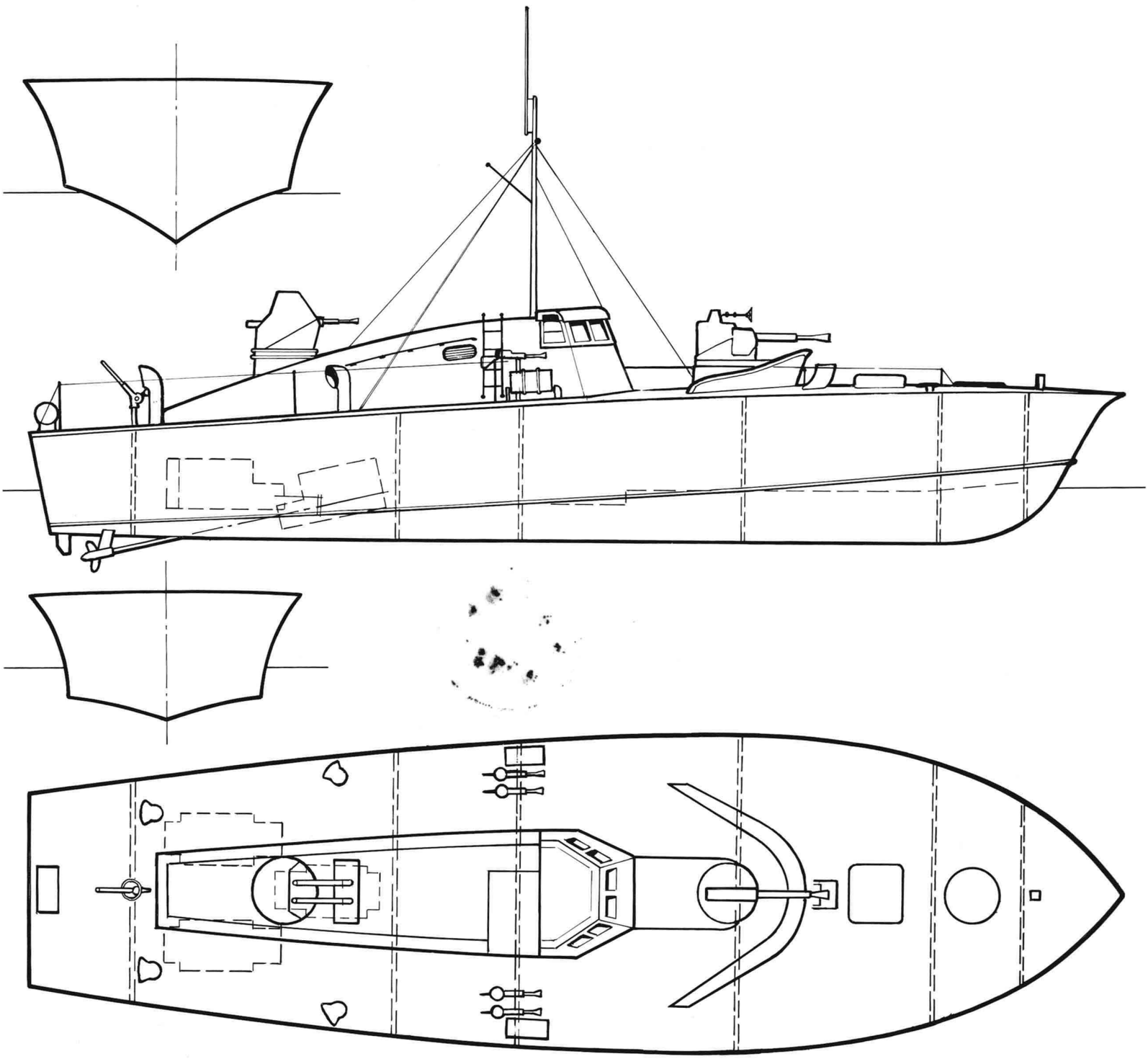
Fast Fighting Boats

Fig 85: British *MGB 74–81*:
L 23·93 m
B 6·35 m
D 46·00 tons
35–40 knots
3 × 1200/1350 hp Packard engines
1–2-pounder
2–20 mm
4–7·62 mm



HARALD FOCK

Fighting Boats 1870-1945

THEIR DESIGN CONSTRUCTION AND USE

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PUBLISHER'S NOTE

Dimensions must be treated with reservation, especially those in chapter 4. The considerable differences in the literature available have been reconciled most conscientiously. It was particularly difficult to establish, for example, which displacement figure was given, unladen, designed or operational. Similarly whether beam was waterline or over decks, whether speed was on trials, sustained or maximum. As far as possible the lengths given are the greatest lengths over decks.

Within these limitations all figures can be used as a basis for comparison and evaluation.

The plans and sketches herein were re-drawn from official sources by Gerhard Mittelstadt.

This work has been translated by Barbara Webb from the German original text which was originally published in two volumes by Koehlers Verlagsgesellschaft of Herford.

The English text has been checked by Mr. Peter C. Smith, who has also given valuable editorial advice.

The publishers also acknowledge assistance given by the photographic department of the Imperial War Museum.

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PREFACE

An impartial description of the technical development of types of fighting ships is never an exactly easy task. The great variety of influences of a military, tactical, technical and geographical nature, added to national characteristics and the individual views of the people mentioned in this book, all affected development directly or indirectly, and are not always easy to identify at first glance. In 1947 the then Vice President of the Institution of Naval Architects in England, Sir Charles S. Lillicrap, in a discussion on the address by the Chief Constructor, Naval Construction Department of the Admiralty, when speaking before a highly qualified audience at this time-honoured Institution, stated: 'If I say that the design of naval ships and craft is a complicated business, none of you are likely to disagree – if I go on and explain that because of the complication it is nearly always impossible for one man to be designer, builder and sailor I feel that many of you will still agree. The designer in the Admiralty is often the least well known of the above trio, the reasons for his actions are often somewhat obscure, and his compromises are often regarded as examples of wilful ignorance.'

