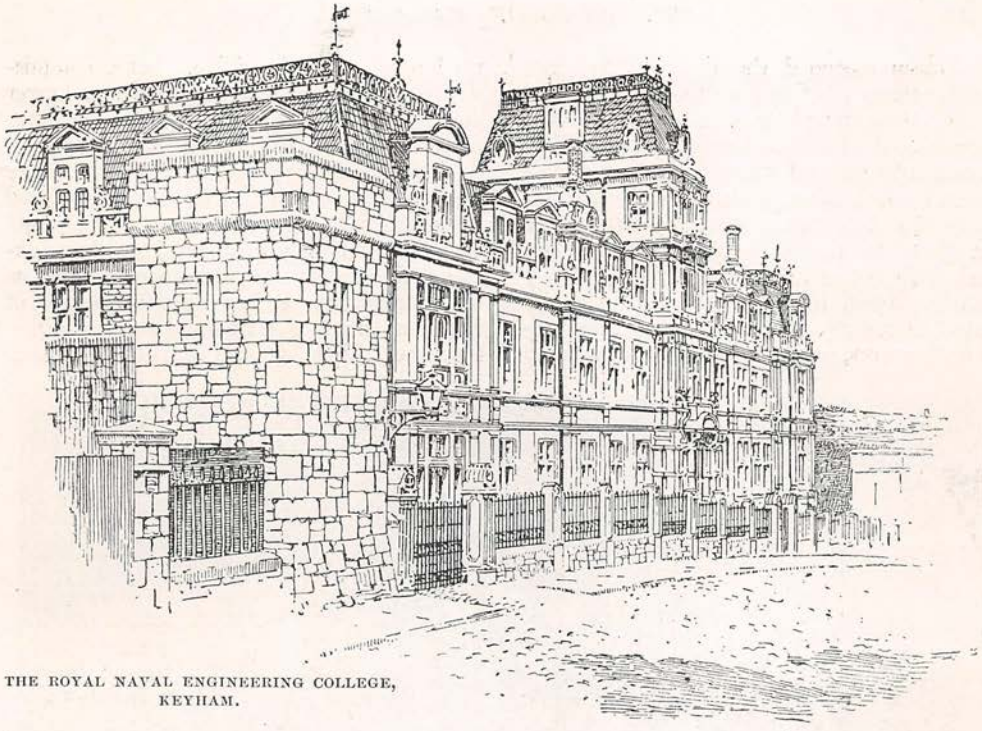


THE ROYAL NAVAL ENGINEERING COLLEGE, KEYHAM.

NAVAL ENGINEERS AND THEIR TRAINING.

By Archibald S. Hurd.

