Illustrated Interviews.

No. LV.—SIR WILLIAM H. WHITE, K.C.B., Etc.

By William G. FitzGerald.

TO say that Sir William White holds the most responsible position in the whole Empire is not an extravagant statement. He designs the battleships of Britain, which is to say that he is virtually the paramount arbiter of fashion in warships for the entire world—literally, from China to Peru.

Sir William White does not actually live in London. Residence in the sturdy North of England has rendered the Metropolis almost intolerable to him. Thus it was at his quiet home on Putney Hill that I saw him.

June, 1867, saw him appointed on the Staff at the Admiralty by Sir Edward Reed, then Chief Constructor of the Navy. Thus, at the age of twenty-two we find the young man in the position of confidential assistant to the Chief Constructor, after a brilliant scholastic record.

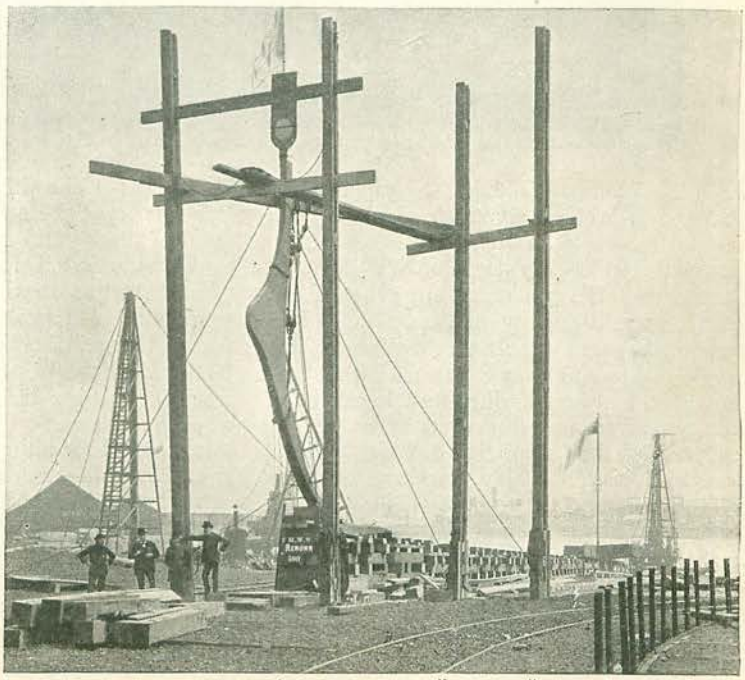
"Coming to the Admiralty in that way," remarked Sir William, "I passed from the scholastic part into the actual work of designing ships for the Navy." The loss of the *Captain*, the retirement of Sir Edward Reed, and the appointment of Sir Nathaniel Barnaby—these events passed in quick succession about this time.

It was in 1881 that Mr. White was appointed Chief Constructor, and the very next year he was approached by the great firm of Sir William Armstrong and Company, who offered him the position of chief naval constructor in connection with the new warship building yard which they were about to establish.

"I had a feeling," said Sir William, "that this was an opportunity which would enable me to show what I could do with a free hand; I therefore decided to accept this offer, and I told the Admiralty in January, 1883, that I was about to quit the public service and take up the proffered position at Elswick.

"When I went to Elswick," resumed this remarkable man, "the place where within two years we were building the ill-fated *Victoria* was just a mud-bank by the river-side. The water came in 12ft. deep at the very spot where the *Victoria* was afterwards completed. When I left Elswick to come back to the Admiralty, about two and a half years afterwards, we were employing 2,000 men there. Among many other ships, we had the *Victoria* well advanced on the stocks."

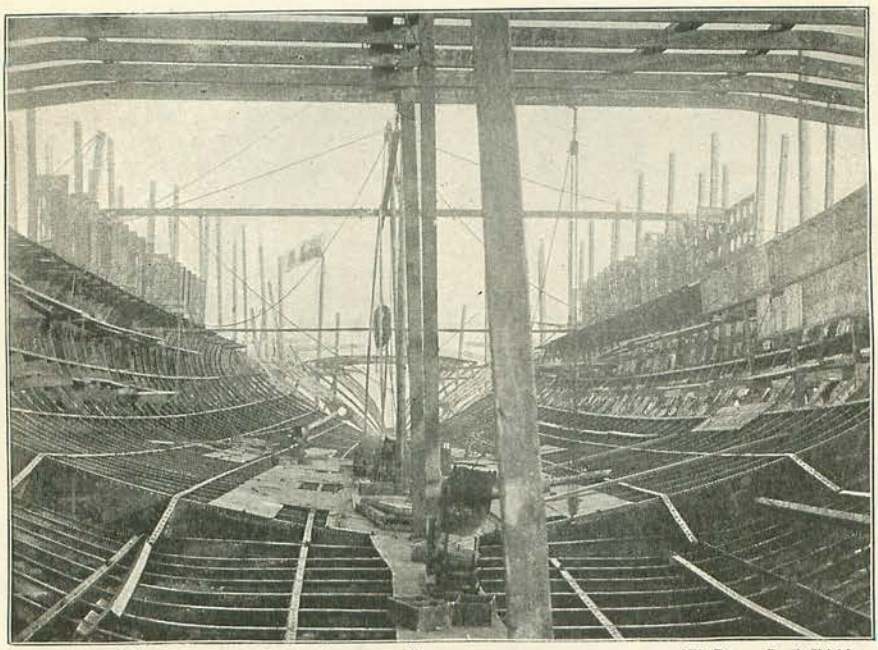
Talking of the *Victoria*, I am greatly indebted to Mr. Philip Watts, Sir William White's able successor at Elswick, for three exceedingly interesting photographs showing various stages in the building of that unfortunate warship. The first photograph shows the stem of the great vessel. It is necessary to mention, in view of the name-plate *Renown*, seen in the photograph, that the name of the vessel was changed at a very early stage in view of the fact that she was launched in the



ONE DAY'S WORK ON H.M.S. "VICTORIA."
From a Photo. by W. Parry, South Shields.

Jubilee year of 1887. In the photo. will also be seen the blocks laid for the keel of the vessel.

"The first photograph," writes Mr. Watts, "shows one solitary day's work on the keel and stem mould." It is, by the way, very unusual to take a photograph so early in the construction of a ship. The second photo. which Mr. Watts was kind enough to place at our disposal for reproduction is likewise very impressive. It shows the *Victoria* partially in frame, as she was



From a Photo. by] THE "VICTORIA" PARTIALLY IN FRAME. *[W. Parry, South Shields.*

when Sir William White left Elswick. This photograph will give you an excellent idea of what the skeleton interior of a battleship looks like in the early stages of building. At Portsmouth, Devonport, or any other of our great dockyards, many of these stupendous frameworks are to be seen on the slips, and the interior is turned into a perfect Babel with clatterings and hammerings, and hundreds of men swarming in all directions.

Naturally, the Admiralty did not want to lose the very valuable services of their brilliant young Constructor. Finding him resolute, however, they actually went out of their way to present him with a special letter of thanks for past services. In the two and a half years which Sir William spent at Armstrong's he designed and obtained orders for ships representing about £1,500,000. He built ships for Japan and China, Italy, Spain, and Austria. When he came away, he left enough work for two years. Armstrong's, as everybody knows, is a power in the civilized world, and as Sir William White had a good deal to do with the building up of its universal reputation, I put several questions to him respecting the establishment of the Warship Dockyard, at Elswick.

