Scientific Zmerican.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors. PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

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, for the U.S., Canada or Mexico. \$6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page. Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U.S., Canada or Mexico, on receipt of seven dollars. To foreign countries within Postal Union eight dollars and fifty cents a year.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern arcintecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate buildings this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, \$2.50 a year. To foreign Postal Union countries, \$3.00 a year. Combined rate for Building Edition with Scientific American and Supplement, \$3.00 a year. To foreign Postal Union countries, \$4.50 a year. Combined rate for Building Edition, Scientific American and Supplement, \$3.00 a year. To foreign Postal Union countries, \$1.00 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published menthly, uniform in size and type-graphy with the SCIENTIFIC AMERICAN. Every number of La America is profusely illustrated. It is the finest scientific, industrial trade paper protected in the Spanish language. It circulates threughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. \$3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

MUNN & CO., Publishers,
361 Broadway, New York.

The safest way to remit is by postal order, express money order, raft or bank check. Make all remittances payable to order of MUNN 30.0.
Fraction and the property of the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK. SATURDAY, DECEMBER 8, 1894.

(Illustrated articles are marked with an asterisk.) Athletics as a mental training... 359 | Lactals

Armery, Tist Regiment* 384 Lirabs, artificial 38 Beeks and publications, new 365 Bread, aerated 385 Bread, Brooklyn, new stations 361 Bridge of Meatar, the Remark* 361 Bridge of Meatar, the Remark* 361 Brooklyn City R. R. power station* 362 Buillet, the small caliber 364 Cast iren, liquid, desulphurization of the carbeit of the carb	Attrictics as a mental training 559	Lactola 35
Bread, aerated. Bridge of Meastr, the Henners. Bridge of Meastr, the Henners. Sol Bridge of Meastr, the Henners. Sol Bridge of Meastr, the Henners. Sol Breoklyn City R. R. power staton. ton of	Armery, 71st Regiment* 369	Limbs, artificial 36
Bread, aerated. Bridge of Meastr, the Henners. Bridge of Meastr, the Henners. Sol Bridge of Meastr, the Henners. Sol Bridge of Meastr, the Henners. Sol Breoklyn City R. R. power staton. ton of	Books and publications, new 365	Literature, early history of 35
Bridge of Mearar, the Roman's 355 Brooklyn City R. R. power stations's 365 Brooklyn City R. R. power stations's 365 Buildings, tall, steel foundations of 36	Bread, aerated	Machinery effects of
Brycking for Mastar, the Homers* 359 Brooklyn City R. R. power statons* 350 ton* 351 Buildings, tall, steel foundations of* 351 Bullet, the small caliber 351 Cast iron, liquid, desulphurization of 352 Cantilever, the, in building* 353 Compass field glass, the* 356 Bead Sea of America, the 356 Beathquakes in Mexico 553 Blectric car builders advice for 358 Electric fraction in Paris 355 Electric fraction in Paris 359 Elm tree, a double* 359 Electric fraction in Paris 355 Electric fraction in Paris 359 Elm tree, a double* 359 Electric fraction in Paris 355 Electric		Maxims good
Breoklyn City R. R. pewer station of the small caliber and sulfillings, tall, steel foundations of soft and steel foundations of sulfillings, tall, steel foundations of sulfillings and sulfi		Meat, frozen, thawing 35
ton* Sof* Sullet, the small caliber Sof* Cast iren, liquid, desulphurization of Compass field glass, the* Compass field glass, the* Soft Beat Sea of America, the Soft Bettric car builders, advice for Soft Bettric bettric car builders, advice for Soft Bettric bettric car builders, advice for Soft Bettric bettric bettric bettric bettric bettric car builders, advice for Soft Bettric		Monkey in man the 36
Buildings, tall, steel foundations of* of* of* of* abiler, the small caliber 333 Buller, the small caliber 334 Cast iron, liquid, desulphurization of. Cast iron, liquid, desulphurization of. Cantilever, the, in building* 335 Compass field glass, the* 336 Dead Sea of America, the 337 Electrical effects on wood 338 Electric car builders, advice for 338 Electric conduit railways 332 Electric traction in Paris 335 Electricity as bait 339 Elm tree, a double* 339 Elm tree, tree imprevements 349 Electric traction in Paris 359 Electric traction in Pa		Mortar batteries, Sandy Hook,
of* 333 Mosquitees, experience with 355 Bullet, the small caliber 354 Cast iren, liquid, desulphurization of 355 Cantilever, the, in building* 355 Cantilever, the, in building* 356 Cantilever, the, in building* 357 Cantilever, the, in building* 357 Cantilever, the, in building* 358 Cantilever, the, in building* 358 Cantilever, the, in building* 358 Cantilever, the same and the sa	Buildings, tall, steel foundations	
