friday morning. We were to take part in the Squadron Regatta next day and, as our crews were in top training, we expected to sweep the board. All the local boys in the ship looked forward to a couple of nights at home, too, before we sailed again. The No. 1 suits were being broken out of their sea stowages when suddenly the blow fell . . . Sail for Portland at 1400 and recover an object lost in Weymouth Bay.

That was the message and with some chagrin we said farewell to Pompey and set off.

A few hours later we were alongside at Portland and alongside we stayed. The weather was not conducive to open sea diving, and the ships that were sweeping for the object got a rough battering. Our deadline was Sunday, and when no action was required of us by then, we slipped and sailed for the Baltic. En route we managed to catch a quick glimpse of Pompey, as we stopped at the Outer Spit Buoy to collect our mail.

Nothing untoward marred a pleasant trip as we hopped from buoy to buoy on the approved routes. Eventually we reached the Elbe and a couple of hours trip up the river brought us to Brunsbittel, the west entrance to the Kiel Canal. A pilot boarded and in a short time we were through the lock.

Last time *Reclaim* went through the Canal was in a howling blizzard. This time the weather was balmy and the scent of summer was still in the air. Rich green fields stretched on either side of the Canal and magnificent dairy herds somnolently munched the succulent grass and gazed at us disinterestedly as we glided by. Charming and comfortable looking

old houses nestled snugly behind a façade of apple blossom, and people on the footpaths at either side gave us friendly waves as we passed. Occasionally, we had to pull into a canal siding to allow a big ship to pass the other way.

We reached Holtenau at the Baltic end late in the evening, passed through the lock and headed for Lubeck. At 8.30 next morning we entered the river Trave and half an hour later we were secured alongside at Travemunde, about eight miles down river from Lubeck.



Norwegian Jazz Band playing to the ship's company of H.M.S. Reclaim

It would be difficult to give one's first impressions of Travemunde. Would it suffice to say it occasioned long low whistles and the baying of a hunting wolf pack? No? Then let me tell you about the beach and the inhabitants thereof.

The beach stretched for about two miles of pure white sand. Thousands of basket work beach huts were dotted all over. These huts seemed to be inhabited by millions of long legged, sun-tanned Nordic beauties with blond hair and come-hither blue eyes. They seemed to wear the minutest swimming apparel, and their whole lives seemed to be dedicated to acquiring as much sun bronze as possible on every square inch of their bodies.

And were they friendly? I remember seeing — but I think a little discretion is indicated here. However, if any of the diving fraternity want an excellent holiday (if, of course, they can afford it) Travemunde is the place. It is Bondi, Blackpool and Monte Carlo rolled into one.

Five days there were sufficient. We did manage to get to Dragerwerk at Lubeck to see what they had in diving equipment. Drager is in effect the Siebe Gorman of Germany and they had some very interesting equipment. We managed to bring back a sample of edible (*sic*) proto if that is of interest to clearance divers.

The ship was open to visitors on Sunday, and literally thousands came on board. Traffic control was quite a problem, but the unflinching humour of the British sailor came to the fore and all went well.

Sunday was our last day and early on Monday we slipped and set course on the track home. On the way to Kiel, I asked our German liaison officer why in fact we hadn't gone up river to Lubeck. He answered 'The only billet available there was in the middle of the red light district, and we couldn't possibly put the dear British sailors in such a place. They would all have been so offended.'



A diver as seen on underwater T.V. screen

The journey home was uneventful and on August 1st we came to rest at our old billet on the North Wall. Leave started at once, and the end of the month found us ready and refreshed for the new term.

The first Monday in September saw us busily embarking stores for the Clearance Diving Team we were taking to Falmouth. Lt. Cdr. Filer was in command and it was a pleasure to have him with us again, even if his bridge was a trifle rusty!

Our own programme entailed Surface Decompression using the Crocker tables. Commander Crocker, incidentally, happened to be holidaying in Falmouth, which was quite a useful coincidence.

We sailed on Wednesday, September 4th, and next day we moored in Falmouth Bay. The Clearance Team went off in the launch to find some nice clear water while we started our trials. The weather was, on the whole, pretty bad. Most of the time we were confined to diving from one side of the ship. If the weather door had been open we would have been flooded out.

Trials were carried out until Saturday morning without incident, and then *Reclaim* entered Falmouth harbour for the week-end. It was pay week, too, and as the natives proved friendly, a good time was had by all.

Monday morning as usual, came round all too quickly and before 9 a.m. we had started our dummy mooring runs. The Captain at last being satisfied, we ran in for the real thing. The stern anchor was the first to go. Unfortunately, it kept on going as the after part forgot to put the brake on in time, and there we were minus one Danforth and 300 fms of valuable wire. Apologies came from aft, but apologies don't recover anchors. A year or so ago we lost one in Norway which we didn't recover. We meant to get this one back!

