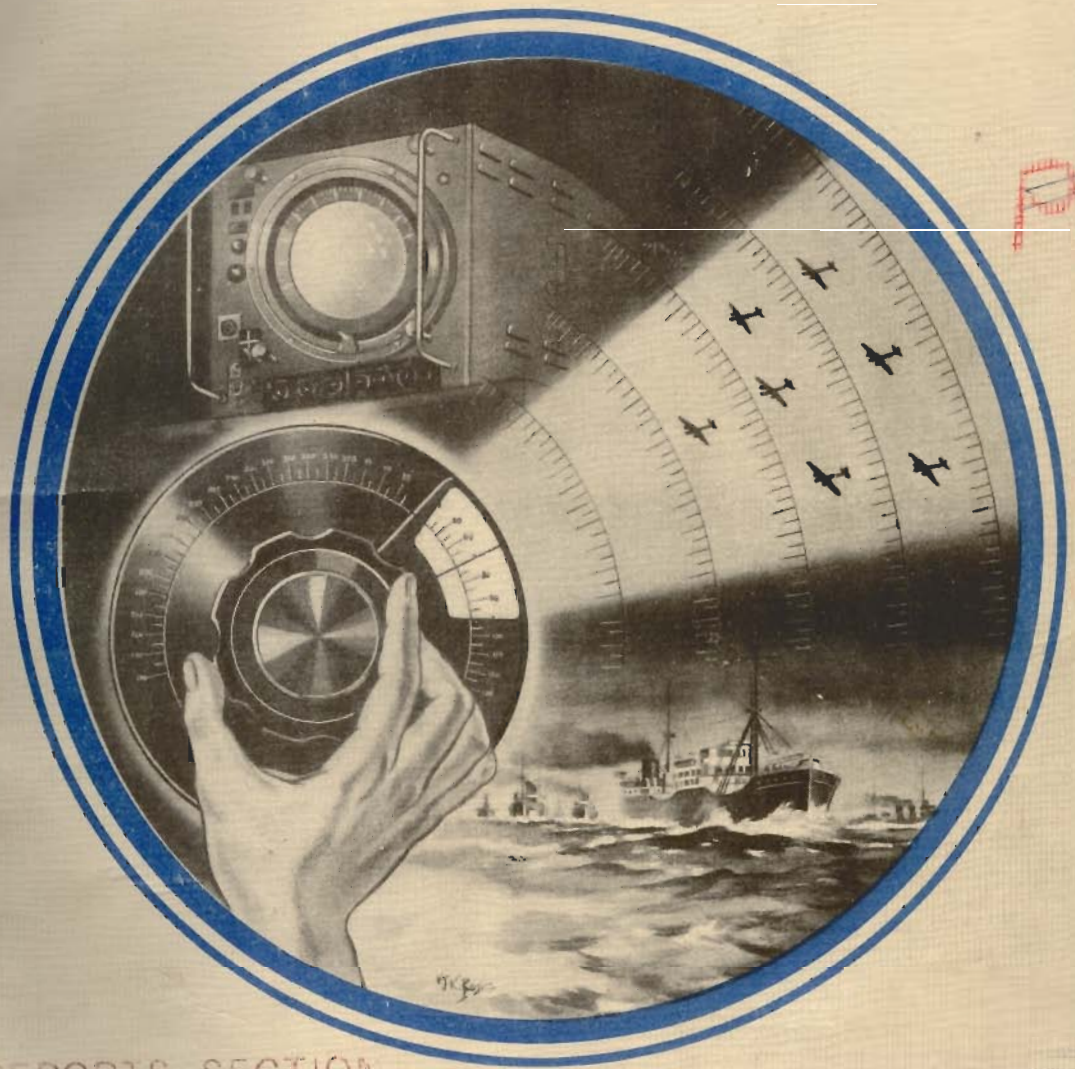


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ADMIRALTY SIGNAL & RADAR ESTABLISHMENT

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ADMIRALTY SIGNAL & RADAR ESTABLISHMENT

ADMIRALTY SIGNAL ESTABLISHMENT

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SEPTEMBER, 1944

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TO BE DESTROYED WHEN SUFFICIENTLY PROMULGATED -
CERTIFICATE OF DESTRUCTION BEING FORWARDED TO A.S.E.

