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NEW YORK, SATURDAY, AUGUST 6, 1898.

HIGHER SPEED FOR OUR NEW BATTLESHIPS.

The country has every reason to be proud of the achievements of its navy. From the very day that war was declared its operations have been brilliantly successful. We have seen one fleet of the enemy wiped out of existence by our protected cruisers, and later have witnessed our battleships administer a crushing defeat to one of the finest and most modern squadrons of armored cruisers and destroyers that ever sailed the seas. Moreover, our ships have been doing things which by all the sacred canons of modern naval warfare they should never have attempted. Protected cruisers, as at Manila, have forced their way past shore batteries, and have not only dared to engage them, but silenced them. Battleships have chased and overhauled fast cruisers, while a converted and unprotected yacht has boldly engaged two of the omnipotent torpedo boat destroyers and promptly sent them to the bottom.

Evidently our ships have done all and more than they were designed to do.

Looking to the future, we must endeavor to build up our navy with strict reference to the new responsibilities which have fallen upon us as the result of the war. When we entered upon the construction of our new navy we had no distant possessions to guard. The Hawaiian Islands, Cuba, Porto Rico and the Philippine Islands were not in our thoughts. It was considered that the duties of the navy, at least as far as the battleships were concerned, would be confined to the defense of our own coastline. No one would have dared to suggest that within the next decade we should be fighting the battles of Manila and Santiago, and fitting out a fleet for a campaign in the Mediterranean.

Proof of this is seen in the designation of our first three battleships, the "Indiana," "Massachusetts," and "Oregon," as given in the official lists of the Navy Department. They were called coast defense battleships. Hence they were given a limited coal supply and the moderate speed of 15 knots an hour. It is owing to the fortunate circumstance that a premium was offered for any excess above this speed that the trial speed of the three ships was respectively 0.5, 1.2, and 1.8 knots above the low figure called for by the government.

The wider sphere of naval duties which is about to fall upon us demands that our future battleships shall be sea-going vessels of large coal endurance and high speed. They should be able to steam at least 7,500 knots without recoaling, and have a maximum speed of 18 knots an hour. Sixteen knots (the speed proposed for our three new battleships) is, as we shall show, from 1½ to 4 knots slower than the speed of some sixty or seventy battleships which are now either built, building, or authorized by the leading naval powers of the world.

One would have expected that this fact, coupled with the lessons of the present war on the subject of speed, would have resulted in a call for higher speed in the three new battleships lately authorized by Congress. It was the desire of Commodore Melville, Chief of the Bureau of Steam Engineering, to place in the new ships engines and boilers capable of driving them at 18 knots an hour; but, for some inscrutable reason, the proposition was overruled, and designs were drawn up for 16-knot ships.

Now we do not hesitate to affirm that while the armor and armament of these vessels render them the most powerful fighting machines in the world, they will be so greatly handicapped by their slow speed as to be unworthy of the title "first-class battleships." In these days of 18 to 20 knot armorclads, a 16-knot ship, we care not how heavy her armor or armament, must be relegated to the second class, for the limited duties of coast defense. This is actually being done in the European navies.

If any reader is disposed to doubt our position, we beg him to picture our 15 and 16-knot vessels being dispatched 3,000 miles from a friendly dry dock to "capture, sink, or destroy," in its own waters, a fleet of French ironclads that is capable of steaming its 18 or 19 knots, if called upon to do it. Without detracting in

the least from the laurels won by our navy at Manila and Santiago (nothing can do that), we affirm that no similar success would await the attempt, if it be true the French navy is kept in the high state of efficiency with which it is universally credited. The splendid gunnery which won in the Philippines and off the Cuban coast would be useless against a fleet with which it was impossible to get within fighting range.

That the speed proposed for our new battleships is entirely too slow is shown by a comparison with the ships of a similar class which are either built, building, or proposed for the leading navies of the world. The following figures are taken from official lists, or gathered from other authentic sources:

Commencing with the English navy, as being the largest, we find that it contains no less than 33 first-class battleships, of between 10,500 and 15,000 tons, whose speed ranges from 17 knots to 18.75 knots per hour. Of these ships, one is of 10,473 tons and 17.25 knots; eight are of 14,150 tons and 17.5 to 18.2 knots; nine of 14,900 tons and 17.5 to 18.4 knots; three are of 15,000 tons and 18 knots; two of 10,500 tons and 18.5 knots; one is of 12,350 tons and 18.75 knots; six are of 12,950 tons and 18.75 knots; and the three latest designs are of 15,000 tons displacement and a speed of 18.75 knots.

