

Secret

Register N^o 404

GERMAN NAVY

(Battleships and Battle Cruisers)

JUNE, 1917

Reprint of British Admiralty Publication

NAVY DEPARTMENT
OFFICE OF NAVAL INTELLIGENCE

July, 1917



WASHINGTON
GOVERNMENT PRINTING OFFICE
1917

DECLASSIFIED
Authority E O 10501

CONFIDENTIAL

Attention is called to the penalties attending the disclosure of official secrets.

C. R. 100

GERMAN NAVY.

PART III
SECTION 2

BATTLESHIPS, WATTLE CRUISERS, AND COAST DEFENCE SHIPS.

| Name | Classification | Year | Tonnage | Armament | Speed |
|------|----------------|------|---------|----------|-------|
| Agis | Light Cruiser | 1912 | 1,850 | 10.5" | 21.5 |
| Agis | Light Cruiser | 1913 | 1,850 | 10.5" | 21.5 |
| Agis | Light Cruiser | 1914 | 1,850 | 10.5" | 21.5 |
| Agis | Light Cruiser | 1915 | 1,850 | 10.5" | 21.5 |
| Agis | Light Cruiser | 1916 | 1,850 | 10.5" | 21.5 |
| Agis | Light Cruiser | 1917 | 1,850 | 10.5" | 21.5 |
| Agis | Light Cruiser | 1918 | 1,850 | 10.5" | 21.5 |
| Agis | Light Cruiser | 1919 | 1,850 | 10.5" | 21.5 |
| Agis | Light Cruiser | 1920 | 1,850 | 10.5" | 21.5 |
| Agis | Light Cruiser | 1921 | 1,850 | 10.5" | 21.5 |
| Agis | Light Cruiser | 1922 | 1,850 | 10.5" | 21.5 |
| Agis | Light Cruiser | 1923 | 1,850 | 10.5" | 21.5 |
| Agis | Light Cruiser | 1924 | 1,850 | 10.5" | 21.5 |
| Agis | Light Cruiser | 1925 | 1,850 | 10.5" | 21.5 |
| Agis | Light Cruiser | 1926 | 1,850 | 10.5" | 21.5 |
| Agis | Light Cruiser | 1927 | 1,850 | 10.5" | 21.5 |

SECRET.

NAVY DEPARTMENT,
OFFICE OF NAVAL INTELLIGENCE,
Washington, July 13, 1917.

This pamphlet is a reprint of a confidential British publication which this office is authorized to republish.

It is very important that this information should be kept secret.

No person not a commissioned officer of the Navy should be allowed to examine this pamphlet.

ROGER WELLES,
Captain, U. S. N., Director of Naval Intelligence.

CONFIDENTIAL.

This book is the property of His Majesty's Government. It is intended for the use of officers generally, and may in certain cases be communicated to persons in His Majesty's Service below the rank of commissioned officer who may require to be acquainted with its contents in the course of their duties. The officers exercising this power will be held responsible that such information is imparted with due caution and reserve.

CONFIDENTIAL.

Attention is called to the Penalties attaching to any infraction of the
Official Secrets Act.

C.B. 1182.

GERMAN NAVY.PART III.SECTION 2.BATTLESHIPS, BATTLE CRUISERS, AND COAST DEFENCE SHIPS.

| Name. | Classification. | Page. | Plate No. | Name. | Classification. | Page. | Plate No. |
|--------------------------------|---------------------|-------|-----------|------------------------|---------------------|-------|-----------|
| Aegir..... | Coast Defence Ship. | 57 | 15 | Lothringen..... | Battleship | 24 | 7 |
| Baden..... | Battleship | 3 | 1 | Mackensen..... | Battle Cruiser | 39 | — |
| Bayern..... | " | 3 | 1 | Manteuffel..... | " | 39 | — |
| Beowulf..... | Coast Defence Ship. | 58 | 15 | Markgraf..... | Battleship | 5 | 2 |
| Brandenburg..... | Battleship | 36 | 10 | Mecklenburg..... | " | 28 | 8 |
| Braunschweig..... | " | 24 | 7 | Moltke..... | Battle Cruiser | 48 | 13 |
| Derfflinger..... | Battle Cruiser | 39 | 11 | Nassau..... | Battleship | 16 | 5 |
| Deutschland..... | Battleship | 20 | 6 | Odin..... | Coast Defence Ship. | 57 | 15 |
| Elsass..... | " | 24 | 7 | Oldenburg..... | Battleship | 12 | 4 |
| Friedrich der Grosse..... | " | 8 | 3 | Ostfriesland..... | " | 12 | 4 |
| Frithjof..... | Coast Defence Ship. | 58 | 15 | Posen..... | " | 16 | 5 |
| Grosser Kurfürst..... | Battleship | 5 | 2 | Preussen..... | " | 24 | 7 |
| Hagen..... | Coast Defence Ship. | 58 | 15 | Prinzregent Luitpold.. | " | 8 | 3 |
| Hannover..... | Battleship | 20 | 6 | Rheinland..... | " | 16 | 5 |
| Heimdall..... | Coast Defence Ship. | 58 | 15 | Sachsen..... | " | 3 | 1 |
| Helgoland..... | Battleship | 12 | 4 | Schlesien..... | " | 20 | 6 |
| Hessen..... | " | 24 | 7 | Schleswig-Holstein.... | " | 20 | 6 |
| Hildebrand..... | Coast Defence Ship. | 58 | 15 | Schwaben..... | " | 28 | 8 |
| Hindenburg..... | Battle Cruiser | 39 | — | Seydlitz..... | Battle Cruiser | 44 | 12 |
| Kaiser..... | Battleship | 8 | 3 | Siegfried..... | Coast Defence Ship. | 58 | 15 |
| Kaiser Barbarossa..... | " | 32 | 9 | Thüringen..... | Battleship | 12 | 4 |
| Kaiser Friedrich III..... | " | 34 | 9 | Von der Tann..... | Battle Cruiser | 52 | 14 |
| Kaiser Karl der Grosse..... | " | 31 | 9 | Westfalen..... | Battleship | 16 | 5 |
| Kaiser Wilhelm II..... | " | 33 | 9 | Wettin..... | " | 28 | 8 |
| Kaiser Wilhelm der Grosse..... | " | 32 | 9 | Wittelsbach..... | " | 28 | 8 |
| Kaiserin..... | " | 8 | 3 | Wörth..... | " | 36 | 10 |
| König..... | " | 5 | 2 | Württemberg..... | " | 3 | 1 |
| König Albert..... | " | 5 | 2 | Zähringen..... | " | 28 | 8 |
| Kronprinz..... | " | 8 | 3 | | | | |
| | | 5 | 2 | | | | |

CONFIDENTIAL

List of Plates.

(Loose at end of Part III.)

- No. 1.—"Baden," "Bayern," "Sachsen," and "Württemberg" Plan.
- " 2.—"König," "Grosser Kurfürst," "Markgraf," and "Kronprinz" Plan.
- " 3.—"Kaiser," "Friedrich der Grosse," "Kaiserin," "König Albert," and "Prinz-regent Luitpold" Plan.
- " 4.—"Helgoland," "Ostfriesland," "Thüringen," and "Oldenburg" Plan.
- " 5.—"Nassau," "Westfalen," "Rheinland," and "Posen" Plan.
- " 6.—"Deutschland," "Hannover," "Schleswig-Holstein," and "Schlesien" Plan.
- " 7.—"Braunschweig," "Elsass," "Preussen," "Hessen," and "Lothringen" Plan.
- " 8.—"Wittelsbach," "Wettin," "Zähringen," "Mecklenburg," and "Schwaben" Plan.
- " 9.—"Kaiser Wilhelm der Grosse," "Kaiser Barbarossa," "Kaiser Wilhelm II," and "Kaiser Friedrich III" Plan.
- " 10.—"Brandenburg" and "Wörth" Plan.
- " 11.—"Derfflinger" Plan.
- " 12.—"Seydlitz" Plan.
- " 13.—"Moltke" Plan.
- " 14.—"Von der Tann" Plan.
- " 15.—"Odin," "Aegir," "Siegfried," "Beowulf," "Frithjof," "Hildebrand," "Heim-dall," and "Hagen" Plan.

| No. | Ship | Designation before Launch. | Programme Year. | Built or Building at | Ordered. | Laid Down. | Launched. | Com-missioned for Trials. | Completed Trials. |
|-----|---|------------------------------|-----------------|-------------------------|------------|------------|-------------|---------------------------|-------------------|
| 1. | Baden, Bayern, Sachsen, and Württemberg | | 1913-14 | Howaldt's Works, Kiel. | *20. 4. 13 | *— 9. 13 | 1915 | — 4. 16 | *— 9. 16 |
| 2. | König, Grosser Kurfürst, Markgraf, and Kronprinz | Ersatz Wörth | 1913-14 | Schichau Works, Danzig. | *— 5. 13 | *19. 2. 14 | *— 12. 15 | *— 11. 16 | *— 3. 17 |
| 3. | Kaiser, Friedrich der Grosse, Kaiserin, König Albert, and Prinz-regent Luitpold | Ersatz Kaiser Friedrich III. | 1914-15 | Germania Yard, Kiel. | 1914 | *23. 5. 14 | *21. 11. 16 | — | — |
| 4. | Helgoland, Ostfriesland, Thüringen, and Oldenburg | Ersatz Kaiser Wilhelm II. | 1915-16 | Vulcan Works, Ham-burg. | — | 1915 | — | — | — |

BATTLESHIPS.

BATTLESHIPS.

Bayern, Baden, Sachsen, and Württemberg.

(See Plate 1.)

| Ship. | Designation before Launch. | Programme Year. | Built or Building at | Ordered. | Laid Down. | Launched. | Com-missioned for Trials. | Completed Trials. |
|-------------|------------------------------|-----------------|-------------------------|------------|------------|-------------|---------------------------|-------------------|
| Bayern | "T" | 1913-14 | Howaldt's Works, Kiel. | *20. 4. 13 | *— 9. 13 | 1915 | — 4. 16 | *— 9. 16 |
| Baden | Ersatz Wörth | 1913-14 | Schichau Works, Danzig. | *— 5. 13 | *19. 2. 14 | *— 12. 15 | *— 11. 16 | *— 3. 17 |
| Sachsen | Ersatz Kaiser Friedrich III. | 1914-15 | Germania Yard, Kiel. | 1914 | *23. 5. 14 | *21. 11. 16 | — | — |
| Württemberg | Ersatz Kaiser Wilhelm II. | 1915-16 | Vulcan Works, Ham-burg. | — | 1915 | — | — | — |

* Approximate dates.

The Bayern is believed to have been launched in a very advanced condition.

General Remarks.

These battleships represent a very great advance on their predecessors, the König class, in calibre of main armament, and in length and displacement, but not, it is believed, in speed. Strictly speaking, the following details apply to the Bayern and Baden only, but it is believed that in all essentials the Sachsen and Württemberg are sister ships. The Baden is fitted as fleet flagship.

Complement.—Peace complement, about 1,200; war complement, about 1,400.

General Appearance.—Tripod foremast, short pole mainmast; two funnels, the foremost funnel, which is considerably the larger, being close abaft the tripod mast.

General Dimensions.—

| | |
|-----------------------------|--------------------|
| Length, L. W. L. | 623 ft. 4 ins. |
| Breadth, extreme | 99 " 9 " |
| Draught, designed load | 28 " 0 " |
| Displacement, designed load | about 28,000 tons. |

Armour.—(The thicknesses are doubtful).

Main Belt.—15" amidships.

Battery.—

Turrets.—The turrets are very noticeably longer than those of the 12-in. guns in previous ships. The lower part of the front armour of the turret is approximately vertical instead of the whole of the front armour being sloping as in previous types. This indicates that the gun trunnions are placed close up to the front armour, as otherwise the gun port openings would be unduly large. The fact of thus throwing the weight of the gun forward involves an extension of the gun house to the rear, in order to preserve a balance about the axis of the turret.

The roofs are gabled with only a narrow portion horizontal. This design may have been adopted in order to reduce the amount of vertical armour necessary and to permit the thickness of the top of the gun-house to be increased for protection against plunging fire without unduly increasing the weight of the revolving portion of the turret; but no information regarding the thickness of the armour is yet available.

The apertures for the range finder are at the sides of the turret, well towards the front.

Conning and Control Towers.—Fore, 17 1/4'; the general arrangement appears to be similar to that in Nassau (see p. 18).

Horizontal.—Two armored decks are fitted, the upper one being designed to give protection against aircraft attack.

DECLASSIFIED Authority E.O. 10501

Bayern, Baden, Sachsen, and Württemberg—cont.

Armament.—(Authentic only as regards Bayern and Baden.)
Guns.—

(For approximate arcs of training, see Plate.)
8—15 in. (38 cm.), L/45, mounted in four turrets on the centre line, the guns of the second and third turrets firing over those of the first and fourth respectively. Loading at any angle of elevation, which represents a departure from previous types of turret mounting.
16—5.9-in. (15 cm.) Q.F., L/50, in battery.
4 or 8—22-pr. (8.8 cm.) semi-automatic, anti-aircraft guns, fitted with curved shields.
Torpedo Tubes.—(Doubtful.)
5—19.7 in. (50 cm.) submerged.

Searchlights.—Probably 8—43.3-in. (110 cm.) are carried, four on legs of tripod mast and four on platforms between after funnel and mainmast.

Fire Control.—As in previous ships, the gun control tower and fore conning tower are practically in one, being merely separated by a bulkhead. The control tower is abaft the conning tower and projects above it.

Accommodation aloft is greatly increased as compared with previous ships. It appears to consist of:—

- (1) A director tower placed immediately on top of tripod mast;
- (2) A spotting position immediately above the director tower;
- (3) Below the director tower, a splinter-proof top used probably in connection with secondary control.

Range-finder Positions.—As in previous ships, a range-finder is mounted on each of the two gun control towers and in each turret; and probably there are also the usual armoured hoods projecting just above the upper deck, with range-finders for the battery guns. The apertures of the turret range-finders are no longer placed in armoured goods, projecting above the roof of the gun-house, as in previous ships, but are in the sides of the gun-house, close up to the front armour.

Machinery and Boilers.—

Main Engines.—

Bayern.—Parsons turbines.

Baden.—Schichau turbines.

Sachsen.—Turbines.

Württemberg.—Turbines.

Boilers.—Twenty Schulz water tube.

Speed, Horse-Power, and Fuel.

| Ship. | Speed. (Designed.) | Horse-Power. (Designed.) | Fuel. (a) Coal. (b) Oil. |
|------------------|-----------------------|-----------------------------|--------------------------------|
| Baden..... | Knots. 23 | — | { (a) 4,724 (b) Some |
| Bayern..... | | | |
| Sachsen..... | | | |
| Württemberg..... | | | |

König, Grosser Kurfürst, Markgraf, and Kronprinz.

(See Plate 2.)

| Ship. | Designation before Launch. | Programme Year. | Built at | Ordered. | Laid Down. | Launched. | Com-missioned for Trials. | Completed Trials. |
|-----------------------|------------------------------------|-----------------|-----------------------------------|----------|------------|-----------|---------------------------|-------------------|
| König..... | S..... | 1911-12 | Imperial Dockyard, Wilhelmshaven. | *-4.11 | -10.11 | 1.3.13 | 26.8.14 | *-11.1 |
| Grosser Kurfürst..... | Ersatz Kurfürst Friedrich Wilhelm. | 1911-12 | Vulcan Works, Hamburg. | *12.8.11 | -10.11 | 5.5.13 | 19.8.14 | *-11.14 |
| Markgraf..... | Ersatz Weissenburg... | 1911-12 | Weser Yard, Bremen.. | *12.8.11 | -11.11 | 4.6.13 | 1.10.14 | *-1.15 |
| Kronprinz..... | Ersatz Brandenburg... | 1912-13 | Germania Yard, Kiel. | *23.4.12 | *8.5.12 | 21.2.14 | *-12.14 | *-3.15 |

* Approximate dates.

The König was launched with all her boilers and turbines in place.

Cost.—

| | |
|--------------------------|-------------|
| Hull, machinery, &c..... | £ 1,467,711 |
| Gun armament..... | 881,115 |
| Torpedo armament..... | 67,025 |

Total..... £2,415,851

General Remarks.—These were the first German battleships with all centre-line turrets. In other respects they do not represent a great advance on their immediate predecessors, the Kaiser class, and details of the latter may be accepted, in the absence more precise information, as applying generally to the König class also.

Complement.—Peace complement, about 1,130; war complement, 1,365. A turret's crew, including magazine and shell room parties, numbers three or four officers and 70 men.

General Appearance.—See Photograph Book.

Accommodation.—The officers' accommodation is aft.

General Dimensions, &c.—

| | |
|---|--|
| Length, extreme..... | 575 ft. 9 ins. |
| " L. W. L..... | 273 " 2 " |
| Breadth, extreme..... | 96 " 9 " |
| Draught, designed load..... | 27 " 3 " |
| Displacement, designed load..... | 25,390 tons. |
| Freeboard (approximate) at designed draught..... | { at stem..... 22 ft. 0 ins. amidships..... 19 " 6 " aft..... 13 " 0 " |
| Height of axis of heavy guns (approximate) at designed draught..... | { No. 1 turret..... 26 " 0 " No. 2 turret..... 35 " 0 " Nos. 3 and 4 turrets..... 27 " 0 " No. 5 turret..... 19 " 0 " |
| Height of sighting slits of fore part of C. T. (approx.)..... | 42 " 0 " |
| " fore funnel to L. W. L. "..... | 73 " 0 " |
| " " lower mast head to L. W. L. "..... | 98 " 0 " |
| Depth from keel to battery deck..... | 39 " 11 1/2 " |

Masts.—

Two light pole masts were originally fitted. In Grosser Kurfürst and Kronprinz, since the Battle of Jutland, a much heavier foremast has been put in, carrying splinter-proof spotting top, and, immediately below this, a searchlight platform.

König, Grosser Kurfürst, Markgraf, and Kronprinz—cont.

Constructive Details.—All considerations of convenience have been subordinated to making the subdivision as complete as possible. Below the armoured deck all main transverse bulkheads are unpierced. All important bulkheads are stiffened in a very thorough manner and tested at 30 ft. head of water.

There are four decks above the armoured deck, viz., middle deck, main or battery deck, upper deck, and sheltered decks. This is one deck more than in *Kaiser* class.

Armour and other Protection.

Material.—Krupp cemented.

Main Belt.—About 14" amidships, tapering to the lower edge, and decreasing to 6" forward and aft, beyond the transverse armoured bulkheads.

Width about 12 ft., of which about 5 ft. 7 ins. is below the designed load water-line.

Transverse Bulkheads.—About 10" thick, one fitted at each end of the midship portion of belt, one about 20 ft. from the stern.

Upper Belt.—About 10" thick, width 6 ft. 10 ins.

Battery.—7·9" thick, width 6 ft. 10 ins.

Barbettes.—14" thick.

Turrets.—14" in front.

Conning and Control Towers.—Fore, 13½"; after, 10". Generally similar to those of *Nassau* (see p. 18).

Horizontal.—The principal armoured deck, thickness 2·4" to 3", is about 1 ft. below the load water line amidships and aft sloping down to lower edge of armour. Forward it descends to a lower level and is flat.

Under Water Protection.—Generally similar to that in *Kaiser Class* (p. 10).

Torpedo Nets.—Beam net defence was fitted but has been discarded since the Battle of Jutland. There were 13 net booms each side, 32·8 ft. apart.

Armament.**Guns and Ammunition Supply.**

(For approximate arcs of training, see Plate.)

10—12-in. (30·5 cm.) Q.F. L/50, on Drehscheiben-Lafette C/08; in pairs in centre line turrets, 2nd and 4th firing over 1st and 5th.

Maximum rate of fire about 2½ rounds per gun per minute.

Ammunition supply electric. Loading at fixed angle of elevation.

The breech mechanism is hydraulic or hand. Percussion or electro-magnetic firing gear.

The gun runs out automatically after recoil, two hydraulic recoil cylinders and a hydro-pneumatic running-out cylinder being fitted.

Elevating gear is hydraulic, alternative hand. Training gear also electric— with one or with two motors at will—alternative hand.

The gunlayers' sights are periscopic, the trainer's sight direct.

14—5·9 in. (15 cm.), in battery.

Maximum rate of fire about 16 rounds per minute.

*4—22-pr. (8·8 cm.) semi-automatic, anti-aircraft guns, on after superstructure.

2—machine guns.

†2—7-pr. (6 cm.) Q.F. L/21, boat and field guns.

For further details, see Part IV. of this book.

Magazines and Stowage.—The stowage of 12" ammunition is about 100 rounds per gun. Magazines are below shell rooms.

Torpedo Tubes.

5—19·7 in. (50 cm.), submerged.

The four broadside tubes are fixed at an angle of 20° before the beam and are fitted with gyro angling gear which can be set for every 15° from 30° before to 60° abaft the direction of the tube.

* These guns have taken the place of four of the ten 22-pr. (8·8 cm.) Q.F. L/45, which were originally carried. The rest of the light guns are believed to have been removed entirely.

† Probably landed for service in the field.

König, Grosser Kurfürst, Markgraf, and Kronprinz—cont.**Armament—cont.**

Torpedoes.—In war time about 20 torpedoes are carried.

Mines.—There is no permanent stowage for mines.

Searchlights.—8—43·3-in. (110-cm.), worked by hand. *Grosser Kurfürst* and *Kronprinz* are believed to have been fitted with an additional searchlight on platform below fore top.

Range-finder Positions.—Generally as in *Kaiser* class (see p. 11). The range-finder in the fore control position is considerably longer than the others. The *Kronprinz* is reported also to have a range-finder mounted in fore top.

Wireless Telegraphy.—The main wireless room is situated on the middle deck, just abaft No. 2 barbette.

Battle Signal Stations.—Fitted on either side of main deck. The general arrangements are similar to those in *Kaiser* class (see p. 11).

Boats.—For details, see Section I. With the exception of a cutter on each side in davits, the boats are carried inboard.

Anchors.—Three stockless bower anchors and one stern anchor are carried. Steam capstans forward, electric capstan aft.

Machinery and Boilers.**Main Engines.**

Type.—*König*.—Parsons turbines, modified, 3-shaft.

Grosser Kurfürst.—A.E.G. turbines.

Markgraf.—Bergmann turbines.

Kronprinz.—Germania turbines.

Boilers.

Fifteen in number. Three fitted to burn oil only, the remainder coal and oil.

Type—Schulz, Navy.

Auxiliary Machinery.—The main electrical installation consists of four turbo-dynamos and two Diesel-driven dynamos.

Funnels.—Two.

Propellers.—Three.

Speed, Horse-Power, and Fuel.

| | Speed (designed) Knots. | Horse-Power (designed). | Fuel: | |
|--|----------------------------|----------------------------|-----------|----------|
| | | | (a) Coal. | (b) Oil. |
| | 21.0 | 31,000 (T) | (a) 3,543 | (b) 690 |

Endurance.

| | Speed. | Horse-Power. | Daily Consumption. | Radius of Action | Remarks. |
|---|--------|--------------|--------------------|------------------|----------|
| | Knots. | | Tons. | Miles. | |
| At ½ths designed power..... | 20.2 | 24,800 | 505 | 4,100 | |
| At maximum continuous seagoing speed..... | 19.6 | 21,700 | 455 | 4,430 | |
| At ¾ths designed power..... | 18.8 | 18,600 | 400 | 4,830 | |
| At ⅘ths designed power..... | 16.6 | 12,400 | 332 | 5,140 | |
| At ⅙th designed power..... | 13.0 | 6,200 | 212 | 6,300 | |
| At 10 knots..... | 10.0 | 2,800 | 135 | 7,600 | |

Part III.
Section 2.

Kaiser, Friedrich der Grosse, Kaiserin, König Albert, and Prinzregent Luitpold.

(See Plate 3.)

Battle-ships.

| Ship. | Designation before Launch. | Programme Year. | Built at | Ordered. | Laid Down. | Launched. | Com-missioned for Trials. | Completed Trials. |
|---------------------------|--------------------------------|-----------------|--------------------------|----------|------------|-----------|---------------------------|-------------------|
| Kaiser..... | Ersatz <i>Hildebrand</i> | 1909-10 | Imperial Dockyard, Kiel. | *9.09 | *10.09 | 22.3.11 | 1.8.12 | 7.12.12 |
| Friedrich der Grosse..... | Ersatz <i>Heimdall</i> | 1909-10 | Vulcan Works, Hamburg. | *9.09 | 26.1.10 | 10.6.11 | 15.10.12 | 22.1.13 |
| Kaiserin..... | Ersatz <i>Hagen</i> | 1910-11 | Howaldt's Works, Kiel. | *4.10 | 11.10 | 11.11.11 | 14.5.13 | 13.12.13 |
| König Albert..... | Ersatz <i>Aegir</i> | 1910-11 | Schichau Works, Danzig. | *4.10 | 17.7.10 | 27.4.12 | 31.7.13 | 8.11.13 |
| Prinzregent Luitpold..... | Ersatz <i>Odin</i> | 1910-11 | Germania Yard, Kiel. | *4.10 | 1.11 | 17.2.12 | 19.8.13 | 6.12.13 |

*Approximate dates.

The *Kaiser* was launched with boilers in place and the *Friedrich der Grosse* with turbines as well as boilers. It was stated these were the first cases in which this practice had been adopted for large war vessels in Germany. The progress of construction of the *König Albert* was greatly impeded by a 20 weeks' strike and lock-out at the Schichau works in 1911 in consequence of which the vessel was delivered some two months late.

Cost.—

| | Kaiser, <i>Friedrich der Grosse.</i> | Kaiserin, <i>König Albert,</i> <i>Prinzregent Luitpold.</i> |
|--------------------------|---|---|
| Hull, machinery, &c..... | £1,443,249 | £1,467,711 |
| Gun armament..... | 814,825 | 823,141 |
| Torpedo armament..... | 68,493 | 64,579 |
| Totals..... | £2,326,567 | £2,355,431 |

The difference in cost of torpedo armament of these ships was said to be due to a reduction in the cost of manufacture at the torpedo workshops at Friedrichsort.

General Remarks.—*Friedrich der Grosse* was fitted as fleet flagship, and *Kaiser* and *Prinzregent Luitpold* as flagships. The *Kaiser* was also provided with special accommodation for the Emperor. Up to then it had been customary for this accommodation to be fitted in the fleet flagship.

These are the first turbine battleships built for Germany, and it is noteworthy that although some uncertainty appears to have prevailed regarding the adoption of a system of propulsion by 3 or 4 screws, the former—followed in and since the *Kaiser Friedrich* type—was adhered to.

As compared with the two preceding types, the designs of these ships exhibit a marked improvement in the disposition of the heavy guns, which enables the whole 10 of them to be fired on either broadside, as against 8 out of 12 in the *Nassaus* and *Helgolands*. Although there is a reduction of one turret and two 12-in. guns there is a further increase in displacement. This is partly accounted for by the very heavy armour protection.

During her trials, it is stated, the *Kaiser* proved herself an excellent sea-boat and steady gun-platform. Reports on her manoeuvring qualities are also favourable.

In the vessels of this class, the two foremost turrets are not usually fired at night, on account of the effect of the flash and blast on the bridge and searchlight personnel.

Kaiser, Friedrich der Grosse, Kaiserin, König Albert, and Prinzregent Luitpold—cont.

Part III.
Section 2.

Battle-ships.

Complement.—Peace complement, 1,125 (as private ship). On mobilisation 300 extra men are put in for purposes of coal trimming. Three Gunnery Officers are carried.

Accommodation.—The officers' accommodation is aft.

General Appearance.—See Photograph Book.

General Dimensions—

| | |
|---|-----------------|
| Length, L.W.L..... | 564 ft. 4 ins. |
| Breadth, extreme..... | 95 " 2 " |
| Draught, designed load..... | 27 " 3 " |
| " full load..... | about 28 " 10 " |
| Displacement, designed load { (except <i>Prinzregent Luitpold</i>) | 24,310 tons. |
| <i>Prinzregent Luitpold</i> | 24,410 " |
| Freeboard (approximate) at designed draught { at stem..... | 22 ft. 0 ins. |
| amidships..... | 19 " 6 " |
| aft..... | 13 " 0 " |
| Height of axis of heavy guns (approximate) at designed draught { in 4 foremost turrets..... | 27 " 0 " |
| " " " " " in aftermost turret..... | 19 " 0 " |
| Height of fore funnel to L.W.L..... | 65 " 0 " |
| " " lower masthead to L.W.L..... | 100 " 0 " |

Masts.—Two pole masts are fitted, 26 $\frac{3}{4}$ in. in diameter.

Constructive Details.—Very broad bilge-keels, extending almost one-third of the length of the ship, are fitted. The *Prinzregent Luitpold*, and probably the other ships of this type also, are fitted with submarine signalling apparatus manufactured by the Norddeutsche Maschinen- und Armaturenfabrik.

Two longitudinal bulkheads, which extend to the upper deck, run nearly the whole length of the citadel, probably at about 30 feet from the ship's side. Above the main deck they are pierced at fairly wide intervals. On the middle (armoured) deck the transverse bulkheads are pierced by watertight doors on the inboard side of these longitudinal bulkheads. Thus it is possible to pass on the middle deck nearly from one end of the ship to the other. The ladders from the main to the middle deck lead each into a small watertight compartment.

Armour and other Protection.—

Material.—Krupp cemented.

Main Belt.—Width 9 ft. 9 in., of which about 5 ft. 7 in. is below the waterline. The midship section extends from the foremost to the aftermost turret, is 13 $\frac{3}{4}$ " thick, tapering to the lower edge, and is closed at both ends by transverse bulkheads 7 $\frac{1}{2}$ " thick. It is continued forward to the stem and aft to within 18 ft. of the stern by 7 $\frac{3}{4}$ " armour, and is closed at the after end by a further transverse bulkhead of similar thickness.

Upper Belt.—Width 7 ft. 3 in. The midship section extends from the foremost to the aftermost turret, is 9" thick, and is closed at both ends by transverse bulkheads 7 $\frac{1}{2}$ " thick. It is continued forward to the stem by 7 $\frac{3}{4}$ " armour, but is not continued aft.

Battery.—7 $\frac{3}{4}$ " thick. It extends from the foremost turret to No. 4 turret, the ends being closed by diagonal bulkheads 7 $\frac{3}{4}$ " thick, which butt on the barbettes.

There are slits in the armour of the foremost and after casemates for the use of Officers of Quarters.

Splinter Bulkheads (or Casemates).—The guns of the secondary battery are isolated singly by splinter-proof 1" bulkheads, fitted with watertight doors, and closed at the rear by longitudinal bulkheads of uncertain thickness.

Barbettes.—11 $\frac{3}{4}$ " thick.

Turrets.—11 $\frac{3}{4}$ " in front and 11" to 11 $\frac{3}{4}$ " in rear. Sighting holes are cut in the armour. The turrets pivot on the lower platform deck. The side turrets are 23 ft. from the centre line, as in the *Helgoland* class. The revolving portion of each turret weighs 526 $\frac{1}{2}$ tons.

Conning and Control Towers.—Foremost 13 $\frac{3}{4}$ ", after 7 $\frac{3}{4}$ ", thick. Similar to those of *Nassau* (page 18).

DECLASSIFIED
Authority E.O. 10501

Kaiser, Friedrich der Grosse, Kaiserin, König Albert, and Prinzregent Luitpold—cont.**Armour and other Protection—cont.**

Armoured Hoods.—See below, under "Range Finder Positions."

Under-water protection.—On the Blochmann-Neudeck system, the characteristic feature of which is the provision of two continuous longitudinal protective bulkheads on each side in the region of boilers, engines, and magazines. The outer of the two bulkheads, which is about 6 ft. 7 ins. from the ship's side and about .3" thick, extends from the inner bottom to the slope of the armoured deck. The inner or torpedo protection bulkhead is 6 ft. 7 ins. from the outer, and of high tensile steel 1½" to 1¾" thick, or possibly thicker. It extends from the inner bottom to just above the armoured deck, and from there is continued by a splinter protection bulkhead, about 1½" thick, up to the battery deck.

In conjunction with this system there is minute subdivision.

Horizontal.—The principal armoured deck extends the entire length of the ship, and is 1½" thick on the flat and 4" on the slopes. Before and abaft the centre line barbettes it descends to a lower level. The decks outside of and on top of the battery are believed to be armoured with armour 1½" to 2½" thick.

Torpedo Nets.—Beam net defence was fitted but has been discarded since the Battle of Jutland. There were 13 net booms each side, 32.8 ft. apart.

Armament.—*Guns and Ammunition Supply.*

(For approximate arcs of training, see Plate.)

10—12 in. (30.5 cm.) Q.F., L/50, in five turrets, believed to be generally similar to the 12-in. turrets of *Helgoland*, but a chain rammer was introduced for the first time in this class. Each turret is fitted with a 10-ft. range-finder except the foremost turret which has a longer one.

Ammunition supply electric. Loading at fixed angle of elevation. Maximum rate of fire about 2½ rounds per gun per minute.

Elevating gear hydraulic; training hydraulic or electric alternative, hand. The gunlayers' sights are periscopic, the trainer's sight direct.

14—5.9-in. (15 cm.) Q.F., L/45, mounted seven a side in a central battery. Maximum rate of fire about 16 rounds per minute.

*4—22-pr. (8.8 cm.) semi-automatic, anti-aircraft guns, on after superstructure.

2—Machine guns.

†2—7-pr. (6 cm.) Q.F., L/21, boat and field guns.

For further details, see Part IV of this book.

Magazines and Stowage.—It is reported that these ships have an unusually large ammunition stowage. The magazines are below the shell-rooms.

The 12-in. magazines are under the turrets, and the 5.9-in. between the echelon turrets. About 98 rounds per gun are carried for 12-in. guns.

About 200 rounds per gun are carried for 5.9-in. guns.

Magazine cooling arrangements are fitted.

Torpedo Tubes.—

5—19.7-in. (50 cm.) submerged. The 4 broadside tubes are fixed at an angle of 20° before the beam, and are fitted with gyro angling gear which can be set for every 15° from 30° before to 60° abaft the direction of the tube.

Torpedoes.—In war time 16 torpedoes are carried, viz., two for the bow tube, four for each of the foremost, and three for each of the after broadside tubes.

