HMS Wear *entering Portsmouth to pay-off in August* 1946. *She has a typical close armament of seven single* 20 *mm Oerlikons, in addition to her two single* 4 *inch* (Wright & Logan).

The 'River' class frigates

FIRST OF TWO ARTICLES

By Peter Hodges

AS the Battle of the Atlantic developed in intensity, it became clear that the existing types of warships engaged in escort duties were suffering from a variety of shortcomings. The 'Flower' class corvettes in their original form were found to be uncomfortable in the prolonged bad weather so prevalent in the North Atlantic, and were not much improved in this respect when a longer-hull version was produced. All did sterling work, but their maximum speed was less than that of a surfaced U-Boat. The escort Sloops were built to full 'warships standards' (ie, with twin turbine engines, a Fire Control system, etc) and although excellent vessels, could not be produced rapidly; while the Escort Destroyers—the 'Hunt' class—were similarly relatively complex and additionally had a restricted range.

Backing up these were the old 'V' and 'W' class destroyers—and an increasing number of the 'between war' destroyer classes—converted to Escort duties, but these, too, had their drawbacks—although again, all performed valiant work. The most useful were probably those 'V' and 'W' class ships converted to Long Range Escorts by the removal of one boiler room to increase oil fuel bunkerage, but these old ships had never been designed for distant ocean work and were really too narrow-gutted for either comfort or efficiency. In any case the extensive alterations involved precluded more than a proportion being fully converted.

Destroyers always paid a heavy penalty in terms of range, for the sake of their high speed, and although they could be refuelled at sea from large warships, the Battle of the Atlantic was a small ship task. Major units, like cruisers and capital ships, did not form part of the convoy escort, except for the very early stages of the war. In consequence, most converted Escort Destroyers could only take a convoy a few hundred miles west of Ireland, and then return—perhaps with an incoming convoy.

To meet the requirements of an escort ship, suitable for long-range deployment, with a weatherly hull and an armament of limited AA but extensive A/S capability, the 'River' class were laid down. In the first instance, they were to be classed as 'Twin-Screw Corvettes', but eventually were called Frigates, thereby re-introducing a name long absent from Naval terminology. To speed and simplify production they were given reciprocating machinery and a gunnery installation which required neither a director nor a predictor.

Their displacement of 1,370 tons equalled that of the pre-war 'I' class destroyers; and though slightly shorter than these, their hulls were both beamier and deeper, making them more stable in bad weather conditions. The main engines developed 5,500 IHP, giving them a theoretical top speed of 20 knots. In practice, 18 knots was a more realistic figure; but in any case this 'sea speed' was quite adequate for the task they had to perform. What they lost on speed they made up for handsomely on operational range.

In these days of a severely depleted Fleet, it is difficult to imagine the size of the Royal Navy during the second world war. Fifty-seven 'River' class frigates were launched in British shipyards alone, as well as 12 in Australia and a further 44 in Canada. Many more Dominion-built ships were cancelled, but the complete order of British-built ships was fulfilled.

The first of the class was launched in November 1941 and the last British-built vessel entered the water in late 1943, although the launching of Dominion-built units continued into 1945. Of all these, only three were lost on the high seas through enemy action, and after the war, a large number were sold both to foreign navies and to the Mercantile Service. The latter fact alone speaks highly for their economy and sea-keeping qualities.

The building of the British ships was carried out by a number of the smaller commercial yards who were well suited to this type of uncomplicated warship, thus freeing the bigger firms for work on larger units. Exceptionally, four vessels were given geared turbines instead of reciprocating engines, but the Dominion-built ships had the standard machinery.

All the British 'River' class complied with their class designation and were named after what were, perhaps, the lesser-known streams in the British Isles. Who, for instance, would guess that *Odzani* was a British river? No doubt names like *Jed, Awe* and *Kale* brought a touch of home to erstwhile bank-clerks who by force of circumstances, found themselves on an open bridge in the bitter wind of winter, North Atlantic. The writer is no student of Commonwealth rivers, but careful examination of the names of some of the ships built abroad seems to indicate that not all were, in fact, named after rivers. Some of them departed from the planned armament layout, too, but the British vessels—with which we will deal in detail—had fairly consistent weaponry.

