

# THE DEVELOPMENT OF DESTROYER MAIN ARMAMENT 1941 TO 1945

BY

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## PART I

At the outbreak of the Second World War, most of our destroyers were fitted with 4·7-in. guns on a variety of low angle mountings, varying from the 4·7-in. C.P. VI fitted in the 'V' and 'W' Class of 1918 vintage, to the 4·7-in. Mark XIX Twin fitted in the recently completed 'Tribal' Classes.

All these weapons, none of which had an elevation of over 40°, were designed around the 4·7-in. shell, which weighed 50 lb and had been the standard shell since the days of Ladysmith, where the 4·7-in. naval guns landed from the Fleet had performed such execution.

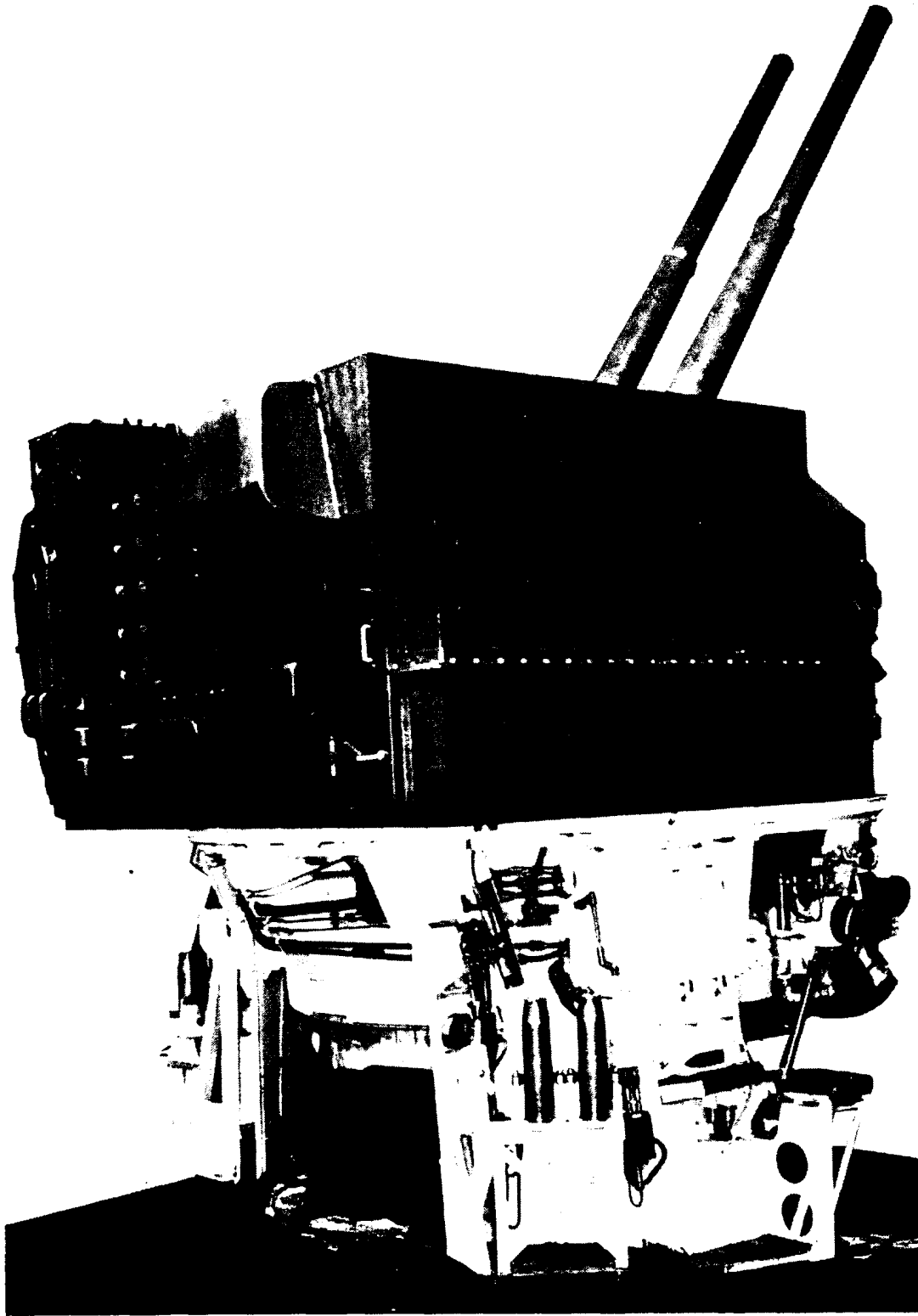
The earlier 4·7-in. guns were of the B.L. type using a screw breech and a bagged cartridge, but when in about 1925 it was decided, mainly to improve the rate of fire, and from safety considerations, to change to the Q.F. type of gun using brass-cased separate-loading charges, the gun was designed, once again, to use the same old 50-lb shell.

