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Vol. 7 H.M.S. VERNON No. 3

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Editor's Notes

WE hope any doubts you may have had about the excuses we made for the delay of the last issue will be erased by the promptness, size and quality this one.

The Committee would like to thank those who sent in articles for this edition, making it I hope one of the best so far, and so paving the way for even better issues.

My thanks to Lieutenant Commander Filer, not only for writing articles but for bringing pressure to bear on those beyond the reach of myself.

Please note our new features 'Buddy Lines' and 'Bye Pass Cracks' and let us have any interesting and amusing contributions you may think of. This is the opportunity for those who quickly get writer's cramp as only a few lines are required.

The First 12 Months

by Lt-Cdr H. WARDLE, R.N. (Retd)

HAVING completed a full year as a civilian employee I feel very guilty in going so long without making a contribution to the Magazine. The only excuse I can offer is that even now I do not feel really qualified to write as a civilian though naturally I am better qualified now than in the early days.

The thought passes through all our minds whilst in the Service 'What are we to do in civilian life?' Equally true I think is the general reaction, i.e. 'I'll worry about that when the time comes'. This, in many ways, is as it should be, for after all, one is doing a job in the Service and you cannot do that job efficiently if you are going to spend your service life worrying about your civvy job !

It might be of interest to prospective civilians if I go through the phases I experienced since leaving the service; a typical case of one who

'swung' the decision as to 'what to do' until actually leaving the service.

Like so many others, my first thought was 'Mine Host'. Having spent so many happy hours in excellent company why not carry this into perpetuity? Fortunately Ginger Le Berton kindly gave me a few weeks 'run around' at the Dolphin Hotel, Portsmouth, where I soon discovered that life for 'Mine Host' was not all beer and skittles. It is enjoyable in many ways but the outlook from behind the bar is a very different one from the other side. If any of you fancy this I recommend you go and do at least one month as a barman first.

The next move for me was a look at the great wide world of industry. It's a strange feeling, having had your next job decided for you for so long, being a free agent for the first time it is incredibly difficult to decide what one really wants. Of course, if you are settled in a certain area with a family to bring up the situation is different, it's what you can get in the area, as opposed to what you want.

In my case, as will be the situation for many others, I was in a married quarter and was homeless anyway. This is I think an advantage, for providing your children do not tie you to the district from the educational viewpoint, you can move anywhere. Obviously in the Naval Ports there are many people with a similar background to yourself, this being so, competition is keener. The Employment Exchange organisation is excellent; they have information on jobs throughout the country.

The next question is 'what can you do?' This is a teazer unless you happen to be a tradesman. I think it is fair comment to say you have to prove your capabilities to your employer once you have started. This means often starting at a low wage. You have several assets which are not available in many employees. You have a wider general knowledge, you are disciplined, you are physically fit and generally adaptable and probably, most important, you can offer an employer loyal service. The foregoing cannot be put on paper, but, if you are any good at all, providing you keep your eyes and ears open and initially reserve your opinions, you are bound to start moving up.

In my case I decided I did not want a static job, i.e. either in an office or a factory, and I was fortunate in being given a start at £500 a year during my first three months training with a civil engineering contractor. You will see my pay wasn't much but, from my employers' viewpoint I was an unknown quantity and quite obviously would have to be trained before I could be of any real use. I rapidly discovered that in many walks of civilian life one has to pay to learn, in many cases after completing a long academic course it is quite common to work for practically nothing for the opportunity of practicing one's chosen profession !

The Head Office of my firm is in Salisbury, so naturally I had visions of working somewhere in the South. Imagine my feelings when I was asked to go up to Muir of Ord, Ross-shire. I'd never even heard of it ! However, early in March 1959 off I went to be met at the station by a pugnacious Land Rover which had obviously seen much service. The driver was an ex-wartime Petty Officer so I had at least one person who knew my language.

My first destination was the Plant Depot, which to my untrained eye looked more like a scrap yard. I was

then given a rapid 'Cooks Tour' of work in progress, three massive dams for hydro electric schemes which had been completed recently, and various 'extensions' from these main works. My mind boggled at the thought of the organisation needed to complete such enormous projects. We have all 'had the ship on our backs' from time to time; looking back I began to wonder whether my 'friends' had perhaps been right in accusing me of having had quiet numbers all the time I had been in the Service !

The first move was a three months basic training course. The theory was that during this period I should have a go at every man's job. As this was the principle I adopted in the school for officers qualifying in diving, I had no argument with this.

The first four weeks were spent in the Plant Depot under a hard, bitter and tempestuous Aberdonian Plant Foreman. After three days I was aching all over having spent most of each day under a Land Rover refitting brakelinings, shock absorbers, etc. My delicate hands suffered enormously and I need hardly say that my work output was low compared with the fitters and labourers in the Depot. This was an eyeopener for me and my respect for the ability and stamina of the various fitters under whom I worked as a mate grew daily.

In these four weeks, by 'doing a job', I learnt more about the plant than I would have gained in four months passive instruction. My tasks included unshipping and servicing engines, removing tracks from excavators, refitting bushes, pins, etc., driving Land Rovers, forked lifts, etc., renewing the odd fuse, building up excavator bucket lips by welding and so on. My time as a torpedo man stood me in good stead on the mechanical side, whilst my diving experience helped with the cutting and welding. By the end of four weeks I suppose I was doing some useful work, though I was always grateful and conscious of the fact that I had someone to sort out the mess.

I was taken for a 'run ashore' by the foreman. It appeared that after 'the treatment' the average Sassenach fell flat on his face by about 9 p.m. I am glad to say that, thanks to my diving training, I was still on my feet with my tutors in the early hours of the morning ! In due course I got the word that the buzz had gone around 'Watch that Naval Type' ! In spite of my time in Scotland I had some language difficulty. However, I was up to date in some of the more vivid language and generally got by.

The next move was to spend four weeks under a General Foreman on a site. This site proved to be a Weir which the firm was building at Glen Beag. This proved to be the proverbial two days camel journey from Dingwall where I was staying, about nine miles north of Aultguish Inn in Easter Ross, roughly 30 miles from Dingwall. The last nine miles was over a rough access road which did its best to tear the guts out of the Land Rovers we used. The effect on the passengers was similar. A heavy meal before the trip would, I think, have been disastrous.

The scenery was magnificent, high snow topped mountains on either side, the river we were to dam flowing through the Glen and a herd of deer wandering freely around. The striking feature was the absence of human habitation which made one feel that you were in another world.

However, I wasn't there to admire the scenery, there was work to do. The General Foreman proved to be

a man about 60 who had rugged weather beaten features which one associates with ancient mariners. The first move was a short tour of the job starting with the camps water supply. He suddenly shot off right up the side of the nearest mountain with yours truly, sweating drops of blood and crying out to 'more air', toiling up behind. Before reaching the small dam across the stream which provided the necessary head of water, I had made several resolutions on my mode of living! The weir itself was really a small dam though it looked pretty big to me, the river had been partially diverted and we were drilling and blasting into the rock of the river bed prior to putting in the foundations. Apart from the trip each way daily I thoroughly enjoyed the next four weeks, rock drilling, blasting, steel fixing, cutting and bending the steel reinforcements and setting up a skeleton frame before putting in the concrete. I became the camp 'Sparky', electrician to you, and managed to sort out one or two snags on the electrical installation, and even did a spot of plumbing! I was introduced to the various engineer's instruments, the basic principles of which were straight forward and here I felt some benefit from my navigational and fire control instruments experience. In many ways I was sorry when my time at Glen Beag ended.

I next moved to 'The Office'. As most readers will know I spent a lot of my time as a chairborne Commando whilst in the Service. I, like most naval types, dislike office work but I know from experience that in this day and age no organisation will function efficiently without a good office organisation. It's a waste of time having good men 'in the field' if you do not provide the necessary tools, transport, etc. We all know what it's like when the boat fails to turn up and you are left hanging around. It's just the same in civil life with the exception that time is money and, certainly in contracting work, the firms income is based on work done, so you cannot afford to have men hanging around.

In the office I had a run around on pay accounts, costing and insurance procedure. Of these though, costing was by far the most instructive. Every small section of a job is given a price, usually based on so much a foot, cubic yard, etc. This price is the basis on which you are given the job to do. If it costs the firm more than the price, you loose on that item, if it costs the firm less, you gain. In practice you gain on some items and lose on others depending on many factors, the weather being the most important in my opinion. Obviously the more efficient the firm, the lower will be the price which you tender for the job, thereby increasing your chances of being given the job to do in the first place. Again profit or loss when doing the job depends on efficiency.

The most striking thing to me was the way every single activity has a price tag. The habit of thinking in terms of £ s. d. in relation to the job in hand takes a lot of getting used to. Where I do laborious sums, the experts from years of experience can say 'that item will take so long, with this type of man and such and such a machine. Cost per week so much, total cost so and so. If the job is excavating 2,000 cubic yards of soil the unit cost will be so and so over 2,000'.

The next move was administration and setting up a job. We were just starting a series of aquaducts, pipe lines, small dams, etc. for a Hydro

Scheme in Glashen, Argyllshire, sixteen miles from Inverary. Off I went via Fort William to Inverary. Here with the assistance of 'Mine Hostesses' of 'Macbrides' and 'The George' my social and domestic problems were solved and I was to settle down to about six months work on this contract.

During this time I had a go at practically all sides of the job assisting my 'Agent' (the engineer in charge of the job) in whatever way I could, guided generally by him and the other engineers. I think I walked more miles in this six months than in all my 24 years in the service, setting out access panels through the peat, surveying over the hills the line which a tunnel was to follow, checking depth of peat, surveying fields for the camp site, running a 'Wells Fargo' service by Land Rover around the site which covered many square miles, preparing plant, etc. for driving the tunnel, working in the tunnel itself, costing and statistics in the office, calculating out the results of the survey (which gave my very rusty trig. a severe shaking) and so on. Hard demanding work in many ways, with a 12 hour day in the summer 'as normal drill', though naturally a lot of time was spent getting to the various parts of the job.

During all this time the call to get back into diving was strong. It was very clear to me, however, that to succeed in the diving side of civil engineering, obviously the more general experience I had the better. However, my Area Manager and my Managing Director had agreed to the principle of my forming a Diving Division and we 'Commissioned' on 1st January 1960. I was fortunate in having by this time Bob Linscott as my right hand man which of course has been, and will be, a great help to me.

Naturally my aim is to build up a team of ex-Naval Divers, my experience to date has shown me that there is a place for both C.D's and Standard Divers in civil engineering diving work. I have gone in for Aqualung, Hookah and standard

equipment sticking as you will see to air. Jobs completed to date have been divided equally between standard diving and swimming and I believe the pattern will remain the same, the choice of equipment depending on the job. For two large contracts in the offing, involving a lot of diving, I expect to use standard on one, and on the other Aqualungs and Hookah. On another two contracts which we hope to secure, again one would use standard and the other Aqualungs only.

At the moment Bob Linscott with an ex-Dockyard Diver is doing a nine months job in standard at Eastney, whilst I have just done a short swimming job in Port Glasgow.

My build-up of divers will naturally depend on work in hand though I have every hope of building up a really first-class team maintaining the best traditions of the Naval Diving Organisation.

Home Station Clearance Diving Team

H.M.S. "DINGLEY"

REGRETABLY it has been a long time since *Dingley* was in the news, so now is the time to make up for this lapse. The team has, however, been kept busy all the time although not much has been written about our activities.

Before the move to 'Pompey' from the 51st M.S.S. in Lochinvar we had a good variety of jobs. Our programme started with exercise 'Bill Brewer' in Falmouth last June,

where apart from night and day attacks, the scallops were up to their usual standard and abundance. During one of these exercises 'The Boss' and Able Seaman Humphrey had an unpleasant experience with a sleeping dog fish about five feet long (and that is no fisherman's five feet either !) The fish in question seemed to object rather strongly to being stabbed and instead of swimming away, turned on it's assailants. It made three attacks, which were fortunately deflected with a knife, before it finally gave up and left the pair in peace.

After a most enjoyable visit to Kings Lynn, and then through the Keil Canal to Flensburg and Aabenraa we embarked Lieutenant Commander Warner's team and spent a fortnight in Alderney. The acceptance trials team had a lot of work to do and were backed up by us. As usual, Alderney proved an ideal place for diving and very good fun ashore.

Work started in earnest after the summer leave with exercises in the Moray Firth and then a fortnight spent hunting for three 'objects off the Isle of May.' We had the

Scottish B. and M.D. Unit with us and although the search was unsuccessful the experience gained and lessons learnt in deep tidal waters were invaluable.