Post-war, the RN units mostly went for scrap in the mid-1950s, but one or two survived—*Meon*, until quite recently as a support ship for landing craft. One ship—HMS *Plym*—was given the doubtful privilege of being at the Nuclear Test carried out at the Monte Bello Islands in 1952, and here she was completely vapourised—truly a Nuclear-age end for any ship.

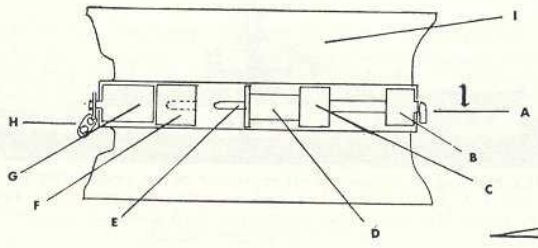
STANDARD EQUIPMENT IN BRITISH-BUILT SHIPS

Gunnery Armament

The 'River' class built in British yards had two single 4 inch HA/LA guns, the forward mounting in 'B' position on a longish extension of the forward superstructure, with a second 4 inch sited aft in 'X' position. The planned armament of ten 20 mm

Continued on page 514

Key to drawings opposite: (1) *Section through quarterdeck*—(a) Depth setting key. (b) Depth setting unit. (c) Diaphragm unit. (d) Firing spring case. (e) Detonator. (f) Primer. (g) Primer 'placer'. (h) Safety fork. (2) *Section through overstern rail*—(a) Inboard extension. (b) Ballast weight for heavy charge. (c) Stop bar. (d) Quarter deck. (3) *D.C. ready to drop*—(a) Resetting lever. (b) Hydraulic cylinder. (c) Piston rod. (d) Link. (e) Actuating lever. (f) Rocking lever. (4) First charge released. When hydraulic pressure was released, the second charge, pushing down on the resetting lever, reset the mechanism. A handle on the shaft of the actuating lever operated the gear in the event of hydraulic failure. (5) *Part side elevation of thrower*—(a) Wire strop. (b) Quick-release toggle. (c) Safety fork. (d) Exhaust port. (e) Explosion chamber. (f) Breech. (g) Firing pin. (h) Buffer liquid reservoir. (i) Carrier piston. (j) Filling plate. (6) *Part end elevation of thrower*—(a) End stop plate. (b) Buffer liquid reservoir. (c) Remote firing cylinder. (d) Buffer cylinder. (e) Striker pull-off link. (f) Local firing handle. (g) Carrier cross-head. (h) Tray. (7) *'Parbuckle' stowage*—(a) Windlass. (b) Stop bar. (c) Ratchet and pawl. (d) Rollers. (e) Thrower tray. (8) *'Parbuckle' principle.* (9) *Ten pattern attack*—(H) Heavy throwers and rail. (L) Light throwers and rail. (Note that range of Heavy thrower was slightly less than that of the Light).



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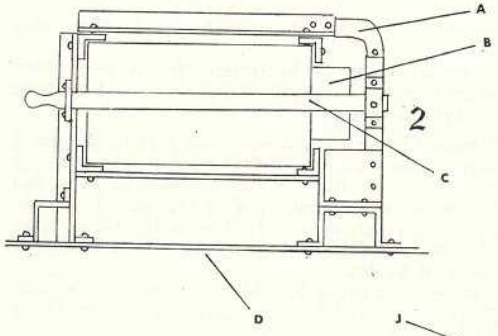

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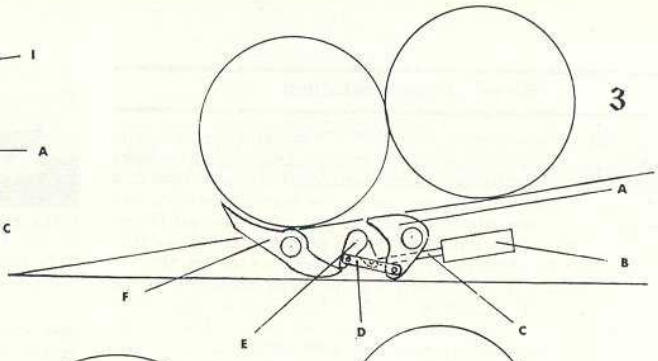