A Gifford creep was shackled on to our second anchor wire and we started dragging. We did quite a number of runs, but to no avail. As usual there were false alarms, but on heaving in we found nothing on the end. Eventually, we dispensed with Mr. Gifford's creep and buttoned on a small kedge. This did the trick on the very first run. The wire came up nicely trapped in the flukes and the only thing to do was put it back on the drum. That took five hours!

While all this was going on, other things were happening elsewhere. Misfortune had struck the engine room in the shape of Asian Flu. Eight went sick practically all at once. The situation was impossible and the Captain decided to shelter in Falmouth Roads for the night. Next day we sailed for Plymouth. It was felt that it would be much better to be near a naval hospital in the event of an epidemic.

It did in fact turn out to be a real epidemic as forty-five went sick while we were at Plymouth. Much to our disappointment we were unable to take part in the N.A.T.O. exercise Standfirm. On the other hand, we were fortunate not to have been quarantined, and, apart from the continual stream of ambulances rolling up to the ship each day, life and leave went on at the normal tempo.

However, bad things—like good—must come to an end sometime, and by Sunday, September 23rd the flu seemed on the wane. It was considered safe to sail for Portsmouth on Tuesday, and here we are, at the moment of writing, securely tied up at the North Wall.

It wasn't a good start to the term and precious little was gained from it. We do hope to catch up by Christmas and our next programme is mapped out. A class of Divers One, qualifying, will join us in the near future; the Surface Decompression trials will be restarted, but I'm sure my successor will give you all the news in another issue. Let me not anticipate.

There will be a few changes by then of course, of which I must speak. Lt. Wookey will be leaving for Malta shortly with best wishes from all. Lt. Barrington will succeed him as D.O.I and we bid him welcome. Your humble servant hopes to relieve Lt. Dodds in Rosyth by the end of the year. The Captain, Lt. Cdr. Drummond, is coming to the end of his time in *Reclaim*, as also is the Engineer Officer. I feel quite sad at the thought of leaving. We have always been known as a very happy ship and after three years one almost feels a part of the structure.

A loss to the diving world will be Surgeon Commander Crocker, who leaves R.N.P.L. for a course at London University. His services to the Branch have always been appreciated and he has served the Branch well over a number of years. We wish him the best of good fortune.

To all divers everywhere a very happy Christmas and a prosperous New Year.

JAYGEE.



Surgeon Commander Crocker, R.N.

### DIVERS'

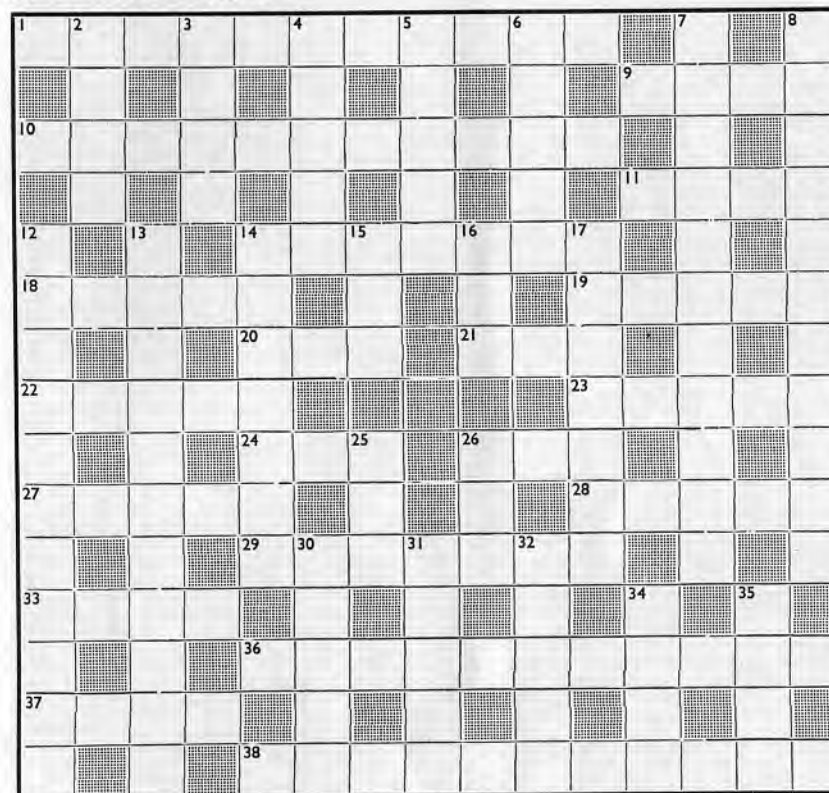
#### CLUES ACROSS

1. The largest, most important and oldest of the world's industries (11)
9. Emblem of New Zealand (4)
10. Storms about the boffins trade are in you (11)
11. A Commonwealth Air Force serves there (4)
14. Let your house again (7)
18. Do a number of lions swallow this (5)
19. A terse rearrangement (5)
20. It should be monthly (3)
21. Two without a vegetable (3)
22. Mum, Mikes gone! That leaves one (5)
23. Divers in the Isles know this (5)
24. She is the same both ways (3)
26. Your safety may depend on it (3)
27. You lose (5)
28. Did a given amount plus five hundred send you to sleep? (5)
29. Mines are sometimes found on these (7)
33. Half a 'mo' Add a noggin without gin (2, 2)
36. This sort of pot is for sitting in! (11)
37. This boy may be of wood (4)
38. Go astern in the ballroom (7, 4)

