Scientific American.

ESTA BLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT NO. 87 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included......One copy, six months, postage included

Clubs. - One extra copy of The Scientific American will be supplied gratis for every club of five subscribers at \$3,20 each: additional copies at same proportionate rate. Postage prepaid.

Remit by postal order. Address
MUNN & CO., 37 Park Row, New York.
To Advertisers.—The regular circulation of the Scientific AMERICAN is now Fifty Thousand Copies weekly. For 1880 the publishers anticipate a still larger circulation

The Scientific American Supplement

Is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size WITH SCIENTIFIC AMERICAN. Terms of subscription for Supplement. \$5.00 a year, postage paid, to subscribers. Single copies, 19 cents. Sold by all news dealers throughout the country

Combined Rates. - The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of seven dollars. Both papers to one address or different addresses, as desired.

The safest way to remit is by draft, postal order, or registered letter Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendidperiodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2., Commercial, trade, and manufacturing announcements of leading houses, Terms for Export Edition, \$5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. **E** Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

NEW YORK, SATURDAY, SEPTEMBER 25, 1880

Contents.

(Illustrated articles are marked with an asterisk.)

Beetle crop of Southern Russia. 199 Benzole 200 Billiard tables. improvement in* 198 Bridge, great, reconstructed 202 Bridge, forg, over the Voiga 202 Bridge, the Plattsmouth 191 Cable, Atlantic, another, new 196 Cappet yarns, adulterations of 195 Chinese steamer first 202 De Pourtales, Louis Francois 201 Diligence, reasonable 202 Double treadle atlachment* 196 Bridge, francois 201 Diligence, reasonable 202 Double treadle atlachment* 196 Brenomena, navural, Nevada's.	193 200 203 203 203 203 204 194 1195 1195
	202 209
Cab. new*	201
Cable, Atlantic, another, new, 1% Lung, chemical, a	106
Carpet yarns, adulterations of 195 Magnetism, terrestrial	202
Chinese steamer, first 202 Mechanical inventions	20(
	19
Diligence, reasonable 202 New York, could affect bombard?	19:
Double treadle attachment* 198 Oven, portable, new*	194
Earth, causes of present figure of 200 Phenomena, natural, Nevada's	19
Engineering inventions 197 Pill printing machine, French*	194
Faucet, beer. new*. 196 Propeller, the De Bay* Flies, traveling 193 Pyramids, how they were built.	13:
Flies, traveling	301
Flora, the, of volcanoes 199 Railway ties and telegraph poles.	
Foreman, model, a	192
Gauge, steam, first inventor of*. 195 Seals*	199
Glass, iridescent	203
Glass making, American 193 Sugarmaking in Louisiana	197
Gun, eight-inch, powerful 198 Telegraph Co., Anglo American.	190
Hens' wire nests'	198
Horn, welding	199

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 247.

For the Week ending September 25, 1880.

Price 10 cents. For sale by all newsdealers

Price 10 cents. For sale by all newsdealers.	- 1
•	PAGE
I. ENGINEERING AND MECHANICS.—Machinery for Makin, Wooden Shoes, 3 figures. On the Manufacture of Jute. By WILLIAM FLEMING. Origin of the Jute industry.—Softening.—Breaker card.—Finishercard.—Brawing frame.—Roving frame.—Spinning frame.—Jute fiber Mechanical Integrator. 1 figure. The Amsler-Laffon Integrator Hot Air Engline of Van Rennes. 1 figure. Pelzer's Screw Ventilator. 3 figures. Centrifugal Screw Ventilator at the Dusseldorf Exhibition. Compressing Steel. Paper on the arrangements for steel compressing at the Barrow Works. By Alfred DAVIS. Wire Rope Connections. 3 figures. Eaumann's wire rope connection for mining cages. The Ville D'Oran and the Ville De Bone. 1 large illustration Two English built French steamers.	3927 . 3928 . 3930 . 3931 . 3932 . 3932 . 3933
II. TECHNOLOGY AND CHEMISTRY—Photo-Lithography. Photography and the Industries. By Dr. H. W. VGEL Largest Sheets of Plate Glass. Nickel Flated Handcuffs. The Manufacture of Vinegar by Means of Bacteria. By EM MANUEL WURM Progress of Sugar Adulteration. The Chemical Reactions of Morphine Purification of Sewage Donato Tommasi's Definition of Nascent Hydrogen. Detection of Salicylic Acid in Wine and Fruit Juices. By Dr. I WEIGERT. Chemistry as an Art and as a Science. American Association Address by Prof. J. M. ORDWAY	. 3929 . 3929 . 3929 . 3929 . 3936 . 3937 . 3937 . 3937 . 3938 n 3939
III. ELECTRICITY, SOUND, ETC.—A New Air Thermometer. Physics Without Apparatus. 8 figures.—Water boiled in a pape box.—Experiments in inertia. Decamier lifted by a struw.—Tantains cup—Electrical attraction. Experiments in acoustics. Electrolytic Determination of Silver. Joseph Henry's Electrical and Magnetic Discoveries. Enloyy b A. M. MAYER. First discovery.—Second discovery.—Prof. Henras a man of genus. Alternative Currents and the Electro-motive Force of the Electric Arc. Remarkable Recovery of Cable from Deep Water.	3930 3935 3938 3938 3938 3938 3942
in Nuremberg: 18th century work. 1 large illustration	e 39 3 5
V. ASTRONOMY.—Present Condition of Astronomical Science. American Association Address by ASAPH HALL Jupiter—Report of observations by Prof. G.W. HOUGH at Dea bortObservatory.—2 views of Jupiter.—The equatorial telescope The figure of Jupiter.—Equatorial Belt of Jupiter.—Red spot. Satellites of Uranus	3941
VI. NATURAL HISTORY, ETC.—A Profitable Strike Pyrethrum the Best Insect Killer.—Directions for raising. Effects of the powder.—Effects of the fumes of burning pyrethrun Bacterias in the Atmosphere. Parasites in the Muscles in Typheid Fever. The New Route to Siberia.	3938 3940 3941