This is absolutely true: if one not only follows the developments of a certain type in an individual country from the beginning to the present day but also compares this with competitive development in other countries, studying their influence upon each other, it is then possible to recognise the individuality of a certain stage of development, the actual position of development at any moment and, to a certain extent, the trend of future development. It is not unlike a river: if one looks towards the bank at right angles one sees running water and nothing more. A glance upstream at the course of the river above one's position, and a quick look downstream not only disclose the beauty but also the individual character of the stream and, within limits, its likely future course.

These problems are especially acute in the case of small high-speed naval craft, even though the history of their development is virtually confined to the twentieth century. These fast fighting boats are part of what the British call Coastal Forces.

Coastal Forces operate both in the nearer and more distant coastal waters, and also in smaller seas such as the North Sea, the Baltic, the Mediterranean, the Black Sea and so on, and can be subdivided by their character and armament into:

- slow craft, mainly defensive, used for guard, security, minesweeping, anti-submarine and convoy duties
- high-speed vessels of a basically offensive nature, which are either pure torpedo boats, rocket-carriers or gun-boats, or which carry a combination of offensive weapons.

With a few important exceptions that are included due to some particular advance in development, this book is concerned exclusively with high-speed offensive vessels. This limitation was necessary because, in this range alone, more than 3000 vessels of different types and great variety have been built, and even within this limit it has not been easy to make a continuous and comprehensive though brief presentation without resorting to purely statistical tables. The task was made more difficult by the fact that, apart from some few exceptions when there was methodical development, or when peace-time building was undertaken speculatively, the bulk of the vessels were designed to meet the situation of the moment during the two world wars and were continually modified in the light of experience. It was not without good cause that Captain F. H. Powys Maurice, in a lecture after World War II on the development of British small high-speed coastal craft, stated: "The diversity of hull types complicated maintenance and, as the war went on, these craft had more and more different types of equipment in them. We really should try and keep the number of types and boats and equipment down to the minimum." This admonition is often forgotten, even today.

Parts 1 to 3 deal with the development of fast fighting boats by all navies from the earliest beginnings shortly after the turn of the century until the outbreak of World War II. It is stimulating to find that during this period these vessels were developed under the pressure of circumstances, using what was already available, and they often developed in entirely unconventional ways. For example it was only the German, Russian and Italian navies that carried out systematic development over an extended period between the wars.

Part 4 covers the vast expansion of coastal forces of all navies during World War II, and gives the delivery figures and fate of the boats. Short, comprehensive reports of operations, and references to successes, experiences and tactical

development, show that work proceeded systematically under the pressure of war and, in so far as it was possible, the vessels were matched to the changing character of operations. The Klein-Schnellboot, many details of which have not been published hitherto, and the first German naval hydrofoils which appeared towards the end of the war, round off a picture of unbelievable expansion in development and tough engagements.

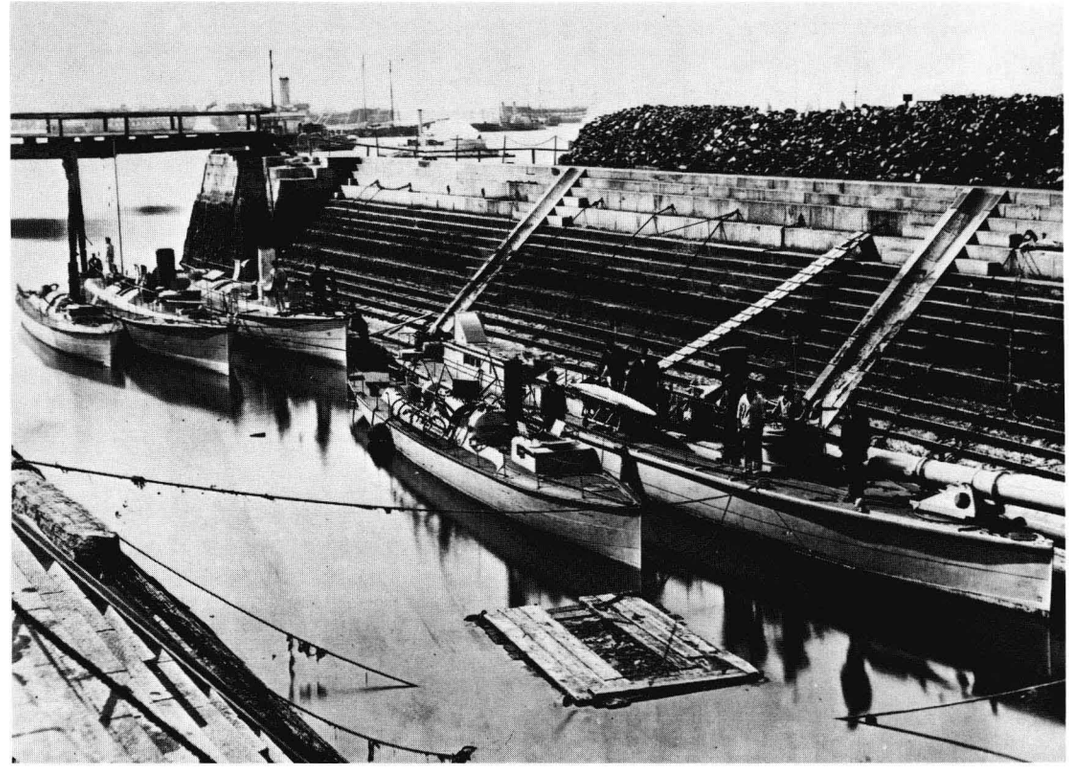
A second volume will cover the development of small fast fighting boats after the war, ending with the fascinating situation today: missiles and combat data-processing systems give small craft strike power, range and the ability to react which, only a short time earlier, were the exclusive attribute of large fighting ships, while hydrofoil and air-cushion vessels open the way to undreamed of speeds.

The author, a staff officer teaching at the Naval School at Mürwik, West Germany, was concerned primarily with covering the development of fast fighting boats from a technical viewpoint, and only to include peace-time, wartime and operational experience as a background to technical development. Communiqués are available in abundance, particularly relating to World War II. Nevertheless the book is written less for the technical expert than 'ad usum delphini' . . . in other words for the younger generation of sailors and lovers of the sea.

Thanks are due to all those who aided the author in this work and, especially, to the Italian navy's 'Ufficio Storico' for permission to use pictures and material for sketches, to the Bundesarchiv/Militärchiv in Freiburg, to the Lürssen yard, and Herr Schiffbau-Ingenieur F. H. Wendel who has made his comprehensive private archives available for the first time. Thanks too to Herr Gerhard Mittelstädt who prepared all the sketches and drawings, and to all those who made documents and information available.