#### CLUES DOWN

1. Start above for a madman (2, 2)
3. This month (4)
4. Together less a number brings together (5)
5. Present, past or future? (5)
6. Knots in Granny's lifeline (5)
7. What Molly Malone did on the Woodland? I shan't tell you (11)
8. Mans to mans is famous or infamous (11)
12. It never knocks twice (11)
13. Songster, no wren this Swedish jenny (11)
14. See 32
15. Hook has one (3)
16. Your full time gardener could not grow her for you (3)
17. Hesitations round the gold mines (7)
25. It is human to do this (3)
26. Can he play the bagpipes as well? (3)
30. Treasure, so they say (5)
31. With a number it disguises, without a diver's fit (5)
- 32, 14. By the night. Do it again (5, & 7)
34. Sued for the well-worn (4)
35. Sometimes with lime, sometimes without (4)

### X-WORD No. 6



The solution to this X-word is on page 58

### NEWS FROM THE EAST

Salaam to all Divers, both wet and dry; this is your Middle East Correspondent reporting from Bandar Pahlavi, Iran. The keen students of geography will be lucky if they can find it mentioned on any map. It is a small port in the south-western corner of the Caspian, some 30 miles north of Resht and 180 miles south of Baku. Pahlavi lies in a coastal plain bounded on three sides by mountains and on the fourth side by the sea. The yearly rainfall is 60 inches (that's real rain, even for Mancunians) which falls almost continuously from October to April. The rest of the year, the sun shines all day and every day. This leaves a week for spring and a week for autumn when the only sensible rig is oilskins and sunglasses.

The problems of starting a diving establishment are by now well known, but in the case of the Iranian Navy's Diving School we've had

some new ones to contend with. When we started, at the end of July, we were slightly hampered by the lack of buildings, equipment and divers. This, however, was fully compensated for by an excess of holidaymakers, sun, and vodka; a veritable diver's delight.

The blow had to come eventually, and it wasn't long before the four Iranian divers trained last year in *Defiance* and lorryloads of equipment arrived, and we were all moved into a semi-detached villa near the sea. Our next-door neighbours were a little startled by our arrival and even more so by the strange noises coming from the Diving Store not to mention the language imported direct from Plymouth. They became used to us very quickly, however, and the fact that they are shortly leaving for Teheran has nothing to do with the loss of their wandering chickens.

We next discovered that diving equipment isn't all that is required to start a school. It does help to have some small items like tables, chairs,

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tools, cleaning gear, and cordage. The only result gained from doing a reducer test on the floor was a slipped disc. So we set about begging, borrowing, and acquiring the essential gear. It should be noted here that the art of acquiring is international among divers. The transport boxes were dismantled and made into store cupboards, work-benches and suit racks; ropes, sinkers, a boat, a tool box and a bottle of vinegar all appeared from nowhere and we were ready to dive.

There are only two places where one can dive here, the sea and the harbour. The harbour has 4 ft of soft mud and no visibility and the sea has hard sand and 20 ft visibility, so taking everything very carefully into consideration we decided to dive at sea. Our first day's diving, however, was rather overshadowed by the fact that all divers found it far easier to make the bottom without a set rather than with a set on. This situation was quickly remedied, and after a week we were in a position to start a two-week selection course for the six students. Three failed to qualify and we are awaiting replacements from Khorramshar before starting a proper course. In the meantime we had hoped to pass the time quietly by making out the S.9's. but much to our horror we found ourselves with some real work on our hands.

Eighteen months ago one of the two bridges in Pahlavi was partly washed away in a flood and is at this moment undergoing reconstruction. This is being done by SENTAB, a Swedish firm, who asked us to assist them. The job was to crawl among the piles supporting one of the bridge foundations and remove 80 tons of concrete from the mud. This foundation had to be pulled upright a distance of about a foot, which might have broken some of the piles as they were firmly embedded in the lumps of concrete. These lumps were up 100 lbs in weight and were kept firm by the mud. We decided to assist, but the problem was—which set to use. The depth of the water was only 20 ft, but in order to do the job properly we reckoned that each diver should do two hours on the bottom. The answer lay in a strange assortment of gear brought from Khorramshar by Lt. Azadi, the Iranian Diving Officer. This consisted of three shallow water diving dresses, some salvus spare parts and a set of American gas mask gear. The American gear was brand new and consisted of an air compressor, reserve chamber, and two sets of gas mask equipment and suits. The compressor supplied at 25cubic ft per minute and ran without fault; the suits were made of canvas with a built-in rubber-and-canvas hood; and the mask was large, triangular, and very comfortable. I don't know if the Americans have got larger feet than we have, but the boots were the first comfortable pair I've ever worn. The weight belt was magnificent. It had beautiful brass studs and ingenious slipping devices but it had one disadvantage, being leather it fell to pieces after two hours under water.