"At the very outset," replied Sir William, "there was in the middle of the river an island, with a farm upon it. This island was known as 'The Meadows.' Its removal formed part of the scheme for the improvement of the Tyne. In fact, deep water was to be substituted for that island. Now, exactly what to do with all the material was something of a problem. So we suggested that if, instead of taking the sand, etc., from 'The Meadows' out to sea, the authorities would only bring it to us at our wharf, we would take it and be glad of it. So we used this material for filling up the new line of the river front where our ship-building was to be carried on. This, of course, saved us a great deal of trouble and expense."

At this time, be it understood, no warships were built at the famous Elswick yard. Only armaments—guns, gun-mountings, etc., were made there.

"How long were you," I asked, "from the time you started removing the island until

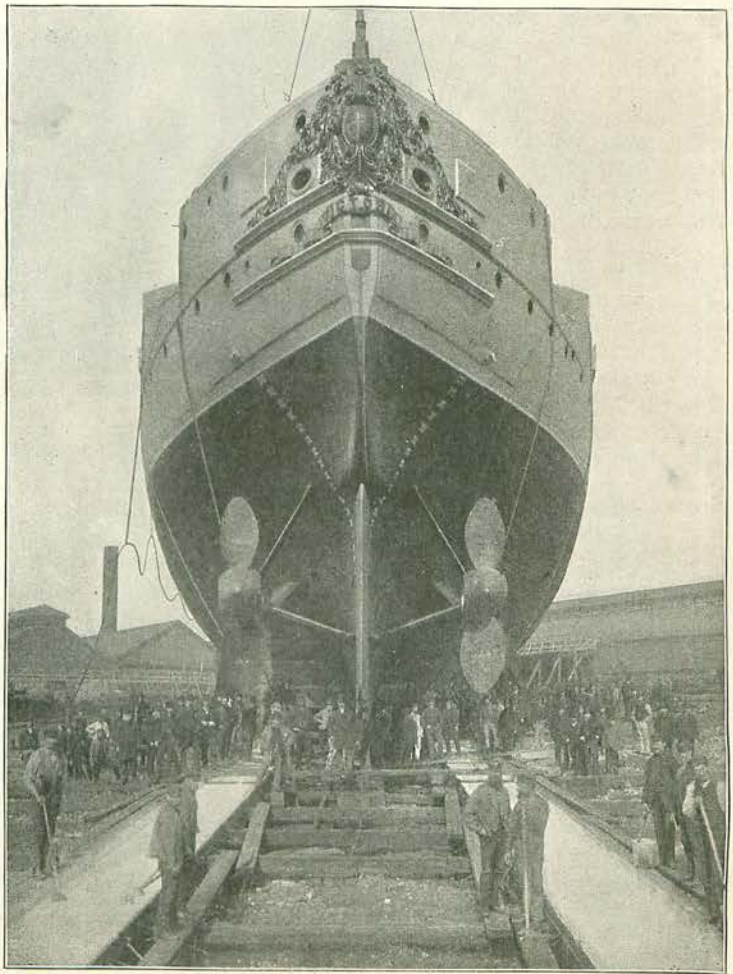
you were actually able to commence ship-building?"

"About eighteen months," was the reply; "and the first ship we built there was the *Panther*, a torpedo cruiser for the Austrian navy. We were building that ship at one end of the yard whilst the other end was still under water."

The next photograph to be reproduced here is a magnificently impressive view of the stern of H.M.S. *Victoria*. The photo. was taken just prior to the launch; and in the words of the French idiom, it "gives furiously to think." Launching-day is observed in a dockyard as more or less of a holiday; it was so on this occasion. Little, however, did the architects and engineers dream, when they surveyed their stupendous handiwork, that only a few years later the great battle-ship would go to the bottom with nearly all her officers and men, including the Commander-in-Chief, Sir George Tryon. The story of the ramming of the *Victoria* by the *Camperdown* is too fresh in the minds of the public to bear narration here. I may merely mention in passing that, after a great disaster of this kind, Sir William White is literally overwhelmed with notions as to prevention and salvage, from inventors of all grades.

"There seem to be quite a number of people," remarked Sir William, "who have plans for raising sunken ships, such as the *Sultan* or the *Victoria*. A great many of these inventors know nothing whatever about the subject; others understand the principle, perhaps, but do not realize the practical difficulties. I remember there was one man who came to me with an idea for raising sunken ships by blowing the water out of them with compressed air. He always carried with him a tin box with holes bored in it; also a flexible tube. He would place the box at the bottom of a tank and then blow through the tube. The pressure, of course, was sufficient to blow the water out of the box, and it would rush up to the surface. On this he would say, 'There you are; you've only got to do that with your ship.' Asked as to how he would *keep* the ship at the surface when it got there, he would reply 'that was our business.'

"There was," he remarked, "a man who used to spend many hours a day in Whitehall, in front of the Admiralty. He carried sandwich-boards on which were printed his grievances, and he used to distribute pamphlets which gave extra details. The Admiralty, he declared, had stolen his notions, particularly the idea of ram bows,



STERN VIEW OF THE "VICTORIA"—READY TO LAUNCH.
From a Photo. by W. Parry, South Shields.

which had been in use for at least fifteen years before the date of his so-called invention.

"Then, again, all sorts of proposals are made to us in connection with aerial navigation. People seem to think that the Admiralty deals with anything that floats, whether in the air, on the water, or under the water. They send us ideas for flying machines and other wonderful things intended to convey explosive charges over the enemy, whether on land or at sea."

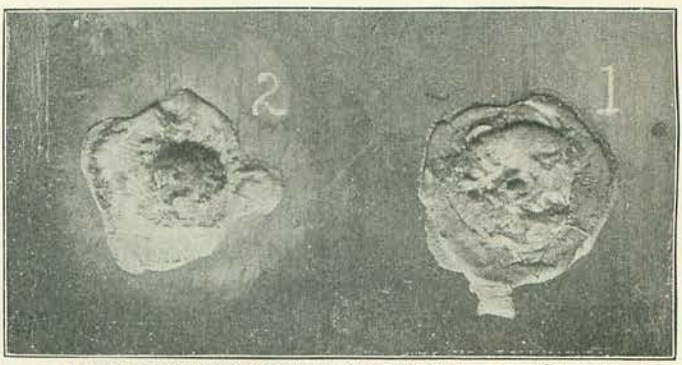
Once his devotion to his duty nearly cost him his life. It was the usual story of an enthusiastic inventor with any amount of faith in the offspring of his brain. In this particular instance that offspring took the form of a submarine boat. A lot of people went down in that boat, and when they had been down some little time it began to dawn upon them that they were never coming up again. The fact was that the boat, instead of going down nicely and gently, took a terrific header into the clay at the bottom of the dock; and after a frightfully anxious time, during which Sir William White and everybody else concerned had to man the pumps and work them furiously, the submarine "warship" came to the surface.

I asked Sir William whether other nations adopted our ideas in the construction of warships.