Harald Fock, Flensburg 1974

Photo 1: British torpedo boats in dock, 1878.



INTRODUCTION

The development of the small high-speed fighting boat which, in some navies is called the Motor Torpedo Boat, Motor Gun Boat or Fast Patrol Boat, stems largely from the self-propelled torpedo, an attacking weapon which was developed by the Austrian Lüppis in 1864–66 and improved by the Englishman Whitehead in 1872. The original 35·6cm torpedo was 3·53 metres long, weighed 136kgs and covered 200 metres at 6 knots in 1866. Later developments of the 35·6cm Whitehead torpedo carried 30kgs of explosive and covered 400 metres at 28 knots or 600 metres at 24 knots. Other major factors were the continual striving to build faster torpedo boats, the evolution of the internal combustion engine as a means of propulsion, and motor boat racing.

Because of the large load of explosive carried, and the damping effect of the column of water above the detonation, the torpedo could be expected to have greater destructive power than any other naval weapon. Furthermore it attacked the sensitive underwater area, threatening the ship's ability to float, so that in most cases not only did the vessel suffer greater damage, but there was a good chance of eliminating the enemy. From the very beginning torpedo boats had certain common characteristics due to the torpedo's limited range and slowness by comparison with artillery fire; they were fast, cheap, and easy to build in large numbers, with low, flat silhouettes. The larger ships which were the main targets had great defensive strength, and success could only be expected through surprise attack at close quarters by night, or through using large numbers of torpedo boats to distract the defences in daytime.

The seagoing torpedo vessels or torpedo steamships that were built by all navies at that time, such as the British *Vesuvius*, the German Zephir class and the *Ulan*, the Italian *Pietro Micca*, the Swedish *Ram*, the US *Alarm* and *Intrepid*, were slow, heavy displacement ships quite unsuited to the task. In 1871 the English shipyard owner Thornycroft conceived the idea of building smaller faster steamboats to carry torpedoes. He first designed *Miranda*, 13·7 metres in length, an extremely light steel boat with a speed of 16·4 knots, the precursor of all torpedo boats. In 1873 Thornycroft built the first torpedo boat for the Norwegian navy, (17·0m. × 2·29m. × 0·91m., 14 knots) equipped with a 3·95 metre towing torpedo attached to the top of the funnel. Two similar but rather faster vessels were ordered by Sweden and Denmark. As the towing torpedo proved unsatisfactory a rather larger 18-knot boat which carried two spar torpedoes was built for the Austro-Hungarian navy. In the years that followed France, Russia, Holland and Italy equipped themselves with torpedo boats of this type, but larger to improve seaworthiness, faster due to increased power output, and operationally more efficient following the introduction of the self-propelled torpedo fired from a tube.

Figure 1 shows the Italian torpedo boat *Nibbio* ordered from Thornycroft in 1876 (24·28m. × 3·05m. × 0·9m., 18 knots, two 35·6 Whitehead torpedoes.)

In May 1877 Mr. John Donaldson of Thornycroft's gave an address to the Royal United Service Institution on the 'designing of small craft adapted for torpedo warfare.'

In the same year Thornycroft's delivered the 18·5 knot *Lightning* equipped with a single torpedo tube, the first torpedo boat to serve with the Royal Navy. (photo 1)

Other firms also began to take an interest in this type of vessel: Yarrow and White in England, Normand in France, Schichau in Germany and others[1].† At this time too development branched out in two different directions: firstly

– torpedo boats 1st class, vessels which increased rapidly

† Superior Figures refer to notes on page 300 et seq.

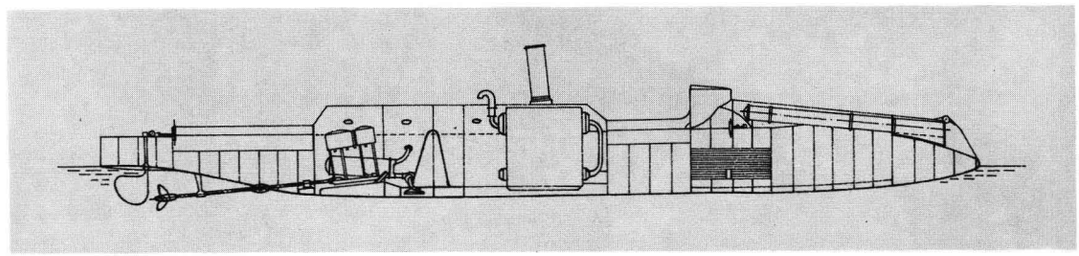


Fig 1: Italian torpedo boat *Nibbio* 1878: L 24·28 m, B 3·05 m, Dr 0·90 m, Disp 26 tons, 1–250 hp triple exp engine, Speed 18 knots, 2–35·6 bow torp tubes.

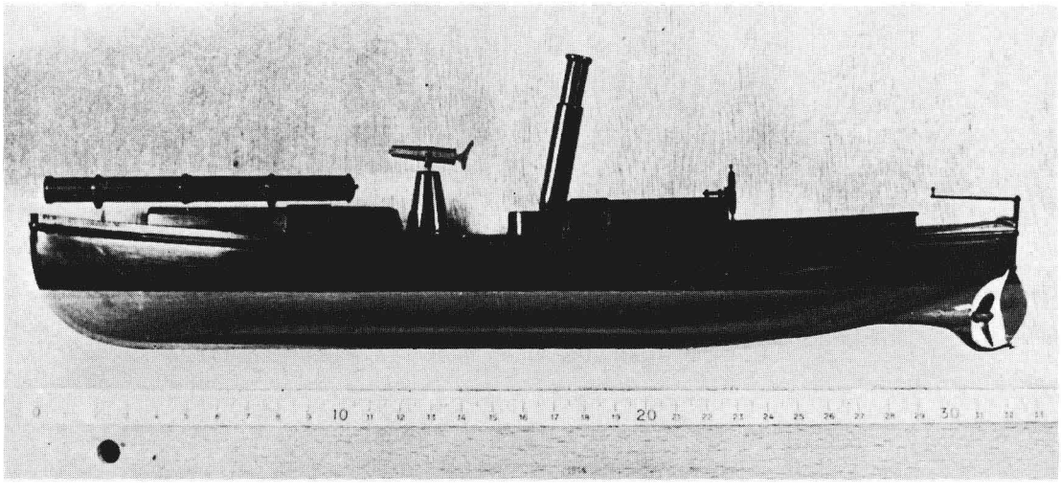


Photo 2: Torpedo boat carried aboard the German cruiser *Irene*.

in size, designed always to operate independently, which later evolved into the destroyer, and secondly

– the initially much smaller torpedo boats 2nd class, designed both to operate independently in the nearer coastal areas, and to be transported in davits aboard larger ships.