Mines.—There is no permanent stowage for mines.

* These guns have taken the place of four of the twelve 22-pr. (8.8-cm.) Q.F., L/45, which were originally carried. The rest of the light guns are believed to have been removed entirely.

† Probably landed for service in the field.

Kaiser, Friedrich der Grosse, Kaiserin, König Albert, and Prinzregent Luitpold—cont.**Searchlights.—**

8—43.3-in. (110 cm.), worked by hand.

Range Finder Positions.—A 10-ft. or larger range-finder is mounted on each of the two control towers and in each turret. In addition, an armoured hood projecting just above the upper deck is fitted on the starboard side of the battery just before the foremost side turret, and on the port side of the battery just abaft the after side turret; and each of these hoods is fitted with a 10-ft. range-finder. They serve as local control positions for the 5.9" guns.

A spare range-finder is carried in each turret. There are thus at least 12 long range-finders in all on board.

A shorter high-angle range-finder is mounted on No. 4 turret.

Wireless Telegraphy.—The main wireless room is on the armoured deck just abaft the foremost funnel casing.

Battle Signal Stations.—

There are two main battle signal stations and two reserve stations.

Main Battle Signal Stations.—On the main deck in two special casemates, one the port side between the midship turret and No. 6 casemate, the other the starboard side between No. 2 casemate and the midship turret.

In action, flag signals are hoisted on the foremast from the starboard station, and on the mainmast from the port station; they are also hoisted on telescopic masts, about 40 feet long, which pass through the upper deck. These masts are operated by hand, the mast being lowered for each fresh signal to be bent on.

Reserve Battle Signal Stations.—In No. 6 casemate starboard and No. 2 casemate port. Signal flags are kept permanently stowed in these positions.

Boats.—Number probably as in *König* (see Section 1). With exception of a cutter on each side in davits, the boats are all carried inboard.

Boat Derricks.—One on port side abreast the foremost funnel, and on one starboard side directly abaft the after funnel.

Steering Gear.—Two parallel balanced rudders are fitted, each having a surface area of 193½ sq. ft., with the centre propeller between them. Diameter of rudder head, 20 in.

Anchors.—Three stockless bower anchors—two on port and one on starboard side; a light stern anchor right aft on centre line.

Coaling Arrangements.—Electric winches are fitted.

Machinery and Boilers.—*Main engines.—*

Turbines.

Type—*Kaiser* and *Kaiserin*, Parsons.

Friedrich der Grosse, A. E. G.-Vulcan.

König Albert, Schichau.

Prinzregent Luitpold, Parsons.

Arrangement—Three complete sets, each consisting of a H.P., L.P., and astern turbine. No cruising turbines. No reduction gear.

Boilers.—

Sixteen in number (except *Prinzregent Luitpold*—fourteen). All are now fitted to burn coal and oil.

Type—Schulz, Navy type.

Propellers.—

Three. Diameter, 11 ft. 8 in.

DECLASSIFIED
Authority E.O. 10501

Part III. Section 2. Battle-ships. Kaiser, Friedrich der Grosse, Kaiserin, König Albert, and Prinzregent Luitpold—cont.

Speed, Horse-Power and Fuel.

| Speed (designed). | Horse-Power (designed). | Fuel: (a) Coal. (b) Oil. |
|-------------------|-------------------------|--------------------------------|
| Knots. 20.5 | 28,000 (T) | (a) 3,543 (b) 197* |

* Possibly increased.

Steam Trials.

| Ship. | Nature of Trial. | Date. | Speed. | Horse-Power. | Revolutions. | Remarks. |
|------------------------|--------------------|---------|--------|--------------|--------------|----------|
| "Kaiser" | Measured mile | — 9.12 | 23.46 | 55,100 | — | |
| "Friedrich der Grosse" | 6 hours full power | — 9.12 | 22.28 | 41,516 | — | |
| "Kaiserin" | Measured mile | — 12.12 | 22.44 | 42,113 | 268 | |
| "Kaiserin" | 6 hours full power | — 12.12 | 21.4 | 31,721 | — | |
| "König Albert" | Measured mile | — 11.13 | 22.3 | 42,501 | 251 | |
| "König Albert" | 6 hours full power | — 11.13 | 21.15 | 30,997 | — | |
| "König Albert" | Measured mile | — 10.13 | 22.15 | 39,813 | 247 | |
| "König Albert" | 6 hours full power | — 10.13 | 21.4 | 32,965 | 251 | |

Endurance.

| | Speed. | Horse-Power. | Daily Consumption. | Radius of Action. | Remarks. |
|--------------------------------------|----------------|--------------|--------------------|-------------------|----------|
| At 3/4ths designed power | Knots. 19.7 | 22,400 | Tons. 456 | Miles. 3,750 | |
| At maximum continuous seagoing speed | 19.0 | 19,600 | 409 | 4,030 | |
| At 2/3ths designed power | 18.2 | 16,800 | 360 | 4,400 | |
| At 1/2th designed power | 16.1 | 11,200 | 300 | 4,670 | |
| At 10 knots | 12.8 | 5,600 | 192 | 5,800 | |
| | 10.0 | 2,800 | 135 | 6,450 | |

Helgoland, Ostfriesland, Thüringen, and Oldenburg.
(See Plate 4.)

| Ship | Designation before Launch. | Programme Year. | Built at | Ordered. | Laid Down. | Launched. | Com-missioned for Trials. | Completed Trials. |
|--------------|----------------------------|-----------------|-----------------------------------|----------|---------------|-----------|---------------------------|-------------------|
| Helgoland | Ersatz Siegfried | 1908-09 | Howaldt's Works, Kiel. | *20.6.08 | 24.12.08 | 25.9.09 | 23.8.11 | 19.12.11 |
| Ostfriesland | Ersatz Oldenburg | 1908-09 | Imperial Dockyard, Wilhelmshaven. | *19.4.08 | 19.10.08 | 30.9.09 | 1.8.11 | 15.9.11 |
| Thüringen | Ersatz Beowulf | 1908-09 | Weser Yard, Bremen | *20.6.08 | 7.11.08 | 27.11.09 | 1.7.11 | 10.9.11 |
| Oldenburg | Ersatz Frithjof | 1909-10 | Schichau Works, Danzig. | * 8.4.09 | — 1.09 (?) | 30.6.10 | 1.5.12 | 1.7.12 |

* Official dates.

Orders for the Oldenburg (Ersatz Frithjof) and battle cruiser Goeben (H)—both of 1909-10 programme—were provisionally given in autumn 1908 (about October) although funds for commencing these ships were not voted by the Reichstag until the following March. This was done ostensibly to combat the threatened formation of a ship-building ring. The Oldenburg was commenced some months before the contract was finally confirmed, for the convenience of the builders, it was said, who desired to avoid discharging men for want of work. The Secretary of State of the Imperial Navy Office disclaimed all responsibility for this, stating that if preparations had been made it was not at the suggestion of the Naval authorities. The construction of the three ships built at private yards was affected by strikes in 1910 or 1911, but with exception of Helgoland they were delivered up to time. The Helgoland, which had been launched in the short space of 9 months from date of laying down, was delivered some one to two months late.

Helgoland, Ostfriesland, Thüringen, and Oldenburg—cont.

Cost.—

| | |
|----------------------|-------------|
| Hull, machinery, &c. | £ 1,307,263 |
| Gun armament | 929,550 |
| Torpedo armament | 68,493 |
| Total | £2,304,306 |

The amount for gun armament is made up as follows (in the case of Ostfriesland):—

| | |
|--|-----------|
| Guns (evidently including mountings and probably reserve guns) | £ 621,332 |
| Accessories, optical instruments | 17,123 |
| Fire-control installations | 12,231 |
| Ammunition (including first outfit and reserve ammunition) | 259,295 |
| Miscellaneous | 19,569 |
| Total | £929,550 |

General Remarks.—

Ostfriesland is fitted as flagship.

These ships, in many respects, are a distinct improvement on the Nassau type. Their displacement is 3,840 tons greater, they have a heavier armament (12-in.) and slightly greater speed, but their heavy guns are still disposed as in Nassau. The funnels were raised about 6 feet in 1914-15.

Complement.—Peace complement, 1,106 (as private ship), except Ostfriesland, which, when flagship, has 1,097, not including flag officer, staff and retinue. War complement, about 1,400.

General Appearance.—See Photograph Book.

General Dimensions, &c.—

| | |
|---|--|
| Length, L.W.L. | 546 ft. 3 ins. |
| Breadth, extreme | 93 " 6 " |
| Draught, designed load | 26 " 11 " |
| Displacement, designed load | 22,440 tons. |
| Freeboard (approximate), at designed draught | { forward... 22 ft. 0 ins. amidships... 17 " 9 " aft... 19 " 6 " |
| Height of axis of heavy guns (approximate), at designed draught | { forward... 27 " 0 " aft... 25 " 0 " |
| Height of fore funnel to L.W.L. | 65 " 0 " |
| " " lower masthead | 98 " 0 " |

Masts.—There are two steel pole masts. The foremast (and probably the mainmast also) is insulated by a teak covering to well above the level of the searchlights.

Constructive Details.—A fore bridge is not specially fitted, the top of the fore superstructure being arranged as such, with wing extensions on either side, pivoted—as in von der Tann—thus enabling them to be swung aft when the ship is cleared for action.

Docking and bilge keels are fitted.

Armour and other Protection.—

Material.—Krupp cemented.

The battery armour, turrets, and conning towers were supplied by Krupp, the belt by Dillingen.

Part III.
Section 2.Battle-
ships.

Helgoland, Ostfriesland, Thüringen, and Oldenburg—cont.

Armour and other Protection—cont.

Belt.—Complete, except for about 12 ft. at the stern, where a transverse bulkhead 7 $\frac{3}{4}$ " thick connects the ends.

Thickness 11.8" amidships at the waterline, 7 $\frac{3}{4}$ " forward and aft. From 4 ft. above the waterline amidships it commences to taper, reaching a thickness of 7 $\frac{3}{4}$ " at the battery deck.

Between the foremost and aftermost turrets the armour extends from 5 ft. 7 in. below the waterline up to the battery deck, having a total width of 16 ft. 1 in. Both ends of this midship section are closed by 7 $\frac{3}{4}$ " bulkheads, which embrace the bases of the barbets. The belt is continued to the bow and stern, the upper edge being carried up to the battery deck forward and to the lower edge of the scuttles aft.

Battery.—The battery armour is 7 $\frac{3}{4}$ " thick, and extends from the foremost to the aftermost turrets, being closed by diagonal bulkheads 7 $\frac{3}{4}$ " thick which butt on the barbets.

Splinter Bulkheads (or Casemates).—Believed to be similar to *Nassau* (p. 18).

Barbets.—11 $\frac{3}{4}$ " thick. The trunks of the side turrets are not armoured behind the side armour, and do not pierce the slope of the armoured deck. The manner in which this is avoided, namely, by placing them nearer the center line, is shown in Plate.

Turrets.—11 $\frac{3}{4}$ " thick. The turrets pivot on the lower platform deck. It is noteworthy that both in *Helgoland* and *Kaiser* types the side turrets are situated at the same distance from the centre line, viz, 23 feet.

Conning and Control Towers.—Fore, 12" or over; after, 7 $\frac{3}{4}$ " thick. Similar in shape and arrangement to those of *Nassau* (see p. 18).

Armoured Hoods.—Are fitted one on either side of the battery, projecting just above upper deck, and take a 10-ft. range-finder for 5.9-in. guns.

Torpedo Protection Bulkheads.—1 $\frac{1}{2}$ " thick, and distant about 14 ft. from ship's side.

Horizontal.—The principal armoured deck extends the entire length of the ship and is 1 $\frac{1}{2}$ " thick on the level and 2 $\frac{3}{4}$ " on the slopes. Before and abaft the middle line barbets it descends to a lower level. The deck on top of the battery is believed also to be armoured.

Torpedo Nets.—All ships of this type were fitted with beam net defence, but this has been discarded since the Battle of Jutland. It extended approximately from a point below the muzzles of the guns of the fore turret to those of the after turret when trained fore and aft. There were 11 net booms each side, 32.8 ft. apart. In sea-going trim the heels of the booms were almost on the waterline. The net shelves are on a level with the battery deck.

Armament.—

Guns and Ammunition Supply.—

(For approximate arcs of training, see Plate.)

12—12-in. (30.5 cm.) Q.F., L/50, in six turrets. Hand rammer, the staff projecting through a hole in rear of turret.

A 10-ft. range-finder is fitted in each turret. Loading at fixed angle of elevation.

14—5.9 in. (15 cm.) Q.F., L/45, on C. P. mounting C/02/06 mounted seven a side in casemates in a central battery.

*4—22-pr. (8.8 cm.) semi-automatic, anti-aircraft guns, on after superstructure.

2—machine guns.

†2—7-pr. (6 cm.) Q.F., L/21, boat and field guns.

For further details see Part IV. of this book.

* These guns have taken the place of four of the fourteen 22-pr. (8.8-cm.) Q.F., L/45, which were originally carried. The rest of the light guns are believed to have been removed entirely.
† Probably landed for service in the field.

Helgoland, Ostfriesland, Thüringen, and Oldenburg—cont.

Armament—cont.

Magazines and Stowage.—The 12-in. magazines are situated within and at the base of the trunks of the turrets below the armoured deck. The 5.9-in. magazines are on each side of the foremost turret magazines.

Torpedo Tubes—

6—19.7-in. (50 cm.) submerged. The 4 broadside tubes are fixed at an angle of 20° before the beam and fitted with gyro angling gear, which can be set for every 15° from 30° before to 60° abaft direction of tube.

Mines.—There is no permanent stowage for mines.

Searchlights.—

8—43.3-in. (110 cm.), electrically controlled. The searchlights are carried at heights varying from 40 to 55 ft. above load waterline.

Fire Control.—Fire can be controlled from the foremost or after conning towers, or from one of the turrets *via* the lower conning tower. For further information, see Part IV., Section 4.

Range-finder Positions.—The same system as in *Kaiser* (page 11).

Boats.—Number uncertain but probably as in *Nassau* (see Section 1). With exception of the cutters, which are carried in davits between the lateral turrets, the boats are carried inboard.

Boat Derricks.—One on either side directly abaft the third funnel. The derrick masts are connected transversely by a cross-piece near the top.

Steering Gear.—Two parallel balanced rudders are fitted.

Anchors.—Three stockless bower anchors—two on port and one on starboard side; also a light stern anchor.

Coaling Arrangements.—Electric winches are fitted.

Machinery and Boilers.—

Main Engines.—

Three sets, abreast, in separate watertight compartments.

Type.—Vertical, 4-cylinder, triple-expansion.

Boilers.—

Fifteen in number, in three separate boiler-rooms. All are now fitted to burn coal and oil.

Type.—Schulz, Navy type.

Funnels.—Three. The first two are circular and the after one oval in section.

Auxiliary Machinery includes Zoelly turbines made by Escher, Wyss & Co. for driving dynamos.

Propellers.—Three in number.

Speed, Horse-Power, and Fuel.

| Speed. (Designed.) | Horse-Power. (Designed.) | Fuel: (a) Coal. (b) Oil. |
|-----------------------|-----------------------------|--------------------------------|
| Knots. 20.5 | 25,000 | (a) 2,950 (b) 197* |

* Possibly increased

DECLASSIFIED
Authority E.O. 10501

Nassau, Westfalen, Rheinland, and Posen—cont.

Armour and other Protection—cont.

The belt is complete except for about 5 feet at the stern, where a transverse bulkhead connects the ends. It extends from about 5 feet below the load-line to the battery deck. The midship section is closed by armoured bulkheads 7 $\frac{3}{4}$ " thick, which butt on to the bases of the barbettes. At the stem the lower edge of the belt is carried to about 9 feet below the waterline.

Battery.—6 $\frac{1}{2}$ " thick. Extends from the foremost to the aftermost turrets and is closed by diagonal bulkheads 6 $\frac{1}{2}$ " thick which butt on to the barbettes.

Splinter Bulkheads (or Casemates).—The battery guns on each side are separated by lateral screens, connected at their rear by longitudinal bulkheads—one on each side of the battery—thus forming separate casemates.

Barbettes.—11" thick.

Turrets.—11" thick.

Conning and Control Towers.—Fore, 12"; after, 7".

The fore conning and control tower is roughly semicircular in transverse section—internal dimensions 16 ft. (max.) athwartships and 13 ft. fore and aft. In general shape it is roughly half an inverted truncated cone and is built into the fore superstructure. It is divided into two parts by a transverse bulkhead. The after part, which is used as control position, projects above the fore or navigating position. In the control position gratings are fitted well above the level of the superstructure deck, as a platform for the control officers and range-taker; the space below these gratings forms the upper transmitting station. A communication tube leads to the lower conning tower below the armoured deck.

The after conning tower is circular in section and nearly 8 ft. in diameter.

Armoured Hoods.—Are fitted one on either side of battery, projecting just above the upper deck between the broadside turrets, and take a 5-ft. range-finder for use with 5 9-in. guns.

Torpedo Protection Bulkhead.—Protection against mines and torpedoes is afforded by a longitudinal bulkhead on either side, 1" thick and distant 6 ft. 7 in. from the ship's side. It extends vertically from the double-bottom upwards—it is doubtful whether it is continued above the armoured deck—and in the fore and aft direction as far as the ends of the citadel, being closed by transverse bulkheads.

The principle of subdivision, to localise the effects of submarine explosions, has been carried as far as possible.

(For bunker protection, see under Machinery and Boilers.)

Horizontal.—The principal armoured deck extends the entire length of the ship and is about 2 $\frac{1}{2}$ " thick on the slopes. Before and abaft the centre line barbettes it descends to a lower level. The deck on top of the battery is believed also to be armoured.

Torpedo Nets.—Beam net defence was fitted, but has been discarded since the battle of Jutland. There were 11 net booms, 32.8 ft. apart.

Armament.—

Guns and Ammunition Supply.—

(For approximate arcs of training, see Plate.)

12—11 in. (28 cm.) Q.F., L/45, in six turrets, on Drehscheiben-Lafette C/06. Range-finder in each turret, 10 ft. in foremost and after turrets, 5 ft. in side turrets. Loading at fixed angle of elevation. Hand rammer only, staff projecting through hole in rear of turret.

12—5.9 in. (15 cm.) Q.F., L/45, on central pivot mounting C/02/06.

*4—22-pr. (8.8 cm.), semi-automatic, anti-aircraft guns, on after superstructure.

2—Machine guns.

†2—7-pr. (6 cm.) Q.F., L/21, boat and field guns.

For further details, see Part IV. of this book.

* These guns have taken the place of four of the sixteen 22-pr. (8.8-cm.) Q. F., L/45, which were originally carried. The rest of the light guns are believed to have been removed entirely.

† Probably landed for service in the field.

Nassau, Westfalen, Rheinland, and Posen—cont.

Armament—cont.

Magazines and Stowage.—

The 11-in. magazines are situated at the bases of the trunks of each turret. (See under "Boilers.")

80 rounds per gun are carried for 11-in. guns.

180 " " " " 5.9-in. guns.

Torpedo Tubes.—

6—17.7-in. (45 cm.) submerged. The 4 broadside tubes are fixed at an angle of 20° before the beam and are fitted with gyro angling gear which can be set for every 15° from 30° before to 60° abaft the direction of the tube. At ordinary draught the stern tube is about 4 ft. under water.

Mines.—

There is no permanent stowage for mines.

Searchlights.—

8—43.3-in. (110 cm.), electrically controlled.

Range-finder Positions.—

The same general system as in *Kaiser* (page 11), but 10-ft. range-finders are fitted in the two conning and control towers and in the foremost and after turrets only, and 5-ft. instruments in the other turrets and the broadside positions.

Wireless Telegraphy.—The wireless room is on the battery deck abaft the second funnel.

Boats.—See Section 1.

With exception of a cutter on each side in davits, the boats are all carried inboard.

Boat Cranes.—There are two cranes for hoisting boats, one on each side between the side turrets.

Steering Gear.—Two parallel balanced rudders are fitted, between which the centre propeller revolves. Each rudder is actuated by a separate steering engine.

Anchors.—Three stockless bower anchors, two on starboard and one on port side; also a light stern anchor.

Coaling Arrangements.—Electric Winches are fitted for coaling.

Machinery and Boilers.—

Main Engines.—

Three sets, abreast, in separate watertight compartments, situated under the mainmast.

Type—Vertical, triple expansion.

Boilers.—

Twelve in number, in three separate transverse boiler-rooms, each containing four boilers. All are now fitted to burn coal and oil. The fore boiler-room is situated before the foremost side turrets, whilst the other two boiler-rooms are immediately abaft these and before the aftermost side turrets.

Type—Schulz, Navy type.

Escapes.—The escapes leading from the various boiler-rooms to the armoured deck are watertight, and pass through the bunkers. They are provided with self-acting watertight doors.

Funnels.—Two. Height above bars, about 80 feet.

Auxiliary Machinery.—

Three auxiliary machinery rooms, situated abaft the three engine rooms, contain the condensers, air pumps, circulating pumps, &c.

Bunkers.—There are 10 wing bunkers on either side of the ship extending up to the armoured deck, and from the foremost to the aftermost turrets. The sliding bunker doors can be closed from the upper decks. If required, coal can be delivered directly in front of the furnaces through special shafts.

Propellers.—Three, bronze.

Nassau, Westfalen, Rheinland, and Posen—cont.

Speed, Horse-Power, and Fuel.—

| Speed (designed). | Horse-Power (designed). | Fuel: (a) Coal. (b) Oil. |
|-------------------|-------------------------|--------------------------------|
| Knots. 19 | 20,000 | (a) 2,658 (b) 197* |

*Possibly increased.

Steam Trials.—

| Ship. | Nature of trial. | Date. | Speed. | Horse-Power. | Revolutions. | Remarks. |
|----------------|--------------------|-------|-----------------|--------------|--------------|------------------|
| Nassau..... | Measured mile..... | —4.10 | Knots. 20.03 | 25,850 | 124 | } In deep water. |
| Westfalen..... | "..... | —4.10 | 20.3 | 27,477 | 125 | |
| Rheinland..... | "..... | —8.10 | 20.03 | 27,498 | 124 | |
| Posen..... | "..... | —8.10 | 20.12 | 28,117 | 127 | |

Endurance.—

| | Speed. | Horse-Power. | Daily Consumption. | Radius of Action. | Remarks. |
|--|----------------|--------------|--------------------|-------------------|----------|
| At $\frac{1}{2}$ ths designed power..... | Knots. 18.3 | | | | |
| " maximum continuous seagoing speed..... | 17.7 | 18,000 | Tons. 380 | Miles. 3,200 | |
| " $\frac{3}{4}$ ths designed power..... | 17.0 | 14,000 | 335 | 3,540 | |
| " $\frac{2}{3}$ ths..... | 15.2 | 12,000 | 293 | 3,800 | |
| " $\frac{1}{2}$ th..... | 12.0 | 8,000 | 200 | 5,050 | |
| 10 knots..... | 10.0 | 4,000 | 110 | 7,250 | |
| | | 2,500 | 83 | 8,000 | |

Deutschland, Hannover, Schleswig-Holstein, and Schlesien.
(See Plate 6.)

| Name. | Designation before Launch. | Programme Year. | Where Built. | Laid Down. | Launched. | First Commissioned. |
|-------------------------|----------------------------|-----------------|-----------------------------|------------|-----------|---------------------|
| Deutschland..... | N | 1903-04 | Germania Yard, Kiel..... | 20.7.03 | 19.11.04 | 3. 8.06 |
| Hannover..... | P | 1904-05 | Wilhelmshaven Dockyard..... | —4.04 | 29. 9.05 | 1.10.07 |
| Schleswig-Holstein..... | Q | 1905-06 | Germania Yard, Kiel..... | —5.05 | 17.12.06 | 6. 7.08 |
| Schlesien..... | R | | Schichau Works, Danzig..... | —5.05 | 28. 5.06 | 5. 5.08 |

Cost.—

| | Deutschland, Hannover. | Schleswig-Holstein, Schlesien. |
|--------------------------|---------------------------|-----------------------------------|
| Hull, machinery, &c..... | £ 765,655 | £ 765,655 |
| Gun armament..... | 366,928 | 386,497 |
| Torpedo armament..... | 35,714 | 35,714 |
| | £1,168,297 | £1,187,866 |

General Remarks.

The fifth vessel of this type—the *Pommern*—was sunk in action on the night of 31st May-1st June 1916.

Deutschland, Hannover, Schleswig-Holstein, and Schlesien—cont.

General Remarks.—cont.

Hannover and *Deutschland* are fitted as flagships. The latter also has special apartments for the Emperor. As regards design and dimensions, these ships are exactly the same as *Braunschweig* type. The stern posts were strengthened before completion in similar but somewhat stronger fashion (see page 25). Owing to slight differences in armament and armour, and a greater coal capacity, they are shown as a separate type.

Complement.—Peace complement, 743 (as private ship). *Deutschland*, when flagship, 735, not including flag officer, staff and retinue.

Accommodation.—The wardroom officers' cabins and mess, as well as the offices, are in the superstructure. The sick bay is in the forward part of superstructure and contains 11 cots.

General Appearance.—See Photograph Book.

General Dimensions, &c.—

| | | |
|--|--------------------|--------------|
| Length between perpendiculars..... | 398 ft. 7 ins. | |
| Length, L. W. L..... | 413 " 1 " | |
| Length, extreme..... | 419 " 0 " | |
| Breadth, extreme..... | 72 " 10 " | |
| Draught, designed load..... | 25 " 3 " | |
| Displacement { | Designed load..... | 13,040 tons. |
| | Full load..... | 14,224 " |
| Tons per inch immersion at designed draught..... | 54. | |
| Height of fore funnel to L. W. L..... | 72 ft. 0 ins. | |
| " " lower masthead to L. W. L..... | 94 " 0 " | |

Masts.—Two military masts fitted.

Constructive Details.—There are very few watertight doors, and such as exist are chiefly in communication with bunkers—all compartment bulkheads are practically intact. A transverse coal bunker separates the forward boiler-room from magazines, and there is another transverse bunker below the after pair of submerged torpedo tubes, separating the second and third boiler-rooms. Cork-filled cofferdams are fitted above the armoured deck before and abaft the citadel. There is a central watertight passage under the armoured deck, leading from the lower conning tower and transmitting station forward to the after bulkhead of the forward lower conning tower and funnel uptakes, and contains leads, voice tubes, steering-engine-rooms. It passes between the funnel uptakes, and contains leads, voice tubes, steering-shafts, engine-room telegraph shafting, &c. Bilge keels are fitted. An extensive refrigerating room is situated on the starboard side, below the lower platform deck forward.

Armour.—

Material.—Krupp cemented.

Belt.—Complete 7 ft. 6 in. wide, lower edge about 4 ft. below L. W. L., extending for 213 ft. amidships. It is 9.4" thick (*Deutschland*) 9" tapering to 6.7" at lower edge, and reduced to 3.9" at bow and stern.

Citadel.—

Immediately above belt, 7 ft. 6 in. wide, extending for 213 ft. amidships. It is 8" thick (*Deutschland* 7½"), and closed at ends by diagonal bulkheads 6.7" to 8" thick, extending from shell plating to barbettes.

Battery.—

Above citadel, 7 ft. 6 in. wide, extending for 196 ft. amidships. It is 6.7" thick (*Deutschland* 6.3"), and closed by diagonal bulkheads 6.7" thick (*Deutschland* 6.3"), which connect to barbettes.

Splinter Bulkheads.—

Four each side in battery, separating guns, the first, second and fourth extending only 15 ft. athwartships from ship's side, the third being continued across the ship as a bulkhead; 1.2" thick.

A centre line bulkhead of same thickness is placed wherever practicable.

Deutschland, Hannover, Schleswig-Holstein, and Schlesien—cont.**Armour—cont.**

Upper Deck Casemates.—6.7' thick in front and 5.5' to 4.7' in rear.

Barbettes and Ammunition Tubes.—

Forward barbette—11' thick before diagonal bulkheads, and 4.9' thick abaft them.
After barbette—9.8' thick abaft diagonal bulkheads; 4.9' before them.

Turrets.—Fronts and sides 11', rear 9.8' thick.

Conning Towers.—

Fore—11.8' to 9.8'. Roof 2'. Large and roomy. Apertures very large. The fore conning tower of *Deutschland* is two-storied, the upper story being devoted to control and the lower to navigation. In the other ships of this type the conning tower is divided into two compartments by a transverse screen, the foremost compartment being used for navigation and the after for control.
After—5.5'. Roof, 1'.

Communication Tubes.—Fore, 9.8', is rectangular in section, and extends downwards to the lower conning tower and transmitting station below the armoured deck.

After—4.7'.

Armoured Hoods.—Fitted one on either side of the battery, projecting just above the upper deck, to take 5-ft. range-finders for use with casemate guns.

Horizontal.—

Principal armoured deck: inside citadel—1.6' on flat, 2.6' on slopes; Outside citadel—2.4' to 1.6'; on glacis forward and aft—3.8'.

Lower deck, outside citadel, on top of belt, .8'.

Roof of battery—1.4'.

Roof of upper deck casemates—1.2'.

Armament.—**Guns and Ammunition Supply.**

(For arcs of training, see Plate.)

4—11 in. (28 cm.) Q. F., L/40.

In pairs in turrets, forward and aft, on Drehscheiben-Lafette C/01. The ports are very small. There are two sighting hoods, one of which is central. Hole-in-the-wall sights. A 10-ft. range-finder is fitted in each turret.

14—6.7 in (17 cm.) Q. F., L/40, on C. P. mounting C/02/04.

Four in casemates on upper deck.

Ten in battery on the main deck.

Hoists, electric, alternative, hand.

2—22-pr. (8.8 cm.), semi-automatic, anti-aircraft guns, on after superstructure.

*6—15-pr. (8.8 cm.) Q. F., L/35, on C. P. mounting C/01, on the bridge and superstructure.

2—Machine guns.

†2—7-pr. (6 cm.) Q. F., L/21, boat and field guns.

For further details, see Part IV of this book.

Torpedo Tubes.—

6—17.7 in. (45 cm.) submerged; one under ram, two on each broadside in line with fore turret and centre funnel respectively, and one in stern on port quarter. White-head air compressors.

Torpedoes.—12 are carried in peace, 18 in war time.

Mines.—There is no permanent stowage for mines.

*Twenty of these guns were formerly carried; two of them have been replaced by anti-aircraft guns, and 12, it is believed, have been removed entirely.

† Probably landed for service in the field.

Deutschland, Hannover, Schleswig-Holstein, and Schlesien—cont.**Searchlights.**—

8—35 4-in. (90 cm.), 42,000 c.p.; two on each mast, two on superstructure close to boat cranes and two on foremost funnel.

Fire Control.—A complete system of fire control is fitted. There is a spotting platform on each mast. In the *Deutschland* the instruments are of the Siemens type. The main control position is in the conning tower. See above, under "Armour."

Systems of Communication.—Telephones, voice pipes and bells.

The following electrical instruments and apparatus are fitted:—

Siemens-Schuckert's engine-room and revolution telegraphs, helm and stokehold indicators.

Boats.—See Section 1.

Boat Cranes.—Two large steel boat cranes abreast after funnel, electrically operated.

Steering Gear.—Steam and hand, two engines aft in tiller compartment.

Anchors.—See Section 1.**Machinery and Boilers.**—**Main engines.**—

Three sets in separate watertight compartments, the central engine being abaft the other two, which are abreast.

Type—Vertical, triple expansion.

Revolutions at full power, 120 (designed).

Boilers.—

Deutschland has same number and arrangement of boilers as *Braunschweig* type (see p. 27).

The remaining ships have—

12 boilers in three separate boiler rooms, four boilers in each.

Type—Schulz, Navy type (eight large and four small), fitted to burn oil fuel.

Tube heating surface of the eight large boilers 34,560 sq. ft.

" " " four small boilers 15,560 "

Total grate surface 1,000 "

Arrangements for accelerated draught.—Two centrifugal fans in each compartment.

Width of double stokeholds, 11 ft. 6 in.

Three funnels.—Height of funnels above bars, 88 ft.

Ash ejectors fitted in each stokehold.

Auxiliary Machinery, includes—**Steam.**—

Circulating pumps, 3.

Auxiliary feed pumps, 3.

Bilge pumps, 3.

Fire pump, 1.

Washing pump, 1.

Drinking water pump, 1.

Boat hoists (to lift 18 tons), 2.

Heating apparatus.

Electric.—

Dynamos—Four; two of 75 k.w., two of 48 k.w. Voltage, 110. Also accumulators capable of lighting and carrying out work of ship for ½ hour in case of sudden breakdown of dynamos.

Ammunition motors.

Turret working motors.

Coaling motors.

Workshop lathe motors.

Ventilating fan motors.

Refrigerating machinery.

Deutschland, Hannover, Schleswig-Holstein, and Schlesien—cont.

Propellers.—

Three, bronze. Outer—three-bladed. Center—four-bladed.
Diameter of outer screws, 18' 11".
Diameter of centre screw, 18' 6".
Pitch.....19' 8".

Speed, Horse-Power, and Fuel.—

| Speed (designed). | Horse-Power (designed). | Fuel: (a) Coal. (b) Oil. |
|-------------------|-------------------------|--------------------------------|
| Knots. 18 | 16,000 | (a) 1,771 (b) 197 |

Steam Trials.—

| Ship. | Nature of Trial. | Date. | Speed. | Horse-Power. | Revolu- tions. | Remarks. |
|-------------------------|-------------------------|----------------|--------|--------------|-------------------|---------------------|
| Deutschland..... | 6 hours full power..... | Knots. 1906 | 18.5 | 16,939 | — | |
| Hannover..... | 24 hours..... | 1907 | 18.5 | 17,768 | — | |
| Schleswig-Holstein..... | m. m..... | 1907 | 16.9 | 12,153 | 114 | 2-in. air pressure. |
| Schlesien..... | 6 hours full power..... | 1908 | 19.25 | 23,456 | 105 | 7-in. air pressure. |
| "..... | m. m..... | 1908 | 19.0 | 19,368 | 128 | |
| "..... | 6 hours full power..... | 1907 | 19.17 | 21,818 | 122 | |
| "..... | 24 hours..... | 1907 | 18.5 | 19,465 | 123 | |
| "..... | | 1907 | 12.2 | 3,574 | 119 | |

Coal per I. H. P. per hour, 1.84 lbs.