"It is a mutual thing, so to speak," he said; "we know what is happening all the world over, and our idea is to get the best, wherever it may come from. In the matter of water-tube boilers, for example, the French have undoubtedly shown the way. On the other hand, the water-tube boilers built by Messrs. Yarrow and Messrs. Thorneycroft are much used abroad, the former extensively in Russia, and the latter in Germany. The French, again, took the lead in the matter of armour, which, of course, is one of the very first considerations in a battleship. It was an Englishman, however, who first suggested the use of nickel-steel for armour. An American named Harvey invented the process of hardening the surface of steel plates; and the German firm of Krupp has made the latest advances."

We are here enabled to reproduce part of an armour-plate made by Messrs. Charles Cammell and Co., Limited, of Sheffield. This is part of a sample plate that underwent a very severe test. Notice the marks of projectiles fired from a 6in. breechloading gun. "The test in question," writes Messrs. Cammell, "shows the quality of armour being supplied to the British Government for the new ships *Albion*, *Canopus*, *Glory*, *Goliath*, and *Ocean*. For these vessels we are making the whole of the armour for the ends of citadels. This armour-plate, which was tested on board H.M.S. *Nettle*, at Portsmouth, was 8ft. long, 6ft. wide, and 6in. thick. The trial took place on September 22nd, 1896. The projectile fired from the 6in. breechloader was one of Holtzer forged steel. It weighed 100lb., and the charge consisted of 48lb. of powder."

If one could only realize the severity of this trial, one would have some idea



PART OF ARMOUR-PLATE THAT HAS BEEN TESTED WITH A 6IN. GUN.

of the extraordinary pitch of perfection to which the making of armour-plates has been brought. The gun, which could probably throw its huge shot ten miles, was only 30ft. away from the plate. The first shot (the one on the right-hand side) hit the plate 2ft. from the bottom. The result was an injury measuring 12in. by 11in. The head of the projectile was embedded in the plate, and the remainder broken up, mostly in small pieces. The blow was equal to 2,663 "foot tons," and a careful record was made after the firing of each round.

It is a peculiar business, this making of armour-plates. "The special plant and tools necessary to deal with this heavy work," write Messrs. John Brown and Co., of Sheffield, "represent a prodigious capital expenditure, which is only productive when armour-plate orders are plentiful. The frequent alterations and improvements to which armour-plate processes are subject put a very short limit on the probable useful life of such costly

plant. As this is not adapted to ordinary manufacturing requirements, much of it has often to be completely dismantled and removed to make room for newer appliances."

In this country an extraordinarily high standard of excellence is looked for by the Government in the work of private manufacturers who produce the *matériel* for Her Majesty's ships. Let us take the case of projectiles, by way of example. Messrs. John Brown and Co. tell me that out of every lot of armour-piercing projectiles received from the manufacturers, a certain percentage are fired against armour-plates under conditions calculated to carry them easily through if their quality be good. As a rule they perform their task with little, if any, damage to themselves ; but in order to get a better idea of the enormous forces called into play at these tests, a huge projectile that has suffered in transit is selected for illustration. Before firing, this projectile was 13½in. in diameter, and weighed 1,256lb. Propelled with 630lb. of gunpowder, it struck the target with a velocity of 2,004ft. per second, and with an energy equal to that of a ton weight falling from a height of over 6½ miles. The shot was, however, arrested by the plate, owing to its (the shot, that is) being a little soft, and expanding in diameter, or "setting up," as the illustration shows. A similar armour-piercing shot fired on the same day under similar conditions readily perforated the target, which consisted of an 18in. compound armour-plate, a 6in. wrought-iron plate, and 12ft. of solid oak. The photograph shows the great projectile and its interior, together with the shattered fragments.

PROJECTILE—AND FRAGMENTS—AFTER BEING FIRED AT ARMOUR-PLATE.

These very interesting tests are sometimes marked by remarkable incidents. Here is one of the most curious ; it occurred at the trial of a 12in. shot in 1887. The projectile, weighing 724lb., was driven uninjured through a 16in. compound plate and 12ft. of oak balks, and came to rest with its point just through an old wrought-iron plate at the back of all. Behind this plate two rabbits were found to have taken refuge. One of these, dazed by the shock, was taken out alive and uninjured, but the other had literally been shot dead by the enormous projectile, which had gone just far enough to kill it without mutilation.

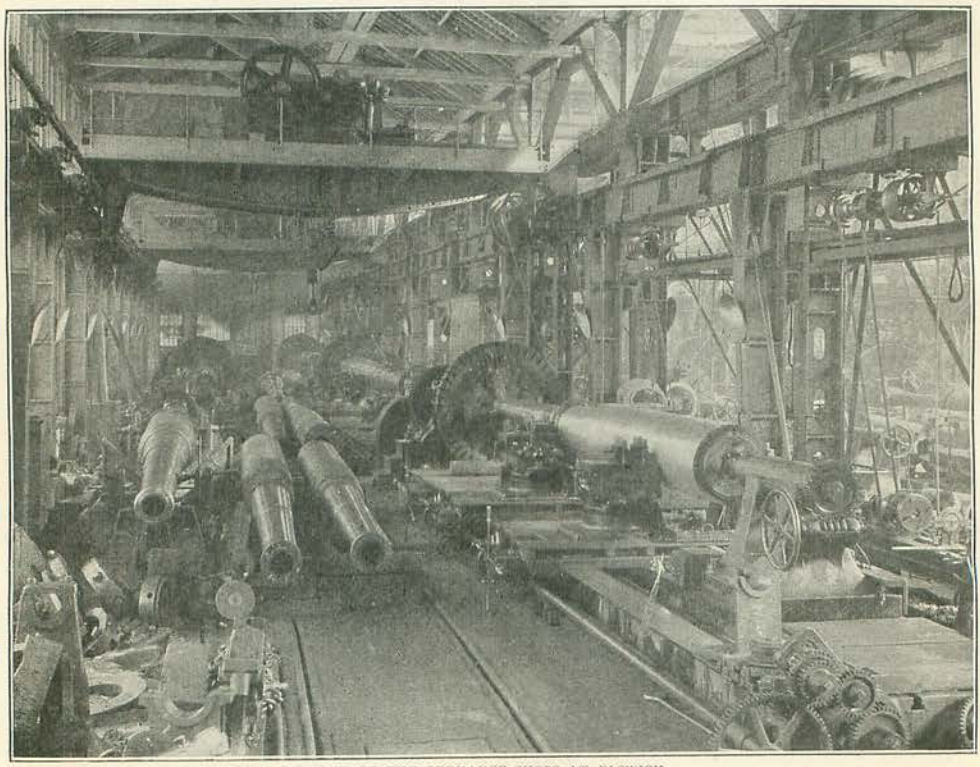
It seems that the largest projectiles used in the English Service are 16¼in. in diameter, and weigh 1,820lb. Fired with 960lb. of powder, they strike the plate with a velocity of nearly 2,100 foot-seconds, and an energy equal to the blow of a ton weight falling from a height of more than ten miles. The target for testing such projectiles consists of a compound armour-plate 20in. thick, an 8in. plate of wrought iron, 20ft. of solid oak, 12ft. of granite, and 13ft. of brickwork. The shot must get through two plates (28in. of metal altogether), or the lot it represents is rejected. A rough estimate of the cost of a single trial of this kind is £2,000.