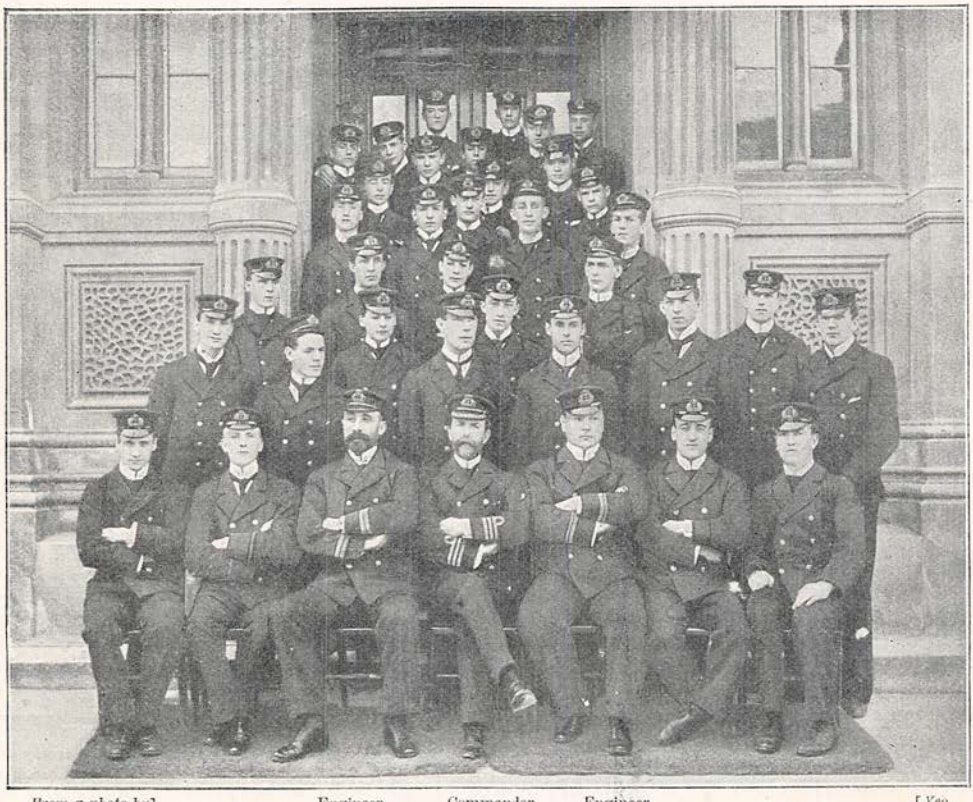
THE year in which the Queen came to the throne was also the year of the birth of our Royal Steam Navy. Since the glorious day when Nelson reasserted at Trafalgar the British supremacy on the seas and laid down his life for his country in the hour of his greatest triumph, to 1837, there were few changes in the types of ships that composed the fleet. But in 1837 a great change began to be foreshadowed, and gradually steam superseded sail, although it was not until after the terrible carnage of the Crimea that the doom of sails was officially pronounced. In 1859 the Admiralty were forced to declare that "sailing ships are unfit for active service," and within a few months another great change occurred when the construction of iron vessels, armour-plated, was commenced. The first of these, the *Warrior*, an ironclad of 9210 tons, which was launched in 1860, remains to this day in Portsmouth harbour, a monument to the enduring character of British shipbuilding and an interesting link to the Navy of Nelson's day, so appropriately represented by the great admiral's famous flagship the *Victory*, which is moored near by. Thus passed away the wooden walls of old England, with their picturesque spreads of canvas bellying to every breath of wind, but not the "hearts of oak" of our men; they are the same to-day as of yore; the ships only have changed from walls of wood to walls of steel.

Year in and year out iron or steel ships have been built, each one an improvement on its predecessor, until to-day we have the *Magnificent* and *Powerful* as the highest type of battleship and cruiser, vessels of gigantic size, which are unrivalled in all the world.

This is the Diamond Jubilee year of the steam war-vessel and of its master the naval engineer, an officer of whom the British taxpayer hears little, but who is the very mainspring of the Navy, and works unceasingly in the bowels of our warships, out of view and often out of mind. This arm of the naval service dates from the time when

the Queen ascended the throne. At first, and for many years, anyone was good enough to look after the engines, and the engineers were treated with little consideration. They were merely granted warrants instead of the Queen's commission, which is conferred on every executive officer from the admiral of the fleet to the sublieutenant, and they ranked with other subordinate officers. They were regarded, in fact, as equal in social status to railway engine-drivers. The progress, however, of steam-power as applied to warfare—which is one of the romances of the Queen's reign—gradually forced home the truth that men of education were required to control the engines of the great leviathan warships and to discipline the stokers and engine-room artificers. Latterly the position of the naval engineer has been improving, and to-day he is officially recognised, step by step in the ladder of promotion, as the equal in rank of the naval lieutenant and captain, with whom he lives and messes. The naval engineer is, in fact, no longer an engine-driver, but a commissioned officer who has undergone a longer and more thorough training than any other officer in her Majesty's services.