The same applied again in the case of the 4·7-in. Mark XIX Mounting, where the guns (left and right handed) were designed once more to use the same ammunition. It was not until 1936, when the design was first considered for the heavy twin mountings for the 'L' and 'M' Class destroyers that using an entirely new shell was contemplated. The 4·7-in. Mark XI gun was designed, and with it the new 62-lb shell. Even these mountings had an elevation of only 50°, but this was found to necessitate a totally enclosed mounting with 'built-in' ammunition hoists, and the relatively staggering all-up weight of 34 tons; and it should be noted that these mountings only had power training, the elevation control of the individual guns being still by hand. (This was modified later, as a result of war experience, to power elevating.)

On account of their heavy cost, and the size and complexity of the ships, only a limited number were built. Although they were considered excellent L.A. mountings and proved particularly effective for bombardment, they were not otherwise liked on account of their very poor A.A. performance.

When plans were being made shortly before the outbreak of war for the production of large numbers of 'War Emergency Programme' destroyers, it was decided that a return to relative simplicity was essential. As a result the design of the 4·7-in. Mark XXII was developed, once again using the old 4·7-in. Q.F. gun and the 50-lb shell, but with the gun elevation increased to 55°.

Owing to the increased elevation, some form of power-ramming gear was considered essential, and it was fortunate that in 1941 Messrs Vickers-Armstrongs Ltd., Barrow had developed a spring-operated rammer for the 4·5-in. Single H.A. Mounting originally designed for Admiralty but subsequently adopted by the War Office. A trial at Eskmeals convinced Admiralty officers of its efficacy and the design was forthwith adapted to suit the 4·7-in. Mark XXII Mounting, and was 'proved' by a further trial at Eskmeals on the first of these mountings to complete.



4.5-IN. R.P. 10 MARK IV MOUNTING REG. NO. 1, WITH GUNS AT 70° ELEVATION

It will be interesting at this point to follow up the differences between the single 4·7-in. equipments, particularly with a view to noting the effect of the increase in elevation on weight. This is shown in the accompanying table.

Date	Nature of Equipment	Gun and Ammunition	Elevation	Weight
1918	4·7-in. C.P. VI and VI* ...	B.L./S.L.	30°	Tons 7·9
1927	4·7-in. C.P. XIV ... ..	Q.F./S.L.	30°	9·6
1931	4·7-in. C.P. XVII ... ..	Q.F./S.L.	30°/40°	9·6
1935	4·7-in. C.P. XVIII ... ..	Q.F./S.L.	40°	10·6
1939	4·7-in. C.P. XXII ... ..	Q.F./S.L.	55°	13·3

This then was the position in 1940 when, as a result of Dunkirk and the Norwegian campaign, it became increasingly apparent that destroyers without an effective A.A. armament were doomed if they had to work close inshore, or within range of enemy air bases. This was largely due, of course, to the destroyers' changed functions, from the pre-war accepted role to that of a 'convoy escort'.