It is an absolute fact that there is not a single branch of warship construction with which Sir William White has not a thorough practical acquaintance. At any given moment, he will be found a perfect encyclopædia of everything that is up-to-date in naval construction. He goes to sea whenever he can, and he is always in touch with naval opinion.

"Then," he said to me, "I must have an intimate acquaintance with foreign navies. I am personally known to the naval authorities of nearly all the nations of the world. I was in Russia and Germany only last summer, and both Governments gave me the utmost facilities in prosecuting my researches. Last year also, when I was in Italy for my health, I visited nearly all the Italian dock-

yards. I am acquainted with the Ministers of Marine in Italy, France, Austria, and Russia; also with the Secretary of the Navy in America. I have been on board all their ships. Nor can you design ships without knowing all about materials. One has to be up-to-date in things innumerable—the latest invention in boilers, in armour-plates, in torpedoes, in guns. All these I must be perpetually inquiring into and weighing in the balance."

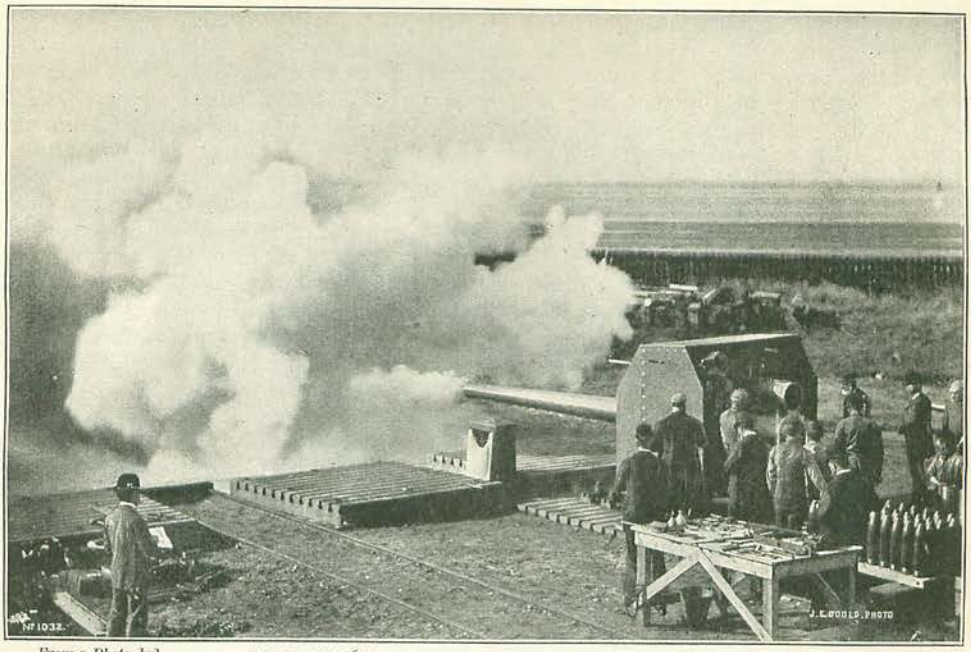
Here is reproduced a photograph of one of the workshops in the ordnance department at Elswick.



ONE OF THE ORDNANCE SHOPS AT ELSWICK.

Lord Armstrong's renowned factory, with which part of Sir William White's career is so closely associated, lines the River Tyne for about one and a half miles, and covers roughly some seventy-five acres of ground. The firm employs 19,000 men, and yet, so perfect is the organization, that this great army is paid within twenty-five minutes every Saturday. There are forty gun-shops in the ordnance department, and in them great cannon of various calibre and in every stage of manufacture are seen lying about at various angles. In one of these workshops the visitor may stand and watch many interesting processes, such as the winding of 108 miles of wire around a 49-ton gun. The testing of the guns is very severe. Messrs. Armstrong have two testing grounds, one at Ridsdale, Northumberland, for the strength of the barrel and the muzzle velocity, and the other for range, at Silloth, on the Solway.

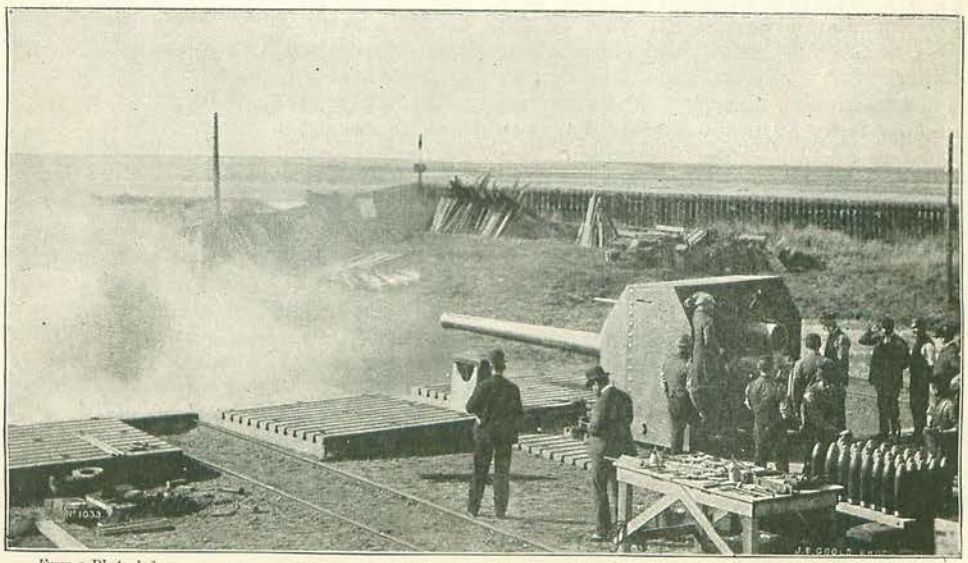
I am here enabled to reproduce two extremely interesting photographs, which show the testing of powders — ordinary powder as against cordite, which is smokeless. The first photo. shows the firing of a 6in. gun with a charge of ordinary powder; and it was taken about three seconds after the projectile had left the muzzle. Observe the cloud of thick smoke, which is quite in accordance with the conventional battle-pictures. Now this may be magnificent, but it is undesirable in war. The second photograph shows the firing of the same gun with a charge of cordite; the two photos. were taken at precisely the same interval after the projectile had left the gun, the velocity being the same in each case. Observe that in the firing of the cordite charge there is no smoke coming from the muzzle of the gun. Unfortunately, however, some little distance away, a cloud of sand



From a Photo. by] FIRING THE 6IN. GUN WITH A CHARGE OF BLACK POWDER. *[J. E. Goold.*

has been raised by the concussion. By the uninitiated this might be taken for smoke, though it could scarcely be mistaken for it by an expert. The difference between cordite, the present Service powder, and ordinary black gunpowder was probably never before so beautifully demonstrated to the non-technical reader as in these two photographs.

