Profile Warship 33

German Battlecruisers

SCHARNHORST and GNEISENAU

by Paul Schmalenbach
Fregattenkapitän a.D.

50p/$2·00

Editorially Speaking

Known to their grudging admirers in the RN as 'Salmon & Gluckstein', the battlecruisers *Scharnhorst* and *Gneisenau* are long overdue for the Profile treatment. They were skilfully handled in the early days of World War II, both as raiders in the Atlantic and as battle units in the Norwegian campaign. Even when they were bottled up in Brest they eventually extricated themselves by their dash up the Channel in 1942, but thereafter the luck seemed to run out.

We were especially wary about the artwork for these beautiful ships, and assumed that they are so well-known that *everybody* would be able to spot any errors in light AA and rig. Imagine our consternation when four well-known authorities (three of them German) failed to agree on the positions of *Scharnhorst's* 2cm guns. Fortunately we had official drawings of her in her original condition and located contemporary documents which listed her armament in 1941-2. This material, with the invaluable help of Dr Rohwer, Director of the Bibliothek für Zeitgeschichte in Stuttgart, enabled us to proceed with some confidence.

The date chosen for the artwork, July 1941, may seem an arbitrary choice, but it was dictated by the need to choose a period in which we could be equally certain about the close-range armament and the colour-scheme. The result may surprise some people, but I can assure readers that the team has done a lot of homework. Photographic evidence for details of the catapult substructure is incomplete, so we can only say that we have been as accurate as we can. As usual we welcome any fresh information from readers who are in a position to help.

The Author

Paul Schmalenbach has been an avid collector of naval photographs since 1924, and entered the German Navy in 1928. As a midshipman he joined the light cruiser *Leipzig* in 1931 and served in the *Emden* and *Deutschland* as well as spending time in coastal artillery. From August 1940 to April 1943 he was the gunnery officer of the *Prinz Eugen,* and although he retired at the end of the War, he found himself back in uniform in 1956. He retired from the Bundesmarine in 1965 with the rank of Fregattenkapitän, and has written Profiles of the *Prinz Eugen* and *Bismarck.*

Stop Press

There are no prizes for spotting an inconsistency in the artwork of *Yamato* in Profile No 30. The text lists the light AA as totalling 29 triple 25mm mountings, but 31 are shown on the plan view. The extra pair are not shown on the profile view, which is correct. Information is lacking about the exact location of the open 25mm mountings on the after superstructure at that time, but only two were carried, the others being on the upper deck.

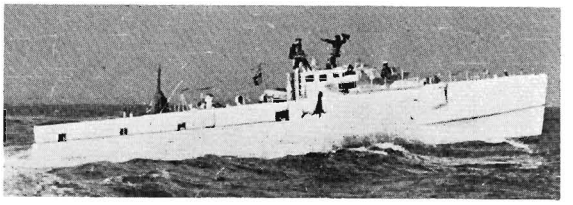
As promised we are willing to print extracts from readers' letters :

I would like to make the following comments on your excellent Warship Profile No 18—*Bismarck:*

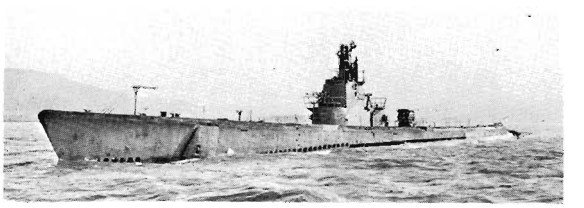
1. The two-colour bands mentioned on p. 136 were surely identification markings in contrasting colours to ensure visibility under all normal light conditions. I also found out from Admiralty records recently that *Bismarck's* turret-tops were painted yellow for her last sortie.
2. All eyewitness accounts say that the *Hood* was hit on the boat deck, not on the stern (p 140).
3. The Swordfish from *Victorious* made only one attack, and the nine aircraft were unescorted. They therefore only launched nine torpedoes against *Bismarck.* The consequences of that one hit were an increase in the amount of water taken on board and a crucial contamination of oil fuel as a result of her violent evasive action (p 140).
4. This may have been the first German use of radar control, although *Graf Spee* is claimed to have fired on *Ajax* and *Achilles* with radar control in 1939, but *Hood* and *Prince of Wales* had been taking ranges from their 284 and 281 sets the day before (p 142).
5. No major British warship was damaged by German gunfire after the last hit on *Prince of Wales* on 24 May, according to all Admiralty records consulted (p 143).
6. According to Warship Profile No 8—*U.107,* the supply ships were sunk in June 1941 as a result of British interception of W/T traffic and cryptanalysis, not 'betrayal' by as yet unidentified fifth columnists (p 143).
7. Surely the Luftwaffe was more involved in the *Bismarck* operation than it was when the *Scharnhorst* was sunk ? The sinking of the *Mashona* at such a distance by a Ju88 was a considerable feat, and the threat of air attack severely curtailed the Home Fleet's movements (p 144).

A. T. Tappman, London

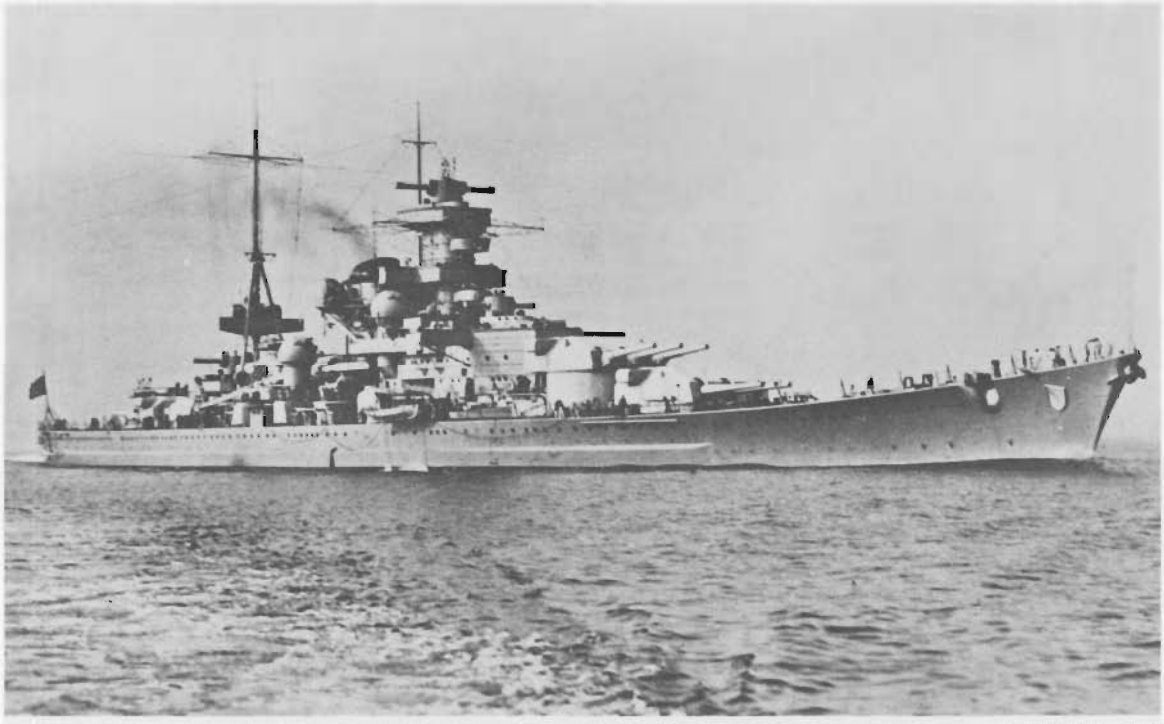
Editor: *Thank you for raising a number of interesting points for readers to ponder. I will only stick my neck out on your point No 5: as far as I know, the story of* Rodney's *damage stemmed solely from American newspaper reports. One must remember that the US newspapers were starved of 'hot' war-news, and when the* Rodney *went to an East Coast navy yard immediately after the* Bismarck *action to have her long-overdue refit, it was immediately assumed that she was having emergency repairs. The only damage reported was the temporary jamming of her starboard torpedo-tube door after a straddle by* Bismarck, *but this is not listed in the exhaustive returns of damage repairs to HM Ships.*



Your next Warship Profiles
No 31 Schnellboote/ E-Boats



No 34 Gato Class Submarine USS Barb (SS.220)



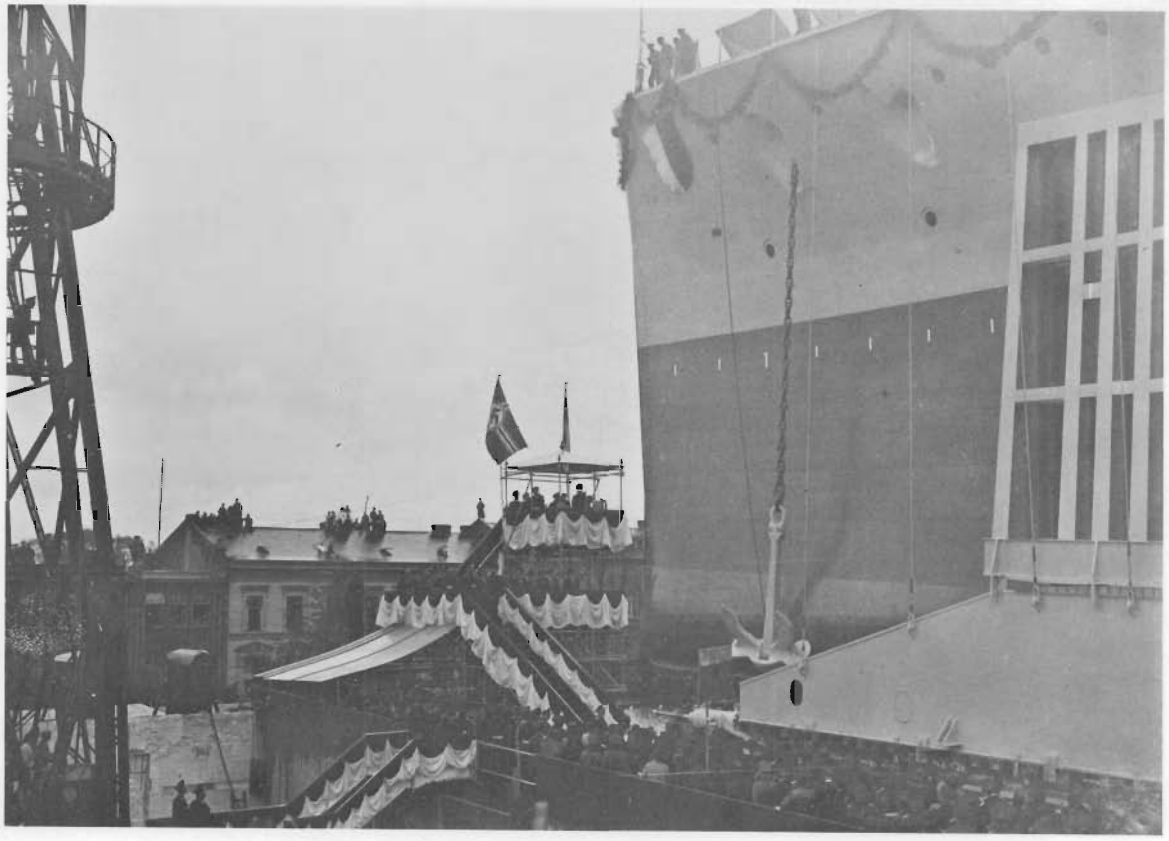
A bow quarter-view of Scharnhorst *after the alteration of her bow, the addition of a funnel cap and the main mast shifted aft. Note the ship's badge which was carried on the bow in peacetime, and the additional stem anchor*
(Author's Collection)

German Battlecruisers *Scharnhorst and Gneisenau*

by Paul Schmalenbach (Fregattenkapitän a.D.)

The Treaty of Versailles allowed Germany to have eight battleships of the *Braunschweig*- and *Deutschland*-Class, which had been commissioned during the years 1904-1908. No more than six of these ships could be in service at one time. with the remaining two in material reserve. New ships built as replacements were limited to a maximum of 10,000 tons. Underwater torpedo tubes were forbidden for all other ships including these new ones. The German Admiralty had given much thought to the possibility of building a ship that would be within the prescribed limits on the one hand, while on the other suiting their own requirements. For a long time the preference was for a Monitor-type ship, similar to the Swedish armoured coast defence ships. Then to meet the political change, a high-seas vessel was developed which, in the event of hostilities with France, could cause considerable disruption to the transport of army forces from Africa to France and so delay any build-up on the German western front. The decision was taken in 1928 and confirmed that initially three ships would be constructed with diesel propulsion and six 28cm guns in two triple turrets. With the exception of the British battlecruisers, the ships would be faster than any warship that was more powerful, and more powerful than any that was faster. The decision led to the building of the *Deutschland, Admiral Scheer* and *Admiral Graf Spee,* the so-called pocket-battleships. (See also : Warship Profile No 4 *Admiral Graf Spee*). At the same time the contract was placed with Friedrich Krupp, A.G., Essen, for the 28cm triple-turrets for a total of five such ships, i.e. ten turrets. Contracts for the remaining two ships were to be placed in 1936 or 1937. By ordering all ten turrets together, the cost of each individual turret was considerably reduced. Completion dates had been laid down in the 'reconstruction plan' of November 1932, which also envisaged a sixth ship.

At this time, the end of 1932, the German Admiralty was already aware that the pocket-battleships would not long remain more powerful than the faster ships and faster than those more powerful. Not only Great Britain and Japan, but also France, were then strengthening their fleets within the framework of international agreements. In December 1932 the keel was laid of the battleship *Dunkerque,* followed a



1

2

3

1 *Launch of the* Scharnhorst *at the Reichsmarinewerft Wilhelmshaven* (Author's Collection)

2 *Quarter view of* Scharnhorst *as completed, with original funnel and mast and two catapults* (Author's Collection)

3 Scharnhorst *at sea as she appeared in 1940-41. Note that her fire control has been altered and she has radar aerials on both forward and after controls. She now carries a quadruple 2cm anti-aircraft gun on her foremost 15cm turrets* (Author's Collection)

Scharnhorst *in dock at Brest as she appeared in July 1941* (Author's Collection)

year later by the *Strasbourg*. These ships were to have a maximum displacement of 35,500 tons and two 33cm quadruple turrets. The speed was given as 29·5 knots.