COULD A ! HOSTILE FLEET BOMBARD NEW YORK !

In these days of modern ordnance, when rifled guns can send missiles weighing nearly a ton to distances never contemplated at the time when most of our harbor defense systems were projected, the question cannot fail to arise: Is New York safe from bombardment by a hostile fleet? not unjust arraignment of the unscientific methods by England, France, Germany, or Italy, could concentrate a | which science is usually mistaught in schools. The chief aim dozen heavy iron clads off Sandy Hook within three weeks of the committee was to inquire how far the public school of a declaration of war, and as we have absolutely no ships our defenses sufficient to save our sea-coast cities from of original investigation, and is naturally interested to know bombardment?

In view of the enormous ranges obtained by Herr Krupp with his new rifled breech-loading guns, the question also arises whether New York could not be shelled from the open sea, where the enemy would be far beyond the effective range of our forts. In the first place, how far can shells be thrown? For the purpose of bombarding a city it is unim-taught scientifically. The reason why fact does not conof the enemy's capacity to single out particular buildings contra-trained for scientific thinking, while the few who nary accuracy at long ranges. The 31/2 and 41/2 inch guns of teaching are prevented by the fixed requirements of the 'lateral deviation at this distance being less than 60 yards. committee, the old idea of a school is a place "where or 6.8 miles. But it is claimed that the larger guns, from 8 ideal. The early effect of grading was to fix and consoliinches to 15.75 inches in calibre, will give a much greater date irrational methods. The sciences were dissimilated to range. During our civil war General Gillmore threw shells the old practice, and the science teaching falls short at just Herr Krupp exhibited a 12 inch gun bearing the modest in teachers had grown rigid under the regime of book studies. scription: "Range 15 English miles." Probably it is allow. As a consequence, the science teaching in the public schools limit of this gun's range. But Krupp's latest gun, 15.75 Its facts and principles are explained as far as possible, famous 100 ton guns furnished to the Italian government by history. He is not put to any direct mental work upon the Sir William Armstrong may have a range proportionate to subjects of science, or taught to think for himself. As an extravagant estimate for them.

guns of an unfinished fort on Sandy Hook. The channel is sively acquired in their results. This is not scientific educachannel is about two miles from the Sandy Hook fort, and, Science, as a means of training the faculties, in the various tant from the fort, but it has a depth of only 14 feet. Now, ing the observing powers, or of stimulating inquiry, or of Sandy Hook, until they approached Forts Hamilton and Wadsworth at the Narrows. The fort at Sandy Hook is only half begun, and it is of old and almost obsolete character, and therefore in the event of a hastily declared war it would not be likely to afford much protection. Hence it is far different at the Narrows. Without going into the the lower part of the city to grief.

of the city in this direction depends upon the fort at Sandy Hook and the efficiency of our torpedo system.

But there is another direction whence the city could be reached if guns can be invented of sufficient range. From from the Sandy Hook fort and five miles east of Fort Hamilton, the distance is exactly ten miles, and one mile further brings one to the 25-foot line of soundings. In other words an iron-clad drawing twenty-four feet of water can approach within eleven miles of the Battery without exposing herself to the slightest danger of even being fired at. Consequently it needs only a gun to carry twelve miles to place out all originality. the whole of Brooklyn and the wealthiest part of New York at the mercy of an enemy. Such a gun is not only possible at is possible for the lower schools to teach science scientifibut extremely probable; and, in view of the helpless posi cally, the committee does not say. The truth is education tion in which we should then be placed, in the absence of any navy to take the offensive, it might be well for our business men to take thought for the future by asking habits through the reasonable attainment of exact know Congress to give them some form of protection in the event ledge. In the child world there is no science; and the at of war. It opens the widest field for the inventive genius tempt to cram boys and girls with scientific informationof this country to exert itself to devise such protection.

SCIENCE TEACHING IN SCHOOLS.