EDITORIAL

On the Editorial page of our first number we invited our readers to send us their contributions. We expressed the hope that all whose job brings them into contact with radio would regard this as their journal, and that they would help to make it effective by providing us with ideas and opinions other than our own.

May we again stress the point. We know - how well we know - the aversion most people have to "paper". But we know too that the Bulletin can do - and is doing - such good work that we feel constrained to quote, once more, the A.S.E. slogan "Make a note of it now for the Bulletin".

ELSEWHERE IN THIS ISSUE WILL BE FOUND A LOOSE-LEAF VERSION OF THIS SLOGAN. WE HOPE THAT IT WILL BE GIVEN WALL-SPACE IN YOUR OFFICE, AS A REMINDER THAT OUR PAGES ARE OPEN TO YOU.

We want your articles and your suggestions, your experiences and - yes - your complaints. Tell us what you want to see in the Bulletin and if we can provide it, we will. So far as material for his "magnum opus" is concerned your editor has no pigeon holes. Address your contributions through the normal channels with a copy, marked "Bulletin", to Admiralty Signal Establishment.

Recent correspondence high-lights an aspect which we feel justified in regarding as a compliment. It seems that "Radio" Officers set such great store by their copies that circulation is apt to be restricted. To quote one Commanding Officer, "It only fell into my hands by accident, because this sort of book is, as a rule, jealously guarded by the Radar Officers".

Now one of the objects of the A.S.E. Bulletin is the dissemination - in palatable and digestible form - of the kind of information that other officers sometimes need to have. We ask therefore that Radio personnel will make this dissemination their responsibility and bring articles of interest to the attention of their Captains and other officers concerned.

SECURITY

The amount of information assembled under this cover makes it a potential dangerous source of information leaks. It is essential that all holders of this Bulletin safeguard its contents as a whole. Each holder should therefore insure that each copy is adequately safeguarded and that information is being properly disseminated.

COURIER

Considerable regret was felt in the Establishment when on June 3rd, 1944, the Wren Couriers left A.S.E. Some of them had done this splendid job for over three years. A number of them, including those who had served longest, would have been very pleased to stay on, though many others felt that another winter would have been too tiring, and so the Admiralty decision to disband them and employ sailors was received with mixed feelings. Those who enjoyed the work felt that the adventurous life was worth the discomfort of long distance travel, often at night, and irregular meals and sleep.

The job of the courier was to take urgent W/T and Radar stores to any part of the British Isles. It often involved cross country travel, as stores had to be collected from one place to be delivered to another. The commissions were all of an extremely urgent nature.

The first two couriers started in April, 1941 and there were six by June. At this time their work had not been organised and they were often 'briefed' on scraps of paper giving insufficient details. They had no help as regards their journey and it was quite commonplace for them to find themselves at the other end of the Kingdom unable to find their destination. In 1941 there were many fewer Y.W.C.A.'s and hostels and so they often had to sit in waiting rooms on draughty stations for hours at a time. At that time they travelled everywhere third class.

Conditions improved greatly during the last year, with first class train travel on all long journeys, full instructions on Courier request forms, better accommodation either in W.R.N.S. Quarters or hostels and a slightly higher rate of subsistence. The subsistence for naval ratings is 7/6d. for a night or twenty four hours absence, which can be increased to ten shillings where there is no hostel accommodation.

They frequently acted as their own porters and trundled barrows up and down platforms! They have been taken for every kind of railway official and have often assisted R.T.O. staff in different places. Stores escorted have ranged from documents and components of a few inches long, to loads of over two tons and over twenty feet in length. The gear has sometimes been too long to get into the goods van on passenger trains and has had to be taken by lorry.

The porter problem has been solved lately by a standard rate of tipping, but in the early days no portage was allowed. One Courier tells us how she had to take a particularly heavy load and of her delight at finding a porter. It did not last long! Immediately he saw the weight of the gear he vanished!

Then there was the Courier who arrived in London on a Sunday night quite broke. She had a heavy load of cases in the luggage van and no money to tip porters, so she made out a bunch of sticky labels "c/o Parcels Office. To be called for on Monday by W.R.N.S. Courier." She made her way to the luggage van

and plastered them all over the existing labels on the cases. On reaching London she slipped out of the train and took cover behind a pillar. There was a considerable amount of bad language when the porters opened the van and saw all the work waiting for them. Later on she strolled into the Parcels' Office and asked if her cases had turned up. Quite unsuspecting, they showed her where they were, so she said she would return with a lorry in the morning. She then went off to a hostel where she knew she could borrow some money to finish her journey!