France has afloat, on the stocks, or in contemplation, ten battleships of 17 knots speed and over. Four of these are of from 11,395 tons to 12,200 tons displacement and from 17.1 to 17.9 knots speed, and the other six range from 11,275 to 12,032 tons displacement and have speeds of from 18 to 18.5 knots per hour.

Chile has her "Capitan Prat," a most efficient ship, of about 7,000 tons and 18.3 knots, and the formidable "O'Higgins," 8,500 tons (more battleship than cruiser), with the high speed of 22 knots an hour.

Germany has in hand three powerful battleships of the "Kaiser Friedrich" type, whose speed is to be 18 knots an hour.

Italy has always realized the value of speed in battleships, and was ten years ahead of the other naval powers in this respect. Her lists include two battleships of 11,000 tons and 17 knots; one of 9,800 tons and 18 knots; two of 14,400 tons and 18 and 18.4 knots; two great vessels of over 13,500 tons and 19 knots; and the celebrated "Sardegna," of 13,860 tons and 20 knots speed.

Russia is credited with one battleship of 12,480 tons and 17 knots; three of 10,960 tons and 17.5 knots; and two of 12,674 tons and 18 knots.

The latest naval power, Japan, is in line with modern developments, in the construction of one great ship (to be the largest and most powerful in the world), of 15,200 tons and 18 knots. She also has in commission two 12,320-ton ships of 18.5 and 19.2 knots and two others of 14,850 tons and 18.5 knots speed.

The above enumeration shows that, before our three latest battleships of 16 knots speed are completed, the leading naval powers will possess among them no less than sixty-seven great battleships with speeds of from 17 to 20 knots, the greater part of them being able to steam over 18 knots an hour.

The events of the war have shown that the purely defensive policy which governed the design of our earlier ships must be modified, if we are to meet the swift battleship squadrons of Europe. As between a 16-knot and an 18½-knot fleet, the option of fighting or running away would rest altogether with the faster vessels. If we are to avail ourselves of the splendid fighting qualities of the personnel of our navy, we must provide it with ships fast enough to allow our officers and men to immediately close in with the enemy whenever and wherever they think fit to do so.

That the Navy Department is aware of the fact that the new ships will be deficient in speed is shown by a circular recently issued which says that "preference will be given, other things being equal, to such bids as offer to guarantee the highest rate of speed and greatest coal endurance, the total weights of engines, boilers, and coal and spaces allowed therefor to remain as now fixed." The latter clause of this statement, unfortunately, takes all the value out of the former, for without an increase in displacement and a more liberal allowance for motive power, it will be impossible to make any considerable addition to the designed speed. This can only be secured by an entire revision of the plans.

MAKE HASTE SLOWLY.

Should we not at once call a halt in the matter of this year's naval programme and defer the preparation of designs, not to mention the letting of contracts, until the valuable experience gained by our ships in the present war has been filed with the Bureau of Construction?

Prudence, common sense, and the best interests of the nation demand that not a design should be passed as final until the very last item regarding the behavior of ships, guns, projectiles, armor, and general protective devices has been carefully noted, drawn, and placed in the hands of Chief Constructor Hichborn, of the navy.

Lying on the mud of Manila Bay and on the beach of the South Cuban coast are some eighteen or twenty vessels of more or less modern construction, from whose battered remains our naval constructors can learn the very truths for a practical demonstration of which the naval world has been impatiently waiting during the purely tentative and experimental work of the past twenty years. On our own ships, moreover, are to be found the marks of the enemy's shells. Battleships, cruisers, and torpedo boats have been struck by projectiles large and small, and delivered both horizontally and vertically by mortar fire. Every shell that struck has its own lessons to teach, and the different effects of projectiles against side armor and deck armor will afford valuable data for our future guidance.

