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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharp, the articles short, and the facts authentic, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE NEW STEEL.

The recent statement by one of our leading iron-masters that the steel industry of America had progressed to a point where it was secure against foreign competition, and particularly against British competition, has been followed by the announcement of an important discovery by the Sheffield manufacturers, which the British steelmakers regard as one of the most important advances in the art of steel manufacture of recent years. They even go so far as to assert that the new steel will give Great Britain a considerable lead, at least as far as quality is concerned, for some years to come. The announcement, which was made by Prof. Arnold of Sheffield University, had reference to the production of a new tool steel, which is stated to possess from three to seven times the cutting endurance of the best known high-speed steel, and which has the further advantage that it can be water-hardened.

Now, although the new invention cannot be regarded as revolutionary, and, considered in respect of tonnage output, will affect but a very small percentage of the total steel production, it will, of course, have a far-reaching effect upon shop practice, and must greatly reduce the labor cost of the output of the machine shops. Prof. Arnold states that it is a new departure in metallurgy to have produced a water-quenched steel, which will make an all-day run with the cutting edge of the tool at a bright red heat, without the necessity which exists in the present steel of four or five visits to the grindstone.

AMERICAN AND BRITISH TURBINES.

The fact that the British government has ordered an American turbine for one of its new high-speed cruisers will afford an opportunity for a test of the two leading types of marine turbines, the Parsons and Curtis, similar to that which was made last summer, in the trials of our scout cruisers "Chester" and "Salem"—a contest which is to be repeated in the forthcoming long-distance trials of these ships. Because of the early start and brilliant record of the Parsons marine turbine, the American type, as designed by Curtis, has a severe handicap to overcome. Therefore, the fact that it should have equaled, and in some respects excelled, the Parsons turbine in the very first comparative test that was made, must be regarded as significant; and the decision of the British government to give the American type a trial was prompted, no doubt, by the excellent results obtained by the turbines of the "Salem." In speed and in steam and fuel economy, the two types of turbines showed approximately the same results; but in convenience of operation the advantage lay strongly with the American type. The Parsons turbines cannot be reversed, the Curtis can; and the former must include a special turbine for driving the ship astern. For ships of large power the Parsons must use six turbines, four shafts, and four propellers. The Curtis gives the same results with two turbines, two shafts, and two propellers. To secure the best results on four shafts, the propellers must be small and must be run at very high speed, and there is a resulting vibration which is very disturbing to the gunner. With the power developed in two shafts, the propellers may be larger; they can be run at a lower rate of revolution; superior propeller efficiency is obtained; and the vibration, as was proved in the trials of the "Salem," is practically negligible—so much so as to win the enthusiastic comments of the naval officers who were on board at the trial. The American type of turbine is now being tested in a British cruiser; in the latest Japanese "Dreadnought" battleships and cruisers; and

in the "North Dakota," one of our "Dreadnoughts." The determination of the relative all-round efficiency of these two leading representatives of the new type of motive power will afford one of the most interesting competitions in the history of steam engineering.

THE SECOND SEA POWER—AMERICA OR GERMANY?  
BY OUR ENGLISH CORRESPONDENT.

The SCIENTIFIC AMERICAN has earned the right to be considered an expert authority on naval affairs, and it is so considered both in America and in England, where this article is being written. For this reason it becomes more than ordinarily important that any statement it may make on this subject should be absolutely trustworthy, giving to the nation a reliable guide upon which to base its calculations. It is proposed by the writer to submit to a close examination a statement, made editorially in its issue of January 23d last, to the effect that the annual construction of two battleships is sufficient to maintain the position of America as the second naval power.

The only other aspirant for that position is Germany. France may, in the course of a dozen years or so, attain a naval strength which will entitle her to be taken into consideration, but for the present her deficiency in large armored ships of modern type, the slowness of construction, and the inefficiency of her personnel, rule her out of the reckoning. Russia, too, may be ignored for similar, and stronger, reasons; while Japan, although strong at sea and contemplating the construction of some very powerful ships, is too handicapped by financial considerations to become a rival candidate for the position for many years. There remains Germany; and her present strength, the efficiency of her personnel, and the rapid expansion of her fleet in recent years, all entitle her to be reckoned—and reckoned seriously—as a candidate for the position now held by our own navy.

What, then, is the position at sea as between Germany and the United States? Here is a summary of the completed armored ships of the two fleets:

	United States.	Germany.
Battleships less than ten years old		
from date of launch.....	16	18
More than ten years ..... 9	9	6
	25	24
Armored cruisers less than ten years		
old from launch .....	13	7
More than ten years old .....	2	1
	15	8

It will be seen from these figures that the United States' superiority in armored ships over Germany is quite appreciable, and it becomes greater as one examines the details. The 25 battleships of the United States have a total displacement of 334,180 tons normal to a total of only 287,140 for the 24 German vessels, while the figures for the armored cruisers are: United States, 186,915 tons; Germany, 79,030 tons. Further, all the battleships of the former carry either 12-inch or 13-inch guns as their main armament, while of the German ships fourteen have 11-inch and the remainder only 9.4-inch guns as their principal weapons.

