

MUNN & CO. Editors and Proprietors

PUBLISHED WEEKLY AT

A. E. BEACH.

No. 361 BROADWAY, NEW YORK.

•. D. MUNN.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, to any foreign country belonging to Postal Union. 4 00 Remit by postal or express money order, or by bank draft or check MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper form 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 Kates, -The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S., Canada or Mexico, on receipt of seven dollars. To foreign countries within Postal Union, nine dollars a year.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERI-CAN is a large and splendid illustrated periodical, issued monthly, con-taining floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and archi-tectura! work in great variety. To builders and all who contemplate build-ing this work is invaluable. Has the largest circulation of any architec-tural 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, \$5.00 a year; combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, \$5.00 a year; Combined rate, for BUILDING EDITION with SCIENTIFIC AMERICAN, \$5.00 a year; Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, \$5.00 a year; Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, \$5.00 a year; Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, \$5.00 a year; Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, \$5.00 a year; Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, \$5.00 a year; Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, \$5.00 a year; Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, \$5.00 a year; Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, \$5.00 a year; Combined rate for BUILDING EDITION, \$5.00 a year; Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, \$5.00 a year; Combined rate for BUILDING EDITION year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typo-graphy with the SCIENTIFIC AMERICAN. Every number of *La American* is profusely illustrated. It is the finest scientific, industrial trade paper profusely illustrated. It is the finest scientific, industrial trade paper printed in the Spanish language. It circulates throughout Cuba, the West Indies, Mexico Central and South America, Spani and Spanish posses-sions-wherever the Spanish language is spoken. \$3.00 a year, post paid to any part of the world. Single copies 32 cents. See prospectus.

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

B The safest way to remit is by postal order, express money order, aft or bank check. Make all remittances payable to order of MUNN G. Readers are specially requested to notify the publishers in case of any failure delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, NOVEMBER 26, 1892.

Cont	ents.
(Illustrated articles are n	narked with an asterisk.)
gricultural appliances, some	Mathematician, a natural 340
gricultural experiments 335	Mineral the most useful 335
bumen in photography 337	Mining inventions
ags instead of barrels for	Mirage
sugar 339	Nasal douche, substitute for 345
ees fly, the distance 344	Notes and queries 347
irds that eat acorns	Ordnance notes 343
oxwood substitutes	Palm, double cocoanut 344
rain, an historian's 343	Patents granted, weekly record
ipher typewriting	OI
orbor, a new	Photographic developer, a new. 343
omet, the Brooks 310	Projectile trial a recent 336
rabe migratory 344	Railway appliances some new 346
leep sea horing*	Railway Jaffa and Jernalem* 342
isinfecting fluid for instru-	Serpents, feeding habits of 344
ments 342	shear legs, winding gear for* 345
ynamo armature, a large* 342	Smoke preventing furnace, Sar-
lectric light upon plants 344	gent's* 338
ngineering inventions, recent. 346	Stone cutters' strike, the 343
invelope and wrapper, O'Don-	Telephone exchange, electro-
nell's 338	mechanical*
ish under ice, torpidity of 344	Tooth filling, lead for
luorography	Tortoise shell and pearl, inita-
as engine, a large	Tunnel a great English 340
Jairs and feathers 344	Tunnel test Prince Edward
erbarium, oldest in the world., 340	Island' 343
nventions, recently patented 346	Veneering
ron manufacture, proposed, in	Vine disease, the California 341
Mexico 344	Water, salt, in cities 339
antern slides, how to color 343	Wool, preparation of 339
•	-

Æ

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT

No. 882.

For the Week Ending November 26, 1892.

Price 10 cents. For sale by all newsdealers

A RECENT PROJECTILE TRIAL.

ing projectile took place on November 10, at Reddington, Pa.

While great strides have been made in the developtry of late, the subject of armor-piercing projectiles has not been neglected. The projectiles that have enrich some collector's cabinet may be the result. stood the most severe tests and are considered the most and the Holtzer, the balance of favor being with the latter. They are both made in France.

up the study, manufacture, and development of pro- observed comets it may have exceeded one hundred jectiles, some having purchased the secret processes of miles. Therefore, in a cometary collision we may be foreign makers.