The training is none too long. The duties of naval engineers are of the most varied and responsible character. On a modern vessel they have not only to superintend the working of the boilers—of which such a vessel as the *Powerful* has no less than forty-eight, of the new tubulous type—and the propelling machinery, but all the auxiliary engines, which in some ships number as many as a hundred and twenty, and do many of the duties that were formerly performed by hand.



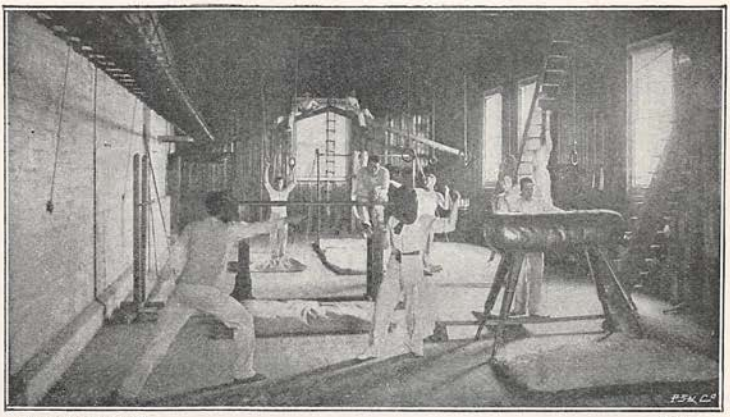
From a photo by] Engineer J. Richardson. Commander A. B. G. Grenfell. Engineer E. H. Ellis. [*Yeo.*

THE NAVAL STAFF AND FOURTH-YEAR STUDENTS.

About a third of the ship's company of such vessels as the *Magnificent* and the *Powerful* consists of stokers and engine-room artificers, and therefore non-combatants, while in a torpedo-boat destroyer the proportion is a half. The engineer officers, under whom all these men are placed, and on whom the responsibility for these hundred-and-one

mechanical operations rests, need to be men of decision and education and resource, who have had a thorough training, not merely in the mysteries of the steam engine, but in ship construction, electricity, torpedo discharging and many other cognate matters.

At the Royal Naval Engineering College at Devonport, the training for this branch of naval service is carried on. This establishment abuts on Keyham Dockyard, or "steam factory," as it is usually termed, to distinguish it from the dockyard proper which adjoins it. Though the college was erected as recently as 1880, the closing of a similar college at Portsmouth has made an extension necessary, and for many months past a new wing has been in course of erection at a cost of £30,000. This new building will be completed shortly, and it is hoped the Duke of York, himself a naval officer, will declare the building open.

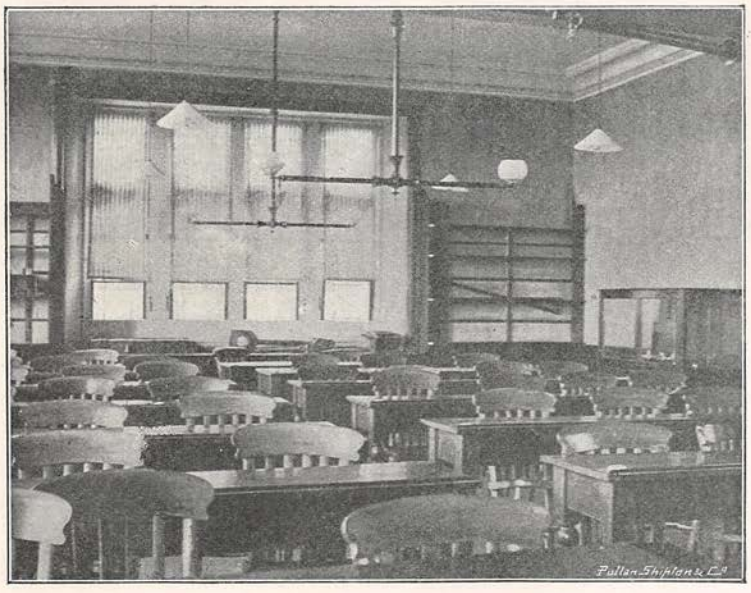


From a photo by] [*Yeo.*

THE GYMNASIUM.