The Report of the Committee on Science Teaching in Schools, signed by Professors E. L. Youmans, A. R. Grote, J. W. Powell, and J. S. Newberry, and read before the American Science Association by Dr. Youmans, is a severe but system has availed itself of the valuable aid which science whatever to meet them at sea, we should have to depend offers in the proper cultivation of the minds of the young. upon our coast defenses and torpedoes for protection. Are The association aims to advance science by the promotion whether the methods of the schools favor or hinder genuine scientific study; whether they foster the early mental tendencies that lead to original thought, or thwart and repress

That the latter is generally the case is only too evident; yet in every school the belief is that science is taught, and portant that the aim should be accurate. New York could form to theory in this matter may be found in the single be terribly injured by any kind of stray firing, irrespective circumstance that the majority of teachers are untrained or as targets. But the Krupp guns have shown an extraordic could be and would be glad to be scientific in their methods have given accurate results as high as 9,057 yards, the schools as developed on examination day. In the words of the Their extreme range, so far as any records have been made knowledge is got from books by the help of teachers, and public, has not exceeded 11,000 meters, about 11,900 yards, our public school system grew up in conformity with this from a 300 lb. Parrott gun into Charleston, a distance of the points where it was inevitable that it should fall short. eight miles. At the Centennial Exhibition in Philadelphia, The methods of school teaching and the habits of the able to stretch the truth at an International Exhibition, and is carried on by instruction. Through books and teachers so it is not unreasonable to allow ten miles as the outside the pupil is filled up with information in regard to science. inches caliber, throwing a solid shot of 1,760 lb. weight, may and then left in the memory with the other school acquivery likely exceed even ten miles. In like manner the sitions. He learns the sciences as he learns geography and their immense size, in which case 12 miles would not be thus treated, the sciences have but little value in education. They fall below other studies as means of mental cultiva-Now let us examine the chart of the sea coast around New ition. Arithmetic rouses mental reaction. The rational York Bay. There are three channels from the open sea to study of language, by analytical and constructive tasks, the Narrows. The main entrance passes close under the strengthens the mental processes; but the sciences are pasdeep and comparatively constant in depth. The Swash tion, because there is no practice in the scientific method. at low tide, its depth will not permit the entrance of a vessel , ways to which they are severally adapted, is not taught in drawing more than 24 feet. The third channel is far distitue public schools. It is not made the means of cultivatwhile every effort would be made, by using torpedoes and exercising the judgment in weighing evidence, or of formother obstructions, to close the main and Swash channels ing original and independent habits of thought. As reagainst an enemy's fleet, it is not impossible that an entrance marked by Agassiz, the 'pupil studies nature in the school should be effected. Since torpedoes are available only when room, and when he goes out of doors cannot find her.' This covered by heavy fire from guns on shore or on shipboard, mode of teaching science, which is by no means confined to the ships could proceed in comparative safety, after passing the public schools, has been condemned in the most unsparing manner by all eminent men of science as a deception, a fraud, an outrage upon the minds of the young, and an imposture in education."

Futher on the committee justly remark that the failure to gain the benefits of real scientific study seems to have its the probability of a fleet passing has been considered; but source deep in the constitution of the public schools. In dealing with masses of children classification became neparticulars of the armaments of these forts it is sufficient to cessary, which gave rise to grading and an elaborate mechani say that there are no vessels afloat that could approach cal system. The working of children in lots is a great nearer than one-half of a mile to these forts without being convenience to the teacher, but it strengthens the method of sunk by torpedoes, unless some skillful inventor shall devise 'verbal instruction, recitations, and lesson-giving. It is well a hitherto unthought of protection against these hidden fitted to impress the public with the idea that there is much and deadly machines. But at the distance mentioned the done in the schools. There is a prescribed routine of ships would be only seven miles from the battery, and if operations and a display of order that is admired. But they could maintain their position there, and if they had teacher and learner are subordinated to the system. It is guns with a range of eight miles, they could easily bring machine work, and the machines make no allowances. Graduation assumes and enforces a uniformity among Assuming that a Krupp 71-ton gun was used, throwing a pupils that is false to the facts. Wide personal differences shell of 1,760 lb., containing a charge of 73 lb. of powder, the of capacity, aptitude, attainment, and opportunity not only destruction would soon reach into the millions. One such exist among children, but they are the prime data of all shell exploding in a warehouse would wreck it from cellar efficient mental cultivation. In the graded schools, just in to roof. Since it is very probable that a range of eight proportion to the perfection of the mechanical arrange miles will be obtained in the near future, the invulnerability ments, individuality disappears; and with individuality goes originality. Science, if rightly pursued, is the mos valuable school of self-instruction. From the beginning men of science have been self-dependent and self-reliant, because self-taught. They have been more hindered than the Battery to the sea beach of Long Island, seven miles helped by the schools. De Candolle, in his valuable book on the conditions which favor the production of scientific men, says that the discoverers, the masters of scientific method, have chiefly appeared in small towns where educational resources have been scanty, and that they have often been most helped by the poorness of their teaching, which means that the schools were not so perfect as to kill

Where there is any cure for this state of things, whether and schooling are and always have been radically at variance, meaning by education an orderly growth in right mental science teaching as commonly understood and practiced-4s