Endurance.—

| | Speed. | Horse-Power. | Daily Consump- tion. | Radius of Action. | Remarks. |
|---|----------------|--------------|----------------------------|-------------------------|----------|
| At 1/4ths designed power..... | Knots. 17.2 | | | | |
| At maximum continuous seagoing speed..... | 16.6 | 12,800 | Tons. 303 | Miles. 2,630 | |
| At 1/2ths designed power..... | 16.1 | 11,150 | 266 | 2,900 | |
| At 3/4ths "..... | 14.6 | 9,600 | 220 | 3,400 | |
| At 10 knots..... | 11.8 | 3,200 | 159 | 4,260 | |
| | 10.0 | 2,600 | 94 | 5,820 | |
| | | | 66 | 7,030 | |

Braunschweig, Elsass, Preussen, Hessen, and Lothringen.
(See Plate 7.)

| Name. | Designation before Launch. | Programme Year. | Where Built. | Laid Down. | Launched. | First Com- missioned. |
|-------------------|----------------------------------|--------------------|-----------------------------|------------|-----------|--------------------------|
| Braunschweig..... | H | 1901-02 | Germania Yard, Kiel..... | 24.10.01 | 20.12.02 | 15.10.04 |
| Elsass..... | J | | Schichau Works, Danzig..... | | | |
| Preussen..... | K | 1902-03 | Vulcan Works, Stettin..... | 5.10.01 | 26.5.03 | 29.11.04 |
| Hessen..... | L | | Germania Yard, Kiel..... | | | |
| Lothringen..... | M | 1903-04 | Schichau Works, Danzig..... | 14.6.02 | 31.10.03 | 12.7.05 |
| | | | | 15.4.02 | 18.9.03 | 19.9.05 |
| | | | | 1.4.03 | 27.5.04 | 18.5.06 |

Braunschweig, Elsass, Preussen, Hessen, and Lothringen—cont.

| Cost.— | Braunschweig and Elsass. | Preussen, Hessen and Lothringen. |
|--------------------------|-----------------------------|-------------------------------------|
| | £ | £ |
| Hull, machinery, &c..... | 765,655 | 765,655 |
| Gun armament..... | 366,928 | 366,928 |
| Torpedo armament..... | 32,289 | 35,714 |
| | £1,164,872 | £1,168,297 |

General Remarks.—Preussen and Braunschweig are fitted as flagships.

The stern posts of this class originally showed grave signs of weakness, the rudder of *Elsass* dropping off in December 1904, when turning at full speed, owing to the stern post fracturing. The *Braunschweig* also developed defects in her stern post in April 1905. These defects were due to original weakness in design; and it is understood that the stern posts were subsequently strengthened by two stout stays from the lower part of the stern post to the curve of the armoured deck aft. The consequent loss of speed, at full speed, is reported as 1/3th of a knot.

The funnels of all these ships have been raised 6 1/2 feet.

Complement.—Peace complement, 743 (as private ship). *Preussen*, when flagship, 735, not including flag officer, staff and retinue.

General Appearance.—See Photograph Book.

General Dimensions, &c.—

| | | |
|--|--------------------|--------------|
| Length between perpendiculars..... | 398 ft. 7 ins. | |
| Length L.W.L..... | 413 " 5 " | |
| Length, extreme..... | 419 " 0 " | |
| Breadth, extreme..... | 72 " 10 " | |
| Draught, designed load..... | 25 " 3 " | |
| Displacement { | Designed load..... | 12,988 tons. |
| | Full load..... | 14,140 " |
| Tons per inch immersion at load draught..... | 54 " | |
| Height of fore funnel to L.W.L..... | 74 ft. 0 ins. | |
| " " lower masthead to L.W.L..... | 94 " 0 " | |

Constructive Details.—These vessels are generally similar to those of the *Wittelsbach* type (see p. 29), but the foremost casemate is absent, the fore turret is on the upper deck, and the citadel and battery armour is extended to the foremost and after barbettes, leaving no unprotected space between the main turrets.

Armour.—

Material.—Krupp cemented.

Belt.—Complete, 7 ft. 6 in. wide, 8.8" thick, tapering to 5.9" at lower edge, for 220 ft amidships, and reduced to 3.9" at the ends.

Citadel.—7 ft. 6 in. wide, 5.5" thick, extending for 213 ft. amidships; closed by diagonal bulkheads, 5.5" thick, which connects to barbettes.

Battery.—7 ft. 6 in. wide, 5.9" thick, extending for 160 ft., closed by diagonal bulkheads, 5.9" thick, which connect to barbettes.

Barbettes.—

For 11-in. guns—forward barbette, 11" to 5.5" thick.
after barbette, 9.8" to 4.9" thick.

For 6.7-in. guns—6.7" thick.

| | Braunschweig and Elsass. | Preussen, Hessen and Lothringen. |
|-----------------------|-----------------------------|-------------------------------------|
| Turrets.— | | |
| For 11-in. guns..... | 9.8" thick | 11" to 9.8" thick |
| For 6.7-in. guns..... | 5.9 to 4.5" thick | 6.7" to 4.5" thick |

DECLASSIFIED
Authority E.O. 10501

Braunschweig, Elsass, Preussen, Hessen, and Lothringen—cont.**Armour—cont.****Conning Towers.**

Fore, 11.8" to 9.8". Large and roomy, about 11 ft. fore and aft by 22 ft. athwartships. Apertures very large and about 9" in depth. Entrance badly protected. In *Preussen* fitted with lift from lower conning tower. After, 5.5". Fire control station for after guns.

Communication Tubes.—Fore conning tower—9.8" to 4.9"; after—4.7".

Armoured Hoods.—Fitted one on either side of battery projecting just above upper deck, to take 5-ft. range-finders for use with 6.7-in. guns.

Splinter Bulkheads.—In battery, 2".

Horizontal.—1.5" on flat, 2.9" on the slopes. Glacis plates forward and aft, 5.5". Deck before and abaft the glacis plates, 1.6". Deck, before and abaft citadel, .8". Battery roof, 1.5".

Torpedo Nets.—The *Lothringen* is fitted with net defence, probably all round.

Armament.—**Guns and Ammunition Supply.—**

(For arcs of training, see Plate.)

4—11-in. (28 cm.) Q.F., L/40.

In pairs in turrets, forward and aft, on Drehscheiben-Lafette C/01. Loading all round. Very small ports. Fitted with two sighting hoods and also hole-in-wall sights. A 10-ft. range-finder is fitted in each turret.

14—6.7 (17 cm.) Q.F., L/40.

Four singly in turrets on upper deck, two firing ahead and two astern, on Drehscheiben-Lafette C/01. Turrets cramped inside. One small sighting hood. 9" hole in rear for ejection of empty cylinders.

Ten in main deck battery on C.P. Mounting C/02, fitted with overhead dismounting gear.

2—22-pr. (8.8 cm.) semi-automatic, anti-aircraft guns, on after superstructure.

*6—15-pr. (8.8 cm.) Q.F., L/35, on C.P. mounting C/01, four forward and two aft on the bridge and superstructure.

2—Machine guns.

†2—7-pr. (6 cm.) Q.F., L/21, boat and field guns.

For further details, see Part IV. of this book.

Torpedo Tubes.—

6—17.7-in. (45 cm.) submerged; one under ram, two on each broadside in line with fore turret and centre funnel respectively, and one in stern on port side aft 6 ft. below waterline.

Torpedoes.—12 are carried in peace, 18 in war time.

Mines.—There is no permanent stowage for mines.

Searchlights.—

6—35.4-in. (90 cm.), two on each mast and two on foremost funnel, electrically controlled.

Fire Control.—Fire is controlled from fore conning tower through transmitting station below armour. A spotting platform is fitted on each mast. A detailed description of the fire control fittings will be found in Part IV., Section 4.

Boats.—See Section 1.

Boat Cranes.—Two, very large, steel, abreast after funnel, worked electrically.

Anchors.—See Section 1.

Machinery and Boilers.—**Main Engines.—**

Three sets, in separate watertight compartments, the central engine being abaft the other two, which are abreast.

Type—Vertical, triple expansion.

Revolutions at full power, 110 (designed).

* Eighteen of these guns were formerly carried; two of them have been replaced by anti-aircraft guns, and 10, it is believed, have been removed entirely.

† Probably landed for service in the field.

Braunschweig, Elsass, Preussen, Hessen and Lothringen—cont.**Machinery and Boilers—cont.****Boilers.—**

Fourteen in number, in three watertight compartments.

Six cylindrical. These are single-ended and are placed fore and aft in the after boiler room. Four of them have four furnaces, the remainder three.

Heating surface 15,070 sq. ft.

Grate surface 447 "

Eight Schulz, Navy type, four placed fore-and-aft in the centre boiler room and four in the foremost one. Fitted to burn coal and oil.

Heating surface 34,176 sq. ft.

Grate surface 657 "

Width of firing space 10 ft. 6 ins.

Height of funnel 82 ft. from grate.

Main steam pipes made of steel, solid drawn.

Fire-extinguishing apparatus fitted to each water-tube boiler.

Ash ejectors in each stokehold.

Auxiliary Machinery.—

All pumps are below the armoured deck:—

| | Capacity, per hour. |
|--|----------------------|
| 2 Stone's pumps | 27 tons (each). |
| 3 circulating | 600 " " |
| 1 steam turbine | 600 " " |
| 3 reserve feed | 59 " (each). |
| 3 steam bilge | 30 " " |
| 3 main engine-driven bilge pumps | 30 " " |
| 1 steam (washing water) | 30 " " |
| 1 steam (drinking water) | 14½ " |
| Total pumping capacity | 2,664 tons per hour. |

Dynamos.—

4—two of 75 kw. and two of 48 kw. Voltage 110.

Propellers.—Three. The propeller shafts are parallel in this and later types.

Speed, Horse-Power, and Fuel.

| Speed (designed). | Horse-Power (designed). | Fuel: | |
|-------------------|-------------------------|-----------|----------|
| | | (a) Coal. | (b) Oil. |
| Knots. 18 | 16,000 | (a) 1,574 | (b) 197 |

Steam Trials.

| Ship. | Nature of trial. | Date. | Speed. | Horse-Power. | Revolutions. | Remarks. |
|---------------------------|--------------------------|-------|--------|--------------|--------------|-----------------------------|
| <i>Braunschweig</i> | 6 hours full power | 1904 | 18.43 | 17,092 | 108 | Coal per I. H. P. per Hour. |
| " | 24 hours | 1904 | 17.0 | 11,588 | 97 | Lbs. |
| <i>Elsass</i> | 6 hours full power | 1904 | 18.0 | 16,685 | 113 | 1.96 |
| " | 24 hours | 1904 | 16.5 | 11,559 | 103 | 1.65 |
| <i>Preussen</i> | 6 hours full power | 1905 | 18.0 | 17,125 | 114 | 2.1 |
| " | 24 hours | 1905 | 16.4 | 11,280 | 103 | 1.74 |
| <i>Hessen</i> | 6 hours full power | 1905 | 18.23 | 16,900 | 114 | 2.0 |
| " | 24 hours | 1905 | 16.6 | 11,384 | 102 | 1.78 |
| <i>Lothringen</i> | 6 hours full power | 1906 | 18.54 | 16,950 | 113 | 2.1 |
| " | 24 hours | 1906 | 16.6 | 11,574 | 100 | 1.74 |
| | | | | | | 1.85 |
| | | | | | | 1.66 |

Braunschweig, Elsass, Preussen, Hessen and Lothringen—cont.

Endurance.

| | Speed. | Horse-Power. | Daily Con- sumption. | Radius-of Action. | Remarks. |
|---|--------|--------------|-------------------------|----------------------|----------|
| | Knots. | | Tons. | Miles. | |
| At $\frac{3}{4}$ ths designed power..... | 17.3 | 12,800 | 303 | 2,380 | |
| At maximum continuous seagoing speed..... | 16.8 | 11,500 | 273 | 2,570 | |
| At $\frac{2}{3}$ ths designed power..... | 16.1 | 9,600 | 220 | 3,060 | |
| At $\frac{1}{2}$ th designed power..... | 14.6 | 6,400 | 159 | 3,840 | |
| At $\frac{1}{4}$ th designed power..... | 11.8 | 3,200 | 94 | 5,250 | |
| At 10 knots..... | 10.0 | 2,000 | 66 | 6,340 | |

Wittelsbach, Wettin, Zähringen, Mecklenburg and Schwaben.

(See Plate 8.)

| Name. | Designation before Launch. | Programme Year. | Where Built. | Laid Down. | Launched. | First Com- missioned. |
|------------------|----------------------------------|--------------------|-----------------------------|------------|-----------|--------------------------|
| Wittelsbach..... | C | 1899-1900 | Wilhelmshaven Dockyard..... | 30. 9. 99 | 3. 7. 00 | 15. 10. 02 |
| Wettin..... | D | | Schichau Works, Danzig..... | 10. 10. 99 | 6. 6. 01 | 1. 10. 02 |
| Zähringen..... | E | | Germania Yard, Kiel..... | 21. 11. 99 | 12. 6. 01 | 25. 10. 02 |
| Mecklenburg..... | F | | Vulcan Works, Stettin..... | 15. 5. 00 | 9. 11. 01 | 25. 6. 03 |
| Schwaben..... | G | | Wilhelmshaven Dockyard..... | 14. 11. 00 | 19. 8. 01 | 13. 4. 04 |

Cost.—

| | Wittelsbach, Mecklenburg Wettin and Schwaben. Zähringen. | |
|--------------------------|--|------------|
| | £ | £ |
| Hull, machinery, &c..... | 803,571 | 793,787 |
| Gun armament..... | 244,618 | 244,618 |
| Torpedo armament..... | 34,736 | 32,290 |
| Total cost..... | £1,082,925 | £1,070,695 |

General Remarks.—

These vessels are now regarded as obsolete; the Wittelsbach and Schwaben are used as training ships for engine-room personnel; the other vessels of the class are believed (May 1917) to have been paid off.

Complement.—Peace complement, 683 (as private ship).

General Appearance.—See Photograph Book.

General Dimensions, &c.—

| | |
|---|----------------|
| Length between perpendiculars..... | 393 ft. 8 ins. |
| Length, L. W. L..... | 410 " 9 " |
| Length, extreme..... | 413 " 5 " |
| Breadth, extreme..... | 68 " 3 " |
| Draught, designed load..... | 25 " 3 " |
| Displacement, designed load..... | 11,611 tons. |
| Height of axis of guns at designed draught..... | 29 ft. 6 ins. |
| Height of fore funnel to L. W. L..... | 21 " 4 " |
| Height of fore lower masthead to L. W. L..... | 74 " 0 " |
| | 94 " 0 " |

Wittelsbach, Wettin, Zähringen, Mecklenburg and Schwaben—cont.

Constructive Details.—

The two military masts have spiral steps inside, with entrances from various decks. There is a passage under the armoured deck from the fore to the after lower conning tower, as in the Kaiser Friedrich type (see p. 33). There are cork-filled cofferdams round the ship above the armoured deck outside the citadel. The steel upper deck is covered with 2.4" teak. The ram is blunter and situated less deeply under water than in Kaiser Friedrich type.

Armour.—

Material.—Krupp cemented.

Belt.—Complete, 7 ft. 8 in. wide, 8.8" thick amidships, reduced to 3.9" at ends, and tapering to 5.9" at lower edge amidships. It extends to 5 ft. 5 in. below the waterline.

Citadel.—5.5" thick, with bulkhead of the same thickness.

Barbettes and Turrets.—For 9.4-in. guns, turrets, 9.8" thick; barbettes, 9.8" to 5.5" thick. 5.9-in. gun turrets, 5.9" to 4.5" thick.

Batteries.—Situating forward on the upper deck and amidships on main deck, 5.5" thick. Splinter bulkheads separating all 5.9-in. guns in the batteries—2" thick.

Conning Towers.—Fore, 9.8"; after, 5.5" thick.

The conning towers of these ships are very roomy and the torpedoes are fired from them but the guns are controlled from the special control tower.

Control Tower.—5.5" thick, placed directly above the fore conning tower.

Horizontal.—Two decks. The lower extends from stem to stern, sloping to lower edge of belt, and is 1.6" thick on the flat and 2.9" on the slopes. Outside the citadel on top of belt it is .8" thick; roof of citadel, outside battery, 1.2" thick; roof of battery, 1.6" thick.

Armament.—

Guns and Ammunition Supply.—

(For approximate arcs of training, see Plate.)

4—9.4-in. (24 cm.) Q.F., L/40, on Drehscheiben-Lafette C/98, in turrets forward and aft.

18—5.9-in. (15 cm.) Q.F., L/40.

4 on upper deck in single turrets, on Turm-Lafette C. 97/99, fitted with sighting hood.

4 in upper battery forward and 10 in main deck battery, on C.P. Mounting C/97.

12—15-pr. (8.8 cm.) Q.F., L/30.

On superstructure on C.P. Mounting C/89, with $\frac{1}{2}$ " shields, six firing ahead, six astern.

2—Machine guns.
*2—7-pr. (6 cm.) B.L., L/21, boat and field guns.

For further details, see Part IV. of this book.

Torpedo Tubes.—

6—17.7-in. (45 cm.) submerged; one under the ram, two on each broadside, and one in stern on port side.

Torpedoes.—12 are carried in peace, 18 in war time.

Searchlights.

4—35.4-in. (90 cm.); one on each mast; two on superstructure on rails.

Boats.—See Section 1.

Boat Cranes.—Two, abreast after funnel, capable of hoisting 8½ and 16 tons.

Steering Gear.—Steam.

Anchors.—See Section 1.

* Probably landed for service in the field.

Wittelsbach, Wettin, Zähringen, Mecklenburg and Schwaben—cont.

Machinery and Boilers.—

Main Engines.—

Three sets, in separate watertight compartments, the central engine being abaft the other two, which are abreast.

Type—Vertical, triple expansion.

Diameters of cylinders, 35.4"; 54.3"; 85.8".

Length of stroke, 37.4".

Working pressure (at engines) 185 lbs. per sq. in.

Revolutions at full power, 110 (designed).

Boilers.—

Twelve in number. In three compartments. Water-tube boilers are in foremost compartment.

Date when first used at sea, 1902.

Type—Six, cylindrical. Six Schulz, Navy type, fitted to burn coal and oil.

Full working pressure, 193 lbs. per sq. in.

Total heating surface, 41,873 sq. ft.

Total grate surface, 978 sq. ft.

Auxiliary machinery includes—

Steam.—

Capstans.

Boat hoists.

Pumps—total pumping capacity, 2,868 tons per hour.

Electric.—

Turret turning gear.

Ammunition hoists.

Ventilating arrangements.

Internal lighting.

Coal hoists.

Refrigerating machinery.

Workshop machinery.

Propellers.—

Three. Outer propellers,—three-bladed. Diameter, 15' 8".
Centre propeller,—four-bladed. Diameter, 14' 9". Pitch, 20' 4".

The outer shafting converges slightly from the propellers towards the engines.

Speed, Horse-Power, and Fuel.

| | Speed (designed). | Horse-Power (designed). | Fuel: | |
|--|----------------------|----------------------------|------------|----------|
| | | | (a) Coal. | (b) Oil. |
| | Knots. 18 | 15,000 | (a) 1,790. | (b) 197. |

Steam Trials.

| Ship. | Nature of Trial. | Date. | Speed. | Horse-Power. | Revolutions. | Remarks. |
|------------------|-------------------------|-------|--------|--------------|--------------|--------------------------------|
| | | | Knots. | | | Coal per I.H.P. per Hour. Lbs. |
| Wittelsbach..... | 6 hours full power..... | 1902 | 18.0 | 14,483 | 109 | 1.8. |
| "..... | 24 hours..... | 1902 | 16.3 | 10,685 | 96 | 1.87. |
| Wettin..... | 6 hours full power..... | 1902 | 18.13 | 15,500 | 113 | 1.9. |
| "..... | 24 hours..... | 1902 | 16.2 | 10,452 | 99 | 1.94. |
| Zähringen..... | 6 hours full power..... | 1902 | 17.68 | 14,750 | 110 | 1.95. |
| "..... | 24 hours..... | 1902 | 16.04 | 10,340 | 97 | 1.7. |
| Mecklenburg..... | 6 hours full power..... | 1903 | 18.1 | 14,355 | 109 | 1.64. |
| "..... | 94 hours..... | 1903 | 16.42 | 9,659 | 96 | 1.55 (centre engine only). |
| "..... | 24 hours..... | 1903 | — | 3,188 | — | — |
| Schwaben..... | 6 hours full power..... | 1903 | 18.0 | 14,390 | 105 | 2.3. |
| "..... | 24 hours..... | 1903 | 16.0 | 10,465 | 94 | 1.84. |

Wittelsbach, Wettin, Zähringen, Mecklenburg and Schwaben—cont.

Endurance.

| | Speed. | Horse-Power. | Daily Consumption. | Radius of Action. | Remarks. |
|--|--------|--------------|--------------------|-------------------|----------|
| | Knots. | | Tons. | Miles. | |
| At $\frac{3}{4}$ ths designed power..... | 17.2 | 12,000 | 282 | 2,825 | |
| At maximum continuous sea-going speed..... | 16.7 | 10,500 | 248 | 3,170 | |
| At $\frac{2}{3}$ ths designed power..... | 16.1 | 9,000 | 205 | 3,650 | |
| At $\frac{1}{2}$ ths designed power..... | 14.7 | 6,000 | 147 | 4,660 | |
| At $\frac{1}{4}$ th designed power..... | 11.9 | 3,000 | 86 | 6,460 | |
| At 10 knots..... | 10.0 | 1,790 | 60 | 7,850 | |

Kaiser Karl der Grosse.

(See Plate 9.)

Programme year.....1898-99.

Designation before launch....."B."

Where built.....Blohm and Voss, Hamburg.

Laid down.....17th September 1898.

Launched.....18th October 1899.

First commissioned.....4th February 1902.

General Remarks.—

Sister ship to *Kaiser Friedrich III.*

Modernised 1910-12, but not to the same extent as the other vessels of her class. Is believed (May 1917) now to have been paid off, and to have had her guns and armour removed. Details as for *Kaiser Friedrich III.* (see p. 34), except as shown below:—

General Appearance.—See Photograph Book.

Complement.—661.

Armament.—

Guns and Ammunition Supply.—

(For arcs of training, see Plate.)

4—9.4-in. (24 cm.) Q.F., L/40, in pairs in turrets, on Drehscheiben-Lafette C/98.

18—5.9-in (15 cm.) Q.F., L/40; 6 in single-gun turrets on Turm-Lafette C/97, 8 on upper deck, and 4 on main deck in armoured casemates, on C.P. Mounting C/97.

12—15-pr. (8.8 cm.) Q.F., L/30; 10 on superstructure and 2 on upper bridge, on C.P. Mounting C/89, guns behind $\frac{1}{2}$ " shields. Dredger hoists worked by hand from main deck.

4—Machine guns.

2—7-pr. (6 cm.) B.L., L/21, boat and field guns.

Searchlights.—

4—One on platform on each mast, and one each side amidships on level of boat deck.

Machinery and Boilers.—

Main Engines.—

Three sets in separate watertight compartments, manufactured by Blohm and Voss, 1900.

Type—Vertical, triple expansion, 4-cylinder.

Diameters of cylinders, 31.9", 51.2", and two of 55.1".

Length of stroke, 37.4".

Revolutions at full power, about 120.

Kaiser Karl der Grosse—cont.**Machinery and Boilers.—cont.****Boilers.—**

Ten in number, manufactured by Blohm and Voss, 1900.
Date when first used at sea, 1902.

Type—Six cylindrical and four Schulz, Navy type.

There are four boiler rooms, two each side of the middle line. In each of the after ones there are three cylindrical single-ended return-tube boilers (three furnaces in each).
In each forward boiler room there are two Schulz water-tube boilers.

Full working pressure, 204 lbs. per square inch.

Total heating surface, 38,106 sq. ft.

Total grate surface, 897 sq. ft.

Arrangements for accelerated draught.—Eight centrifugal fans (two in each stokehold).

Propellers.—

Three—three-bladed. Diameter of outer, 14' 5", center, 14', pitch, 19' 8".
Projected area of one outer propeller, 48.9 sq. ft.

Projected area of centre propeller, 47.5 sq. ft.

Designed Speed, Coal, Endurance, &c., as in *Kaiser Friedrich III.*

Kaiser Wilhelm der Grosse and Kaiser Barbarossa.

(See Plate 9.)

| Name. | Designation before Launch. | Programme Year. | Where Built. | Laid down. | Launched. | First Commissioned. |
|--|-------------------------------|-----------------|-------------------------|------------|-----------|---------------------|
| <i>Kaiser Wilhelm der Grosse</i> . . . | Ersatz <i>König Wilhelm</i> . | 1897-8 | Germania Yard, Kiel. | 22. 1. 98 | 1. 6. 99 | 5. 5. 01 |
| <i>Kaiser Barbarossa</i> | A | 1898-9 | Schichau Works, Danzig. | 3. 8. 98 | 21. 4. 00 | 10. 6. 01 |

General Remarks.—Sister ships to *Kaiser Friedrich III.*

The *Kaiser Wilhelm der Grosse* was modernised in 1910 and *Kaiser Barbarossa* in 1907, the alterations being similar to those effected in *Kaiser Friedrich III.* (see page 34). Both vessels removed.

Details as for *Kaiser Friedrich III.*, except as mentioned below.

General Appearance.—See Photograph Book.

Constructive Details.—Compartments below the armoured deck have no doors. The cork cofferdam is of greater width than in the *Kaiser Friedrich III.* A central passage, about 4 ft. square, is fitted under the armoured deck. It is watertight and contains the steering shafts, engine-room telegraph shafting, electric leads, voice tubes, and fire mains. The transverse bulkhead aft is reduced to 7.9" and ammunition tube for 9.4-in. guns to 9".

Armament.—

Same as *Kaiser Friedrich III.*, except that the 9.4-in. guns are mounted on Drehscheiben-Lafette C/98 (for details, see Part IV., Section I).

Boat Cranes.—

Kaiser Barbarossa is fitted with two abreast after funnel (*Kaiser Wilhelm der Grosse* has derricks as in the other vessels of this class).

Machinery and Boilers.—**Diameters of Cylinders.—**

35.4 ins., 57.4 ins., and 2 of 61.3 ins.

Length of stroke, 37.4 ins.

Kaiser Wilhelm der Grosse and Kaiser Barbarossa—cont.**Machinery and Boilers—cont.****Boilers.—**

Each ship has six cylindrical single-ended boilers, in two boiler rooms aft; but *Kaiser Barbarossa* has six Thornycroft, and *Kaiser Wilhelm der Grosse*, four Schulz, Navy type, water-tube boilers in the two foremost boiler rooms.

Full working pressure, 193 lbs.

Total heating surface, 40,721 sq. ft. (cylindrical, 16,792 sq. ft.).

Total grate surface, 919 sq. ft. (cylindrical, 506 sq. ft.).

Steam trials.

| Ship. | Nature of trial. | Date. | Speed. | Horse-Power. | Revolutions. | Remarks. |
|------------------------------------|--|-------|----------------|--------------|--------------|---|
| <i>Kaiser Barbarossa</i> | 6 hours full power 50 hours coal consumption. | 1901 | Knots. 18.0 | 13,940 | 113 | Coal per I. H. P. per hour, 1.84 lbs., main engines only. |
| | | 1901 | 15.5 | 7,360 | 94 | |

Designed Speed Coal, Endurance, &c., as in *Kaiser Friedrich III.*

Kaiser Wilhelm II.

(See Plate 9.)

| | |
|-------------------------------------|--------------------------------------|
| Programme year | 1896-7. |
| Designation before launch | Ersatz <i>Friedrich der Grosse</i> . |
| Built at | Imperial Dockyard, Wilhelmshaven. |
| Laid down | 26th October 1896. |
| Launched | 14th September 1897. |
| First commissioned | 13th February 1900. |

Cost.—

| | |
|-------------------------------|-----------|
| Hull, machinery, &c | £ 690,802 |
| Gun armament | 244,618 |
| Torpedo armament | 34,736 |
| Total | £970,156 |

General Remarks.—Sister ship to *Kaiser Friedrich III.* Fitted as fleet flagship. Was modernised in 1908-1910, the alterations being similar to those carried out in *Kaiser Friedrich III.* (see page 34). Now (May 1917) serves as harbour accommodation ship for the Commander-in-Chief and staff of the High Sea Fleet.

Details as for *Kaiser Friedrich III.*, except as mentioned below.

Constructive Details.—A watertight passage runs fore and aft under the armoured deck, between the conning towers. It is about 2 ft. 9 ins. broad and contains the steering shafts, engine-room telegraph shafting, electric leads, voice tubes, and fire mains. It can be closed at the ends by watertight doors.

Searchlights.—

4—one on each mast and two on platform before the foremost funnel.

Boilers.—

Eight cylindrical and four Schulz, Navy type. First used at sea 1899.

Total heating surface, 38,267 sq. ft.

Total grate surface, 949 sq. ft.

Part III.
Section 2.Battle-
ships.

Kaiser Friedrich III.

(See Plate 9.)

| | |
|---------------------------|-----------------------------------|
| Programme year | 1894-95. |
| Designation before launch | Ersatz <i>Preussen</i> . |
| Built at | Imperial Dockyard, Wilhelmshaven. |
| Laid down | 5th April 1895. |
| Launched | 1st July 1896. |
| First commissioned | 21st October 1899. |

General Remarks.—This vessel is believed (May 1917) now to have been paid off, and to have had her guns and armour removed.

She was the first German battle ship to be fitted with three propeller shafts. Was modernised in 1907-09. The work carried out consisted principally in replacing the military masts by pole masts, removing the four 5.9-in. guns on main deck and one above-water torpedo tube in stern, cutting down the upper works, retubing boilers, and reducing weights generally. By these changes the displacement was reduced by 500 tons, and consequently the upper edge of the armour belt was brought higher above the water.

Complement.—622 (as private ship).

General Appearance.—See Photograph Book.

General Dimensions, &c.—

| | |
|---|----------------|
| Length between perpendiculars | 377 ft. 4 ins. |
| Length, L. W. L. | 396 " 8 " |
| Length, extreme | 411 " 1 " |
| Breadth, extreme | 66 " 11 " |
| Draught, designed load | 25 " 6 " |
| Displacement, designed load | 10,474 tons. |
| Height of fore funnel to L. W. L. | 70 ft. 0 ins. |
| Height of fore lower masthead to L. W. L. | 95 " 0 " |

Constructive Details.—Cork-filled cofferdams are fitted inside on the waterline. The use of wood in decks and fittings has been abolished as far as possible. The number of openings in the armoured deck is reduced as much as possible. Below the armoured deck there are no openings whatever for passage between the various engine and boiler rooms, which are in separate watertight compartments. All watertight doors below the armoured deck have spring hinges, and an arrangement by which closing one clip closes all. The ram lies very deep under the water and is acute shaped.

Armour.—

Material.—Krupp nickel steel.

Belt.—7 ft. wide; extends from the stem for four-fifths the length of the ship; 11.8" thick abreast the engines and boilers, 5.9" forward and 7.9" aft.

Bulkhead.—Aft, 9¾" thick.

Turrets and Gun Positions.—

Turrets for 9.4-in. guns—9.8" thick.

Turrets for 5.9-in. guns—5.9" thick.

Casemates for 5.9-in. guns—5.9" thick in front, 4" in rear. Gun shields, 2.7" thick. In the forward and after casemate, each containing two guns, a 2" screen divides the guns to within 3 or 4 ft. of outer wall of casemate.

Ammunition Tubes.—For 9.4-in. guns—forward, 9", aft, 9.8" thick; for 5.9-in. guns—4" thick.

Conning Towers.—Fore, 9.8", after, 5.9" thick; both are rectangular and roomy.

Horizontal.—Deck on top of the belt, 2½"; abaft the belt, 3" thick. Deck over engines and boilers, .8" thick.

Kaiser Friedrich III.—cont.

Armament.—

Guns and Ammunition Supply.—

(For arcs of training, see Plate.)

4—9.4-in. (24-cm.) Q.F., L/40. In turrets on Drehscheiben-Lafette C/97.

14—5.9-in. (15-cm.) Q.F., L/40. Six in single turrets, on Turm-Lafette C/97. Ready supply in turrets, 6 rounds.

Eight in armoured casemates on upper deck on Central Pivot Mounting C/97.

Electric, alternative hand dredger hoist to each casemate, controlled in casemate. Rate of supply, 8 rounds per minute.

14—15-pr. (8.8-cm.) Q.F., L/30. On C.P. Mounting C/89 with ½" shields. Dredger hoists worked by hand from main deck.

2—Machine guns.

2—7-pr. (6-cm.) B.L., L/21, boat and field guns.

For further details, see Part IV. of this book.

Magazines and Stowage.—

9.4-in. guns.—Magazines under guns, 80 rounds per gun.

5.9-in. guns.— " " 150 " "

Torpedo Tubes.—

5—17.7-in. (45-cm.) submerged; one under ram, with 3° elevation, two on each broadside, fixed 20° before the beam

Torpedoes.—12 are carried in peace and 15 in war time.

Searchlights.—

4—35.4-in. (90 cm.), each 40,000 c.p.; one on each mast, and two on platform before foremost funnel.

Boats.—See Section 1.

Boat Cranes.—Two, abreast after funnel, tested to 32 and 18 tons respectively.

Steering Gear.—Hand and steam.

Rapson's slide. Two engines in tiller compartment. Each engine has its own steering wheel and compass. There are seven steam-steering positions and one hand. Steam—one on bridge, one in each conning tower, one in each fighting position under the conning tower, and one at each steering engine. The hand wheel is in the flat before the tiller flat.

Coaling Arrangements.—Four electric and two steam hoists each side.

Machinery and Boilers.—

Main Engines.—

Three sets in three separate water-tight compartments, the central engine being abaft the other two, which are abreast.

Type—Vertical, triple expansion, four-cylinder.

Diameter of cylinders, 34.6 ins., 54.2 ins., and two of 60.6 ins.

Length of stroke, 37.4 ins.

Working pressure at engines, 170 lbs. per sq. in.

Revolutions at full power, 110.

Boilers.—

Date when first used at sea—1898.

Twelve in number; in pairs in six separate compartments.