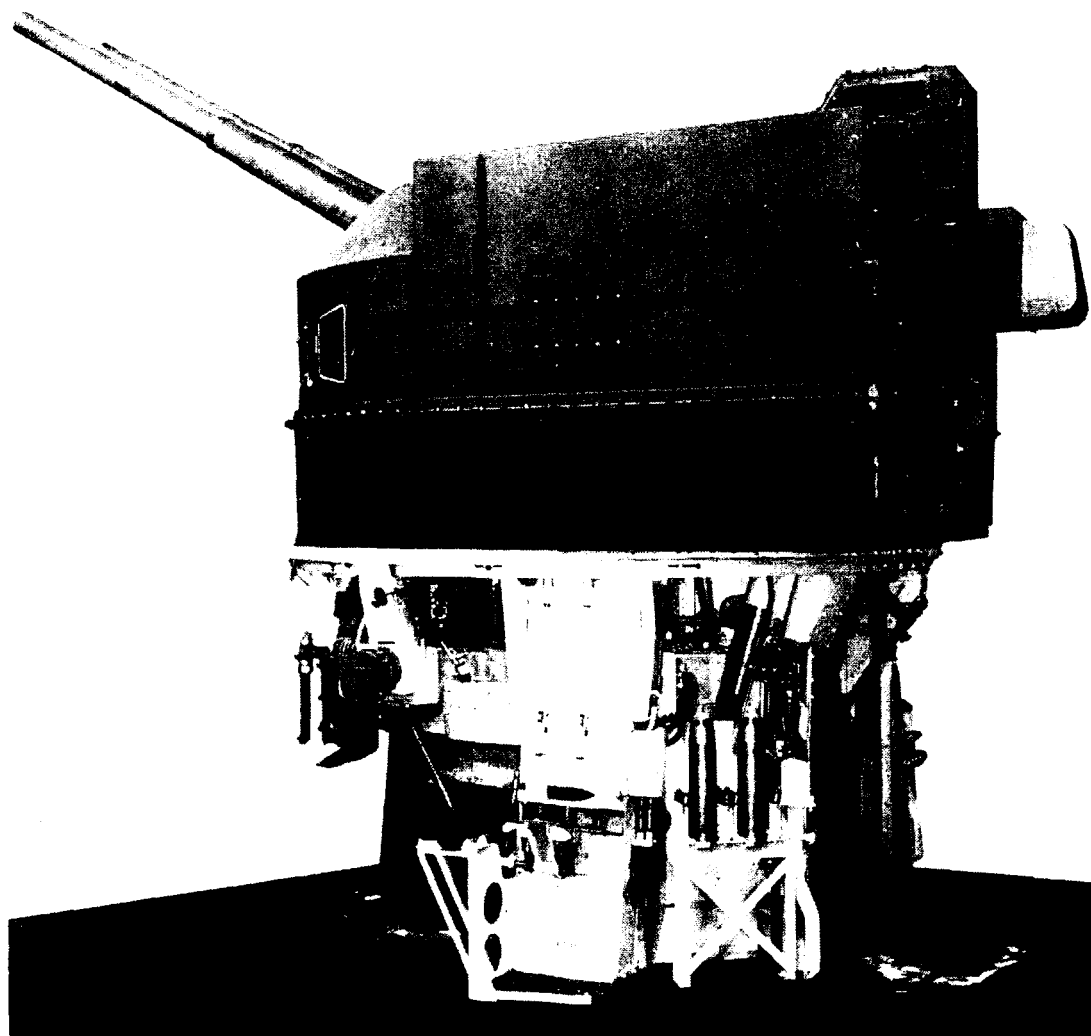
Early in 1941, after considerable discussion, the Naval Staff asked D.N.O. to investigate, as a matter of urgency, exactly what would be the 'cost' to be paid for installing fully H.A. mountings in destroyers; the assumption being that these would mount the 4·7-in. Mark XII gun (as in the 'Tribals') firing the same old 50-lb shell—though as an alternative the Mark XI (62-lb) gun was also to be considered. This investigation began in July 1941.

Out of this requirement arose a tentative sketch design, known to its intimates as the '4·6-in. bastard', which was based on the 4·5-in. Mark II Mounting with a 4·7-in. Mark XIX cradle. This proved to have many associated difficulties, not the least of which was the impossibility of combining the traditional destroyer long-recoil cradle with the equally traditional short-recoil heavy ship mounting.