Bullet, the small caliber	of* 353	
Cast iren, liquid, desulphurization of the properties of the prope	Bullet the small caliber 354	
tion of	Cast, iron, liquid, desulphuriza-	
Cantilever, the, in building* 538 Compass field glass, the* 366 Dead Sea of America, the 361 Earthquakes in Mexico. 357 Electric car builders. advice for 358 Electric car builders. advice for 358 Electric car builders. advice for 358 Electric traction in Paris. 355 Electric traction in Paris. 356 Electric traction in Paris. 356 Electric traction in Paris. 357 Electric traction in Paris. 356 Electric traction in Paris. 356 Electric traction in Paris. 357 Electric traction in Paris. 356 Electric traction in Paris. 357 Electric traction in Paris. 356 Electric traction in Paris. 357 Electric traction in Paris. 358 Electric traction in	tion of	Notes and queries. 36
Compass field glass, the* 356 Dead Sea of America, the 861 Earthquakes in Mexico 357 Electrical effects on wood 358 Electric car builders, advice for 358 Electric conduit railways 352 Electric traction in Paris 355 El	Cantilever the, in building* 353	Patent decision 96
Dead Sea of America, the \$61 Photographic reproduction of Earthquakes in Mexico \$357 Electrical effects on wood \$358 Electrical effects on wood \$358 Electrical effects on wood \$359 Electric conduit railways \$350 Electric traction in Paris \$350 Electric tra	Compass field glass, the* 356	Patents granted weally record 36
Earthquakes in Mexico. 357 chalk drawings. 358 Electric car builders, advice for 358 Electric conduit railways. 352 Electric conduit railways. 352 Electric traction in Paris. 355 Electric traction in Paris. 355 Electric traction in Paris. 355 Electric traction in Paris. 356 Electric traction in Paris. 357 Electric traction in Paris. 358 Electric traction in Paris. 359 Electric traction in Electric tracti	Dead Sea of America, the 361	Photographic reproduction of
Electrical effects on wood. 388 Photography, prevention of hallectric car builders, advice for .388 Electric conduit railways. 329 Electric fraction in Paris. 355 Electric traction in Paris. 355 Electricity as bait. 359 Electricity as bait. 350 E	Earthquakes in Mexico 357	
Electric car builders, advice for, 388 Electric conduit railways. 382 Electric conduit railways. 382 Electric traction in Paris. 355 Electricity as bait. 339 Elm tree, a double*. 330 Elm tree, a d		Photography prevention of he-
Electric conduit railways. 322 Plaster center piece industry* 35 Electricity as bait 359 Electricity as bait 359 Elm tree, a double*. 351 Eyesight, influence of occupation on. 362 Fox and the eagle, the 358 Freude, James Anthony* 362 Evenue, James Anthony* 363 Evenue, James Anthony* 365 Eve		lation (6315)
Electric traction in Paris. 355 Electricity as bait 339 Elm tree, a double* 339 Elm tree, a double* 339 Elm tree, a double* 339 Evesight, indicence of ecupation on. 359 Fox and the eagle, the 358 Fronde, James Anthony* 361 Gelatine sheets, making (6316) 365 Hestograph patent, expiration* 355 Hydrogen, phosphoreted 360 Hydrogen phosphoreted 360 Hydro		Plaster center niece industry* 35
Electricity as bait 339 Elm tree, a double* 361 Eyesight, influence of occupation on. 362 Fox and the eagle, the 588 Freude, James Anthony* 381 Gelatine sheets, making (6316) 365 Hestograph patent, expiration* 355 Hydrogen, phosphoreted 360 Hydrogen phosphoreted 360 Hydro		
Eyesight, influence of ecupation on	Electricity as bait	Ruins of cliff dwellers 38
Eyesight, influence of ecupation on	Elm tree, a double* 361	Signaling military experiments
ton on. 322 Smoke bleacher, the Eureka* 35 Froude, James Anthony* 351 Steam as a defense. 35 Gelatine sheets making (6316) 35 Tenement house, a model. 35 Hydrogen phosphoreted. 350 Torpedo boat Ardent. 35 Hydrogen phosphoreted. 360 Water jet pumps (6313). 35	Evesight, influence of accura-	in 36
Fox and the eagle, the	tion on 269	Smeke bleacher the Euroku* 35
Froude, James Anthony* 361 Swordish, a ship pierced by 35 Gelatine sheets, making (6316) 365 Tenement house, a model 35 Hestograph patent, expiration* 355 Torpedo boat Ardent 35 Hydrogen, phosphoreted 360 Water jet pumps (6313) 363	Fox and the earle the 358	
Gelatine sheets making (6316) 365 Tenement house, a model 35 Hestograph patent, expiration* 355 Torpedo beat Ardent 355 Hydrogen, phesphoreted 360 Water jet pumps (6313) 33	Fraudo James Antheny* 361	Swordfish a ship piercod by 25
Hektograph patent, expiration* 355 Torpedo beat Ardent	Gelutine sheets making (6316) 365	
Hydrogen, phosphoreted 360 Water jet pumps (6313) 367		Tornado hast Ardont 25
Inventions, recently patented 364 Water power of Niagara 36	Frdrogen pheenhoroted %0.	Woter let nume (6212)
in only the recently parented obs water power of magain 30		Water nower of Niegore 98
	intentions, receiving parented 304	water power of Magaia 30