This college is no place for any young fellow who is afraid of downright hard manual labour and who has not quick wits. But for such as come up to the standard, are thoroughly sound in wind and limb, and can truthfully say that they are from fourteen to seventeen years old, the training at the college presents no horrors.

Once through the ordeal of the entrance examination, the front door of the college at Keyham is open to the student, and he dons the short round jacket of blue serge and the peaked cap, which every West-countryman knows to be the outward and visible signs of a naval engineer student.



THE NORTH CLASS-ROOM.

The life of the inmate of the college during his five years' training spells work—good, honest, horny-handed labour, part of it. Of course his mental faculties are not allowed to go unexercised. Professor Worthington and his staff provide food for reflection in the study of advanced chemistry, physics and mathematics.

This instruction and the yearly examinations do not appear to cast any shadow over the lives of the students. A healthier, happier, better developed crowd of young fellows it would be

difficult to find; but a look in their faces when they are at the practical part of their training shows that they appreciate manual work better than the thirteen odd hours every week of confinement to the class-room. This scientific and mathematical instruction is, however, the ground-work upon which the engineering staff build during the thirty-three hours every week that the students are in their charge, learning all that is to be learnt about engines and boilers.

Passing along one of the college corridors, down a winding and narrow stone staircase, one is in Keyham Dockyard, a busy hive of industry where two thousand skilled mechanics are continually engaged in war-like tasks. This dockyard covers an area of seventy-five acres, and is now being extended, or rather doubled in size, at a cost of £3,000,000. This is where war-vessels are fitted out for service, and as one wanders from shop to shop ranged round the basins, where ships of war are being prepared for action, some idea is gained of the labour which the maintenance of a great navy entails. And wherever one goes there are to be seen groups of students. Here they are designing engines; there is a cluster with chisel and mallet or plane, fashioning, in teak or mahogany, the model from which some part of a ship's engines may be cast; in another shop a group is ranged round a mould, preparing it with infinite care for the reception of the glowing brass or iron; and in the blacksmith's shop are forges set apart for the students, who are busy hammering some huge piece of white-hot metal into shape. Indeed, into whatever part of the yard one goes, there is the engineer student in working "rig," as much occupied as any workman whose bread and cheese and that of his wife and family depend on his labours.

The place where students do most congregate is, however, a large fitting shop specially set apart for their training, and provided with the latest types of machinery for fashioning engines. It is a large and lofty building, where the whirling noise of many machines makes a variety of music as the foreman and his assistants who are in charge of the college working party move

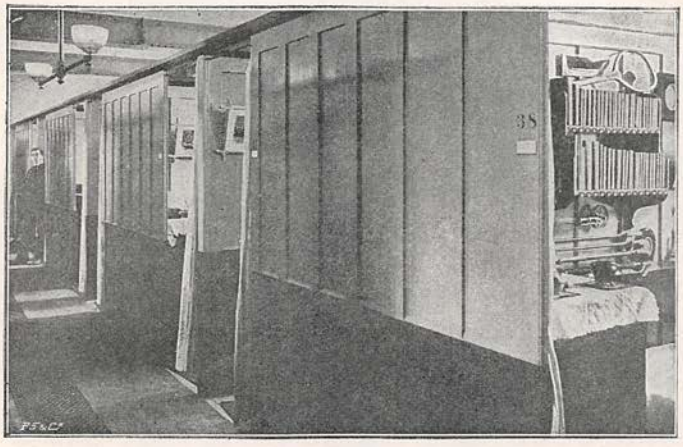
From a photo by] [*Yeo.*

THE FITTING SHOP.

from one student to another giving practical hints and instruction.