A small digression should perhaps be made here to explain the true inwardness of the last sentence. In the design of gun mountings for destroyers, which were traditionally lightly-built ships, efforts had always been made, by using very long recoil lengths, to reduce as far as possible the deck-blows on the structure supporting the mounting. (The recoil length of the 4·7-in. Mark XIX Mounting was 26·5 in.) On account of their greater strength, this requirement never applied to the mountings designed for larger ships, and in the case of a high-angle mounting, from trunnion height considerations, which considerably affect the ease of loading at all elevations, the recoil length was normally kept as short as possible. (The recoil length of the 4·5-in. Mark II was 18 in.)

It soon became obvious that the 4·6-in. bastard would virtually involve a completely new design of mounting, in which little or no advantage could be taken of existing design work. Thus D.N.O. came to the firm conclusion that the only answer would be to accept the 4·5-in. gun as the new standard destroyer gun in lieu of the 4·7-in. which had survived for so many years.

It must be appreciated that the 4·5-in. gun had only been developed in about 1935 as a new anti-aircraft weapon, principally because it was then considered that it was the largest calibre for which 'handleable' fixed ammunition could be produced. (The overall weight of round was 85 lb on a length of 50 in.)



4·5-IN. R.P. 10 MARK IV MOUNTING REG. NO. 1, SHOWING CORDITE HAND-UP, SHELL AND CORDITE LOADING POSITIONS, LOOK-OUT HOOD, VENTILATION INLET AND OUTLET

Ballistically the 4·5-in. shell, weighing 55 lb, was much better than the old 4·7-in. 50-lb shell, and this was brought in as an additional argument in favour of the change. The strongest argument that was produced against the change was the fact that enormous stocks of 4·7-in. ammunition were already available, with a world-wide distribution, and in war-time it was felt that there might be considerable difficulty in building up stocks of 4·5-in. ammunition to a similar extent.

It was finally decided, however, that the arguments in favour of the change to 4·5-in. outweighed those against, and as a result, on 26th February 1942, the decision was taken to go ahead with a 4·5-in. Twin H.A. destroyer mounting, based on the 4·5-in. Mark II, which was eventually to become the 4·5-in. Mark IV.

It was essential to produce a 'pilot' mounting as rapidly as possible and get it to sea in a ship for evaluation. It was finally decided, in consultation with Vickers-Armstrongs, Barrow, and D.N.C. that the pilot mounting should be fitted in H.M.S. *Savage*, then building at Hawthorn, Leslie's, in lieu of the normal two 4·7-in. Mark XXII that she should have had forward. At the same

time, and as a logical corollary to the above decision, and to avoid *Savage* having a 'mixed armament', it was decided to convert a couple of 4·7-in. Mark XXII to take 4·5-in. guns (these being the pilot 4·5-in. Mark V Mountings).

It may be thought that this was a classic case of 'changing horses in mid-stream', but it is considered, in retrospect, that it all worked out very satisfactorily and D.N.O. can feel that the change was justified.

We were greatly helped by the fact that there was a partly completed 4·5-in. Mark II Mounting (spare for H.M.S. *Illustrious*) available at Barrow at the time, and it was in just about the right state of completion to enable the modifications to be incorporated (and they were fairly considerable) without having to unbuild much of it.

The first decision which had to be taken was to incorporate R.P.C. in this mounting from its inception (this gave considerable help in the problem of incorporating it in the later 4·5-in. Mark II Mountings for the carriers too) and it thus became virtually the first British naval gun mounting designed with R.P.C.

The second, and perhaps even more far-reaching decision required was whether to use fixed or separate-loading Q.F. ammunition, it being appreciated that at this time there was no 'separate' 4·5-in. ammunition at all. However, experience at sea in H.M.S. *Scylla* and *Charybdis* (armed with 4·5-in. Mark III) showed that even in these 5,000-ton ships handling of 4·5-in. fixed ammunition was difficult in bad weather, and it was finally decided to adopt separate ammunition for the destroyers.

