

ENGLISH ENGINEER'S ANALYSIS OF SQUADRONS OF SPAIN AND UNITED STATES.

The London Engineer is responsible for the comparison between the Spanish and United States navies published herewith.

"As the effective components of the two squadrons now facing one another in West Indian waters are considerably modified by the completion and purchase of additional vessels, their relative forces have been correspondingly changed since we last described them. The accompanying diagrams denote precisely the existing condition of the two groups of battleships, armored cruisers, and protected vessels which are of recent type, it being assumed that they—and not the older ships—will occupy the van of the fighting line in the event of war being declared. The diagrams, therefore, are illustrative of these types alone, and are framed upon the displacement, indicated horse power, weight of metal thrown, energy of fire, extent of armament, and relative speeds of twenty-five vessels, sixteen of them being Spanish and nine from the United States. America has other ships available, but so has Spain, and a more useful comparison can be drawn by adhering to the more important ships.

The totals of displacement, indicated horse power, extent of armament, combined weight and energy of projectiles thrown in one minute's fire, together with the average speeds of the vessels contained in the two respective fleets, are shown comparatively on the dia-

rather exceeds that of the ships of Spain; also that the guns are more in number. Here, however, any fancied superiority in the average qualities of the vessels composing the two groups ends. We have carefully analyzed the conditions as regards efficiency of fire, and separated the various types of quick-firing guns from those of ordinary character which happen to have the same caliber. The result of investigation, however, proves that, though the number of separate pieces of ordnance carried in the Spanish ships is less than that contained in the American squadron, the weight of metal thrown and the fire energy developed is far greater; the weight of projectiles fired usefully in one minute being 40,811 lb., or practically 20 tons, against only 37,808 lb.; while the fire energy is 1,529,516 foot-tons, against only 1,120,323 foot-tons as capable of being delivered by the ships of the United States. These are significant facts. The main factor in the product of gun power on the Spanish vessels is the output of energy created by the 47 quick-firing guns of 5.5-inch caliber; just as in our own squadron in Chinese waters, the chief element of gun power is derived from the 6-inch-quick-firing gun.