It is quite a mistake to suppose that these young "lions" of the great building which overshadows this dockyard merely play with tools. When they first join they are, of course, of little use, and the best that can be done is to give them a lump of metal and a cold chisel and let them learn by painful experience of many cuts and bruises how to use their hands deftly and accurately. But they soon pass this elementary stage, and then real honest work commences. Recently a party of students has been engaged in making the auxiliary machinery required for the new twenty-knot cruiser *Proserpine*, which is being built at Sheerness. This

machinery will depend for steam upon eight Thornycroft tubulous boilers, which have been constructed in a neighbouring shop. The tubulous type of steam generator, which has been tested with such conspicuous success, is the marine boiler of the future. It consists of a number of steel tubes, of an inch or more in diameter, which drop down into the fire so that the flames play round them in all their fierceness, thus heating the water much quicker than in the older kind of boiler, where the fire had to reach the water as well as it could, and the heating-surface was less. The *Proserpine* will be a small vessel, having about a seventh of the displacement of the *Powerful*, and therefore requiring less steam; but the eight boilers consist of no less than fifteen miles of steel tubes, almost sufficient to connect Dover with Calais. Other students go off to ships in Devonport harbour with working parties when repairs are needed. In fact they are such good workmen that their labour, and the annual sums paid by their parents, render Keyham College an almost self-supporting training institution. This is a unique distinction.



STUDENTS' CUBICLES.

Mental and manual labour occupy forty-six hours in the week, almost equal to the eight hours a day of the dockyard workmen.

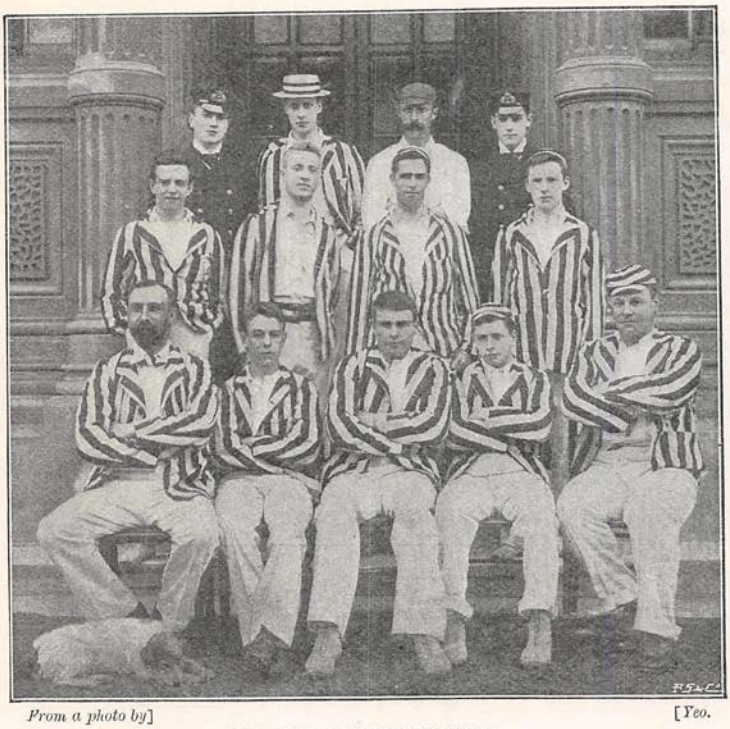
As he is a hard worker, so is the student a good player at athletic sports—at football, at cricket, at boating, and even at billiards, for there are two tables. The naval authorities recognise that "all work and no play makes Jack a dull boy," and £300 is allowed every year to defray the expenses of the recreations—to keep the thirteen rowing-boats in order, to replenish the college library with books, and to generally support all forms of healthy amusement, and to maintain the large recreation-ground. There is an excellently fitted gymnasium, and so much importance is attached to muscular development that each student is required to be a good gymnast, as well as to be able to pull a boat with ease and precision, and to swim. This last and very necessary accomplishment has only been insisted upon comparatively recently. To this day there are seamen and stokers in the British fleet who are unable to swim, although they know that at any moment, in the discharge of their duties afloat, the lack of a knowledge of this simple art may result in their death. The Admiralty are determined to remedy this defect, and every officer and man in the Navy will, in future, have to show that he is a good swimmer.