Variety is the spice of life so they say, and we soon were off again through the Caledonian Canal to carry out trials with H.M.S. *Adamant* in the Gare Loch. The passage through the canal is without doubt one of the most scenic and interesting trips we have ever made. It is impossible to describe the beauty of the heart of the highlands; except by saying that it even affected the worst Sassenachs amongst us.

We arrived at our new home in *Vernon* just before Christmas after a fair drop of 'roughers' on the way round, and the leave that followed was most welcome. Being the closed season we could not really go anywhere except Portland after leave. We had ten days there, however, doing preliminary trials with the one man recompression chamber. One or two members of the team seemed a little put out when the idea of a full therapeutic decompression was envisaged. Having experienced six hours plus in the pot their fears were fully justified. The team should have been fit, however, because we had had a week's 'wet pot' trials on C.D.B.A. to 180 feet. The diver's task consisted of lifting a 40 lb. weight through one foot as often as possible in the time allowed on the bottom. It is amazing what people will do for a bottle of whisky, one or two exceeded an average lift of over one ton per minute. The whisky was an exceedingly nice gesture offered as incentive to the man who lifted the the most per average minute. 'The Boss' was robbed by Doc. Mackay changing the rules of the competition half way through, thus making Chief Bryant and Nutty Carr the winners.

At last the practice of sending the H.S.C.D.T. to Gibraltar for the Spring exercies has been reinstated, so we had a fortnight there carrying out night attacks and day dives on the assembled ships. It was very good value and we hope that Gibraltar becomes an annual visit for the H.S.C.D.T.

Before I sign off and go on leave it might be of interest for the divers to know who is in the team as we have been out of print for a long time. We are Lt. Grattan, Sub.-Lt. Graham (from down under), Chief Bryant, Carter, Gardner, Corbett, Gould, Humphrey, Fowles, Carr, France and Booth. J.G.

Changing a Propellor

IN 1955 a team of divers from H.M.S. *Vernon* changed a propeller on an old 'T' class submarine alongside in Haslar Creek. Although this trial change was successful it was not until last July that the submariners took us seriously and asked us to change *Trespasser*'s port propeller as she had had a slight accident.

A diving team from *Vernon* went over to *Dolphin*, and armed with all the necessary tools and appliances proceeded to remove a very badly damaged propellor and replace it. The whole operation took about two and half working days, using Gas Mask and C.D.B.A.

In September, S.O.S.M. Portland asked us to send a team down there

to change both of *Sentinels* screws. We managed to have both new propellers securely in place in just over 24 hours. This job was done using C.D.B.A. only.

After this we were of the opinion that we could manage any job of this kind that the Submariners threw at us. Up in the wilds of Scotland the YO. YO. team managed to change *Seraphs* port screw quite easily, using Standard Diving Equipment and Gas Mask.

Provided all the conditions are in favour such as visibility, warmth, and friendly and helpful depot ships the job of changing an 'S' or 'T' boat's screw is quite simple.

Briefly this is how the job is carried out. Firstly the rope guards are removed, whilst this is going on another diver removed the Fish Plates from the boss nut using an easy out and replaced the end cap of the boss with an eyebolt. The propeller spanner is then lowered down, and with the aid of a 14lb. hammer the boss is loosened. If the boss nut refuses to budge a turn of cordtex placed round it left handed soon loosens it up. By the time the boss nut has been taken off and hoisted inboard, the diver removing the rope guard using almost every tool in the boat and a great deal of bad language should have completed his job. This done, the nuts holding the gland packing rings can be removed and the ring brought forward to leave a space in which to place the cordtex. Now the threads on the shaft are well packed with codline and then three turns of cordtex are placed in the gland packing ring recess and the charge is

The Yo. Yo. Team

fired. This done it should be quite possible to just guide the propeller off the end of the shaft and hoist it clear.

The new propeller is then checked for the correct fit and fitted together with a new gland ring using almost the reverse procedure as used for removing the old one. The only big problem that may be encountered is in tightening up the boss nut and ensuring that the propeller is securely fitted. It is no use just tightening up the boss with a hammer so a crane has to be used with a measuring device incorporated to obtain the correct tightness. R.M.H.

Surface Demand Diving Equipment (S.D.D.E.)

by 'B.F.'

TO the bewildering conglomeration of short titles for diving equipment such as S.W.B.A., S.C.B.A., C.D.B.A., M.D.D.O., B.I.B.S., S.E.B.A., O.D.B.A., S.C.U.B.A., S.A.B.A. and D.C.B.A., we in A.E.D.U. hope to add S.D.D.E. by the end of 1961. Incidentally, I wonder how many of you can give the full titles to all these equipments that I have indicated by their short titles? Back to S.D.D.E. however, which is going to take all the pain out of air diving and give almost unlimited endurance under water, with a high degree of safety and comfort. No more cumbersome air pumps, pumping parties, helmets, corselets, etc., with the long and tedious preparations for diving watched by the Commander, whose jaundiced eye betrays the resentment he feels at having to supply a pumping party, and part, perhaps for a whole day, with one of his precious boats. All that you will need if our development programme goes according to plan is a couple of 150 cubic foot Aluminium Alloy Cylinders, a panel, a length of 3/8″ bore air hose, an adaptation of the Damage Control Breathing Apparatus (as reserve supply), swim suit and accessories. The whole lot weighs substantially less than the equipment the Standard Diver has to support without considering the pump and air pipe, which just about doubles the weight of his outfit.

You will in fact be getting the convenience of gas mask diving with considerably greater safety, infinitely more comfort and economy of air.

The main features and operation of the new equipment are as follows:

Supply. The air supply may be taken from any clean air source such as H.P. air cylinders or ship's L.P. or H.P. line. For portability and use from a boat the 150 cubic foot Aluminium Alloy Storage Cylinders are the best arrangement, particularly if a small compressor is available to top up the storage cylinders from time to time. To give some idea of the practical endurance of these cylinders we found during trials that two 150 cubic foot cylinders would maintain two divers at 33 feet for 60 minutes doing hard work.

Supply Panel. From whatever source is used, the air is led to

(*a*) Inlet connections and valves for H.P.
(*b*) Filter.
(*c*) A reducing valve.
(*d*) L.P. air connection.
(*e*) H.P. and L.P. gauges, and
(*f*) Outlet connections to the diver.

When 150 cu. ft. cylinders are used the system operates in a similar way to that used to supply gas to the underwater cutting torch. The reducer is set to supply air to the diver at 100lbs./sq. in. plus an additional 1lb/sq. in. for every foot the diver submerges.

Air Hose. This consists of a rubberised fabric hose made up in lengths of 60ft. to facilitate the appropriate quantity being assembled for the task in hand. The bore of the hose is approximately 3/8″ diameter, with 3/4″ diameter external maximum measurement. The hose buoyancy factor was a tricky one, it had to be buoyant enough not to drag and foul everything on the bottom when a diver was systematically searching, and yet on the other hand it must not be so buoyant as to foul underwater fittings, barnacles, etc. when the diver was operating under a large ship. The solution of course, had to be a compromise and the hose now in use is just less than neutral buoyancy.

We found that operating in a tideway, suitably weighted as a walking/crawling diver, demanded that the hose should be of considerable strength. The hose at present in use is designed to withstand a tensile pull of 600lbs. (breaking strain 900lbs.). The diver can nevertheless cut through the hose as a last resort to free himself in an emergency.

The hose is connected at one end to the supply panel, and at the other to a union on the diver's harness. A short length of similar hose leads the air supply from the belt to a N.R.V.

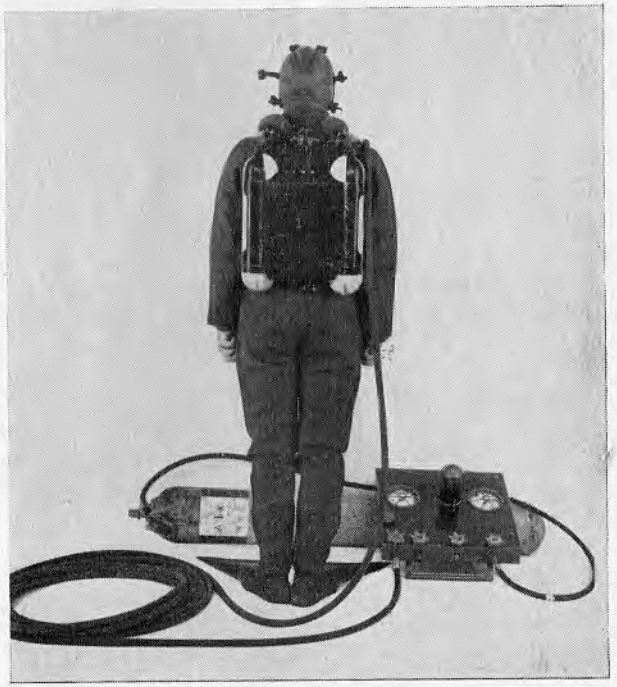
Inlet N.R.V. In accordance with good surface air supply practice a non-return valve has been mounted close to the diver to prevent immediate squeeze if the air supply becomes ruptured near the surface. For convenience the N.R.V. has been builtin to the D.C.B.A. reducer.

Demand Valve, Breathing Tubes and Face Mask. From the N.R.V. the air passes to the seat of a tilt type demand valve, which, being operated by the divers inspiratory effort causes air to be supplied to the diver via breathing tube and wide vision water seal face mask. By arrangement of N.R.V's placed in the circuit the divers exhaled breath passes down the exhale breathing tube to the outlet side of the demand valve and then to the outside medium. The demand valve, breathing tubes and face mask are identical to those used with D.C.B.A. and S.A.B.A.

With the equipment outlined above the diver has only to put on the necessary ballast, fins, boots, etc. and he is capable of diving to 120ft., and in fact, for our trials we carried out really hard work at 180ft. without ill effects. He has, however, no reserve should the air supply suddenly fail.

Reserve Supply. After much deliberation it was decided that to cover eventualities such as burst or severed hoses it was necessary to have a reserve supply of air. It was greatly appreciated that any reserve arrangement would inevitably detract from the almost unbelievably simple arrangement that was required for the diver to breathe comfortably under normal circumstances. What was also appreciated, was that the air

Front view
S.D.D.E.



Back view
S.D.D.E.

supply might conceivably fail as the diver had just exhaled whilst working under the keel of, say, an aircraft carrier. Free ascent is by no means simple under these circumstances particularly if there is little or no visibility. Common sense and the desire to make diving safe dictated that a reserve must be provided in spite of the inevitable complication. The die having been cast, we decided to go further and arrange that, on the failure of the main supply, the reserve would automatically cut in without any action on the part of the diver. This worked so well in trials that the air supply could be completely disconnected from the panel without the diver being aware of it, but more about the operation later.

The form that the reserve air supply should take came to us from our development of the D.C.B.A. which was then in the prototype stage. In essence this is a baby S.A.B.A., and sits very snugly on the diver's back, weighs only 30lbs., and is sufficiently compact when worn to enable a man to pass through the standard manhole. The advantages of using this apparatus were tremendous. It automatically provided us with our reserve air supply, demand valve, breathing tubes, mask and harness, and was going to be a standard piece of service equipment anyway. Some modification was necessary to accommodate ballast weights, hose connections, etc., but these were of a minor nature compared with having to design a completely new system from scratch.

Reserve Supply Operation. The reserve air supply is contained in the twin D.C.B.A. cylinders, which when charged to their maximum working pressure of 3,600lbs. sq. in. contain 1,200 litres of air. Air from the main cylinder is supplied through a control valve to the demand valve via a first stage reducer. Air from the second cylinder is used to replenish the main cylinder through an equalising valve.

After preliminary functioning tests, the diver enters the water breathing air supplied from the surface via the air hose, and with air from his reserve supply switched on. The air supply from the surface is normally at a higher pressure than that supplied from the reducer, and whilst this situation remains, the diver uses no air from his reserve. If however, the surface supply pressure drops to that of the reserve L.P., or stops altogether, the diver will automatically, and in all probability without being aware of the fact, commence breathing from the reserve. If he remains in ignorance of the primary air supply failure and remains at his task, he will eventually breathe down the contents of his main reserve cylinder to a stage when inhale resistance becomes significantly greater At this stage he knows he is on reserve, and must operate the reserve equalising valve, and return to the surface. This means of course, on the face of it, that the diver has only one of his twin D.C.B.A. cylinders as a true reserve to 'come home' on. We thought of this, and in our early trials we had both reserve cylinders switched off, and the diver operated the main control if, and when, the need arose. This of course gave the diver twice the amount of reserve gas but on the other hand we reasoned that in an emergency the less the diver has to do to save the situation the better, and that automatic supply from the main reserve cylinder was the best arrangement. To back this argument further, we reasoned that, if an emergency arises, such as a burst air hose or

failure of surface supply, it is almost certain that the diver or his attendant will very soon become aware of the fact, and the diver will surface, or be called to the surface, before the contents of his main cylinder are expended.