If the three pocket-battleships due to be built subsequently were not to be hopelessly inferior to the new French ships right from the outset, then the only way out for the German Admiralty was to find some way round the Versailles Treaty or to have it annulled altogether. Consequently in 1933, the Head of the German Navy, Admiral Raeder, proposed to the Reichs Chancellor, Adolf Hitler, that the starting date for the fourth pocket-battleship should be brought forward by two years to 1934, that the ship's armour should be strengthened considerably and provision made for the inclusion of a third 28cm turret. Hitler agreed except in regard to the third turret, which would increase the displacement to about 19,000 tons. However he accepted that in the planning of the ship, allowance should be made for a subsequent conversion and the possible inclusion of a third turret. The same applied for the building of the fifth pocket-battleship, which would now be started in 1935 instead of 1937, as originally intended. The 19,000 tons approved by Hitler for the fourth and fifth pocket-battleships was not a random figure. It was based on the plans of a battlecruiser that had been under examination from about 1928. The result was a ship with four screws, driven by turbines with 160,000shp, giving a speed of 34 knots. The armour was similar in thickness and area to that customary for battlecruisers.

Of course the casemate with the secondary armament in individual mountings was done away with, for the secondary armament now consisted of nine 15cm guns in triple-turrets (as for the light cruisers from *Königsberg* onwards). The main armament comprised eight 30·5cm guns, calibre length 55, in four twin-turrets—two forward and two aft. Four 8·8cm A/A guns completed the gun armament. There were no plans to include torpedoes. Viewed in retrospect, the speed appears too great and the armour too weak. But in evaluating this preliminary drawing of the 19,192-ton ship, one should consider the prevailing strategical situation with the relentless pressure exerted by France through her overseas army reserves. The German Admiralty knew very well how to impress the Government of the unknown factors inherent in this sketch design and thereby gain Hitler's approval to increase the displacement to 26,000 tons[1]. Additional demands by the navy ultimately resulted in a standard displacement of 34,841 tons and a maximum displacement of 38,900 tons. Three factors were decisive in determining the size of the ship:

1 The third heavy gun turret and the gun calibre
2 strength and area of the armour
3 the power installation and the radius of action.

Third turret and gun calibre

The choice lay between the 28cm triple turret and a 38cm twin turret, the plans for which had been started in 1934. To a certain extent the Navy and Krupp were able to utilize data for the 38cm twin turret which had seen front-line service in *Baden* and *Bayern* from 1916 to the end of the war. Admittedly since then there had been considerable technological progress, not least due to experience with the 28cm triple turret. But in spite of this, the 38cm turret would have to be constructed from scratch. The earliest delivery date for the first turret would have been 1938/39. Measurements and weights for the essential parts were certainly available earlier but still not soon enough to prevent an unacceptable postponement in the design drawings of the fourth and fifth pocket-battleships. Consequently the only course left open was to continue with the four 28cm triple turrets already building, and confirm the order for two more (turrets) for the new ships. In fact it was not so much a case of making a decision as making the most of the situation.

While considering the main armament, the secondary armament also requires examination. The first three pocket-battleships had four 15cm single mountings on each side. Consequently a further 16 single mountings had been ordered from Rheinmetall at Düsseldorf for the fourth and fifth pocket-battleships. These guns were nearing completion, when the decision was taken to build the large ships. In the course of the tests regarding the positioning of the secondary armament it had to be confirmed that because of the essential substructure. 15cm turrets could not be installed near the boiler-rooms. On the other hand it would be possible to fit 15cm single mountings, whose cylindrical supports did not

[1]The German Admiralty was thus responsible for the original concept of a 'treaty-breaking' design, although the final responsibility lay with Hitler. (Ed).

need to go deeper than one deck. The obvious thing to do therefore was to plan for fitting the spare 15cm single mountings as far as was possible in the new ships. These mountings did not by any means meet the dictates of war experience, for they provided little protection for the gun crews, and indeed none at all against splinters from behind. Nevertheless this drawback had to be accepted, since it would otherwise have been impossible to instal six 15cm guns on each side.

In the same context it is worth noting that the anti-aircraft defensive strength was increased, in as much as the design drawings provided for seven 10·5cm twin mountings, directed from four stabilized fire-control positions. This increase was undoubtedly a consequence of the knowledge which Germany

Icing on the weather deck and superstructure was a severe problem for Scharnhorst *when she operated in the Arctic in 1942-3* and below *a quarter-view of* Scharnhorst *in 1943. Note that she is wearing what appears to be an overall light grey colour-scheme* (Author's Collection)

After launching the hull of Gneisenau *went out of control and the stern collided with the quayside. Workmen are seen here inspecting the damage to the stern, but damage to the quay is more evident!* (Author's Collection)

was now in a position to acquire with the assistance of her own Luftwaffe. The two ships, replacements for *Elsass* and *Hessen,* were ordered on 14 February 1934. But owing to the increase in size and the consequent need to modify the constructional drawings, the keels were not laid down until May and March 1935 respectively.

At the beginning of 1935 discussions were held with Krupp as to the possibility of replacing the 28cm triple turrets at a later date with the 38cm twin-turrets then being designed. Krupp naturally replied in the affirmative, yet this problem was not examined in more detail until 1942, when a decision had to be taken whether to modify the seriously damaged fore-part of *Gneisenau* to take 38cm guns. The outcome of a thorough study showed that although the turret-support bulkheads would have had to be reinforced, the 38cm turret could nevertheless have been installed.

Armament installed

Ammunition supply per gun :	28 cm	105 rounds
	15 cm	150 ,,
	10·5cm	200 ,,

Ranges were respectively 46km, 26km and 17·5km. In addition there were sixteen 3·7cm guns in twin mountings with 2000 rounds per gun, and originally ten 2cm A/A guns in single mountings, with 3000 rounds per gun.

Control of the main and secondary armament was to a great extent similar to that in *Bismarck* and *Tirpitz.* (See Warship Profile No 18). The same applied for the control and operation of the A/A guns. In general the models of the guns and equipment were somewhat older than those of the later ships.

Gneisenau *as she appeared on completion, looking very similar to* Scharnhorst *with straight stem and mainmast stepped against the funnel* (Author's Collection)

Armour Protection and Dimensions

The armour specified by the German Navy and supplied by Krupp has already been thoroughly described in connection with the *Bismarck* and *Tirpitz* (see Warship Profile No. 18), as have the difficulties in machining and welding it. In brief, it is obvious from the reasons explained that, given armour of equal strength, the areas provided with armour protection could be more extensive than hitherto, because the new armour materials could also be utilized as load bearing members in the construction of the hull. Details of the various armour dimensions were as follows:

Hull	**Minimum**	**Maximum**
Transverse Bulkheads	150mm	200mm
Side Armour	30mm	250mm
Citadel Armour		45mm
Upper Deck		50mm
Armoured Deck	20mm	50mm
Torpedo Bulkhead		45mm
(breadth of armour ca 5m)		
Main Armament		
Barbettes	200mm	350mm
Turrets	150mm	360mm
Secondary Armament		
Barbettes		150mm
Turrets	50mm	140mm
Single Mountings		20mm
Forward Control Turret		350mm
After Control Turret		100mm

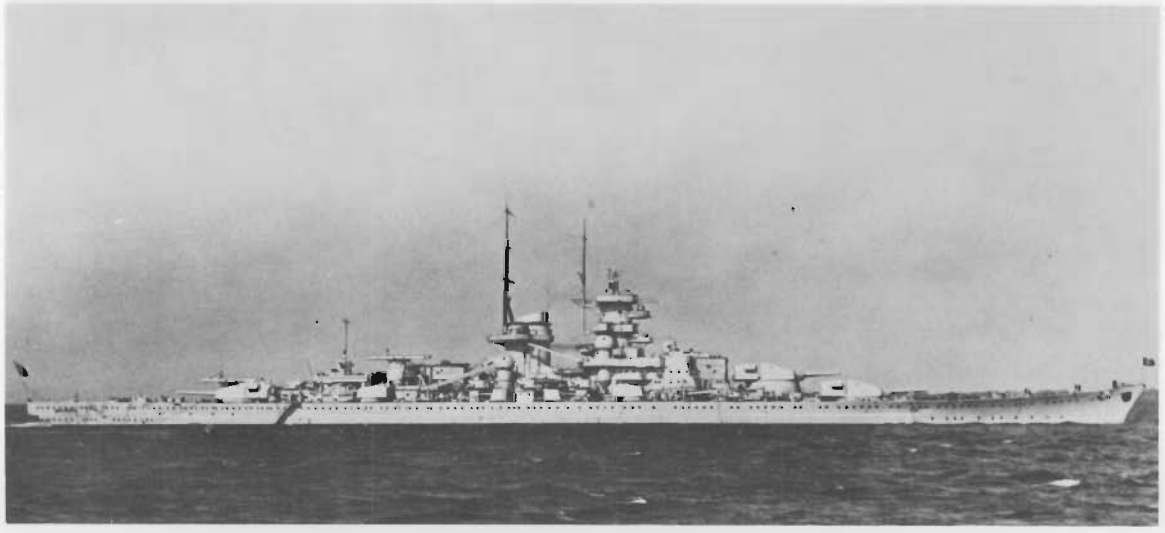
Main Engines

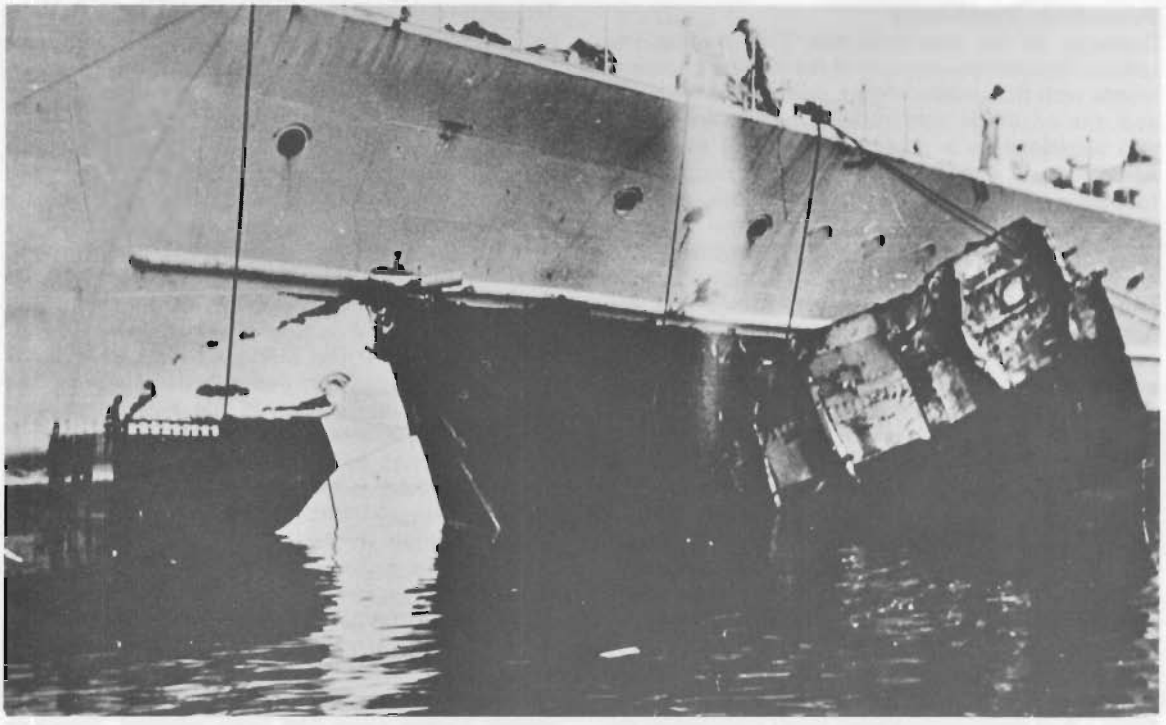
On the basis of the steadily increasing experience with *Deutschland* and *Admiral Scheer,* the Navy became strongly biased in favour of diesel engines for the fourth and fifth pocket battleships. The first three ships had an engine output of 54,000hp, driving two propellers, whereas the output wanted for the new ships was trebled to 160,000hp. Even if this were distributed over four propellers, it meant 40,000hp for each, a demand that could not be met with the engines then available; it was doubtful if even future designs could achieve this. Therefore, despite the greater radius of action which, in theory, the diesel engines would provide, the Navy decided to fit high-pressure superheated steam plant, with which they had already accumulated adequate experience.

Three geared turbines were fitted, each to drive one propeller. The turbines for *Scharnhorst* were provided by Brown, Boveri & Cie, and those for *Gneisenau* by the Krupp Germania yard. The steam was generated in 12 Wagner high pressure boilers. Maximum output developed was 165,000hp with which *Scharnhorst* reached a top speed of 31·5 knots and *Gneisenau* 30·5 knots.