Photograph 2 shows the torpedo boat which was carried aboard the German cruiser *Irene* but never included in the navy list.

Typical of the early torpedo boat 1st class, was the German Schütze class (photo 3): seven boats were built by A. G. Weser of Bremen to a french design by Normand, and entered service with the German navy in 1883: (31·5m. × 3·93m. × 0·87m., 50/56 tons displacement). They achieved 17·9 knots powered by one vertical 2-cylinder double expansion engine of 500/599 indicated hp. supplied by a 9at.* locomotive boiler, driving a propeller of 1·6 metres diameter, and carried 8·2 tons of coal to give a range of 110 nautical miles at 16 knots or 750 nautical miles at 10 knots, with a crew of 13 and two 35cm. bow bow torpedo tubes[3].

Fig. 2 shows a typical torpedo boat 2nd class, built by Thornycroft in 1883 for the Royal Navy: length 19·2 metres, beam 2·25m. displacement 12·89 tons, one 170 indicated hp. piston steam engine giving a top speed of 17·3 knots and a sustained speed of 15 knots for two hours. Broken down,

* 1at = 14·7 lbs/in².

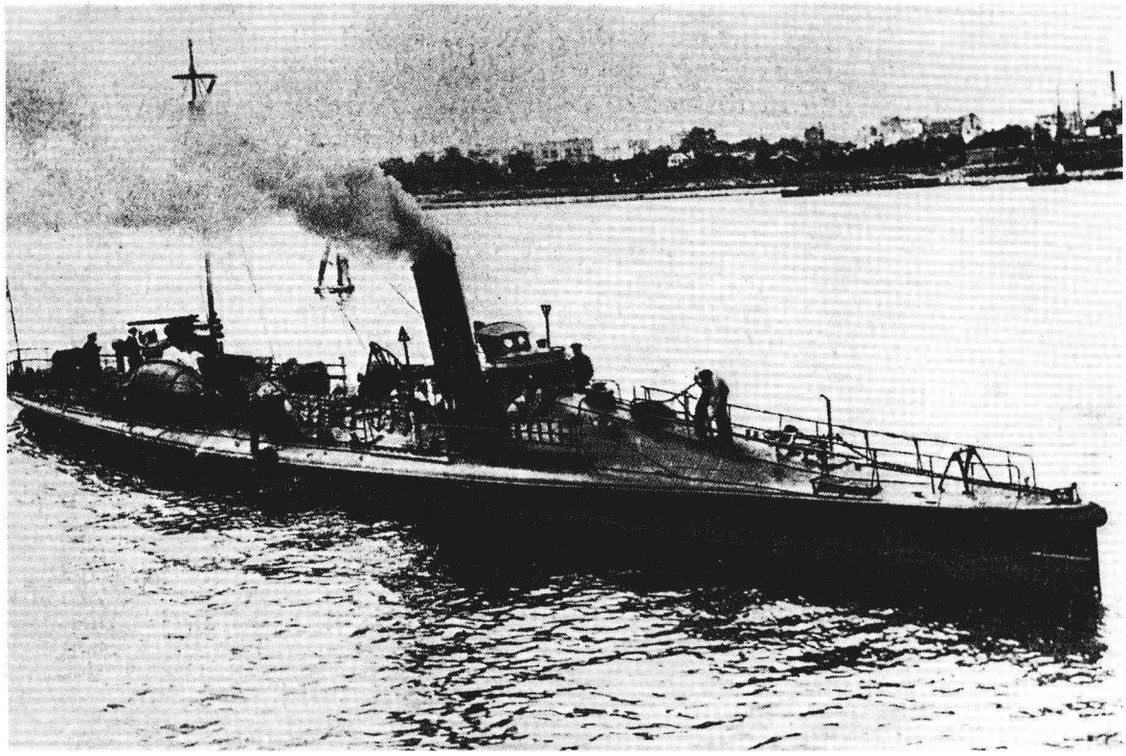


Photo 3: German torpedo boat *Schütze*.

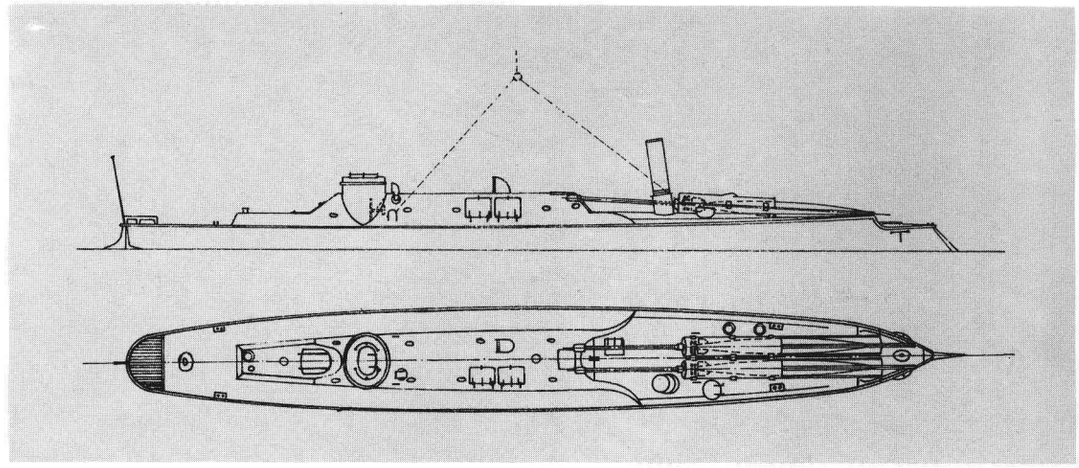


Fig 2: Thornycroft 65′ torpedo boat (1883): L 19·20 m, B 2·25 m, Disp 12·89 tons, 1–170 ind hp piston steam engine, 15–17·3 knots, 2–bow torp tubes 35·6 cms.

