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NEW YORK, SATURDAY, DECEMBER 12, 1891.

Contents (Illustrated articles are marked with an asterisk.)

(Inustrated at ticles are i	haikeu with an aste
Agricultural inventions, recent. 377 Baboon, the South African* 371	Patent decisions, Patents granted,
Battleship, model, at World's	Photomicography
Fair*	Prestidigitation*.
cement, oil resisting (3716) 378	Printers' roller co
Copper deposits, the Keweenaw. 373	Printing press fris Pumping engines,
Cruiser New York, the*	Railway station,
Drainage system of St. Clair tun-	City
nel*	Rain making expe
Electrical atom, the	Stove feeder, Jon
Elevator door closer, Butler's* 370	" The Thrift "
Finances, public school 368	Tortoises, the Gal
luns, heavy, and the best armor 368	Tunnel, St. Clain
nventions, recently patented 377	the*
Magnets, ring	Twins, the Tocci*.
Dil fires	Vesuvius, cruiser, ure of
Dil of turpentine. testing 370	World's Fair mode
Paint for water tanks (3710) 377	World's Fair Note

F

Supreme Court 369 weekly record... 379 large*..... great, Jersey , great, Jersey 370 370 100 100 370 370 369 369 lapagas*..... r, drainage of dynamite, fail-

PAGE

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT

No. 832.

For the Week Ending December 12, 1891.

Price 10 cents. For sale by all newsdealers

1329 13299

13297

III. BIOGRAPHY.-Alfred Tennyson.-Biographical note of the great poet, now past his 30th year, with portrait.-I illustration... Fiftheth Year of the Prince of Wales.-The Prince of Wales and his family, with notes of his life and habits.-I illustration... 1329 13296

and his family, with notes of his life and habits.-1 illustration... CHEMISTRY.-American Association-Ninth Annual Report of the Committee on Indexing Chemical Literature. Avery import-ant report upon the titular subject, with probabilies of future ad-vance in this line.-The chemical index of the SCIENTIFIC AMERICAN and SUPPLEMENT. Apparatus for the Estimation of Fat in Milk.-By F. MOLINARI. -Details of a method of determining fat in Milk.-By F. MOLINARI. -Details of a method of determining fat in Milk.-By F. MOLINARI. -Torner Researches upon the Element Fluorine.-By A. E. TUT-TON.-Additional researches upon this element, following up the work outlined by M. MOISSAN--3 illustrations. The Allotropic Conditions of Sliver-A recent letter from M. CAREY LEA on this subject, with note of its presentation before the French Academy by M. BERTHELOT... The French Wine Law.-Recent enactment as to the adultera-tions of wine 13301

13301

13299 13302

FAILURE OF THE DYNAMITE CRUISER VESUVIUS. This novel type of war boat is declared by our best naval advisers to be of little use in her present condition, and it is recommended that she be altered into an ordinary torpedo cruiser.

of Lieut. Zalinski in New York harbor, 1887, in throwing projectiles charged with dynamite from pneumatic guns located on shore, led to the belief that similar weapons might be successfully used on shipboard; and the government, anxious to possess itself of an arm that appeared to be at once novel and formidable, hurried forward the construction of the Vesuvius. She was launched in 1888.

The Vesuvius is a steel ship of 725 tons displacement. 252 feet long over all, and 261/2 feet wide. She is with out masts, and practically unarmored. She draws a maximum of nine feet of water; the mean draught is eight and one-half feet. Her engines, which have been illustrated and described by us, are of four-cylinder, triple-expansion type. They actuate twin screws, and give a speed of about twenty knots an hour. Her model is characterized by very fine lines, engines 4 000 horse power.

In the forward part of the ship the three pneumatic guns that form her armament are placed. These are built into the ship. Their muzzles are carried forward and project above the deck near the bow. They are 15 inches in diameter, fifty-four feet long, made of thin cast iron, not rifled, the vanes upon the projectile being relied on to give any desired axial rotation.