S.D.D.E. is now being put through its acceptance trials by the H.M.S. *Vernon* Trials Team. If they achieve their target of 1,000 hours diving, covering every conceivable application of the equipment, without any major complaints, the fleet should get a thoroughly tested replacement for Standard Diving Equipment in 1961.

By the way, if you don't know the interpretation of the lettered symbols given at the beginning of this article, here they are:—

S.W.B.A.—Shallow Water Breathing Apparatus — Obsolescent with introduction of S.A.B.A.
S.C.B.A. — Swimmer Canoeist Breathing Apparatus — used by R.M's.
C.D.B.A. — Clearance Diving Breathing Apparatus.
M.D.D.O. — Mine Disposal Diving Outfit.
B.I.B.S. — Built-in Breathing System. Used in Submarines.
S.E.B.A. — Submarine Escape Breathing Apparatus. Used in Submarines.
O.D.B.A. — Oxygen Decompression Breathing Apparatus—used in Recompression Chambers.
S.C.U.B.A. — Self Contained Underwater Breathing Apparatus — Collective American title for all self-contained sets.
S.A.B.A. — Swimmers' Air Breathing Apparatus.
D.C.B.A. — Damage Control Breathing Apparatus.
S.D.D.E. — Surface Demand Diving Equipment.

Clearance Diving Acceptance Trials Team Notes

I would like to take this opportunity of thanking all divers for their most generous contribution to the Sarginson Fund. I consider that it was a noble effort on everybody's part and we were able to turn over a total of £158. Both 'sarge' and his wife have expressed their sincere appreciation of your efforts.

Acceptance Trials of new equipment have been going ahead at full speed and I hope that you will be seeing the results in equipment supplied to the Fleet in the near future. Not the least important of our trials has been the making and trying of sponge rubber hoods and mitts. The hoods are used in conjunction with neck seals and like the mitts, are very warm even in the coldest water. With a little luck we should be able to replace all our bulky woollens and underclothes by foam rubber or neophrene in the future.

It is also the intention to replace the diver's torch with a new type of headlamp operated by a sea cell and designed rather like a miner's lamp. Under normal conditions it is carried on a spring clip attached to the wide vision face mask straps, but it can easily be taken off and used as a hand torch. There is no doubt that this is far superior to the present hand torch.

Current trials include the Surface Demand Diving Equipment to replace Standard Diving Equipment in the Fleet. (More details of this breathing system are included in a seperate article in this edition). In addition we are doing trials with an underwater telephone as part of the S.A.B.A. accessories.

News of the Gemmi Dinghy is much more encouraging and no doubt many of the C.D. teams will have received them before reading this. For the uninitiated a Gemmi is a small craft consisting of a U shaped inflatable buoyancy tube bonded to a wooden transom and a flexible but fairly stiff floor. The buoyancy tube is sub-divided into five seperate compartments each fitted with a combined Inflation/Deflation Safety-Relief Valve. They come in various sizes but so far, the small size will be the standard attendant craft for divers. The propulsion unit will be a Johnson 10 h.p. outboard motor.

There have been several changes in the Acceptance Trials team since the last magazine was published. Able Seaman Phipps has unfortunately spent a considerable period in hospital and will very soon be invalided from the Service. Leading Seaman Drain is off to Singapore and Able Seaman Pilling is doing a C.D.2's course before going to H.M.S. *Brenchley*. The present team consists of Lieut.-Commander Warner, Petty Officer Howe, Leading Seaman Davies, Able Seaman Eagan, and Able Seaman Sharp.

As a point of interest the lobsters and crabs are back in the Portsmouth Area for those that know where to find them !

Divers' Underwater Communication System

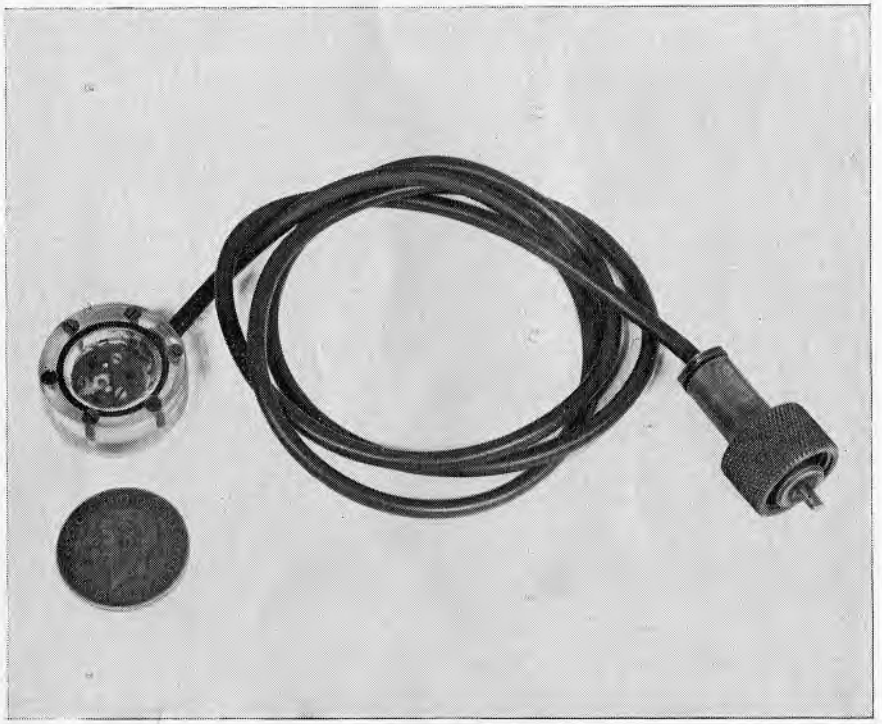
(D.U.C.S.)

by T.H.G.

IT is hoped that soon after the introduction into service of S.A.B.A. and D.C.B.A., a lightweight telephone between attendant and diver will be introduced. It is a simple device, but, like all such, has had a chequered development and an interesting history. It originated when Commander Harland, a former Superintendent of Diving in H.M.S. *Vernon*, was carrying out his grand tour of Europe in 1954. In Sweden, he saw a 'toy' underwater telephone called the 'Quack', strictly for 'Aqua Hams' (any resemblance between their name and the title of our telephone is purely deliberate !) It consisted of a microphone earpiece inside the diver's helmet, a light cable to the surface and a small amplifier using miniature valves which feed the system and was operated by very small batteries. The possibilities of the system, which worked but was delicate and very accident prone, were obvious. For training or for any operation where a swimmer or diver was on a line, an attendant wearing a head set, earpieces and microphone, and with the amplifier in his jacket pocket, could hear the diver breathing and talking, and needed only one hand to press a switch to reply.

There were weaknesses to be overcome before this could be engineered into a piece of service equipment — and a lot of paper to move around before it could appear on A.E.D.U's job list. However between 1954 and 1957 a good deal of preliminary work was carried out in A.E.D.U. to overcome the obvious weaknesses. The attendants headset was now a piece of service equipment, strong and proven; a small prototype amplifier had been made and tried; a lightweight lifeline/cable was designed and produced and 'C' Type hoods fitted with earpieces and intended for use in other service applications, matched to the lifeline and transmitter. The A.E.D.U. 'dip-boffins' had tried it out in this form and so had the E.C.D.U. and although the difficulties of speech through the mouthpiece were not solved, the outfit was considered promising enough in 1957 for a development contract to be placed with Messrs. E. K. Cole Ltd. to manufacture six sets of D.U.C.S.

The D.U.C.S. outfits received from Ekco are jolly good — all the trials right up to date have been carried out on the original six amplifiers. They are, as you can see from the photograph, quite small in size and very strong and tough. Each is a transistorised job using, as far as possible, available service components, and the whole lot 'potted' into a moulded transparent plastic box. There is only one switch, the 'press-to-talk' switch. Connecting up the headset energises the circuit. The



cable was supplied in 50 and 100 feet lengths with watertight connectors between. It is designed to stand a breaking load of 500lbs so that a diver in difficulties — even flooded — can be lifted right out of the water using this. It is a co-axial cable of low electrical inpedance — quite a piece of design work when you consider the diameter of the centre core. A phosphor bronze strain wire supplies the main strength and the outside diameter is small. The outfit worked well under laboratory conditions but there was always difficulty in hearing the diver when he tried to talk with the mouthpiece in.

Trials with the original outfit showed it to be efficient and useful both for training and operation — but revealed some unexpected weaknesses. The arrangement of the 'C' Type hood had been kept common with other gear under development, and two crystal transceivers were used, one as the microphone and one as the earpiece. Although every possible trick was tried with the microphone — siting it at the throat, the jaw and the cheek, as well as in front of the mouth — it just wasn't sensitive enough. Background noise, change of voice with depth and particularly speaking round the mouthpiece, distorted speech so that it couldn't be understood at the surface. Similar troubles but to a less degree, were experienced with the earpiece. It was all right when right over the ear (but liable to get painful when the pressure caught it), but small positional changes made it difficult for the diver to hear. A change over

was made to small magnetic transceivers and this necessitated an 'operation' being carried out on the plastic block of the amplifier to match it up to the new impedances. Unfortunately the improvement was not sufficient. At this time we were playing with the protypes of the wide-vision face mask and began to get better results because the mouthpiece could be removed for short conversations. However, ships bottom searches with S.A.B.A. revealed a definite weakness in the drill. Swimming face upward, with the demand valve down, and mouthpiece removed there was a strong tendency for the mask to lift. Despite strengthened straps, the danger of flooding a mask in this position was considered too great. All this activity was, as you can imagine, pretty time-consuming, particularly as there were 'cable' troubles too — which I will come to later. This 'dead end' was reached, in fact, only last year — but then occurred a lucky break. The 'Otological Research Unit' (Earhole Exploration Dept. to me) of a London Hospital approached S. of D. for help in making some prototype rubber masks for them. We were happy to help, of course, and while discussing 'ears' in general with them this particular problem came up. As a result they sent us a 'deaf aid' type bone conductor.

At this time, in this country anyway, bone conductors had been used only as earpieces in deaf-aids. The one we received gave very good reception at the ear and showed some promise as a microphone. Phil Payne and Fred Noad — the A.E.D.U. Electrical Dept. known to many of you ! — were very quick to exploit the possibilities. By making a series of tape recordings they picked the right acoustic frequencies, and modified the bone conductor accordingly until it worked as a very sensitive microphone. The manufacturers, Messrs. Fortiphone Ltd., supplied us with bits and with technical information, making the job that much easier. The modified version microphone has been put into a watertight case and is giving very good results as a transceiver. It works by (*a*) picking up the vibrations made by speech in the bones of the face and head and transmitting them; (*b*) vibrating against the bones when speech is put into it so that the ear can pick these up. It can be worn against the cheek or jaw bone, against the middle of the forehead, or the top of the head. It can be tucked under the straps of the face mask against the outside of the 'C' Type hood, or tucked inside a wet hood. It is very sensitive and speech with a mouthpiece in can be received and understood at the surface. Reception by the diver is plain and quite distinctive. It has been described as 'a still, small but very clear voice talking inside your ear'. We have very high hopes for it.

So now we can get the two ends working, at the surface, and at the diver, provided that we can join them together by a suitable cable. This is giving us some problems too. We need the cable to be strong enough to handle, flexible but tough, not too heavy or it will sink and snag, but not too light or it will float up and drag or foul when under a ship's bottom. For electrical reasons either co-axial or twin core cable is essential — we recently tried a single core with earth return through the sea but this picks up too much outside interference. Several cables have been tried and we have one or two more bright ideas still cooking. For straight up and down booted diving and training purposes the equipment

we have is adequate — but the cable is too heavy in one case and too weak in the other to use when swimming or under ship's bottoms. However the problem is nearly beaten (I hope).