The job was completed in six days or forty diving hours. Each dive took two hours, and the average amount brought up in that time was 4 tons. Although this may seem child's play to some people, it is a surprisingly good effort for divers who received three months training in search diving a year ago and had a work-up period of only three weeks recently. It certainly gives a good send off to the Iranian diving branch.



Lt. Azadi and his three divers wish me to convey very best wishes to their friends at *Defiance* and in particular to Lt. Honour, P.O. Edwards, P.O. White, and L.S. Roper.  
M.G.G.

### "I CRIED, 'COME TELL ME HOW YOU LIVE,' AND THUMPED HIM ON THE HEAD"

'Of course, the scientific way is to drop a charge in the middle and then collect and count the fish afterwards.' A slightly chilled silence, followed by the quiet but firm decision to be unscientific, lead to an interesting dive amongst scores of enormous salmon trapped in a mill pool on the river Avon.

The object was to try and estimate as accurately as possible the number of fish detained in the pool, for the purposes of evidence to be used at an enquiry into the problem. Those who are good at mental arithmetic and who also dive will appreciate how this faculty is impaired as soon as their heads go underwater. Those who are not, need not dive to realise that counting hundreds of moving salmon in a pool seventy by sixty ft and with four dark tunnels in it each crammed with fish is very nearly impossible, particularly when the visibility is at the most only



Who hasn't taken his 'Sleep Sweeter Nilleter'?

twelve ft. Hence the opening remark and the decision to take an estimate as being good enough. The divers found that by using an oxygen set and behaving like a salmon anxious to go up river it was possible to swim amongst them, shouldering them aside, as they would nudge the diver, or stroking them gently. The moment the diver did anything odd like emitting a cloud of bubbles, standing up, or moving suddenly or in the wrong direction, panic would break out and all the fish would rush wildly from one tunnel round to another. Amongst these mostly red fish were a few very large barbel. One in particular is a well-known character of the pool and when it was mentioned that the diver had stroked him a coarse-fisherman at the enquiry interjected that they'd been trying to catch that one for fourteen years. One salmon of truly immense proportions with a crumpled dorsal fin was an easily recognised prisoner. The expert estimates of the size of this salmon ran as high as 210 lbs. and certainly he looked as large as any reasonable fishing story could demand.

The count of the fish was done by counting the cross-section of each column of fish in each tunnel, noting gaps if any, and then calculating the total number knowing the average length and spacing of the salmon, the size of the turbine tunnels and the cross-sectional number of fish.

Other inhabitants of the pool were met in smaller numbers and included perch, eels, and fresh water flounders.

It was also interesting to find how much easier it was to locate the right places to swim against the current, by watching where the salmon and sea-trout kept to. They were seldom actually in the main flow, most of them keeping just under or inside.

During this inspection which took place on two days in August and on the morning of the enquiry in October, a noise quite apart from the rhythmic noise of the turbines was to be heard. It was like the noise of a thousand tiny voices—was it the salmon?

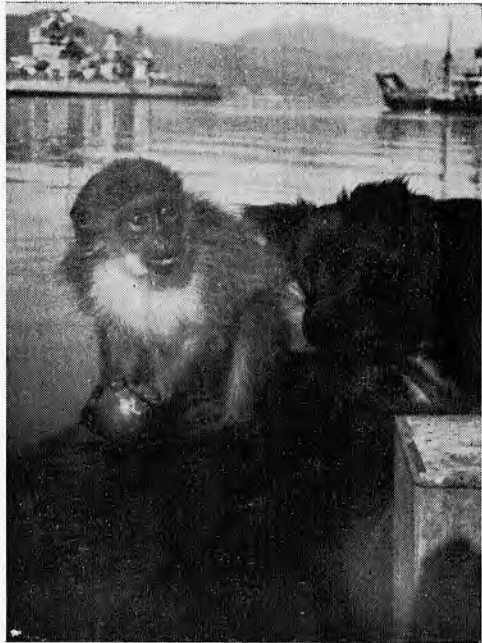
### H.M.S. 'ADAMANT'

Greetings once again from 'Yo-Yo' now at Faslane. It has been some time since our last contribution but it is hoped we are not forgotten. Our team is unchanged except for our Dustman (Sorry M(E)) who really gets no consideration, only kicks when there's any oil on the deck.