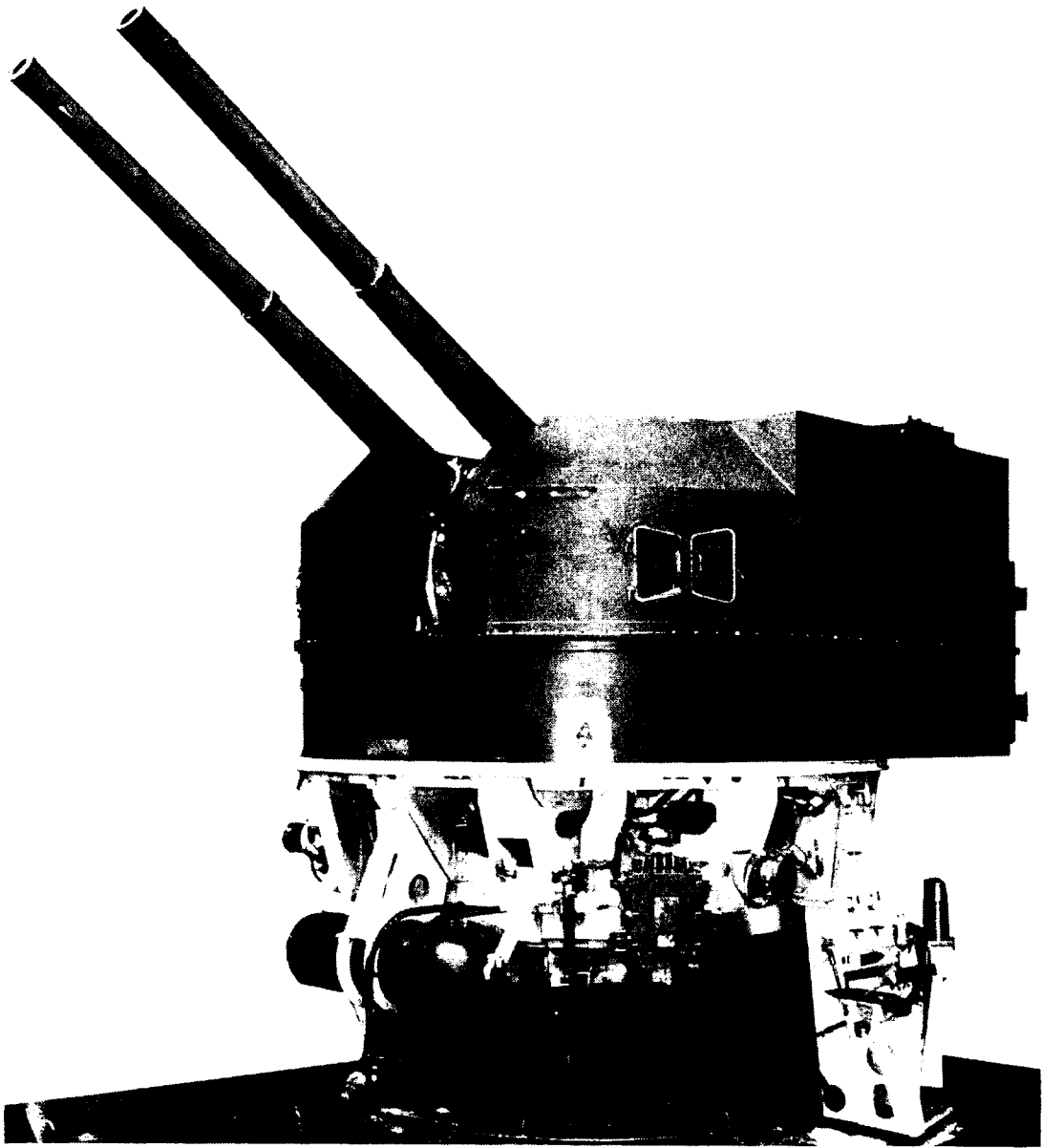
A wooden mock-up was therefore constructed at Barrow in October 1941, based on the lower part of the 4·5-in. Mark II Mounting, but with the whole mounting brought further up through the deck, so as to provide greater depression and a more weatherly mounting, and incorporating short shell-hoists and cordite hand-ups (later converted to hoists) to bring the ammunition from the gun bay (as it was called henceforth, as in the carriers) to the gun house.