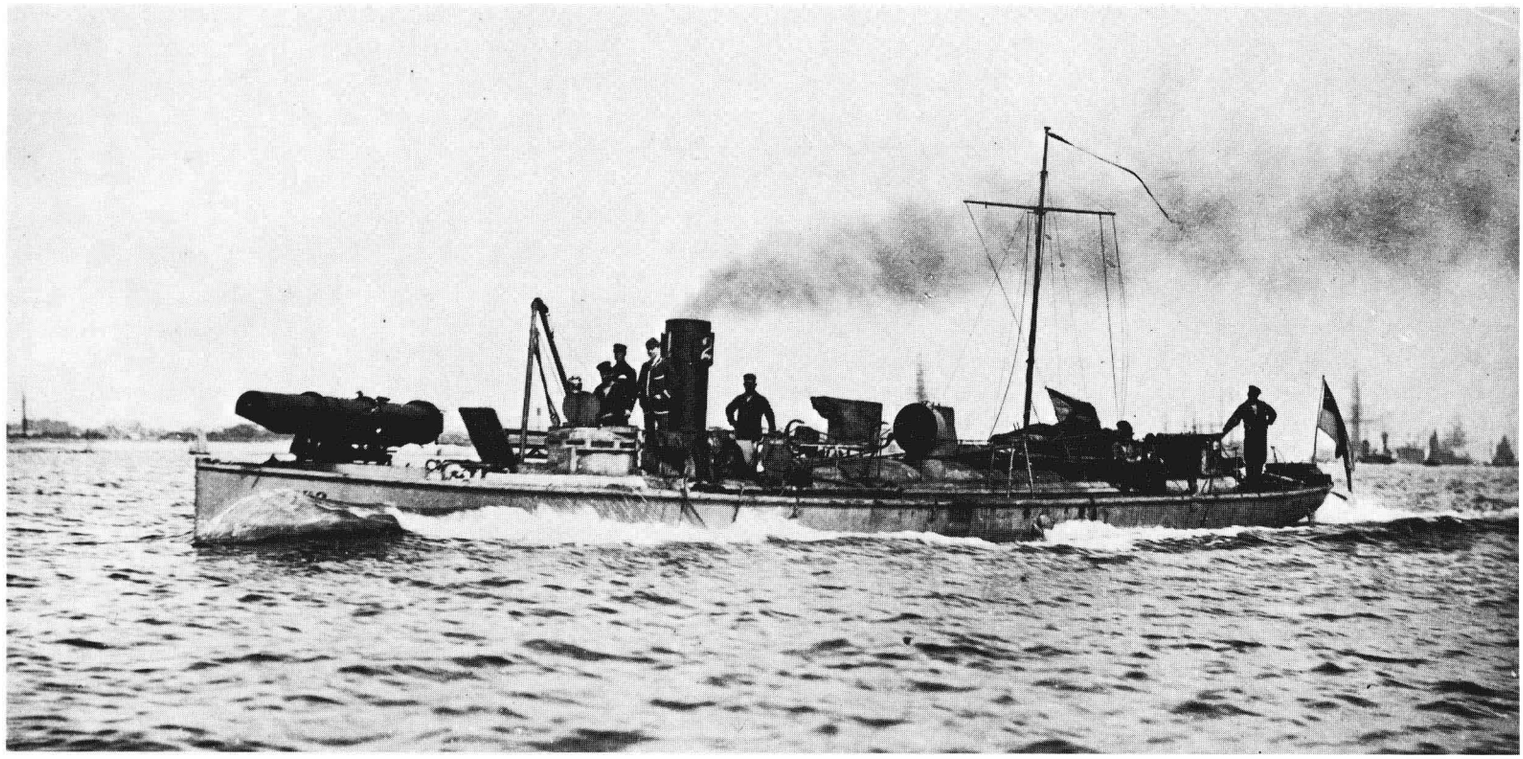
displacement comprised: hull weight with equipment 5·16 tons, machinery 5·36 tons, bow torpedo tube equipment 0·80 tons, fuel 1·0 tons, crew 0·57 tons. Fuel consumption was 1500g. per hp. hour and the specific power to weight ratio of the machinery was 31·5kg per hp.[2]

A year later, on 1 August 1884, the German navy took delivery of a similar boat from Thornycroft's, the *TH.1* later renumbered No.4: 19·2m. × 2·44m. × 0·46m., 13·0 tons designed displacement, 14·5 tons operational displacement, with a 9at. locomotive boiler supplying one vertical 2-cylinder double expansion engine of 120 indicated hp. driving a propeller of 1·42m. diameter for a speed of 14·0 knots, 0·4 tons of fuel, a crew of 6 and two 35cm. bow torpedo tubes[3].

All these vessels were straightforward heavy displacement ships with round bilges, but as early as 1872 an Englishman, the Rev. C. Ramus, had approached the Admiralty with proposals for a 'stepped' ship, and the granting of a patent even earlier proves that the principle of planing without a step had been established in England[4].

As Ramus' proposals concerned a 2500 ton planing vessel which still to-day seems rather impracticable they were rejected as unrealistic by William Froude, the well-known expert on resistance who was commissioned to look into them. He was the first to test models in tanks.

Photo 4: British *torpedo boat No. 2*, 1886.