Frankland has taken wife and seems all the better for it although we cannot say as yet how long the first tender bliss will last.

Our Father Confessor, P.O. Black, is almost due for return to civilisation so any D.1 who is a good M.F.V. Driver and wants to develop webbed feet in this rain-soaked wind-blown Scottish beauty spot is welcome to volunteer but have a good check up on the old sense of humour first.

A keen type joined the boat temporarily; the photographs show him checking up on the good book. In spite of the resemblance it is not a C.D.3; it can read.



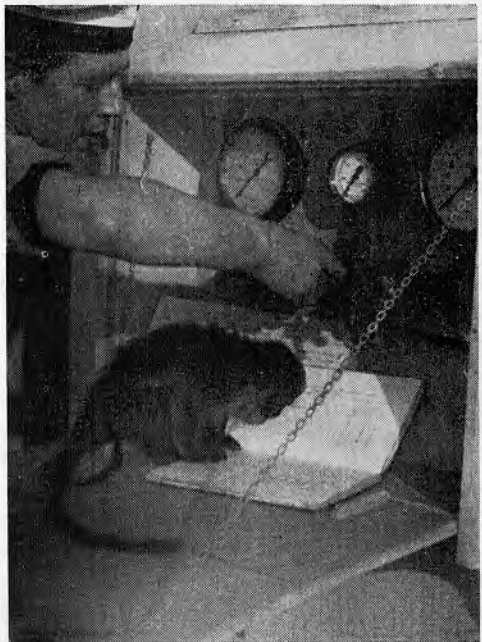
Look over there mate. I wonder what really goes on in this boat.



This is all clever stuff. No wonder divers are mathematical wizards, some of them must even be able to read.

I expect I could work it out if big head here gets out of my light. Hmm! Very technical, stops, time under water, revs. Blimey, I'll—

just turn it all on, something's bound to happen.



We have had a couple of good runs ashore and ere I forget we have been diving too—too ruddy often since the Clyde Unit paid off. Blessings on the oaf who put up the pennant and then took the bosun's chair on draft with him.

It is said the ghost of Brooke-Foster haunts the boat; weirdys sometimes happen, the winch goes with the main engine stopped and the boat goes backwards for forwards, etc., but in spite of a high pressure seance held in the hold to exorcize the spirit all that came to light was a wickered jar, devoid of any spirit of course.

A few weeks ago the police wanted us; we shipped clean underwear and crossed the fingers but it was O.K., they wanted our help to search for the body of a five-year old boy in Greenock; anyone watch T.V. by the way? This was a long tedious job covering acres of harbours and reservoirs and we were grateful for the backing up of the team by L.S. Morris and A.B. Lovell of Barcombe. Funnily enough for Scotland it rained all the time. We also welcomed the C.D. Team from Lochinvar who did Victoria Harbour and a very big cold reservoir, but no result was forthcoming from either team.

When the child's body did eventually surface in the above-mentioned harbour I must admit that we breathed a sigh of relief and did a little chortle, not that it alters the deep affection and respect that we hold for our C.D. brethren.

The police were very good and we were well refreshed after the job was completed, and then having started the rot they informed us that our run ashore that night had police protection and we could do anything except commit murder or indulge in anything mentioned in the Wolfenden Report—that put one of our member's night out 'ten left' before it started.

Since *Adamant* returned and tied up in the Gareloch things have been one long round of 'IN Bung', 'OUT Bung', 'Please sir, I dropped it here and it went Glop, Glop', 'My port propellor is singing' (What do they want us to do, give it some bird-seed?) in fact back to normal.

To relieve the monotony we have made contact with Glen Fruens Divers and in return have been invited to view the underwater experiments that are taking place up there. The D.O. says next time he goes up he is taking a packet of ants' eggs as they must feel like goldfish in their lovely clean glass-walled tank.

A Merry Christmas and a Liquid New Year to all Dip-chicks; if you want any snow, let's have your addresses.

*Au revoir Mes Amis*, we will write again soon. Visitors are always welcome, bring your tots. FOUR D.

### KEEP IN TOUCH

#### THE NAVY NEWS

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# BREATHING PATTERNS

By

SURGEON COMMANDER S. MILES

Supplying oxygen and getting rid of carbon dioxide is only one function of breathing. In addition the breath is used for talking, blowing of hot soup, shouting, singing, coughing, sneezing and even spitting. A pressure can be built up in the lungs to clear sticky ears, blow bunged-up noses or form an air cushion to assist in straining in moments of constipation. Many wind instruments require huge pressures and breathing control to be played. Even the baby at the breast must employ its respiration to assist the suction, the teenager likewise needs its help to raise 'coca-cola' through the straw and the joys of smoking are dependent entirely upon the breathing ability.