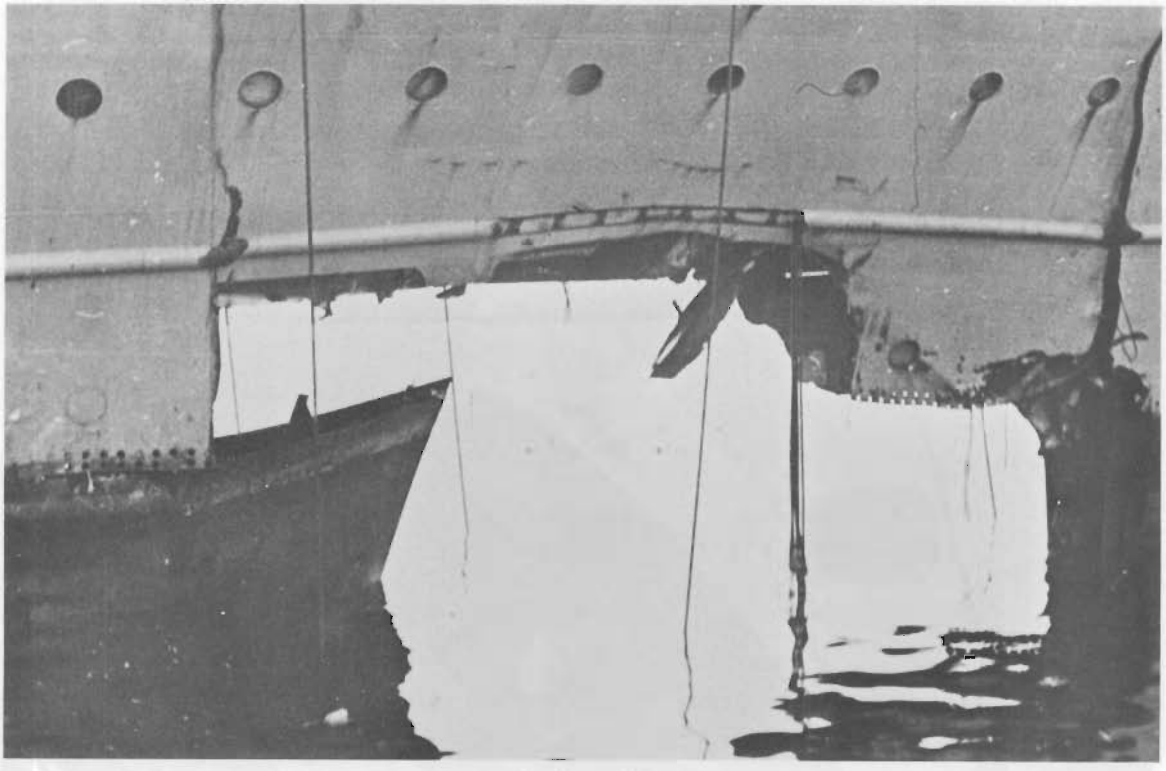
1

2





3



1 Gneisenau *after reconstruction to incorporate the lengthened 'Atlantic' bow. From this period she can be distinguished from* Scharnhorst *by the fact that she retained the tripod mainmast stepped against the funnel. A prominent funnel cap has been fitted as in* Scharnhorst, *but the second catapult is still in position on 'C' turret and the fire control has not been altered* (Author's Collection)

2 *A starboard broadside view of* Gneisenau *after alteration, showing the two catapults clearly. Note that she is not fitted with a stem anchor, although fitted for one like her sister ship* (Author's Collection)

3 *Port and starboard views of the torpedo hit on* Gneisenau *scored by HM Submarine* Clyde *in April 1940* (Author's Collection)

Propulsive Machinery

Diameter of the propellers was 4·45 metres. The turbine installations were in three turbine compartments with the middle engine on the centreline aft, and one on either side equidistant forward of this and separated by a central longitudinal bulkhead. At maximum speed the turbines developed the following revolutions per minute: high pressure 6700, intermediate pressure 3200, low pressure 2700. The astern output of the whole installation amounted to only 13,000hp. The 12 boilers were in groups of four in three boiler-rooms arranged one behind the other. Steam temperature was 450° centigrade at a pressure of 50 atmospheres, providing up to a maximum of 54·5 tons of steam per hour. The ships had an electricity output as follows:

2 diesel generators each providing 150 kilowatts
2 diesel generators together providing 300 kilowatts
6 turbo-generators each providing 460 kilowatts
2 turbo-generators each providing 430 kilowatts (this connected to an alternating current generator with an AC output of 200 Kilovoltamperes).

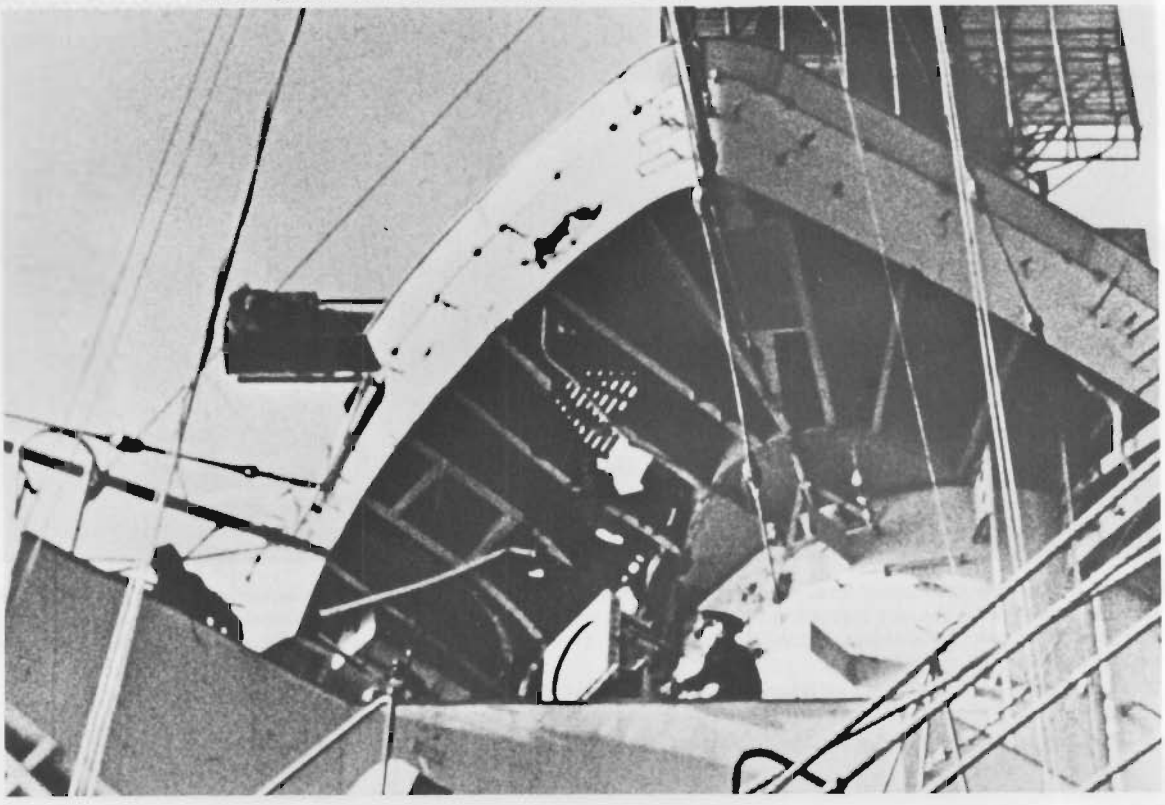
In all, 4,120 kilowatts at 220 volts.—The ships had two rudders positioned at the extremity of the propellers' streams and were therefore very efficient. Once a firm decision had been taken concerning the specifications of armament, armour and power installation, a start could be made to the constructional drawings of the individual parts and the actual building commenced in 1935.

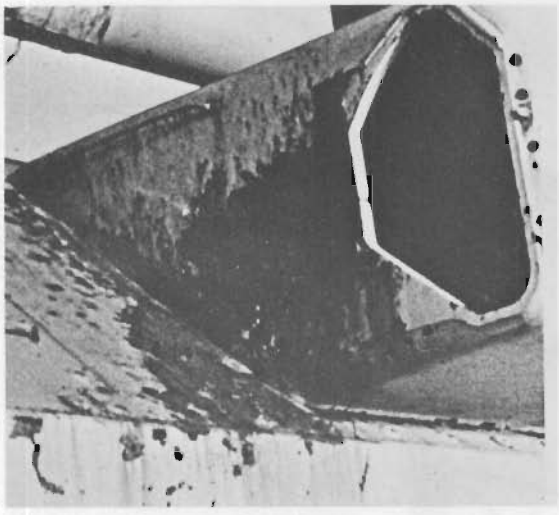
The ship to be built by the Navy Yard at Wilhelmshaven was given the dockyard designation 'Battle Ship D', and the other, to be built by the Deutsche Werke at Kiel, 'Battle Ship E'.

Structure

The hull was a longitudinal frame band-steel structure, and apart from a few unimportant modifications, bore a strong resemblance in its specifications to the battlecruiser *Mackensen* launched in 1917. The ships were welded throughout and subdidivided into 21 watertight compartments. The double bottom extended over 79% of the overall length. The bulbous bow improved the speed and housed the hydrophone receivers. The height of the hull's side at the main transverse frame was 14·05 metres. With each 55·1 load tons, the construction water-line was lowered by 1cm. When launched, both ships still had the vertical bow with normal anchor hawse-pipes. When undergoing sea trials in the Atlantic it turned out that they shipped a lot of water over the forecastle. Consequently in mid-1939 *Scharnhorst's* bow was converted to the so-called 'Atlantic' bow with a deck hawse-pipe port and starboard and an anchor hawse-pipe in the stem. The conversion of *Gneisenau* had already been carried out in 1938/39, but the normal hawse-pipes had been retained. However after disappointing experiences these were converted to deck hawse-pipes. The 'Atlantic' bow added 5·1 metres to the ship's overall length, but the alterations to both ships brought no fundamental

A hit on the foremast of the Gneisenau *from a 15in shell fired by HMS* Renown *off Norway in April 1940. Note the 'mattress' radar aerial showing above the platform* (Author's Collection)





1

2

improvement. Almost invariably during the war their 'A' turrets were under water and the range-finding gear housed there put out of action through sea water. Two booms forward and one on the stern, several accommodation ladders and two propeller-guards were all parts of their equipment, but for some reason or other there was no retractable boom on the bow for mine protection gear.[1]

Aircraft

Both ships were fitted with an aircraft catapult resting on a cylindrical substructure between funnel and after control position, and a catapult on top of 'C' turret, a little to the left of the fore and aft line. The hangar could take two Arado Ar. 196, and was positioned between the funnel and the forward catapult. The aircraft were lifted by crane through the hangar roof and placed either on the forward catapult or on the deck on the port side, where they were picked up by a movable crane and deposited on the after catapult on 'C' turret. It was also possible to transfer aircraft from crane to crane, so that it was not always necessary to set them down on the deck at all. But this arrangement did not prove to be very efficient and even before the war the catapult on the turret was dismantled and

[1]Paravanes

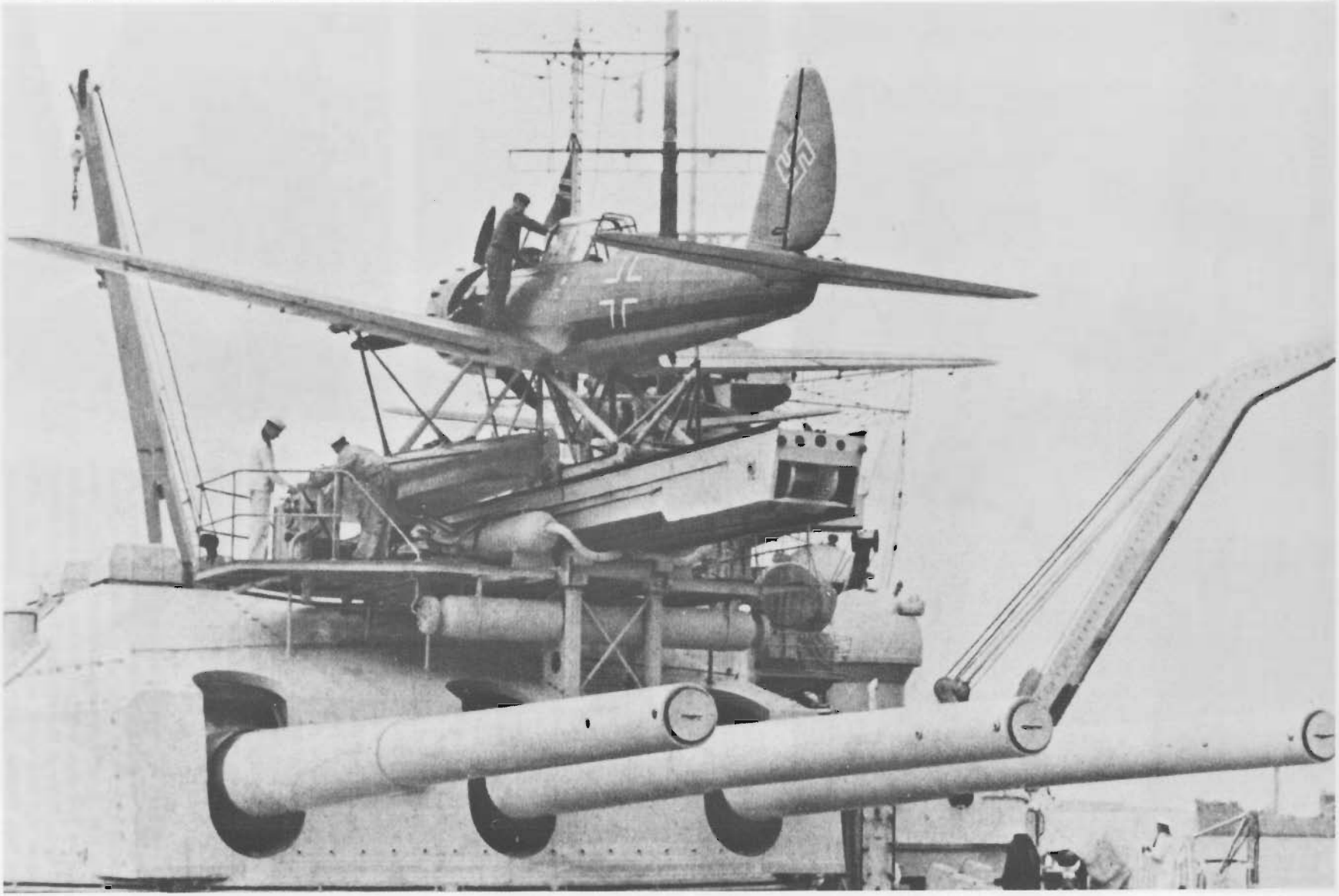
1 *Another hit on* Gneisenau *during the same action, scored on the portside range-finder extension of 'A' 28cm turret. This hit was scored either by HMS* Renown *or HMS* Birmingham (Author's Collection)

2 Gneisenau *and a torpedo boat seen from* Prinz Eugen *during the Channel Dash, 12th February 1942* (Author's Collection)

3 Gneisenau *seen at sea during the Atlantic operation of January-March 1941. Note that her fire control has been altered, but she still retains the visual range-finder forward and aft* (Author's Collection)