Type—Eight cylindrical, four Thornycroft water-tube. Retubed 1908.

Full working pressure, 170 lbs.

Total heating surface, 36,530 sq. ft.

Total grate surface, 935 sq. ft.

Auxiliary Machinery includes—

Steam.—

Two capstans, one forward and one aft.

Pumps with a total pumping capacity of 2,298 tons per hour.

Two sets of distilling apparatus with an output of 24 tons per day.

Four coaling winches.

Kaiser Freidrich III.—cont.

Machinery and Boilers—cont.

Electric.—

- 5 dynamos, four of 60 kw. and one of 75 kw.
- 6 motors for training 5.9-in. turrets.
- 18 motors for 5.9-in. ammunition hoists.
- 11 motors for light gun ammunition hoists.
- 4 motors for engineer's workshop.
- 18 ventilating fans.
- 8 coaling winches.
- Internal lighting.
- Refrigerating machinery.

There are also three accumulator batteries. If the dynamos cease running these batteries are ready for immediate use for purposes of navigation, transmission of orders, the lighting of lanterns and signal apparatus.

Propellers.—Three.

Outer propellers—three-bladed. Diameter, 14 ft. 8 ins. Pitch, 19 ft. 6 ins. The shafting converges slightly from the propellers towards the engines. The Centre propeller—four-bladed. Diameter, 13 ft. 8 ins.

Speed, Horse Power, and Fuel.—

| Ship. | Speed (designed). | Horse-Power (designed). | Fuel: (a) Coal. (b) Oil. |
|--------------------------------|-------------------|-------------------------|--------------------------|
| Kaiser Karl der Grosse..... | Knots. 17.5 | 13,500 | (a) 1,053 (b) 98 |
| Kaiser Wilhelm der Grosse..... | | | |
| Kaiser Barbarossa..... | | | |
| Kaiser Wilhelm II..... | | | |
| Kaiser Friedrich III..... | | | |

Endurance.—

| | Speed. | Horse-Power. | Daily Consumption. | Radius of Action. | Remarks. |
|---|----------------|--------------|--------------------|-------------------|----------|
| At 3/4ths designed power..... | Knots. 16.8 | 10,800 | Tons. 254 | Miles. 1,750 | |
| At maximum continuous seagoing speed..... | 16.3 | | | | |
| At 2/3ths designed power..... | 15.8 | | | | |
| At 1/2ths designed power..... | 14.3 | | | | |
| At 1/4th designed power..... | 11.5 | | | | |
| At 10 knots..... | 10.0 | 2,700 | 132 | 2,920 | |
| | | 1,745 | 78 | 3,910 | |
| | | | 58 | 4,580 | |

Brandenburg and Wörth.

(See Plate 10.)

| Name. | Programme Year. | Where Built. | Laid Down. | Launched. | First Commissioned. |
|------------------|-----------------|----------------------------|--------------------------|-------------------|---------------------|
| Brandenburg..... | 1889-90 | Vulcan Works, Stettin..... | Spring 90..... 3.3.90 | 21.9.91 6.8.92 | 19.11.93 1.8.94 |
| Wörth..... | 1889-90 | Germania Yard, Kiel..... | | | |

General Remarks.—

The Wörth was modernized in 1903, and Brandenburg in 1904, submerged tubes being installed, woodwork removed, ventilation improved, and boilers thoroughly repaired. Both vessels were paid off early in the war, and have probably had their guns and armour removed.

Brandenburg and Wörth—cont.

General Remarks—cont.

The other vessels of this class—Kurfürst Friedrich Wilhelm and Weissenburg—were sold to Turkey in 1910 for a total sum of 880,626l., the proceeds being devoted to paying off the loan contracted to meet the deficit on the Budget for 1909.

Complement.—585.

General Appearance.—See Photograph Book.

General Dimensions, &c.—

| | |
|-------------------------------------|----------------|
| Length between perpendiculars..... | 354 ft. 4 ins. |
| Length, L.W.L..... | 373 " 8 " |
| Length, extreme..... | 379 " 7 " |
| Breadth, extreme..... | 64 " 0 " |
| Draught, designed load..... | 24 " 3 " |
| Displacement, designed load..... | 9,901 tons. |
| Height of fore funnel to L.W.L..... | 70 ft. 0 ins. |
| " " lower masthead to L.W.L..... | 95 " 0 " |

Constructive Details.—Is divided into 120 water-tight compartments.

Armour.—

Material.—Compound.

Belt.—Complete; 8 ft. 6 in. wide, 15 3/4" thick at the upper edge, tapering to 7 3/4" at the lower edge, amidships; reduced to 11 3/4" forward and aft, and tapering to 7" forward and 6" aft at the lower edge.

Barbettes, Gun Positions.—11 3/4". Shields 4 3/4", circular in shape in front and at the sides, but rectangular in rear, with a sighting position on the top. The 4 1-in. gun battery is protected by 2" armour, with 2" screens forward and aft, and 3/4" screens between the guns.

Conning Tower.—11 3/4" with 1.2" top.

Horizontal.—Deck 2 1/2", at the upper edge of the belt.

Armament.—

Guns and Ammunition Supply.—

(For arcs of training, see Plate.)

- 4—11-in. (28-cm.) B.L., L/40; in pairs in barbettes forward and aft.
- 2—11-in. (28-cm.) B.L., L/35; in a central barrette.

All six guns are mounted on Drehscheiben-Lafette C/92 and are loaded, trained, and elevated by hydraulic power with alternative hand gear. Elevation + 25°, - 4°.

8—4 1-in. (10.5-cm.) Q.F., L/35, on C.P. Mounting C/91; in upper deck battery.

8—15-pr. (8.8-cm.) Q.F., L/30, on C.P. Mounting C/89; one each side forward on upper deck, one each side abreast foremast on superstructure, two each side abreast mainmast on after superstructure and bridge.

2—Machine guns.

2—7-pr. (6-cm.) B.L., L/21, boat and field guns.

For further details, see Part IV of this book.

Magazines and Stowage.—

11-in. guns—60 rounds per gun. There are magazines under each barrette. The midship one is between the engine room and stokehold, and is protected from the heat of the latter by a thwartship coal bunker.

Torpedo Tubes.—

- 2—17.7-in. (45-cm.) submerged; one on each side in line with foremost end of fore barrette.
- 1—17.7-in. (45-cm.) stern tube, above water.

Searchlights.—2—on platforms above each fighting top.

Part III.
Section 2.
Battle-
ships.

Brandenburg and Wörth—cont.

Boats.—See Section 1.

Steering Gear.—Hand and steam.

Rapson's slide. Two steering engines in tiller compartment, which is very large. Each engine has its own steering wheel and compass. A light upper tiller (not available for a sudden emergency) can be coupled to either hand or steam gear.

Machinery and Boilers.—

Main Engines.—

Two sets in very roomy separate watertight compartments.
Type—Vertical, triple expansion.
Diameters of cylinders—32.6 ins., 54.6 ins., and two of 86.6 ins.
Length of stroke, 39.3 ins.
Working pressure at engines, 170 lbs. per sq. in.
Revolutions at full power, 108.

Boilers.—

Twelve in number, in four boiler rooms containing three each.
Fitted to burn oil fuel as well as coal.
Type—Cylindrical, return tube, single-ended. Thoroughly repaired, 1903-04.
Full working pressure, 180 lbs.
Total tube heating surface, 24,640 sq. ft.
Total grate surface, 753 sq. ft.

Auxiliary Machinery includes—

Four boat hoists.
Pumps with a total pumping capacity of 2,175 tons per hour.

Propellers.—Two, three-bladed, bronze. Diameter, 16 ft. 8 ins.

Speed, Horse-Power, and Fuel.—

| Speed (designed). | Horse-Power (designed). | Fuel: (a) Coal. (b) Oil. |
|-------------------|-------------------------|--------------------------------|
| Knots. 17 | 9,000 | (a) 1,062 (b) 98 |

Endurance.—

| | Speed. | Horse-Power. | Daily Consumption. | Radius of Action. | Remarks. |
|---|--------|--------------|--------------------|-------------------|----------|
| | Knots. | | Tons. | Miles. | |
| At $\frac{3}{4}$ ths designed power..... | 15.8 | 7,200 | 173 | 2,460 | |
| At maximum continuous seagoing speed..... | 15.3 | 6,400 | 155 | 2,680 | |
| At $\frac{2}{3}$ ths designed power..... | 14.7 | 5,400 | 127 | 3,130 | |
| At $\frac{1}{2}$ ths designed power..... | 13.0 | 3,600 | 92 | 3,810 | |
| At $\frac{1}{4}$ th designed power..... | 10.4 | 1,800 | 55 | 5,070 | |
| At 10 knots..... | 10.0 | 1,570 | 50 | 5,440 | |

BATTLE CRUISERS.

Hindenburg, Manteuffel, and Mackensen.

| Ship. | Designation before Launch. | Programme Year. | Built or Building at | Ordered. | Laid Down. | Launched. | Commissioned for Trials. | Completed Trials. |
|-----------------|-----------------------------|-----------------|-----------------------------------|----------|------------|-----------|--------------------------|-------------------|
| Hindenburg..... | Ersatz Hertha..... | 1913-14 | Imperial Dockyard, Wilhelmshaven. | *20.4.13 | *9.6.13 | 1.8.15 | *— 5.17 | |
| Manteuffel..... | Ersatz Victoria Louise..... | 1914-15 | Blohm & Voss Works, Hamburg. | | 1914 | *— 10.15 | | |
| Mackensen..... | Ersatz Freya..... | 1915-16 | " " " " | | 1915 | 21.4.17 | | |

* Approximate dates.

General Remarks.—These vessels are believed generally to resemble the *Derfflinger* (see below), but will undoubtedly represent an advance on that type, and the *Manteuffel* and *Mackensen* may be armed with 15-in. guns. The completion of the *Hindenburg* was much delayed owing to the removal of several armour plates, two of her turrets, and all her 12-in. guns, to make good damage in other ships after the Battle of Jutland.

The gun armament of the *Hindenburg* is believed to be:—

8—12-in. (30.5 cm.) L/50, in twin turrets on centre line.

14—5.9-in. (15 cm.) L/50, in central battery.

8—22-pr. (8.8 cm.) semi-automatic, anti-aircraft guns, fitted with curved shields.

There is no reliable information as to the torpedo armament.

General Appearance.—*Hindenburg* has a tripod mast forward and a short pole mast aft like the battleships of the *Bayern* class, but is believed otherwise to be generally similar to *Derfflinger*.

General Dimensions, &c. (These figures are doubtful.)—

| | |
|-----------------------------|----------------|
| Length, L.W.L..... | 700 ft. 0 ins. |
| Breadth, extreme..... | 95 " 2 " |
| Draught, designed..... | 27 " 3 " |
| Displacement, designed..... | 27,000 tons. |

Speed and Horse-Power.—The designed S.H.P. is reported to be 85,000, and designed speed, 28 knots.

Derfflinger.

(See Plate 11.)

| Ship. | Designation before Launch. | Programme Year. | Where Built. | Ordered. | Laid Down. | Launched. | Commissioned for Trials. | Completed Trials. |
|------------------|----------------------------|-----------------|------------------------|----------|------------|-----------|--------------------------|-------------------|
| Derfflinger..... | K..... | 1911-12 | Blohm & Voss, Hamburg. | *— 6.11 | — 3.12 | 1.7.13 | *— 8.14 | *— 11.14 |

* Approximate dates.

Cost.—

| | |
|--------------------------|-----------|
| Derfflinger.— | £ |
| Hull, machinery, &c..... | 1,450,586 |
| Gun armament..... | 735,322 |
| Torpedo armament..... | 47,456 |
| Total..... | 2,233,364 |

Part III.
Section 2.Battle
Cruisers.

Derfflinger—cont.

General Remarks.—The *Lützow*, which was a sister ship to the *Derfflinger*, was sunk in action 31st May—1st June, 1916. These were the first German battle cruisers with all centre-line turrets.

A noticeable feature in the *Derfflinger* is the continuous deck running with a marked sheer from the stem to the stern and forming amidships the battery deck. The 5.9-in. battery is thus practically one deck higher than in previous battle cruisers.

Complement.—Peace complement, 1,125; war complement, about 1,400.

General Appearance.—See Photograph Book, but a heavy-looking tripod foremast has been fitted since the Battle of Jutland.

General Dimensions, &c.

| | |
|--|----------------|
| Length, L.W.L. | 689 ft. 0 ins. |
| Breadth, extreme | 95 " 2 " |
| Draught, designed load | 27 " 3 " |
| Displacement, designed load | 26,180 tons. |
| Freeboard (approximate) at stem | 24 ft. 0 ins. |
| designed draught | 15 " 0 " |
| Heights of axis of guns above waterline— | |
| 1st turret | 26 ft. 11 ins. |
| 2nd " | 35 " 7 " |
| 3rd " | 30 " 4 " |
| 4th " | 20 " 9 " |
| 5.9-in. guns (average) | 18 " 0 " |
| Height of fore funnel to L.W.L. | about 72 " 0 " |
| " " lower masthead to L.W.L. | " 110 " 0 " |

Constructive Details.

Below the armoured deck the framing is of the longitudinal type except at the ends of the ship. Above the armoured deck it is of the transverse type.

The distance between frame stations is 25.2 ins. For the greater part of the length of the ship bracket frames are worked at every third frame station; at the intermediate stations the vertical keel is stiffened by triangular plates.

The vertical keel is .7" thick. Bilge keels are fitted, about 206 ft. in length, 47 ins. in depth, and 19.7 ins. width at base. Docking keels also are fitted.

From abreast the fore side of the first turret to just abaft the fourth turret two continuous longitudinal protective bulkheads are fitted. The outer one, at a distance of about 6 ft. 7 ins. from the ship's side, is about .3" thick. The inner, which is referred to below under "Armour" as the torpedo protection bulkhead, is about 13 ft. from the ship's side and is from 1.2" to 1.8" in thickness. The space between these two bulkheads forms the protective coal bunkers. The supply bunkers are on the inner side of the torpedo protection bulkhead and are about 10 ft. in width. A middle line bulkhead is fitted for the whole length of the ship between the turrets, being interrupted only in way of turret ammunition trunks.

The average thickness of the hull plating is .6". The thickness is increased to .9" in way of the stern framing, &c. Immediately below the armour the plating is doubled.

Armour and other Protection.

Material.—Krupp cemented.

Main Belt (amidships).—Extends from the fore side of the first to 10 ft. abaft the fourth turret. Length, 399 ft. Width, about 12 ft. of which 5 ft. 7 ins. is below the waterline. The maximum thickness is believed to be about 12".

Upper Belt (amidships).—Has the same extent as the main belt and is believed to be about 7 ft. in width and 8" in thickness.

The thickness is increased to .9" in way of the stern framing, &c. Immediately below the armour the plating is doubled.

Part III.
Section 2.Battle
Cruisers.

Derfflinger—cont.

Armour and Other Protection—cont.

Wing Splinter Bulkhead.—A longitudinal splinter bulkhead, 1.2" thick, is fitted on either side between the armoured and battery decks, forming a continuation of the torpedo protection bulkhead (*q.v.*).

Main and Upper Belts (prolongation to ends of ship).—The main and upper belts are continued forward to the stem, and aft to within 15 ft. of the stern, by armour believed to have a maximum thickness of 5".

Transverse Bulkheads.—At the ends of the midship portion of the main and upper belts transverse bulkheads are fitted. The foremost one butts on No. 1 turret. The thickness in both cases is believed to be about 9".

A further transverse bulkhead is fitted, 15 ft. from the stern, between the after ends of the side armour.

Battery.—The battery extends between No. 2 and No. 4 turrets and is closed at either end by diagonal bulkheads which butt on the turrets. The thickness of the armour and bulkheads is believed to be about 7".

Splinter Bulkheads and Casemates.—The interior of the battery is subdivided by two longitudinal bulkheads, .8" thick, in rear of the line of 5.9-in. guns, and by short splinter screens, also .8" thick, between the guns.

Barbettes.—Believed to be about 10" in thickness.

Turrets.—Front armour believed to be about 11" in thickness.

5.9-in. Gun Shields.—3.1" thick.

Conning and Control Towers.—Believed to be generally similar to those in *Seydlitz* (see p. 46).

Armoured hoods are fitted, one on either side of battery, projecting just above the upper deck. They take 10-ft. range-finders for use with the 5.9-in. guns.

Torpedo Protection Bulkhead.—1.2" to 1.8" thick, is fitted on either side of the ship, extending for the same longitudinal distance as the midship section of the belt, viz., 399 ft. Vertically it extends from the outer bottom to 28 ins. above the armoured deck, whence it is continued as a wing splinter bulkhead, 1.2" thick, up to the battery deck.

Horizontal:—

Principal Armoured Deck.—Is generally 3 ft. 9 ins. above the waterline amidships, 4 ft. 4 ins. below the waterline forward, and about 2 ins. above it aft. Forward the deck is flat; amidships and aft it slopes down at an angle of 30° to 4 ft. 4 ins. below the waterline at the sides. Amidships and forward the deck is about 2" thick; aft, about 3.2" on the flat and 2" on the slopes.

Battery Deck.—Probably armoured only where shown in Plate; thickness .8" to 1.2", with doubling plates .8" thick in certain places.

Upper Deck.—Thickness, 1" to 2".

Torpedo Nets.

Beam net defence was originally fitted, but has been discarded since the Battle of Jutland.

Armament.**Guns and Ammunition Supply.**

(For approximate arcs of training, see Plate.)

8—12-in. (30.5-cm.) Q.F. L/50, mounted in pairs in turrets on centre line, second and third turrets firing over first and fourth respectively.

Training electric, elevation hydraulic, ammunition hoists electric.

Maximum elevation 13° 30', maximum depression 8°.

Rate of delivery of projectiles and charges, 3½ rounds a minute.

Loading at fixed angle of elevation.

14—5.9-in. (15-cm.) Q.F. L/45, on C.P. mounting, with 3.2-in. shields, in central battery.

Ammunition hoists electric, alternative hand.

Maximum elevation 20°, maximum depression 10°.

Derfflinger—cont.**Armament—cont.**

8—22-pr. (8.8-cm.), semi-automatic, anti-aircraft guns, fitted with curved shields.
2—machine guns.

For further details, see Part IV. of this book.

Magazines and Stowage.—

The main magazines are situated immediately below each turret. The central magazine, between the two boiler rooms, supplies the 5.9-in. battery.

A middle line passage immediately under the armoured deck allows of an interchange of ammunition between the third turret supply and the fourth turret supply.

Stowage for 12-in. guns, 720 rounds.

“ “ 5.9-in. guns, 2,240 rounds.

Torpedo Tubes.—

4—19.7-in. (50-cm.) submerged tubes. The bow tube, depression nil, is fitted 15 ft. 5 ins. below waterline; the stern tube, depression 1° 45', 5 ft. 5 ins. below waterline. The two broadside tubes, depression 2°, are fixed at an angle of 20° before the beam and are fitted with gyro angling gear which can be set for every 15° from 30° before to 60° abaft the direction of the tube; they are about 18 ft. below waterline.

Torpedoes.—

Sixteen torpedoes are carried, three being stored near the bow and three near the stern tube, and five near each broadside tube.

Warhead magazines are fitted both forward and aft.

Mines.—There is no permanent stowage for mines.**Searchlights.—**

Probably 9—43.3-in. (110-cm.) searchlights are carried in position, and two spare. In addition there are four searchlights for signalling.

Of the nine searchlights in use one is believed to be carried on platform under fore top, and two on platform on fore side of mainmast. The searchlights are electrically controlled, the control positions being below the lights. Switching on and off is effected from the control position.

Stowage for all the searchlights in use as well as for the two spare searchlights is provided behind armour. An electrically controlled disappearing platform is fitted for each spare searchlight.

The searchlights are fed by four groups of special motor generators, 80 volts, 200 ampères.

Communications.—

A transmitting station is fitted below the armoured deck, just abaft after conning and control tower.

For the whole length of the boiler rooms there are two fore and aft passages, one on either side of the middle line bulkhead immediately below the armoured deck. These passages carry cables, voice pipes, and other means of communication between the fore part of the ship and the after part.

Range-finders.—12—10-ft. range-finders are carried, one in each control tower, one in each of the armoured hoods for 5.9-in. guns, and two in each of the turrets (i. e., one in use and one spare).

Boats.—

For details, see Section 1.

All boats are stowed inboard except the two cutters, which are carried in davits.

Derricks.—There are two derricks on stump masts, each capable of lifting 12 tons.

Derfflinger—cont.**Steering Gear.—**

Two rudders are fitted, one abaft the other. Area of after rudder, 344 sq. ft.; foremost rudder, 205 sq. ft. Foremost rudder works on ball bearings.

Maximum angle of helm is 40°.

Each rudder has a special electric steering engine and controls, but the two rudders can be worked simultaneously. The hand steering arrangements also permit of the two rudders being worked independently or together. The two rudders can be worked by one of the steering engines alone.

Bridge.—

The navigating bridge is formed by the fore superstructure deck with a swinging bridge extension on either side. A portable shelter and a compass and steering wheel are fitted before the conning tower. Portable shelters for signalmen are fitted on either side of the bridge. The charthouse is abaft the conning tower.

A signaling bridge is fitted above the charthouse, and is so arranged as not to interfere with the view from the conning tower.

Compasses.—Seven magnetic compasses and five gyroscopic compasses are fitted. The main standard compass is fitted just before and below the lower conning tower. An auxiliary standard compass ships on a portable platform on the quarterdeck.

Anchors and Cables.—

Two bower anchors, each of 7.5 tons, and one stern anchor of 3.75 tons, are carried.

For the bower anchors, 21 shackles of 2.8-in. cable are carried; for the stern anchor, a 6½-in. wire hawser.

The two capstans for the bower anchors are worked independently of each other by a steam engine. The capstan for the stern anchor is worked by an electric motor.

Coaling Arrangements.—

Coaling stays are fitted on either side of the ship with 18 whips, worked by nine portable electric winches with double drums. The foremost and after capstans and the boat hoists are also utilised.

There are bunkers on either side of the wing splinter bulkhead above the armoured deck; protective bunkers on the one side and supply bunkers of the other side of the torpedo protection bulkhead below the armoured deck. Openings in the wing splinter bulkhead enable coal to be passed from the upper outer into the upper inner bunkers. The protective bunkers are filled from the scuttles of the upper outer bunkers.

Coal is passed from the upper deck to the scuttles of the battery deck through shoots which can be unshipped where they obstruct the fire of the casemate guns. A separate scuttle is fitted for every 40–50 tons of coal.

The scuttles of the after bunkers, which extend abreast the engine rooms, allow of the passage of a full bag, as the coal in these bunkers is kept stowed in bags to enable it to be transported forward when necessary. These after bunkers constitute reserve and protective bunkers only.

There are no coaling scuttles in the casemates.

Machinery and Boilers.—Main Engines.—Turbines, Navy type, on four shafts.

Boilers.—18 Schulz, Navy type. Several boilers are fitted for oil-firing only, the remainder for coal and oil.

Propellers.—Four.

Speed, Horse-Power, and Fuel.—

| Ship. | Speed (designed). | Horse-Power (designed). | Fuel: (a) Coal. (b) Oil. |
|------------------|-------------------|-------------------------|--------------------------------|
| Derfflinger..... | Knots. 26.5 | 63,000 | (a) 4,625 (b) 984 |

DECLASSIFIED
Authority E.O. 10501

Seydlitz—cont.

Part III.
Section 2.
Battle
Cruisers.

Armour and Other Protection—cont.

Barbettes—cont.

thick except on the fore side, where it is 9" thick and forms part of the transverse bulkhead. This portion consists of two plates, each 15 ft. 5 ins. high and 9 ft. 10 ins. wide.

Nos. 2 and 3.—Of same diameter as No. 1, but cylindrical only above upper deck and like an inverted irregular truncated cone between that deck and the battery deck. It consists of 5 plates each 3 ft. 11 in. high by 17 ft. 0 in. wide and 9" thick above upper deck, and of 4 plates, each 7 ft. 3 in. high and with a mean width of 7 ft. 3 in., and 3.9" thick between that and the battery deck; and is 1.2" thick between the battery and armoured decks.

No. 4.—Above the battery deck it consists of 9 plates, each 12 ft. 2 in. high with a mean width of 9 ft. 2 ins., 8 of which are 9" thick, whilst the ninth on the after side, where it is partially protected by No. 5 barrette, is only 7.9" thick. Between the battery and armoured decks it is only 1.2" thick.

No. 5.—Consists of 4 plates, each 4 ft. 3 in. high and 17 ft. 5 in. wide, extending to battery deck. These plates are 9" thick. Below the battery deck the barrette is 1.2" thick, except on the after side, where it is 9" thick and forms part of the transverse bulkhead. This portion consists of two plates, each 16 ft. 5 in. high by 8 ft. 6 in. wide.

Turrets.—Front 9.8", sides and rear 7.9" thick. Roof 3.9" on slope, 2.75" on flat, Floor 3.9" and 2" thick.

Conning and Control Towers.—

Fore.—In elevation the foremost conning and control tower is roughly an inverted truncated cone, built into the fore superstructure. Front and sides 13.8" thick, rear 9.8". Roof 3.1" thick, and floor 2.75". Entrance is by door in rear of the centre line. The tower is divided into two parts by a bulkhead 2.4" thick, in which there are two doors. The after part or control position projects 2 ft. 9 ins. above the foremost or navigating position and is 13.8" thick in front and 9.8" in rear. Both positions are provided with observation slits. In the control position gratings are fitted well above the level of the superstructure deck, as a platform for the control officers and range-taker; the space below these gratings forms the upper transmitting station. A communication tube, square in section, 3½ ft. × 3½ ft., and 28 ft. 9 in. long, extends to the armoured deck. It is 7.9" thick in front and sides and 5.9" in rear. The base of the conning tower is 3.1" thick, and extends down to the battery deck, where there is a door.

After Conning Tower.—Inner diameter 7 ft. 10 in., height 7 ft. 10 in., sides 7.9" thick, roof and floor 2". The communication tube is cylindrical—internal diameter 2 ft. 6 in., thickness 5.9" above, and 3.1" below, the battery deck. Door in rear on centre line.

A 10-ft. range-finder with armoured protection is fitted on top of each conning tower.

Armoured Hoods.—Are fitted, one on either side of the battery, projecting just above the upper deck, immediately before the broadside turret in each case. They take 10-ft. range-finders for use with 5.9-in. guns.

Torpedo Protection Bulkhead.—Is fitted on either side of the ship and 13 ft. 2 in. distant therefrom, and extending the same longitudinal distance as the midship section of the belt, namely, 376 ft. 4 in. This bulkhead extends from the outer bottom to the battery deck. It is 2" thick in the wake of the magazines and 1.2" elsewhere. The ends are closed by 8" transverse bulkheads, which are continuations of the armoured bulkheads which close the main and upper belts.

Seydlitz—cont.

Part III.
Section 2.
Battle
Cruisers.

Armour and Other Protection—cont.

Horizontal.—

Armoured Deck.—This is 4 ft. 7 in. above the waterline, for the extent of the midship section of the belt, and drops to 3 ft. 11 in. below the waterline forward and 6 in. below it aft. Amidships it slopes to 3 ft. 11½ in. below the waterline (or 1 ft. 3¾ in. above the lower edge of the main belt). Forward it is nearly flat; aft it slopes to 4 ft. 3 in. below the waterline, or 11¾ in. above the lower edge of the armour. Amidships it has a uniform thickness of 1.2"; forward 2"; aft 3.1" on the flat and 2" on the slopes.

Battery (or Main) Deck.—This is only armoured between the ends of the battery and the armoured bulkheads which close the main and upper belts. It is 1" thick.

Upper Deck.—2.2" to 1.4" thick over the space enclosed by the longitudinal splinter bulkheads (in rear of the 5.9-in. guns) and the ship's side, and 1" elsewhere over the battery except in the neighbourhood of the echelon turrets, where it is thicker. (See Plate.)

Torpedo Nets.—Beam net defence was fitted but has been discarded since the Battle of Jutland. There were 14 net booms, 32.8 ft. apart.

Armament.—

Guns and Ammunition Supply.—

(For approximate arcs of training, see Plate.)

10—11-in. (28-cm.) Q. F., L/50.

12—5.9-in. (15-cm.) Q. F., L/45.

*2 or 4—22-pr. (8.8-cm.), semi-automatic, anti-aircraft guns.

4—Machine guns.

†1—7-pr. (6-cm.) Q. F., L/21, boat and field gun.

All the above are believed to be generally similar to the guns and mountings of the *Moltke* (page 50).

Magazines and Stowage.—

96 rounds per gun for 11-in. guns, centre line turrets.

81 " " " " side turrets.

160 " " " 5.9-in. guns.

Torpedo Tubes.—

4—19.7-in. (50-cm.) submerged, situated as follows:—one under the fore foot, one each side immediately before the foremost turret, and one aft on the starboard side. The two broadside tubes are fixed at an angle of 20° before the beam and are fitted with gyro angling gear which can be set for every 15° from 30° before to 60° abaft the direction of the tube.

Mines.—There is believed to be no permanent stowage for mines.

Searchlights.—

8—43.3-in. (110-cm.), arranged as in *Moltke* (page 51).

Range-Finders.—As in *Moltke* (page 51).

Boat Derricks.—Two—one on either side of after funnel.

Steering Gear.—One balanced rudder is fitted on centre line aft, and two parallel rudders before it (see Plate).

* These guns have taken the place of four of the twelve 22-pr. (8.8-cm.) Q. F., L/45, which were originally carried. The rest of the light guns are believed to have been removed entirely.

† Probably landed for service in the field.

DECLASSIFIED
Authority E.O. 10501

Seydlitz—cont.

Machinery and Boilers.—

Main Engines.—

Parsons turbines on four shafts.

Boilers.—

27 Schulz, Navy type, in five watertight compartments, which are sub-divided by means of longitudinal bulkheads into 15 smaller ones (containing one or two boilers each).

Total grate surface—2,806 sq. ft.

Propellers.—Four, diameter about 11' 6".

Speed, Horse-Power, and Fuel.—

| Ship. | Speed (designed). | Horse-Power (designed). | Fuel: (a) Coal. (b) Oil. |
|----------|-------------------|-------------------------|--------------------------|
| Seydlitz | Knots. 26.5 | 63,000 | (a) 3,543 (b) 197 |

Steam Trials.—

| Ship. | Nature of Trial. | Date. | Speed. | Horse-Power. | Revolutions. | Remarks. |
|----------|--------------------|---------|--------|--------------|--------------|----------|
| Seydlitz | Measured mile | — 7. 13 | 28. 13 | 89,738 | 293 | |
| | 6 hours full power | — 7. 13 | 26. 75 | 73,923 | | |

Endurance.—

| | Speed. | Horse-Power. | Daily Consumption. | Radius of Action. | Remarks. |
|--------------------------------------|-------------|--------------|--------------------|-------------------|----------|
| At $\frac{3}{4}$ ths designed power | Knots. 24.5 | 50,400 | Tons. 1,028 | Miles. 2,080 | |
| At maximum continuous seagoing speed | 23.7 | 43,100 | 905 | 2,280 | |
| At $\frac{2}{3}$ ths designed power | 22.7 | 37,800 | 810 | 2,440 | |
| At $\frac{1}{2}$ th designed power | 20.2 | 25,200 | 567 | 3,000 | |
| At 10 knots | 18.2 | 12,600 | 351 | 4,020 | |
| | 10.0 | 3,000 | 141 | 6,225 | |

Moltke.

(See Plate 13.)

| Ship. | Designation before Launch. | Programme Year. | Built at. | Ordered. | Laid Down. | Launched. | Com-missioned for Trials. | Completed Trials. |
|--------|----------------------------|-----------------|--------------------------|------------|-------------|-----------|---------------------------|-------------------|
| Moltke | G. | 1908-09 | Blohm and Hamburg. Voss. | *17. 9. 08 | †28. 12. 08 | ‡7. 4. 10 | 30. 9. 11 | 31. 3. 12 |

*Official dates.

† Approximate date.

‡ The Moltke was launched with all boilers in place.

Cost.—

| | |
|---------------------|-------------------|
| Hull, machinery, &c | £ 1,426,125 |
| Gun armament | 684,931 |
| Torpedo armament | 45,499 |
| Total | £2,156,555 |

Moltke—cont.

General Remarks.—

The *Goeben*, the *Moltke's* sister ship, was handed over to Turkey on 11th August, 1914, and re-named *Sultan Selim*.

Moltke is fitted as flagship.

The upper deck is flush from bow to abreast No. 4 Turret, the quarter-deck being one deck lower.

The gun trials are said to have been very satisfactory.

The ammunition supply for the secondary battery is reported to be arranged inconveniently, the rate of fire being slow in consequence.

The use of wood has been reduced as much as possible.

The foremost funnel of both ships has been raised to protect the searchlight crews.

The general impression conveyed by a visit was that communications from one compartment to another were difficult; this is no doubt due to the very thorough system of subdivision.

Complement.—Peace complement, 1,013 (as private ship); war complement, about 1,400.

A turret's crew, including magazine and shell-room parties, consists of 70 officers and men (1 executive officer, 1 warrant officer, 9 petty officers or leading seamen and 59 seamen).

A 5.9-in. gun's crew consists of 6 men.

General Appearance.—See Photograph Book.

General Dimensions, &c.—

| | |
|---|---|
| Length, L. W. L. | 610 ft. 3 ins. |
| Breadth, extreme | 96 " 10 " |
| Draught, designed load | 26 " 11 " |
| Displacement, designed load | 22,640 tons. |
| Freeboard (approximate) at designed draught. | at stem 24 ft. 0 ins. amidships 19 " 0 " aft 12 " 0 " |
| Height (approximate) of axis of heavy guns at designed draught. | foremost turret 28 " 0 " echelon turrets 26 " 0 " aftermost turret 19 " 0 " |
| Height of fore funnel to L. W. L. | 68 " 0 " |
| " " lower masthead to L. W. L. | 104 " 0 " |

Constructive Details.—Bilge keels fitted. Frahm's anti-rolling tanks are reported fitted.

Armour and Other Protection.—

Material.—Krupp cemented.