Not less important in its bearing upon future designs is the behavior of the various types of gun mounts. It has been stated persistently in the daily press that many of the mounts are badly in need of overhauling; and rumors of this ship and that needing repairs to her gun-carriages have come thick and fast since the scheme for sending Watson's fleet to Spain was first broached. All of these weak points will have to be noted and the mounts modified and strengthened in our future warships.

It will at longest be but a matter of a few months before the war is closed and the whole of its invaluable data in the hands of the Construction Department, and it cannot but happen that this data will suggest the modification of existing designs in various important particulars. As at the Santiago as well as the Yalu fight, armor, even of moderate proportions, has proved to be wonderfully effective, as witness the almost complete immunity of the "Cristobal Colon" due to her plentiful protection of 6-inch armor. We think it will be decided, among other things, that by using the improved Krupp process it will be possible to greatly reduce the thickness of the armor on the new battleships and put the weight so saved into engines and boilers. Are we really justified in the construction of the four monitors and sixteen torpedo boats? Neither type has proved itself so useful as the battleships and cruisers. There is every reason why we should defer their construction until our various admirals and captains can turn in exhaustive reports upon the services rendered by these much debated types of vessels.

In view of the fact that it will be probably three or four years before this year's programme has been completed and put in commission, we can well afford to delay its commencement a few months, in order to incorporate in the new ships the experience which we are gaining at a costly expense in blood and treasure.

TO PREVENT COLLISIONS DURING A FOG AT SEA.

The tragic sinking of the "Bourgogne" again brings up the question of preventing collisions in foggy weather. While many such catastrophes are no doubt due to want of proper watchfulness and precautions, the majority occur in spite of every effort of science and good seamanship to prevent them. The supreme need of the present day is some thoroughly reliable device for detecting the approach of a ship which, by reason of the fog, is not visible to the lookouts. It is safe to say that, in spite of the ingenious instruments which have been devised and are more or less in use, there is at present no apparatus which will under all conditions detect and report the presence of one vessel to another in thick weather.

The devices which depend upon auricular signals, such as the eophone, topophone, and others of a similar nature, are intended to determine the direction from which the sound proceeds. For their successful use each vessel must be active, both in sounding its sirens or trumpets and in intercepting the other's signals. A transatlantic liner may be furnished with eophones, worked by skilled observers, which are capable under normal conditions of the atmosphere of infallibly detecting the direction from which the signals come; but unless the approaching vessel is equally careful to sound its foghorn at regular intervals, the eophones might just as well be at the bottom of the sea for all the protection they afford to the liner.

But even if we assume that auricular signals are faithfully sounded and received, there yet remains a fruitful source of accident which may at any time render the foghorn or siren inoperative. We refer to the curious eccentricities which have been observed in the action of sound waves under certain atmospheric and geological conditions—eccentricities which render it uncertain that signals that are sounded by one ship will be heard by another that may be well within hearing distance under normal conditions. The investigations made by Major Livermore for the United States government have shown that under certain conditions sounds that were inaudible near the surface of the water could be plainly heard at some distance above it, and sounds from a distance which are heard at one end of a vessel may be quite inaudible at the other end. The explanation offered is that sound waves may, under certain conditions, be thrown upward and

descend at some distance to resume their original course.

The ideal system of signaling would be one whose action was at all times entirely automatic and unaffected by atmospheric conditions. We have lately received from Mr. Hermann Herberts, of Newark, N. J., a description of a beautiful, scientific device of this kind, which, for want of space, we publish in the current issue of the SUPPLEMENT. Mr. Herberts discards the field of acoustics and calls to his aid the wonderfully sensitive and infallible powers of the thermopile. This delicate instrument in its most recent and highly developed form will register changes of temperature as small as $\frac{1}{100000}$ degree Centigrade. An ordinary thermopile will indicate the radiant heat from a person's hand at a distance of a yard or more, and Prof. Boys has been able to detect the heat of a candle that was a quarter of a mile distant from the thermopile.