This mock-up was inspected several times, and finally on 23rd March 1942 a decision was taken to 'go ahead' on the detail design. The time remaining now was very short as *Savage* was due to complete in April 1943, and the mounting had to be designed, built and put through shop trials in this period. In fact the ship was very slightly delayed.

Also, as a result of staff requirements, it was decided to incorporate a means of locally controlling the mounting in A.A. barrage fire, and for this the armour-plate glass look-out hood had to be designed, built and proved, and a local joystick control developed to provide one-man control of both training and elevation motions, from the look-out position.

There were many other difficulties to overcome, not the least being that of adequate and satisfactory ventilation and extraction of fumes from the empty cartridge compartment. This had proved, in the somewhat similar arrangement in the 5·25-in. Mark I Mounting, to be capable of disabling the crew if not adequately catered for.

All these developments, many of which were applicable to some extent to other mountings as well, went on in parallel at the same time as the detail design and manufacture of the mounting were proceeding. Thanks to enormous enthusiasm and a considerable amount of hard work on the part of all concerned, the mounting was finally ready, though short of a few of its more luxurious accessories (e.g. window-wiping gear for the look-out hood) in time to be fitted in *Savage*.



4·5-IN. R.P. 10 MARK IV MOUNTING REG. NO. 1, SHOWING SHELL-HOIST LOADING POSITION

At the same time the two 4·5-in. singles were also being designed and built, again in this case, two partly completed 4·7-in. Mark XXII having been taken off the production line and converted. At this time the major effects of the loss of Far East tin production was being seriously felt, and opportunity was taken to incorporate in both the 4·5-in. Mark IV Twin and the 4·5-in. Mark V Singles, the war-time economy standards where steel was substituted wherever possible for brass and bronze. Another departure from tradition was introduced in these mountings in the utilization of fabrications in lieu of steel castings for a large number of items such as reduction gear boxes, balance weights and the like, mainly with a view to reduction of unnecessary weight, and partly with a view to overcoming the bottleneck in the supply of good quality steel castings.

It would perhaps be expecting too much to assume that these mountings in *Savage* met with immediate success. In fact, the ship seems to have had relatively few opportunities to use them in anger during the remainder of the war ; but the reports that were received were sufficiently encouraging for D.N.O. to feel justified in putting both the 4·5-in. Mark IV and 4·5-in. Mark V into production for the ' Battle ' Classes and the ' Z ' and later Classes of ' Intermediate ' Fleet Destroyers respectively. The 4·5-in. Mark V was subsequently modified to incorporate metadyne R.P.C. and joystick local control with a look-out hood.

It must be appreciated that the 4·5-in. Mark IV Mounting was a compromise designed to produce a quick and reasonably adequate solution to a very urgent problem. It was in no sense a ' new design ', but was merely intended to be the best possible ' interim solution '. It should be borne in mind that the development period of a mounting of this type, under normal conditions, would have been three to four years before any production mountings were put in hand. When it is remembered that R.P.C. was being incorporated as well, this period might well have been longer. Admittedly the R.P. 10 (electro-hydraulic system) experiments were started on the 2-pdr. Mark VI Mounting in 1940 and on the 5·25-in. Mark II in 1941, and all the lessons learned were incorporated in the 4·5-in. Mark IV. Nevertheless, the whole design represented a very considerable ' step in the dark ', and if its present performance is not as good as could be wished, it is very difficult to apportion much blame to those involved in the design and development.

The illustrations in this article show the pilot 4·5-in. Mark IV Mounting as fitted in H.M.S. *Savage*. Differences between this and the later mountings will be appreciated by those who have served in ' Battle ' Class.