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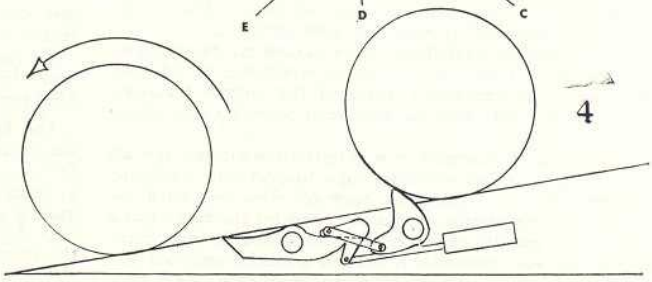

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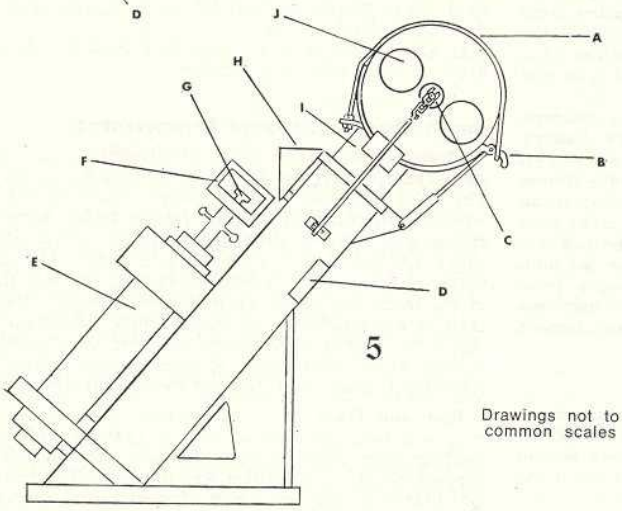

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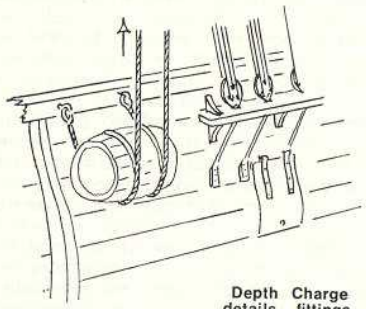
Drawings not to common scales



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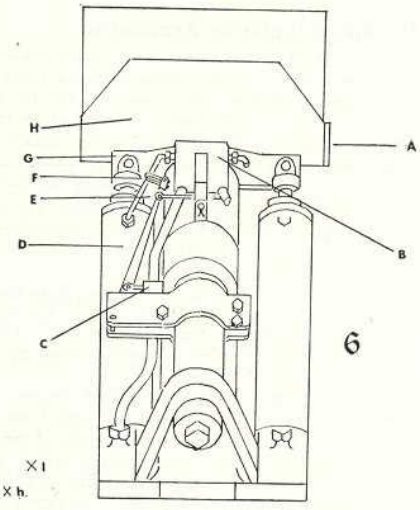
Depth Charge details, fittings, and operations



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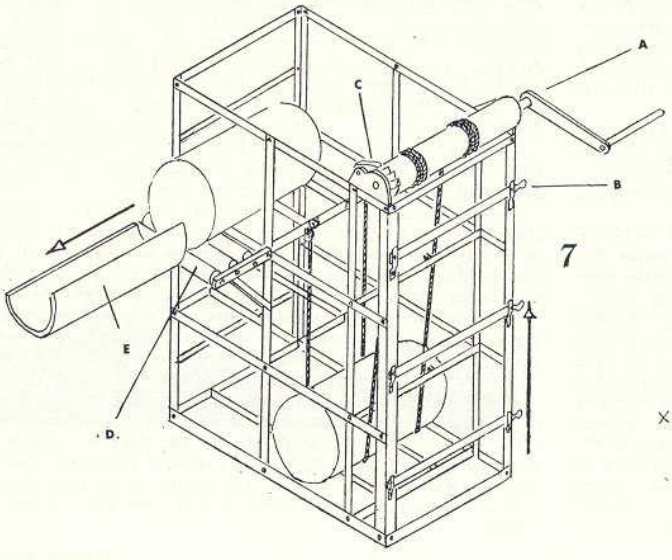

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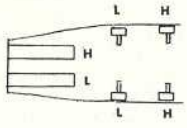

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Oerlikons did not materialise, most vessels mounting at best only eight single guns. As more weapons became available the singles were sometimes doubled up, being replaced by power operated twin Oerlikons; and towards the end of the war a few units had 40 mm Bofors. On the whole, however, their guns were all simple hand-worked affairs which not only eased production and installation in the first instance, but also made maintenance simpler.