It is, however, when one comes to look at what has been happening within the last two or three years, and, more important still, what is going to happen in the near future, that the inadequacy of the suggested programme of two battleships annually becomes evident. It will have been seen from the analysis given above, that the United States have three more battleships over ten years old than Germany, but that that nation has two more under ten years than we have. This dangerous tendency—vulgarly known as "living on our fat"—is growing, and the following comparison of the programmes of the United States and Germany for the last few years will show how serious it is becoming:

ANNUAL PROGRAMMES, 1904-1909.

	United States.		Germany.	
	Battle-ships.	Armored Cruisers.	Battle-ships.	Armored Cruisers.
1904 .....	2	0	2	1
1905 .....	1	2	2	1
1906 .....	2	0	2	1
1907 .....	2	0	2	1
1908 .....	2	0	3	1
1909 .....	2	0	3	1
	11	2	14	6

These figures show that in six years Germany has laid down three battleships and four armored cruisers more than America. Further, ten of the German battleships and three of the cruisers are of the "Dreadnought" type, whereas only six of our battleships answer to that description. It is interesting to note that in the same period Great Britain (whose programme for 1909, however, is not yet known) has laid down only ten battleships and seven armored cruisers, so that Germany has been building warships even more energetically than the first naval power herself.

A scrutiny of the above figures will show that a yearly programme of two battleships has not been sufficient in the past to guarantee the position of the United States as second naval power; nor will it be in the future, for the enlarged programme upon which Germany embarked in 1908—three battleships and one armored cruiser per annum—is to be repeated again in 1910 and 1911; and although from 1912 onward only one battleship and one cruiser yearly are as yet contemplated, it is confidently expected that a new navy bill will be introduced in two years' time which will keep the rate of construction up to its present level. If, therefore, we carry our calculations only as far as 1911, it will be found that in that year Germany will possess the following armored ships, built and building:

	Battleships.	Armored Cruisers.
Completed by or before 1908.....	24	8
Provided for—		
In 1906 .....	2	1
In 1907 .....	2	1
In 1908 .....	3	1
In 1909 .....	3	1
In 1910 .....	3	1
In 1911 .....	3	1
	40	14

Sixteen of the battleships and five of the cruisers will be of the "Dreadnought" type.

Under the suggested annual programme of two battleships, the increase in and position of the United States navy in 1911 would be as follows:

	Battleships.	Armored Cruisers.
Completed by or before 1908.....	25	15
Provided for—		
In 1906 .....	2	0
In 1907 .....	2	0
In 1908 .....	2	0
In 1909 .....	2	0
In 1910 .....	2	0
In 1911 .....	2	0
	37	15

Of these totals, ten battleships would be of the "Dreadnought" type, but not a single cruiser, so that Germany would have, all told, twenty-one "Dreadnoughts" to America's ten, built and constructing. Already Germany has ten "Dreadnought" battleships and three "Dreadnought" cruisers under construction to our six battleships building and authorized, and it would seem to an impartial observer that nothing short of an annual programme of five "Dreadnoughts" can save the United States from being ousted from her position. Great Britain herself can only maintain a bare "Dreadnought" lead over Germany by laying down seven "Dreadnoughts" this year (according to rumor six will be provided for), so that the seriousness of German naval ambitions and of the position of the United States can easily be seen. For many years the authorities in England have shut their eyes to the marvelous naval expansion of Germany, hoping against hope that something would turn up to nip her ambitious projects in the bud. They have at last been forced to admit the growing seriousness, with the result that the economy of the last three years has got to be made good in one. It is just the same with the United States. If they wish at the same time to reap the advantages of steady shipbuilding and to keep their position as second naval power, then they must formulate their programmes according to the efforts that are being made to eject them from it. Germany—now the third in strength—is building three battleships and one armored cruiser every year; surely the United States cannot be content with a smaller programme than this—not to mention one only half the size.

With regard to the accessories of naval power—scout cruisers and torpedo craft—the following figures summarize the position:

	United States.	Germany.
Protected cruisers and scouts of 22 knots and over.....	5	13
Torpedo-boat destroyers over 400 tons) .....	21	72

Of the five American cruisers, the "Columbia" was built in 1892, the "Minneapolis" in 1893, and the "Salem," "Chester," and "Birmingham" in 1907. None is building. All the German vessels have been built since 1903, and there are under construction six cruisers of 25.5 knots. Fifteen destroyers are building and authorized for the American fleet and twenty-four for the German, while the latter country will lay down twelve every year up to 1917. It is, therefore, not only in armored ships that Germany is outbuilding the United States, but also in cruisers and torpedo craft; and since no fleet is properly equipped without a full complement of these vessels, it follows that if the United States are to keep their position at sea, they must be prepared to provide a large number of these, as well as an adequate force of armored vessels.