These are the positive functions of breathing but perhaps more interesting still is the way in which the breathing reflects the activity of the mind. Literature is full of reference to the close association between respiration and emotions such as, 'the hot breath of burning passion', 'the sigh of despair', 'gasp of surprise', 'the breathlessness of anticipation', 'the panting of desire' and many others. It is not unreasonable to assume, therefore, that when breathing is studied in detail it can be full of surprises.

For many years physiologists were content to count the rate and measure the depth of respiration and in so doing much of the significance of its variation was missed.

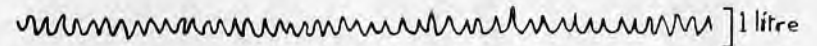
In the past year or so at the R.N. Physiological Laboratory continuous tracings have been made of the respiratory patterns of 175 divers and the quite startling finding was that however much conditions were standardised, the individual patterns were vastly different. There was no conformity in rate, depth or regularity. Rates varied from 4 to 32 per minute, depths from 442 c.c. to 3,259 c.c., volumes from 7.6 to 33.2 litres per minute, and 32% showed marked irregularities in rhythm. All occurred under identical standard conditions and three extreme types are shown in the figure.

It is of course possible for the same volume per minute to be breathed by rapid shallow breathing as by slow deep breathing. Of the two the latter is more satisfactory especially in diving. In all breathing, a certain volume of air in each breath never gets to the lungs but fills up the nose, mouth and windpipe. This is called the 'dead space' and the quicker the breathing the greater volume will be wasted in this dead space. The slow deep breather has less of this waste and the lungs are stretched and fully ventilated. In the survey, the slow deep breathers were to be found amongst the best and most experienced divers. In some cases

## BREATHING PATTERNS



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breathing is both deep and rapid. This occurs in men who have been taught to breath deeply but who in their anxiety increase both depth and rate. This increases the total volume breathed and may wash out too much carbon dioxide which is undesirable.

A few men, particularly when breathing against a resistance, may breathe shallowly without sufficient rate so that they build up carbon dioxide in the body. When this pattern is recorded it is often seen that at frequent intervals they take single deep breaths to catch up as it were.

But most interesting are those whose breathing patterns are completely irregular. It seems that these men have a respiratory centre in the brain which is more sensitive than others. They show a marked response when carbon dioxide is breathed and their 'brain wave' records react more acutely to simple mental problems. These are the men who are generally sensitive and more emotional than others.

Although the respiration is very largely sensitive to the emotional changes there is the well known underlying chemical control of which the most important factor is carbon dioxide which limits breath-holding more than oxygen lack.

As far as oxygen supply is concerned breathing is uneconomical. The inspired air contains 21% oxygen and the expired air 16% so that there is still plenty of oxygen left when breathing out. This is of course the reason why an air breathing set is so wasteful as compared with the closed circuit oxygen breathing apparatus.

Carbon dioxide is being given off from the blood in the lungs continuously, just as oxygen is being absorbed, and during inspiration it builds up. This increase, together with the stretching of the lungs themselves, brings inspiration to a stop and sets off expiration. It follows, therefore, that a person who is more sensitive to carbon dioxide is likely to be a rapid shallow breather and vice versa. This is indeed borne out when breathing patterns are studied with carbon dioxide added to the inspired air.

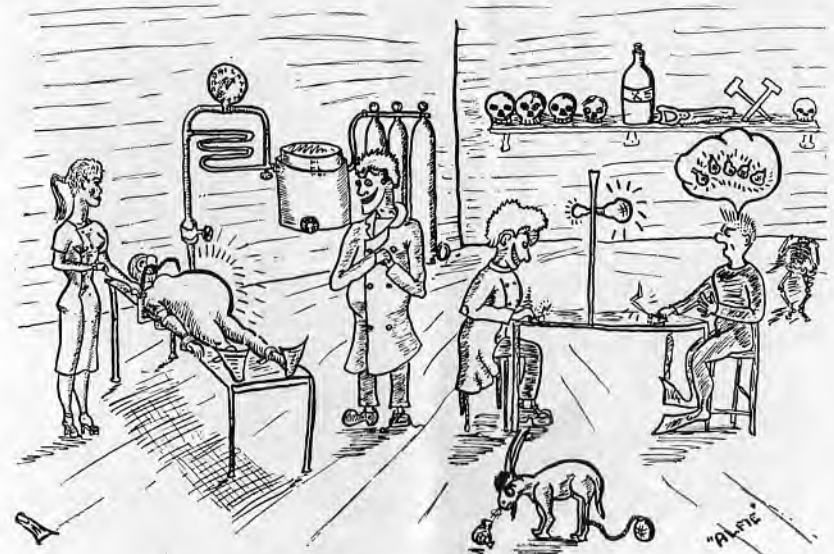
Good swimmers, athletes and those who have been interested in physical training invariably show a deep slow respiratory pattern and make the best divers. There is a lot to be said for physical training which emphasises the value of breathing exercises and in time many people develop a basic slow deep rhythm which is a good thing. A slow deep rhythm is to be encouraged and with time should become natural. The main danger is that of over enthusiasm. So many men have increased their depth of breathing without sufficient slowing. This results in hyperventilation which washes out too much carbon dioxide and upsets the chemistry of the body. This is more likely when attention is being paid to the breathing rhythm. Success is only achieved when the rhythm is quite unconscious and unless the habit is fully formed there is a risk that, in sensitive individuals, the pattern may revert to a rapid one in an emergency.