Unlike the elderly 4 inch which was mounted elsewhere in the Fleet, both gun and mounting in the 'River' class were comparatively modern in design, despite their simplicity. They were, in fact, specially designed to have that very attribute.

Because they had no real fire control system to direct them, the 4 inch could offer little more than deterrent fire in AA, but were quite capable of engaging U-Boats on the surface, the ships relying on their 20 mm Oerlikon armament to tackle aircraft at close range.

The Oerlikons were mounted in a variety of positions, but all ships had a 'single' on sponsons set high to port and starboard of the bridge superstructure. The sponson was supported by conventional lattice girdering, and a platform (at the more usual sponson position on 'B' gundeck level) extended to the ship's side beneath the gun position. A second gundeck spanned the ship abaft the funnel, between four mercantile-style ventilator cowls. Here, twin Oerlikons (or single 40 mm Bofors) were mounted to port and starboard in some ships, instead of the more usual single Oerlikons. Often there was a centre line Oerlikon abaft this position, super-firing over the after 4 inch and many of the class had an Oerlikon 'bow-chaser'.

To prevent guns from accidently firing into the ship's structure, special arrangements were made on mountings with 'electric firing' to break the circuit when the weapon was aimed into its own ship. On purely hand-worked close-range weapons like the 20 mm Oerlikon, the barrel movement was constrained by a shaped rail which encompassed the mounting at such a radius as to bear about midway along the barrel. By careful design, the rail was arranged to allow the absolute maximum 'sky-arcs' for the individual weapon, at the same time physically preventing it from pointing into the ship's structure. These rails are frequently mistaken as supports for gun-covers, but clearly served a much more important purpose.

The Anti-Submarine Armament

Since the 'River' class were designed for ocean anti-submarine tasks, we may take the opportunity of examining this aspect of the ships' armament. Previous articles in *Airfix Magazine* on second world war warships have fringed on the subject but it has never been dealt with in depth, so to speak.

The Depth Charge: This was the principle A/S missile in use during both World Wars, for although Ahead Throwing Weapons, in the form of the Hedgehog and Squid, saw service in specialised ships in World War 2, the depth charge continued to be the more general device in the Royal Navy for several years after the cessation of hostilities in 1945.

There were three basic types: the Standard depth charge, the Aircraft depth charge and the Slow Sinking depth charge. The first is the type to be discussed; the second was naturally special to its application for air-dropping; and the third was designed for use by Coastal Forces.

The Standard charge consisted of a steel cylinder 18 inches in diameter and 3 ft long, containing about 300 lb of explosive, but its all-up weight was over 400 lb. Several types of explosive were used, including TNT, and charges were 'coded' with narrow coloured bands to show their contents. A hollow tube ran through the axis of the charge, one end containing a removable primer, and the other, a removable 'pistol'. The 'pistol' consisted of a spring-loaded firing pin and detonator, and was operated hydrostatically via a depth setting device incorporating a diaphragm. It would not operate unless the equivalent water pressure corresponding to the depth set was reached. The primer fitted at the opposite end of the axial tube and was he'd away from the pistol by a safety device which was not released until the depth charge was discharged. After release, a spring pushed the primer into engagement with the detonator, and this safety device ensured

HMS Helmsdale *continued to serve for some years after the war as an A/S Trials Ship. She had no gun-armament, but carried twin Squid Mortars on her forward* 4 *inch gundeck, and retained the D/C arrangements aft.*

that the charge would not explode prematurely—or if the ship sank.

On reaching the set depth, the hydrostatically operated 'pistol' fired the detonator; this in turn fired the primer, which itself fired the main explosive charge.

The Deep Depth Charge: There were two reasons governing the introduction of this type. In the first place it was necessary to increase the sinking rate of the Standard depth charge so that a 'layer' effect could be achieved; and in the second, as submarine pressure hull design improved allowing the vessel to go very deep, it became equally important to be able to blast it at the extreme range of its dive.