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 988.

For the Week Ending December 8, 1894.

Price 10 cents. For sale by all newsdealers. I. AGRICULTURE. - Eight Tons of Sugar to the Acre. - Statistics of the sugar industry of the Sandwich Islands, with the exact fig-

wres of results.

ANTHROPOLOGY.—Bables and Monkeys.—By S. S. BUCKMAN.

ANTHROPOLOGY.—Bables and Monkeys.—By S. S. BUCKMAN.

BUGKRAPHY.—King Ageliagho • Dahomey.—Notes on the King of the Amazons, with reproduction of a photograph of his majesty.—I thus tration. His Imperial Majesty Nicholas II. the New Czar of Russia.— Notes on the new Czar of Russia. bis life and character.—1 illus-

tration

IV. CHEMISTRY.—History of Soda Water.—An interesting monograph on a suggestive subject in the history of chemistry.

The Free Exygen of the Missing of the history of chemistry.

The interesting the property of the history of chemistry.

The interesting of the history of chemistry.

The free Exygen of the history of chemistry of the history of the property of the history of the history of the control of the history of the work of the w 15794

15790

which there amount it is a mapled to the largest ships.—12 mustices.

Sanitation of Ships.—A view of the past and present of ships with reference to health upon the waters.

PHOTOGRAPHY.—Recent Advance in Photography.—By E. W. HILL.—An important paper on the Possibilities and present status of advanced lines of work in this science.

Use of Photography in Topographical Drawing.—The application of the camera for topographical work, with practical examples. 3 illustrations.

1. PHYSICS.—Ink Crystals. An exceedingly pretty experiment in the production of effects similar to those of snow crystallization.—11 lilustration.

the production of effects similar to these of snow crystallization. -lillustration. -PSYCHOLOGY.—Hallucinations and Delusions.—By W.M. M. MCLATRY, M.D.—Peculiarities of the mind and the phases of its

MCLAURY, M.D.—Peculiarities of the mind and the phases of its development, elaborately treated Measuring the Senses.—Direct experiments on the operations of children's minds in judging of weights and measures in the operations of children's minds in judging of weights and measures in the T. J. COBDEN-SANDERSON. A very exhaustive and excellent paper on the bookbinding of the present day, its operations and characteristics. Confectioners' Flavorings.—Essential oils and their sources. The Relative Efficiency of Different Abrasive Productsin Common Use.—The comparison of different kinds of emery with each other and with other abrasives.