The D.U.C.S. is illustrated. It is really so simple that the complete instructions are printed on the side of the amplifier ! It will be used with S.A.B.A. and eventually with S.D.D.E. which is described elsewhere in this Magazine. I hope you like it when you get it. It is one of very many developments under way in A.E.D.U. and I hope its story will help to show why things — simple seeming in themselves — appear so long winded getting into service. Remember at the end of all this, when it is fully accepted, all the production drawings have to be finalised, orders placed and manufacture completed before it gets into Naval Stores.

'Buddy Lines'

PROMOTION.

Congratulations to Lt.-Cdr. H. T. Wilson, R.N. on his provisional selection for promotion to Commander. The Diving branch will no longer be all medals and no promotion, and we hope all divers will see this promotion as an omen for a brighter diving future.

Congratulations, too, to Lt.-Cdr. (S.D.) W. Y. McLanachan, M.B.E., B.E.M., R.N., Lt. (S.D.) E. L. Graham, R.A.N. and Lt. (S.D.) A. Wright, R.N. Great news to the branch you illuminate so brightly.

* * *

DECORATIONS.

In our last issue we erroneously stated that Lt. P. J. Messervy had been awarded the George Cross to add to his M.B.E. The award was in fact the George Medal. Sorry Pete, we allowed our delight in your achievement to run away with us.

Congratulations to Major A. B. Hartley, M.B.E., G.M. Royal Engineers of the Bomb Disposal Unit, Horsham, on being awarded the George Medal for his work on U.X.B's in London last year.

COMMENDATIONS.

Congratulations to Petty Officer Lardner, who was commended by Her Majesty The Queen for good work on a crashed helicopter off Portland; and to Able Seaman Pilling, commended by the C.-in-C. Far East for working so well on the Japanese Submarine in Singapore.

* * *

BERMUDA.

A welcome letter from Lt.-Cdr. Gordon Gutteridge, R.N. (Retd.) tells us he is with the Steel Corporation (Bermuda) Ltd., Ireland Island, Bermuda. They 'are hoping to go in for shipbreaking in the not too distant future and will be looking for steel cutters with some diving knowledge !'

Lt.-Cdr. Gutteridge also reports having made pleasant social contact with the C.D. Team now operating with H.M.S. *Shoulton* in the United States.

* * *

CIVIL ENGINEERING.

Lt.-Cdr. H. Wardle, R.N. (Retd.) is now firmly established with Reed and Mallik Ltd. of Milford Manor, Salisbury and is in the process of forming a Diving Division. He will be interested to hear from any divers requiring employment and is particularly keen at the moment to find a 'winger come storekeeper'. He just can't get along without Arthur Smee.

* * *

WELCOME HOME.

Leading Seaman Kissack's twelve duly rolled on and he went outside. Within a month he came back and said it was deadly out there.

* * *

STOREKEEPING.

C.D.2's courses will in future include two days of indoctrination by the Stores branch. Candidates for C.D.1 are not being indoctrinated because, being long standing members of the branch, they might unwillingly indoctrinate the Stores branch and queer somebody's pitch.

* * *

"DEEPWATER"

is now an empty hulk and will be scrapped shortly. It is sad to part company with a ship which has served us so well but you cannot trust a vessel which tries to sink herself and have Viking funerals on Sunday afternoons.

A Son of a Temple Cox Bolt Gun

by 'B.F.'

SEVERAL safety arrangements have been introduced to protect users of that wonderful invention, the Temple Cox Bolt Driving Gun. Most of us have heard of accidents happening; some caused by charge inconsistencies, several owing to improper handling, and the classic, where an ill directed bolt went straight through a diver's helmet without even pinning his ears back; as perhaps it should have done.

My own untoward experience with the gun occurred in its early days, and I might even have been its first casualty. December 19th 1941 was the fateful day. An Italian human torpedoman penetrated Alexandria Harbour and succeeded in immobilising the *Queen Elizabeth*, and the *Valiant*, and an oil tanker. The loss of these units to the fleet was a crippling blow and no time was lost in trying to patch them up so that they could be sent to repair yards to be restored to fighting fitness. To this end, Commander Wheeler, and an expert salvage diver from the Liverpool and Glasgow Salvage Organisation were flown out to Alexandria to make a survey of the damage and recommendations as to the form of temporary repairs.

At some time during Commander Wheeler's day in Alexandria he kindly offered a demonstration to all concerned of a recently invented bolt driving gun he had brought with him. A large party duly assembled in the dockyard's plating shed, and Commander Wheeler and his able diver assistant commenced to demonstrate how, at the mere thrust of the gun against a steel plate, a screwed bolt could be embedded; welded in place by the friction of entry. This bolt was capable of withstanding a high tensile stress without coming out. The implications for salvage were enormous.

Being a somewhat high powered gathering of some 30 or 40 people, mainly 'brass' and dockyard officials, we fleet divers were observing on tip

toes from the back. Having had a very convincing demonstration against various thicknesses of plating some wag piped up and said 'How does the gun perform on armoured plate?' I don't know what the verbal answer to this question was but a plate of 'D' quality steel was produced and the gun brought back into action. The effect was shattering. Instead of the bolt entering the plate, it merely disintegrated against the tough steel and pieces of shrapnel flew in all directions at high velocity. The human instinct of survival of the fittest asserted itself and for a brief moment the dignified crowd became more like a stampede of buffaloes, each animal seeking its own blast-proof shelter. The anti-climax arrived in a matter of seconds however when, with weak laughs and 'proper Charlie' feelings inside, the crowd regrouped for the inquest.

I had behaved with a little less alacrity than most of the people present because (*a*) I wasn't really close enough to see what was happening, and (*b*) I had a human wall between me and the scene of the operations. I must admit though, that I felt a fairly sharp crack and concluded it must have been the blast. Seconds later I began to feel a cold trickle down my leg and suspicion began to form in my mind as to what might be the cause. I wanted to look, but felt I just couldn't be the only one looking for war damage, especially as owing to my position at the back, I was the least likely to have been hit. However, the trickling persisted and became more than a suspicion in my mind, so without a word I crept out of the building and round the back where I rolled up my trousers and had a private look. A gory mess that was fast becoming a river of blood greeted my eyes. It was evident that a piece of shrapnel from the shattered bolt had sorted out my leg from the mass of hairy pedestals, as its resting place. By now the whole leg was becoming numb so I hobbled back into the shed where intense interest was still being shown in the bits of the 'one that got away'. How to announce the fact that I had 'collected' one of the pieces was something of a problem because I didn't think they would credit the fact, in view of my rearguard position. I didn't want to be made to prove it, by exhibiton, in front of the assembly so I solved the problem by showing the Diving Chief, Bill Scudder, the lower reaches of the gory river and he soon informed Commander Wheeler of the casualty. The Commander immediately took me to hospital in the car at his disposal where I was X-Rayed and eventually prepared for the operation to remove the offending body. There was an eleventh hour reprieve however, it being considered that the splinter had lodged in a harmless place and had been sterilised by friction of entry into the thigh. Thus I was saved the unloading procedure for the Temple Cox Gun and I've carried a ready use piece of ammunition with me ever since.

I did not find out the real cause of the accident but presumably the special 'D' bolts for the high quality steel had not been thought of at that early stage.

Londonderry Diving Team

H.M.S. "SEA EAGLE"

18/12/59

THE team now consists of:—
S.-Lt. Hillman (S.D.) T.A.S.
C.P.O. Edwards, D.I.
A.B. Culpin, D.III.
A.B. Roche, S.W.D.
O./Sea McKiernan, S.W.D.

Changes in the above since the last report:—
Lt. Boon, D.S.M. (S.D.) T.A.S. to Torquay.
A.B. Lees to *Verulam*.
A.B. Halliday to *Ark Royal*.

It is nearly 12 months since we last made an offering, so this is something in the nature of an annual report ! As we go on leave to-day we can look back over a very satisfactory year's progress.

Since the last Edition we have exercised divers from many visiting ships, including *Agincourt*, *Carysfort*, *Cavendish*, *Zest*, *Eastbourne*, *Whitby*, *Contest*, *Jutland*, *Saintes*, *Ulysses*, *Undine* and *N.O.R. Narvik*.

Since Londonderry Corporation Swimming Baths opened early this year we have availed outselves of its facilities for training, etc. (the team, **not** monthly Dippers !)

We have also given diving demonstrations to Sea Cadets, Royal Marines, Army Units and the Belfast Sub-Aqua Club. As regards the latter, we went to the Belfast Swimming Baths to let them see our U.B.A., and it finished up with giving them a

two an a half hour lecture in Queens University ! (without mortar board).

Apart from the routine jobs of clearing the mud away from the slipway, the usual foul screws, bashed in Asdic Domes and numerous Submarine examinations, we have also had a few jobs out of the usual run.

During Whit weekend we had to search for the body of a boy who was drowned in a lake on the border near the town of Clones in the Irish Republic. As most of the team was on Long Weekend — in England — it involved dragging the Chief out of his nest, and borrowing the divers from H.M. Ships *Whitby* and *Eastbourne*.

As usual, the authorities had spent hours dragging, with the usual gear, before they sent for us, so everywhere was nicely ploughed up, and we had an area roughly the size of Horsea Lake to search. We used up all available O_2 before the search was completed at dusk, but with no luck, and the body surfaced after the usual interval.

The fire brigade (Republic) were very good and supplied us with beverages (brewed in Dundalk). We were sorry that we weren't able to satisfy the spectators !

A modification to the slipway required old pile stumps to be sawn off using a 'windy saw' to enable the widened cradle to run to its full extent to take the local S.D. Squadron.

During the balmy summer days we had a few trips to the entrance of Lough Foyle and had a combined banyan party and swimming practice (with visibility) on one occasion with the Norwegian divers from the *Narvik* and gained experience using their DRAGER aqualung type equipment. These trips usually resulted in a fish supper.

In September, Bungy Edwards went to 'Pompey' to do the 'free swimmer course', and came back with much of the latest 'gen'. Net result to date — new phones — repair outfits — woollens ordered — all due to the assistance of *Deepwater* staff.

In October we put on a Static Diving display at the R.N.R. Centenary Exhibition at Belfast which gave us much publicity and also resulted in the 'Boss' going down with a breathing tube which had nearly been severed in two. Moral — don't let kids touch the diving knives !

Last month due to the Chief being sober, he read the local Rag, which resulted in us recovering a bike, on which a local messenger boy had done a O/20 ! Again yet more publicity.

Our latest effort was a contract job with Du Pont Co. who are constructing a Synthetic Rubber factory, near Derry—we had to secure, by bolting, the underwater section of a 42" pipe and its supporting girders. This job would have been simple had the designer taken into account that piles are rarely driven straight !

We have obtained a compressor for the tank, where we train our more recent members in the art of using Underwater Cutters' Burning Gear. The Stoker is happy now, being atmosphere bosun without having to man the pump.

Incidently, we tried to obtain Seafire Equipment, but without success, as, owing to it only being used in diving schools, etc. it is not yet available for general issue—hence the need for training in gear available ! We are now waiting for the approval of a Pot, as at present there is no Pot available in Ireland. Here's hoping for happy 'Pot Dips' all qualified welcome.

The 'Boss' has been provisionally accepted for a C.D. course commencing April 1961.

It has now been undertaken to qualify all members of the team as 'Heamarroid Inspectors' as there are about 8,000 Piles in the Port area to be examined . . . Lucky Heamaroidis.

P.S.—Old Steamers from Guzz may remember Lt. Donnelly — who we think was the last Gunner (G) in charge of the Diving School (1946). He is the Gunnery Officer (Reserve Fleet) here and wishes to be remembered to all Dip Chicks.

Divers' Day

THREE Admiralty divers from the Gareloch - based H.M.S. *Adamant* found themselves rubbing shoulders with lords and ladies and treated as V.I.P. guests at the Cartsdyke yard of the Greenock Dockyard Company.

The men, Chief Petty Officer Peter Roberts, A.B. John Langley and Leading Seaman Roy Reece, were the team who patched up a hole in the side of the cargo vessel *Clan McIver* when it sank while under construction in the James Watt Dock at Greenock last year.

The divers' work enabled the ship to be raised and refloated. In recognition of this the divers were promised a day out to the first Greenock launch after this accident.

The occasion came yesterday when Lady Rotherwick launched the *Rotherwick Castle*, and the divers were members of the official platform party.

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Photograph by kind permission of James Hall (Photographers) Ltd. and The British and Commonwealth Shipping Co. Ltd.

Making Underwater Movies

by H. H. HARSENT

UNDERWATER adventures, when recorded in the form of a movie film, can provide an invaluable record of the location visited and the diving techniques employed. The cost of film stock for a 15 minute movie is not great and could perhaps be shared among the club members.