In the course of my several interviews with Sir William White, I chanced to ask him how many warships he actually built whilst at Armstrong's. He replied: "For Austria, two; Japan, two; China, two; Spain, two; and Italy, one. Whilst I was there also, the United States, who were just about to create their navy, sent to buy designs of mine to be built from in America. When I went to Armstrong's," pursued Sir William, "I had no idea of going back into the Government



From a Photo. by] FIRING THE SAME GUN WITH SMOKELESS POWDER—"CORDITE." *[J. E. Goold.*

service. What happened was this. Early in 1885 Sir Nathaniel Barnaby fell ill, mainly through over-work. To put it plainly, he was advised by his doctors that, if he wished to live, he had better retire. Then arose the question as to who was to be his successor; and—this is important—it was just about this time that the great agitation arose about the increase of the Navy. Lord George Hamilton, then First Lord of the Admiralty, wrote to me and asked me if I would take Barnaby's place. Now, I was under legal obligations to Armstrong's to remain, and, moreover, there was an immense amount of work in hand. The result of much correspondence was that Sir William Armstrong (as he then was) agreed to my leaving, provided that his firm might consult me whenever they wished, until the work then in hand should be completed. Thus, even after I left, I continued to be responsible for the ships I had designed."

Here it may be mentioned that Sir William White's return to the service of his country has cost him quite a large fortune in the way of income; besides which, his freedom of action has, of course, been curtailed. He felt, however, that he could really do something worth while for the Navy, and be of some service to the nation at a very critical time. Doubtless also the splendour of the position weighed with him. On his return to the Admiralty he was given the additional title of "Assistant Controller of the Navy." Now, in previous years, the naval construction of this country had gone on at a pretty even jog-trot. Sir William's return to the Admiralty from Armstrong's was at the time of the "great awakening." Everybody knows that within the last few years the whole Empire has awoke to the necessity of having an invincible Navy capable of upholding our power and prestige before the world. You will readily understand, therefore, that Sir William White recommenced his work at the Admiralty only to face a truly terrific increase. All sorts of building "programmes," commencing with Lord Northbrooke's, began to rise before him. From 1869 to 1885 the average expenditure on new construction was £1,500,000 a year; the year he came back it was £3,337,000. Nor was the awakening yet complete. People said this was abnormal, and could not continue. But listen to Sir William White:—

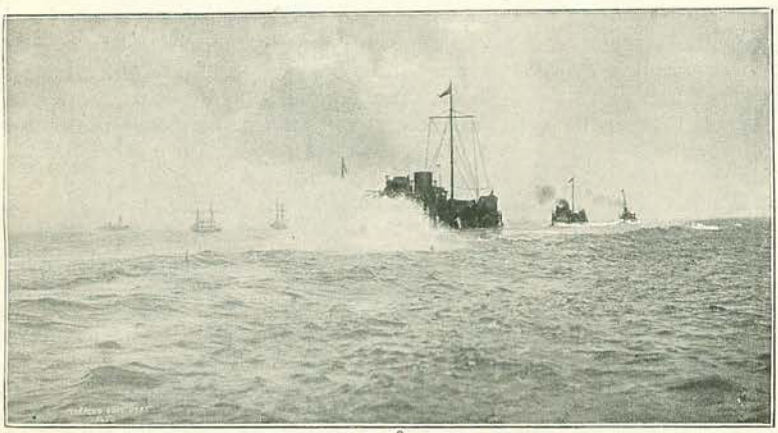
"I have now," he said, "been at the Admiralty eleven and a half years, as Director of Naval Construction; and during that time the average expenditure on new construction has been £4,300,000, or about three times what anybody could have foreseen. This last year, ending 31st March," he added, turning to his notes, "the expenditure is 7½ millions, or, say, *five times* the previous average. The total expenditure on new construction in the eleven and a half years is close on 50 millions sterling." In other words, Sir William White has designed ships for the Navy to the value of this stupendous sum. I asked him for some details respecting the ships built and building from his designs for the Royal Navy. "If we except 'destroyers' and the like," he replied, "the ships number 174, carrying 1,510 guns; the total tonnage is 861,000. Taking the ships designed by me for foreign navies, they are 12 in number; 76 guns; 32,000 tons; and 75,000 horse-power."

Strangely enough, Sir William White's first independent design was a warship for a foreign Government. That was in 1879. Of course, he had "official" sanction; but, nevertheless, the matter gave rise to much adverse criticism in the House of Commons and elsewhere. The Argentine Government wanted a warship built, and they called for designs. They wanted to have a competition, but could state no conditions; all they knew was that they wanted a better ship than any possessed by the Chilians. In their dilemma they came to Sir Nathaniel Barnaby, the then Director of Naval Construction, and he passed the matter on to Sir William White. With official sanction, that warship was designed by Sir William, and built by Samuda, on the Thames. She was called the *Almirante Brown*, and was an armoured cruiser of 4,500 tons, of an entirely new type.

To the layman, the science of warship building seems a mere endless chain of engines of destruction, recalling Dr. Johnson's doggerel about the fleas. For instance, there are big battleships. Well, someone comes along and invents torpedo-boats to blow them up. The next type to be devised is torpedo-boat destroyers, whose name sufficiently indicates their mission. Powerful armoured cruisers of very high speed are intended *inter alia* to look after the destroyers, and so the pitting of brain against brain goes on like a tremendous game of cards, one nation "countering" the other in its turn.

The mention of torpedo-boats opens up a very interesting subject. The very first attempt to use torpedo-boats systematically was made during the American War; and as two vessels at least—the United States steamer

Housatonic and the Confederate ram *Albemarle*—were actually sunk, and several others severely damaged by means of these weapons—to say nothing of the apprehension excited among all the vessels engaged—the attempt may be said to have been decidedly successful. The speed of the torpedo-boats designed at the present day is exceedingly high, and is only surpassed, in fact, by that of their arch-enemy, the "destroyer." There is no prettier sight than a flotilla of torpedo-boats at full speed. The photograph here reproduced shows in the foreground Torpedo-boat No. 83 in a sea-way. The officers and crew of these



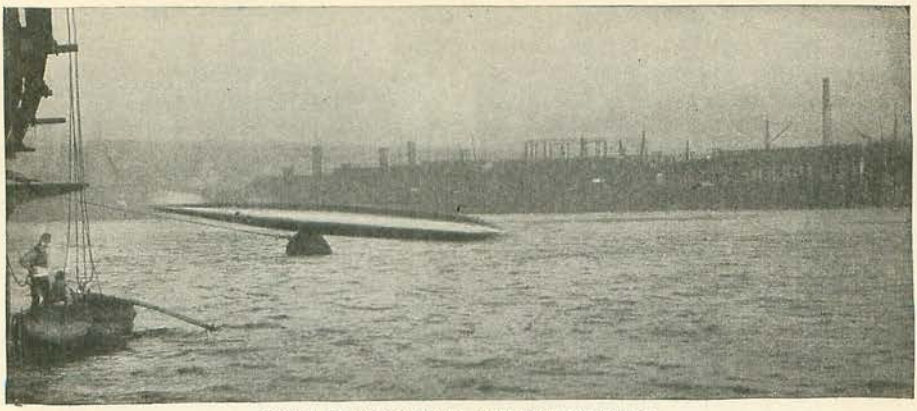
TORPEDO-BOAT NO 83 AT FULL SPEED.
From a Photo. by Symonds & Co., Portsmouth.

deadly little vessels are by no means so comfortable as their colleagues on a cruiser or a battleship; and in time of war the commander of a torpedo-boat would be constantly engaged in missions of most terrible danger. The great search-lights from his prospective prey would be glancing in every direction, possibly to be followed by a hail of projectiles before which nothing could live.

