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Contents.

(Illustrated articles are marked with an asterisk.)

Acetylene plant, a homemade 199 Antiseptic, a new 198 Archæological news 198 Bessemer, Sir Henry* 203 Books, new 198 Books, new 198 Bridge, Brooklyn, street cars on 185	Gunboat "Helena," conning tower of 1200 200 200 Haveneyer Hall, Columbia University" 201 Inventions recently patented 204 Library, Columbia University". 183 Musical wheel, a
Cane loading apparatus. Wiley s. *198 Cats and dogs, spschic develop ment	Notes and queries. 20 Patents granted, weekly record of 20 Physics building, Columbia University*. 193 Report, Commissioner of Patents. 195 Schermerhorn Hall, Columbia University*. 199 Sprinkling car, the Miller*. 197 Steel, Bessemer, effects. 198 Technical schools, German. 196 Teredo, the* 208
Fruit cleaning machine, Wright's *196 Game, new naval war	Warships, our recently purchased

TABLE OF CONTENTS OF

No. 1160.

For the Week Ending March 26, 1898.

Price 10 cents. For sale by all newsdealers

Price 10 cents. For sale by all newsdealers.	
P	AGE
1. ARCH ÆOLOGY.—Man in Relation to the Glacial Period	18536
II. BACTERIOLOGY The Longevity of Germs in Dust The Bacterium of Ambergris	
III. BIOGRAPHY.—Alphonso XIII., King of Spain.—An interesting account of the young monarch of Spain.—1 illustration	18533
IV. CHEMISTRY.—The Atomic Weights of Nickel and Cobalt	18543
V. ELECTRICITY.—An Electrolytic Process for the Manufacture of Parabolic Reflectors.—By SHERARD COWPER-COLES.—12 illustrations Telegraphs and Telephones in Persia.—Telegraphs	18542
VI. GEOLOGY.—Man in Relation to the Glacial Period	
VI. HORTICULTURE.—Artificial Fertilizers for Pot Plants	
	10040
VIII. MARINE ENGINEERING.—The Imperial Navy Yard at Kiel. —I illustration	18540 18541
IX. MEDICINE AND HYGIENE.—The Phonendoscope.—A curious instrument for ascertaining the state of the organs in the human anatomy.—4 illustrations.	
X. MISCELLANEOUS.—Nature's Compasses. Engineering Notes. Miscellaneous Notes. Selected Formulæ.	18538 18538
X1. PATENTS.—Abstract of Report of the Commissioner of Patents for 1897.—A full account of the work for the year 1897, with refer- ences to statistical tables, expenditures, laws, patent bar, the conference at Brussels and the international registration of trade marks.—The first installment of this always welcome report	
XII. PHYSICS.—Fantastic Soap Bubbles.—I illustration	18537
XIII. STEAM ENGINEERING.—Reduction in Cost of Steam Power from 1870 to 1897.—By F. W. DEAN, Boston, Mass.—This paper gives important figures as to the actual cost of producing steam in 1870 and 1897, showing the great increase in efficiency of steam generating and consuming devices.	
XIV. TRICKS.—The Mysterious Box.—lillustration	18537
XV. TRAVEL AND EXPLORATION.—Antarctic Exploration	18537

OUR RECENTLY PURCHASED WARSHIPS.

chased two cruisers whose general features so closely approximate to the distinctive features of warship design as carried out in this country. From time immespeed, and even more for the great power of their batteries. This was true in the days of the sailing frig-very high velocities of the "Amazonas" guns as comate, when our ships were wont to crush their opponents with the weight of their superior gun-fire and their principle is a good one. It has proved effective in the naval gun 2,188 feet, and so on through the smaller past, and it will do so in our next naval war. The calibers. British "Magnificent" is half as large again as the As further illustrating the development in naval debattery. The British "Blake" and our own "Brook- parison: lyn" are about the same size, yet the American ship is greatly superior in the weight of its guns.