The Couriers have travelled by road, rail, sea and air all over the British Isles. A journey to Northern Ireland or Scapa was a frequent occurrence and generally took three days or more. The boat trip to Northern Ireland was sometimes very difficult. A Courier describes her first journey! She says, "I had to take fifteen cases. Steerage saloon packed, nowhere to sit down, no berths and no tea, people being sick in all directions - usually mine. I went on deck in the lee of a lifeboat, and stayed there all night. It was bitterly cold but better than down below."

They all carried passes permitting them to fly. The most usual air travel was between Hatston and Donnibristle and has included flying in snowstorms and gales. A Courier was once in a plane that had to make a forced landing in a cornfield but she was none the worse for it.

They have caused sensations in inland towns where Wrens were quite unknown, especially by appearing in duffle coats in cold weather.

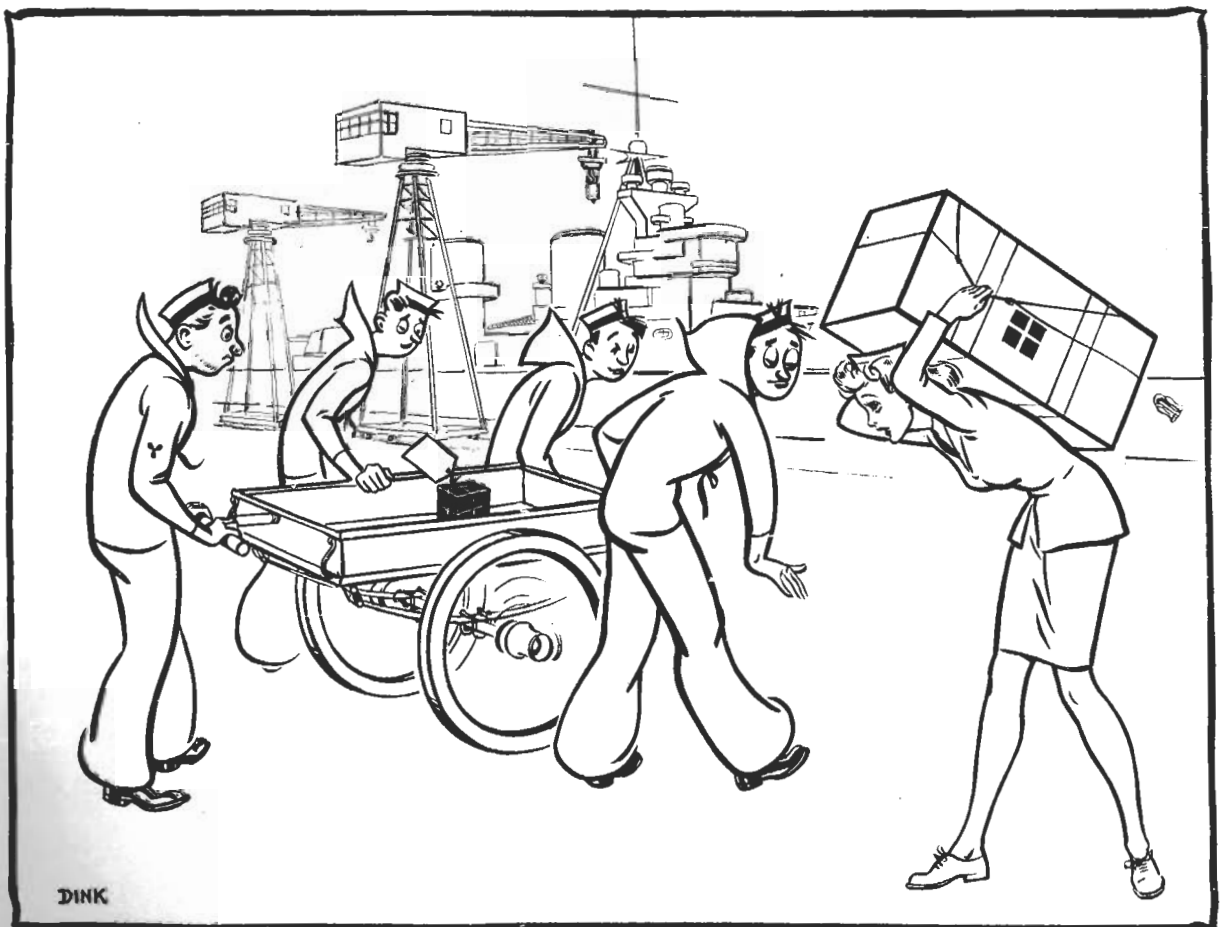
One Wren has estimated her mileage, over a period of two years nine months, at approximately two hundred and twenty thousand. Some of their jobs were very thrilling. One was sent off to Northern Ireland at a moment's notice with a small package containing vital stores for an experiment timed to take place at noon the following day between a cruiser and an aeroplane. Trains and the boat were packed and she arrived late. She was told that the ship had sailed and was lying out at sea, she was sent out in the mail boat and arrived on board at 11.50, ten minutes before the experiment was due to begin. Another Courier was not so lucky. She arrived at Rosyth dockyard five minutes after H.M.S. PRINCE OF WALES had sailed on a mission so urgent that no delay could be permitted.