The manufacture of torpedoes, which will probably play a very important part in the next great naval war, is a very fascinating business. Messrs. Greenwood and Batley, Limited, of Leeds, make a large number of these terrible weapons; but by far the most extensive manufacture is carried on at the famous "Whitehead" Works, near Weymouth. Whitehead was an Englishman, settled in Austria; and it is a remarkable fact that the first German inventor was a man named Schwarzkopff, which means "Black-head." The exact details of the construction of the Whitehead torpedo are kept carefully concealed, but generally it consists of a cigar-shaped vessel, varying from 14ft. to 19ft. in length, and from 14in. to 16in. in diameter. It is made of specially prepared steel, and is divided into three parts. The head contains the gun-cotton and explosive apparatus; the central part contains the machinery; and the third or tail part contains the supply of compressed air for the engines. The working pressure in the tail is usually 1,000lb. per square inch, and the quantity carried is sufficient to propel the largest torpedo a distance of 220yds. at 24 knots, or 1,000yds. at 16 knots. By an arrangement connected with the horizontal rudders, the torpedo can be made to run below the surface of the water at any required depth, and to keep at that depth to the end of its run. Such is the skill already acquired in the use of the torpedo, that it is now almost impossible to miss an ironclad at a distance of 1,000yds., even when the ship attacked is moving at twelve or more knots an hour.

The next photograph to be reproduced shows a torpedo actually being discharged from the broadside tube of a cruiser at the Elswick Works. Of course, in tests of this kind none of the torpedoes are allowed to be lost, for each costs some hundreds of pounds. A boat is always in waiting to recover the missile, which, even when travelling below the surface of the water, can be traced by the line of bubbles it creates at the surface.

Naval experts have various theories as to what is the most suitable protection for a battleship against torpedoes. Many of our large ironclads are fitted with enormous wire nets, which, when a torpedo attack is feared, are let down all round the ship. These nets are called "crinolines," and we are enabled to reproduce a very interesting photograph showing a torpedo being discharged from a torpedo-boat at a warship protected by her "crinoline." The illustration shows the torpedo caught in the meshes of the netting; and the photo. was taken from the porthole of the ship attacked. In this

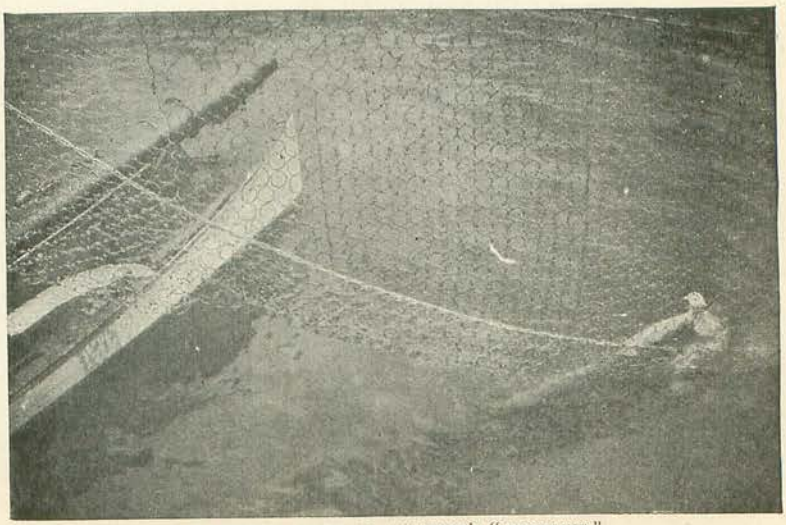


FIRING A TORPEDO FROM A CRUISER AT ELSWICK.

matter the war of intellects is again made manifest, for after these "crinolines" were invented the torpedoes were fitted with screw-cutting noses, which enabled them to cut their way through the wire meshes.

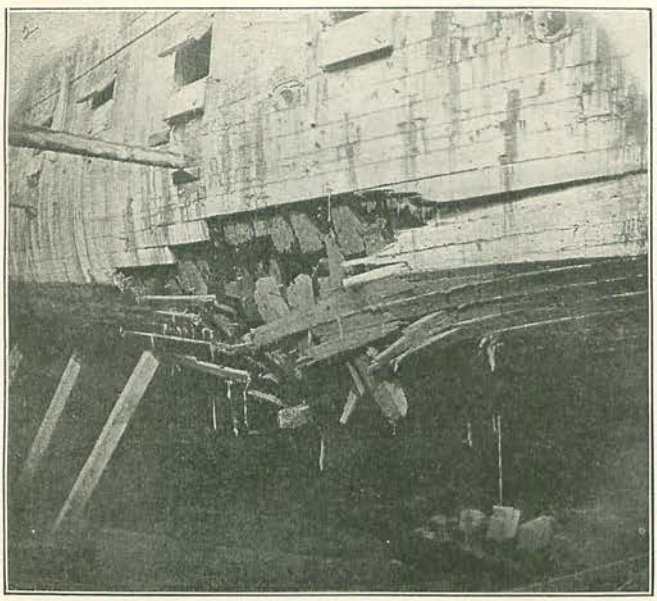
Naval experiments are pretty costly affairs. Now and then our own Navy will deliver up some old ship-hulk to be the *corpus vile* for the latest thing in guns or torpedoes. The very interesting photograph which is next reproduced shows the result of a very remarkable experiment conducted at Cherbourg, in March, 1877. Here is the story. It was decided that the old 2,000-ton wooden frigate *Bayonnaise* should be subjected to an attack by torpedo-boats. This much-abused vessel had already been damaged in one of the earlier experiments, and was on this occasion kept afloat by means of empty casks. In order to realize as nearly as possible the actual conditions of warfare, the *Bayonnaise* was towed by the paddle-steamer *Coligny* at the rate of about six knots an hour. The attacking torpedo-boat, under the command of M. Lemoine, came up at a speed of about fourteen knots, which on nearing the *Bayonnaise* was reduced, so as to prevent a collision between the two vessels at the moment of attack. The torpedo, charged with 15 kilogrammes of damp gun-cotton, and submerged to a depth of 2½ mètres below the surface of the water, exploded immediately on striking, with the result that the *Bayonnaise* would at once have gone to the bottom, had it not been for the empty casks with which she was filled. The hole in her bow, shown in the photograph, was large enough to admit a full-sized omnibus.

The question of speed in warships is, of course, of very great importance. In this matter, it seems, there is no finality. "We have," remarked Sir William, "gone up to thirty-three knots in our latest contract for torpedo-boat destroyers, which means practically thirty-eight statute miles an hour, or the speed of an average passenger train. One little boat, called the *Turbinia*, which is now being experimented with, has actually done over thirty-five knots."



A TORPEDO CAUGHT IN A WARSHIP'S "CRINOLINE."
From a Photo. by West & Son, Southsea.

Sir William White had some interesting remarks to make on this subject. "Put a thirty-knot destroyer into a rough sea," he said, "and the limit of the speed she can make is what she can bear—what the people on her can bear. The same thing is true of bigger vessels. The question as to what speed can be reached is not to be measured by what is theoretically possible, but what is commercially remunerative, and, in the case of warships, by what is practically useful. The highest speed of battleships like the *Renown* is from seventeen and a half to nineteen knots; the Italians, however, have some very large ships, like the *Sardegna*, which I think they claim to have exceeded nineteen knots. The fastest first-class cruisers afloat, such as the *Powerful*, have actually exceeded twenty-two knots."