Belt.—Complete except for about 10 ft. at stern where it is closed by a transverse bulkhead 5' thick. The portion between the foremost and aftermost turrets is closed by transverse bulkheads embracing bases of barbettes, 8' thick. Maximum thickness 11", reduced to 6" and 4" forward and 4" aft, and tapering to the battery deck and lower edge. It extends about 5 ft. below the waterline.

Battery.—The battery armour and bulkheads are 5" thick. The battery armour extends approximately from foremast to 20 ft. before mainmast. Gun shields of 5.9-in. guns 3".

Splinter Bulkheads (or Casemates).—The interior of the battery is subdivided by two longitudinal splinter-proof bulkheads, in rear of and parallel to the line of 5.9-in. guns, and by splinter-proof screens 1" thick between the guns.

Moltke—cont.**Armour and Other Protection—cont.**

Barbettes.—About 10' thick.

Turrets.—10' thick.

Conning and Control Towers.—Fore 10', after 7' thick. The fore conning and control tower is roughly in the shape of a truncated cone base up. As in the case of *Seydlitz* (p. 46), it is divided into two parts, the after part, which forms the control position, projecting above the foremost part, which forms the navigating position, the observers in the former can look out of the slits over the roof of the latter. From either position it is possible to observe, practically without any interference, through an arc of 270°, *i. e.*, from 0° to 135° each side. The observation slits in the conning tower are about 1 in. wide and 1 ft. long.

Armoured Hoods.—Are fitted one on each side of the battery, projecting just above the upper deck, and take 10-ft. range-finders for use with 5.9-in. guns.

Torpedo Protection Bulkheads.—Probably similar to *Seydlitz*, page 46.

Horizontal.—Probably similar to *Seydlitz*, page 47.

Torpedo Nets.—Beam net defence was fitted, but has been discarded since the Battle of Jutland. It extended from the foremost to the aftermost turret. There were 13 net booms, 32.8 ft. apart. The electric bollards used for coaling were also employed for working the nets.

Armament.—**Guns and Ammunition Supply.—**

(For arcs of training, see Plate.)

10—11-in. (28-cm.) Q.F., L/50; mounted in pairs in barbettes, the gun houses being large and roomy. Usual Krupp wedge mechanism, hand only. Loading at fixed angle of elevation. Hand rammer, the staff projecting through a hole in the rear wall of the turret. A 10-ft. range-finder is fitted.

12—5.9-in. (15-cm.) Q.F., L/45, on C.P. Mounting, with 3" shield. Ammunition hoists electric, alternative hand.

*4—22-pr. (8.8-cm.), semi-automatic, anti-aircraft guns, on after superstructure.

2—Machine guns.

†1—7-pr. (6-cm.) Q.F., L/21, boat and field gun.

For further details, see Part IV. of this book.

Magazines and Stowage.—

For 11-in. guns, 96 rounds per gun (centre-line turrets).

81 " " (side ").

" 5.9-in " 160 " "

" 22-pr " 287 " "

Torpedo Tubes.—4—19.7-in. (50-cm.) submerged. The two broadside tubes are fixed at an angle of 20° before the beam and are fitted with gyro angling gear, which can be set for every 15° from 30° before to 60° abaft the direction of the tube.

Mines.—There is believed to be no permanent stowage for mines.

Searchlights.

8—43.3-in. (110 cm.); four on the foremost funnel and four on the mainmast.

The four foremost lights are situated on platforms on the funnel, one group of two lights each side. The lights in each group are situated one vertically over the other. The port group is situated on the port side forward of the funnel, and the starboard group on the starboard side aft of the funnel, *i. e.*, diagonally disposed.

* These guns have taken the place of four of the twelve 22-pr. (8.8-cm.) Q.F. L/45, which were originally carried. The rest of the light guns are believed to have been removed entirely.

† Probably landed for service in the field.

Moltke—cont.

Fore Searchlight Control Platform.—Situated before the lights and at a lower level, completely roofed in both from the weather and from the rays of the lights.

For further details, see Part IV., Section 3.

Communications.—There are three systems fitted—(1) transmitters, (2) telephones, (3) voice pipes. The voice-pipe system for turrets consists of one large 8-in. to 10-in. pipe running fore and aft the ship, from which are branched smaller pipes to each turret. They are led in to the turntable by a flexible pipe covered with canvas and padding.

There is one central station connected to all control towers, turrets, and 5.9-in. guns.

Voice pipes to the 22-prs. are fitted as permanent fixtures, with flexible ends.

Range Finders.—

1—10-ft., in each turret.

1—10-ft., in each of the two control towers.

1—10-ft., in each of the two armoured hoods, just above level of upper deck, for use with 5.9-in. guns.

Boats.—See Section 1.

All boats are stowed inboard, except the two cutters, which are carried in davits.

Boat Derricks.—There are two derricks on stump masts, one on each side of the after funnel.

Steering Gear.—Electric.

Wheel-house.—In the form of a segment of a circle round the fore side of the conning tower. Can be unshipped and stowed below in about 10 minutes. The roof and a small portion of the fore screen are made in segments of light iron, secured to the roof of the conning tower, and to the lower or standing part of the fore screen, by steel pins. These pins are pulled out and the segments lifted off, leaving only the lower portion of the screen standing, and thus clearing the field of view of the conning tower.

Look-out Houses.—One each side of the bridge or shelter deck.

Compasses.—Gyro-compasses in wheel-house, and there is, presumably, a gyro conning tower. Standard compass on the fore upper bridge.

Anchors.—Three bower and one stern—all stockless. The stern anchor is carried in a hawsepipe in the centre line, about 4 ft. above the water.

Coaling Arrangements.—A number of electric bollards, fitted on each side of the upper deck, are used for coaling.

Machinery and Boilers.—

Main Engines.—Parsons turbines, on four shafts.

Dimensions.—H.P. rotor 78-in.; blade length, 1st row, 1 $\frac{3}{4}$ -in.

L.P. rotor 120-in.; blade length, last row, 16-in.

Revolutions (designed)—260.

Boilers.—24 Schulz, Navy type. In four transverse boiler-rooms—six in each.

Propellers.—Four in number.

Moltke—cont.

Speed, Horse-Power, and Fuel.—

| Ship. | Speed (designed). | Horse-Power (designed). | Fuel: (a) Coal. (b) Oil. |
|-------------|-------------------|-------------------------|--------------------------|
| Moltke..... | Knots. — | 52,000 | (a) 3,050 (b) 197 |

Steam Trials.—

| Ship. | Nature of Trial. | Date. | Speed. | Horse-Power. | Revolutions. | Remarks. |
|-------------|--|--------------------------|-------------------------|------------------|--------------|----------|
| Moltke..... | Measured mile..... 6 hours forced draught.. | — 11. 1911 — 11. 1911 | Knots. 28.4 27.25 | 85,782 76,795 | — 306 | |

Endurance.—

| | Speed. | Horse-Power. | Daily Consumption. | Radius of Action. | Remarks. |
|---|----------------|--------------|--------------------|-------------------|----------|
| At $\frac{1}{2}$ ths designed power..... | Knots. 24.0 | 41,600 | Tons. 845 | Miles. 2,155 | |
| At maximum continuous seagoing speed..... | 23.1 | 36,400 | 742 | 2,370 | |
| At $\frac{3}{4}$ ths designed power..... | 22.1 | 31,200 | 668 | 2,510 | |
| At $\frac{1}{4}$ th designed power..... | 19.6 | 20,800 | 490 | 3,030 | |
| At 10 knots..... | 15.6 | 10,400 | 322 | 3,700 | |
| | 10.0 | 2,750 | 141 | 5,350 | |

von der Tann.

(See Plate 14.)

| Ship. | Designation before Launch. | Programme Year. | Built at | Ordered. | Laid Down. | Launched. | Com-missioned for Trials. | Completed Trials. |
|-------------------|----------------------------|-----------------|--------------------------|------------|------------|-----------|---------------------------|-------------------|
| von der Tann..... | F..... | 1907-08 | Blohm and Voss, Hamburg. | *30. 9. 07 | *25. 3. 08 | 20. 3. 09 | 1. 9. 10 | 20. 2. 11 |

Cost.—

| | |
|--------------------------|------------|
| Hull, machinery, &c..... | £ |
| Gun armament..... | 1,272,016 |
| Torpedo armament..... | 489,236 |
| Total..... | 32,289 |
| | £1,793,541 |

General Remarks.—

Fitted as flagship. The *von der Tann* was the first battle-cruiser and first large turbine ship built for the German navy. Her designs were prepared in the Imperial Navy Office, and were approved by the German Emperor on the 24th November 1906. In her construction there seems to have been a general striving after saving of weight. It is reported she is lightly built, and that the beams and angle-bars supporting her decks are lighter than in British ships of similar type.

von der Tann—cont.

Complement.—Peace complement, 911 (as private ship); war complement, about 1,300.

Accommodation.—The Admiral's quarters are forward on the starboard side of the upper deck, and the wardroom on the port side forward on the main deck. There is no gunroom. Some four-berth cabins are fitted for midshipmen. The absence of large open spaces, such as the captain's lobby, aft deck, &c. is very noticeable, and indicates that every available space has been systematically utilized. The officers' cabins are forward on the upper deck and main deck. There are a large number of midship cabins and offices, &c., those in the superstructure deck. There are a large number of midship quarters are on the main and lower decks aft, petty officers' quarters on the main deck before the officers' quarters. There are no messes in the battery.

General Appearance.—See Photograph Book.

General Dimensions, &c.—

| | |
|---|-----------------------------|
| Length, L.W.L..... | 562 ft. 8 in. |
| Breadth, extreme..... | 87 " 3 " |
| *Draught, designed load..... | 26 " 7 " |
| Displacement, designed load..... | 19,100 tons. |
| Freeboard (approximate) at designed draught | { at stem..... 26 ft. 6 in. |
| | { a ships..... 19 " 0 " |
| | { aft..... 19 " 0 " |
| Height of fore funnel to L.W.L..... | 60 " 0 " |
| " " lower masthead to L.W.L..... | 90 " 0 " |

Constructive Details.—Frahm's anti-rolling tanks were proposed and fitted after construction was well advanced, and had therefore to be adapted to the existing structure. In consequence they were fitted farther from the ship's sides than would otherwise have been the case, thus reducing their effective leverage; the width and length of the tanks also had to be limited, and the connecting channel to be carried across the top of the inner bottom instead of through the double-bottom. The tanks, therefore, have not been entirely successful. The *von der Tann's* rolling period is given as 11 secs., and her metacentric height is more than double that of the *Invincible*, whose period was about 14 secs. With 231 tons of water in the tanks, the *von der Tann's* roll has been reduced from 17° (mean of maxima) to 11° (mean of maxima).

Armour and Other Protection.—

Material.—Krupp cemented.

Belt.—Complete, except for about 10 ft. at stern, where it is closed by a transverse bulkhead 4" thick. The portion between the foremost and aftermost turrets is closed by transverse bulkheads 7" thick. Maximum thickness 9.8", reduced to 6" and 4" forward and 4" aft, and tapering to the battery deck and lower edge. It extends about 5 ft. below the waterline.

Battery.—Battery armour and bulkheads, 5" thick. The former extends from just abaft the fore funnel to abreast the mainmast.

Splinter Bulkheads (or Casemates).—The guns of the secondary armament are isolated from each other by splinter-proof screens about 1" thick, which are closed at the rear by longitudinal screens of same thickness thus forming 10 separate casemates.

Barbettes.—9" thick.

Turrets.—Fronts, 9"; hoods, 3" thick.

Conning and Control Towers.—Fore, 10", after, 7" thick.—General arrangements similar to *Seydlitz* (page 46), and the fore conning tower is divided into two by a transverse bulkhead in the same way, the foremost portion forming the navigating position, and the after portion the control position. The after portion is fitted with gratings on a level with the deck, and below these are the various transmitting instruments. The control officer, standing on the gratings, passes orders to men stationed immediately below him at the transmitters, &c. The observation slits are about 2 ft. by 3 ins.

* After commissioning, the vessel was reported to have a draught of 29 ft. 6 in. forward and aft.

von der Tann—cont.

Armour and other Protection—cont.

Armoured Hoods are fitted one on either side of the battery, projecting just above the upper deck, between the broadside turrets and the ship's side, for range-finders for use with 5.9-in. guns.

Torpedo Protection Bulkheads.—Probably as in *Nassau* (page 18).

Horizontal.—Probably similar to *Seydlitz* (page 47).

Torpedo Nets.—Beam net defence was fitted, but has been discarded since the Battle of Jutland. There were 12 net booms, 32.8 ft. apart. The electric bollards used for coaling were also employed for working the nets.

Armament.—

Guns and Ammunition Supply.—

8—11-in. (28-cm.) Q.F., L/45, on Drehscheiben-Lafette C/06; in pairs in turrets, one forward and one aft on the centre line and two in echelon amidships. The fore turret is on the forecastle, the three after turrets are a deck lower. Loading at fixed angle of elevation.

10—5.9-in. (15-cm.) Q.F., L/45, on C.P. Mounting C/02/06; in central battery on main deck.

*4—22-pr. (8.8 cm.) semi-automatic anti-aircraft guns, on after superstructure.

2—Machine guns.

†2—7-pr. (6-cm.) Q.F., L/21, boat and field guns.

For further details, see Part IV. of this book.

Torpedo Tubes.—

4—17.7-in. (45-cm.) submerged. The two broadside tubes are fixed at an angle of 20° before the beam, and are fitted with gyro angling gear which can be set for every 15° from 30° before to 60° abaft the direction of the tube.

Mines.—A small number of mines, with moorings, may be carried.

Range-Finders.—1 in each turret; 1 in an armoured hood on top of each conning tower, and 1 each side in armoured hood, just above the level of the upper deck, for use with the 5.9-in. guns.

System of Communications.—Telephones are not extensively used. There is no central telephone exchange. Communication is by voice-pipes, but there appear to be very few of the latter, and in many cases they are of very small diameter. Small indicating whistles are fitted instead of bells.

Battle Signal Station.—Half way between the starboard turret and foremost funnel there is a deck plate marked "Battle Signal Station."

Submarine Bell Receiver.—A submarine bell telephonic receiver is fitted in the chart house.

Searchlights.—

8—43.3-in. (110 cm.), fitted with iris-diaphragm shutters: four forward, placed one on each side of the upper and lower platforms of the fore upper bridge; and four similarly arranged on the after superstructure. The foremost four are controlled by controllers on the fore bridge, one to each light. The driving motors are below, and are connected by shafting to the searchlights.

Boats.—For details, see Section 1.

No single-banked boats are carried.

The large steamboat, and two motor boats are stowed abreast the starboard turret in crutches. The steamboat, Class I., is stowed on top of starboard turret, and the launch and pinnace abreast the port turret. The two cutters are hoisted at davits each side amidships. The launch and pinnace are the only boats which could be carried under war conditions.

Derricks.—Two stump derricks, with standing topping lifts, are fitted, one on either side abreast the after funnel. The purchase—a single whip—is worked electrically, and the guys by hand.

* These guns have taken the place of four of the sixteen 22-pr. (8.8 cm.) Q.F. L/45, which were originally carried. The rest of the light guns are believed to have been removed entirely.

† Probably landed for service in the field.

von der Tann—cont.

Fore Bridge.—Roomy, triangular in shape, with conning tower at the fore end around the front of which is a small shelter, with windows, and chart house on the after side amidships. The lateral bridge extensions are pivoted and can be turned aft out of the way.

Steering Gear, &c.—

The ship is fitted with twin rudders.

There is no telegraphs or steering gear on the forebridge, the steering position in the fore conning tower being always used, the necessary orders being passed in direct by word of mouth.

Compasses.—There are four gyro receivers forward, one on each side of the fore bridge, one on the upper platform of the fore upper bridge, and one in the conning tower.

Anchors.—Three stockless bower anchors—two on port and one on starboard side; also a light stern anchor right aft on starboard quarter.

Coaling Arrangements.—About eight small electric bollards, fitted on each side of the upper deck, 6 to 10 ft. from the ship's side, are used for coaling.

Machinery and Boilers.—

Main engines.—

Four sets in four separate compartments.

Type—Parsons turbines.

The H.P. ahead turbines drive the wing shafts, and the L.P. turbines the inner shafts. The cruising turbines are in series, the H.P. cruiser on the starboard inner shaft ahead of the main L.P., and the M.P. cruiser similarly situated on the port side. H.P. astern turbines are fitted on wing shafts and the L.P. astern turbines are embodied in the L.P. casings. The engine-rooms are divided into four by a longitudinal and a transverse bulkhead, the latter situated between the two turbines on each shaft, so that the exhaust pipes from the H.P. to the L.P. turbines pass through it.

H.P. rotor drum 82½" in diameter; blade length, first row 1¾".

L.P. rotor drum 115" to 111" in diameter, stepped; blade length, last row 18½".

Revolutions—280 (designed).

Boilers.—

18 Schulz, Navy type. Diameter of tubes, 1.4 in.

Date when first used at sea—May 1910.

Grate surface—1,935 square feet.

Steam guaranteed—625,000 lbs. per hour.

Funnels—Two.

Ventilation.—Through louvres in the superstructure at base of funnel which form the downtakes to the stokeholds. There is also a big ventilating trunk under the forebridge to the foremost side of the fore funnel. The internal ventilation is by air trunks and electric fans.

Auxiliary Machinery.—Includes two turbo-dynamos for electric lighting, voltage 220.

Propellers.—Four in number.

Speed, Horse-Power, and Fuel.—

| Ship. | Speed (designed). | Horse-Power (designed). | Fuel: (a) Coal (b) Oil. |
|-------------------|-------------------|-------------------------|-------------------------|
| von der Tann..... | Knots. 24 | 43,600 | (a) 2,760 (b) 197 |

DECLASSIFIED
Authority E.O. 10501

America, she maintained miles.

| Horse-Power. | Daily Consumption. | Radius of Action. |
|--------------|--------------------|-------------------|
| | Tons. | Miles. |
| 34,800 | 690 | 2,330 |
| 30,000 | 626 | 2,500 |
| 26,160 | 532 | 2,795 |
| 17,140 | 386 | 3,110 |
| 8,720 | 260 | 4,000 |
| 2,600 | 134 | 5,130 |

COAST DEFENCE SHIPS.

Odin and Aegir.

(See Plate 15.)

General Remarks.—

Programme year—1892-93.

Aegir was built at the Imperial Dockyard, Kiel, and launched on 3rd April 1895.

Odin was built at the Imperial Dockyard, Danzig, and launched on 3rd November 1894.

Both these ships were reconstructed in 1904. They are similar to *Hagen*, of *Siegfried* type (see p. 58), except in the following particulars:—

General Appearance.—See Photograph Book.

General Dimensions.—

| | |
|------------------------------------|----------------|
| Length between perpendiculars..... | 263 ft. 9 ins. |
| Length, L. W. L..... | 278 " 2 " |
| Breadth, extreme..... | 50 " 6 " |
| Draught, designed load..... | 17 " 6 " |
| Displacement, designed load..... | 4,084 tons. |

Constructive Details.—The belt only extends for about three-fifths of the ship's length; the unprotected end aft has a cofferdam filled with cellulose fitted inside, round the water-line.

Armour.—

Material.—Nickel steel.

Belt.—The belt only extends to the ammunition tubes forward and aft. Width of belt, 7' 6"; maximum thickness, 8.6"; foremost bulkhead, 7" to 8".

Barbettes.—7.9". The guns in the foremost redoubt are separated by a 4" bulkhead.

Ammunition Tubes.—7.9".

Conning Tower.—6.3".

Communication Tube.—7.9".

Horizontal.—2" inside the citadel and 2.7" before and abaft it.

Armament.—

In *Aegir* the 9.4-cm. guns have electric, alternative hand, training and hoists.

Boilers.—*Aegir* has Thornycroft boilers.

Speed, Horse-Power, and Fuel.—

| Ship. | Speed (designed). | Horse-Power (designed). | Fuel: (a) Coal. (b) Oil. |
|--------------------|-------------------|-------------------------|--------------------------------|
| <i>Odin</i> | 15 | 5,000 | (a) 570 (b) 98 |
| <i>Aegir</i> | | | |

DECLASSIFIED
Authority E.O. 10501

Odin and Aegir—cont.

Steam Trials.—

| Ship. | Nature of Trial. | Date. | Speed. | Horse-Power. | Revolutions. | Remarks. |
|------------|------------------|-------|----------------|--------------|--------------|--|
| Odin..... | 6 hours..... | — | Knots. 15.5 | 5,100 | — | Coal per 1 H. P. per Hour, 1.8 lbs. |
| Aegir..... | 6 hours..... | — | 15.54 | 5,522 | 143 | |

Endurance.—As in *Beowulf, Frithjof, &c.* (see p. 59).

Siegfried, Beowulf, Frithjof, Hildebrand, Heimdall and Hagen.

(See Plate 15.)

| Ship. | Programme Year. | Built at— | Launched. | Reconstructed. |
|-------------------------|-----------------|---------------------------------------|-----------------|----------------|
| <i>Siegfried</i> | 1887-88 | Germania Yard, Kiel..... | 10 August 1889 | 1902 |
| <i>Beowulf</i> | 1889-90 | Weser Yard, Bremen..... | 8 November 1890 | 1901 |
| <i>Frithjof</i> | | | 21 July 1891 | 1902 |
| <i>Hildebrand</i> | 1890-91 | Imperial Dockyard, Kiel..... | 6 August 1892 | 1901 |
| <i>Heimdall</i> | 1891-92 | Imperial Dockyard, Wilhelmshaven..... | 27 July 1892 | 1901 |
| <i>Hagen</i> | | | 21 October 1893 | 1900 |

General Remarks.—These ships were reconstructed in the years mentioned above. They were cut in two and a midship section 27 ft. 7 in. in length added. The coal supply, stability, armament, and accommodation were much improved, and a slight increase in speed obtained. The woodwork was, at the same time, reduced to a minimum. Prior to reconstruction *Siegfried* was fitted to burn oil fuel only.

Some of these vessels have been paid off, others are still (May 1917) in commission for coast defence.

Complement.—307.

General Appearance.—See Photograph Book.

General Dimensions, &c.—

| | |
|------------------------------------|----------------|
| Length between perpendiculars..... | 267 ft. 0 ins. |
| Length L. W. L..... | 278 " 2 " |
| Breadth, extreme..... | 48 " 11 " |
| Draught, designed load..... | 17 " 6 " |
| Displacement, designed load..... | 4,034 tons. |

Armour.—

Material.—*Hagen, Heimdall*, nickel steel; *Hildebrand, Beowulf, Frithjof, Siegfried*, compound.

Belt.—Complete, extending from 2 ft. 7 in. above to about 5 ft. below load waterline; 9.5" thick amidships, 7" forward and aft, and tapering to 4" at lower edge.

Barbettes.—7.9".

Ammunition Tubes.—7.9"; the forward tube also forms communication tube to conning tower.

Conning Tower.—7.1", nickel steel.

Horizontal.—Armoured deck on top of the belt, 1.2" thick.

Armament. —

Guns and Ammunition Supply.—

(For arcs of training, see Plate.)

- 3—9.4-in. (24-cm.) B. L., L/35. On C. P. Mounting C/90 with dome-shaped shields, 2 mounted at each end of athwartship redoubt, 1 in a single barrette aft. Training, hydraulic, alternative hand. Elevation +24°, -4°.
- 10—15-pr. (8.8-cm.) Q. F. L/30, in sponsons, on the superstructure.
- 2—Machine guns.

Siegfried, Beowulf, Frithjof, Hildebrand, Heimdall, and Hagen—cont.

Armament—cont.

Torpedo Tubes.—

- 3—17.7-in. (45-cm.) submerged; one under ram, one on each broadside.
- 1—17.7-in. (45-cm.) above water (armoured); in stern.

Searchlights.—

- 2—one above the conning tower, the other on a raised platform aft.

Machinery and Boilers.—

Main Engines.—

- Two sets in separate water-tight compartments.
- Type—Vertical, triple expansion.

Boilers.—

- Eight in number in two water-tight compartments.
- Type—Schulz.
- Total heating surface, 17,000 sq. ft.
- Total grate surface, 340 sq. ft.

Auxiliary Machinery includes:—

- Pumps with a total pumping capacity of 1,446 tons per hour.

Propellers.—Two, three-bladed.

Speed, Horse-Power, and Fuel.—

| Ship. | Speed (designed). | Horse-Power (designed). | Fuel: (a) Coal. (b) Oil. |
|------------------------|-------------------|-------------------------|--------------------------------|
| Class, except..... | Knots. 15 | 5,000 | (a) 570 (b) 98 |
| <i>Siegfried</i> | 15 | 5,000 | (a) 570 (b) 230 |

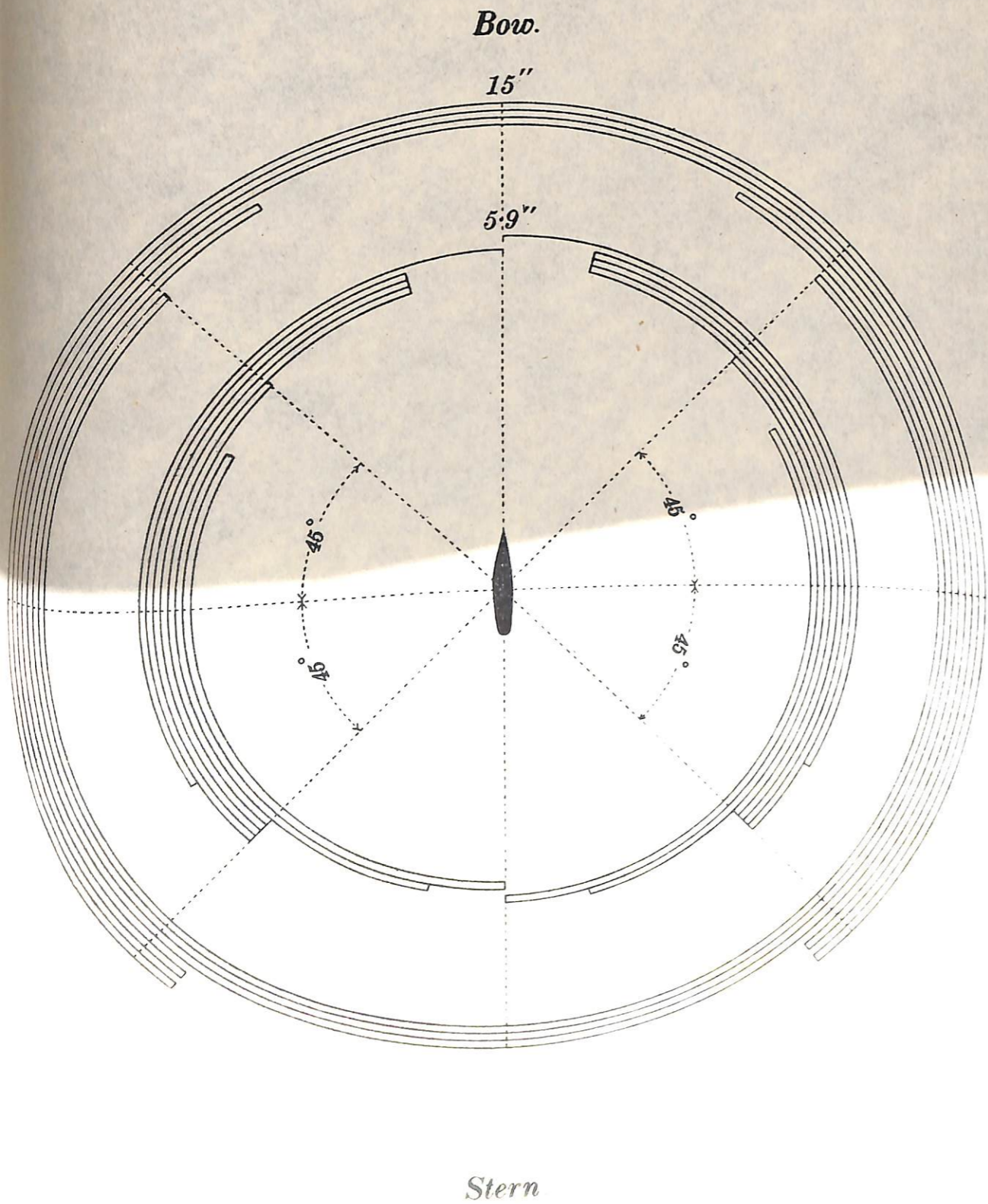
Endurance.—

| | Speed. | Horse-Power. | Daily Consumption. | Radius of Action. | |
|--|--------|--------------|--------------------|-------------------|--------------------|
| | Knots. | | Tons. | Miles. | <i>Siegfried</i> . |
| At $\frac{3}{4}$ ths designed power..... | 14.7 | 4,000 | 102 | 2,300 | 2,870 |
| At Maximum continuous sea-going speed..... | 14.5 | 3,700 | 95 | 2,440 | 3,155 |
| At $\frac{2}{3}$ ths designed power..... | 13.8 | 3,000 | 78 | 2,800 | 3,500 |
| At $\frac{1}{2}$ th designed power..... | 12.4 | 2,000 | 56 | 3,530 | 4,420 |
| At $\frac{1}{3}$ th designed power..... | 10.1 | 1,000 | 35 | 4,670 | 5,840 |
| At 10 knots..... | 10.0 | 950 | 34 | 4,700 | 5,960 |

DECLASSIFIED
Authority E.O. 10501

BAYERN.

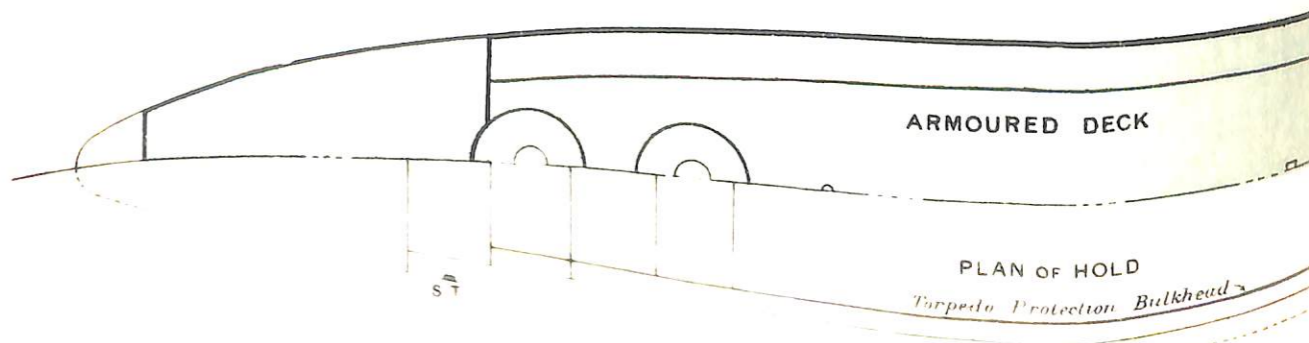
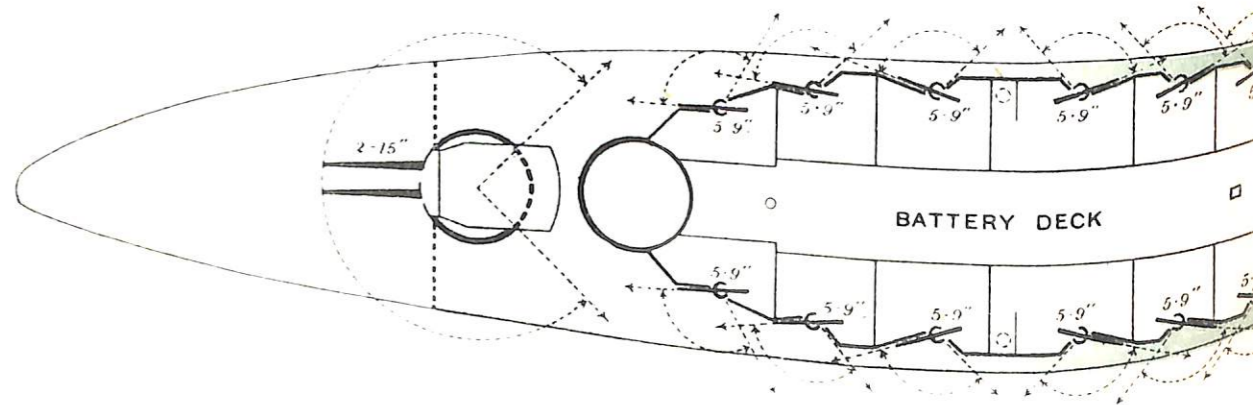
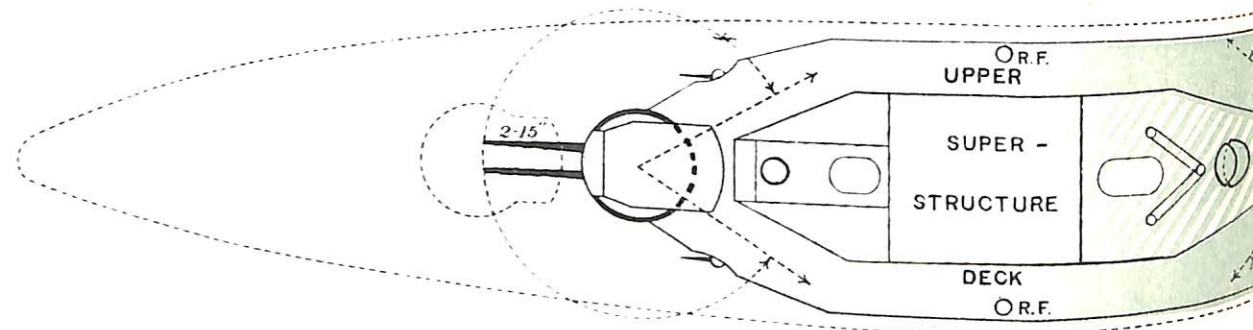
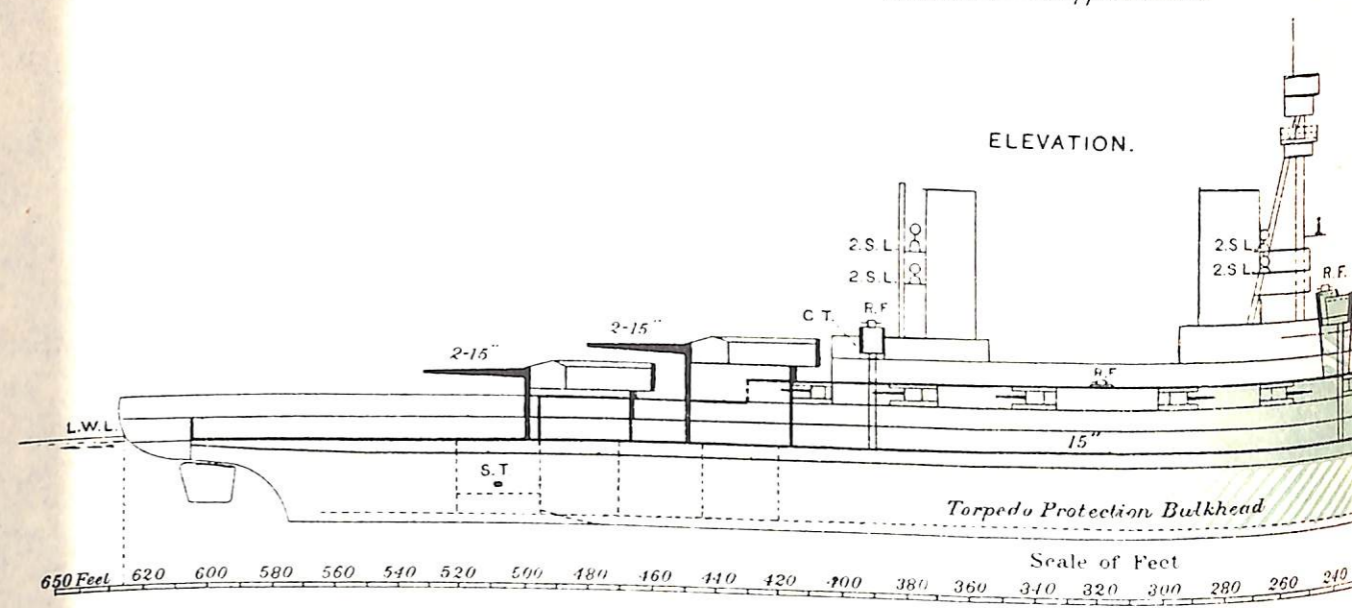
Diagram showing arcs of fire of Guns. (Approximate)



The number of lines shows number of Guns bearing in each Section

BAYERN.