Travelling during the air raids of 1941 and 1942 was often very difficult. On occasions many of the main line stations were out of action. On Courier took twenty four hours to reach Glasgow from Portsmouth and another on her way to Barrow spent six hours on the line near Nuneaton, where the line had been bombed. While the raid was going on she lay on the floor with the seat cushion on top of her!

In April 1942 a Courier had to travel to Arbroath. The night train was crowded and by the time the gear - two and a half tons of it - had been put aboard there were no seats or even standing space left, so she travelled in the guards' van. The train was running two hours late as the line had been blitzed but the time passed very quickly as the guard explained the railway code to her and gave her cups of tea out of his can.

The Couriers have visited, and often been shown over, every kind of factory, from the one room variety of the London suburb to some of the biggest firms of their kind in the world. They have travelled to the remotest parts of Scotland, including some which cannot be reached by rail. They have visited many of the most important ships of the Fleet, in H.M. Dockyards, in Contractors Yards and in other places such as Scapa Flow. Many people knew them personally and had learnt to rely on them when urgent stores had to be got to a distant destination at the earliest possible moment.

Both the Naval and Civilian Staff at A.S.E. regret their passing and Port Radar Officers, Naval Store Officers and many others will miss the fifteen Wren Couriers who carried out their duties with such unflinching efficiency.



THE PASSING OF THE WREN COURIER.

"ON THE LEVEL"

As the beam from a radar set, as the result of various technical advances, is sharpened up, it approximates to a cone of extremely narrow angle. The spread of energy over a large area being thus reduced, the same amount of output power will then give an increase in range and an improvement in bearing accuracy.

The difficulty then arises of keeping the sharpened beam on its target when the ship is rolling. In the Type 271 sets this particular problem was solved, or at least evaded, by deliberately "spoiling" or reducing the sharpness of the beam in a vertical plane. This, of course, gave a reduced performance, but had the advantage that the echo remained on the screen all the time, and did not have to be spotted during the comparatively short period when the ship happened to be on an even keel.

It soon became evident that this was no real solution of the problem, and that means must be found to maintain the radar beam horizontal, irrespective of the motion of the ship of which it formed a part. Thus was born the aerial outfit AUH.