The naval engineer has nothing to do with the military side of the service, but until quite recently every student had to know how to use the cutlass and rifle; and when the new wing of the college is opened it is probable that these engineer neophytes will again be allowed to indulge in this form of recreation and instruction combined.

A student's career is not a five years' frolic; it is not, on the other hand, five years of unrelieved drudgery, as a glance at the reading-rooms, with their pianos, and the smoking-rooms show. Moreover, besides the ordinary recreations, parties are allowed to go up any of the beautiful rivers for which the West country is famed and camp out on the banks, freed from all rigid restraint, and a photographic club—some of whose work illustrates this article—takes excursions in search of suitable "subjects" for the camera.

The life in the college approximates very closely to that of a public school, but the college is "commanded" by a naval officer, Commander Algernon B. G. Grenfell. The students are divided into two sections, seniors and juniors, the former being those who have been three years or more at the college, and are permitted to affect, as full-dress uniform, a long frock-coat like that of an admiral, only not so gorgeous in its adornments, in place of the short jacket. The students are

further subdivided into divisions, with a captain—himself a senior—to every twenty, while over the captains is a kind of despotic ruler, who is the head student of all the college, and who enjoys the privilege of staying out every night—if he desires to assert his freedom—until within three-quarters of an hour from midnight. The other captains can only indulge in this licence twice a month. There are other privileges attaching to the position of chief captain, among which may be included the use of a cubicle with little or no ventilation; whereas the partition of an ordinary student's cubicle stops short of the ceiling to admit of the passage of air.



From a photo by] [*Yeo.*

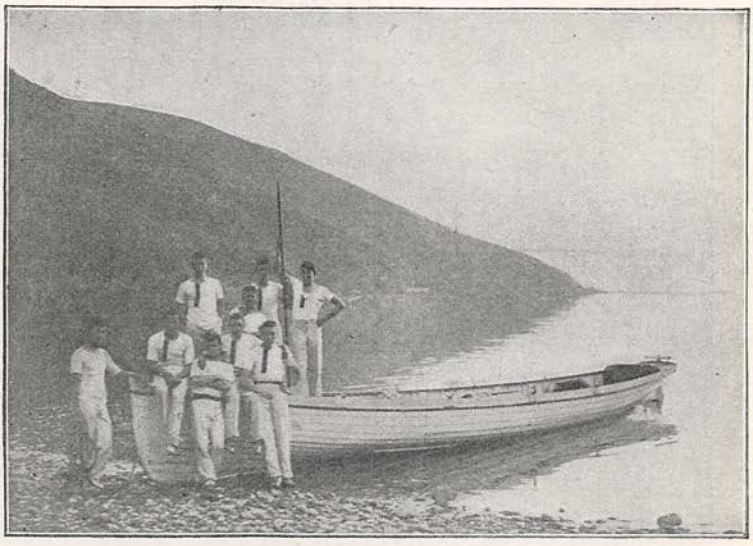
THE COLLEGE CRICKET TEAM.

At the end of five years comes the final test examination, when the student is harassed with alarming questions in mathematics, mensuration, statics, hydrostatics, graphical statics, pneumatics, dynamics, mechanism, machinery, heat, light, electricity, magnetism, combustion, practical engineering, mechanical drawing, workshop appliances and practice, steam, and other subjects too tedious to enumerate, besides a number which are optional. On this examination depends a student's place as a probationary assistant engineer, when his name first figures in the official Navy List as one of the officers of her Majesty's Navy, and to this extent his whole future is affected. If he obtain sixty per cent. of the highest possible number of marks the doors of the Royal Naval College at Greenwich are open to him, and he may undergo a further course of training, which brings increased pay. Promotion being by seniority, the last test of the college often makes or mars a career; indeed students who fail to obtain thirty per cent. of the maximum marks cannot enter the Navy, and if, after another year, having meanwhile lost thirty or forty places on the Navy List, a student is still unsuccessful, then his case is hopeless, and he has to turn to some other career. Such an experience is not unusual, for the final examination is not by any means merely a formal test. Nor is this the last examination; nor is the training completed.