In whales and other diving mammals, the body is much less sensitive to carbon dioxide and therefore these animals are able to hold their breath

for quite long periods, using up a much greater percentage of oxygen from the inspired air.

In man, it is well known that by taking a dozen or so deep rapid breaths some carbon dioxide can be washed out so that it will take longer for it to build up to the limit again. By this trick the breath holding time can be increased by a minute or so. This is not without danger and there are three cases on record where it nearly caused disaster. These men were trying to see just how far they could swim under water. They dived in after hyperventilating and, by swimming hard whilst holding their breath, they actually used up all the oxygen in the lungs before the carbon dioxide had built up to the breaking point. They lost consciousness in the water from oxygen lack and had to be fished out to avoid drowning.

The effect of oxygen lack on the breathing pattern is very interesting. There is a chemical mechanism in the body which detects a fall in the blood content of oxygen. This signal is received by the brain which automatically increases the breathing volume. However at the same time, if blood flowing through the brain is lacking in oxygen, the brain centres are affected and lose their sensitivity to the incoming chemical stimulation. If the oxygen lack is sudden the brain packs up before respiration is increased but if it comes on slowly, increase in respiration may be seen. When a 10% oxygen mixture is breathed it is touch and go what the result may be. In about half the men respiration decreases and in half it increases. In some the actual struggle can be seen taking place with bursts of increasing respiration mixed up with gaps where hardly any respiration occurs.



In a quiet corner of old 'RNPL'

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The importance of this is that generally speaking oxygen lack (provided there is no simultaneous carbon dioxide build-up) is unlikely to be detected by the sufferer and it is quite easy to pass gracefully into unconsciousness without any warning.

In diving, respiration is perhaps the most important function of the body and much is to be learnt from its study under various conditions, both in the water and out of it. It is, however, essentially a subconscious process and the less one is aware of its occurrence the more likely it is to be fulfilling its purpose efficiently. Therefore, visitors to R.N.P.L. who find their breathing patterns being traced in scarlet ink on snow white paper should not be alarmed if theirs do not look quite the same as the other chaps'. There is no such thing as a normal breathing pattern and under the experimental conditions used it is fairer to say that the resulting pattern is the normal one for the individual under investigation.



A MERRY CHRISTMAS TO ALL  
from Bernie Stockton and Reetham-Clayton in Nigeria

## NOTES FROM THE CLEARANCE DIVING ACCEPTANCE TRIALS TEAM

By . . . 'B.F.'

We are happy to report a certain amount of good solid progress since last committing ourselves to paper in this our magazine. Eliminating items with a security tag, from those without, we can offer you the following veiled comments on what we have been doing:—

### Two-Way Stretch Swim Suits.

This project isn't going as well as we hoped and two attempts to produce final acceptance trials models have had to be sent back to the makers. However, S. of D. is going flat out to rectify this situation and get the manufacturers back on the rails.

### Cure-C-Cure Repair Outfits.

This is an extremely useful repair outfit for patching suits and repairing seams without having to resort to the stenor machine. The patches are applied using the bicycle inner tube technique; hence, the necessity for heat, which might damage some of the modern swim suit materials, is avoided. We have not completed trials but it looks as though we may have a new repair outfit for U.W.S.S. in the not too distant future.

### Wide Vision Face Mask.

We have had the privilege of trying S. of D's wide vision face mask, though it has not reached the acceptance trials stage yet. It is sheer joy to be able to see over such a wide angle of vision, and the novel seal, which is achieved by a water filled rubber duct, is most efficient. We hope it will not be too long before the organisation for getting this sorely needed piece of equipment into the fleet is completed.

### Diverphone.

The loudspeaker telephone for Deep and Standard Diving has grown in physical proportions since some of you last saw it as the 'Mess Kettle'. Only the designers know the reason why it should have expanded, though we have been accused of stating that it should float in water. (Perhaps our boats are not as seaworthy these days!)

Anyway the telephone has been to H.M.S. *Reclaim* for acceptance and has gone back to the designers for circuitry modifications, as its performance was not up to the standard of the prototype.

### Double Wool Combinations.

There is a distinctly seasonable flavour about these items in U.K. at the moment and we are happy to say that we have recommended acceptance of these warm garments for service. It only remains for the wheels of production to be set in motion for them to appear in service. Considerable patience is required, however, because this takes time.