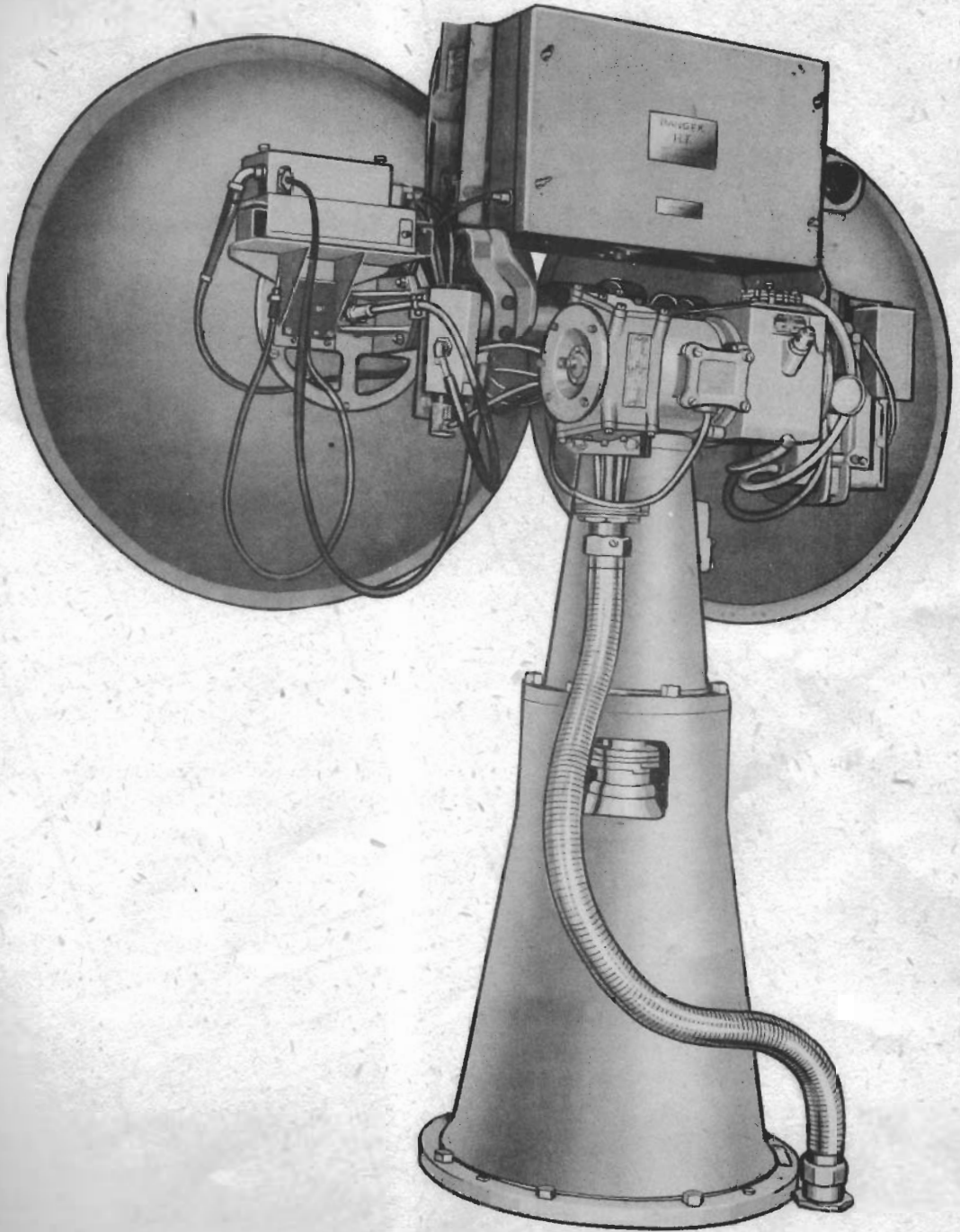
The development of the outfit was started before the "combined T and R" technique was fully worked out; consequently it had, as will be seen from the picture, two separate mirrors, one to transmit and the other to receive. As a sharp beam in both planes would now be possible, the parabolic "dish" was selected as the best shape. The problem was thus to "stabilise" this somewhat formidable mass of two mirrors, receiver amplifier and transmitter unit, about a horizontal axis located as near as possible to its centre of gravity.

Naturally, the first question asked by the designer, on being confronted by such a task, was, "what apparatus exists that can be used?". The first few models to go to sea therefore, were constructed by "tacking on" to a Type 273 outfit an existing complete stabiliser unit taken from the well known "Exeter" searchlight sight. And, whereas this gave quite satisfactory results, acute production difficulties soon arose, and it was decided to look for a simpler solution, and one that would be less of a strain on our diminishing supply of highly skilled labour.

The "brain" of any stabiliser is, of course, a gyroscope. That used in outfit AUH and known officially as the "Sperry MK 1. gyro vertical" is derived, with comparatively little change, from the similar instrument used to provide an aircraft pilot with his "artificial horizon". In the gyro vertical, the "pointer" of the artificial horizon has been removed and replaced by a flat semicircular plate which just covers two air nozzles, from which flexible rubber pipes lead to the two sides of an air diaphragm (taken from the Sperry gyro pilot).