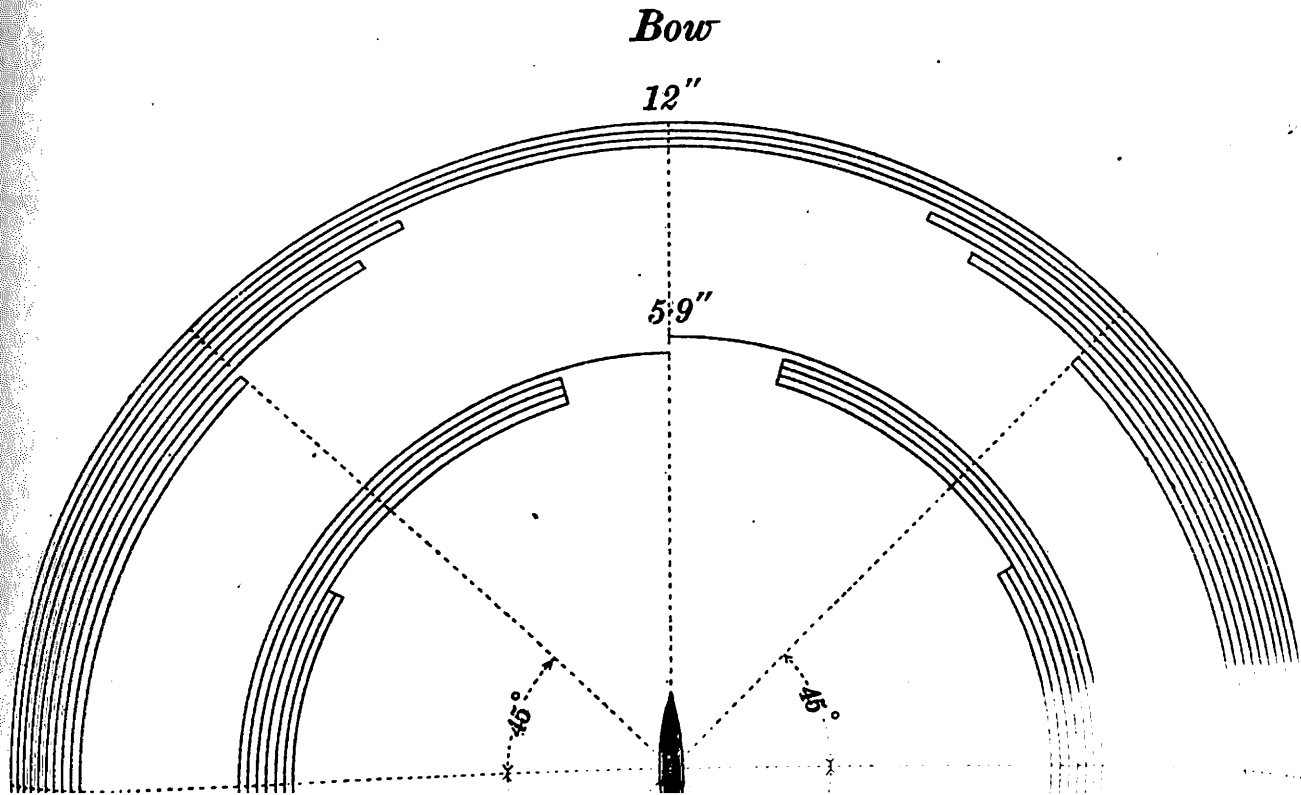
ARMOUR — Krupp Cemented

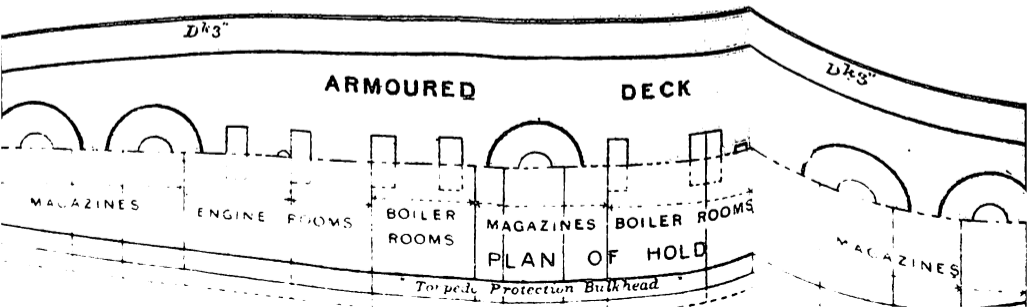
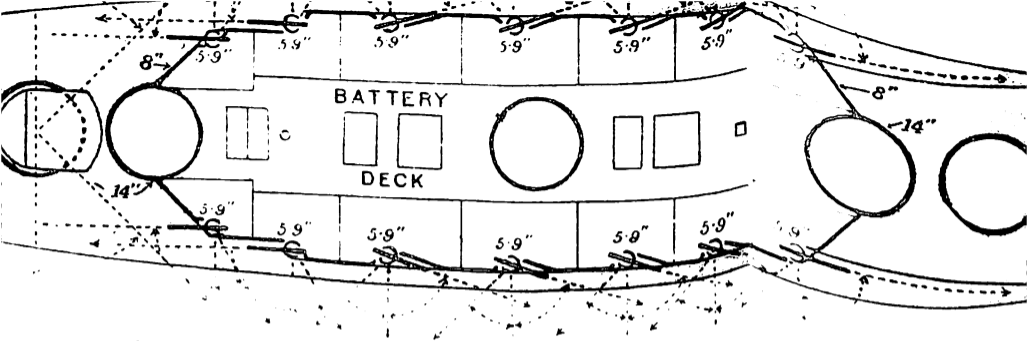


Vessels of Similar Type.
BADEN SACHSEN, WÜRTTEMBERG

KÖNIG.

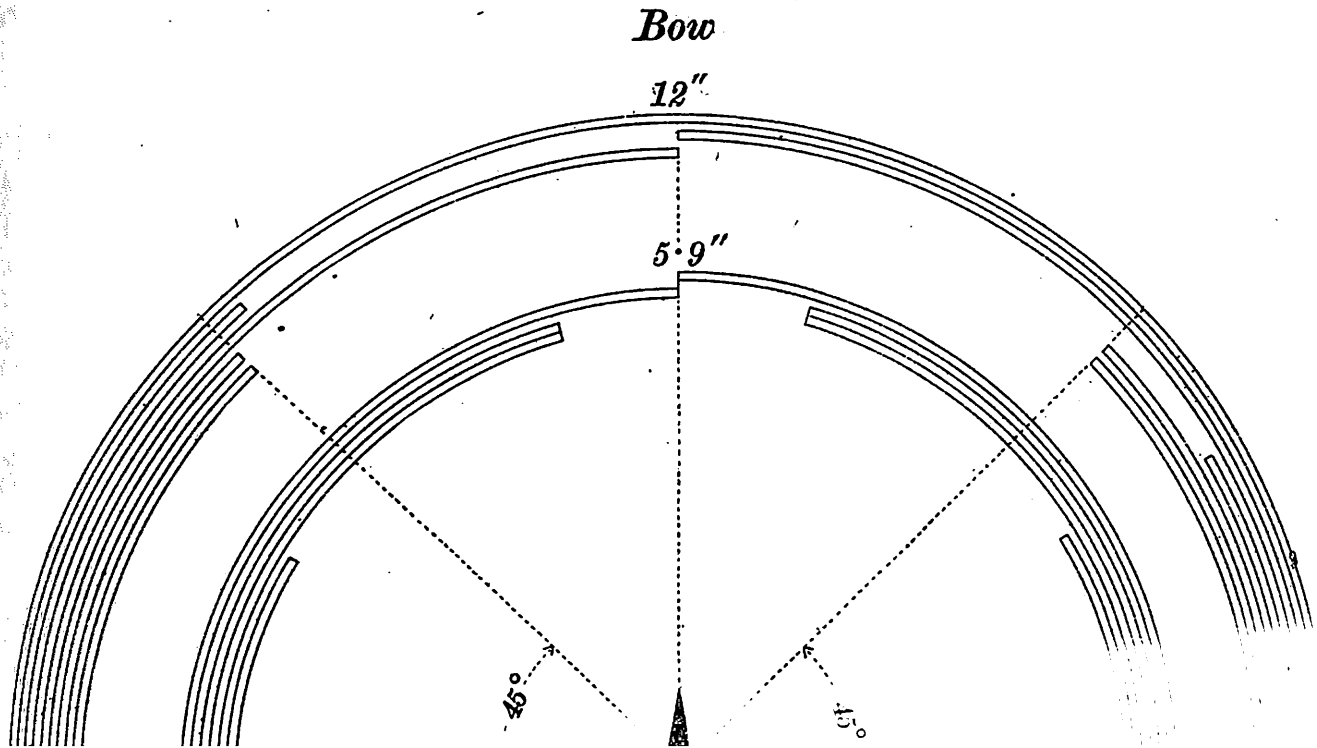
Diagram showing arcs of fire of Guns. (Approximate)

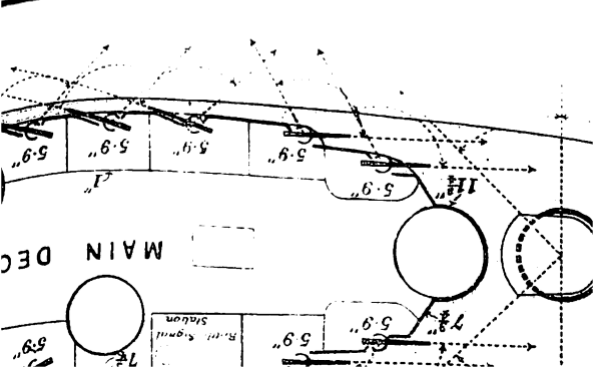
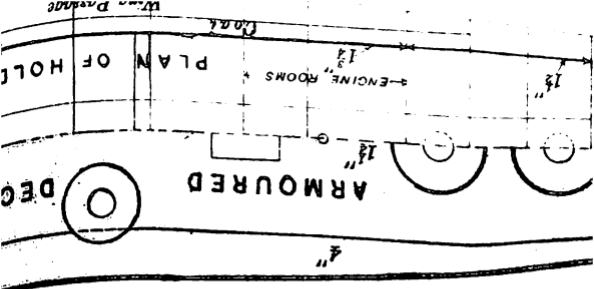




KAISER.

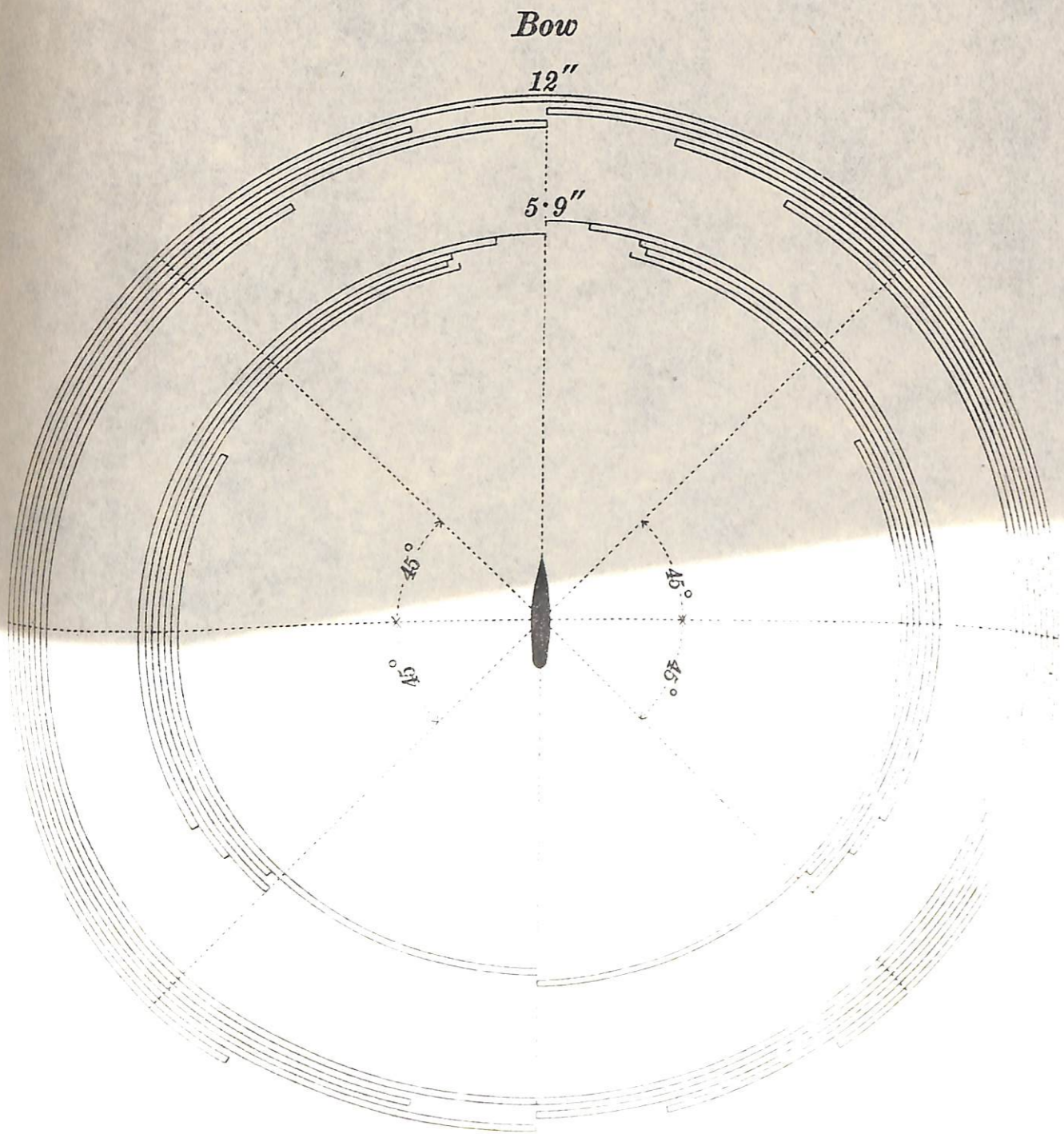
Diagram showing arcs of fire of Guns





THÜRINGEN.

Diagram showing arcs of fire of Guns



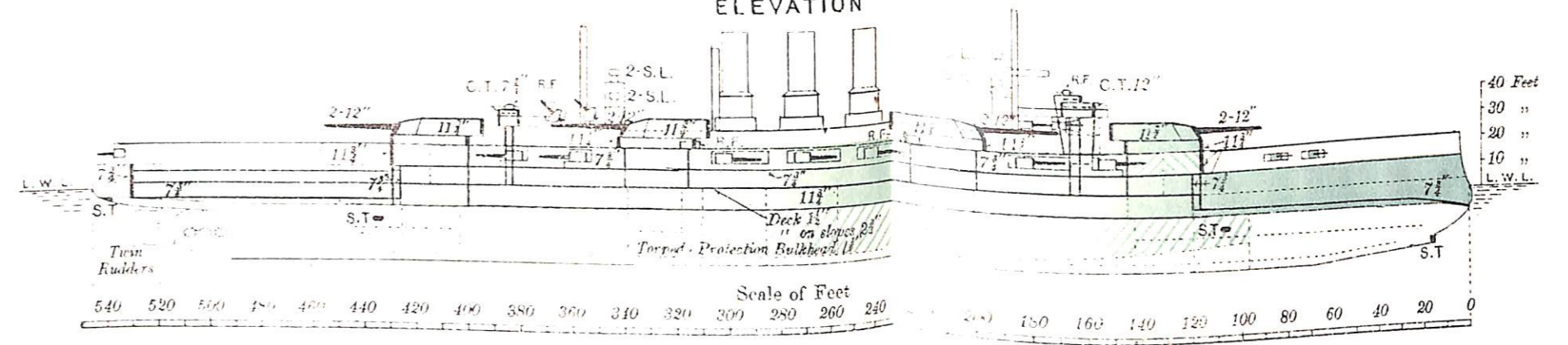
Stern

The number of lines shows number of Guns bearing in each Sector

THÜRINGEN.

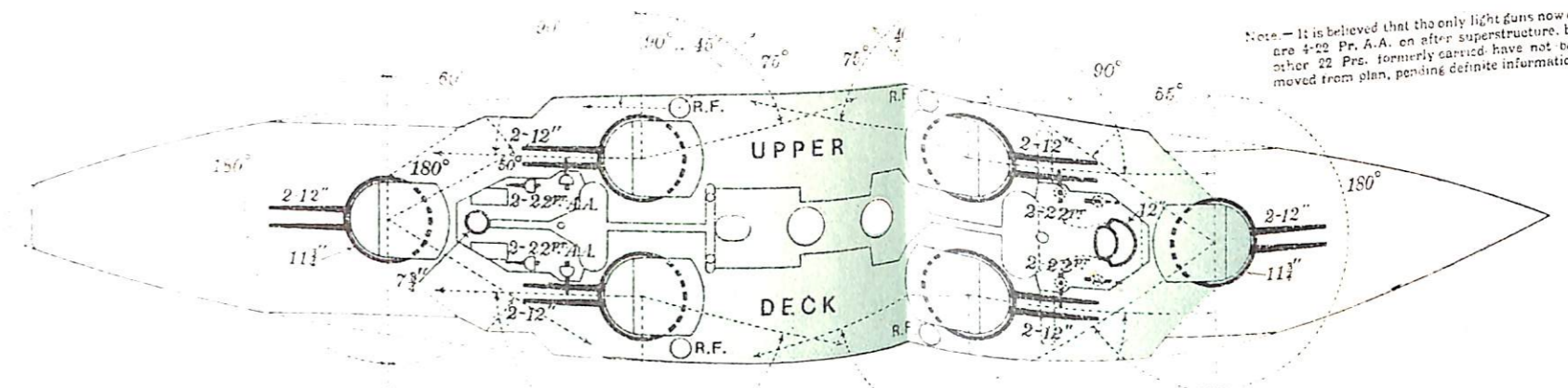
ARMOUR -- Krupp Cemented

ELEVATION

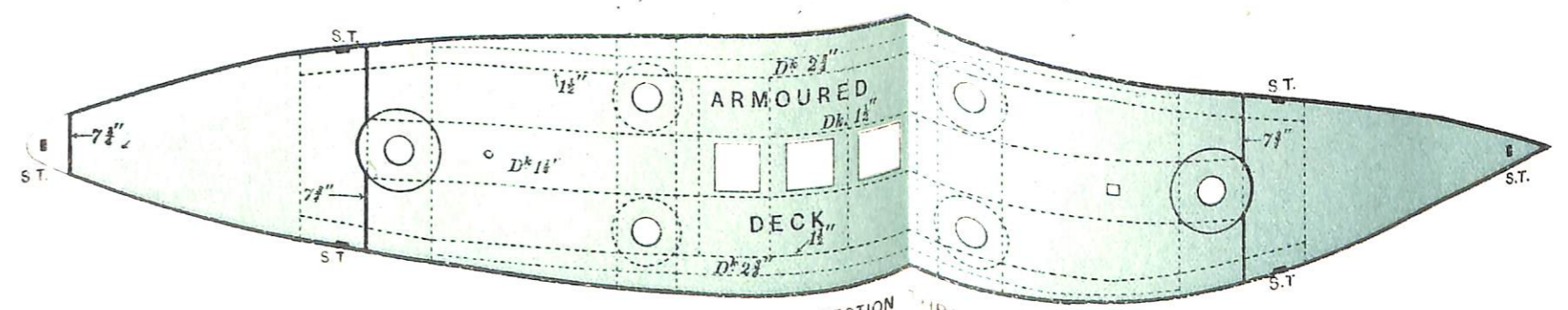
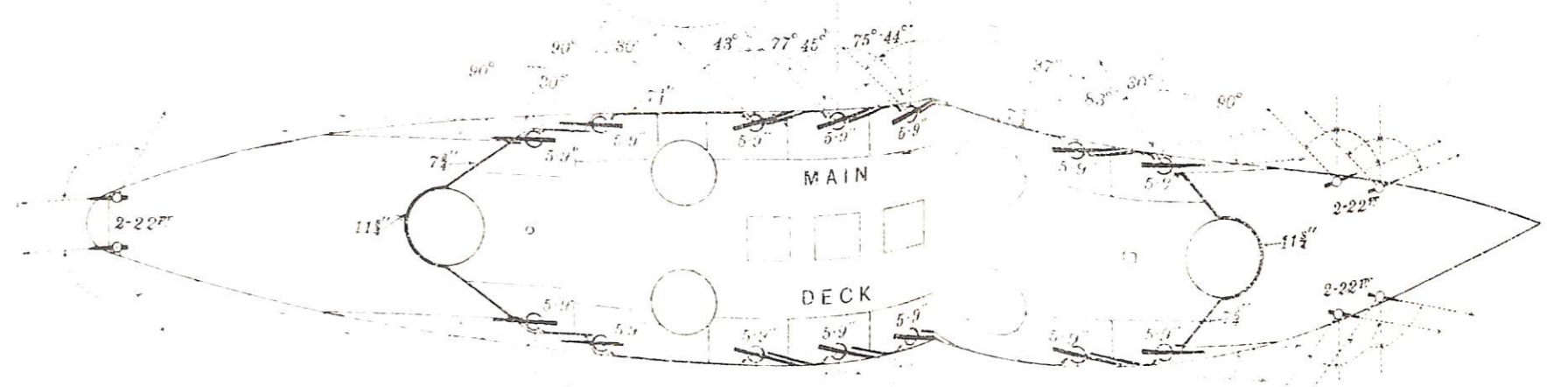


Scale of Feet
540 520 500 480 460 440 420 400 380 360 340 320 300 280 260 240

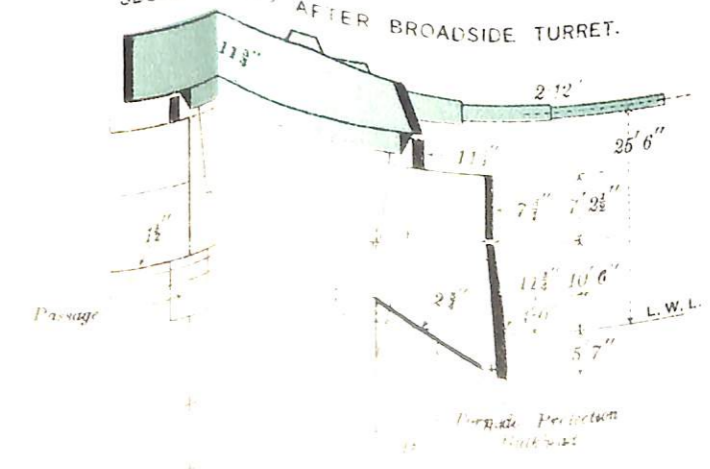
40 Feet
30
20
10
L.W.L.



Note -- It is believed that the only light guns now carried are 4 on Pr. A.A. on after superstructure, but the other 22 Prs. formerly carried have not been removed from plan, pending definite information.



SECTION AFTER BROADSIDE TURRET.



Vessels of Similar Type
HELGOLAND OSTERIESLAND.

NASSAU.

Diagram showing arcs of fire of Guns.

Bow

11"

5.9"

45°

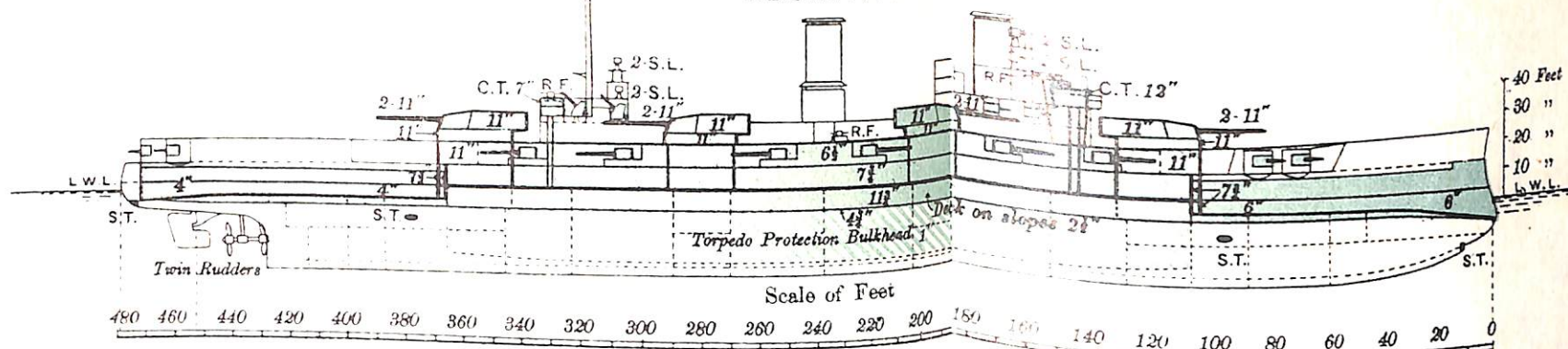
45°

Stern

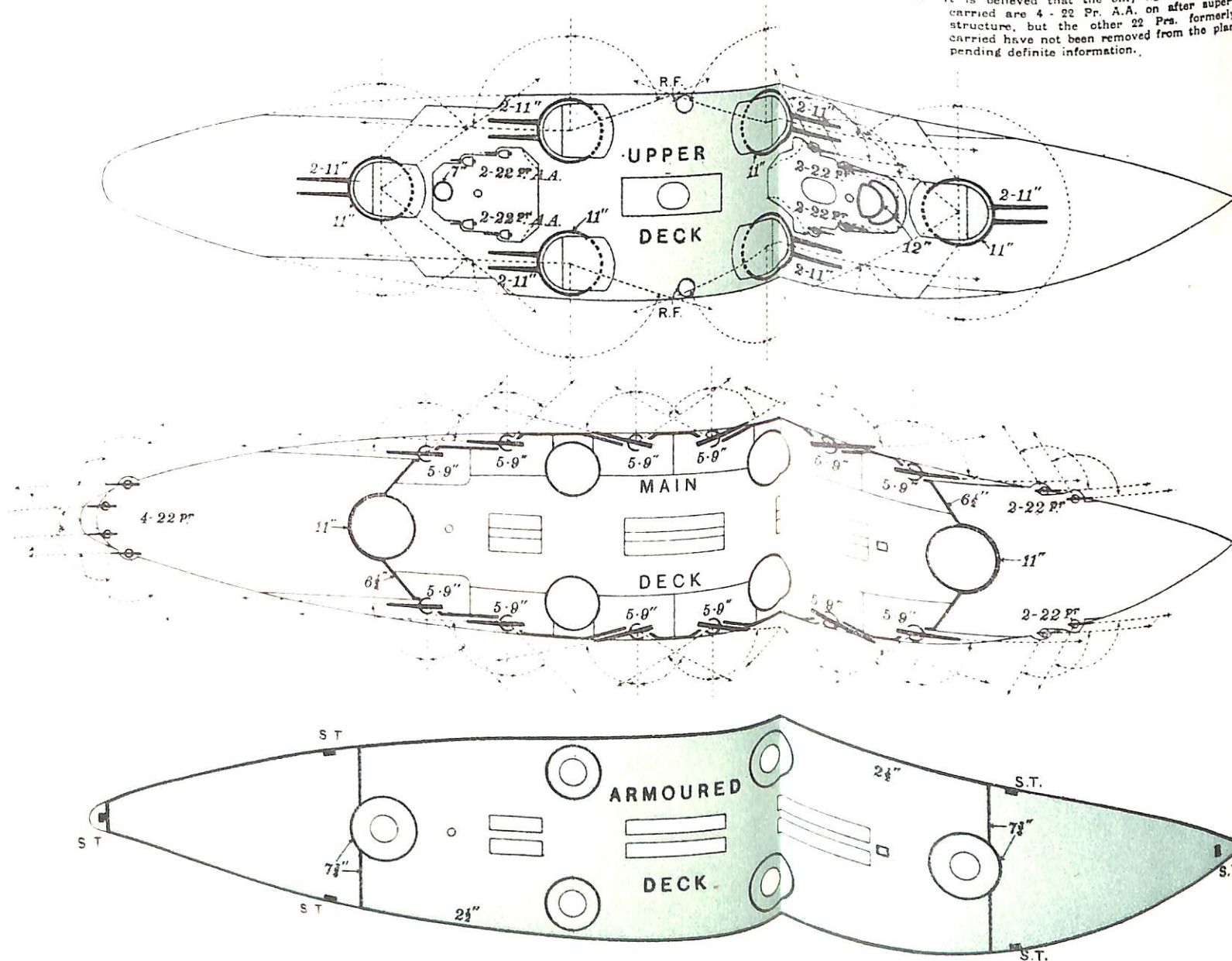
The number of lines shows number of Guns bearing in each Sector

NASSAU

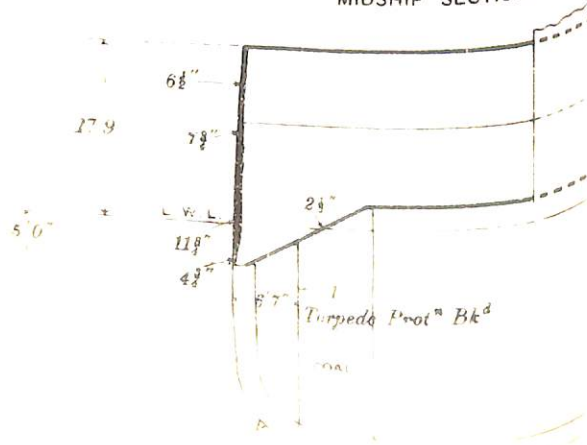
ARMOUR - Krupp Cemented
ELEVATION



NOTE - It is believed that the only light guns now carried are 4 - 22 Pr. A.A. on after superstructure, but the other 22 Prs. formerly carried have not been removed from the plan pending definite information.



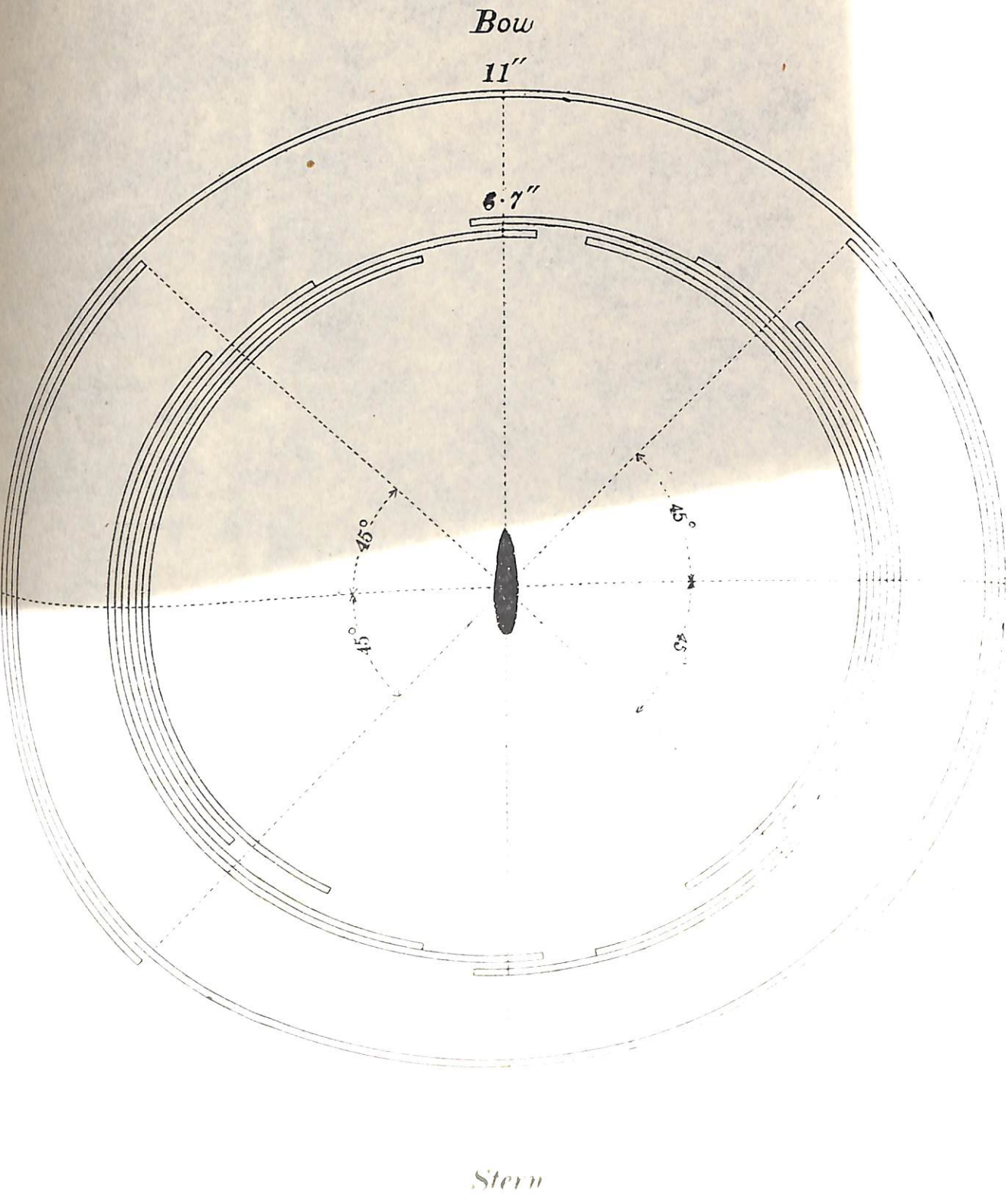
MIDSHIP SECTION



Vessels of Similar Type
WESTFALEN RHEINLAND.