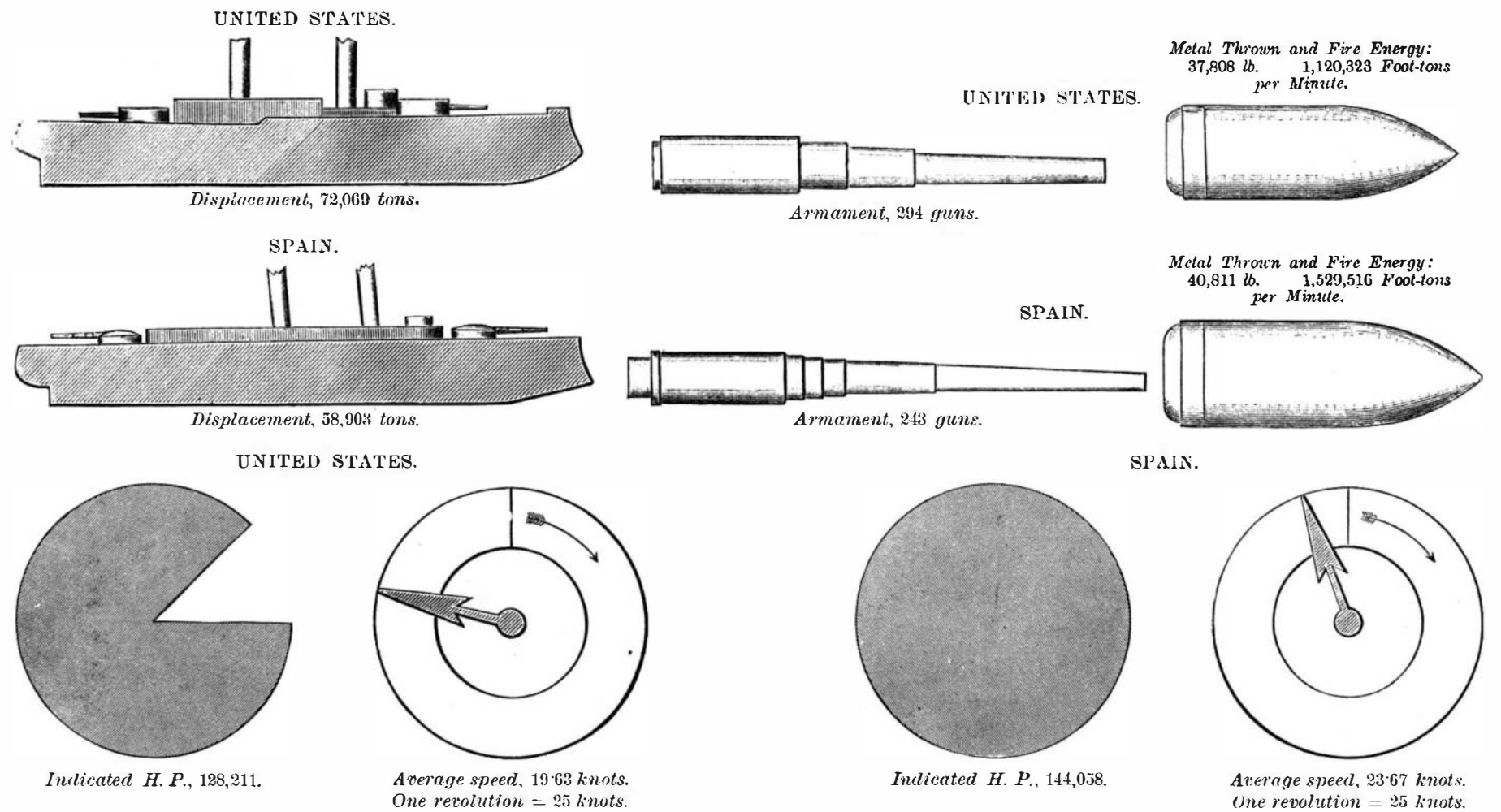
We ourselves, when visiting an important United States cruiser, took the opportunity of pointing out to the gunnery officer the unwisdom of mounting the old-fashioned 6-inch ordinary breech-loading gun in a brand new up-to-date ship of 22 knots speed. It is a fact, nevertheless, that out of thirty 6-inch guns car-

Cuba and Porto Rico run out, she must depend upon colliers which can run into and from blockaded ports; and the United States armed mercantile cruisers should be able to render this a very perilous little game.

A great deal, too, depends upon the man behind the gun. The 3,000 Swedish sailors who are to form part of the complement of the United States vessels might be excellent material if fighting in defense of their own hearths and homes; but naval warfare of the present day is no pastime—it is a grim and ghastly reality, swiftly executed, and no hirelings of an alien state are likely to come well out of such a terrible ordeal. In point of fact, we do not believe that the Yankees thoroughly understand the spirit of mischief that they seem so determined to evoke."

ANALYSIS OF SPANISH AND UNITED STATES SQUADRONS—A REPLY.

We feel compelled to criticise an article which appeared in The Engineer of April 15, and is reproduced on this page, on the subject of the American and Spanish navies. The writer attempts to prove that the Spanish fleets in the Atlantic have a positive advantage over those of this country in every point of comparison save two. He professes to select from each navy the ships which would be available in West Indian waters to "occupy the van of the fighting line." Of these he finds sixteen in the Spanish navy and



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gram; so they need not be repeated in the text. But these totals are most instructive. It will be observed that the displacement of the United States vessels

United States.	Knots.	Displacement.	I.H.P.	Guns.
Indiana ...	15.5	10,288	9,738	42
Massachusetts ...	16.2	11,410	10,403	44
Iowa ...	16.1	11,410	11,000	44
Brooklyn ...	21.9	9,250	18,769	36
New York ...	21	8,200	17,401	30
Columbia ...	22.8	7,475	21,500	27
Minneapolis ...	23	7,475	21,500	27
San Francisco ...	20.2	4,083	10,400	22
New Orleans ...	20	3,600	7,500	24

The United States vessels are arranged in three groups: Battleships, armored cruisers and protected cruisers.