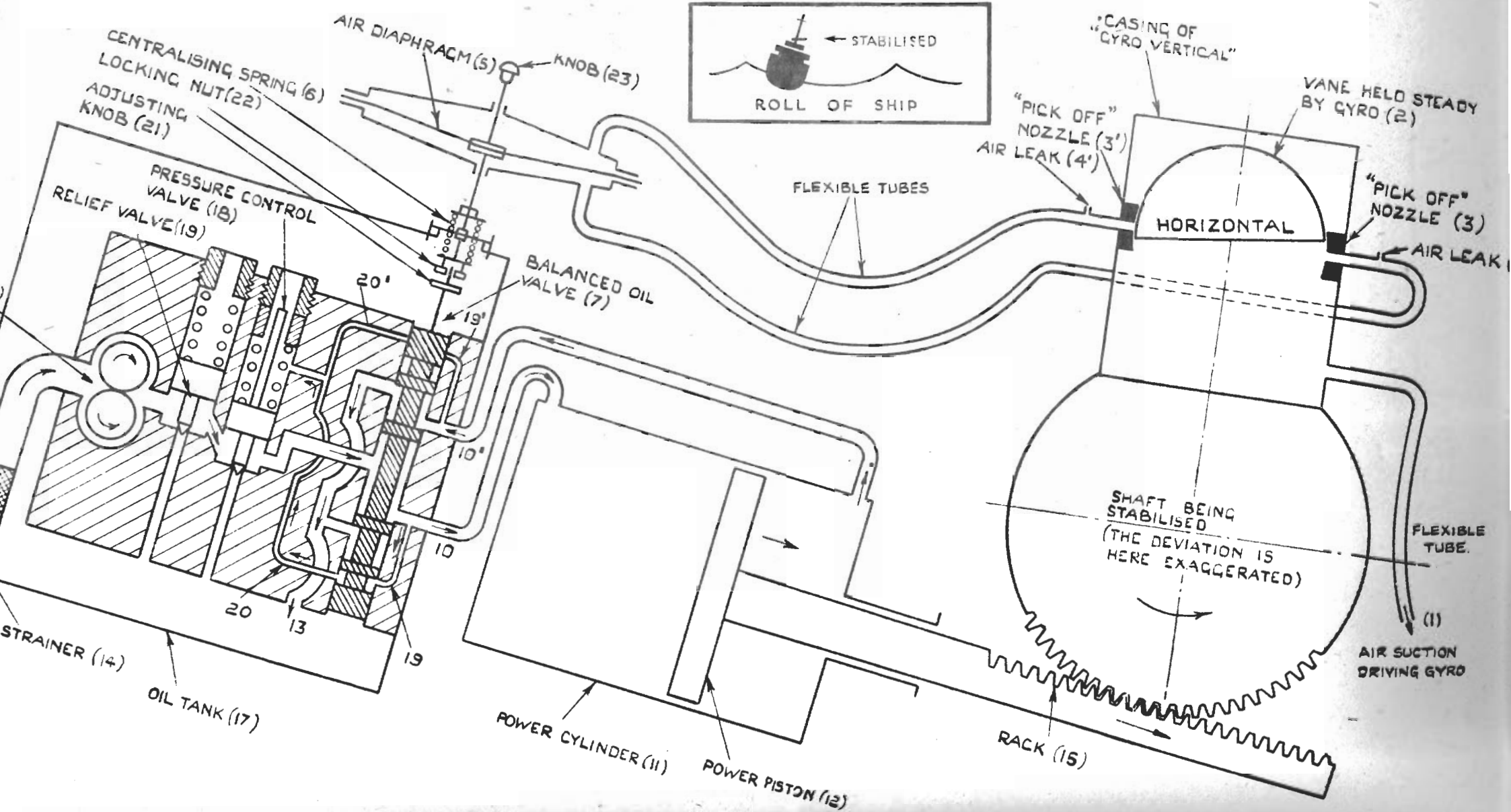
The needle, or plunger, of the air diaphragm is directly coupled to a balanced oil valve which admits oil under pressure to one side or the other of a comparatively large piston: by means of a toothed rack cut on the cylindrical surface of the plunger attached to this piston, engaging with a toothed wheel coupled directly to the mirror support arms, the movement of the latter is controlled by the much smaller movement of the oil valve. This, in turn, is governed by the movement of the semicircular plate, mounted on the outer ring of the gyro frame.

AERIAL OUTFIT AUH



"ON THE LEVEL"

DIAGRAM ILLUSTRATING ACTION OF
GYRO VERTICAL STABILISER FOR AERIAL OUTFIT AUH.