Of late years the celebrated Armstrong firm, in the North of England, has been turning out ships which have carried truly enormous batteries compared with the displacement of the ships, and, at the same time, have shown themselves phenomenally speedy. The most noted instance of this is the re- a ship with more speed, with 50 per cent better pronowned "Esmeralda," of the Chilean navy-not the tection, 80 per cent larger coal capacity, and over 100 old "Esmeralda," of the late Chilean war, but a new cruiser of 7,000 tons displacement. This vessel carries no less than eighteen rapid fire guns of the 8-inch and 6-inch sizes, besides eight 3-inch rapid firers and ten 6pounders. From these guns she could pour into an enemy from either broadside during the first few minutes of the fight an amount of shell-fire whose total energy would be far greater than that of the biggest battleship afloat.

Our new acquisitions, the "Amazonas" and "Admiral Breu," are the very latest product of this yard and they exhibit the characteristic qualities of good be to bring the general average of the navy more speed and abnormally heavy battery, comparing in the roughly up to date. this respect with our own "Cincinnati." The princi pal dimensions, etc., of these twin ships are as follows: Length 330 feet, beam 43 feet 9 inches, draught 16 feet 3 inches would be equal to a vertical wall of say 5 boiler tests on the older ship. inches of Harvey steel. Before the shells could reach 6 or 7 feet of coal which is stored in the wings of the ship abreast the engine and boiler rooms.

ship, very powerful. It is not only powerful in num-Scientific American Supplement type. Not only are these guns more powerful for their out the trial. weight, but they have improved breech mechanism which enables them to be fired with greater rapidity. The following comparison of the Armstrong ship with one of the same size and type built for the cruiser of the existing navies of the world.

COMPARISON OF TOTAL ENERGY OF FIRE DURING

ONE MINUTE FROM ETHER BROADSIDE.					
	Number and Size of Guns.	Muzzle Energy.	Shots per Minute from Each Gun.*	Total Energy.	
"Amazonas," 1897	Four 6-inch. Two 4.7-inch. Five 2.24-inch.	4,840 foot tons 2,158 " " 280 " "	6 12 20	116,160 51,792 28,000 195,952	
"In tr epid," 1892		3,356 " " 1,494 " " 137 " "	5 10 20	33,560 44,820 10,960 89,340	

* This rapidity of fire would not of course be maintained for any length of time in the excitement and slaughter of a modern sea fight. The figures, however, serve for the present comparison.

zonas" can deliver from her broadside more than double | vessel of 2,400 tons and about 17 knots speed. The

the energy of shell fire that the "Intrepid" can, al-It may safely be said that Armstrong's is the only though the latter ship was built only five years in adshipbuilding vard in Europe where we could have purvance of the former—such is the rapidity with which naval science and construction advances.

Foot-ton energy, which we have chosen as the basis of comparison, is the product of weight or mass by vemorial American ships have been celebrated for their locity; and as the weight of the shells for each caliber of gun is the same, the increase in energy is due to the pared with those of the "Intrepid." Thus the 6-inch rapid fire Armstrong gun has a velocity of 2,642 feet excellent markmanship, and the same powerful bat-per second, against 2,200 feet for the British naval gun; teries are found on the ships of our new navy. The the Armstrong 4.7 inch gun has 2,630 feet per second, the

"Indiana," yet the latter carries by far the heavier sign in a brief five years, we append a further com-

Thickness Coal of Deck. Horse Power. Speed. Capacity. Amazonas "...... 2 inches. 7,500 20.00 9.000 "Intrepid"..... 2 " 19.75 400

We find then that by the use of improved materials and methods the naval architect has been able, using the same capital (3,600 tons displacement), to produce a ship having superiority on every point of comparisonper cent more powerful armament.