Choice of Film Guage.

The two popular film sizes for the amateur movie-maker are 8mm. and 16 mm. (this dimension is the over-all width of the film) and the choice will depend on the size of the audience for which the film is intended. 8mm. is the popular gauge for the family movie-maker, giving low cost filming for an audience of up to 20 or so. 16mm. is chosen when the film is intended for a larger audience, it will give first class quality in black and white or colour, on a large screen, suitable for several hundred people. Many 16mm. films have been 'blown up' to the professional 35mm. gauge for projection in the cinema.

Let us examine the relative cost of 8mm. and 16mm. filming. The film is available in magazine or roll loading to suit the camera being used. Magazine loading is quick and fool-proof, it has the advantage that one can change magazines at any time (from colour to black and white for example) with no loss of film, but magazine film is a little more expensive.

8mm. film is usually 'double run', i.e. it is supplied as a 25foot roll or magazine of film 16mm. wide. This is run through the camera twice, putting a row of pictures on each side. After processing the film, the film is split down the centre, the ends are spliced together, thus making 50 feet of 8mm. film for projection.

The table below gives a comparison of costs and running times of 8mm. and 16mm. film.

At first glance, four minutes screen time may seem very little, but let us divide it into separate shots or 'takes' each lasting six seconds.

		Colour		*Black & White*	
		Mag.	*Roll*	*Roll*	*Screen* time*
		£ s. d.	£ s. d.	£ s. d.	
8 mm.	25ft. double run ..	1 11 10	1 5 6	1 1 6	4 mins.
	100ft. double run ..	—	4 8 4	—	16 mins.
16 mm.	50ft.	2 12 0	2 2 8	—	2 mins.
	100 ft.	—	3 12 10	2 16 0	4 mins.

* At 16 frames per second, the standard 'silent' speed.

(A longer shot, except when a great deal of action is taking place, becomes boring). Thus a 25ft. roll of double run 8mm. for example will produce 40 shots of six minutes duration, each of which, in colour, would cost approximately 7½d.

Choice of Camera.

A wide range of movie cameras is available, both new and used, and, having decided the film gauge, there are are a few other points worth noting.

Some 16mm. cameras will accept only a 50ft. roll of film which means, after shooting two minutes of film, the camera operator must rise to the surface, dry off and open the watertight housing, remove the camera, change films, replace the camera, pressurise the housing and then descend to his former position before shooting can continue. A camera accepting a 100ft. spool will enable twice as many shots to be taken. Some older cameras have only one running speed (16 frames per second, the standard 'silent' speed) a variable speed camera will allow underwater scenes to be shot at 24 frames per second while the above water shots are taken at 16 frames per second, thus, when the film is projected at 16 frames per second, movement underwater appears slower and more graceful and, if the 'actors' are skin diving without breathing apparatus, they appear to stay longer beneath the surface before finning slowly and leisurely to the surface for air ! If there's a character in the club with gills who claims he stays submerged for almost four minutes — film him at eight frames per second and on the screen he will appear to bob up and down like a cork.

One 8mm. camera, the Eumig C.8, has an electric drive powered by a 4½ volt battery which will transport several rolls of film. This drive eliminates the watertight control normally required to wind the spring motor. A simple shallow water housing for the C.8 would need only a stout rubber diaphragm to allow the release button on the camera to be pressed.

Many cameras are designed to allow interchange of lenses and a wide angle lens, if available, is a great advantage, permitting a closer approach to the subject and giving a greater depth of sharp focus. Around the shores of Great Britain the water is frequently 'cloudy' and it is most important to approach as close to the subject as possible.

The reader who is mechanically-minded could consider the purchase and conversion of a 16mm. 'gun camera' from one of the war surplus stores. These cameras were fitted into the wings of fighter aircraft and operated when the guns were fired. Two types are available one British and one of American manufacture. The former uses a special cassette which must be loaded in the darkroom, the latter accepts the standard 16mm. Kodak magazine. The lens supplied with the camera should be removed and replaced by a wide angle lens. These cameras are both electrically driven, either 12 or 24 volts, and the British made camera contains a lens and body heater (to prevent icing) which should be disconnected to reduce the current consumption. The power supply can be provided by either dry batteries or accumulators. If a housing is made for a set-up of this type it could be based on the Rebikoff 'Torpille' with the camera at the front and the batteries occupying the remainder of space. This streamlined design is easy to propel under water.

Housing Design.

Underwater housings are usually cast in light alloy, with a lid, sealed by a rubber gasket, to allow the camera to be easily fitted. A window of good quality glass or plastic, large enough to cover the acceptance angle of the lens is required, and another window, positioned to allow sight of the footage indicator (showing the amount of unused film remaining) is essential. This footage indicator will probably be difficult to see in the subdued light underwater so a torch bulb and small battery should be installed inside the housing to illuminate the dial. To avoid the construction of a waterproof switch, a mercury switch can be fitted inside the housing arranged to switch the light on when the housing is turned to a non-operating position, i.e. upside down.

Watertight controls are required to allow the spring motor to be wound (except in electrically driven cameras), the release button to be operated, the iris diaphragm to be set to suit the light available and, although not essential, a control for focussing is useful. If controls for the iris diaphragm and focussing are fitted, the housing should have a window placed so the scales on the lens can be seen.

A large camera housing will be easier to handle underwater if handles are fitted to the sides of the case. All housings should be fitted with a valve so that air can be pumped in with a small bicycle pump, it can then be immersed and checked for leaks. Before taking the housing under water replace the cap securely on the valve, otherwise if the water pressure exceeds the internal pressure, water will enter the case.

Most amateur filming will be carried out at shallow depths, indeed, when shooting with colour film, it is impossible to achieve correct colour balance at depths greater than approximately 35 feet. For filming in colour at greater depths underwater lighting is required and this is usually not available to amateur film units.

All underwater housings should be fitted with a standard tripod bush on the bottom so that it can be mounted on a weighted tripod with a well greased pan and tilt head. A much steadier picture will result and the housing is easier to handle.

Script Before Shooting.

Filming without a script is like diving without checking the bottles are filled — results doubtful ! A script will save both time and film, is easy to prepare and enables shooting to go ahead smoothly. When writing a script first survey the area where the film is to be made and then rough out the story the film is to tell. From this, write a shooting script giving details of each shot to be made, illustrated by thumbnail sketches if required.

'Underwater' films generally have about half the film footage shot above water, and it is often convenient to shoot all the above water footage first, crossing each shot off the script as it is taken.

Continuity.

The shooting of a film may be spread over several weekends and one member of the film unit, possessing an eagle eye, should be responsible for continuity. He must watch for such film faux pas as a lady diver finning out of one shot in a bikini and appearing in the next shot in a one piece costume, or single bottle sets that suddenly change underwater to twin sets, etc.

Photographic Technicalities.

Exposure underwater (the iris diaphragm setting) will depend on the clarity of the water, film speed (sensitivity), running speed (frames per second) and the brightness of the light. An underwater exposure meter is of great assistance and various meter housings are available.

If colour film is being used, filters of Kodak Wratten series CC.R should be used to correct the colour balance as far as possible. (See the table in Triton, June–July issue).

The underwater housing can be fitted with a holder to position the CC.R. filter in front of the lens, allowing quick exchange of filter.

An interesting underwater shot, very effective on the screen, is to show a diver rising to the surface and to follow with the camera. First the diver breaks surface and then the camera follows showing on the screen the transition from a water world to the familiar scene above the surface. This shot must be made in two parts to allow the correct exposure for each medium.

First shoot the rise to the surface and stop the camera when it breaks surface, then adjust the iris diaphragm to the correct setting for the above water lighting and start the second shot with the camera just below the surface, raise the camera above the water and complete the shot. When the film is returned from processing, cut each shot at the point where the camera broke surface and splice the two shots together.

Editing.

When the film is returned from processing it should be cut ruthlessly into the separate shots. These are put into numbered boxes and the numbers entered on the script. Then the task of building the film can begin. Start with a length of black leader, (used when threading the projector) splice on the first shot from the script, using a suitable film cement, and continue shot by shot to the end of the script.

Titles and credits to precede the film can be filmed or Messrs. Kodak will make them in a few days, these make the film much more attractive to the audience, and are spliced into the film during the editing.

Music and Commentary.

If a film is being made for a large audience, music and sound commentary can be added by various methods. A tape recorder can be synchronised with the projector, the film can have a magnetic stripe added after editing and the sound added as the film is run through a magnetic stripe projector, or, if sufficient financial resources are available, a copy of the film can be made with an optical sound track. Music of a suitable type adds tremendously to the presentation (it also hides the projector noise!) and records, long players for preference, are available to most people.

If a movie camera and the technical 'know how' are not among your club's resources, remember that in all parts of the country are cine clubs, who make a number of films each year, and are always looking for new subjects. Why not contact the local Hon. Secretary and arrange a joint 'get together'. You can tell them about the joys of diving (and perhaps make some new members) and they will be able to give you technical assistance on filming.

A film record of your club's activities will be treasured in the future. Why not start NOW?

Albert and the Diver

In the summer months many tourists, both English and American, visit the Caspian Sea resorts — but be warned . . .

There's a famous seaside place called Pahlavi,
That's noted for fresh air and fun,
And Mr. and Mrs. Ramsbottom
Went there with young Albert, their son.
A grand little lad was young Albert,
All dressed in 'is best, quite a swell,
Wi' a stick wi' a 'orses-'ead-'andle,
The finest the Bazaar could sell.

They didn't think much to the Caspian;
The waves they was fiddlin' and small:
No wrecks, and nobody drownded —
Fact, nothin' to laff at, at all.
So seeking for further amusement,
They went into the Diving School,
Where there was thousands and thousands of divers,
And vodka and caviare too.

There they saw one great big diver;
'is body was all black and blue,
And 'e lay in somnolent posture,
As many good divers will do.
Now Albert 'ad 'eard about divers,
'ow they was ferocious and wild,
And to see one lying so peaceful —
Well it didn't seem right to the child.

So straightway the brave little fellow,
Not showing a morsel of fear,
Took 'is stick wi' 'orses-'ead-'andle,
And poked it right in diver's ear.
You could see that the diver didn't like it,
For, giving a kind of a roll,
'e up, and 'e grabbed 'old of Albert,
And swallowed the little lad 'ole.

Now Pa, 'oo 'ad seen the occurence,
And didn't know what to do next,
Said 'Ma, yon diver's ate Albert !',
And Ma said 'Ee, I am vexed'.
The 'ead diver 'ad to be sent for;
'e came, and 'e said 'What's to do ?'
Said Ma, 'Yon diver's ate Albert,
And i'm in 'is Sunday clothes too'.

The 'ead diver wanted no trouble,
'e took out 'is fags right away,
Saying ' 'ow many to settle the matter ?'
Said Pa 'What do you usually pay ?'
But mother 'ad turned a bit awkward,
When she thought where 'er Albert 'ad gone;
She said 'No, someone's got to be punished',
So that was decided upon.

So off they went to the Barracks,
In front of the Admiral chap;
They told 'im what 'appened to Albert,
And proved it by showing 'is cap.
The Admiral gave 'is opinion:
As they knew that no divers were tame,
If they wanted to go in the School,
Then they'd only got themselves to blame.

At that Mother got proper mad,
'And thank you, Sir kindly,' said she,
'What, come all this way to Iran,
Just to feed ruddy divers — not we !'

HANLEY STOLLOWAY

NEWS FROM R.N.P.L.

by SURG. LT.-CDR. MCKAY

BRAINWASHING is a form of establishing a reflex, without the use of violence, so that the victim believes what the instigator wants him to believe. This has been applied to me in such a way that I cannot see or hear certain members of the Diving fraternity without getting a very guilty conscience about producing an article for the magazine. To try and rid myself of this mental load I am putting pen to paper and I will try to explain what we have been doing in the last year in this laboratory. (These are entirely my own thoughts and comments and in no way binding on anyone else).

The main task is how to achieve the maximum time in the water for the diver with the minimum time in decompression. Contrary to the opinion held by many people, this is of vital concern to the self-contained diver, although for safety's sake in the experimental stages the standard diver is more suitable. Hence the preliminary stages in open water are best done in H.M.S. *Reclaim*. She has on hand a series of dives to establish the safety — or risk — of diving on Table II and to compare the British and American tables From that, it is hoped to evolve safe routines for repetitive diving (combined or multiple diving if you prefer those terms) with or without the use of surface decompression and with or without the use of oxygen. An example of the sort of diving that could result is found in the Australian Pearl Fishing Bed Survey where four to five dives per day to depths of 140 feet for 25 minutes are carried

out by each diver day after day although in our present state of knowledge the decompression is hopelessly inadequate. (They run into surprisingly little trouble).