A TORPEDO BOAT THAT RATES OVER THIRTY-THREE tion wrought by the new bullet is largely the result of MILES PER HOUR.

feet long, 19 feet wide, 14 feet deep. Her engines are 5,000 horse power, built by Thornycroft & Co. On flesh and fractured the bone. trial November 9, making two runs with and against | ever attained by a steam vessel. At the above speed the Japanese field hospital, near Nagasaki, he says: there was an absence of the usual vibration and but little flame at the tops of the chimneys. The Ardent wounding qualities of the new small bore rifle that all is a wonderful boat. We need not enlarge upon the Europe is adopting. The Japanese infantry arm is the importance to our own navy of the possession of vessels equal in speed to those of other nations, and it is ordnance of Japan. The caliber of the gun is 0.315 and to be hoped Congress will lose no time in providing the bullet weighs 235 grains. for their construction.

THE NEW BROOKLYN BRIDGE STATIONS.

Brooklyn Bridge is being rapidly advanced, and some-finely comminuted bone splinters. The knee was perthing of their ultimate design is already apparent. fectly soft, without a bone in it unbroken an inch long. With the new system of tracks and platforms, trains Of course the leg had to be amputated." may be run across the bridge every 45 seconds, instead of every 90 seconds, as at present. The present carry-10:30 and the bullet weighs 220 grains. When this buling capacity of the cars is 16,000 per hour, and this will let was first decided upon, there was considerable talk be increased to 32,000 persons per hour. There will also about the new bullet lessening the mortality in war. be an entirely new arrangement of stairs and passage. Many persons claimed that the new projectile would, ways for reaching the street and the elevated railroad in a large number of cases, simply put the soldier hors stations. The exacting requirements of the new sta- de combat, and some even went so far as to call it a tions and the limited amount of space available for "humanitarian" bullet; butit is difficult to see wherein carrying them out make the work very interesting humanity is benefited, in view of the facts mentioned from a mechanical standpoint.

The platforms in the new stations will be much wider than the present ones, and tracks will be laid on Vinci has well remarked. each side of them. The trains will be run to and fro on both sides of these platforms, thus making it possible to load and unload two trains at a time. At presthe bridge is much farther advanced than on the New York side. The framework of the building is in place and the work of putting on the roof is already well under way. The outward appearance of the station will be much the same as the old one, but the interior arrangements will be widely different. The Brooklyn station now extends from Sands Street to High Street. although it will ultimately extend on its north end as far as the north side of Sands Street. This part of the work, however, will be delayed until the Brooklyn elevated railroad has finished its connection with the bridge, and the present elevated railroad station has been removed. The new bridge station will not be used until both of the elevated roads are ready to bring passengers to its southern end. The Brooklyn elevated road intends to run through the northern end of the bridge station, then to encircle the plaza and pass again through the station at its souththe trouble of switching. According to Superintendon the new system before next spring.

the stations on both sides of the river to prepare for the apartments for Germans, Jews and Italians. new arrangement. The purpose is to spread the railroad tracks wider apart than they are at present, so that the trains may be run to the outer edges of the new platform. The new tracks will therefore extend a trifle over the old roadway.

A serious objection to the new system will be the increased danger of accident incurred in handling so many trains. The new system is, however, the most perfect one possible under the present conditions. To obtain greater safety of transportation, relief can only be found by building other bridges.

THE SMALL CALIBER BULLET IN THE EAST.