The full-sized shell for this gun is 14% inches in LA AWERICA CLENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFICA MERICAN) is published monthly, uniform in size and typo-graphy with the SCIENTIFICA MERICAN. Every number of La America is projusely illustrated. It is the finest scientific, industrial trade paper indiced in the Spanish language is spoken. Stoll a year, post paid to sions-wherever the Spanish language is spoken. Stoll a year, post paid to any part of the world. Single copies 25 cents. See prospectus. MUNN & CO. Publishers. of high explosive, dynamite or gelatine, the whole weighing about 1,500 pounds when charged. This is the largest shell the guns are adapted to fire, and the effects of such a heavy charge of explosive can only be surmised. Should one explode in the air over a ship, the effects of the concussion on her crew would proba bly be very disastrous. According to the opinion of students of torpedo practice, the submarine explosion of such a shell within 20 feet of a ship would destroy it. ance of the naval experts a plant capable of turning

> The air by which the projectile is driven is compressed under a pressure of 2,000 pounds per square inch into tubular reservoirs.

> No attempt has ever been made to test the guns with a full charge of the explosive, by reason of defects in the mechanism which render dangerous the operations of loading and discharge.

The naval bureau considers this vessel in no respect fitted as a gun platform for artillery of this description, submarine torpedo effect at ranges where the question even if the latter proved of any military value. It will of accuracy of fire is absolutely eliminated." be readily appreciated that, unarmored as the Vesuvius is, her stores of high explosives and a large portion of the length of her guns are completely exposed to the fire of rapid-fire ordnance. The effect of a single shell from a 1-pounder sent into her magazine of high explosives may be imagined.

The vessel, as is well known, possesses only indifferent steering qualities, and, this being the case, it is outfits equal, if not superior, to those possessed by forprobable that two torpedo boats of the type of the eign nations." Touching the submarine gun now ap-Cushing, armed with an automobile torpedo and with proaching completion, the report says: "A further rapid-fire guns of smaller caliber, would very much consideration of the subject of submarine artillery overmatch her. It is considered, therefore, that the inclines the Bureau to the belief that it will prove a question of the value of the guns for war purposes valuable and important adjunct to our defensive armshould receive an early conclusion.

It is believed that the range of efficiency of the Vesuvius would be greatly increased by turning her into a that the chances of the ram being able to reach her torpedo cruiser. Her displacement is such that, with ; antagonist with destructive effect will be quadrupled her dynamite guns removed and a battery of considerable power placed for fore and aft fire, supplementing the larger calibers of rapid-fire guns with a number of 6-pounders, this vessel would then become a formidable antagonist for any of the unarmored types.

Her tubes, however, would be useful should they pass the necessary test for shore stations, or perhaps for a moored battery in harbor defense. The number of these weapons ordered for the land fortifications at New York, Boston, and San Francisco will also give opportunity to thoroughly investigate their value under more favorable circumstances than exist on board now been published by the Census Bureau. The centhe Vesuvius. sus bulletins Nos. 54, 98, and 141 contain these interest-

have been carried out with great thoroughness, and the work of production is now being pushed in American shops and by our own skilled mechanics.

In the recent report of Commodore Folger, chief of the Bureau of Ordnance, an interesting account is The striking success which attended the experiments given of the armor tests conducted during the year, and the report says the bureau considers that two important results have been achieved : First, a better plate, of American manufacture, has been produced than the department was able to purchase abroad a year ago; secondly, it has developed a new principle in the manufacture of armor, of American origin, which will furnish greater protection to the vital parts of a vessel of war than any other system hitherto employed. It has been established definitely that armor of excellent quality may be produced by the rolling process, and that forging by means of the hammer is not absolutely necessary. The report strongly urges the establishment of a national gun factory on the Pacific coast similar to that in Washington.

The expenses of the bureau for the year are estimated at \$4,780,291, of which \$4,186.250 is to be applied toward the armament of new vessels authorized to be built. The number of guns required to arm the new vessels is placed at 347, ranging in caliber from 4 to 13 in. The guns completed number 155, of which 117 were 6 in. caliber; 294 sets of forgings have been ordered, and 246 have been delivered. Although none of the ships authorized to be built requires guns of 16 in. caliber, it is believed that such guns may be needed, so the necessary plans have been made, and authority is sought for construction of one of them. It is believed that the difficulties experienced abroad with these large guns can be overcome.