It may be argued, of course, that the semicircular plate on the gyro, and also the assembly of mirrors and transmitter do not move. They remain level while the ship moves. But for the purpose of studying the action of the mechanism it is somewhat easier to imagine that the mirrors "move" and the ship remains stationary.

A partial vacuum is maintained in the gyro case which the air enters through a series of jets directed at the wheel itself, which is thus caused to rotate at a high speed. The air leaves the flywheel casing through a series of slots which are partly covered by freely suspended vanes: as the spindle of the flywheel moves out of the vertical these slots are opened and closed by the movement of the vanes in such a direction that the ejected air exerts a reactionary force in the correct direction to restore the upright position of the spindle. A gyro designed in this way is said to be "pendulous" and when it has reached its vertical position it is "erected". A period of about a minute is required for the flywheel to take up its erected position, and for this reason it is advisable to switch on the air pump and run the gyro up to speed before switching on the power to the oil motor.

Now consider what happens when the ship rolls. The diagram shows this clearly.

The gyro case is mounted rigidly on the mirror assembly, and the whole starts to move. The gyro spindle, of course remains dead vertical. Thus the semicircular plate begins to uncover one of the air "pick-off" nozzles, allowing a partial vacuum to be created on one side of the diaphragm.

To make the action smooth and progressive, and prevent a sudden jamming of the diaphragm at the end of its stroke as soon as the pressure is unbalanced, small air leaks are introduced at the "pick-off" nozzles, leading into the atmosphere. Thus for every small displacement of the plate there is a corresponding position of stable equilibrium for the diaphragm.

The deck will only have rolled about a degree when the air diaphragm comes into action, opening the oil valve and causing the rack and pinion mechanism to move in a direction to restore the upright position of the gyro box, so that, although the diagram, for clearness, shows the movement tilted up through about 15 degrees, this will never happen in practice; the restoring mechanism comes into play immediately and maintains the whole mirror system horizontal, irrespective of the roll of the vessel.

The oil supply is maintained under a constant pressure by a pump driven by a D.C. motor, clearly visible on the photograph. During periods when the stabilising mechanism is quiescent, or lightly loaded, most of the oil pumped is discharged through a relief valve. The actual working pressure is set to 45/60 lbs. by means of a subsidiary valve, shown in the diagram, and accessible by removing the top plate of the oil unit. The somewhat complicated structure of the oil valve is due to the necessity for exact balance of the working forces, and to the introduction of a pressure economising device whereby a sudden large movement of the valve causes an excess pressure of oil to "sit on" the pressure control valve, thus permitting a momentary overload, and a corresponding rapid acceleration of the working piston. Without this accelerating device the system would be sluggish and irresponsive, or conversely, would have to be of prohibitive power output and weight to provide the maximum instantaneous working forces which may occur.

The complete aerial outfit is plan packed at the factory and has been fully tested under its own power; there is thus no need to perform an immediate operation on its vitals, 'to see how it works'. Do not forget, however:

- (1) To treat the "gyro vertical" MK 1 or MK 11 (the latter has an improved set of bearings) as a delicate scientific instrument, and to remove the locking screw in the barrel of the instrument before fitting. Keep the double packing - it will be needed when changing or returning the instrument for servicing.
- (2) Make sure that the main oil chamber is "topped up" to the level of the filler plug, with light torpoil.
- (3) See that the vacuum pump is lubricated in accordance with current instructions. It has to run all day!
- (4) See that you have your full quota of gyro verticals. The life of each is only 300 hours, and overhaul is a maker's job. This means that each one will last a fortnight to three weeks when on continuous watch.

In addition to the Outfit AUH, the stabiliser system on the later (single mirror, combined T and R) set, Outfit AUK uses the same principle of operation, and the same gyro vertical but there are many differences in detail, and the appropriate operating instructions for each outfit should be referred to before any adjustments are made.

(Editor's Note: Aerial outfit AUH has proved to be a great success in large ships and it is under consideration to extend its use to certain small ships which have not sufficient dynamo power to take Type 277 when Type 271 is replaced.)

ERRATA

Bulletin No. 2.

- Page 15, Para. 1. - Scan coils are not reversed when switching from long to short range.
- Para. 2. - Two range scales are provided, 15,000 and 50,000 selected by switch, the mask being rotated 180° to obtain appropriate height line scale in upper 180° of tube.
- Page 44, Para. 2 - for 70° read 7°.
- Page 36, Last para. - Spotting Tube Design 4. For "will now have" read "will not have".