THE "BAYONNAISE" AFTER THE TORPEDO EXPLOSION.

Asked as to what dockyard held the record for fast building, Sir William replied that this was "a very delicate question. You must remember," he said, "that a private firm cannot even so much as order any of the materials until they receive the definite order. In the case of the Government dockyards, however, we send the drawings of the ship long beforehand; so that the materials can be ordered immediately and preparations for building can go on in the interval. Certain portions of the structure can thus be ready in advance, and our own yards have perhaps hundreds of tons of material brought together before they begin to work. The fairest way to judge is from the day that building preparations are actually put in hand, and not from the laying of the keel. A first-class battleship," pursued Sir William, "is completed in this country in from two and a half to three years, or about half the time our foreign rivals take. The *Mars*, built by contract, by Laird Brothers, of Birkenhead, was ordered in June, 1894, and was ready to come away about February, 1897."

The *Mars*, by the way, is one of the largest battleships constructed for the British Navy. She is of the *Majestic* class, of 14,900 tons displacement, and 12,000 horse-power. Her armament consists of four 12in. 46-ton breechloading guns, each firing a projectile weighing 850lb. There are, besides, fifty quick-firing guns, in addition to the usual auxiliary armament. The ship is lighted by about 900 electric lights, and equipped with six search-lights, each of 30,000 candle-power.

"The details of the cost of a first-class battleship," remarked Sir William White, "may perhaps prove interesting. Let us take the *Prince George*. Here are the official figures, roundly. She was built at Portsmouth. The labour upon her hull cost £216,000; materials in the hull, including armour, £445,000; propelling machinery, £90,000; gun-mountings and torpedo gear, £70,000; and armament, £70,000. Then you have stores, ammunition, and reserves; so that by the time the ship is fully equipped, you may say that the captain has charge of a million of money. A first-class cruiser costs £450,000; a second-class about £250,000; and a third-class about £130,000. A 'destroyer' of the latest type represents something like £60,000. All these figures are exclusive of armament. The two well-known cruisers, *Powerful* and *Terrible*, are quite exceptional. Each cost about £700,000, plus another £40,000 for the guns."

These statistics led me to ask Sir William what he estimated the entire British Navy to be worth.

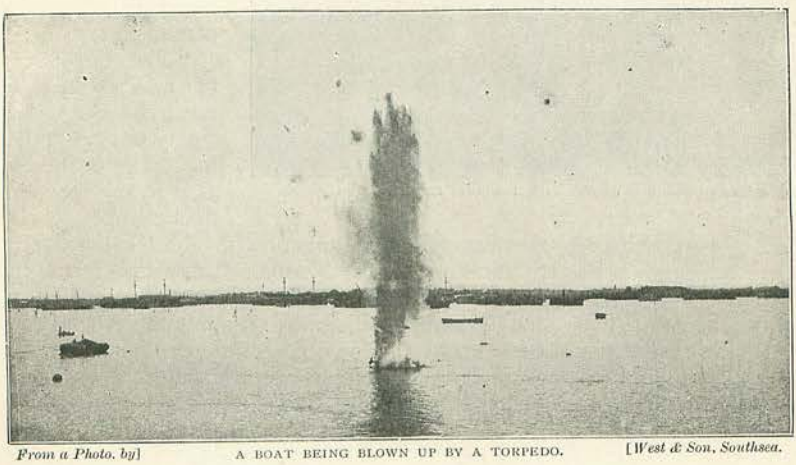
"In 1813," he replied, "the Navy, exclusive of armament, might have been valued at

about ten millions sterling. Its value to-day, according to Parliamentary returns, is sixty-one millions, excluding small ships, steam tugs, and the like." More than two-thirds of the money value of the whole British Navy is represented in ships designed by Sir William White.

The names of the warships, I learn, are decided upon by the First Lord. "People think," remarked Sir William, "that this is a matter with no method in it; but in point of fact, the names chosen are nearly always those which have historical associations. The first *Mars* was won from the French over 150 years ago, in one of the smartest single-ship actions ever fought. The present *Mars* is the fifth of her line. Then, again, we have a whole class of ships named after famous admirals—for example, the *Howe*, *Collingwood*, and so on."

It is an amusing fact, by the way, that the Peace Society, and other kindred bodies, seem to think Sir William White a very warlike person, and they frequently send him circulars and tracts.

The next photograph to be reproduced is of unique interest; it shows a torpedo blowing up what had been a fair-sized boat. The



From a Photo. by] A BOAT BEING BLOWN UP BY A TORPEDO. *[West & Son, Southsea.*

specks seen in the air, a little to the left of the column of water, are fragments of the shattered boat. This interesting experiment took place in Porchester Creek, Portsmouth Harbour. The torpedo was inclosed in what is called a jacket, thus giving it greater force.

"Experiments of this kind," remarked Sir William, "are constantly being conducted in Portsmouth Harbour, Stokes Bay, and elsewhere."

Sir William, by the way, has enjoyed some extraordinary experiences in his time. During the Chino-Japanese War, he could sit in his arm-chair reading the despatches from the scene of action with peculiar interest, in that *his own vessels were fighting on either side!*

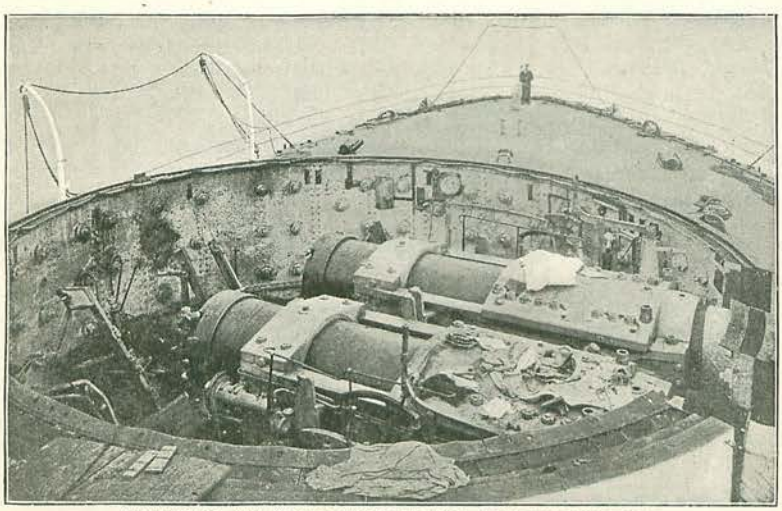
"Before Sir William left Elswick," writes Mr. Philip Watts, "he had prepared the outline design of the Chinese cruiser *Chih-Yuen*, which was sunk at the battle of the Yalu River."

I regret being unable to reproduce here in full a perfectly unique "unsolicited testimonial" which Sir William White received from Viscount Ito, Commander-in-Chief of the Japanese fleet at Yalu. This very interesting letter is dated from H.I.J.M.S. *Matsushima*, at Wei-hai-Wei, 23rd December, 1894. Count Ito thinks it "quite natural" that "I should think of addressing a few lines to the illustrious Constructor to whose talents are due the late success of our *Naniwa* and *Takashiho*."