Apart from the actual testing of tables, this means work must go on into finding out how the excess gases are given off by the body, how decompression sickness occurs and many more problems — the old, old, trouble, the more you discover the more problems arise to be solved.

Another aspect of our work concerns submarine escape where the problem of air embolism is the most obvious but oxygen poisoning, nitrogen narcosis, and bends must also be borne in mind. We have carried out a simple observation of timing trainees to find their speed of ascent with an inflated life jacket and find that the variation is far greater than we anticipated (the few divers included are amongst the slowest rates of ascent, contrary to all expectations). Following Dr. D. C. Wright's work (the underwater blast expert), I have tried a type of corset (W.R.N.S. roll-ons were not tight enough) made in this laboratory which has some promise in cutting down the accident rate during training. (This rate by the way, is one accident in 2,000 ascents or about five per year — none fatal so far).

Yet another research side is the problem of finding out what makes a diver and consequently what factors does the ideal diving gear have to take into account. We have now checked about 400 divers, would-be divers, and men who have come off-course. Every time we think we have found something of value, a group of divers will show an opposite effect. So far the only constant factor is that divers, as tested by our pack test (one third of his weight carried on his back while he steps up and down from a platform for five minutes) are much fitter than the average National Serviceman — irrespective of his smoking or drinking habits. The saving in money, man-hours, frustration and so on if we could devise a selection test for divers would be very great.

A logical follow-up of this is naturally the investigation of any unusual incident involving a diver. In the ideal set up, any diver who has trouble would be seen by someone experienced in underwater medicine and preferably at R.N.P.L. so that an attempt could be made to find the true cause of the trouble instead of the present system which leaves so many incidents unexplained. We doctors have just had a forcible reminder that diving accidents can be due to troubles which can be found on the surface, e.g. pneumonia and coronary thrombosis, which are considerably aggravated by diving without being caused by diving and we wonder how many minor accidents in the past have been labelled 'a touch of CO_2' or 'anoxia' when the real trouble has been ill-health. At any rate we would rather have too many reports or people to investigate than too few.

Turning from the research side, we also do some training here. In the past year we have had visitors from countries such as Venezuela and Kuwait as well as our own medical officers for training in medical problems underwater. Lectures are also given to divers and submariners as required. Recently I addressed the Sub-Aqua clubs at Brighton on mixture-breathing and I only hope they enjoyed it as much as I did.

Then there are always the miscellaneous jobs — anything from

arguing on the frequency of X-rays and radiation to suggestions for a Diver's Log, from working with the teams on a trip to Siebe-Gormans to visiting Cardiff — or in Surg.-Cdr. Miles' case Australia, and from divers jumping from helicopters to underwater farmers.

Life at the laboratory is not routine but very interesting. Our whole problem is the one common to all research set-ups — not enough money, not enough time, and not enough 'guinea pigs' with a consequent slowing down of actual physical work. When that happens, there's a pile of paperwork to plough through. However there are hopes of a brighter future — a change of address to *Vernon II*, leaving our wooden sheds behind and perhaps a 'wet pot' of our very own. Who knows, we might even have a keen diving team with us semi-permanently so that our trials can go on continuously. Our aim will remain how can we help a diver to go under water as often as he likes, for as long as he likes, as deep as he likes as safely as possible.

The Kharg Island Project

by LT. BURSTALL

THOUGH it has little to do with diving, this project is of considerable general interest, and as we visited Kharg last November it has provided a good opportunity of giving a first hand account of what is involved.

Kharg Island is situated in the North East corner of the Persian Gulf, 22 miles from the coast. It is five an a half miles long by two miles, rising to 200 feet, and surrounded by a coral reef out to 200 yards, but beyond that the water falls away steeply to 60 feet. Because of this, large ships are able to take shelter close inshore, and so in 1957 the Iranian Oil Operating Companies decided to turn Kharg into a deep water crude oil loading terminal.

From being a desert island with some 500 villagers and a few goats, in two years it has become a scene of modern industrialisation. involving over 3,000 people. Whichever way you look now there are enormous stores, dumps, cranes, bulldozers and civil engineering projects of every description. An air field has been constructed, together with houses, a hospital, canteen, club, power station, etc., and last but not least a golf course.

The work is shared between six companies, two British, two Dutch and two American; but of the tasks undertaken, quite the most interesting and most formidable is the 'pulling' of the underwater pipe from Kharg to the mainland by the American firm INMARCO. This is the final link in the 100 mile long pipe from the Gachsaran oil fields to the tank farm on top of Kharg. This pipe, 25 miles long, 36 inch in diameter and weighing nearly 450 lbs. per foot is literally pulled by brute force across the ocean bed. The difficulties encountered can be imagined with depths of 160 feet involved. However this particular task was finally completed on December 19th after a three month struggle. To achieve this, the necessary gear including all the pipe, was first laid out on Khargu, a small spit of sand three miles north

of Kharg. This pipe is rolled steel half an inch thick, and diameter 30 inches. This was all supplied in 24 foot lengths, was then welded into approximately mile long lengths, and then covered with fibre glass and two an a half inch concrete. The resultant 25 sections were then laid alongside each other on a ramp waiting to be rolled into position. While this work was progressing, two large wires were run from Kharg to Ganaveh, the shore end of the line. These were provided to secure and guide the pulling barge. When all was ready the pulling barge stood a mile off shore firmly moored with eight anchors as well as the guide wires.

Another wire was rove from the outboard end of the first section of pipe to a winch on the pulling barge. At the order 'start the pull' from the control tower on Khargu, the pulling barge heaves in and the pipe runs out, being steadied at its after or inboard end by a 'holdback winch' with a tension of 20,000 lbs. When this section has been nearly all pulled, it is checked and a further section is then rolled into place behind it. This is welded on, coated with fibreglass and concrete and X-rayed. Meanwhile the pulling barge weighs anchor, winches itself along the guide wires to its next position a further mile towards the land and re-anchors. When all is ready it heaves in again, but this time pulling two instead of one mile of pipe. In this way the whole pipe was laid, the final pull being, of course, 25 miles long.

It would have been very convenient if it had all gone as smoothly as this, but of course many snags were encountered. To begin with, for the first 24 hours the pipe did not move at all, and when it finally did move, instead of sinking owing to its supposed negative buoyancy of 5 lbs. per foot, it floated. This happened because the concrete did not absorb the water as quickly as was calculated To investigate this the senior engineer and two assistants walked out along the floating pipe, and of course the pipe immediately began to sink. They were rescued three quarters of an hour later, but were so exhausted they had to be flown home for medical treatment. To make it sink quicker, concrete saddles were hastily slung across the pipe, but the strong currents twisted the pipe sideways and the saddles were knocked off by the coral. When at last the stretch between Kharg and Khargu was across, it had a large kink in it and had to be recovered and laid a second time.

Most of these problems arose in the Kharg-Khargu pull, only a three mile one, but the experience gained saved further difficulties in the longer pull. In this, the 'big pull', they were hampered instead by the weather and the increased weight of the pipe. Once the outlook was very gloomy when the pipe was remaining obstinately stationary with a tension of 800,000 lbs. applied. It had settled in the mud and coral after a long delay. The pipe would take a tension of 2,000,000 lbs., but the winch had only another 200,000 lbs. pull in reserve. However all was well in the end and the pipe is now lying happily on the bottom between Kharg and Ganaveh. When the oil is pouring through it from Gashsaran (elevation 2,215 feet), this pipe will be delivering 350,000 barrels per day, at which rate the pressure in it will be in the order of some 500 lbs. per square inch. (Just as a matter of passing interest, the 25 miles of this pipe cost £7 per foot).

Another American firm, Raymond Costain, is responsible for the loading jetty. Initially this will be a four-berth jetty, but designed to take an extension for a further four berths later if required. 100,000 ton tankers will have a turn-round period of 24 hours, oil being gravity fed at the rate of 7,000 tons per hour from the tank farm on the top of the hill. This farm initially consists of 12 tanks, each with a capacity of approximately 60,000 tons of fuel, with a site for a further 60 tanks, if the project proves a success. Built by a Dutch firm, one of the aspects of these tanks is an enormous iron plate floating inside, which by sheer weight will drive the oil down to the jetty. Thus, it will be appreciated, that in the whole of this line, from its source at Gachsaran to its point of discharge not one single pump is employed.

Construction along these mammoth lines always carries accompanying problems. Feeding 3,000 men on a small island for two years or more calls for special measures. Food is not brought in by sea — it is all flown in fresh from Shiraz in Dakotas — five tons of it, four times a week. It is estimated that it costs approximately £3 per day to feed each man.

Accommodation is not so difficult. Kharg enjoys a temperate climate, and though it gets hot in summer, it does not get cold in winter, so that living in a tent is tolerably comfortable. Because of its small size and other similar conditions, life in Kharg is in fact not unlike that on board a ship.

When the project is finished, which is expected to be some time in the early autumn, it will cost nearly £40,000,000 — and all the thousands of tons of equipment used will have been loaded from barges over a temporary jetty with little more than 100 feet of sea room, and a maximum depth of less than 20 feet.

By-Pass Cracks

NITROGEN NARKS.
Spivs who pinch bubbles out of tonic water.

DOUBLE DIVE.
A place that's twice as bad as the last joint you were in.

CRACKED BY-PASS.
M.I. Disaster.

ABSOLUTE DEPTH.
The bottoms.

SUIT INFLATION.
Latest body building process.

JACKSTAY.
Ladies request.

COUNTER LUNG.
Chinese mathematical genius.

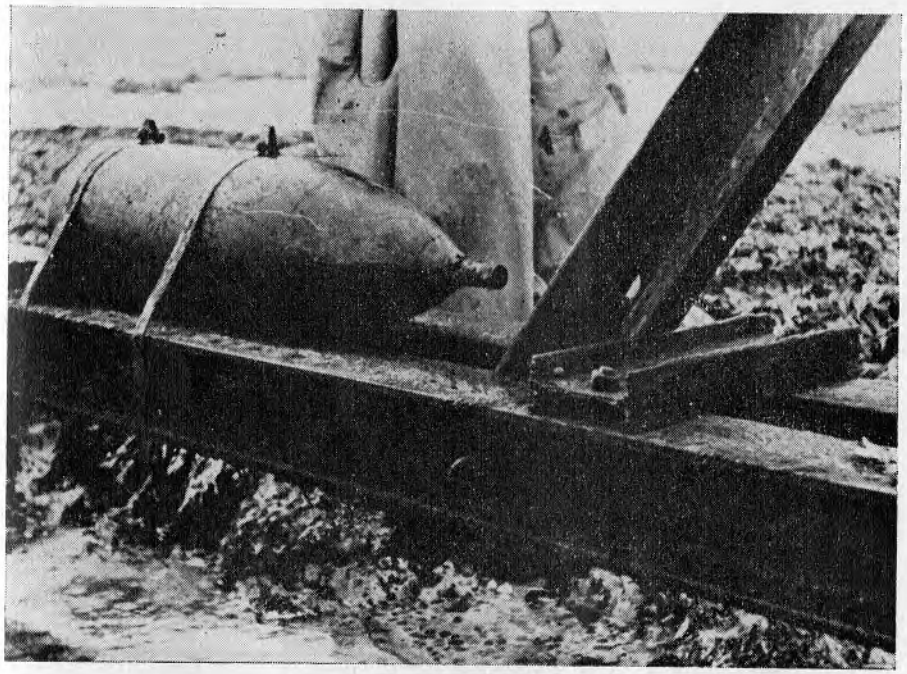
Command Bomb and Mine Disposal Unit — Mines

THE last time I wrote an article for the DIVING MAGAZINE I was stationed in God's own country (Scotland). However since then I have returned to my Alma Mater, H.M.S. *Vernon* where I have been engaged in book correcting and B. and M.D. duties, and other odd jobs from time to time. One of the most interesting jobs we have had in the B. and M.D. unit lately was in Alderney where we arrived on the 2nd January. Alderney is of course well known to many of the diving

fraternity, and we were made very welcome during our stay. We had a great deal of help from the islanders in disposing of the eleven 10.5 shells which had been found there. These shells which are believed to have come from the Maginot line were used by the Germans as anti-invasion defences (*see picture*). Unfortunately we had to manhandle most of them up the beach on to the road, and as they weighed about 600 lbs. each it was quite a struggle. As we were struggling up the beach with what we thought was the last one, there was a joyous shout from one of the islanders that he had found another. It was the first time I had ever seen a gunnery man (young 'Jazz') speechless.