Spain.	Knots.	Displacement.	I.H.P.	Guns.
A. Oquendo ...	20	7000	13,000	28
I. Maria Teresa ...	20.25	7000	13,758	28
Vizcaya ...	21	7000	13,000	26
Cristobal Colon ...	20	6840	14,000	38
Emp. Carlos V. ...	20	9235	18,500	20
Pelayo ...	16	9900	8,000	19
Alfonso XIII. ...	20	5000	11,000	22
Lepanto ...	20	4826	12,000	20
Audaz ...	30	400	8,000	6
Furor ...	28	300	6,000	6
Osado ...	30	400	8,000	6
Pluton ...	30	400	8,000	6
Terror ...	28	300	6,000	6
Ariete ...	26.1	97	1,600	4
Azor ...	24	108	1,600	4
Rayo ...	25.5	97	1,600	4

Spanish vessels in four groups: Armored and protected cruisers, destroyers and torpedo boats.

ried in the United States ships now under consideration, only six are quick-firing. There is an important difference, too, as regards speed and handiness in favor of the Spanish vessels, the average rate of her ships being 23.67 knots per hour, against an average of 19.63 as ruling in those of the United States. This degradation in the average is due to the comparatively slow steaming of the three battleships. It is difficult to see where the usefulness of these heavily armed floating citadels comes in except to capture and sink the "Pelayo." The main factors of projectile weight and fire energy which the American squadron possesses are due to the slow-firing 13-inch and 8-inch guns of these battleships. Yet there is small chance of their ever catching a glimpse of the swift, handy armored cruisers of the "Vizcaya" type, and still less chance of getting an effective shot at them. Were these weapons the rapid-firing 8-inch guns recently perfected by the Elswick firm, and which—we are delighted to say—are to be mounted in our cruisers of the "Diadem" type, it would be quite another story. But they are not, and we fear that the United States may find that their obstinate determination to arm their new vessels with guns which are the creation of their own genius has landed them in a dilemma at this juncture. Spain has wisely copied and purchased some of the best guns of all nations, including the productions of Krupp and Schneider-Canet, and she is, relatively, in a better position now as regards the armament of her recent vessels than the United States.

The great difficulty for Spain will, of course, be centered in the fact that she fights from a base more than 3,000 miles away. When the coal supplies in

only nine in that of the United States, and working on this basis he figures out that Spain could silence our fleets by superior gun-fire and outmaneuver them by superior speed.

By way of showing the unfairness of the comparison in detail, as well as in its comparison of totals, we have drawn up the tables on the next page basing our selection of American ships upon the principle laid down by our contemporary, viz., that the ships must be up to date and capable of operating in our first line of defense. It will be seen at a glance that the whole comparison is mischievous and misleading.

In the first place, the United States is credited with nine instead of twenty-seven ships, or just one-third of the ships that are actually engaged in or available for the West Indian waters. Two of the ships omitted are battleships, one the "Oregon," of over 10,000 tons displacement and about 17 knots speed, carrying a heavier armor-piercing armament than any ship in the world to day; the other the "Texas," of nearly 18 knots speed, and armed with 12-inch guns, a ship presenting the most stable gun platform of any vessel in our navy.

Even after excluding eighteen out of the twenty-seven ships which on The Engineer's basis of calculation should have been enumerated, our contemporary finds that the United States ships have the larger total displacement, 72,069 tons against 58,903 tons; but the writer proceeds to discount this superiority by proving that our fleet is relatively cumbersome and slow. This he does by throwing in the speed of the eight Spanish torpedo boats in striking an average speed for the whole fleet, by which maneuver he reaches an average speed of 23.67 knots for the Spanish fighting line.

In order to render the comparison strongly favorable to Spain and keep down our average speed, not a single torpedo boat is credited to the United States, although we have eight of these craft actually employed in Cuban waters.