entitled "Small Caliber Projectiles." Since the ap- these would prevent any person from approaching pearance of this article the world has learned of the | nearer than this distance. Similar pipes could be run terrible wounds produced by the small bullet in the to the rear of the train and be supplied with nozzles, war between China and Japan. It has been known rendering it impossible for any one to reach the rear for a long time that the small caliber bullet would platform. necessarily increase the death rate in war. In Germany doors, while by the use of flexible pipes or hose the the number of litter bearers has been largely increased, steam could be carried and discharged from the winso that every corps now has 1,168 litter bearers; this dows at will. These pipes need not be so large as to increase was made in view of the fact that greater be unsightly or inconvenient in any way. mortality might be expected. As far back as the bat- A further use of steam as a means of defense, the intle of Gravelotte, in 1870, the superiority of the French ventor claims, would be in protecting banks against chassepot of 11 mm, over the Prussian needle gun of thieves. Since banks are usually heated with steam, 14 mm. was noted. From 18 6 on experiments have the attachment could readily be made. Small jets of been conducted to ascertain the efficiency of the new steam might be so arranged at the windows of the projectiles and the nature of the wounds produced by | tellers that they could be projected into the faces of them. In the lecture delived to the cadets at Annapolis the robbers. These jets might be operated by hidden "On Gunshot Injuries Produced by the New Projec- levers or by electrical attachments. tile of Small Caliber," by Henry G. Beyer, Surgeon 15791 Institute, thirty-four references were made to literature jets of steam could be discharged at doors and winexperiments were made on cadavers and animals, and lar manner, and as long as the supply of steam held showed that a great deal of the tissue was destroyed out, the inventor claims, they could not possibly be and the bones very finely comminuted. The destruc- carried by assault.

the so called "explosive action." By this term we are The British Admiralty is adding a large fleet of fast to understand the injury produced by projectiles, torpedo boats to the navy, several of which, already which is out of proportion to the size of the projectile completed, are faster than any boats in the world. itself. Thus if the tissues are destroyed or pulped and The latest example is the Ardent. This boat is 200 the bone pulverized, the injury would be more extensive than if the bullet had merely plowed through the

The captain of one of the American warships on the tide, her mean speed was 29 18 knots per hour, or a Asiatic station has written home of some very interlittle over 331/2 miles per hour—the fastest velocity esting things that he has seen. Describing a visit to

"There I got a fair conception of the killing and Murata, the invention of Gen. Murata, now chief of

"I saw a Chinese officer who had been struck in the knee joint by one of these bullets, fired at a distance of about 1,000 yards. The thin steel envelope of the The work of enlarging the terminal stations of the bullet had broken and the joint was simply a mass of

> The caliber of the new United States magazine rifle is above, unless it is to assist in extirpating war, for after all a battle is a "bestial frenzy," as Leonardo da

A Model Tenement House.

Plans are being discussed by a number of philanent the work on the station at the Brooklyn end of thropic people in New York for providing healthful and comfortable tenement houses for the poor at reasonable rates of rent. It is proposed to build on a plot of ground in Brooklyn, 75 by 208 feet, a huge structure six stories high, to contain 408 rooms. Several of the provisions for the comfort of these people will doubtless prove of great value. A central open court, 20 feet wide, will run from the front to the rear of the building, thus providing plenty of light and air. No rooms are to communicate, but all will be easily accessible. The frame of the building is to be constructed of iron or steel, and the covering will consist of sheets of corrugated iron. The whole is to be absolutely fireproof. The building will also be supplied throughout with the most approved sanitary arrangements. The estimated cost of the building is \$125,000. The rooms will be rented in suites of 2, 3 or 4, at the rate of \$3 a month for each room. The stock company who expect to supply the capital for this undertaking argue that ern end, thus forming a continuous loop and avoiding the tenement houses are a necessary evil, and that charity should be expended to the end of making them ent Martin, it will not be possible to run bridge trains as wholesome as possible. A novel feature of this es tablishment will be the distinct divisions into which The roadways on the bridge have been widened near the house is to be divided, in order to provide separate

····• + = + + Steam as a Means of Defense.

A simple and effective method of repelling train robbers by discharging jets of steam upon the attacking party has recently been patented by William H. Reeve, an old tugboatman, of New York. The inventor has enlarged upon the plan long followed by railroad companies of attaching a steam jet to locomotives to scare cows and other animals from the track. The patent provides for running steam pipes along the boiler, one on either side from the cab forward. The ends of the pipes are supplied with small nozzles so formed that jets of steam may be projected through In our issue of November 10 we published an article them a distance of 50 or 60 feet. It is claimed that Other pipes could be arranged at the

A more ambitious plan, however, is to utilize steam U. S. N., printed in the Proceedings of the U. S. Naval in the defense of forts, armories or arsenals. Powerful on the subject, no title being earlier than 1881. The dows of arsenals. Forts could be protected in a simi-