Mr. Herberts' instrument consists of two thermopiles, each provided with a funnel for collecting the heat rays, which point in opposite directions and revolve in a horizontal plane upon a fixed standard, so that the full circle of the horizon is swept twice in every revolution of the pair. The piles are connected with a galvanometer scale and with a local circuit provided with call bells. If a ship is approaching from a given quarter, its heat radiations are caught in the revolving funnels every time they swing past the ship, and as she draws nearer, the strength of the current set up in the thermopile increases until the alarm bell is rung. By means of a revolving position indicator, an observer is able to determine the direction of the approaching ship. The increasing or diminishing action of the thermopile tells whether the ship is approaching or receding. The same laws of radiation make it possible for the instrument to indicate the approach of an iceberg, and in many cases the proximity of a sunken wreck or of the land itself. The instrument is a most ingenious adaptation of science to commercial uses, and it gives promise of solving one of the most perplexing problems connected with deep sea travel.

THE APPROACHING SCIENTIFIC JUBILEE.

BY HORACE C. HOVEY.

A widespread interest is felt in the elaborate preparations that are now in progress for the fiftieth anniversary of the American Association for the Advancement of Science, to be celebrated in Boston, from the 22d to the 27th of August. The council will have its headquarters at the Copley Square Hotel, while those of the association will be in the Rogers Building. The general and special meetings will be held in the rooms and halls of the Boston Society of Natural History, the Harvard University Medical School, and the Massachusetts Institute of Technology, all in the vicinity of Copley Square, where are also located the Boston Public Library, the Museum of the Fine Arts, and other buildings of interest. The place is easily accessible from suburban points by electric lines. Round-trip tickets may be had on all the railroads for one and one-third fare, good from August 18 to September 15, on certificates from local agents officially indorsed at Boston. Lunch will be furnished daily without charge to members, and most of the hotels offer reduced rates. Special arrangements will be made as to mail, telephone, telegraph, and express facilities.

Preliminary programmes have been issued as to the general and sectional meetings, from which it is evident that Boston is to have one of the most remarkable scientific gatherings ever held in this country. Every branch of science will be represented, and the members and guests will come from all parts of the continent and from many foreign lands. There will be addresses and papers on a vast variety of topics, many of them made clear by experiments or illustrated by the stereopticon. The first general session will be held in Huntington Hall, at 10 A. M., Monday, August 22, when addresses of welcome will be made by Governor Walcott, Mayor Quincy, and President Crafts, to which President F. W. Putnam will reply. Then will follow meetings of the nine sections into which the association is divided, to listen to addresses by their respective vice-presidents. These will be at different hours, to enable as many to hear them as possible. The address by the retiring president, Prof. Wolcott Gibbs, of Newport, R. I., will be Monday evening, and his subject will be, "Some Points in Theoretical Chemistry." Following the address will be a general reception. The wealth of material to be brought out by the sections may be inferred from the fact that nearly two hundred papers are already announced and many more are to follow.

Wednesday, August 24, will be "Salem Day," the association being the guest of the famous Essex Institute. In a similar manner Friday will be "Cambridge Day," on the invitation of the faculty and alumni of Harvard University. Numerous excursions are to be enjoyed, as the members may find the time and inclination, to localities of historic or educational interest in the vicinity of Boston. And after the adjournment of the association, more extended trips are planned to Cape Cod, the White Mountains, and other attractive resorts for pleasure or instruction.

Information as to the presentation of papers may be had by addressing the secretaries of the respective sections. Letters as to the general business of the body should be sent to the Secretary of the Association, Salem, Mass., previous to August 15, who will also receive assessments and nominations to membership. Prof. H. W. Tyler, local secretary, A. A. S., Boston, Mass., will give all desired information as to local arrangements.

SPAIN'S LOSSES ON THE SEA.

Now that Spain has definitely made overtures looking toward a cessation of hostilities and eventually peace, it is time to make an estimate of her losses at sea, which have been severe. Some fifteen or twenty merchant vessels have been seized as prizes and eighteen war vessels have been destroyed or captured. It is probable that the total money loss inflicted by the sunk or captured war vessels is not far from \$35,000,000, as the fleet of Admiral Cervera is alone estimated to have been worth \$20,000,000. The first merchant vessel which was captured was the "Buena Ventura," which was seized on April 22. Then followed the capture of the "Pedro," "Catalina," "Saturnina," "Panama," "Ambrosia," "Guido," "Bolivar," "Lopez," "Reina de los Angeles," besides a number of schooners, tugs, etc. We give below a table of the principal war vessels which were sunk or captured. No mention is made of such unrated gunboats as the "Alvarez," captured in Santiago Harbor after the surrender, the gunboats "Baracoa" and "Lijera," and the tugs "Rapido" and "Hercules."