Having worked out a disadvantage in speed against our navy, The Engineer proceeds to prove that in gun-fire we are hopelessly outclassed. This it does by making the false assumption that we have no, or practically no, heavy rapid-fire guns in our navy, and on this assumption, coupled with the fact that the Spanish ships are well supplied with rapid-fire guns, he figures out a total energy of gun-fire of over 1,500,000 foot-tons for Spain as against 1,120,323 foot-tons for the United States. In order to make this grossly erroneous showing, The Engineer has evidently not only failed to credit us with the 42 rapid-fire guns carried on the ships given in its table, but it has entirely left out of the table the four cruisers "Cincinnati," "Montgomery," "Marblehead" and "Detroit," which carry forty rapid-fire guns of 5-inch caliber as well as heavy secondary rapid-fire batteries. These four ships are as much entitled to be included in the comparison as are the protected cruisers Alphonso XIII. and the Lepanto. The fiction that our ships do not carry rapid-fire batteries is an old one with The Engineer, and, judging from the persistence with which it reappears, it is as popular as it is abiding.

Another curious fiction which is constantly cropping out is the idea that the United States monitors are not available in the fighting line. If our contemporary could be present in the preliminary skirmishes of the war, it would find that our monitors are very much alive, one of them having steamed into Matanzas Harbor and dropped 12-inch shells with precision into a battery which failed even to get her range; and another, also engaged in the blockade of the island, having chased and caught a 4,000-ton English-built liner that was endeavoring to run the blockade.

Our modern monitors are not to be confounded with their earlier prototypes. They carry complete Harvey steel belts, 9 to 14 inches thick, 11 to 14-inch Harvey steel barbets and turrets and 10 and 12-inch modern high power rifles. It may surprise our contemporary to learn that even on the monitors are to be found batteries of 4-inch rapid-fire guns. They have moved with the fleets in all the operations of the war, and any Spanish fleet that hopes to raise the blockade will have to do so after penetrating the Harveyized turrets and resisting the 10 and 12-inch guns of our coast defense monitors.

In drawing up our comparative table of the fleets we have followed the only fair and logical course and separated the ships into classes. Any other comparison is entirely misleading, as in the case of the average speed shown in the table of the article referred to, in which the torpedo boats, whose total displacement is only 2000 tons,

BATTLESHIPS.				
	Speed.	Displacement.	I. H. P.	Guns.
Indiana.....	15.5	10,288	9,788	42
Massachusetts.....	16.2	10,288	10,408	42
Oregon.....	16.8	10,288	11,111	42
Iowa.....	17.1	11,340	12,105	44
Texas.....	17.8	6,315	8,610	20

MONITORS.				
	Speed.	Displacement.	I. H. P.	Guns.
Puritan.....	12.4	6,060	3,700	20
Amphitrite.....	10.5	3,990	1,600	14
Miantonomoh.....	10.5	3,990	1,426	10
Terror.....	10.5	3,990	1,600	12

CRUISERS.				
	Speed.	Displacement.	I. H. P.	Guns.
Brooklyn.....	21.9	9,250	18,769	40
New York.....	21.0	8,200	17,401	32
Columbia.....	22.8	7,375	18,509	27
Minneapolis.....	23.1	7,375	20,862	27
San Francisco.....	19.5	4,098	9,913	22
New Orleans.....	21.0	3,670	7,500	24
Cincinnati.....	19.0	3,213	10,000	23
Montgomery.....	19.1	2,089	5,580	20
Marblehead.....	18.4	2,089	5,451	20
Detroit.....	18.7	2,089	5,227	20

TORPEDO BOATS.				
	Speed.	Displacement.	I. H. P.	Guns.
Porter.....	28.6	190	4,000	4
Dupont.....	28.5	190	4,000	4
Foote.....	24.5	142	2,000	3
Rogers.....	24.5	142	2,000	3
Winslow.....	24.5	142	2,000	3
Morris.....	24.5	103	1,850	3
Ericsson.....	24.0	120	1,800	4
Cushing.....	22.5	105	1,720	3

are allowed to pull the average speed of the whole fleet (58,903 tons) up to 23.67 knots an hour. In battleships we have five times the displacement, higher average speed, ten times the number of guns, and nearly four times the energy of gun-fire. In cruisers we have over 2,000 tons more displacement, slightly higher average speed, 40 per cent more guns, and over 180,000 foot-tons greater energy of gun-fire. It is only in torpedo boats that Spain is stronger, having double the displacement, 2½ knots greater average speed, more and heavier guns, and seven or eight times the energy of gun-fire. The greatly superior gun-fire of the torpedo boats is due to the fact that most of them are torpedo boat destroyers, and carry heavy batteries for the express purpose of sinking the enemy's torpedo boats.