These facilities were achieved by adding a weight to the standard charge making it about 550 lb all-up, and suitably modifying the 'pistol' depth setting.

It will be seen in due course how both Standard and Heavy depth charges were used together.

Depth Charge Discharge Arrangements

Chutes: The earliest form of dropping gear consisted of a stern chute, which should not be confused with the later 'trap'. The chute held two or three charges, each secured by a double wire lanyard, fitted with a quick release device. Sometimes, similar chutes were fitted to drop depth charges athwart-ships from the ship's side and all these were operated locally. The chute principle persisted through the second world war, but was then restricted in the main to Coastal Forces vessels. Because they were small craft, it was possible to arrange a simple remote operation of the chutes by leading wire cables to levers on the bridge. Coastal Forces often used Slow Sinking charges offensively against opposing E-Boats, and dropped them from wire-operated chutes.

Rails and Traps: Between the wars, the usual overstern dropping gear took the form of a set of rails inclined to a slope and holding three depth charges. Reloads were carried close-by on support chocks and loading was by davit. The rear-most charge was held in position by a pair of curved arms carried on a transverse shaft, and when this was turned—either by a hand lever or remotely through a hydraulic cylinder—the arms dropped, allowing the depth charge to roll off the rails. As the release arms dropped, a second pair one 'step' inboard rose to hold the next charge, so preventing a double drop. Resetting the gear actuated the arms in the reverse sense and the second charge rolled to the overboard position. Sketches show the sequence of operation.

There were several marks of Trap to suit special requirements (for instance, when sweep gear was also fitted on the quarter deck) but the principle remained the same.

The standard set of World War 2 overstern rails held six depth charges. The outboard section—terminating in the trap—held three DCs and was inclined at 10 degrees, and the second section, also holding three, was inclined at 1½ degrees. Removable stop-bars were fitted outboard, inboard and between the two rail sections to prevent the whole outfit of charges from bearing on the trap gear or rolling inboard on to the deck. Frequently, a wooden wedge was knocked between the stop bar and adjacent charge to prevent bumping in a seaway.

Additional sections of 1½ degree rail could be added inboard in multiples of three charges to a total of 18, each with its own stop bar. In many A/S ships, double tier rails were fitted and in this case the trap was on the top level and the lower merely held reloads. Rail loading was by davit and when twin double-tier rails of maximum length were carried they held a total of 72 charges.

Depth Charge Throwers: Up until the middle of the first world war, the chute method was the only means of dropping depth charges, and there was no means of achieving a 'spread' of explosions. The Admiralty asked several commercial companies to investigate this problem, and the bulk of the pioneer work was carried out by Thornycroft's, the famous Southampton destroyer-building firm. From their experiments, the first successful depth charge throwers were evolved and were fitted in quantity throughout the small ships of the Fleet. They were also built under licence by foreign governments, but one country—which shall be nameless— simply copied the Thornycroft design (even to the 'GR' monogram) but studiously avoided royalty payments!

The original thrower—the Mk II—used a 'carrier' consisting of a stalk fitting into the barrel. The carrier terminated in a curved carrier plate to which the charge was lashed, and both carrier and charge were expended together. The carrier idea was thus expensive in material and wasteful in space, so Thornycroft's took up the challenge and came up with a redesigned thrower. This was the Mk IV, and many thousands were made during World War 2. In this mark, the carrier was limited in movement and was not expended.

To reduce the shock of discharge, the cartridge was detonated in an explosion chamber. The cordite gases passed from this into the barrel itself, thrusting the carrier piston outwards as they expanded. Towards the end of its movement the carrier piston allowed the gases to escape from exhaust ports and finally it was brought to rest by a pair of hydraulic buffers. It then ran back to the inboard position by gravity.

The depth charge was secured into the carrier tray by a wire strop with an automatic release; a second strop fixed at one end to the barrel was clipped to the Primer arrangements, keeping them 'safe' until the depth charge was discharged.