3

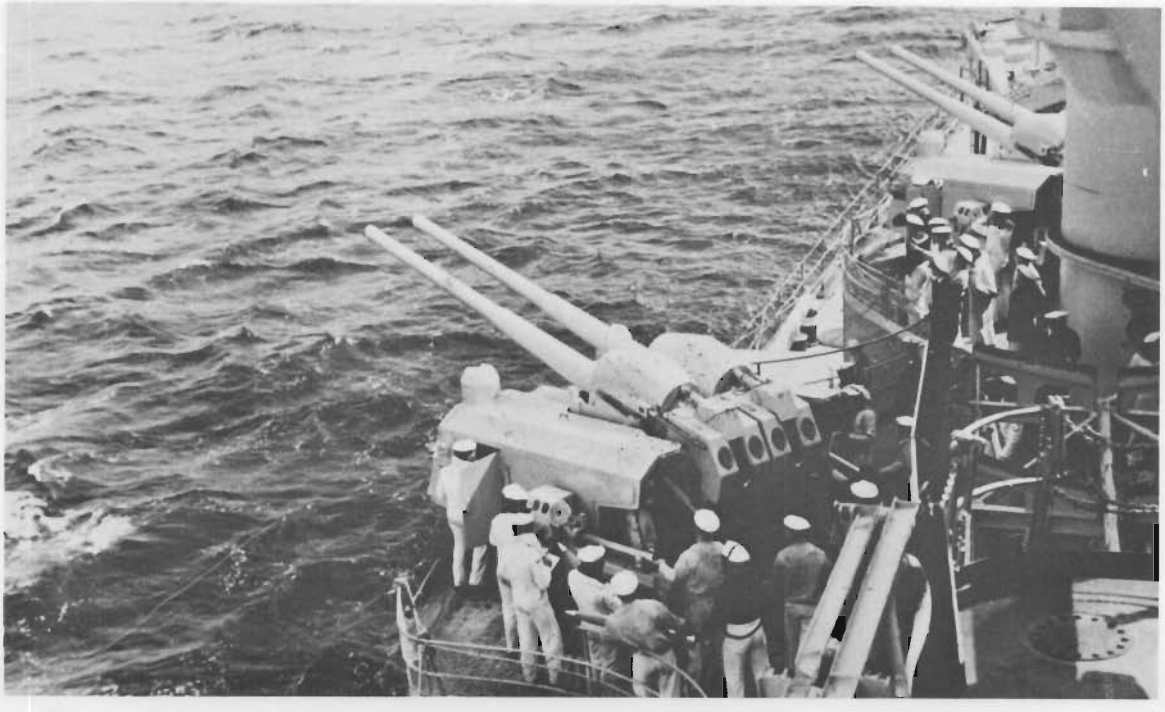
The Ar 96 in position on the after catapult on 'C' 28cm turret aboard Gneisenau (Author's Collection)



got rid of together with the collapsible crane and the port-side canvas landing mat. *Gneisenau's* masts were altered several times. First of all in Summer 1940 a top-mast was fitted to the fighting top. When the catapult was shifted in 1941 in Brest, a short mast was erected forward of the after control position, whilst the mainmast remained as it was, at the after edge of the funnel. The strengthening of the A/A defence meant a reduction in the number of searchlights. Originally there were five (one forward of the fighting mast below the foremast, one on either side of the funnel and on lifts either side of the forward catapult where they could be lowered in order not to get in the way of the catapult) but now only three were left on *Scharnhorst,* the two on either side of the catapult being replaced by 2cm, A/A guns. During her lengthy, enforced spell in dock at Brest with bomb damage, *Gneisenau* underwent a considerable refit. The aircraft installation was completely re-designed, the hangar being broadened and lengthened, so that the catapult was actually inside the hangar, which could accommodate one aircraft on the catapult itself and two with folded wings underneath it. For take-off, etc, the hangar was opened by means of large drop doors on horizontal axes, thus permitting the catapult to be swung round. This new device was never used, because in preparation for their dash through the Channel, the three large ships put their aircraft ashore in order to avoid unnecessary danger from aviation fuel or burning aircraft. In the course of these changes *Gneisenau* was given extra 2cm A/A guns. The after mast was moved a bit forward of the after control position and heightened.

Vice-Admiral Ciliax addressing the Ship's Company on board Prinz Eugen *in January 1942* (Author's Collection)

Details of the 10·5cm AA guns on board Scharnhorst (BfZ/Dressler Collection)



A number of 2cm A/A guns were added to the armament in preparation for the dash through the Channel. *Scharnhorst* had 24 installed and 12 of these were retained on board while she was undergoing repairs in Wilhelmshaven[1]. Presumably the same applied to *Gneisenau*. However, almost all the light guns were removed from her when she paid off on 1st July 1942, as a result of serious bomb damage sustained in Kiel on 26/27 February 1942.

In Summer 1940, as part of the preparation for operations in the Atlantic, *Scharnhorst* was equipped with torpedoes. The object of this was to enable her to penetrate a convoy screen and sink ships without having to rely upon a boarding party to carry out the task with scuttling charges. Six torpedo tubes were fitted in two sets of three on rotatable mountings. They were positioned on the upper deck near the after 15cm twin turrets, but had no fire control system, relying entirely on the leading torpedo-man and the aiming equipment on the torpedo-battery itself.

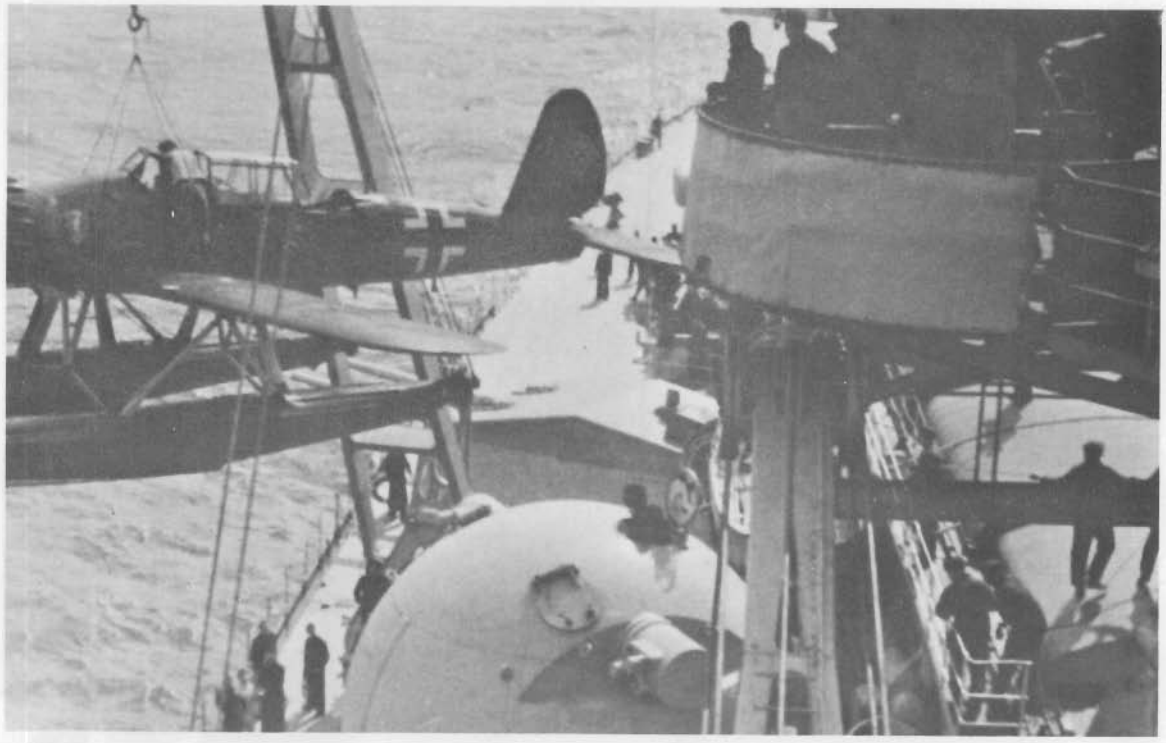
The alterations to *Gneisenau* that have already been mentioned were started on 1 July 1942, but were temporarily interrupted as early as January 1943, to be continued only as and when labour became available at the Gotenhafen (Gdynia) dockyard. As a first stage in the work, the burned out fore part of the ship was cut off just forward of 'A' turret. The intention was to lengthen the forecastle by 10 metres and give her a sharp stem, but without the bulbous forefoot. The 28cm triple turrets were to be replaced with 38cm twin turrets. No decision had been taken as to whether the 15cm and 10·5cm

[1] These 24 guns (six quadruple 'vierling' mountings) included the two added in the searchlight positions abreast of the catapult. The four added between July 1941 and February 1942 were positioned on the foremost 15cm twin turrets, on 'B' 28cm turret, and on the after end of the funnel platform. The mounting on 'B' turret was removed because it obscured vision from the bridge, and the two abreast of the catapult were removed to allow this to function once more. In 1941 the mountings in the searchlight position appear to have been moved to the 15cm turrets forward, and then put back. (Ed)

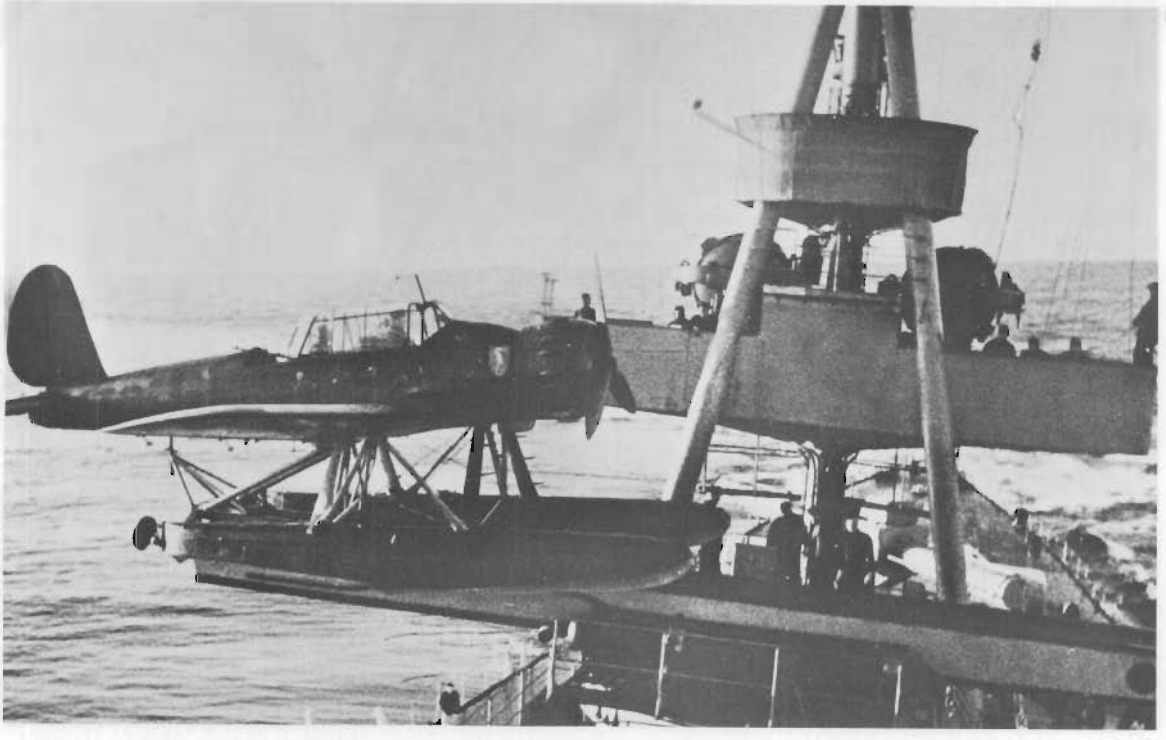

1


2


3



4



5

1 Scharnhorst *at Brest in 1941-2, covered in camouflage netting* (BfZ/Dressler Collection)

2 *Another view of the quadruple 2cm AA mounting abreast of the catapult, on board* Scharnhorst *in Norwegian waters in 1942* (BfZ/Dressler Collection)

3 *An overhead view of the quadruple 2cm AA mounting which replaced the searchlight positions port and starboard of the catapult. Note the details of the aircraft crane and the triple torpedo tubes on the deck below* (BfZ/Dressler Collection)

4 Scharnhorst*'s Arado floatplane being hoisted out by the aircraft crane* (BfZ/Dressler Collection)

5 Scharnhorst*'s catapult and floatplane trained to port, ready for launching* (BfZ/Dressler Collection)

1 *The Arado floatplane is seen leaving the* Scharnhorst*'s catapult in Norwegian waters in 1942. The quadruple 2cm AA mounting in the foreground is sited on the crown of the foremost 15cm turret. One of the single 15cm guns can be seen and the starboard 10·5cm battery is shown to good advantage* (BfZ/Dressler Collection)

2 *Details of the 10·5cm AA guns on board* Scharnhorst (BfZ/Derssler Collection)

3 *The Ship's Company mustered when* Gneisenau *was taken out of service at Gotenhafen in October 1942. The forepart of the ship had been destroyed, and was never repaired* (Author's Collection)

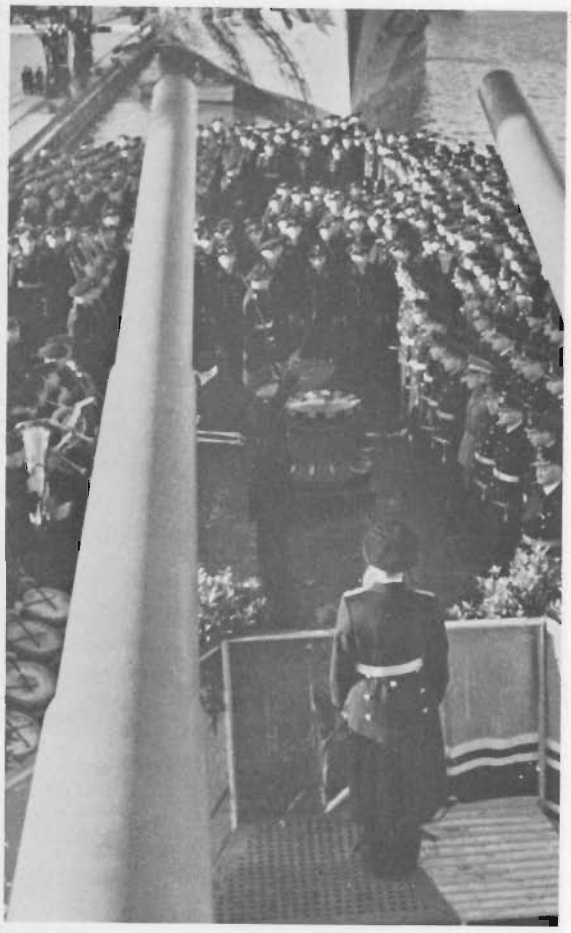
4 *Details of the 10·5cm AA guns on board* Scharnhorst (BfZ/Dressler Collection)

guns should remain or be replaced with a new 12·8cm gun.