Name.	Material of Hull.	Displacement.		Length.		Beam.		Maximum Draught.		Indicated Horse Power.	Armor.			Armament.		Torpedo Tubes.	Speed.	Normal Coal Supply.	Complement.
		Tons.	Ft.	In.	Ft.	In.	Ft.	In.	In.		In.	In.	Guns.	Kts.	Tons.				
Almirante Oquendo.....	Steel.	7,000	340	65	21	6	13,000	12	10½	3	12	10½	3	Two 11-in.; ten 5.5-in.; eight 2.2-in. Q. F.; eight 1.4-in.; two machine guns.	6	20	1,200	700	
Infanta Maria Teresa.....	"	7,000	340	65	21	6	13,758	12	10½	3	12	10½	3	Two 11-in.; ten 5.5-in.; eight 2.2-in. Q. F.; eight 1.4-in.; two machine guns.	6	20	1,200	500	
Vizcaya.....	"	7,000	340	65	21	6	13,000	12	10½	3	12	10½	3	Two 11-in.; ten 5.5-in. Q. F.; two 2.7-in.; eight 2.2-in.; four 1.4-in.; two machine guns.	6	21	1,200	500	
Cristóbal Colon.....	"	6,840	328	59	8	24	14,000	6	6	1½	6	6	1½	Two 10-in.; ten 6-in. Q. F.; six 4.7-in.; ten 2.2-in.; ten 1.4-in.; two machine guns.	4	20	1,000	450	
Furor.....	"	380	230	22	5	6	6,000							Two 12-pdr.; two 6-pdr.; two 37-mm. automatic.	2	28	100	67	
Plutón.....	"	400	225	22	6	5	7,500							Two 12-pdr.; two 6-pdr.; two 1-pdr.	2	30	100	70	
Reina Mercedes.....	"	3,090	278	10	42	7	16	5	3,700					Six 6.2-in.; two 2.7-in.; three 2.2-in. Q. F.; two 1.5-in.; six 1.4-in.; two machine guns.	5	17	5	600	375
Alfonso XII.....	"	3,090	278	10	42	7	16	5	4,800					Six 6.2-in.; two 2.7-in.; six 6-pdr. Q. F.; four 3-pdr.; five machine guns.	5	17	5	600	300
Jorge Juan.....	Wood	935	243	5	29	6	12	2	1,100					Three 4.7-in.; two 2.8-in.; two machine guns.	13		130	146	
Reina Christina.....	Steel.	3,520	282	2	42	7	16	5	3,970					Six 6.2-in.; two 2.7-in.; three 2.2-in. Q. F.; two 1.5-in.; six 6-pdr.; two machine guns.	5	17	5	600	370
Velasco.....	Iron.	1,152	209	11	29	3	12	5	1,500					Three 5.9-in.; two 2.7-in.; two machine guns.	14	3	220	173	
Don Antonio de Ulloa.....	"	1,130	210	32	12	6	1,600							Four 4.7-in.; two 2.7-in.; two Q. F.; five machine guns.	2	14	210	130	
Don Juan de Austria.....	"	1,130	210	32	12	6	1,600							Four 4.7-in.; three 2.2-in. Q. F.; two 1.5-in.; five machine guns.	3	14	210	130	
Isla de Cuba.....	Steel.	1,030	185	30	11	6	2,200							Four 4.7-in.; four 6-pdr. Q. F.; two 3-pdr.; two machine guns.	3	16	160	160	
Isla de Luzón.....	"	1,030	185	30	11	6	2,200							Four 4.7-in.; four 6-pdr. Q. F.; two 3-pdr.; two machine guns.	3	16	160	160	
Marqués del Duero.....	Iron.	500	157	5	25	7	8	5	550					One 6.2-in.; two 4.7-in. smooth bores; one machine gun.	10		90	98	
General Lezo.....	"	524	157	5	25	7	8	6	600					Two 4.7-in.; one 3.5-in.; two Q. F.; one machine gun.	2	11	80	97	
Elcano.....	"	524	157	5	25	7	8	6	600					Three 4.7-in.; two Q. F.; two machine guns.	1	11	5	80	116