An interesting report was recently received from the B. and M.D. unit in Scotland of finding a Mine of World War I origin washed ashore at Aberdeen. This mine which was in very good condition is thought to be an anti-U-boat net mine and the date on the primer was April 1918. The electro-contact net mine which contained 65 lb. T.N.T. charge and had its battery housed ashore was first used off Belgium in 1915. A short description of it is given in Captain Cowie's book on 'Mines, Minelayers and Minelaying' which is recommended to be read by all those interested in mines.

MAC.



German 10·5″ shell rigged as anti-invasion obstacle.
Found at Corbetts Bay, Alderney.

Cox of Scapa

The Man Who Bought a Navy

IT was a Saturday afternoon in June 1919.

The war which was to have ended all wars was seven months over and an exhausted, embittered world was entering on its long years of convalescence.

In the far north of Scotland, on the Orkney island of Hoy, the children were at play, their shrill cries echoing over the sunlit waters of Scapa Flow.

There, in that vast natural harbour, lay Germany's defeated navy — battleships, cruisers, destroyers, torpedo boats — a fleet of 72 ships ignominiously surrendered at the Armistice and now immobolised, waiting for the Allies to determine their fate.

The children's game grew noisier and one lad, breathless from so much scampering, flung himself to the ground. Shading his eyes, he gazed out to sea, as he had done so often before, dreaming fanciful dreams of those now familiar grey warships.

The time was a quarter to three.

Suddenly, the lad sat up, 'Look ! look !' he cried, 'one of the ships is sinking'.

The children's game was abruptly stilled and for a few moments there was only the screech of gulls to break the silence.

Then: 'There's another sinking . . . and another'.

The boys scattered for their homes to raise the alarm.

Within minutes a motley fleet of rescue boats had put to sea. The sight that met them was monstrous in its fantasy.

Heeling over like drunken giants, plunging headlong beneath the waves their sterns lifting as if in supplication to the heavens, the Kaiser's ships were going down.

Soon the sea was littered with hammocks, lifebelts, deck gear . . . and escaping German sailors jubilant that, in the hour of their darkest defeat, they had snatched final victory, scuttling their vessels to keep them out of the Allies' hands.

Such was the end of the German fleet and the beginning of the life work of Ernest Cox.

His first job — as an errand boy.

Ernest Frank Guelph Cox was born in Wolverhampton in 1884. He left school at the age of twelve to become an errand boy with a firm of drapers.

Later, he served his time as an electrical engineer and for two years was a jointer in the corporation's electricity department.

From the Midlands he went to Scotland to become borough electrical engineer of Cambuslang, near Glasgow. It was there, that he met and married Jenny Miller, daughter of a Glasgow forge master.

Cox was taken into the business and before long he was in control.

But he was already showing signs of the restless energy, the impatience with routine, the forward vision and the superb contempt for risks which were to be the mark of his character all through his life.

In 1913, with a shadowy partner named Danks, of whom little is now recalled, he formed Cox & Danks. His plans were ambitious—

but the war brought them to an abrupt halt.

For four years thereafter Cox was turning out munitions. Then, with the Armistice, he was able to break the bonds of restraint. Cox & Danks secured contracts for the disposal of huge supplies of surplus war equipment and the road to fortune seemed open.

By 1920 Cox had moved south, to an office in fashionable Regent Street, flanked by exclusive dress shops and elegant silversmiths.

Scrap depots were now started in Sheffield, Manchester, Birmingham, and elsewhere. It was Cox's ambition to have a chain of branches throughout the country, 'just,' as he said, 'like Woolworths'.

His imagination was set alight.

In 1921 he opened a yard at Queenborough on the Isle of Sheppey in Kent. From the Admiralty he bought two old battleships, the *Orion* and the *Erin* — they cost him £25,000 each — and he was in the ship-breaking business.

This new venture prospered and in 1924 Cox bought a floating dock, designed for testing submarines, which had been towed from Kiel as part of reparations levied on the Germans.

This dock was a huge structure, over 400 feet long, and Cox had just begun to dismantle it when it was suggested to him that this might be the ideal instrument for attempting to salvage the German ships slowly rotting at Scapa.

Cox's imagination was set alight. This was the gamble he was waiting for, a gamble that might ruin him, but a gamble for stakes which might reach as much as half a million pounds.

His mind already half made up, he sought his wife's advice. She told him 'not to be a fool' and at first he was inclined to agree; 'after all', he recalled later, 'I had never lifted a ship in my life, so the idea was somewhat ambitious.'

But he couldn't let the idea alone. He went to the Admiralty. They, too, were sceptical, but suggested that he might go to Scapa to have a look at the ships.

He did. 'The sight,' he said, 'was one of the most fascinating I have ever seen and could not fail to stimulate the imagination of any man who was fond of engineering problems. As one travelled around, the sunken warships could be seen, some of them projecting out of the water and others just beneath the surface so that only the tops of the masts were visible'.

It was a challenge Cox could not resist: "After thinking the matter over carefully, I decided to undertake the work of salvaging the fleet and returned to the Admiralty with that proposal".

'They agreed as a start to sell me 26 destroyers and two battleships'.

The price Cox paid was described as 'laughable', so doubtful were the Admiralty that he would ever be able to raise the vessels.

But the newspapers were electrified at what one of them picturesquely headlined as 'The Awakening of the Sleeping Monsters'.

The floating dock is towed to Scapa.

Cox's first task was to modify his floating dock to her new task. He fitted her with a score of hand winches and two electric cranes, and he installed on her engineers', joiners' and blacksmiths' workshops, generating plant for electricity, compressed air equipment and storerooms and offices.

Thus transformed, the dock was towed the 700 miles to Scapa; in addition to her new workshops, she carried railway wagons, sleepers and tracks, and even furniture for some of the men who, for the next ten years were to make their homes in the far north.

Arriving at Scapa — the journey took eight days — Cox cut his dock in two, with ten winches and one crane on each of her halves.

His plan was to moor the halves on either side of a sunken ship, to pass chains beneath the vessel to form a cradle and — with the help of the tide lift of nine feet — to winch her up by hand.

The first ship he tackled — and she was almost the last — was a 700-ton destroyer, the *V.70*, lying in ten fathoms.

Cox had brought from Queenborough the old anchor chains of the *Orion*: if, he argued, these were strong enough to hold a battleship, then they were strong enough to lift a destroyer.

So the two halves of the dock were anchored in position above the *V.70*, divers passed ten lengths of the wrought iron chain underneath the vessel and the winches, each manned by four men, began to lift.

> *Without warning, there was an ear-slitting crack as one of the great links snapped. The strain on the next link snapped that, too, and in a few moments the air was filled with hunks of flying metal.*

David Masters, who has written extensively on salvage, described the scene that followed:

"Men shouted, threw themselves face down where they stood; others rushed to the workshops for safety. The flying metal made reports like gunfire and the *V.70*, which was peeping above the surface, sank quietly down again.

"The bombardment of links had hardly ceased when Cox was leaping to attend to the injured. Those present expected the place to be a shambles. Over a hundred men were clustered along the edges of the dock. It seemed impossible that many would escape. Yet by a miracle not one was touched."

Cox was learning the hard way . . .

A tense ten days —
with a fortune at stake.

Grim faced, he set off for London, there to spend what remained of his rapidly dwindling capital on nine-inch wire ropes.

The next ten days were tense. The wire ropes were substituted for the iron chains and on the morning of August 1st 1924, the lift began again.

Cox was everywhere, spurring on his men, watching anxiously for any weakness in the ropes. He had already spent £40,000. Was it all to be lost ?

But this time the ropes held and, inch by agonising inch, the *V.*70 emerged from the sea-bed where she had lain for more than five years.

When she was well clear of the bottom, tugs took over and towed her and the docks which supported her to a sandy inlet on Hoy. There she was beached.

It had taken six weeks to raise this first ship. The second, the *S.53*, was lifted in eleven days, the third the *S.55*, in six days.

"Some of the ships," Cox wrote later, 'were upside down; it was very easy to pass ropes underneath since the vessels rested on the bridge and forward gun with most of the hull six feet from the bottom. It took us two days to turn a boat over before we began to lift her.

"Several of the destroyers had been fastened three to a buoy and in some cases, therefore, we found three sunk together, resting on top of each other. Here again it proved quite easy to pass ropes underneath the destroyers and to lift them up, sometimes tearing off parts of the upper structures in the process.

"Finally, we became so expert in dealing with these craft that the last destroyer was raised in four days'.

Salvage had to be halted during the winter and these months were utilised in breaking up the more badly damaged vessels and shipping the steel to the Scottish furnaces.

Those of the destroyers which were still seaworthy were patched up and towed south to the Firth of Forth where they were broken up by the Alloa Shipbreaking Company, the organisation from which Metal Industries sprang.

Thus began the link between Cox & Danks and M.I., a link which was finally sealed when C. & D. joined the Group in 1949.

In his book, 'Wonders of Salvage, David Masters, who spent some time at Scapa, gives a vivid description of the destroyers as they came to the surface:

"The searchlights and masts and upper works were bent and twisted into every imaginable shape. Long ribbons of seaweed festooned the guns and a shorter growth grew like grass all over decks and hull.

"Dozens of baby oysters grew inside some of the lamps, and spiny sea urchins, some with black markings, some with red, were lying about all over the place.

"Directly the wreck came into view the marine growths were beautiful, but after a short time in the open air they began to droop.

"And in a day or two an abominable stench arose as the seaweed and shellfish decayed under the hot sun . . .

"Plates and glasses and cups were scattered in the cabins of the wrecks; photographs and oddments were lying tumbled in all sorts of corners; mattresses had rotted away, spilling horsehair all over the place . . ."

Living conditions in the early days of the Scapa operations were arduous. Cox housed his men in a disused naval camp which he had fitted up with separate messes for the divers, engineers, labourers and clerical staff. The executives lived in bungalows; Cox put up on a farm.

There were no shops on Hoy at that time. Trading was by barter. A tiny schooner travelled around the islands exchanging tea, sugar and other commodties for eggs, mutton and wool.

This was not good enough for Cox: he persuaded the schooner owner to give up his 'round' and to establish a store on Hoy.

Later, a dance hall was built and on party nights a drifter would be sent to the mainland to pick up the village girls as partners for the salvage men. Romance blossomed . .

The 'Hindenburg' and her 800 patches

Now that he had successfully lifted the destroyers — 'I'm sorry there were no more of them,' he said; 'they were just beginning to pay nicely' — Cox raised his sights . . . to the 27,500-ton battle cruiser *Hindenburg*. 'In raising this ship,' he declared, 'I spent £75,000 and only just succeeded in recovering my money'.

Yet the *Hindenburg* appeared to present an easy task: she had settled on her keel in about ten fathoms and her mast and funnels stood well clear of the water.

All through the summer of 1926 fourteen divers were busy fixing patches on the vessel, sealing every opening in her hull so that the water could be pumped out.

No fewer than 800 patches had to be made. They were put on with oakum and tallow and at first they vanished almost as quickly as they were fixed: eaten away by shoals of tiny fish. Cox mixed cement with his tallow — 'that ought to give them indigestion', he said — and the marauders turned away.

By mid-August the 40 pumps were in action and the great vessel began to stir in her bed.

'But as the ship rose', Cox wrote afterwards, 'she began to take on a dangerous list and to become uncontrollable'.

Every expedient was tried to righten her but all were in vain.

'We found it possible', Cox said, 'to raise either the stern or the bows, and, indeed, we did both until we were tired of seeing them. For always the ship tilted over to an angle of about 35 degrees.

"Moreover, to add to our troubles, the coal strike occurred at that time. The price of our fuel rose from £1 to £4 15s. a ton. I was paying £1,000 a week in wages and £1,000 a week in fuel and could see no sign of success.

"We had been working on the boat for five or six months day and night and were completely exhausted. It was with a heavy heart that I decided to give up the attempt, at any rate for the time being."

'*For the time being* . . .'

Four year later he tried again.

Four years later — he had raised two other battle cruisers, the *Moltke* and the *Seydlitz*, in the meantime — Cox turned once again to the *Hindenburg*.

The challenge she presented had nagged continuously at his mind and now, with more experience, he believed he saw the way to victory.