Radar Equipment

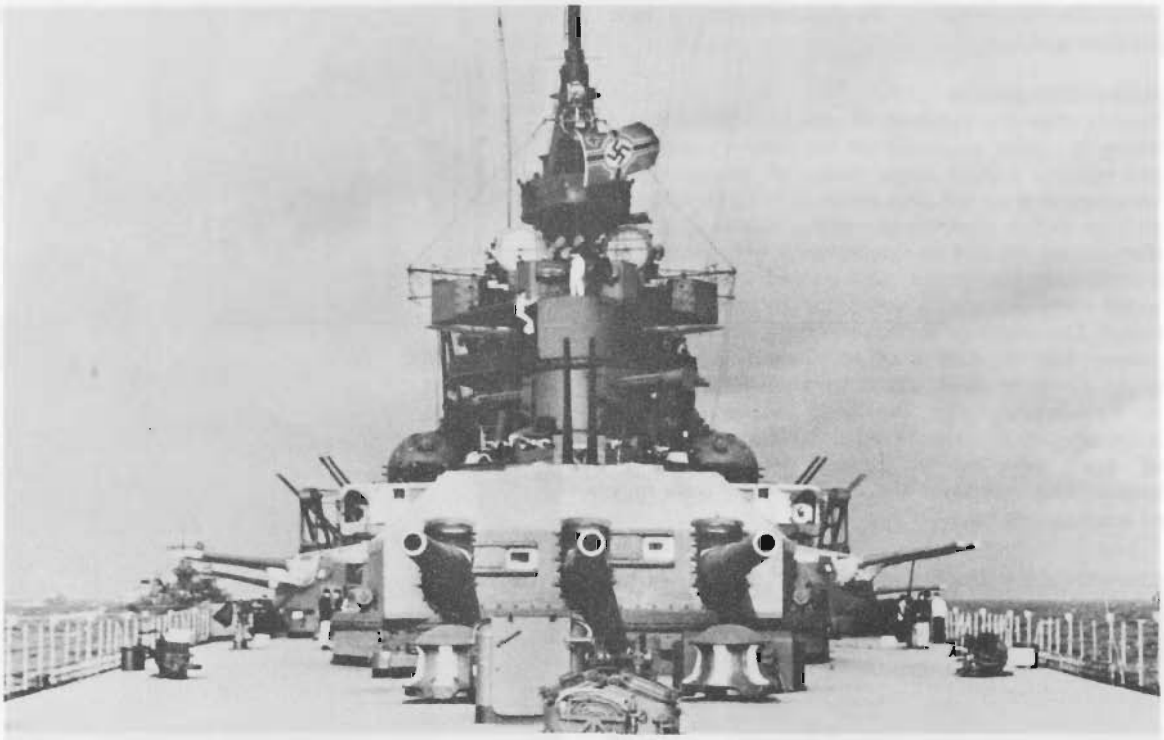
Shortly after the outbreak of war both ships had a fitting for radar mounted on the rotating dome of the foretop optical range-finder. A similar fitting was mounted on the after position in 1941 in Brest. It is no longer possible to tell the extent to which data could be fed to *Gneisenau's* fire control. In *Scharnhorst* the ranges were passed to the control in the same way as the data from the optical range-finder. The angle of deflection could also be transmitted, but the degree of accuracy was not very great. Firing by radar seems to have been possible in *Scharnhorst,* with the firing taking place by traversing an artificial horizon. Before the outbreak of war radar antennae were fitted purely for experimental purposes and consequently were only of a temporary nature.

2



3

4



Above: Quarter deck of Scharnhorst *at sea. This photograph would appear to have been taken in good weather off the coast of Norway in 1943, as it is very similar to the following photograph, showing the superstructure and forward turret from the forecastle* (BfZ/Dressler Collection)

Opposite: The forward turrets and superstructure of Scharnhorst *taken during the Channel Dash in February 1942. This photograph can be dated because the quadruple 2cm AA mounting seen on 'B' turret was only put on in Brest and was removed immediately after the operation as it obscured vision from the wheelhouse* (BfZ/Dressler Collection)

Crew

The crew originally consisted of 56 officers and 1613 nco's, officer candidates and ratings, but in the course of the war the numbers increased by 171, including four officers—mainly A/A and radar personnel.

Weight Distribution	SH/GU[1]	Mackensen
Hull	8,223t = 23·6%	28·6%
Armour	14,006t = 40·2%	24·1%
Power installation	2,578t = 7·4%	20·5%
Auxiliary engines and ships power supply	1,080t = 3·1%	2·6%
Armament	5,121t = 14·7%	12·3%
Equipment	1,394t = 4·9%	3·1%
Fuel	2,439t = 7·0%	8·8%
	34,841t = 100%	100%

[1] Call signs for visual signalling were:
'SH' = SCHARNHORST and 'GU' = GNEISENAU

Building Costs

Scharnhorst cost DM143·5 million and *Gneisenau* DM 146·2 million.

The comparison of *Scharnhorst* and *Gneisenau* with battlecruiser *Mackensen,* on which they were modelled, shows the substantial variation in weight distribution. Armour benefited greatly from the very much lighter power installation. The watertight subdivision of the new battleships satisfied the very stringent demands made even before World War 1, and which the experiences of war had adequately proved to be justified. (See Warship Profile No. 14 *SMS Seydlitz.*)

Scharnhorst was launched at the Navy Yard in Wilhelmshaven on 3 October 1936. The naming speech was delivered by the War Minister and C in C Armed Forces, Generaloberst (Colonel General) von Blomberg. He recalled the peasant's son from Hannover, who, due to his great talents and the encouragement of the King, became an officer and later, as Chief of the General Staff of the Prussian Army, created the Prussian People's Army and was the originator of general conscription.—The ship was commissioned on 7 January 1939 and her first Commanding Officer was Kapitän zur See Ciliax, who, as Flag Officer Battleships had his flag in *Scharnhorst* when leading the German heavy ships from Brest through the English Channel to home waters.

Gneisenau was lauched at the Deutsche Werke, Kiel on 8 December 1936, on the anniversary of the battle of the Falkland Islands. The C-in-C Army Generaloberst (Colonel General) Freiherr von Fritsch spoke of General Field Marshal August Graf Neidhardt von Gneisenau and his decisive services in liberating central Europe from the French yoke. The ship was named by Frau Maerker, the widow of the Commanding Officer of the armoured cruiser *Gneisenau,* killed in action at the Battle of the Falkland Islands. After entering the water, defective drag weights failed to hold her and she ran on the opposite bank, but the damage was not serious.

In both naming speeches, tribute was paid to the ships which had previously borne these names, the two armoured cruisers: *Scharnhorst,* Flagship of Vice-Admiral Graf von Spee, and her sister-ship *Gneisenau,* which were destroyed by British Battlecruisers, following the brilliant victory over a

British Cruiser squadron on 1 November 1914 at Coronel (Chile). The crews of both ships were cited as examples for the crews of the new battleships. Both ships were completed according to plan and commissioned on 7 January 1939 and 21 May 1938, respectively. Thus *Gneisenau* was finished earlier and on the whole in a shorter time than *Scharnhorst.* Of necessity therefore, *Gneisenau* was subjected to a greater trials programme. This included a prolonged voyage in the North and Central Atlantic for very thorough tests with the new-type gunnery control equipment for main and secondary armaments, and also to try out the modern fire control for the heavy A/A. This was the first occasion on which the fully stabilized, spherical A/A fire control systems together with their computers were tested. The results were so satisfactory, that only very few improvements could be devised for the newer ships (*Prinz Eugen, Bismarck* and *Tirpitz*). But the time spent in the Atlantic, also showed that she tended to ship a great deal of water over the forecastle, making a modification to the bow essential.

Both ships were converted accordingly, each by its own dockyard, i.e. *Scharnhorst* in Wilhelmshaven and *Gneisenau* in Kiel.

On 4 September 1939, immediately after hostilities began, both ships lay at anchor in Brunsbüttel roads on the River Elbe and here together they experienced the first British bomber attack. Both ships were undamaged. The crews saw a lot more action and almost always together, just like inseparable brothers. For this reason it seems fitting, that the further careers of both battleships should also be described jointly.

The almost inter-linked careers of Scharnhorst (SH) and Gneisenau (GU)

An undated photograph of Scharnhorst, *probably taken in the Atlantic in 1941, against the setting sun*
(BfZ/Dressler Collection)

8-10.10.1939	GU (Flagship, C-in-C Fleet Admiral Boehm), light cruiser *Koln* and destroyers carry out a sortie to a point off south Norway. No action.
21-27.11.1939	SH and GU (Flagship Admiral Boehm), carry out a sortie to the south of Iceland and on 23.11 sink the British Armed Merchant Cruiser *Rawalpindi* of the Northern Patrol.
18-20.2.1940	SH and GU (Flagship Admiral Boehm), heavy cruiser *Admiral Hipper* (AH) and destroyers sortie as far as the Shetlands-Norway passage without encountering the enemy
	Operation 'WESERUBUNG' (Weser Exercise) Occupation of Norway and Denmark
7-12.4.1940	SH and GU (Flagship of Acting C-in-C Fleet, Vice-Admiral Lütjens) take up a westerly position to give covering support and facilitate the destroyers' occupation of Narvik. When off Vestfjord on 9.4 they encounter HMS *Renown* and *Birmingham*. Hits are obtained on *Renown*. But much more serious is the damage to GU. A hit from a 38·1cm shell destroys her foremast leaving the guns without the most important fire control position. GU therefore proceeds to Wilhelmshaven for repairs, arriving there on 12.4. The repairs were completed by the end of May.
	Operation 'Juno'
4-10.6.1940	This operation, carried out by SH, GU (Flagship, Admiral Marschall), AH and four destroyers, serves to relieve the heavily pressed Gebirgsjäger (mountain troops) and destroyer crews in Narvik. GU and SH together sink the British aircraft carrier *Glorious* and the destroyers *Acasta* and *Ardent*. SH is hit by a torpedo from *Acasta*, tearing a hole 12×4m, so that she takes in about 2500 tons of water. The after 28cm 'C'-turret, the starboard after 15cm twin-turret and a considerable amount of equipment are put out of action, including the starboard engine and, for a time, the centre engine, as well as a few auxiliary engines. The force puts into Trondheim.
10-11.6.1940	*Gneisenau, Admiral Hipper* and four destroyers carry out a sortie from Trondheim.
11 and 13.6.1940	*Scharnhorst* unsuccessfully attacked in Trondheim by aircraft from *Ark Royal*[1] and by RAF bombers.
20.6.1940	*Scharnhorst* leaves Trondheim for Kiel to carry out repairs. *Gneisenau, Admiral Hipper* and four destroyers are detailed to help *Scharnhorst* out of Trondheim. On leaving the Leads GU is severely damaged by a torpedo from HMS/m *Clyde* and returns to Trondheim.
25-27.7.1940	GU accompanied by the light cruiser *Nürnberg* proceeds to Kiel.
	War against merchant shipping in the Atlantic—Operation BERLIN
28.12.1940	Both battleships start their long-planned economic
3.1.1941	war in the Atlantic. The operation has to be broken off because of serious damage to *Gneisenau* by heavy seas.
22.1.1941	SH and GU (Flagship, C-in-C Fleet Admiral Lütjens) again sail on operation against enemy merchant shipping. On the morning of 28.1, when south of Iceland contact is made with the British Fleet under Admiral Tovey, but no action develops. After refuelling close to Jan Mayen (30.1-1.2.1941) they pass through the Denmark Strait in the night of 3-4.2.1941.
5-6.2.1941	Refuel south of Cape Farewell. Commence the planned search of the shipping lanes.
8.2.1941	SH and GU encounter a convoy which is escorted by HMS *Ramillies*. In view of their strict order to avoid any action with battleships, the German ships withdraw in order to refuel (14.2.1941 west of Cape Farewell), whilst the cruiser *Admiral Hipper*, operating out of Brest, is directed on to convoys.
23.2.1941	SH and GU intercept several independent merchant ships, sinking five. They then continue in a southerly direction.
26-28.2.1941	Refuel in approximate position 33° North 42° West and proceed in the direction of the Canary Islands. Following a fruitless search west and south of there, the force made for the Cape Verde Islands—Africa passage.
7.3.1941	SH reports on enemy battleship (*Malaya*) screening a convoy. Since an attack with the battleships was out of the question, the C-in-C Fleet directs three U-boats on to the enemy. Contact is maintained until the next day, but the battleships refrain from an attack because the convoy's escort has been reinforced by two cruisers and additional destroyers. SH and GU withdraw to the north-west to refuel.
9.3.1941	SH sinks a collier.
11-12.3.1941	Refuel and then sweep in a north-westerly direction towards the westerly area of the shipping lanes to and from Halifax. With the help of the two supply ships *Uckermark* and *Ermland*, the reconnaissance line is extended to 90 miles and a sweep carried out to a depth of 120 miles. This measure proves successful.
13-15.3.1941	SH sinks six and GU seven merchant ships. Three ships are taken as prize and dispatched with prize crews to France. On the evening of 15.3.1941 HMS *Rodney* is sighted, but because of her inferior speed she is easily shaken off.
18.3.1941	The four German ships join up and refuel on 19.3.1941. They now head towards France for an urgently needed refit, to prepare them for another operation against merchant shipping at the same time as the battlegroup *Bismarck/Prinz Eugen*.
23.3.1941	*Scharnhorst* and *Gneisenau* arrive at Brest and start mechanical overhaul and repair of sea weather damage. The operation has lasted 60 days in which the two battleships have covered 17,800 miles. Within a short time both ships become targets for increasingly heavy air attack by the RAF and Coastal Command.
3-4.4.1941	Air attack. No damage.
6.4.1941	While shifting moorings inside the harbour *Gneisenau* is hit by an aircraft torpedo[1].

[1]The Skuas of 800 and 803 Squadrons obtained one direct hit and one near-miss with 250lb SAP bombs, but unfortunately the bomb which hit failed to detonate correctly.

[1]Beaufort of No 217 Squadron, RAF, pilot Flying Officer Campbell, RAF, who was awarded a posthumous VC.

10-11.4.1941 *Gneisenau* lying in dock is hit by four bombs.

23.7.1941 *Scharnhorst* moved to La Pallice so that she will not be exposed unnecessarily to the attacks on Brest, which are also being directed against *Prinz Eugen*.

24.7.1941 *Scharnhorst* hit by five bombs. A simultaneous attack on *Gneisenau* is unsuccessful.
In August SH is moved back to Brest for repairs. In spite of numerous attempts to disrupt work, the two battleships and the cruiser *Prinz Eugen* complete their refit according to plan and reach a remarkably high degree of operational preparedness. All three ships carry out sea trials independently with destroyer escort and fighter cover.

1.1.1942 Discussion with the Naval Group Command, West, in Paris concerning sailing orders for the heavy ships lying in Brest.

12.1.1942 At the Führer Headquarters Adolf Hitler decides on the Channel breakthrough.

Operation 'Cerberus'

11.2.1942 After a delay of more than an hour due to an air raid, the force sails from Brest under the command of Vice-Admiral Ciliax, flying his flag in *Scharnhorst*. The force has an escort of six destroyers, which are joined on the following day by 15 torpedo-boats. The escort is further reinforced by about 30 E-boats and about 250 fighters.