It is impossible to get accurate figures of the cost of the cruisers which were sunk in the battle of Manila. Many of them were practically worthless, although their first cost may have been very great. The cost of Cervera's fleet is figured by "El Nacional"—and the value of the vessels certainly would not be overestimated by this paper—as follows:

Vizcaya.....	\$3,600,000
Oquendo.....	3,600,000
Maria Teresa.....	3,600,000
Cristóbal Colon.....	4,400,000
Plutón.....	500,000
Furor.....	500,000
Artillery.....	3,800,000
Total.....	\$20,000,000

That is to say vessels whose value was \$20,000,000 were lost to Spain in less than four hours. These figures check fairly well with those given in Brassey's Naval Annual. To the loss of territory and indemnity which Spain will have to pay should be added the \$35,000,000 worth of vessels sunk or captured, and to this will also have to be added an immense sum for the loss of freight and passengers which would have been carried in Spanish bottoms had it not been for the war. All this is a part of Spain's punishment.

A Unique Map of the Philippines.

A truly magnificent present has been received by the widow of the assassinated Spanish premier Canovas from the friends of her deceased husband in the Philippines. The gift consists of a splendid map of the Philippines made of solid gold, with all the provinces in relief; each city is marked by a ruby, every inscription consists of sapphires, and the dedication of brilliants of the choicest beauty. The map is inclosed in a beautiful frame, likewise composed of gold and precious stones and surmounted by a golden

bust of Canovas. The whole creation rests in a case of the finest wood, which is likewise a work of art. The gift represents a value of 120,000 marks (\$30,000). The Duchess of Canovas intends to exhibit it publicly for the benefit of the national subscription.—Gold und Silberw. Industrie.

Rapid Transit in Paris.

The law authorizing the city of Paris to erect a system of metropolitan railways having been promulgated, the municipality have published the terms of the convention concluded in July last with the General Traction Company, which undertakes to form within six months a special company for working the lines when constructed, with a capital of not less than 25,000,000 francs (\$5,000,000). The total length of the system of lines is forty English miles, but only twenty-five miles will be taken in hand at first, the city undertaking to construct the first portion in eight years.

As this is perhaps the first example of such a considerable work being undertaken by a municipality, details of the working convention may be of interest, says The London Economist. It has already been stated that the amount of the loan to be raised for the execution of the first portion of the lines is 165,000,000 francs (\$33,000,000). The Traction Company, which has obtained the working concession, undertakes to employ only Frenchmen, and to have all its plant and rolling stock made in France. The board of directors of the working company must be exclusively French; the company will be permitted to have its depots and works outside the city, but they must pay the octroi

duties on the materials employed, as if the buildings were within the city walls; the names of the stations must be of a uniform color and must be so placed that they may not be confounded with advertisements; the minimum wages or salary to be paid to any of the company's servants or employes will be 150 francs per month, or for workmen engaged temporarily 5 francs per day; the wages must be paid in full during the period of military instruction; the day's employment must not exceed ten hours, with a whole day or two half day's rest weekly, and ten days' holiday annually without deduction of wages; in case of sickness wages must be paid in full for at least a year; in case of accident, until complete recovery, without prejudice to the indemnity to be paid if permanently disabled, wholly or partially.

The fares are fixed at 25 centimes (5 cents) first class and 15 centimes (3 cents) second class for any distance. Passengers before nine in the morning may have for 20 centimes (4 cents) a return ticket, available at any hour in the day. Children of the municipal schools are to pay a fare of 5 centimes (1 cent) only when traveling collectively, accompanied by a master. The working company will pay to the city for the use of the lines 10 centimes (2 cents) per first class passenger and 5 centimes (1 cent) second class, increased progressively should the number of passengers carried during the year exceed 140,000,000. Children traveling for 5 centimes are not to be taken into account for the payment or the number. The stations and means of access to the platforms to be at the charge of the company, but the platforms are comprised in the work executed by the municipality. The concession is for thirty-five years, but the city reserves a right of purchase from the year 1910.