Thrower Loading Arrangements: These at first were similar to the re-loads for the early chutes and three-charge rails, but were improved during World War 2. Each thrower then had a stowage rack for six charges carried in two vertical trios. The upper outboard position was in line with the depth charge carrier tray and had a short bridging rail fitted with steel rollers. The depth charge was moved sideways from this position directly on to the tray ready for firing, and the inboard charge in the rack rolled forwards to the top outboard position. To raise the charges up to the top tier, the stowage was provided with a simple windlass which lifted a charge by the 'Parbuckle' principle. This process is more easily described graphically and the sketches should make it clear. In addition to the Parbuckle-gear, each stowage also had its own davit.

Depth Charge Attacks: With the advent of the early throwers the standard attack became the 'Five Pattern', two charges being fired from the throwers and three dropped from the single rail astern to form a roughly cross-shaped spread. During the second world war the complete installation was doubled up—that is to say that ships had four throwers and double rails and traps. The attack became a 'Ten Pattern'—four charges from the throwers and six from the rails. With each thrower stowage topped up and twin 18 charge rails, it follows that there were 60 depth charges on deck—sufficient for six successive 10 pattern attacks—and extra depth charge stowages were often added (by the two tier rails, for example) as well as in other upper deck rail like racks. To achieve a 'layering' effect, one rail (usually the port) and the forward pair of throwers discharged 'Heavies' so that the complete pattern resembled one cross shape of five explosions superimposed upon another.

Notice the prominent minesweeping davits on the quarters of Ness, *and the extensive depth charge stowages. The photograph dates from June* 1950, *when her working days were over.* (P. A. Vicary).

The last 'River' class to be actively employed in the Royal Navy was HMS Meon. *Notice the revised gun armament, exclusively of close-range weapons, and particularly the special Oerlikon sponson above the post-war pendant number. As an HQ ship for landing craft, she had an extensive radio system, and wore the 'Combined Ops' badge on her funnel beneath the 'leaders' band.*

Other patterns were fired to suit the particular installation. An 'Eight Pattern' was used on ships with two rails, but only two throwers, and the 'Seven Pattern' by ships with four throwers and one rail. The 'Five Pattern' was retained for doubtful 'contacts' so as to avoid unnecessary expenditure of DCs. In addition, there was also the 'Creeping Attack' perfected by Captain Walker to plaster deep submarines. This expended some 26 charges and lasted over half a minute. It involved the rapid reloading of the throwers after their first firing and needed much physical effort, team work and good drill from the depth charge crew who numbered over 30.

Pattern Control: This was decided by three factors. The first was the positioning of the throwers in relation to the stern and to each other and was standard for most ships. The second was the automatic firing/dropping interval, achieved by a clock-style mechanism, which in making one revolution, operated electro-hydraulic valves in the firing system. The firing cycle was normally initiated by the Asdic at a predicted time, but this control could be over-ridden by alternative means. In the event of an equipment failure, local firing was carried out by stop watch on the quarterdeck.

Thirdly, the overall spread depended upon the speed of the attacking ship and was tabulated for 15 knots, but could be dropped at anything over 10 knots. The exception was the creeping attack, but this was restricted to very deep attacks, when the damage to one's own ship from the depth charge explosions was minimal.

The throwers were set at a fixed elevation of 50 degrees and were angled slightly astern of the beam. In some small ships, where quarterdeck space was at a premium—the 'Hunt' class for example—the forward pair of throwers was sometimes sited towards the waist, in which case they were angled further astern so as to produce the same dropping pattern.

The Asdic instruments which formed the Anti-Submarine 'predictor' were often housed in a small A/S 'House' in the rear of the bridge under the close scrutiny of the Torpedo Officer. He was the professional expert in all matters relating to Torpedo, A/S and mine warfare, and was the Captain's right-hand man in this respect.

Ahead Throwing Weapons

The great drawback of the depth charge attack lay in the fact that the surface ship had, of necessity, to pass over the target before releasing her charges. This had the double effect of, firstly, enabling the U-Boat Commander to make rapid last minute alterations of course and depth, and secondly of making it very likely that Asdic 'contact' would be lost.

These problems were, of course, well realised; and development began on a weapon which would fire ahead of the attacking ship. Several schemes were tried, but finally the back-room boys came up with the Hedgehog. This was a spigot mortar—implying that instead of fitting *into* a barrel, the bomb fitted *over* a spigot. Twenty-four such spigots were carried on girders in four longitudinal rows of six. The girders were slung in fore-and-aft trunnions and were connected by a link bar, allowing a tilt up to about 45 degrees each side of upright. This enabled the weapon to be compensated for ship-roll, and also provided a small deflection, or 'aim-off' facility.