12.2.1942 At 1042 when off Le Havre the German ships are sighted for the first time by an enemy Spitfire. The first sign of enemy reaction, at least as far as the crews are concerned, is when the Dover coastal batteries open up at 1219. This has as little success as the motor-torpedo-boats' attack shortly afterwards and the heroic attack by Swordfish torpedo-carrying aircraft. The subsequent aircraft attacks with bombs and gunfire continue until dusk and these too have virtually no success. Only *Prinz Eugen* suffers one casualty from gunfire. Out of a total of 242 bombers that took off, only 39 carried out direct attacks.
At 1431 *Scharnhorst* detonated a mine. The safety switches are actuated and so prevent damage to the turbines. The ship is unable to proceed for half-an-hour. A little later enemy destroyers attack *Gneisenau* and *Prinz Eugen* with torpedoes and gunfire, but entirely without success. At 2134 *Scharnhorst* detonates a second mine. *Gneisenau* too detonates a mine at 1955.

13.2.1942 SH puts into Wilhelmshaven, *Gneisenau* and *Prinz Eugen* enter the Kiel Canal. GU proceeds into Kiel for repairs while Vice-Admiral Ciliax transfers his flag to *Prinz Eugen* and, turning about, proceeds in company with *Admiral Scheer* to Norway.
From this point onwards, the two battleships SH and GU,until now almost inseparable, part company. First of all let us trace the later fate of:

SCHARNHORST

15.2.1942 SH moves from Wilhelmshaven to Kiel for repairs. These are completed by Autumn 1942 and she starts working up in the Baltic in company with *Prinz Eugen*.

January 1943 Two attempts by *Scharnhorst* (Flagship C-in-C Fleet, Admiral Schniewind) and *Prinz Eugen* to move unobserved to Norway. On both occasions the ships are spotted by the enemy.

8-10.3.1943 *Scharnhorst* proceeds independently to northern Norway.

6-9.9.1943 The Task Force comprising *Tirpitz* (Flagship Admiral Kummetz), *Scharnhorst* and 10 destroyers carry out a sortie to Spitzbergen.

Operation 'Ostfront' (Eastern Front)

22.12.1943 A German weather-reporting aircraft sights the British convoy JW 55B, en route from Loch Ewe to Murmansk. There are 18 freighters and 10 destroyers[1] with additional cover provided by 'Force 1' (three cruisers) and 'Force 2' (Battleship *Duke of York*, one cruiser and four destroyers, under the command of the C-in-C Home Fleet, Admiral Sir Bruce Fraser). Due to the steadily deteriorating weather conditions, the Germans manage to send out only one more air reconnaissance. It should be appreciated that at this time of year in this latitude, there is little more than one hour of daylight.

[1]19 merchant vessels, 10 destroyers, three corvettes, one escort oiler — four additional destroyers joined from RA55 on 26.12.1943.

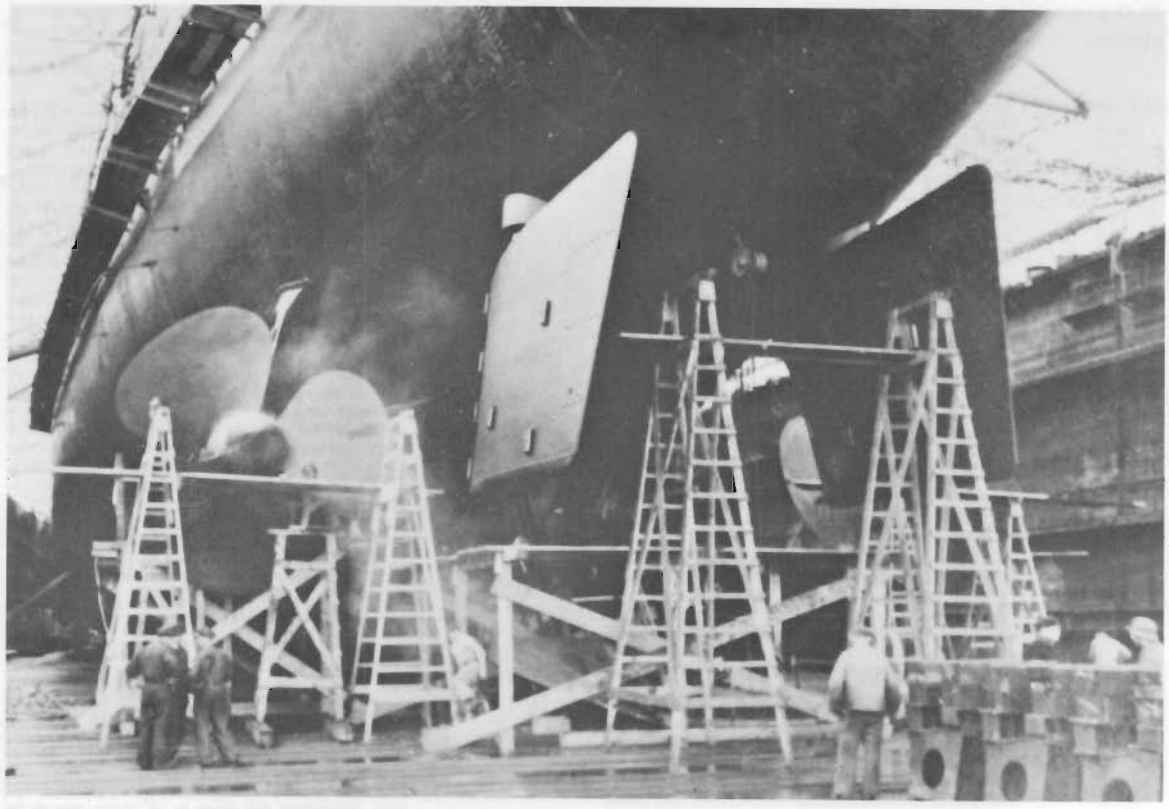
25.12.1943 *Scharnhorst* (Flagship, acting FO of Battle Group, Rear Admiral Bey) and five destroyers put to sea. The weather becomes even worse. SH is restricted in the use of her armament, while the destroyers are unable to use theirs at all.

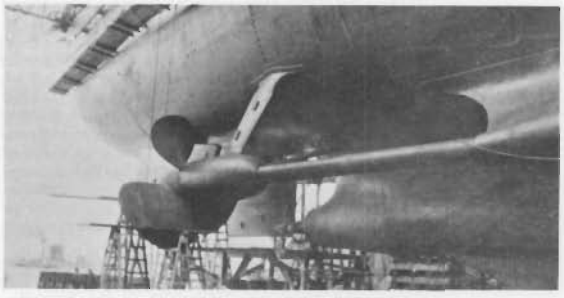
26.12.1943 At 0926 SH is illuminated by starshell and fired on with 8in shells. The radar gear in the foretop is destroyed, thus eliminating the ship's most important and far-seeing 'eye', so necessary in this dark, stormy night. With the aid of the after radar gear SH manages to ease the pressure being exerted by the three cruisers. She subsequently turns towards the enemy and in the grey dawn of the Arctic day obtains two hits on *Norfolk*. *Belfast* and *Sheffield* can not be made out at all. Whilst the German destroyers, as ordered, continue their reconnaissance sweep in search of the convoy and later turn back towards Norway, *Duke of York*'s radar picks up the enemy. It is now only a matter of time before SH meets her end. At 1655 *Duke of York* opens up with her main armament in the final phase of the battle obtaining 13 hits with 35·6cm shells. *Jamaica* and *Belfast* finish her off. In all 55 torpedoes are fired at *Scharnhorst*, eleven of which are said to have hit her. She capsizes about 1945, taking the Flag Officer and Commanding Officer down with her. Out of a crew of 1968 only 36 survived, victims of a rash and, in some respects, badly prepared operation, which was bound to fail, because of the poor co-operation within the Navy, and the lack of co-operation between Navy and Luftwaffe.
Let us now return once more to

GNEISENAU

26-27.2.1942 Lying in the Deutsche Werke at Kiel for repairs, *Gneisenau* is seriously damaged forward. In preparation for the commencement of work, the hatches cannot be closed. Empty bunker tanks have still not been cleaned, so that oil fumes spread throughout the entire forepart of the ship. The bomb hit releases such an explosion that the entire fore part, right from the stem to 'A' turret has to be replaced, if the ship is ever to become operational again. For this reason the ship is moved to Gotenhafen (Gydnia) on 4.4.1942 and paid off on 1 July. The fore part is cut off in 1944, and a start made to convert the ship to take 38cm twin-turrets as had been planned years before. From 1943 the work grinds gradually to a halt, due to the scarcity of labour and materials. From 1944 all that is left is a small labour force to ensure that the ship does not sink. On 27 March 1945 she starts her last journey, to be scuttled in the entrance to Gotenhafen (Gdynia) and so render it as difficult as possible for the Russians to make use of her. The salvage work goes on from 1947 to 1951.
Both ships gave no cause for disappointment in what was expected of them. Built in the period of transition from the restrictions of the Versailles Treaty to the validity of the international Naval Agreement that included the German Navy, they were still not battleships in the real sense of the word. If the war had been merely between Germany and France, they would have been quite capable of fulfilling that task originally intended for them, i.e. to have a decisive delaying effect on French reinforcements from West Africa, something which the Atlantic operations undoubtedly proves[1]. Another point regarding these ships is that modern technology to a great extent determined their end: in the case of *Gneisenau* it was the air force and with *Scharnhorst*, radar-technology, so sadly neglected by the Germans.
The crews of both ships performed their duty to the end, convinced that the cause they were serving was just. Just like their forebears, Admiral Graf von Spee's two armoured cruisers, they fought for Germany in such an exemplary manner, that two of the first ships acquired by the Bundesmarine were named after them. The two training ships of the Naval Gunnery School, purchased in England were named:
Scharnhorst ex HMS *Mermaid* of the Black Swan Class
Gneisenau ex HMS *Oakley*, ex *Tickham* of the Hunt III-Class.

[1]Troop convoys at this period *always* included at least one battleship as ocean escort, so the two battleships might not have been allowed to attack. (Ed.)





Two views of Scharnhorst*'s twin rudders and propellers seen during her docking at Gotenhafen after the Channel Dash. The propeller has been removed from the centre shaft*

PREVIOUS SHIPS BEARING THE NAMES SCHARNHORST AND GNEISENAU

Scharnhorst

1 Armoured cruiser built 1905-7 at Hamburg by Blohm and Voss; sunk in action at the Battle of the Falklands, 8 December 1914.

2 Auxiliary patrol trawler, sunk by mine in North Sea in 1917.

Gneisenau

1 Steam corvette built 1877-80 at Danzig Dockyard; wrecked off Malaga 16 December 1900.

2 Armoured cruiser (sister to *Scharnhorst* No 1) built 1904-8 at Bremen by A. G. Weser; sunk in action at Battle of the Falklands, 8 December 1914.

3 Auxiliary patrol trawler which served in World War and subsequently.

LIST OF COMMANDING OFFICERS

Scharnhorst

Kapt z. See Ciliax	January 1939	—October 1939
See Hoffman	October 1939	—March 1942
See Hüffmeier	April 1942	—October 1943
See Hintze[1]	October 1943	—26 December 1943

Gneisenau

Kapt z. See Förste	May 1938	—November 1939
See Netzbandt[2]	November 1939	—August 1940
See Fein	August 1940	—April 1942

[1] Killed in action.

[2] Killed in action as Fleet Chief of Staff on board *Bismarck* 27.5.1941.

Scharnhorst—Laid down 16 May 1935; launched 3 October 1936; complete 7 January 1939; built by Marinewerft, Wilhelmshaven

Gneisenau—Laid down March 1935; launched 8 December 1936; complete 21 May 1938; built by Deutsche Werke, Kiel.

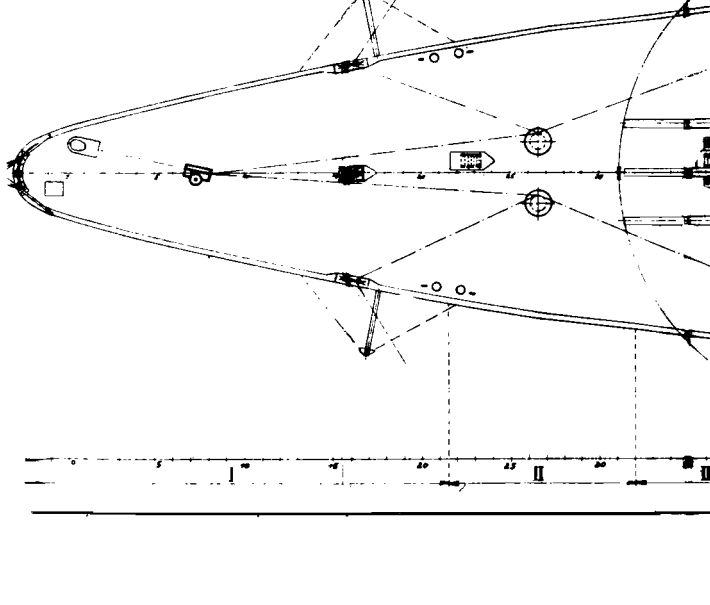
Displacement:
26,000 tons (announced standard)
34,841 tons (normal draught)
38,900 tons (full load)
Dimensions:
229·8m (overall) × 30m × 8·2/9·1m (as built)
234·9m (overall) × 30m × 8·2/9·1m (as lengthened)
Guns:

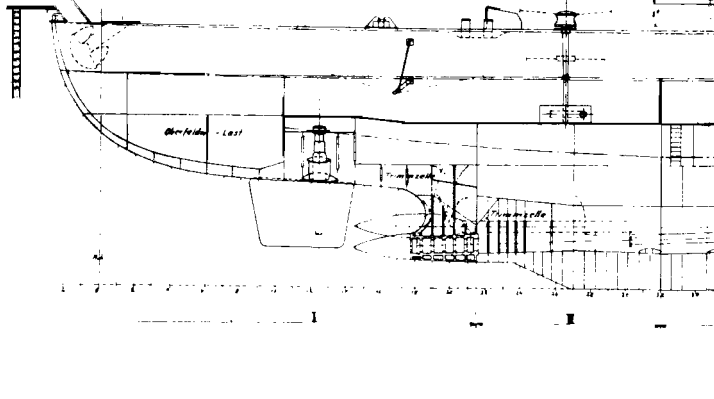
9-28cm L/54·5 (3 × 3)	=11in
12-15cm L/55 (4 × 2, 4 × 1)	=5·9in
14-10·5cm L/65 AA (7 × 2)	=4·1in
16-3·7cm AA (8 × 2)	