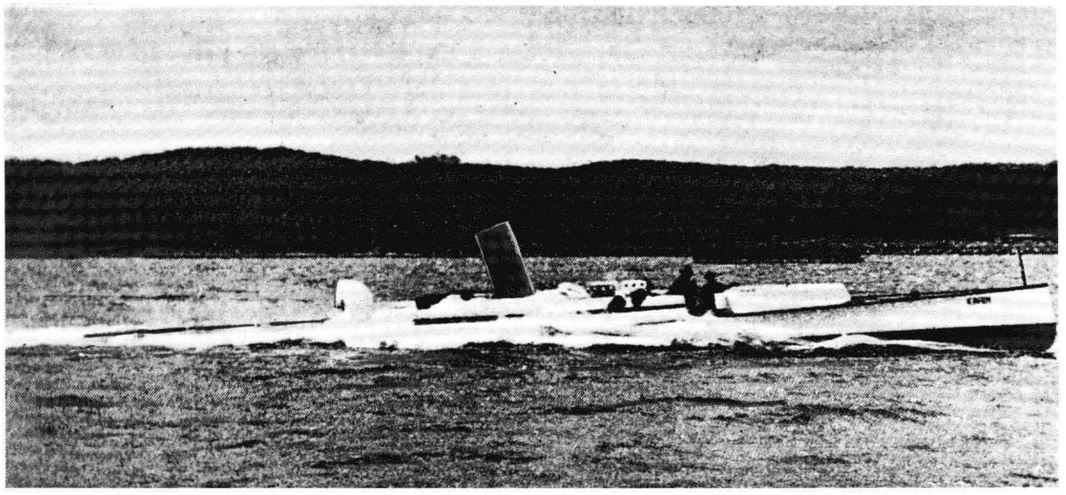


Photo 5: 25 knot steamboat *Karin*, 1904.

The development of the piston steam engine as the motive power of small high-speed boats reached its culmination in the *Karin* built in 1904 by the Schichau yard at Elbing (photo 5). She resulted from a remark by Prince Henry to Privy Councillor Ziese, the owner of this world-famous firm of torpedo boat builders when he referred to the rapid development of the Daimler motor boats. Ziese answered 'Your highness, if he can, so can we!' Professor Krainer was asked to design the engine, 246mm. high pressure, 400mm. intermediate pressure and 610mm. low pressure, actual weight 10,209kgs. The engine ahcieved 582 indicated hp. on the test bench, that is a power to weight ratio of 17·5kgs. per hp!

This fully-decked steel boat was 24·7 metres in length, 3·0m. designed waterline beam and 0·7m. draft. She was extremely lightly built displacing 18 tons, and achieved 25·5 knots at 510rpm and 560 indicated hp. driven by a three-bladed propeller of 1·2 metres diameter and 1·93 metres pitch.[5]

Charles A. Parsons in England now pointed the way ahead for further development of propulsion machinery for high speed vessels[6 7]. In 1892 he built the first large steam turbine which developed 200hp. at 4800rpm, and two years later completed the *Turbinia*, the first experimental turbine boat (Fig. 3 and photo 6).

Direct transmission of the high revolutions of the turbine caused difficulties so first deliberations concerned the provision of a suitable propeller. At first *Turbinia's* outward flow radial turbine drove only one shaft fitted with three triple-bladed propellers of 785mm. diameter and 523-575-627 pitch. at 1780rpm. she made 18·75 knots with a slip of 37·5%. Parsons solved the crucial transmission problem by giving her three shafts driven by separate direct-coupled turbines. The three turbines were connected in series and thereby, without increasing the boat's length, a greater number of stages was obtained, as well as a reduction in revolutions. The three sets of propellers meant a greater total propeller area in spite of the necessity for smaller diameter screws. In 1896 the *Turbinia* reached 32 knots, and even touched 34 knots for a short time.

The turbine, then, might have been expected to replace the classic piston steam engine as the power unit for small high-speed vessels. The advantages of lack of vibration, less weight for the same output, and more freedom in the engine room lay-out were offset by even higher fuel consumption, particularly at partial load. Nevertheless by 1898 the Royal Navy had ordered the 12,000 indicated hp. quadruple shaft turbine destroyers *Viper*, *Velox* and *Cobra*. These 344–462 ton vessels achieved 37·118, 33·64 and 35·6 knots respectively, speeds which are still worthy of note in fighting vessels built today[8,9].

While the turbine continued to be developed as a power unit for destroyers which were rapidly increasing in size, the newly invented internal combustion engine became increasingly important in the smaller high-speed craft field. Some really interesting attempts to further the development of steam power through the use of flash boilers and steam engines for small boats soon faded out, but the turbine engine, in the shape of the gas turbine, is today gaining in importance in small boat building.

In 1883 boats first used kerosene and heavier petroleum fuels with hot bulb ignition, and Gottlieb Daimler was working on the first internal combustion engine.

A 6-metre boat with a 2hp Daimler engine achieved 5·5 knots in Frankfurt in 1886 [10].

In 1887 Escher Wyss built the first planing boat in Zurich. Designed by the Frenchman Pittet *Le Rapide* was 23·5 metres overall, 3·9m beam and displaced 47 tons with 400hp output. On trials she lifted 0·3 metres but did not really plane properly because she weighed too much in relation to the engine output.

In 1888 the Naphtha-fuelled boat was developed in the USA. For a long time the Naphtha-fuelled engine was an interesting half-way stage between carburettor engines and steam power. Dangerous and somewhat intricate, like a steam engine it could stand overloading well and was reversible.