### Neck Seals.

Here again acceptance has been recommended and we hope you will get them by the time your diving medium acquires the temperature suitable for their use. If you are sufficiently unfortunate never to have seen a neck seal, we would describe it as a 'C' type hood, cut off below the chin and reduced in diameter so that it makes a seal around the neck in the same way as the cuff does around the wrist. The horrors of the 'C' type hood are therefore avoided.

### Gloves.

These have been promised for acceptance trials in January when they will doubtless be sorely needed. If they maintain the promise of the earlier versions they should be very good and even the most conservative of divers will use them.

### Alumimium Alloy Storage Cylinders.

Some very thoughtful person dreamed up these cylinders as an alternative to the standard 100 cu ft gas storage cylinders. When charged to 3,000 lbs per sq in. the new cylinders hold 150 cu ft of gas and weigh 25 lbs less than the old type. As if this was not enough to gladden our hearts, the cylinders are encased in fibre glass jackets which greatly reduce wear and tear on the poor old 'Umping Parties', though their



'How many in the POT Chief?'

real purpose is to protect the cylinders. We had almost recommended acceptance of these assets to our trade when unfortunately the valves started to leak and it was concluded that the design of the valve was not suitable. We understand that this problem is likely to be solved in the near future and we look forward to getting the cylinders back for final acceptance quite soon.

**Swimmers Air Breathing Apparatus.**

This is the Navy's compressed air set on which we have completed prototype trials and await production sets for final acceptance. Considerable priority has been given to this equipment and although there has been some delay in obtaining cylinders we expect to get the first off the production line in the new year.

We have been on other trials but security precludes mention here. Sufficient it is to say that our activities have taken us to Falmouth, Alderney, London Docks and the privileged member of the team even got as far as Malta, where he was handsomely looked after by the Med. Fleet Clearance Diving Team, and shown a few tricks into the bargain.

We have been royally accommodated in H.M.S. *Reclaim* and *Dingley* on occasions, and would like to put on record our sincere appreciation of their hospitality.

That's about all for this edition so cheerio and good diving to all Dip Chicks.

There is just one thing, did you ever hear about the diver whose wife thought the slaves heaving around the air pump were winding the diver up from the bottom, and said he must have been down to a hell of a depth when he didn't appear for half an hour !!!



**SOLUTION TO CROSSWORD No. 6**

**Across**—(1) Agriculture; (9) Fern; (10) Consciences; (11) Afar; (14) Release; (18) Pride; (19) Reset; (20) Dip; (21) Air; (22) Other; (23) Annet; (24) Eve; (26) Pin; (27) Tails; (28) Dosed; (29) Strands; (33) No Go; (36) Compression; (37) Tall; (38) Reverse Dear.

**Down**—(2) Go On; (3) Inst; (4) Unite; (5) Tense; (6) Reefs; (7) Selfishness; (8) Ingratitude; (12) Opportunity; (13) Nightingale; (14) Redress; (15) Lip; (16) Ava; (17) Errands; (25) Err; (26) Pan; (30) Trove; (31) Ample; (32) Dress; (34) Used; (35) Soda.

**DIVER'S EMPLOYMENT BUREAU**

The Bureau continues to function, and if you wish your name to be recorded please forward the undermentioned to the Employment Bureau.

Applicants must be either serving R.N. Divers or Ex-R.N. Divers who are subscribers to the *Diving Magazine*.

Full Name .....

Rating..... Off. No..... Age.....

Time Expired or Expires.....

Private Address .....

Willing to Serve Abroad.....

Diving Rate..... Date and Place Qualified.....

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This information will be filed and referred to as and when diving employment is required. The Bureau does not assure you of a job, but it will advise applicants on vacant diving situations.



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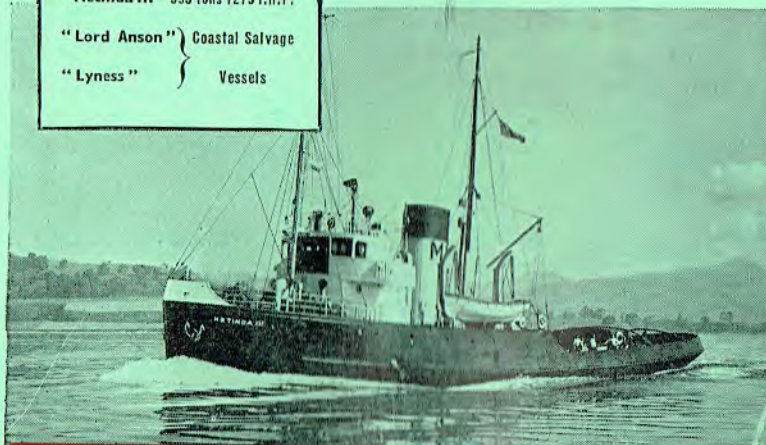
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