Spain has absolutely nothing to oppose to our monitors, and if she wishes to release her beleaguered army, she must meet and break through a line of battle which will include these powerful ships.

There is another line of comparison which has been left out of The Engineer's article. We refer to the question of armor, as important an element as any in the whole comparison. Here, as the writer of the article must know only too well, the United States ships have a vast superiority. In the first place, the disposition

of the armor is better. The heavy 10, 12 and 13-inch guns of our ships are protected from the water line to the roof of the turrets with a continuous wall of from 12 to 18 inches of Harvey steel. All the Spanish ships, even including the "Pelayo," have the fatal defect—so eloquently descanted upon by The Engineer at other times, but curiously ignored in the present comparison—that there is a space of 8 or 10 feet between the belt and the base of the barbets which is absolutely without armor protection. This means that the searching fire of our rapid-fire guns will cut away the supporting framework below the barbets, and tumble guns, turning gear and barbets into the hold of the vessel. One well placed shell from our larger guns will do the same thing.

But what of the armor itself? Our ships carry our own Harvey steel, a make of armor for which the British Admiralty abandoned the old fashioned, faulty "compound" armor in a veritable panic when the superior excellence of the American product was proved a few years ago. If we mistake not, the building of ships in Spain was inaugurated under English supervision at a time when "compound" armor was considered the best. The keels of the armored cruisers were laid when these old ideas were prevalent, and it is probable that it is compound armor that clothes the Spanish cruisers to-day. If so, when our gunners begin to place 13-inch shells against the belts and barbets of the enemy, they will see the steel face crack and fly from its backing in the same lively fashion that it did when we tested an English compound plate against our own Harveyized armor a few years ago. The Engineer shared the consternation which seized the British authorities at the time when the superiority of the Harveyized plate was shown, and it will appreciate the force of the suggestion as applied to the comparison of the American and Spanish ships.

In concluding our comparison, we draw attention to the last and most ridiculous fiction of the many with which The Engineer has regaled its readers in this article. We refer to the suggestion that the American navy is largely manned by foreigners, who will not fight with any zeal for the flag under which they sail. In the first place, the proportion of foreigners is exceedingly small, and, in the recent enlistments, the additions have been entirely native born. Even in the case of the small minority of foreign-born men-of-war's men there is an enthusiasm for the adopted country which is the natural outcome of the better pay, better food, more humane treatment, and general tone of self-respect which falls to the lot or characterizes the bearing of the boys in our navy.

In referring to the accompanying tables, it should be borne in mind that only such vessels have been included as are actually in commission and available for engagement, if necessary, in or near the waters of the Gulf and West Indies.

TYPE OF SHIP.	DISPLACEMENT IN TONS.		NUMBER OF GUNS.		ENERGY OF GUN-FIRE IN FOOT-TONS.		AVERAGE SPEED IN KNOTS PER HOUR.	
	UNITED STATES.	SPAIN.	UNITED STATES.	SPAIN.	UNITED STATES.	SPAIN.	UNITED STATES.	SPAIN.
Battleships.....	5 ships. 48,519	1 ship. 9,900	190	19	933,600	263,000*	16.7	16.0
Coast Defense Monitors.....	4 ships. 18,030	None.	56	265,800	11.0
Cruisers.....	10 ships. 49,378	6 ships. 46,901	255	182	1,606,236	1,426,000	20.45	20.18
Torpedo Boats...	8 boats. 11,134	8 boats. 21,021	27	42	15,187	113,580	25.2	27.7
TOTALS.....	117,061	58,903	528	243	2,820,883	1,802,580†		

* Large energy due to her new armament of nine 5.5-inch rapid-fire guns.

† We have made a liberal computation of the energy of Spanish rapid-fire guns, assuming them to be the Canet 50-caliber pieces in every case.