DEUTSCHLAND.

Diagram showing arcs of fire of Guns.

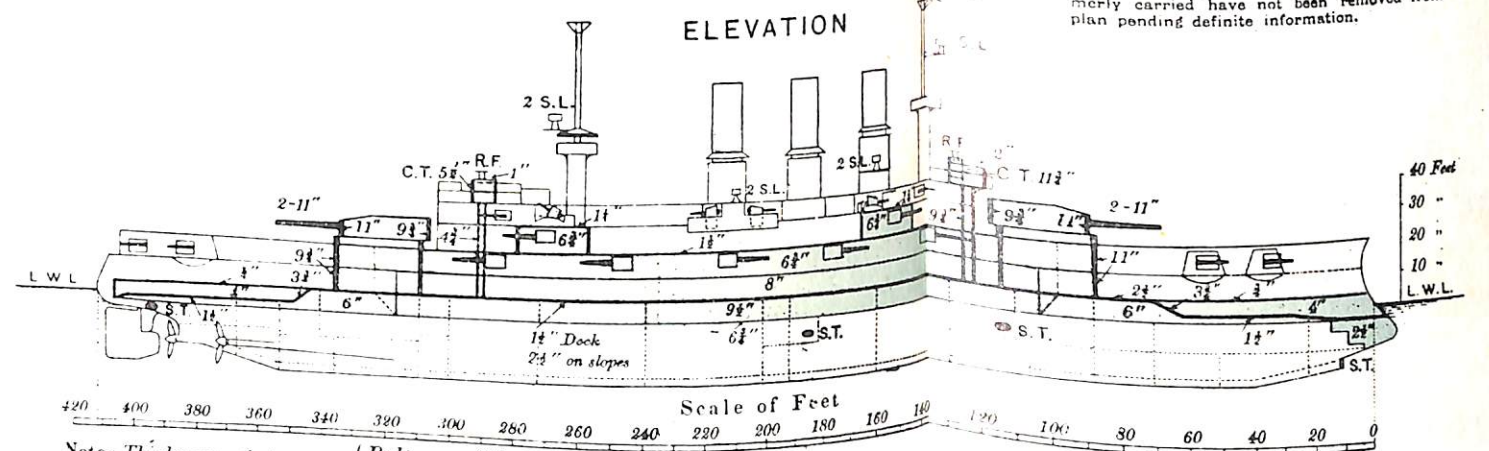


The number of lines shows number of Guns bearing in each Section

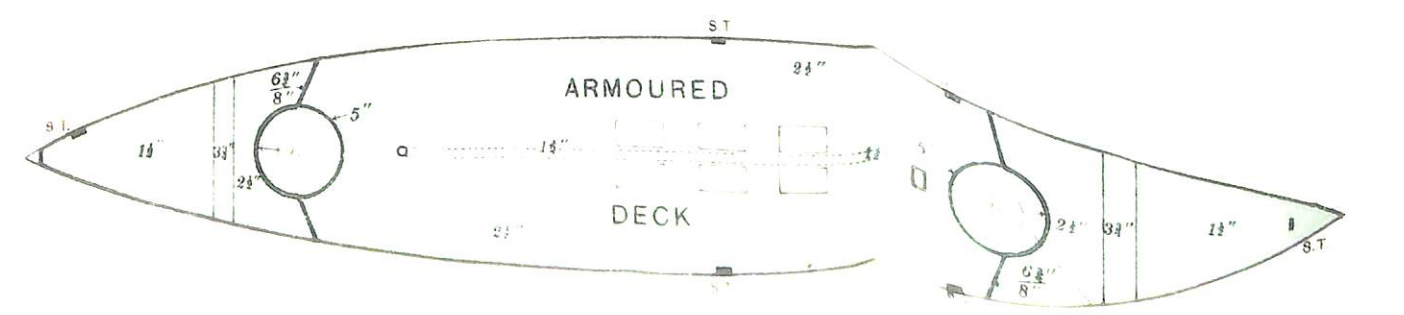
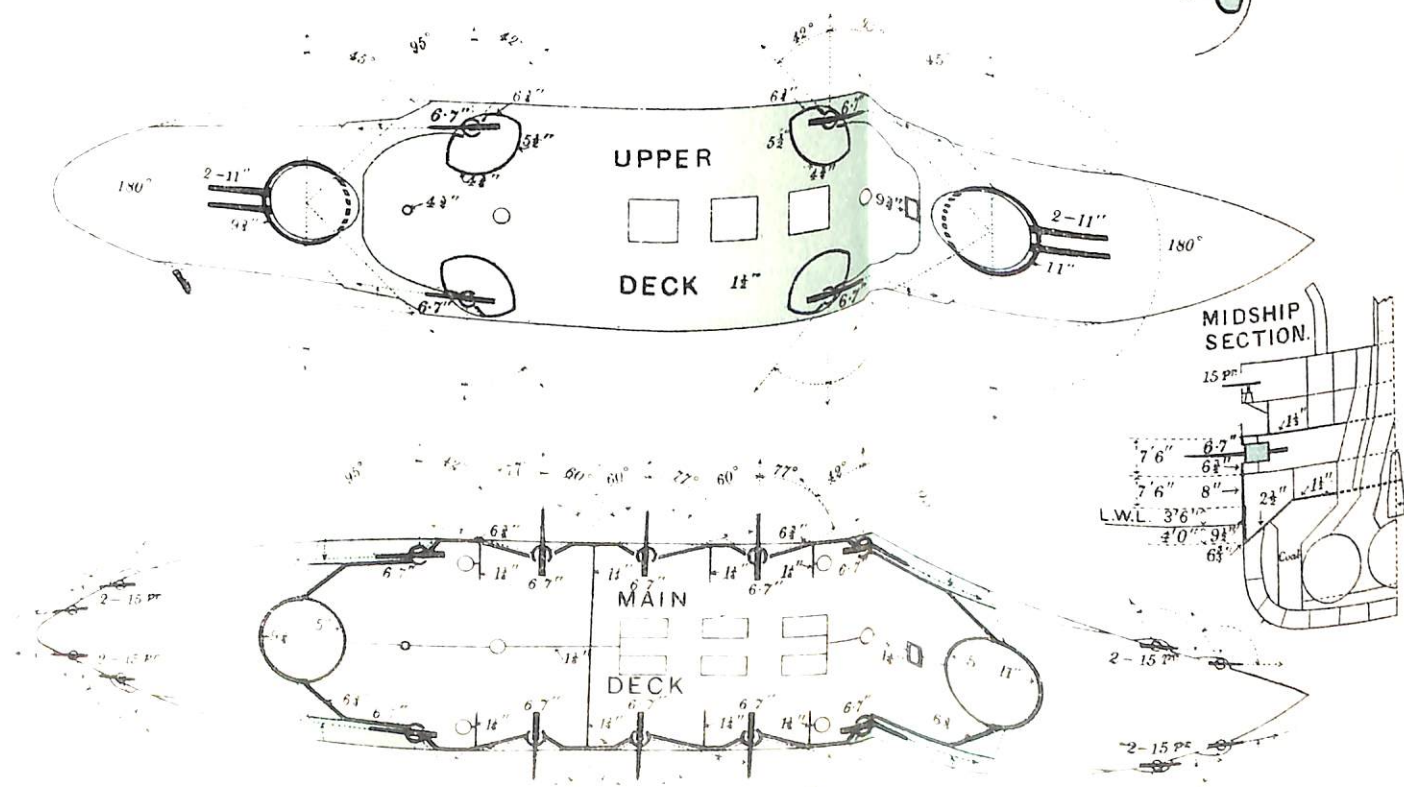
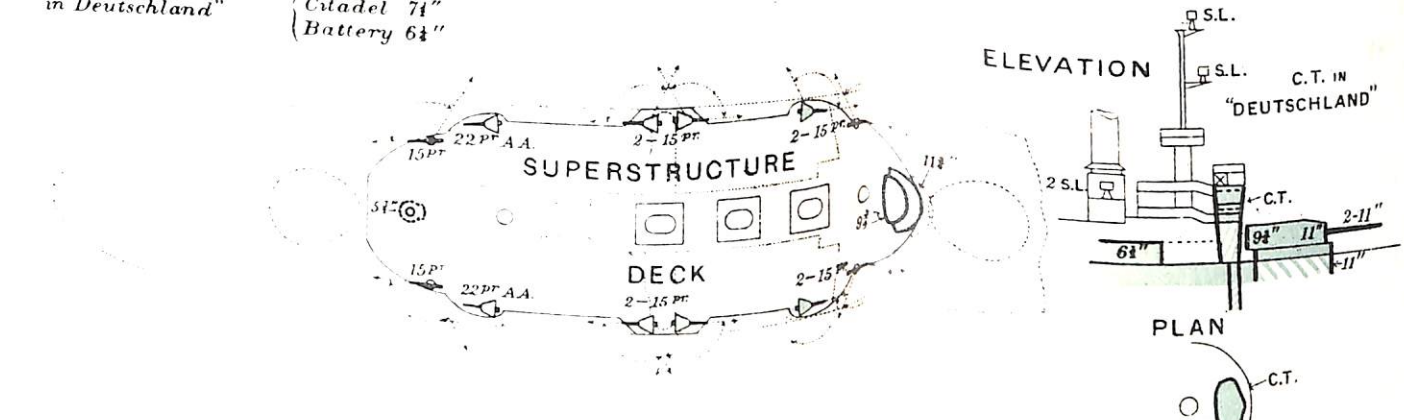
HANNOVER.
SCHLESWIG-HOLSTEIN. SCHLESSEN.
DEUTSCHLAND.

ARMOUR - Krupp Cemented

NOTE - It is believed that the only light guns now carried are 2 - 22 Pr. A.A. and 8 - 15 Pr. on superstructure, but the other 15 Pr. formerly carried have not been removed from plan pending definite information.

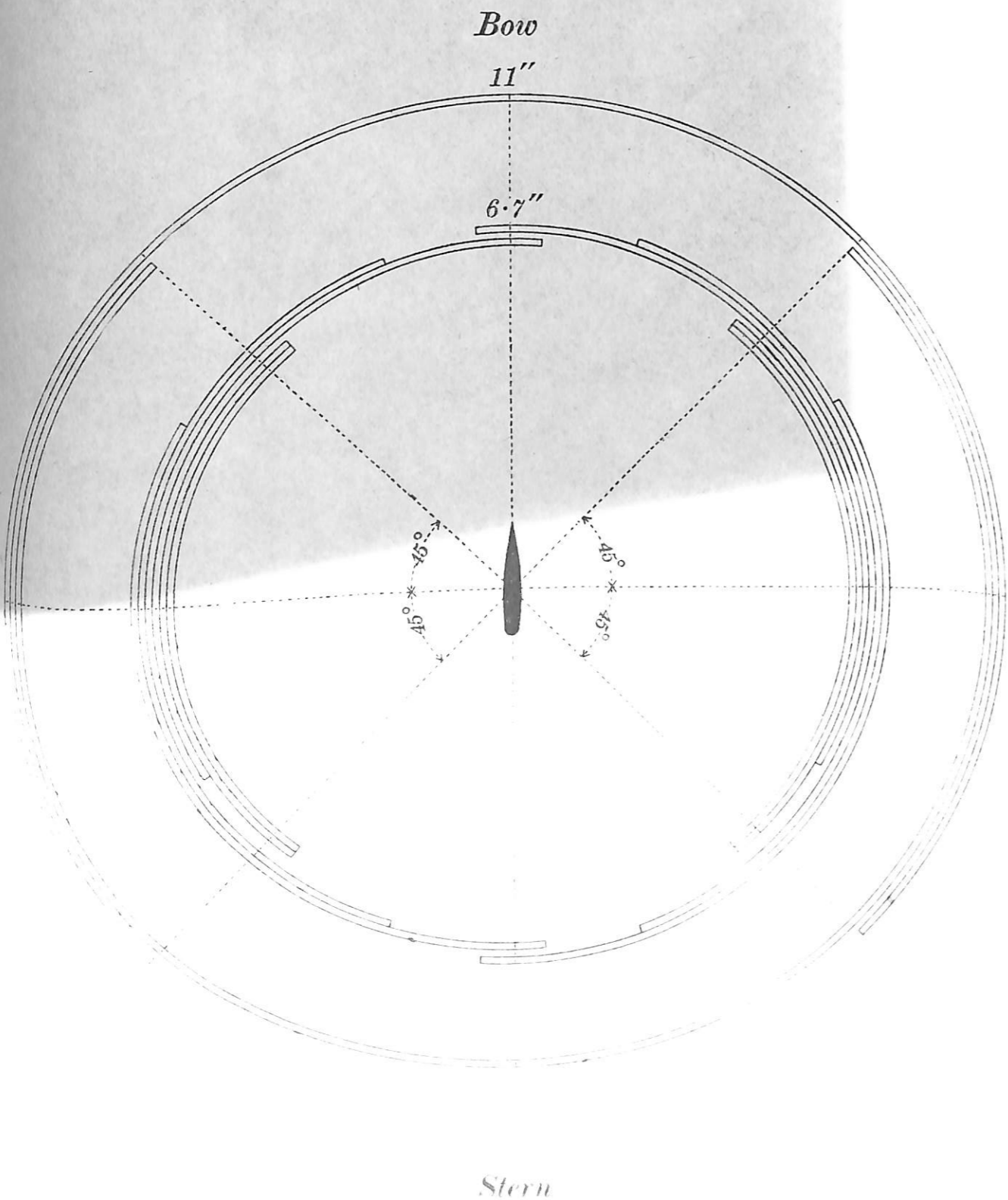


Note - Thickness of Armour in Deutschland } Belt 9\"/>



BRAUNSCHWEIG.

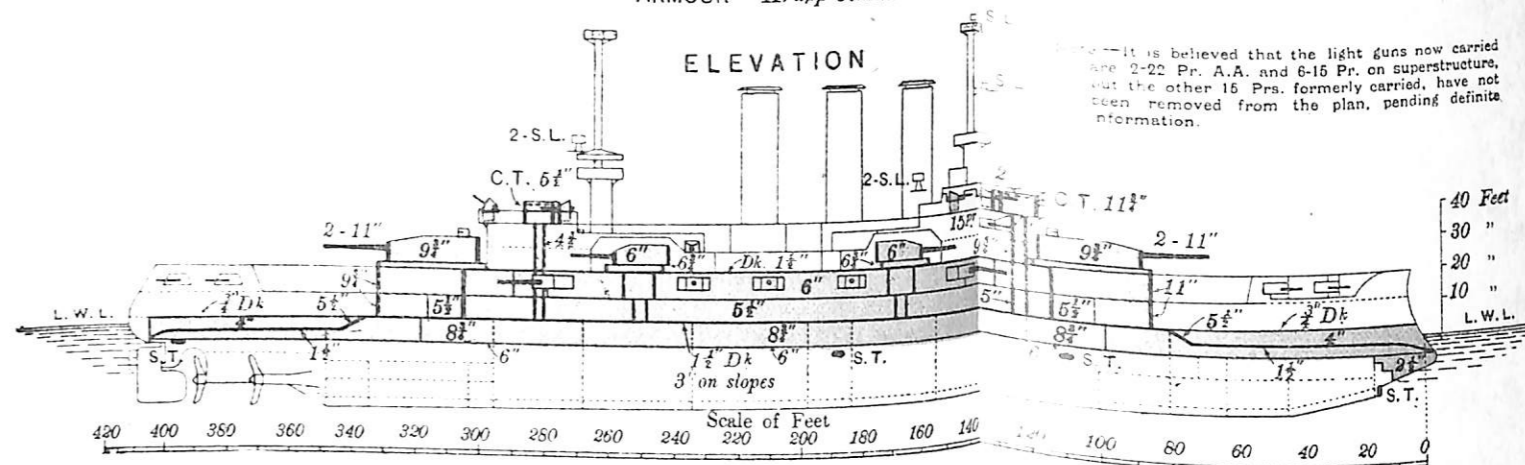
Diagram showing arcs of fire of Guns.



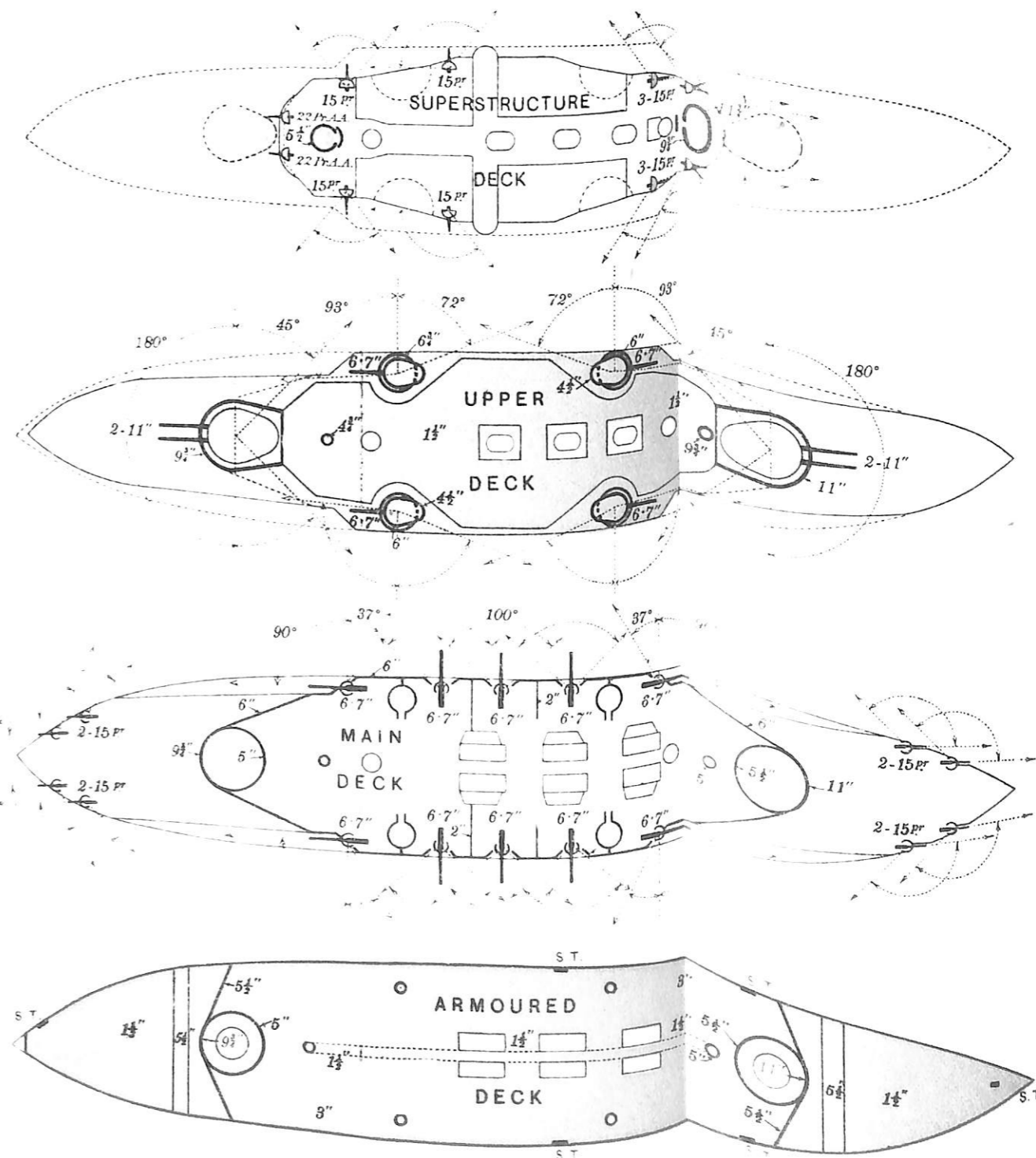
The number of lines shows number of Guns bearing in each Sector

BRAUNSCHWEIG.

ARMOUR - Krupp Cemented



It is believed that the light guns now carried are 2-22 Pr. A.A. and 6-15 Pr. on superstructure, but the other 16 Prs. formerly carried, have not been removed from the plan, pending definite information.



Vessels of Similar Type

ELSASS * HESSEN
PREUSSEN * LOTHRINGEN

* Thickness of Turret Armour differs slightly See

WITTELSBACH.

Diagram showing arcs of fire of Guns.

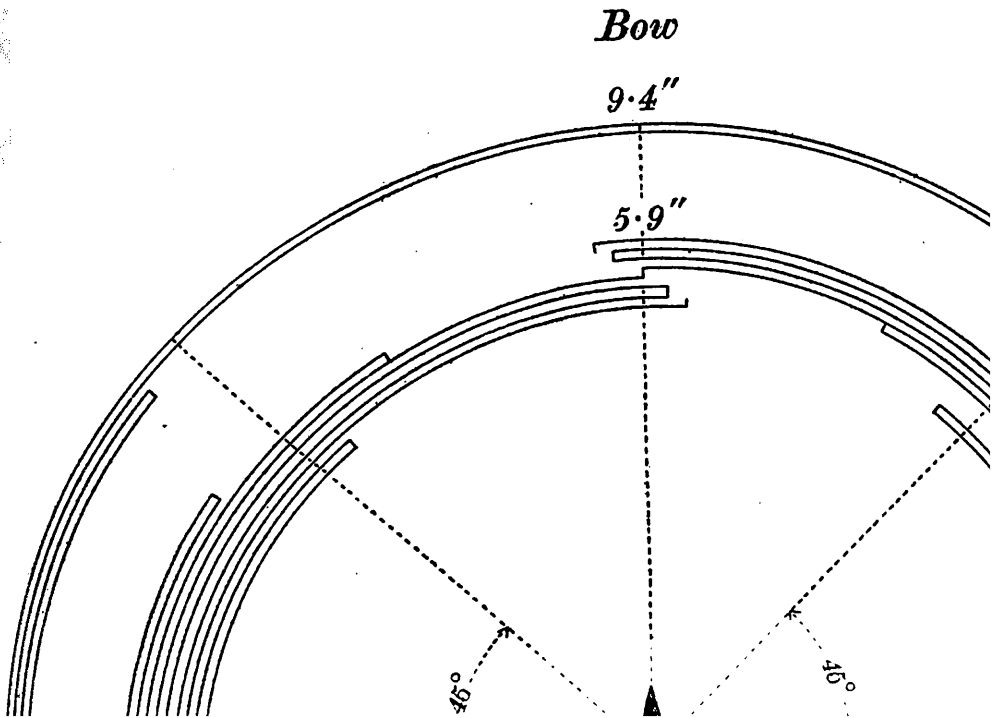
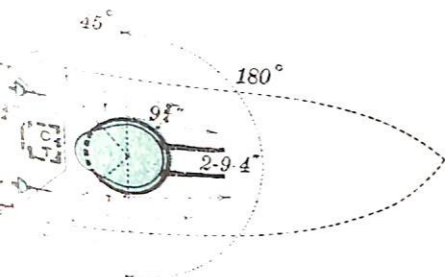
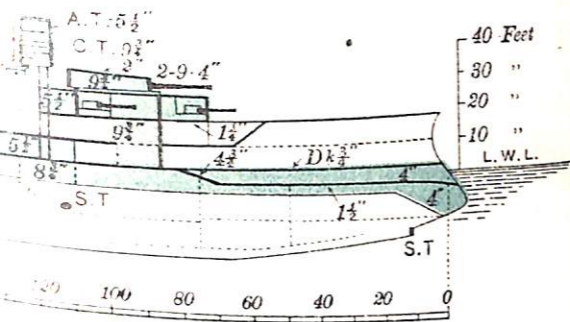


Plate 8.

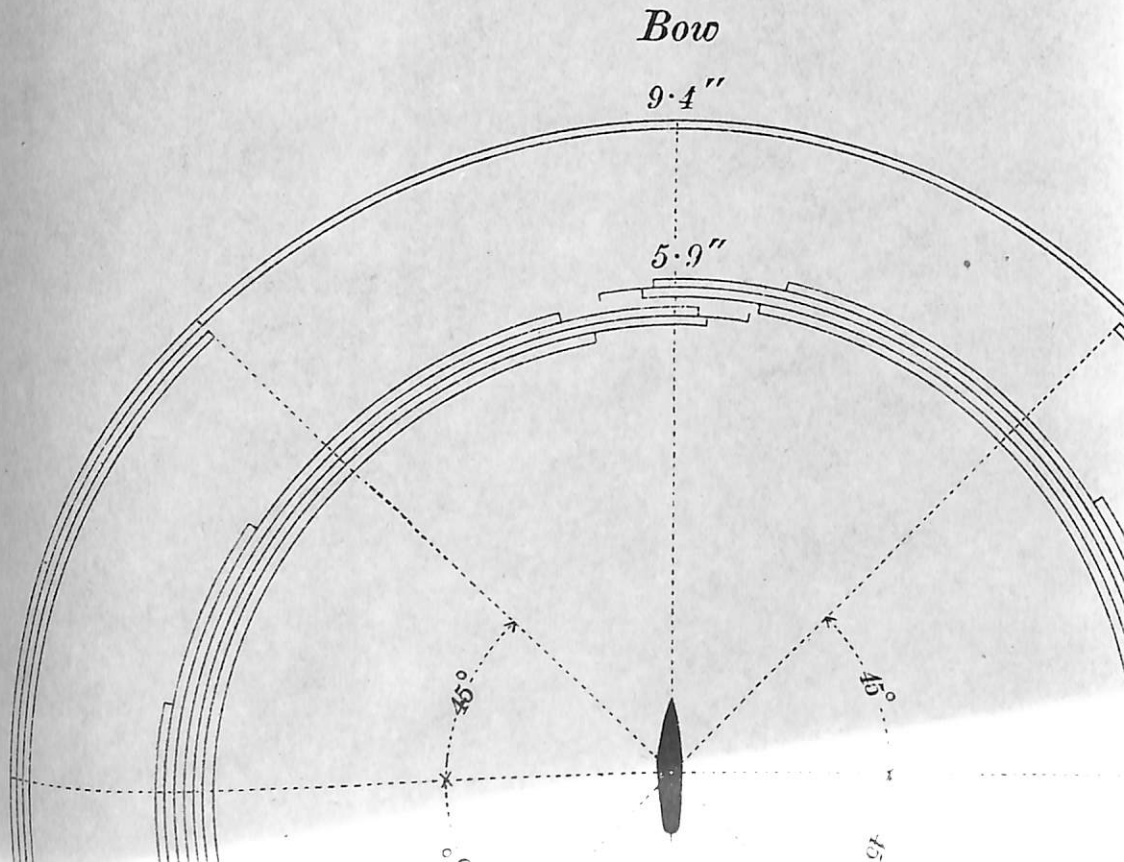
C.B. 1182.

Part III.



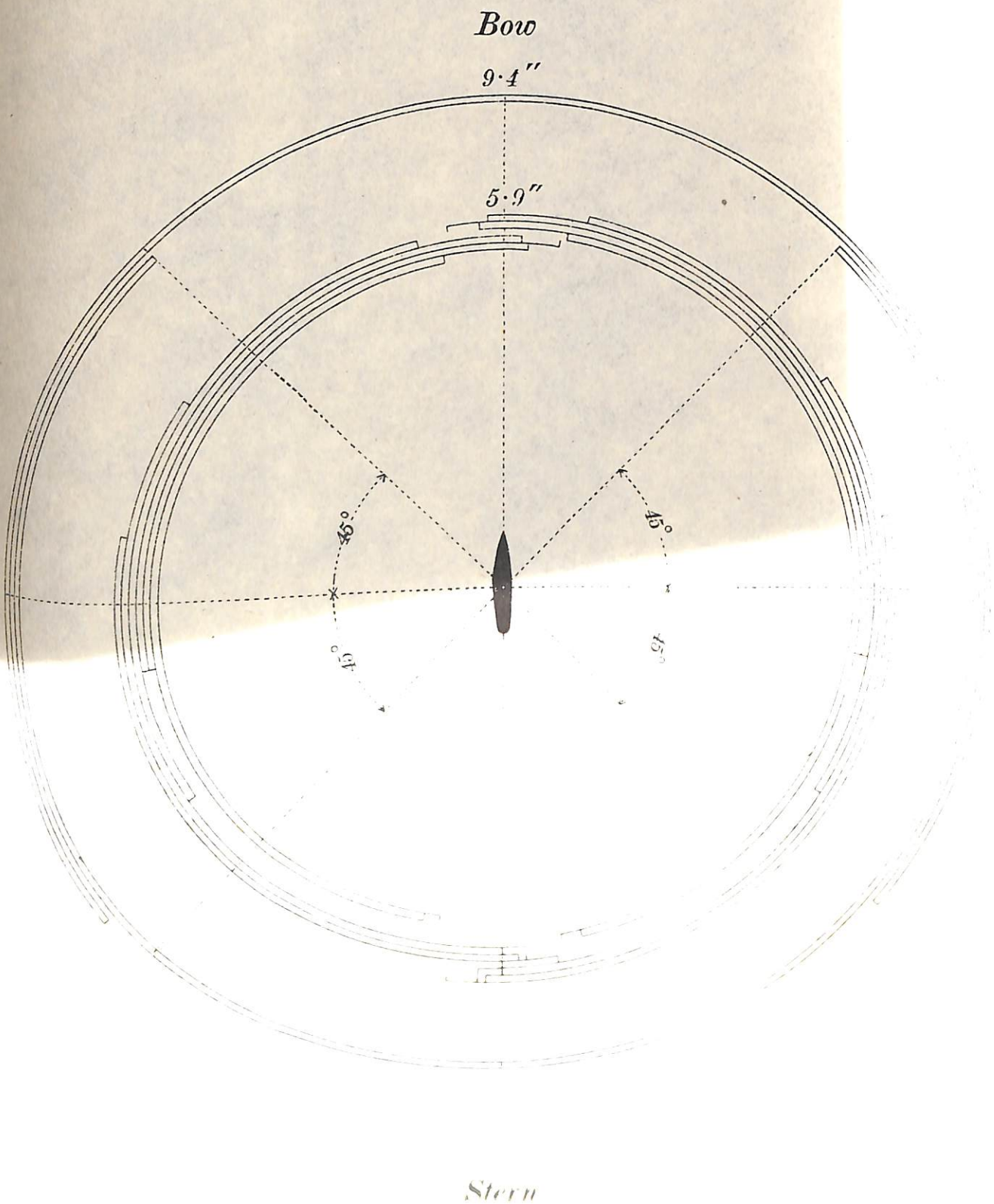
KAISER BARBAROSSA.

Diagram showing arcs of fire of Guns.



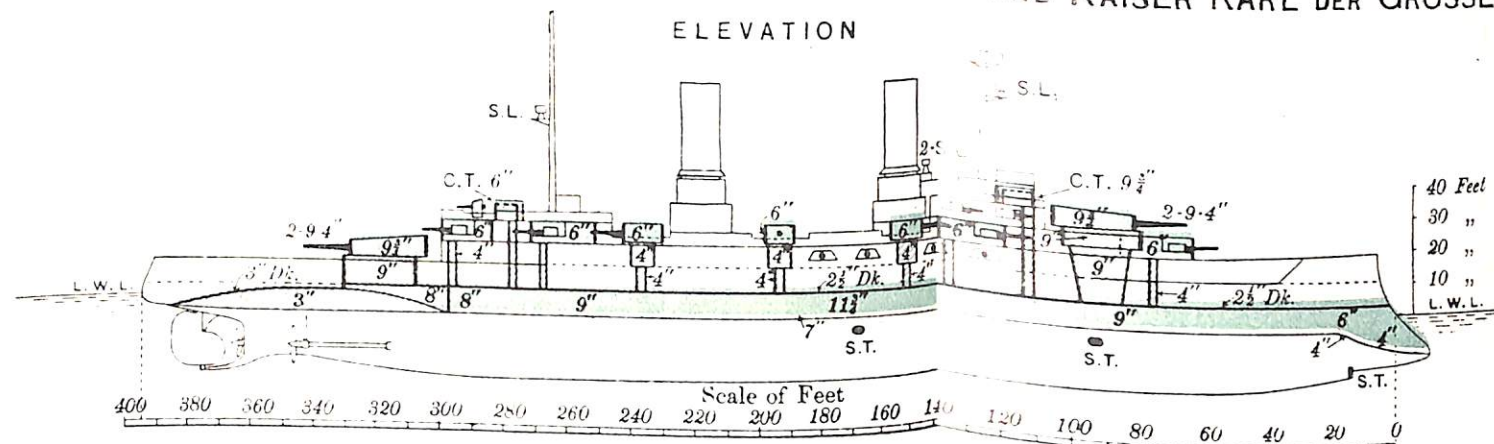
KAISER BARBAROSSA.

Diagram showing arcs of fire of Guns.