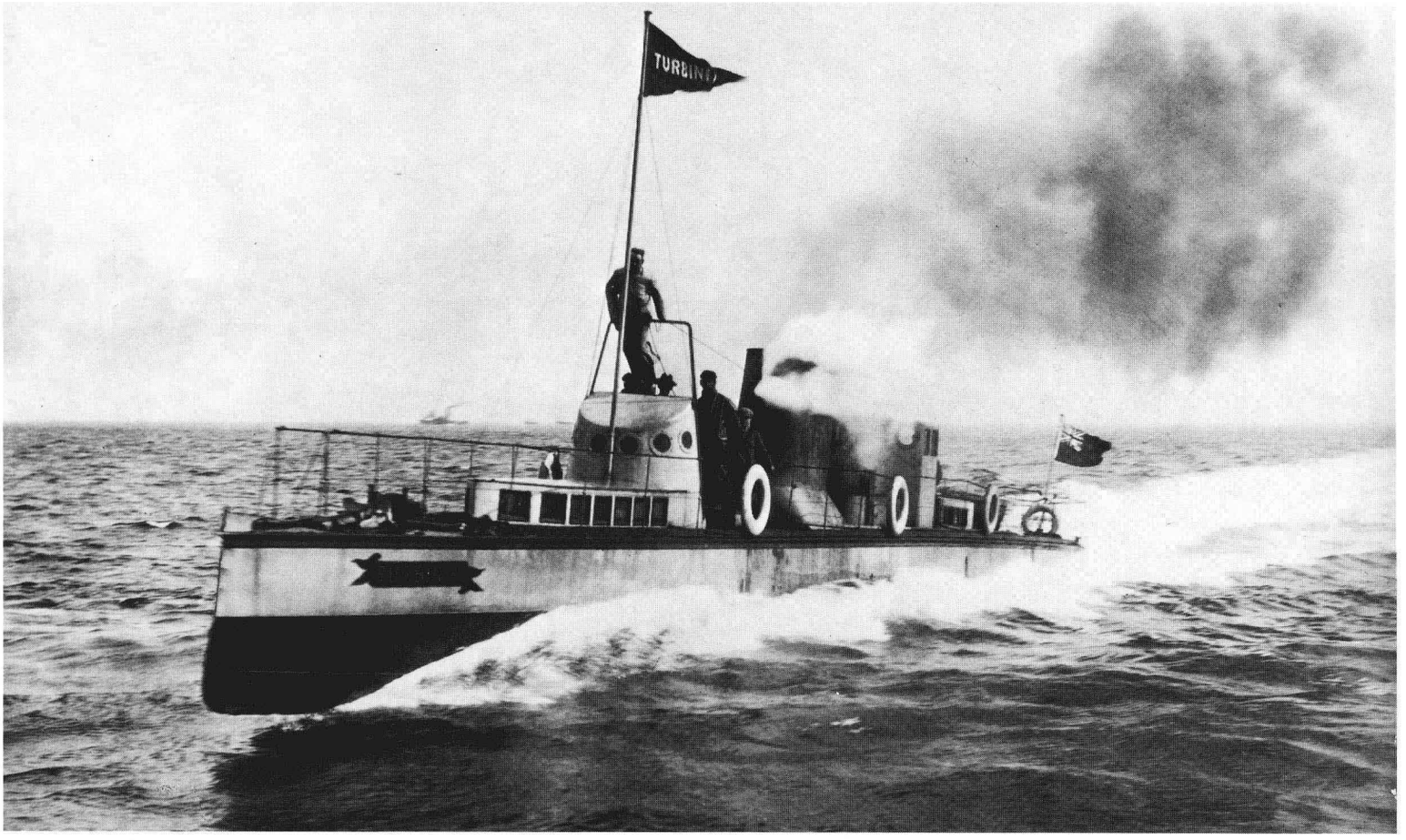
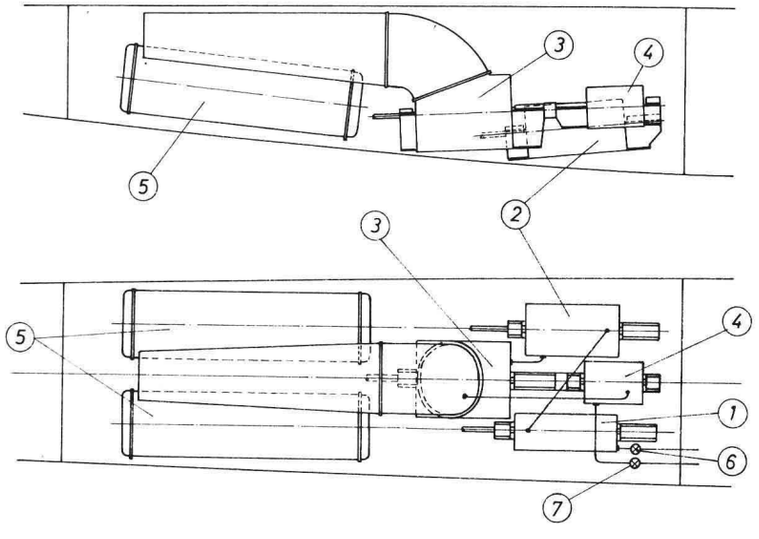


Photo 6: Parson's 32 knot steamboat *Turbinia*, 1896.



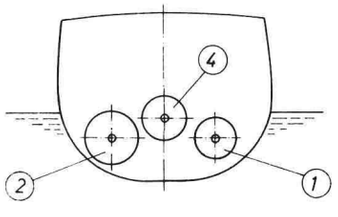


Fig 3: Power installation of *Turbinia*, 1896 version:
1 high pressure turbine
2 intermediate pressure turbine
3 low pressure turbine
4 astern turbine
5 condensers
6 main manoeuvring valve
7 astern manoeuvring valve

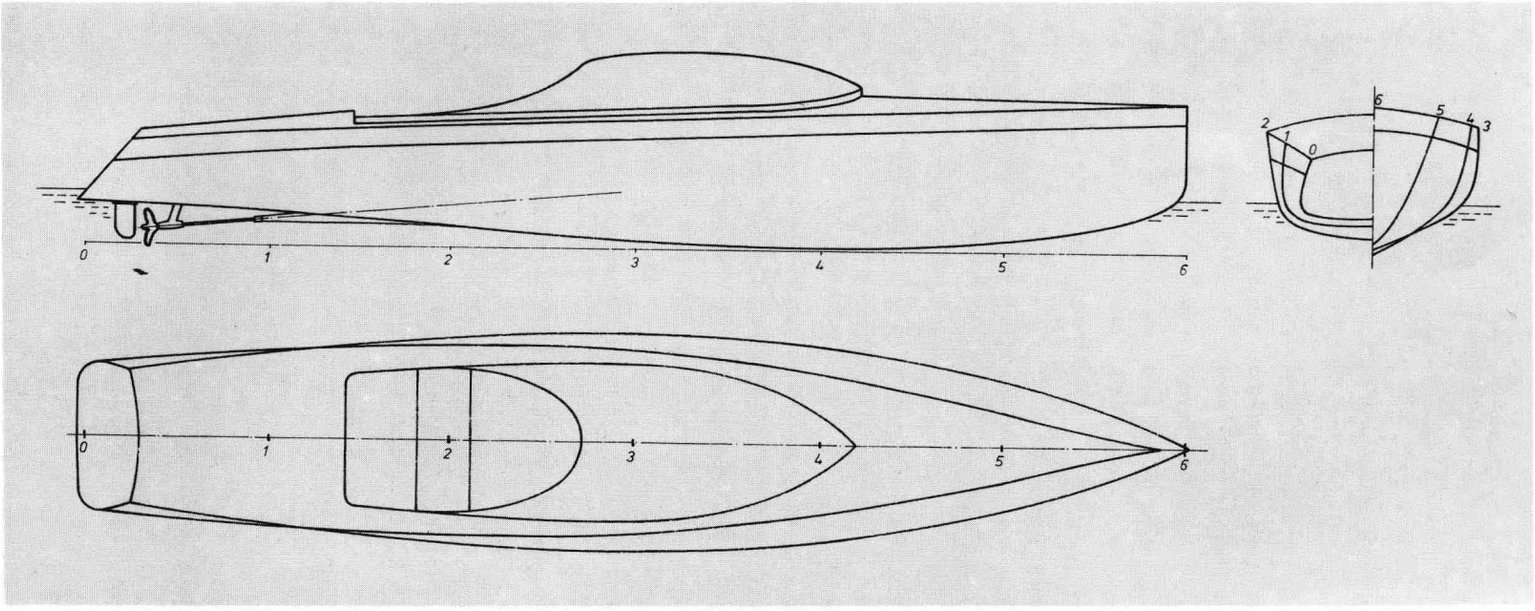
In 1896 a further British patent was granted for a hull design which clearly had the features of a planing boat, curved smoothly from bow to stern, broken by a step amidships with a transom stern.