When a new type of battleship has to be designed—as in the case of the *Royal Sovereign* class—the members of the Board of Admiralty call into counsel (notwithstanding the fallacy to the contrary extant) a large number of the most experienced naval officers; and the opinion of each of these is solicited and discussed. In fact, thanks mainly to the extraordinary ability of our Director of Naval Construction, the warships of the British Navy are built with such care and precision, even in the smallest details, that accidents of any kind are extraordinarily rare. There is testing here, and testing there, and calculations everywhere. We don't jump at innovations; we wait to see their value tested in a practical manner—at someone else's expense. More or less serious accidents in foreign navies are comparatively

common. One hears strange rumours about French warships; and the newspapers often tell us of disastrous accidents on board the vessels belonging to the various European navies.

Here is reproduced a very interesting photograph, which shows the havoc wrought by the explosion of a gun on board the Russian ironclad *Cissoi Veliky*. It will be remembered that not many months ago this ship was anchored off Crete, when the breech mechanism of one of the guns blew out, and the entire top of the armoured turret, after being blown a considerable distance in the air, fell upon the deck, killing instantly a large number of officers and men. The photograph reproduced shows the breeches of the guns immediately after the explosion.



BREECHES OF THE "CISSOI VELIKY'S" GUNS AFTER THE EXPLOSION.

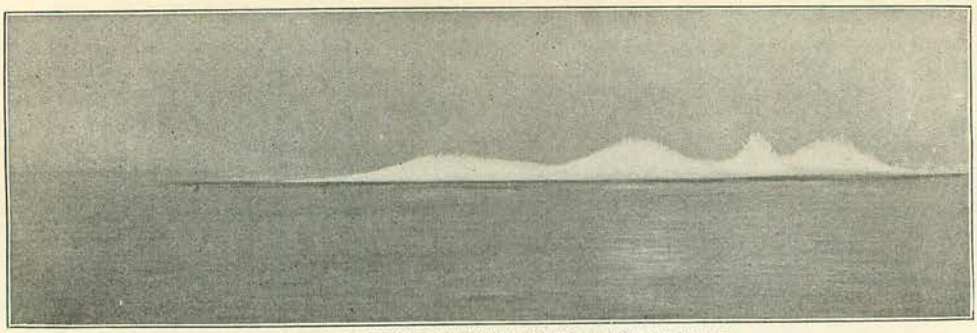
Elsewhere I have hinted that Sir William White keeps well abreast of the times, and is posted up in every invention that concerns his profession, from submarine boats to non-inflammable woods. I asked him what was the routine of his work as Naval Constructor.

"The Naval Members of the Board of Admiralty," was the reply, "decide that they want a ship of a certain type. These high officials meet whenever there is necessity, and give me certain conditions as to speed, coal, armament, etc. Then it is my business to produce a design embodying these properties; and, of course, before the Board of Admiralty decide finally, they want to know the cost. I next come to the Board and give them, perhaps, two or three alternative sketch designs; they then say which they prefer, and I tell them what will be the probable displacement, etc. You see," pursued Sir William, "we have substantial facts to deal with in foreign navies. Our policy is just this: we can build more rapidly and more cheaply than anybody, and we simply wait *until we know what we have to meet*, and then we go to work at once."

As to how and where Sir William White actually does his designing and planning, these are points concerning which he can give no fixed rule. He designs our battleships lying on his couch in his private sitting-room, in hotels, on board ship—in fact, anywhere and at any time. In the perfected design, he tells me, every ounce of weight must have been calculated and allowed for, together with its effect upon the position of the centre of gravity. Propulsion, structural strength, and a thousand other things have likewise to be considered.

"The ordinary architect," remarked Sir William, "builds a structure which rests upon a substantial foundation, whereas the naval architect's handiwork is required not merely to float in the water, but also to be propelled, to carry many enormous guns, etc., and to meet the wildest weather." And surely Sir William White is the most able naval architect that the world has yet produced. The *Majestic* weighs nearly 15,000 tons; yet when she was completed she was just exactly the weight that Sir William had calculated, and her centre of gravity was within two inches of where it was expected to be!

Submarine mines form a very interesting chapter of naval strategy, which I have not yet dealt with. Better than pages of description, however, are the two extremely successful photographs here reproduced. The first shows the first upheaval of twelve submarine mines, which were exploded by electricity at Portsmouth. Woe unto any foreign warship which attempts to enter this great naval arsenal as an unbidden guest!

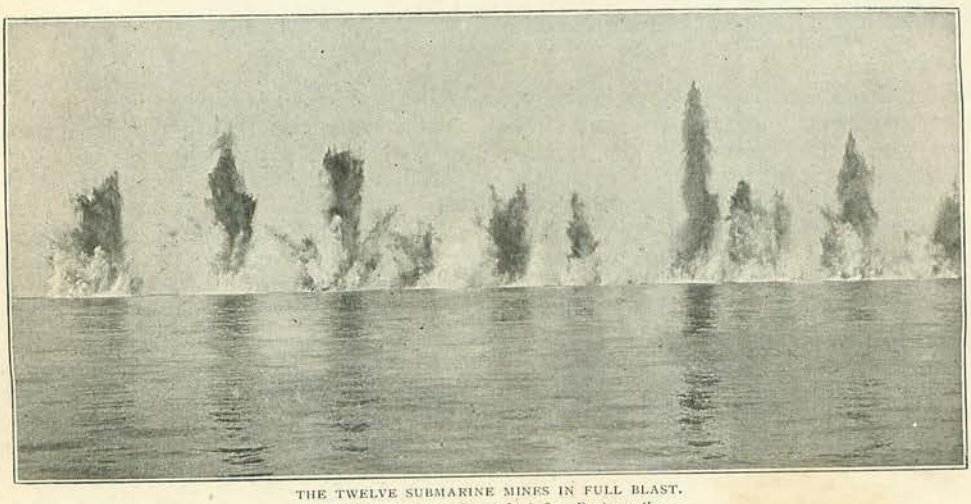


EXPLOSION OF TWELVE SUBMARINE MINES—FIRST UPHEAVAL.
From a Photo. by Symonds & Co., Portsmouth.

The second photograph, taken some minute fraction of a second after the first one, is probably unique. Never, perhaps, has a photograph been taken under such difficulties or with greater danger. It shows clearly the whole line of the tremendous upheaval. The black columns are principally composed of mud and stones from the bottom of the sea, the rest consisting, of course, of hundreds of tons of water.

Of all these, and many other things fascinating to the ordinary person, did Sir William White speak. I have, however, space for only one more interesting incident narrated by our Director of Naval Construction. A few years ago Sir William took up an American paper, and in it he found a lengthy account of the launching of a new warship. The writer gave a detailed description of that ship, and evidently could not resist the temptation of crowing over all the world at the close of his article; Great Britain was mainly apostrophized. "Now, why," the writer remonstrated, "can't you advance like America in warship designing and building? Just think of this young nation being far ahead of you! It is a disgrace to Great Britain. We are ahead in guns, in armour—in everything; and only ten years ago we had nothing. This, our latest ship, shows that we are ahead of the world."

"This sort of thing," remarked Sir William, quietly, "rather amused me, because *I designed that ship!*"



THE TWELVE SUBMARINE MINES IN FULL BLAST.
From a Photo. by Symonds & Co., Portsmouth.