We can imagine no more convincing argument for a systematic and continuous programme of naval shipbuilding than is presented by a study of these figures. The "Intrepid" was one of seventy-two warships which were authorized in a single appropriation and built with a rush. The present policy in England and Europe generally is to build so many ships each year, and thereby insure that each year's ships shall embody all the latest improvements. A similar policy will undoubtedly be adopted in this country, and its effect will

THE EFFICIENCY OF THE WATER TUBE BOILER.

The efficiency of the water tube boiler needs no de-10 inches, displacement 3,600 tons. They have twin monstration at this late day; but the coal consumpscrews and engines, the horse power being 7,500 and tion trials which have lately been carried out on the the speed 20 knots. Their normal coal supply is 700 new cruiser "Diadem" are worthy of note because of tons, though they have stowage room for much more, the size of the boiler installation and the high ecoand could therefore proceed at low speed far from our nomy realized. The "Diadem" is a smaller edition of coal supply stations and reach hostile waters with a the "Powerful," which was of 14,000 tons displacement supply on hand. They are protected from stem to and 26,000 horse power, the displacement in the present stern by a complete Harvey steel deck which is 3 case being 11,000 tons and the horse power 16,000. Like inches thick where it curves down below the water the "Powerful" she is furnished with the Belleville line along the sides. This 3 inches would present a slop- water tube boiler and carries such improvements in the ing surface to the enemy, which would tend to deflect way of economizers for heating the feed water and highthe projectiles. If they were not deflected the oblique er steam pressure as were suggested by the memorable

The best results were obtained on a thirty hour test this deck, however, they would have to pass through at 12,500 horse power—three-fourths of the full power when the coal consumption worked out at 1.59 pounds per indicated horse power per hour. It is doubtful if The battery, as we have said, is, for the size of the this low rate is ever realized in the navy with the cylindrical boiler, and it is rarely reached with the same bers, but owing to the fact that its guns are of the type in the merchant marine. The "Powerful" using latest Armstrong pattern, they have vastly greater | the same boiler burned 1.83 pounds on a three-fourths power for their size than guns that were built only four horse power trial and the "Terrible" 1.71 pounds. or five years ago. Armstrongs are the builders of the The steam pressure on the "Diadem" was 280 pounds wirewound type of gun, which has shown results at the boilers and 245 pounds at the engines, and these greatly superior to those obtained by the built-up pressures were maintained with little variation through-

IS OUR MARITIME COMMERCE VULNERABLE?

It is a fortunate fact that in the event of hostilities we should be practically invulnerable in a quarter British navy from government plans shows clearly the where most nations would be open to disastrous attack. greater fighting power of the former. The figures Great and rapidly increasing as is our foreign trade, are taken from the official tables of the British navy only a very small percentage of it is carried in Ameri and the firm in question. The speed of fire is that ac- can ships. Although American shipping, inland, coasttually obtained by crews on board ships in com- wise and deep sea or foreign, ranks in the aggregate mission. The "Intrepid" is one of a class of thirty next to that of Great Britain, we are secure from ships built under the late Naval Defense Act, and attack for the reason that the bulk of it is confined to though not so up-to-date as the "Amazonas," may be the lakes and our great inland canal and river systems. considered as a good example of the average protected As regards our foreign trade, for the year ending June 30, 1897, the proportion of foreign commerce carried by American ships was a fraction over 11 per cent, and for the month of December, the same year, it had de creased to about 71/2 per cent. Thus it will be seen that in the fiscal year mentioned, for one ton of our commerce that was exposed to attack there were about nine tons which were safeguarded by the laws of neutrality.

Nor would our coastwise commerce, which is carried entirely in American bottoms, be so seriously affected as might be supposed; for the fastest of the ships which are in this trade would probably be utilized as auxiliary cruisers, and the merchandise, thanks to our superb system of seaboard railways, could be shipped by land.

Turning from the question of defense to that of attack, we note that the Naval Board appointed for the inspection and purchase of auxiliary cruisers has made From this comparison then it is evident that all a start by adding the late Ogden Goelet's fine yacht though the two ships are of the same size, the "Ama- the "Mayflower" to the fleet. This is a brand new