When a student turns his back on the college, even if he does not go to Greenwich, he has to devote three or four months at Portsmouth to perfecting his knowledge of torpedoes, hydraulics, and electric light, and during the whole of his career he must be on the alert to study new types of boilers and machinery which are introduced into the service. He is always learning from the day when he enters the college fresh from school until nineteen or twenty years later, when he blossoms forth, if all goes well with him, as a chief engineer, ranking with, but after, naval lieutenants of eight years' service, and with full pay at the rate of £255 a year, in addition to 2*s.* 6*d.* to 5*s.* a day if he has the good fortune to be serving on a ship flying an admiral's flag. Such an officer has every hope of reaching the head of the service, with pay at the rate of £730 a year, and a retiring allowance, when sixty years old, of £500 a year.

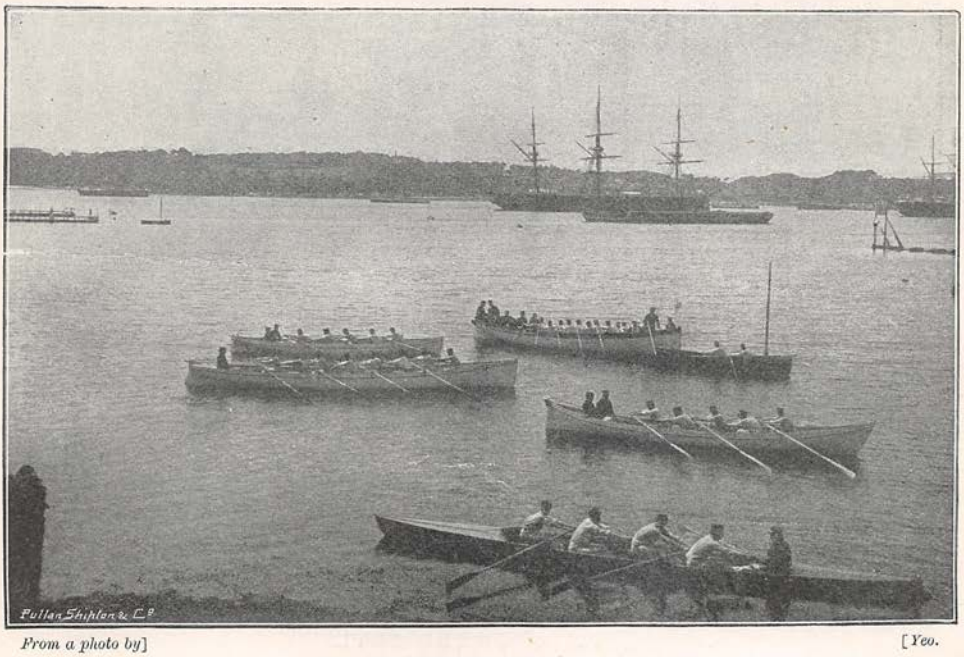
One interesting point in connection with

this engineering branch of the Navy is its democratic character. Though the engineer is the social equal of the executive officer, it is not a "close" profession. Shipwright apprentices in the dockyard—sons of shipwrights in many cases—who show exceptional ability are given a college course by the Admiralty. By this door several of the best engineers of the Navy have risen from the position of workman to that of officer, and undoubtedly the Navy has gained immeasurably.



BOATING ON THE YEALM.

Some students are selected by the Admiralty to train for the Royal Corps of Naval Constructors. There is no better illustration of the prospects of the constructive department of the Navy than Sir W. H. White, LL.D., F.R.S., the present Director of Naval Construction, who, by sheer merit and hard work, has raised himself from a dockyard apprentice to a position of great responsibility, with a correspondingly great reward.



From a photo by] [*Yeo.*

COLLEGE BOATS ON THE HAMOAZE.