The problem was still that of controlling the alarming list which had defeated him earlier.

To curb it, Cox hit on two devices.

First, he installed pumps all over the ship and had them connected to a master control room. From there he was able to detect any weaknesses and swiftly bring additional pumps into action.

Secondly, he placed a huge concrete block on the starboard side of the vessel in an attempt to steady her as she rose.

"I cut a German destroyer in two to provide a container for the concrete', Cox wrote, "and selected the engine room for this purpose since it was strongly built. This empty engine room was carried out and sunk beneath the *Hindenburg*.

"Its dimensions were 30 feet wide by 40 feet long and 600 tons of concrete were required to fill it.

"The total cost of this was £2,000 and I was therefore very reluctant to place such blocks on both sides of the stern, hoping that support on one side would be sufficient to give stability to the ship.

"We began pumping and the *Hindenburg* rose 17 feet out of the water without tilting and we were congratulating ourselves on our success.

"Suddenly, however, she tilted over the other way. I had half expected this, but at any rate I was

now assured that I was on the right track.

"We therefore let her down again and built another concrete block on the other side.

"As my patience had been severely tried and was nearly exhausted, I came away for three weeks' rest while the additional 600 tons of concrete were being placed in position.

"I knew that the next time we began to raise the ship she would be the critical point in the whole operation.

"I had already spent £40,000 during the first attempt to raise the ship and my money was going like water again. If this next attempt was unsuccessful, it would mean my complete reuination".

The crucial day was July 22nd 1930.

The agonising moment as she tilted again.

Cox had put a man on the *Hindenburg's* bridge: 'he had a life-belt on and he was perfectly safe since there were plenty of boats handy if she turned over.

"His duty was to observe the angle of list, which was measured by a special scale on the bridge.

"You can imagine the anxiety as he called out at intervals 'two degrees, four degrees, five degrees, six degrees'. By this time I thought everything was lost again, but suddenly the list stopped.

"After a further quarter of an hour he called out 6½ degrees" and then 'six degrees'. and I knew that all was well.

"You will understand my feelings when I mention that this was the biggest ship in the world that had ever been lifted."

On August 25th the *Hindenburg* left Scapa in tow for Rosyth, there to be broken up.

It would need a volume of several hundred pages to tell adequately the stories of the 26 destroyers and seven battle cruisers that Cox lifted.

There was the *Moltke* which lay on the bottom upside down. Cox raised her by filling her with compressed air, as though she was a balloon, and had her towed to Rosyth still upside down. It took him a year.

Battle Cruiser *Moltke*, still upside down, arrives at Rosyth

The *Seydlitz* ('25,000 tons of obstinacy') gave a great deal of trouble: 'indeed', said Cox, 'we created a record by raising either the bow or the stern no fewer than 40 times before we secured her'.

He "always set up a commotion."

All through the arduous years of the operations at Scapa, Cox & Danks was steadily expanding its activities in scrap collection and processing.

That, however, is another story and all that can be said of it here is that Cox was again the driving force.

He would visit each of his branches in turn and, as a colleague put it, 'he always set up a commotion'.

But his outward ferocity concealed a heart that was easily touched.

He would visit his men when they were ill; hand out half-crowns to ragged children he met casually on the street.

In a burst of anger, he would fire a man for some stupidity and then, full of remorse, reinstate him the next day at a higher wage.

He lectured all over the country on his work at Scapa, gave every penny of his fees to hospitals and other charities.

His favourite saying, which lives on in Cox & Danks today, was: 'If you don't know what to do, do something'.

The 'something' that Ernest Cox undertook was the greatest salvage operation the world has ever known; it has assured him a place in history.

Photo and story by permission of 'Metal Industries News'.

Experimental Clearance Diving Unit

AS you know this Unit works in close co-operation with the A.E.D.U. under the direction of the Superintendent of Diving.

This team now consists of Lieutenant Hodgson, Petty Officer Hills, Leading Seaman Hough, Able Seaman Robbie and Able Seaman Futcher.

We have carried out several very interesting trials, the first being a trip to 'Glen Fruin' for escape trials from ditched aircraft, under the direction of Dr. Rawlins and his assistant Dr. Davison. A programme was arranged and the unit started work. After the first day it was decided that we would not be able to finish the trials in time unless we worked from 0800 until 2300 each day, much to the consternation of the civilians, but very much in favour by the divers. We worked for a full 13 days and left very tired, but jubilant as we were going on Christmas leave the next day.

After leave we carried out a series of trials on the new depth gauge and compass, so far these items are still under trials as several snags were found which we hope will be ironed out very soon.

George Robbie after a short dive has decided that it is now too warm for Neoprene Mitts to be worn, so may I take this opportunity to ask all those who have these Mitts out on loan officially or otherwise to return them to us for stowage in cool dark places until the weather turns the

water dark grey. These Mitts, I must confess, are a great asset to a diver; diving in very cold water is now almost a pleasure.

Another new thing coming is the Surface Demand Diving Equipment (S.D.D.E.). This is one of the best sets I have ever dived in during my 16 years in the diving world, and every one else who has used it agrees that it is 100%.

At the present time we are engaged in helping with the trials on the Divers Underwater Communication System which is explained fully in another article by Mr. Grosvener of A.E.D.U. 'P'

An Old Mine for a New Team

THE unexpected so often turns out to be the unusual and so it was with the last few days of the current C.D.O. and C.D.1's course. Over a beer and a game of skittles two days before the final result was known, the three qualifying C.D.'s Tag Caisley, James Majendie and George Wookey, the latter two destined for Bomb and Mine Disposal duties in the near future, were detailed to assist Lieut-Cdr. Mc Lanachan and Lieut John Grattan in recovery and disposal of a suspected mine trawled up by a fishing trawler off Newhaven.

Early the following morning the 30th March, saw the three embryo B. and M.D. officers madly dashing around preparing sets of mixture breathing apparatus and gathering other odd sundries normally required for such a job.

By 1300 the team had arrived at Newhaven, located the *Ilfracombe Belle*, on which there was not a sign of life, and started loading all the gear on board, whilst one of our number scoured the town to find the elusive Skipper who, it seemed, knew precisely under which wave three and a half miles out at sea he had dumped the mine.

Now as everyone knows, there are mines, and mines — many of them turn out to be old boilers, gas cylinders, etc., so it was not an entirely optimistic team that went to investigate this one, though to give the Skipper of the *Ilfracombe Belle* his due, he had trawled this object off the sea bed, realized its possible nature, and without disturbing it at all, secured the neck of the net around the mine and lowered it as gently to the sea bed as possible, marking it well with a small buoy and wire — the depth about ninety feet.

Diving time is very limited between flood and ebb tide and visibility not at all good in this locality, consequently diving had to be progressed as quickly as possible. Mac, already dressed and equipped, slipped over the side, pulled himself down the mooring wire against the increasing tide and finally reached the object completely shrouded in fish net. A few minutes later up he came, having decided that the object was indeed a mine — and without any delay started preparing a ten pound charge to be taken down by the next diver.

With a weighty charge like this as ballast the diver was quickly lost to the surface and was soon cutting a way through the net. Reaching as far into the parachute pocket as possible, the charge was placed, the cordtex

lead straining against the tide to the trawler above.

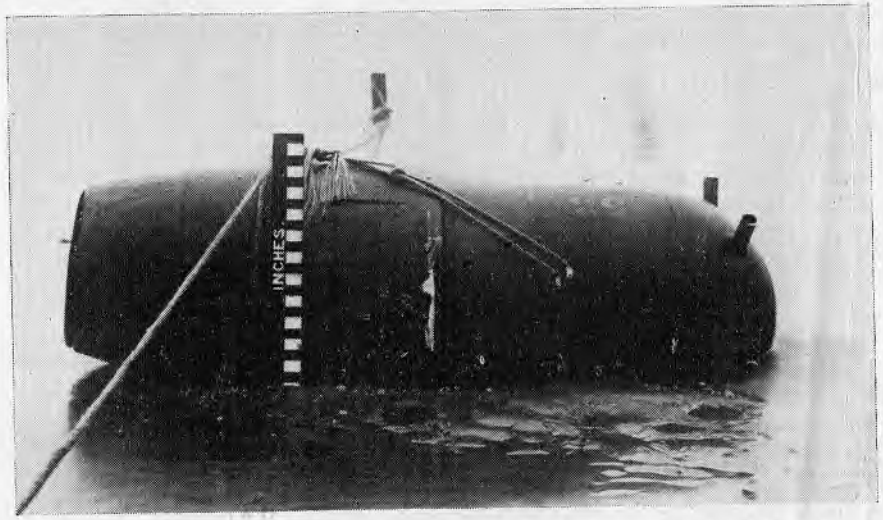
The fuze ignited and supported on the surface by a small float, we retired to a safe distance and waited. The six minutes delay seemed an eternity before the charge detonated, but if we expected to see an impressive plume of water burst above the surface we were diasppointed — no such thing.

Back we went to recover the buoy and wire, never expecting any complications in drawing it up. Diving deep was now out of the question on this tide, so the decision was made to lift what remained as far as possible and attach a further ten pound charge in closer proximity to the detonator.

With the end of the net visible above the surface the mine hung about 25 feet below the trawler — to bring it up any further could be a trifle dangerous as a hydrostatic system within the mine could operate upon release of water pressure and complete the firing circuit, thus firing the mine.

By a strange phenomenon the charge had split the aluminium case of the mine along the seams longitudinally and blown the parachute housing of the mine into the side of the net where it hung entangled. The various pockets, fuze housings and switches were still intact and enabled positive indentification, but the mine, weighing half a ton, was slowly but surely slipping from the clutches of the tattered net as the trawler surged up and down. It appeared doubtful whether there would be sufficient time to secure another charge before the mine plunged to the bottom in 90 feet of water, and with such a strong tide flowing that would make future location unlikely.

Never had a charge been made up so rapidly — fingers fumbled to secure it tightly to the few projections remaining on the mine. At last the job was completed and the mine lowered as carefully and quickly as possible to the bottom. This time with fingers crossed we waited the six minutes delay — then a most satisfying thump and a magnificent plume of water shot way above the surface.



German Mine type G.A., one of the early German ground magnetic dip needle mine. Trawled up off Newhaven.

Now of course we all fondly imagined we could spend the next hour picking up the choicest of fish— I guess it must have been the fishes migratory season — nothing appeared but a few sprats that the sea gulls beat us to anyway.

Certainly a most interesting mine — a type which has not been seen since the early days of the war. A German 'A' ground magnetic mine with bomb fuze which was designed to prevent anyone raising it above 15 feet below the surface. Only 50 are recorded as having been laid, and these all before 1940.

To round off this useful introduction to practical mine disposal, we went the following two mornings at 5 o'clock to a section of beach called Birling Gap, where there remained hundreds of A.A. shells fired during the War. Many of these are solid, but a high proportion of them are filled and must be disposed of by countermining. Each successive tide seems to reveal more and the job of disposing of them is one which will occupy disposal units for some time to come. Our score for these two days was 163, not to mention the number of blistered feet. Nevertheless three days to remember with pleasure.

On return to *Vernon* we learned that Lieut McLanachan had been promoted. GEO. W.

Divers' 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* .....

Equipment Experienced in .....

.....

Diving Experience .....

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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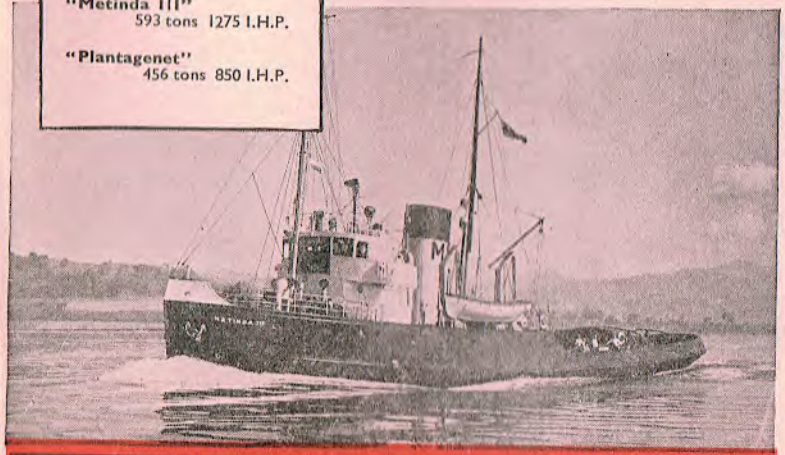

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