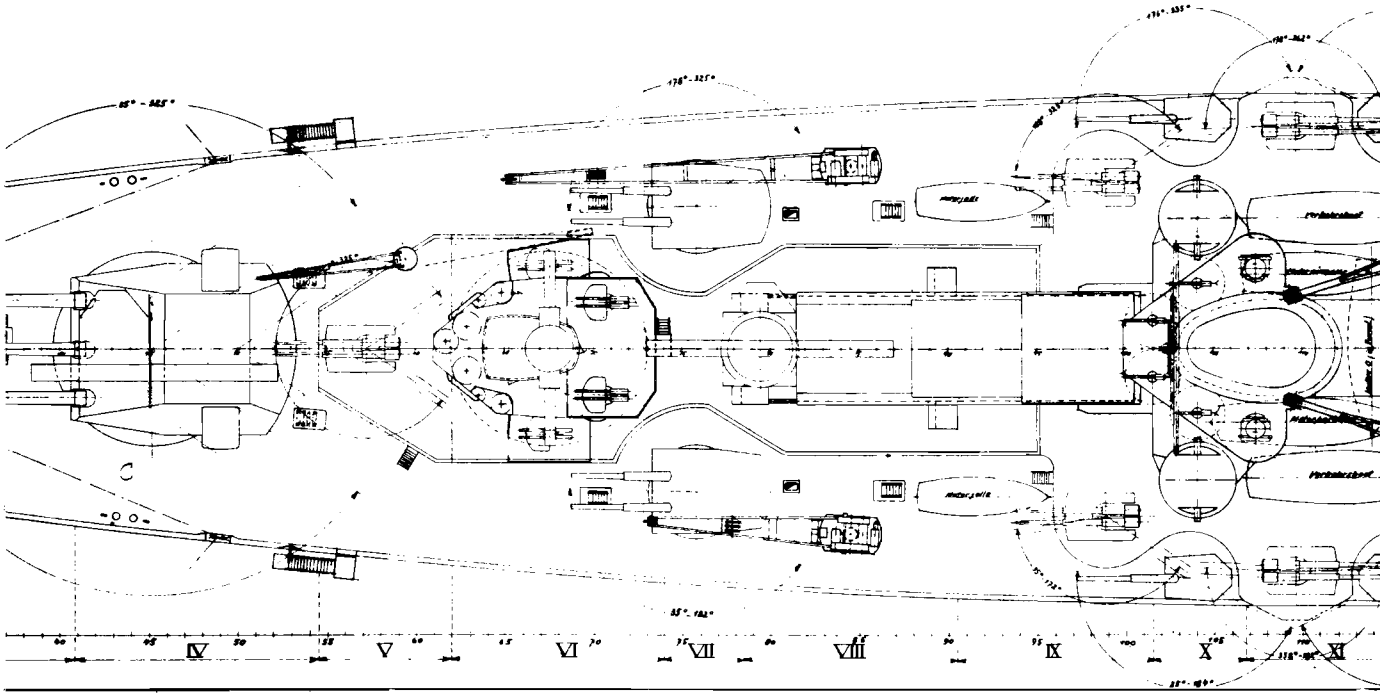
SH	GU
1938-1939 8-2cm AA (8 × 1)	8-2cm AA (8 × 2)
1939-1940 10-2cm (10 × 1)	10-2cm (10 × 1)
1940-1941 18-2cm (10 × 1, 2 × 4)	16-2cm (10 × 1, 2 × 4)
July 1941-Feb 1942 34-2cm (10 × 1, 6 × 4)	24-2cm (8 × 1, 4 × 4)
1942-1943 22-2cm (10 × 1 3 × 4)	probably stripped

Torpedo Tubes: 6-53·3cm (2 × 3) =20·98in
Armour:
250mm belt; 45mm citadel; 50mm upper deck and armoured deck; 350-200mm barbettes; 360-150mm main turrets.
Machinery:
3-shaft geared turbines, 165,000 shp = 32 knots (max);
12 Wagner high-pressure boilers
Fuel: 2,756 tons oil (6,200 tons max)
Endurance: 10,000 miles at 17 knots
Complement: 1,840 (wartime)

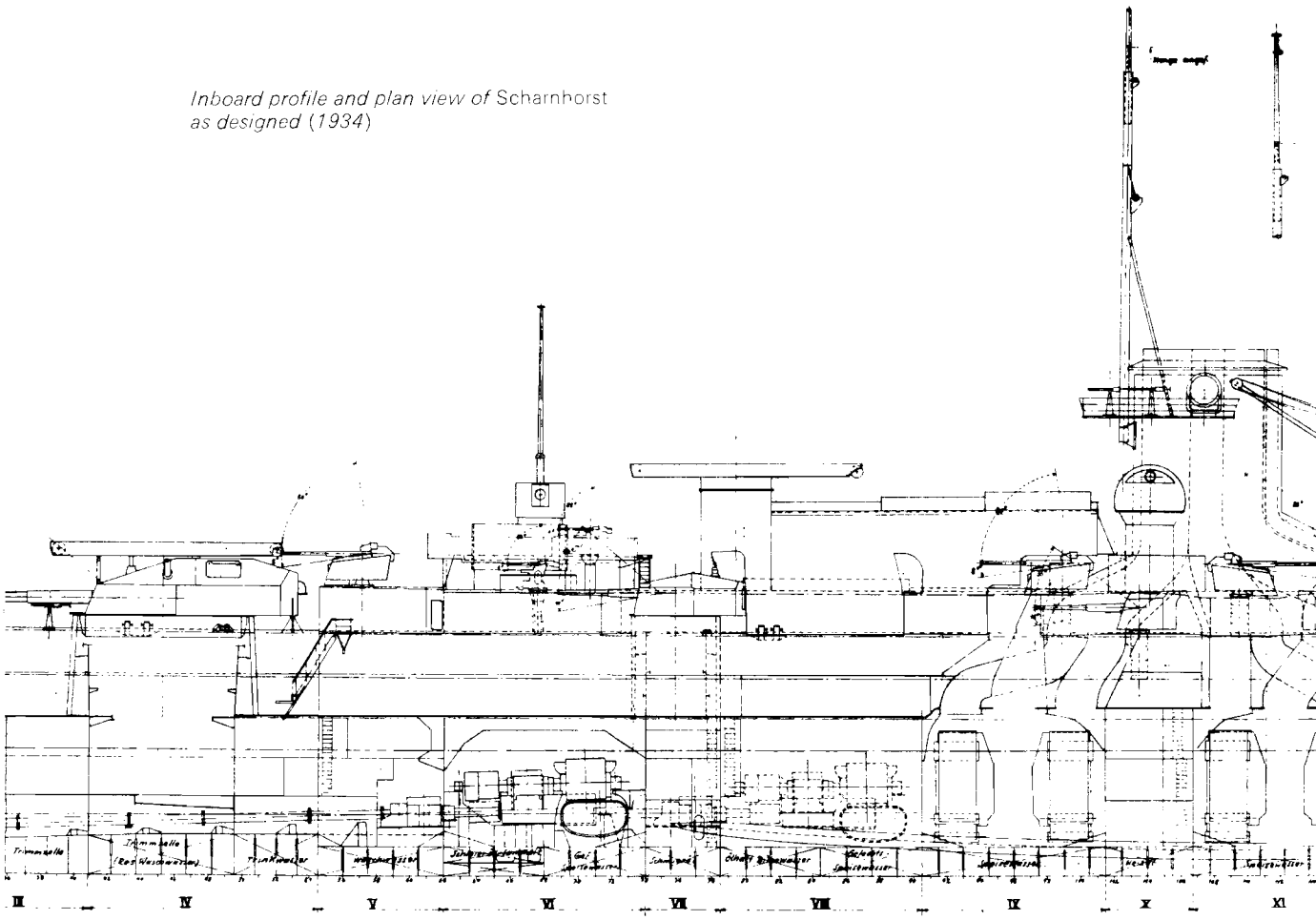
Editor's Acknowledgements
The Editor wishes to express his gratitude for assistance in preparing the Profile and the artwork. In particular John Lawson, R. A. Freeman and Dr Jurgen Rohwer have contributed information which was essential.

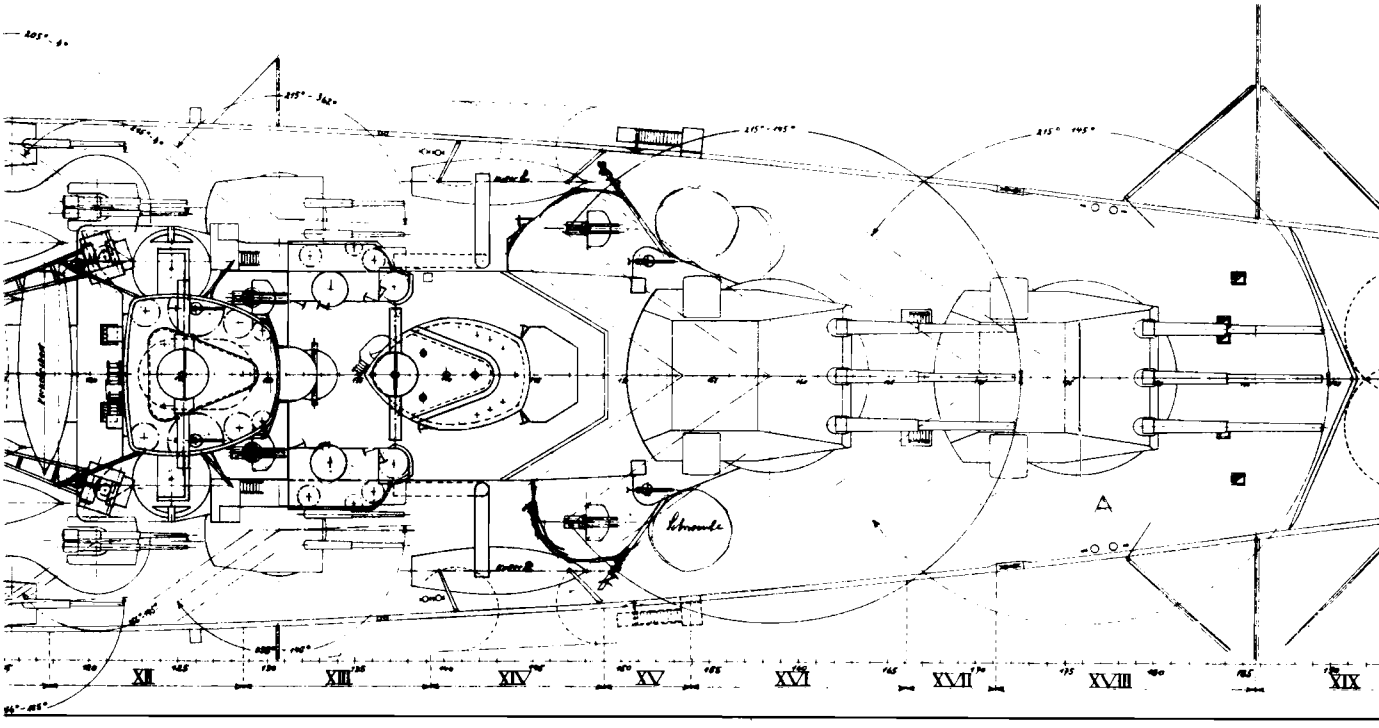


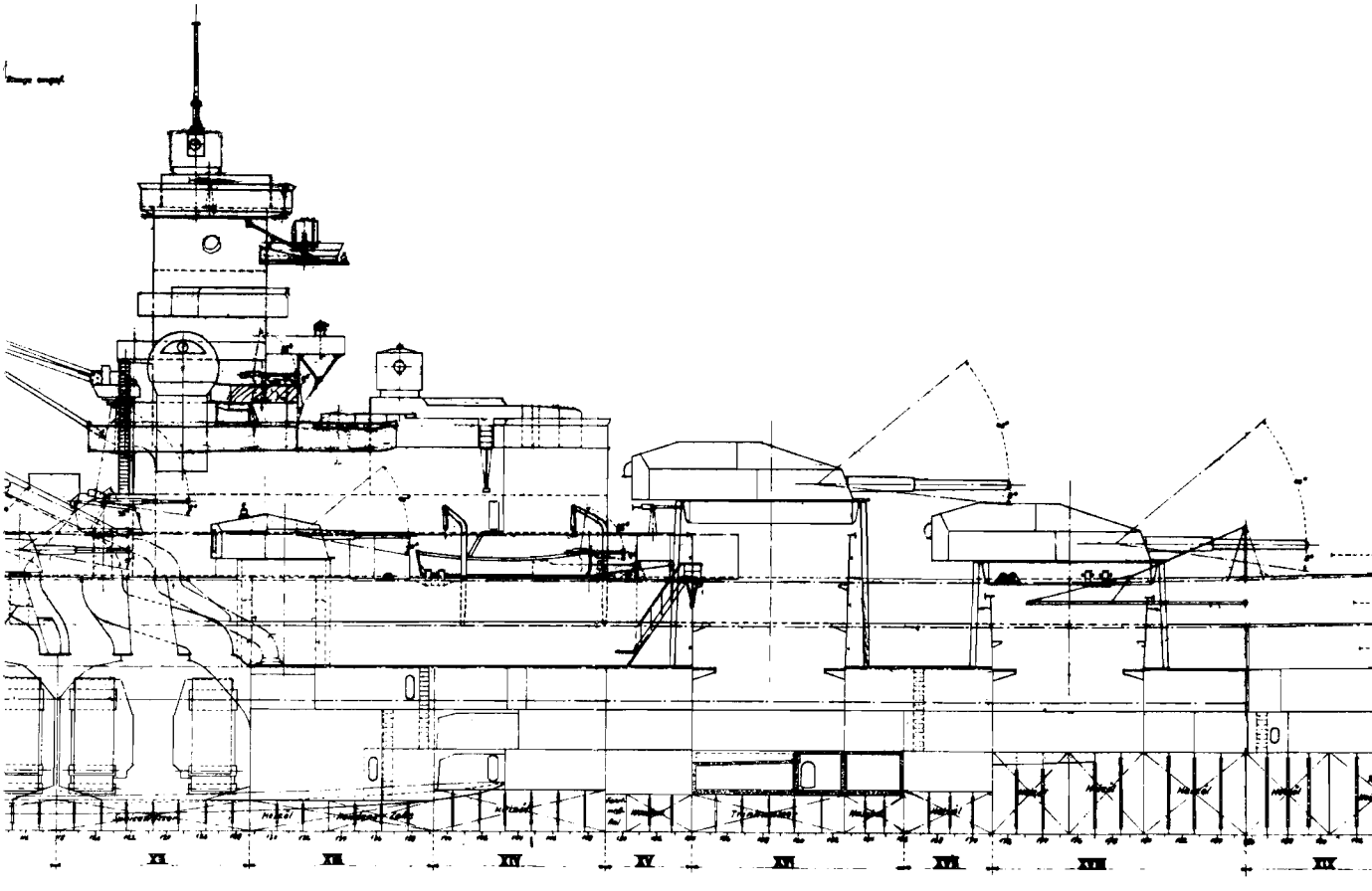




Inboard profile and plan view of Scharnhorst
as designed (1934)




XII
XIII
XIV
XV
XVI
XVII
XVIII
XIX



Geheim.