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'River' Class—from page 515

In the 'River' class it was mounted on what would otherwise have been 'A' gun position and a weather and splinter-proof shield was fitted abaft the mounting carrying circuit switches, a training receiving and a training handwheel. The input pointer on the training receiver moved for a combination of ship roll and deflection (or 'aim-off'), and the mounting trainer, in matching pointers, tilted the mounting accordingly. Normally, the ship was steered on the correct attack course to keep the deflection angle to a miniuum because aim-off tended to distort the pattern of the bomb trajectory. In the final development of the mounting, the training and drive arrangements were adapted for Remote Power Control and were then fully automatic.

The Hedgehog crew was eight, which included three loading numbers, and in the 'Rivers' a sloping canopy projecting downwards from the forward 4 inch gundeck gave them protection from the weather. Large ready-use ammunition lockers flanked this area in which at least two complete salvoes could be stowed.

Among the cluster of indicator and repeat instruments on the bridge was a Master three-position switch. Its central position was 'off' each side of which was a position either for Hedgehog or Depth Charge. This selected the firing and control circuits for the particular form of engagement, because whereas the ten pattern D/C attack was carried out at comparatively high speed, the Ahead Attack was a creeping affair.

The natural successor to the Hedgehog bomb and Depth Charge was the Squid Bomb, which was fired by an ahead throwing weapon but had a preset depth fuse and the destruction power of a depth charge. However, the Squid, as a weapon, was only fitted in HMS *Helmsdale*, and as this was for post-war development, it is really out of context in the present article. It did appear in other classes, however, before the end of the war.

H/F Direction Finding Aerials

Although not a weapon in the true sense of the word, the H/F-D/F can be included here, because of its importance as a submarine detection device.

Once merchant ships had been sighted by a patrolling U-Boat, it usually surfaced to shadow the convoy and communicated by H/F radio with other submarines in the area as well as to U-Boat HQ ashore. In this way the Wolf Pack mustered its forces.

Unknown to the enemy, however, the H/F-D/F set had been developed, and while it could not on its own pinpoint a U-Boat on the surface by picking up her radio signals, two escorts so equipped and operating in unison were able to do so (by a cross-bearing 'fix'), thereby giving all in company advance warning of an impending assault.

Those escorts with a 'sprint speed'—like the 'Hunt' class and the converted escort destroyers—were also able to deliver attacks ahead of the convoy by this means, frequently catching unwary submarines on the surface.

Hull and Superstructure Features

All 'River' class ships had a tripod foremast, crossed by a single yard with a conventional look-out position arranged at the intersection of the tripod 'legs'. A diminutive main mast rose from the athwartships Oerlikon gundeck, and had a small yard and monkey-gaff for the ensign.

There was no Fire Control Director on the bridge, but instead, a Surface Warning Radar, mounted on a lattice pylon. The early 'lantern' was the most usual fitting, but later units had the more versatile Type 277 (similar to part 29 in the Airfix *Devonshire* kit). This could elevate as well as train, and therefore could also serve as an Air Warning. Otherwise a separate Air Warning Aerial was mounted on the fore topmast.

Amidships, the boats were contained in radial davits pivoting in brackets extending from the ship's side. There was sufficient space to allow the davits to be stowed more or less fore-and-aft rather than directly inboard, allowing for reasonably rapid lowering of the boats. A 27 ft whaler was carried to port, balanced by a 25 ft motorboat to starboard with a dinghy immediately abaft it.

The quarterdeck area was mostly taken up by the long depth charge rails leading to the stern traps, and four depth charge throwers with their associated ready use stowages. Some 20 ships were fitted for mine-sweeping duties, and had heavy-duty davits for the sweep paravanes on the extremity of each quarter. They were never, in fact, used in a minesweeping role—indeed, many minesweepers were used as escorts—and a few of the 'Rivers' had extra depth charge throwers in addition to the standard four.

So much, then, for the 'River' class frigates and their equipment. The second part of this article will detail the construction of an example of these fine little ships, using a modified Airfix 'Hotspur' hull.