In 1898 Naphtha boats won the international motor boat races in Paris, and two years later a petrol-engined boat won.

In 1902 the sport of motor boating was reorganised and associations formed: the Marine Motor Association in Britain, the American Power Boat Association and the Automobile Club de France, were followed by the German Deutsche Automobilclub. The first International Boat Exhibition was held in Germany in Berlin-Wannsee[11]. The most notable boats exhibited were a 1·3 ton, heavy displacement 44hp Daimler-engined boat which made a good 18 knots, and Count Zeppelin's air propeller driven boat which reached 7·5 knots powered by a 12hp engine.

In 1903 the Englishman Harmsworth founded the British International Trophy and presented a challenge cup for racing boats which was competed for over several decades. It was won at Monaco by the British displacement boat *Napier I*, 65hp 18·9 knots.

The Frenchman Campet built the first planing boat which really did plane in 1905, and wrote to the young engineer



Techel, later one of the pioneers of German U-boats: 'if larger motor boats are built successfully which perform well, the use of high-speed motor boats as coastal torpedo boats will also be possible.'[12]

Between 1905 and 1909 Otto Lürssen built and tested the round-bilged racing cruiser *Donnerwetter* (Fig.4: 8·0m. × 1·5m. × 0·9m., 4-cylinder 20hp Daimler engine, 16·5 knots). Lürssen and his brother-in-law Karl Vertens built their own tank in order to carry out tests. In 1908 they competed in the Bodensee races. Later further tests were made in open waters with models towed by the *Donnerwetter*.

The German Motor-Yacht-Verband was formed in 1907 and the leading motor yacht clubs of Germany, England, France, Holland and Sweden formed an international union. Rules and formulae were laid down, but were naturally altered periodically in the course of time. The USA won the Harmsworth Cup in Monaco with *Dixie II*. She was so lightly built that she leaked badly, and the water taken through her hull while she raced had to be sucked out by an automatic siphon[13].

In 1908 the Frenchman Tellier built the first stepped planing boat *Rapière III*, 120hp. 31·3 knots.

In 1910 *Daimler II* designed by Vertens and built by Lürssen won the Lanz prize on the Bodensee, powered by a Daimler engine[14]. In the same year *Miranda IV*, developed and built by Thornycroft's, a single stepped planing racing boat (7·9m. × 1·8m. 1·27 tons, 120hp. Thornycroft engine) carried out trials on the Thames. She achieved about 35 knots and had considerable influence on the later World War I fast fighting boats.

In 1911 the German boat *Lürssen-Daimler* (ex *Daimler II*), photo 7, won both the Championship of the Seas in Monaco and the Prix des Nations. The Harmsworth Cup was successfully defended by the American *Dixie IV* (400hp., 38·8 knots)

In 1912 the Harmsworth Cup went to the British 12-metre five-stepped 750hp. planing boat *Maple Leaf IV* and she successfully defended the Cup at 33·1 knots the following year. After the First World War the Cup went to the USA, where it remained [10,13,14,15,16,17].

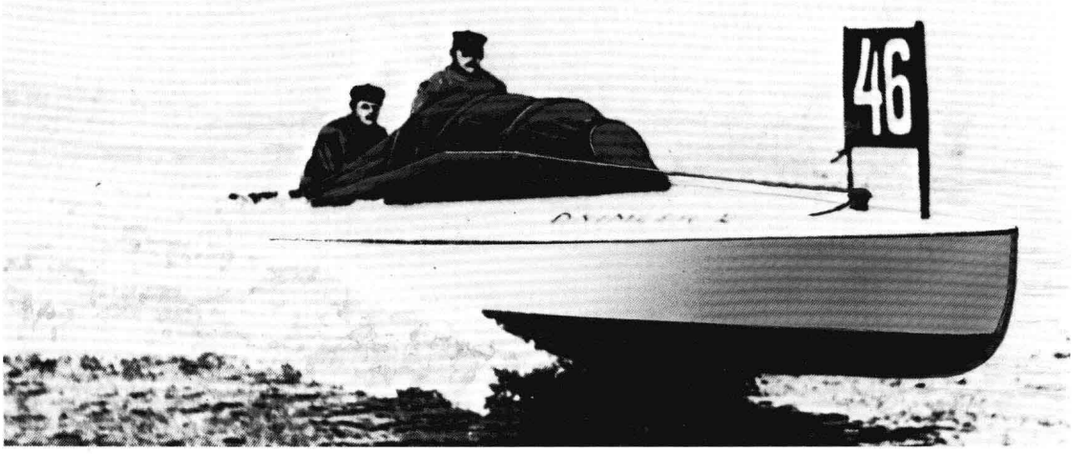


Fig 4: (*top*) Lürssen racing boat *Donnerwetter*, 1905.

Photo 7: German racing motor boat *Lürssen-Daimler*, 1911.