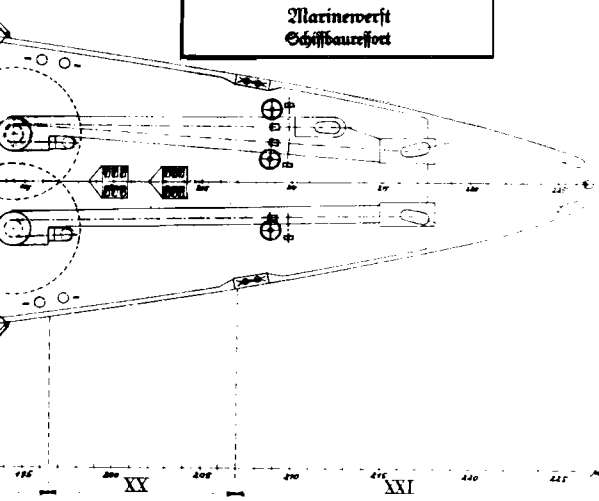
Skizze 13

Obere Ansicht.

1 : 200.

Dies ist ein geheimer Gegenstand im Sinne des § 88 Reichs-Straf-Gesetzbuch (Fassung vom 24. April 1934). Mißbrauch wird nach den Bestimmungen dieses Gesetzes bestraft, soweit nicht andere Strafbestimmungen in Frage kommen.

Marinewerft
Schiffbauressort



Schiff 125
Marinewerft Wilhelmsh.
Planheft V.

Skizze 17

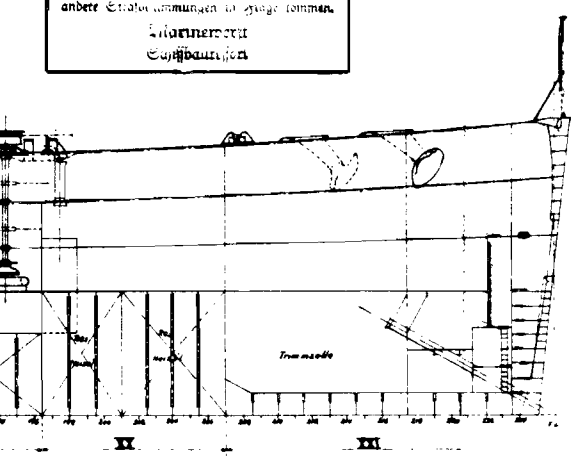
Längsschnitt

1:200

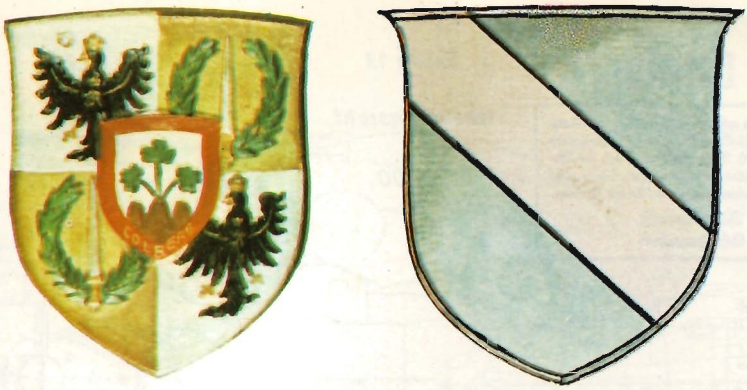
Geheim.

Dies ist ein geheimer Gegenstand im Sinne des § 88 Reichs-Straf-Gesetzbuch (Fassung vom 24. April 1934). Mißbrauch wird nach den Bestimmungen dieses Gesetzes bestraft, soweit nicht andere Strafbestimmungen in Frage kommen.

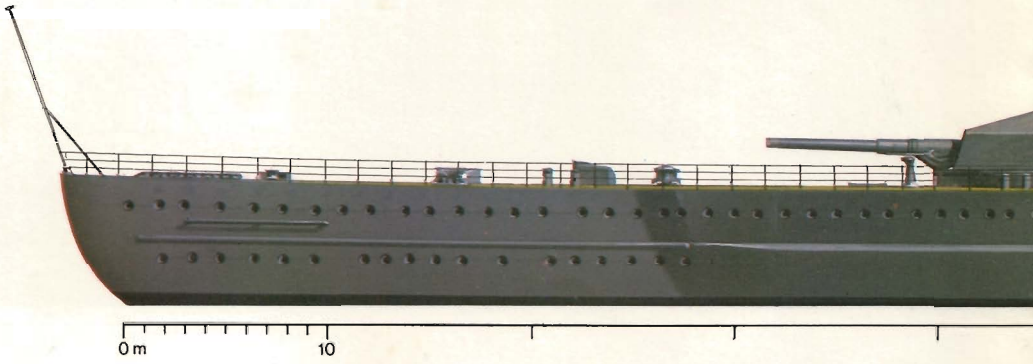
Marinewerft
Schiffbauressort

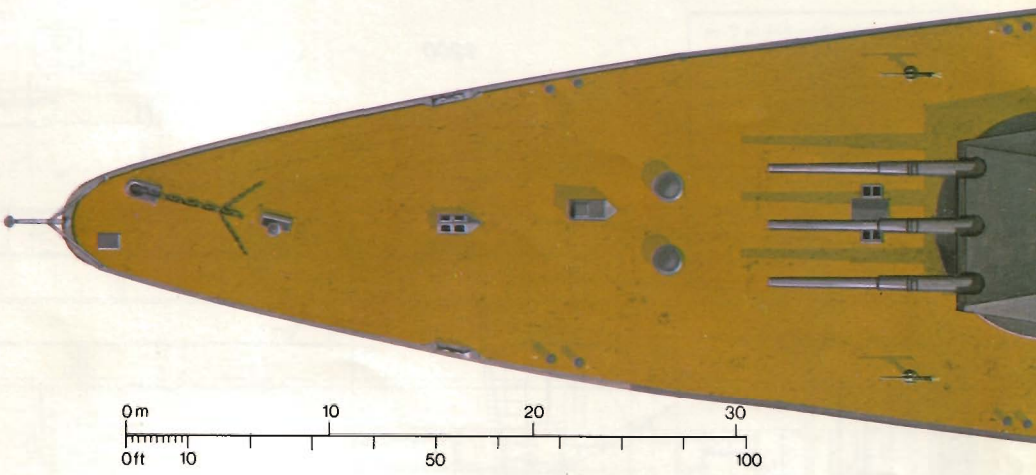


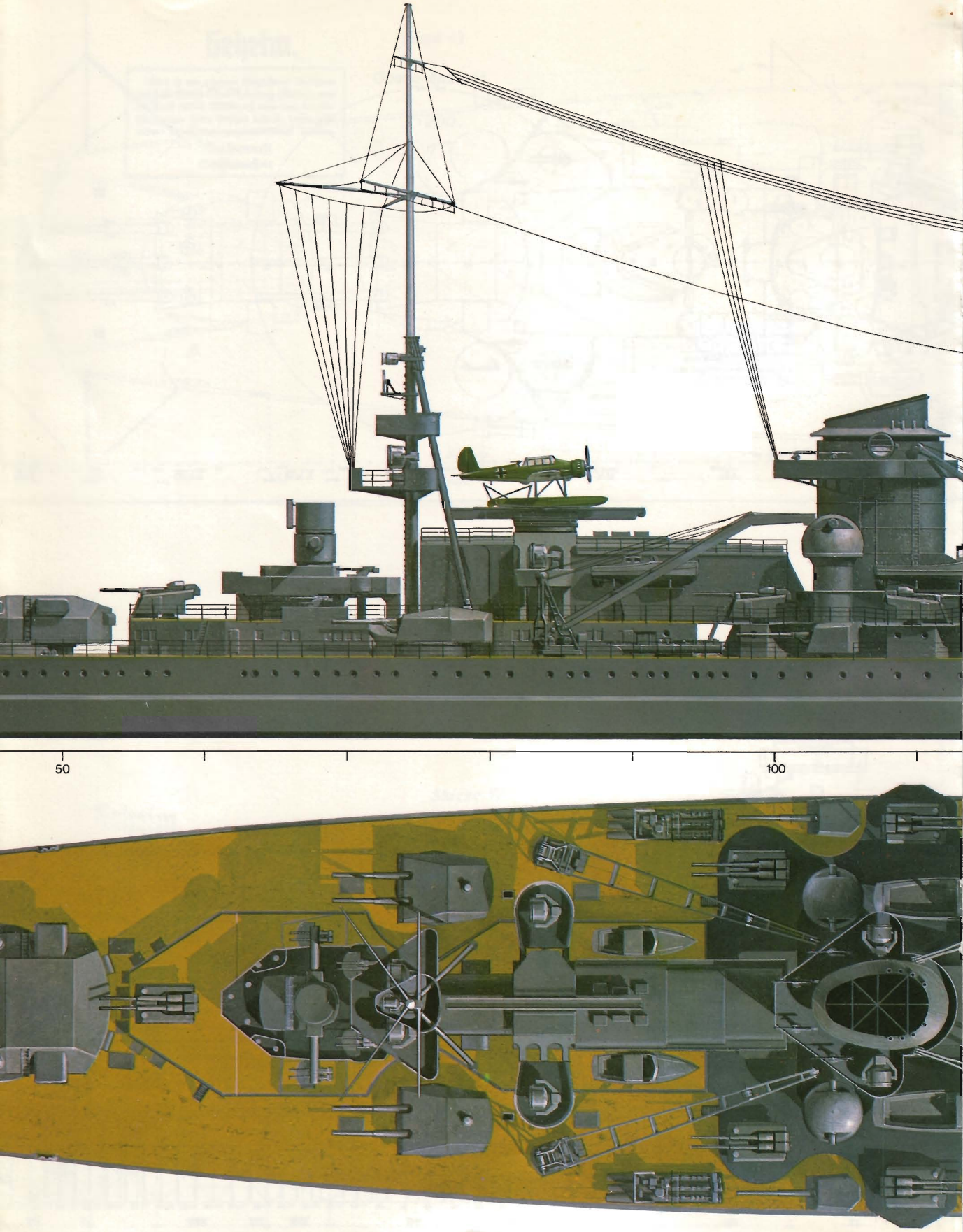
Schiff 125
Marinewerft Wilhelmsh.
Planheft V.

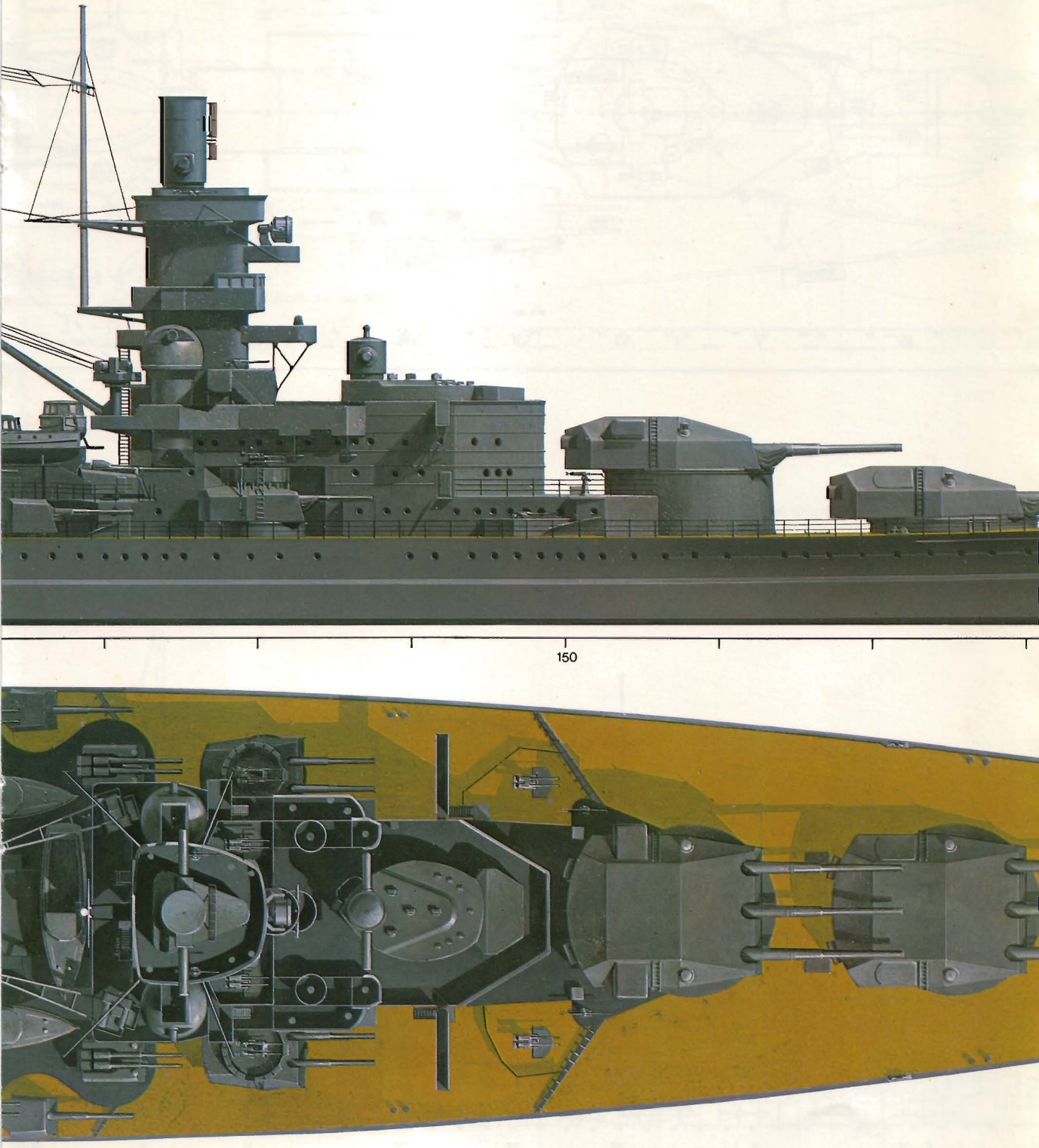


The badges shown are left *Gneisenau* and right *Scharnhorst*.






50
100


150

Scharnhorst as she appeared in 1941 with a two-tone colour-scheme designed to foreshorten the hull. The Arado floatplane has been omitted from the plan view to clarify the catapult structure. A quadruple 2cm AA gun is shown on the forward twin 15cm turret, but one was also mounted temporarily in place of the searchlight abreast of the catapult during this period. The strip forward and aft of the armour belt is the protective covering for the degaussing coil.