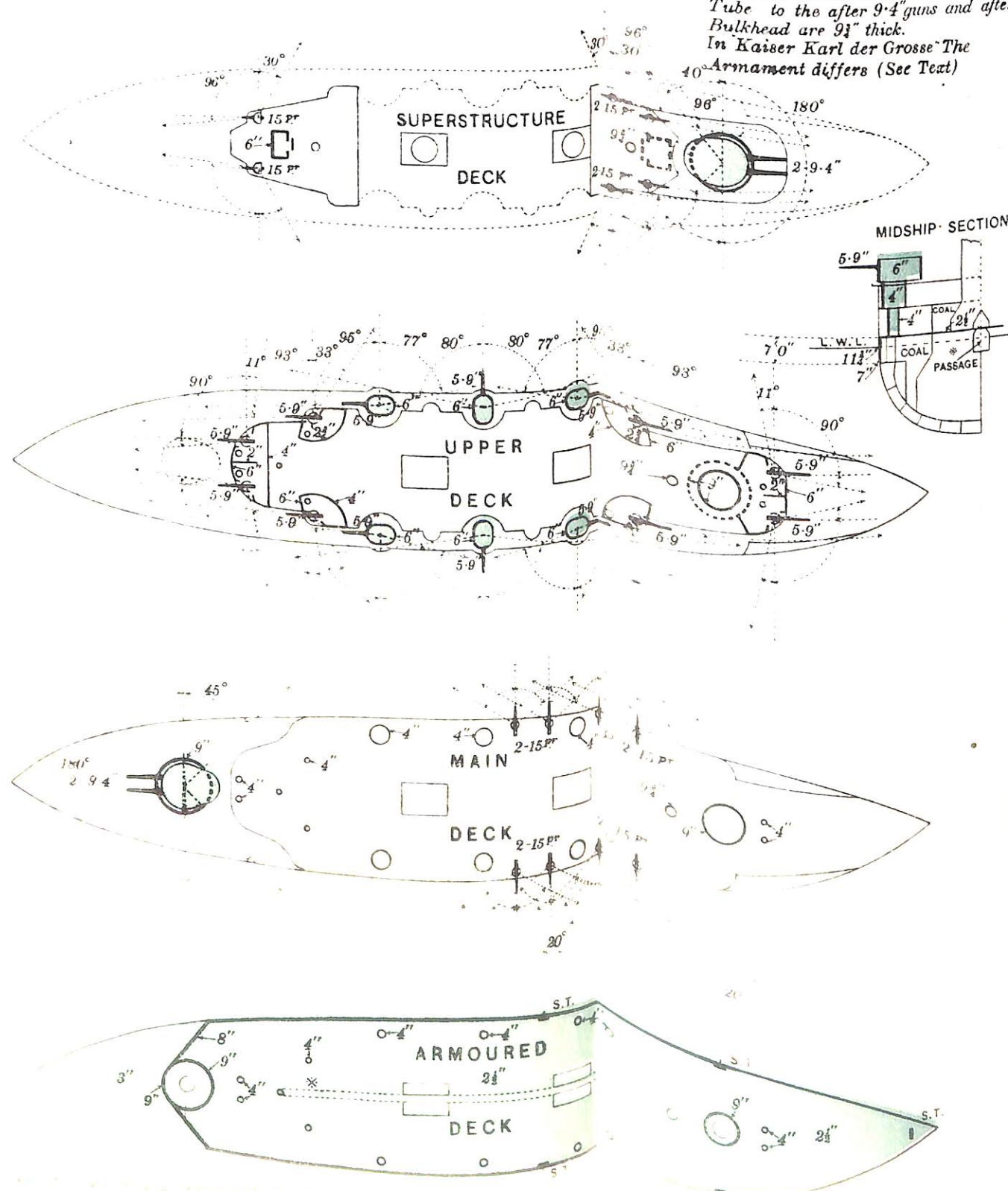


The number of lines shows number of Guns bearing in each Section

KAISER BARBAROSSA,
KAISER FRIEDRICH III, KAISER WILHELM II, KAISER WILHELM DER GROSSE,
AND KAISER KARL DER GROSSE.
ARMOUR — Krupp Steel

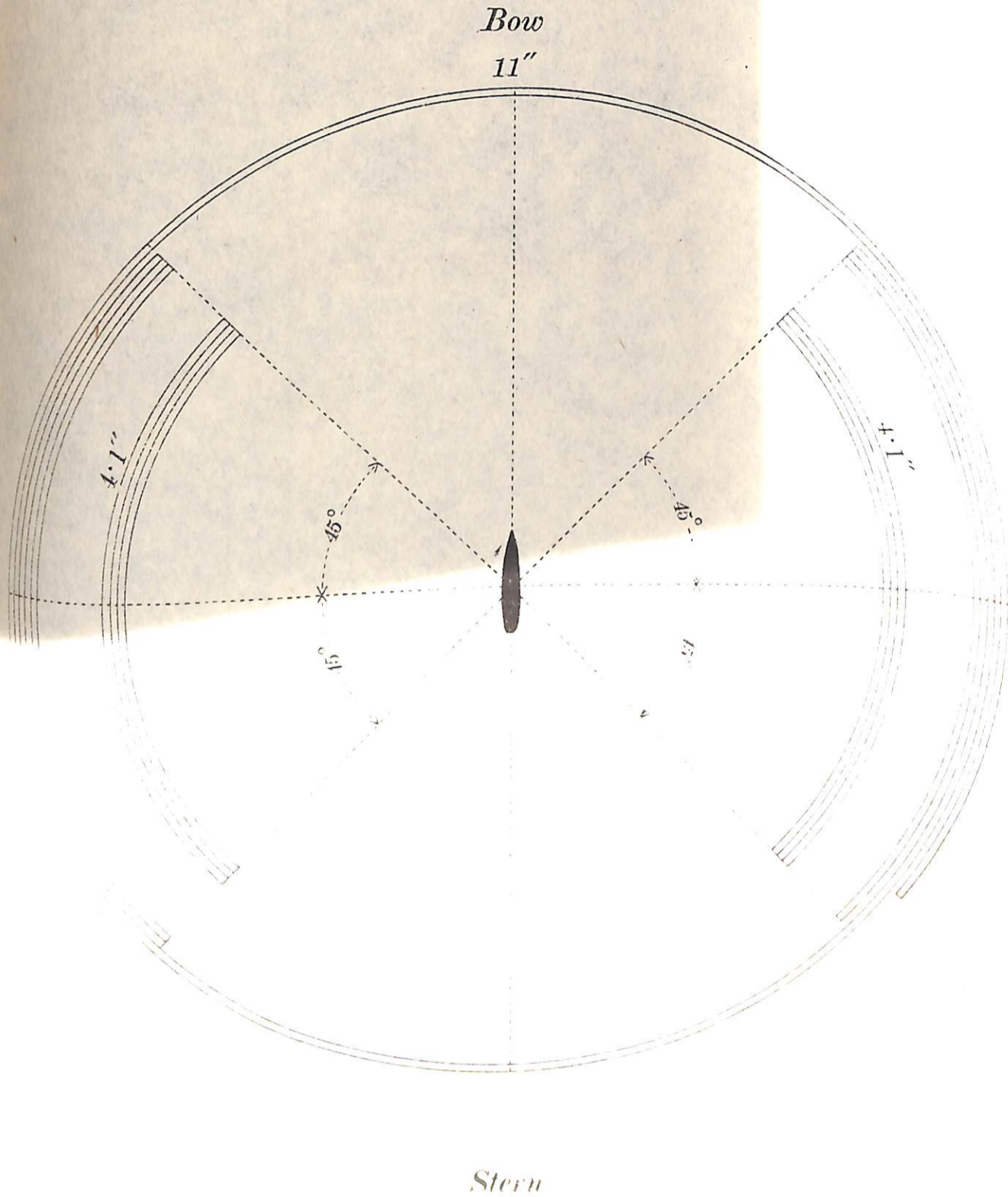


Note:— In "Kaiser Friedrich III" the Ammunition Tube to the after 9.4" guns and after Bulkhead are 9 1/2" thick.
In Kaiser Karl der Grosse the Armament differs (See Text)



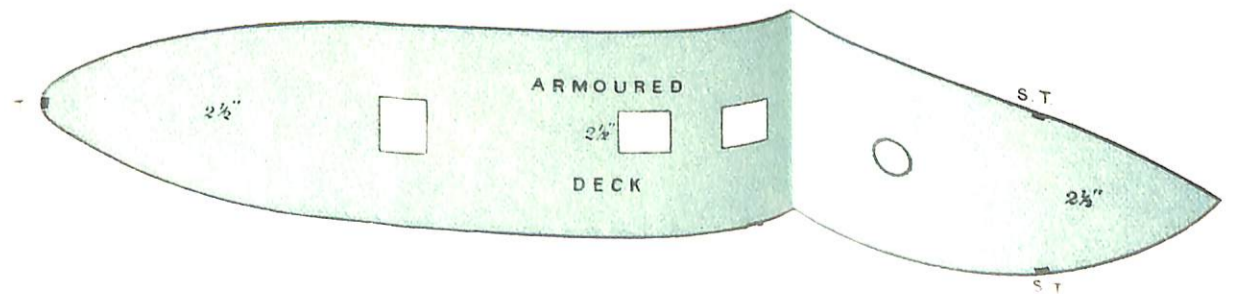
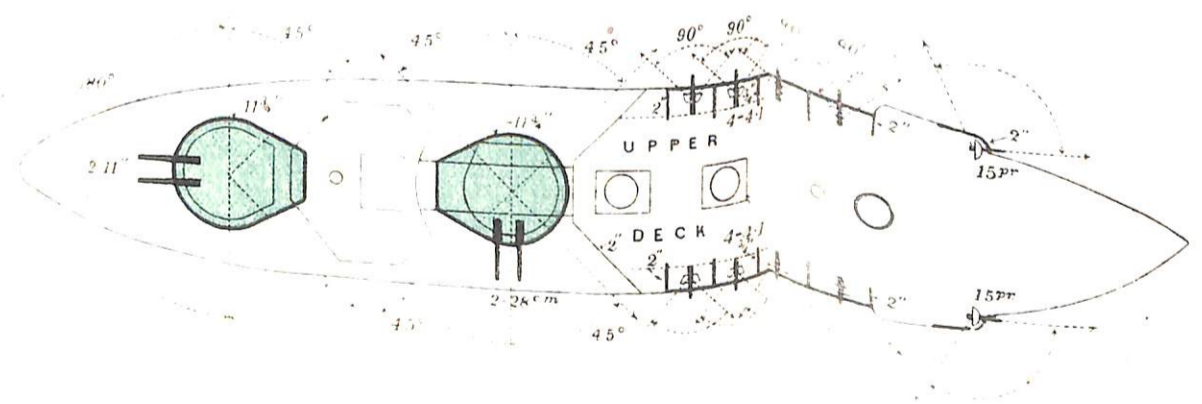
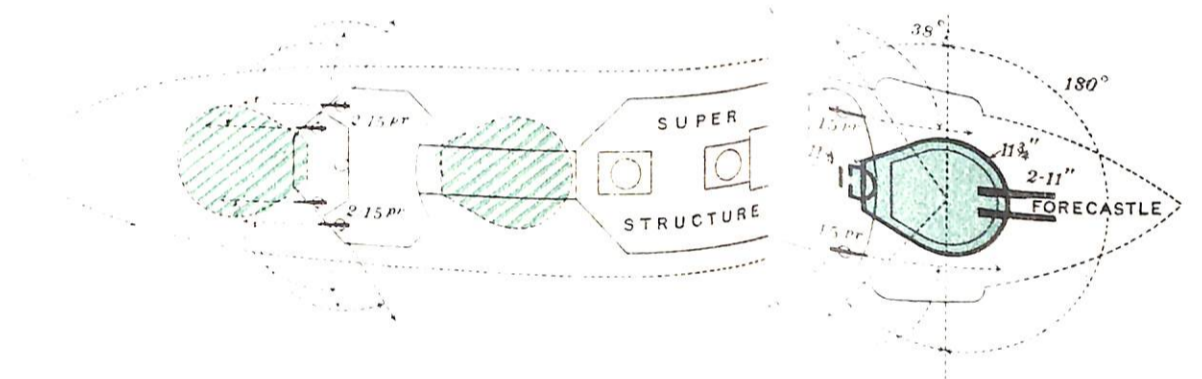
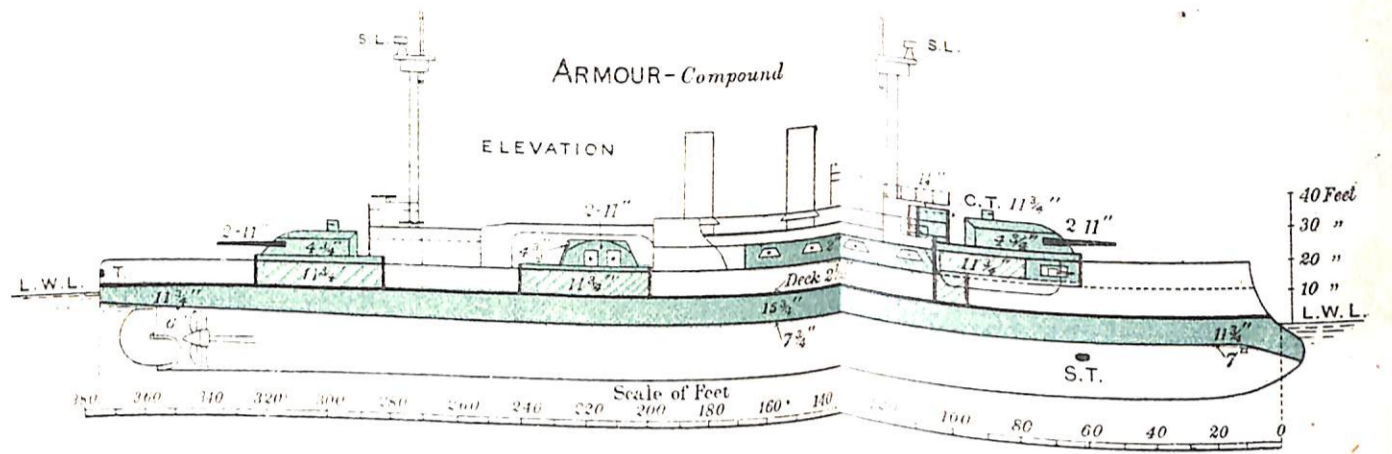
BRANDENBURG.

Diagram showing arcs of fire of Guns.



The number of lines shows number of Guns bearing in each Section

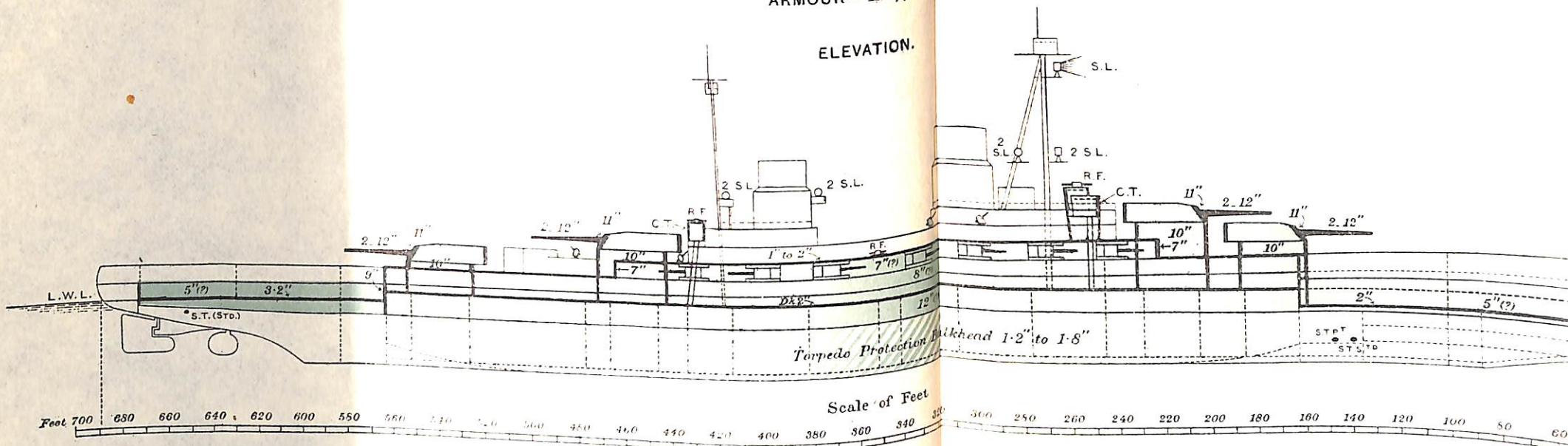
BRANDENBURG.
WÖRTH.



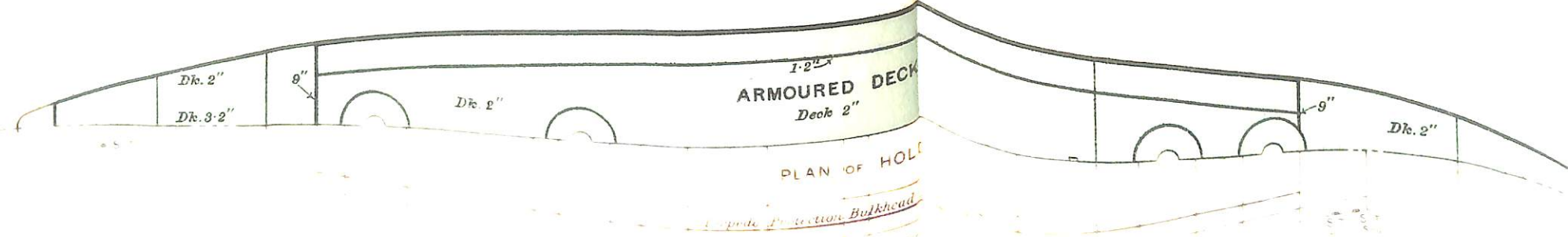
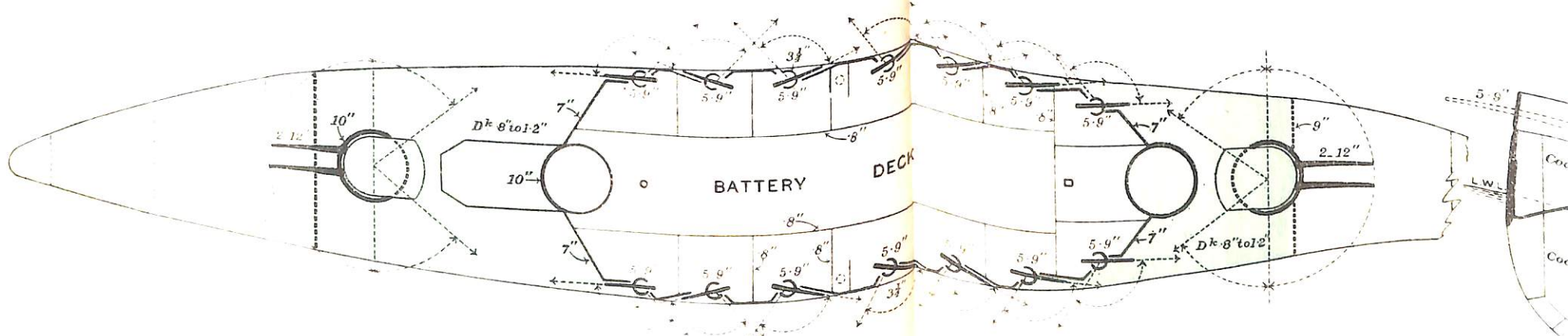
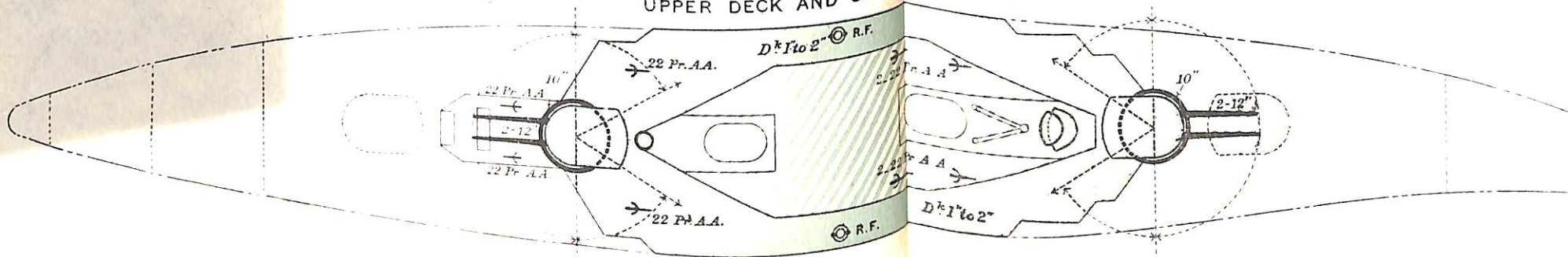
DERFFLINGER.

ARMOUR— *Krupp Cemented*

ELEVATION.



UPPER DECK AND SUPERSTRUCTURE



MOLTKE.

Diagram showing arcs of fire of Guns

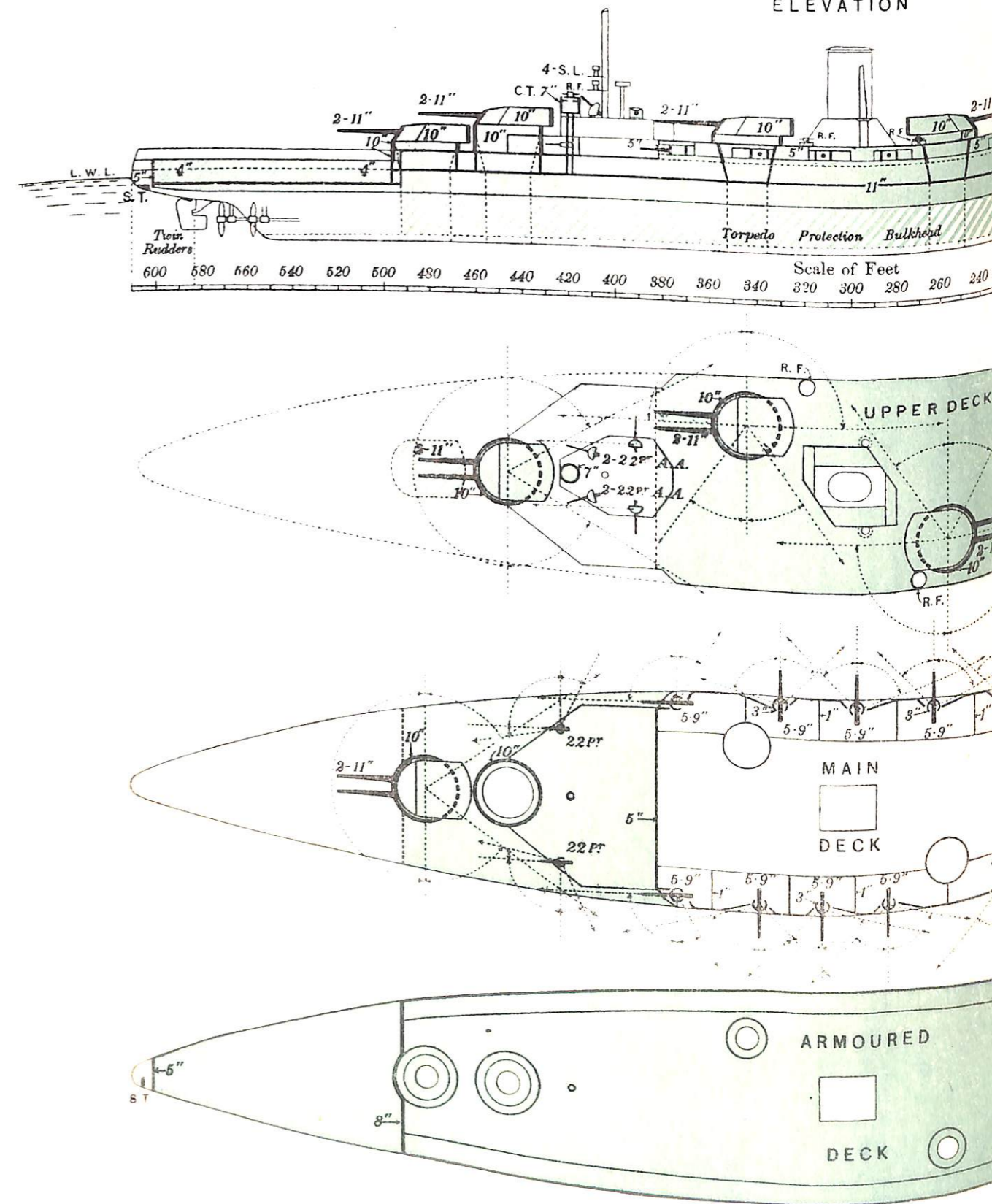


The number of guns shown under 4 Arms bearing in each Sect.

MOLTKE

ARMOUR — Krupp Cemented

ELEVATION



VON DER TANN.

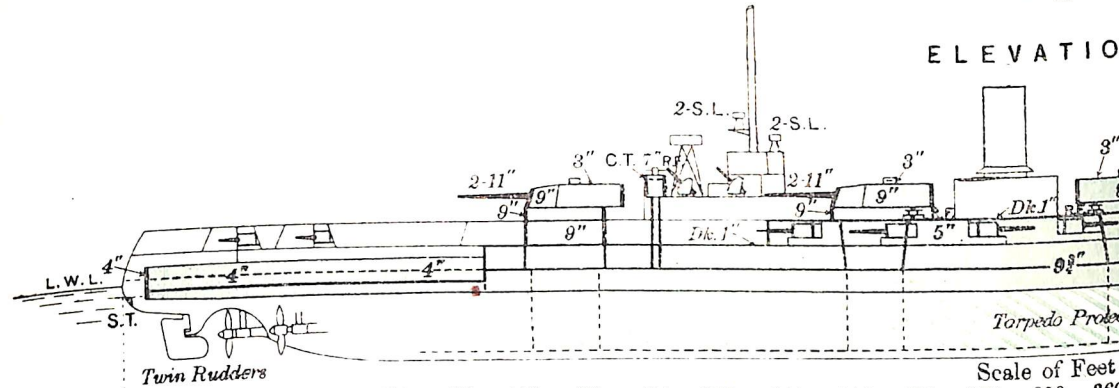
Diagram showing arcs of fire of Guns.

Bow

VON DER TA

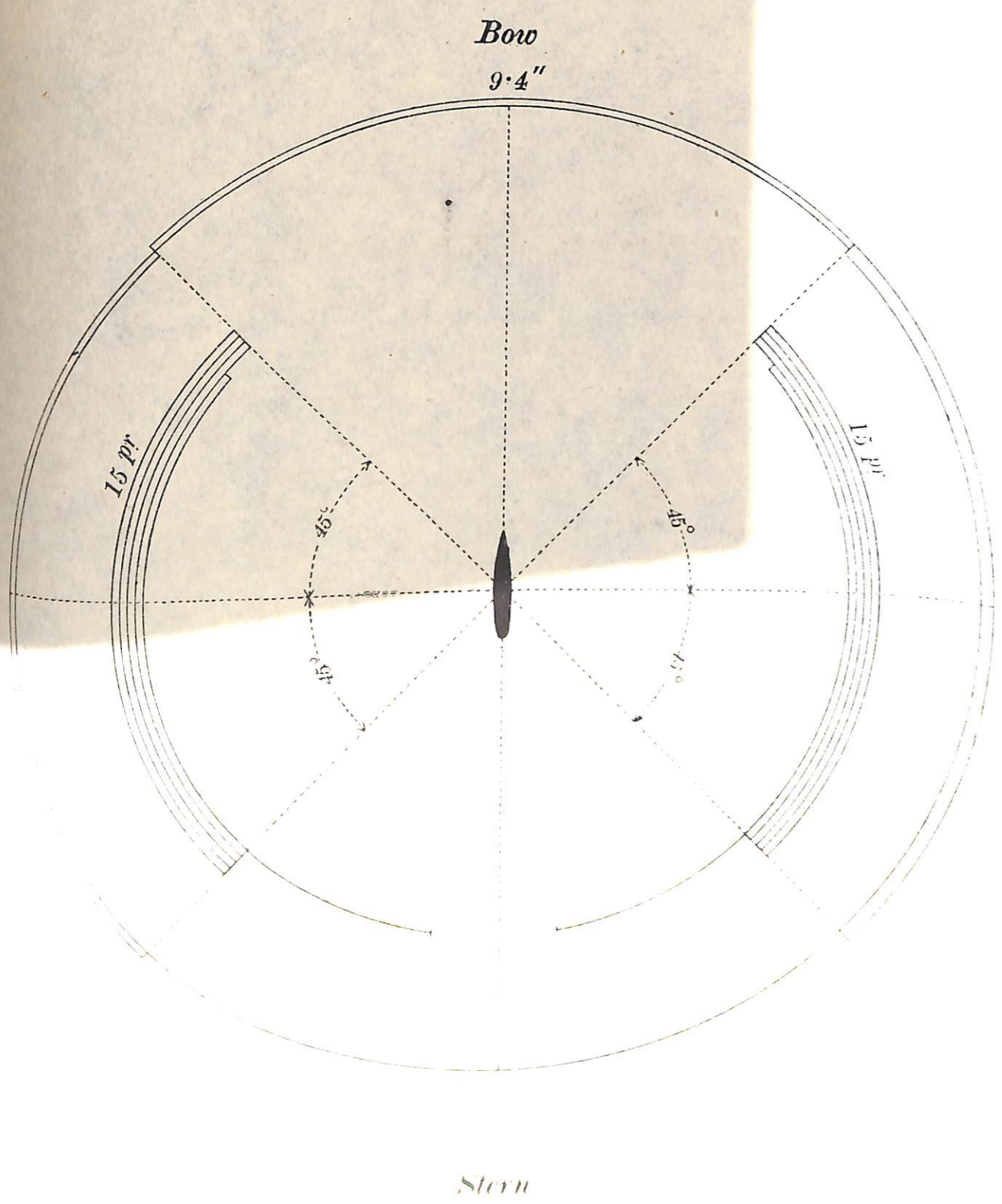
ARMOUR - Krupp Cem

ELEVATION



HAGEN.

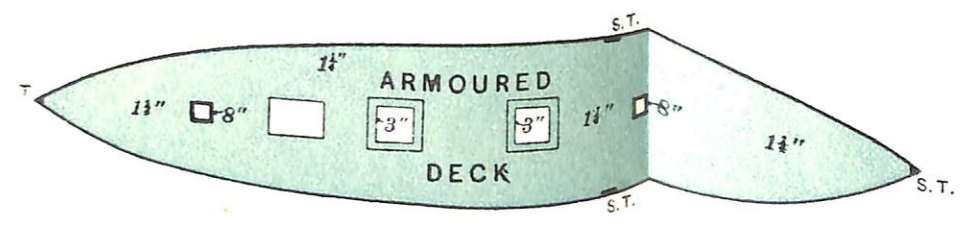
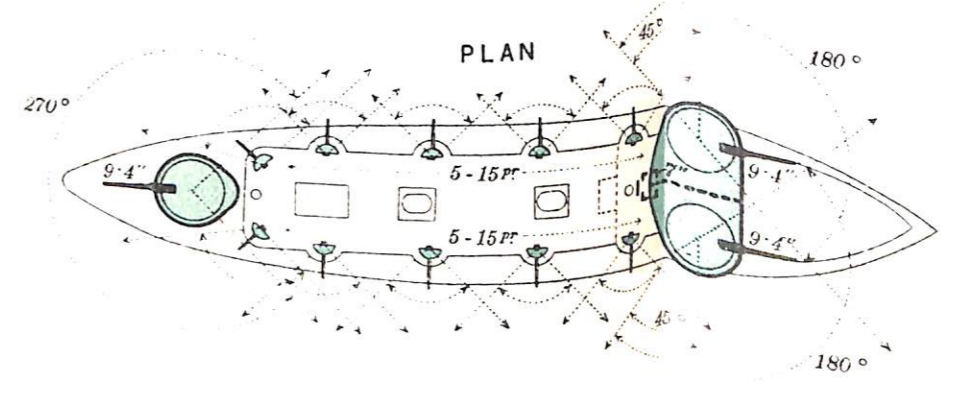
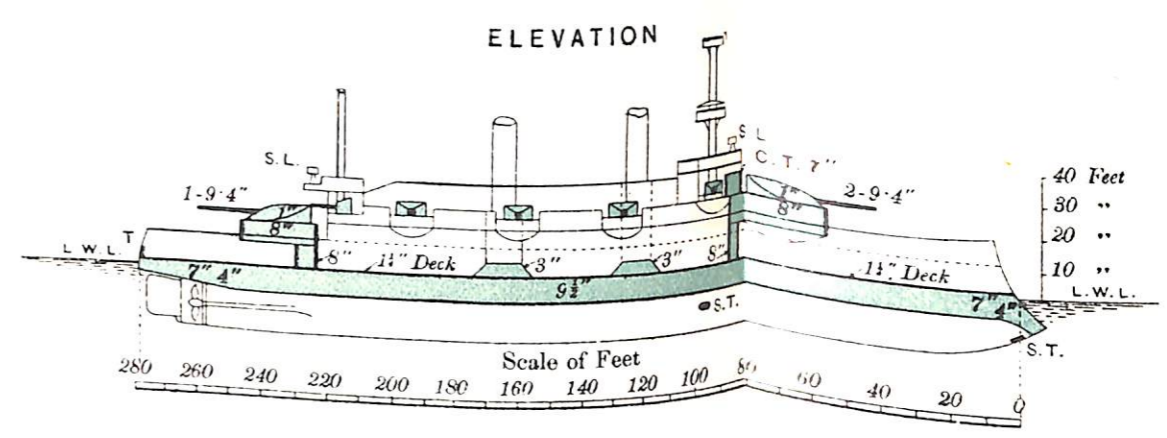
Diagram showing arcs of fire of Guns.



The number of lines shows number of Guns bearing in each Sector

HAGEN.

ARMOUR - Nickel Steel



| | | |
|------------|---|-------------------|
| HILDEBRAND | } | ARMOUR - Compound |
| HEIMDALL | | Nickel Steel |
| BEOWULF | | Compound |
| FRITHJOF | | " |
| SIEGFRIED | | " |
| ÆGIR | } | Nickel Steel |
| ODIN | | |

Armament of these Vessels similar, and similarly placed
Armour of the "Ægir" and "Odin" differs "See Text" part of "Hagen"

DECLASSIFIED