The trials of smokeless powder, invented and manufactured at the torpedo station, are said to have resulted so satisfactorily that it is believed that within a very short time the use of gunpowder will be entirely abandoned in calibers of six inch and below it, being replaced by one of the smokeless powders. An order for 50,000 pounds of gun cotton, the best known high explosive for naval use, has been placed with the Duponts on condition that a complete plant be erected. The condition has been accepted, and with the assistout 1,000 pounds a day will be in operation in two months. After describing successful trials made with emmensite, the report says : "It is the bureau's intention to recommend the adoption of a relatively short gun of large caliber, using powder as the propulsive charge and firing a projectile containing a charge of emmensite, or gun cotton, for a feature of the armament of vessels, with a view of utilizing an aerial or

After recounting the efforts made to secure an effective automobile or fish torpedo, the report says: "The present state of work, in connection with automobile torpedoes and their accessories, is such as to justify the belief that the installation of outfits on board vessels will commence early in the coming year, and that our navy will soon be equipped with torpedo ament, particularly when mounted on board of vessels intended especially for ramming. It seems possible by the addition of this weapon to her means of offense."

Under the head of armor it is announced that negotiations are in progress to cause the plate to be delivered by the Bethlehem Company for the double turret monitors and the Maine and Texas to be of nickel steel. The armor ordered from Carnegie. Phipps & Co. is to be of the same material, the department supplying the nickel; 800 tons of ore for that purpose were purchased last year.

tions of wine	13202
 V. CIVIL ENGINEERINGModern Methods of QuarryingA recent paper of great value to all interested in exploiting quarries. -The most recent methods described, tending now to replace the cruder processes12 illustrations. The Trotter Curve HangerA surveying instrument for laying of railroad curves, with full details of its theory, construction, and use in the field4 illustrations. 	
and use in the field4 illustrations 1	13291
VI. METALLURGY.—The Great Bell of the Basilica of the Sacred Heart of Montmartre.—The founding of the great bell "La Savo- yarde" at the Paccard foundry in France.—Description of the bell, its inscriptions, and decorations.—3 illustrations	
VII. M1SCELLANEOUSDuck Hunting in ScotlandA curious method of approaching ducks under the guise of a donkey311 lustrations	
VIII. NAVAL ENGINEERING.—Hints to Shipmasters.—A very practical view of the proper personal habits of the commander	
of a merchant ship1 The British Cruiser ÆolusDetails of dimensions and arma-	13294
ment of this recently launched British ship	13293
IX. PHOTOGRAPHYDevelopment with Sucrate of LimeDe-	15294
velopment formulæ, involving the use of sugar solution saturated with lime. – Accelerating influences of certain chemicals	13296
X. RAILROAD ENGINEERING.—The Rail Spike and the Locomo- tive.—A most interesting article on an old time railroad.—Curious incidents in the construction of the Camden & Amboy Railroad, by the celebrateit Kohert L. Stevens.—A most graphic account of early difficulties	13292
XI. TECHNOLOGY-American Workshops.—The care of tools and practice in American workshops, as view from an English stand- point	
and other countries	13288

HEAVY GUNS AND THE BEST ARMOR.

ing statistics. They give the number of pupils en-As the result of the efforts made during the last half rolled, amount expended on salaries and miscellaneous accounts, and total expenditures. These are given in dozen years, the position of the country as to means sum totals and reduced to sums expended per capita of offense and defense has been vastly improved. Not of pupils enrolled, and the total expenditures are also only have we the fine new vessels of the white squadron, with many other and more formidable reduced to sums per capita of population. Many other tabulations of the money employed in the various ships approaching completion, but in the manufacture functions of the public school system are also given. of heavy guns and armor we have about passed the To all interested in education and the much debated experimental stage, and in several private establishments, as well as in the government shops, are now public school system these figures will be of the highturningout both guns and armor believed to be equal to lest interest. Curious instances of the wide range of or better than any made heretofore in Europe. The ex-expenditure occur. Alabama is given as expending periments which have been made in the testing of but \$1.85 per capita of pupils against Massachusetts' armor and armor-piercing projectiles, in trials of \$17.27 and Colorado's \$16 40. The total expenditure smokeless and other powders, and as to the service per capita of population does not fluctuate so widely, possibilities of various types of guns and gun carriages, ¹Alabama spending \$0.37 against \$4.08 in Colorado,



Public School Finances. The public school finances of thirty-one States have