The projectile fired at Reddington was one that had Head Proving Grounds, Maryland. There it was fired from a six inch breech-loading rifle at a six inch nickel- the destinies of a continent. steel armor plate. It penetrated the plate and wood in the bore of the gun.

ed to the rear a distance of 125 yards, and two large supply of this slight diluent or impurity. pieces of it were found. About one-twentieth of the up into small fragments.

intact with the ogival head, the other part detached.

The average projectile either breaks up or becomes so distorted on the first fire at a modern armor plate that it is useless; but this one had passed, with very Von Leer.

THE COMET.

sun. The hair star or tress bearer, as its name "comet" may be rendered, pursuing its orbit, will approach Here is at least a notch or foothold for a theory. much theorizing. We now may make the acquaint-|lery. meeting.

For to-day we know little of comets. They have as the gaseous friction of the atmosphere, and such part distinctive features a head or nucleus and a tail. The only we may assume can reach our earth. latter is of such excessive tenuity that although it may This would account for the cosmic dust, and for the be conspicuous on the absolutely black background survival of the fittest projectile material, nickel-iron or of the heavens, yet stars can shine with virtually un-inickel-steel, for even the carbon is there for its cementation. This gives us the satisfaction at least of feeling diminished luster through a million miles of it. Sir Isaac Newton compared the brightness of a that our earth's envelope of oxygen and nitrogen will protect us from all but metallic projectiles, and if we comet's tail to that of the motes in a sunbeam an inch or two thick. Imagine this diffused through the vast are to be bombarded, it will be with improved and space filled by the comet. Sir John Herschel was so modern shot. For of all meteoric material, only the nickel-steel or nickel-iron alloy, as a rule, reaches the impressed by this tenuity that he put the weight of a comet's tail as being perhaps only an affair of a few earth in masses. The rest is pulverized to dust. Its pounds, or only of a few ounces. Our earth will meet constitution may be widely different from that of the perhaps with the tail. It is satisfactory to feel that metallic meteorites we find on the earth. All or most of what is taught about comets and meteorites is little in walking through a recently swept room the particles of dust suspended in the air resist our progress more than theory and surmise. Even the name of the present visitor is uncertain. We are not yet sure that far more than would the matter in a comet's tail. it is Biela's comet at all. But the nucleus of the visitant is more solid and contains a greater concentration of mass. From it the THE demand for Percheron horses for export is so tail emanates. The tail points away from the sun in whatever direction the comet is moving, suggesting great that the purity of the breed is threatened, and a Stockton's "negative gravity." The nucleus of the stud-book has been started in France by which the largest comets resolves into a mere speck of light pedigree may be preserved and the race kept up to when seen by the most powerful telescopes. But this the standard

speck may be solid incandescent matter or may shine A very interesting ballistic trial of an armor-pierc- by reflected light. From it in its passage through space fragments of all sizes may be torn off and distributed along the comet's orbit. The earth intersecting this orbit may pick up or attract into her atmoment and manufacture of armor and guns in this coun- sphere some of these fragments, and a fall of shooting stars, a meteoric display and a rain of meteorites to

The tail of a comet points away from the sun. Runexcellent in the world are those known as the Firminy ning down its axis, a dark straight line has been observed. This seems to be the shadow of the unknown nucleus. The knowledge we possess as to the In this country a number of steel makers have taken size of the nucleus is negative and conjectural. In struck by a white hot missile of these dimensions.

Volcanic eruptions making or annihilating islands been manufactured under the Wheeler process, by the impress us as overwhelming in their might. The Sterling Steel Works, at Demuler, Pa. This projectile impact of a cometary nucleus in the formation of a had been tested by the government officials at Indian crater, with the possible penetration of the earth's crust, and in the creation of tidal waves, might affect

But even this is all conjecture. Meteorites are princibacking of thirty-six inches and embedded itself in the pally composed of metallic iron and nickel. These inearth bank behind the target. After recovery, it was cidentally are about the last things we should look for found to be in perfect condition. It had been so little in them. The fact is that their composition is such. injured and distorted that it could be and was pushed The theory that they are derived from comets is rather through the bore of the gun from which it was fired. a favorite one with astronomers. To determine the It had been upset or shortened a very small fraction of constitution of comets the spectroscope has been apan inch, and the diameter had been so slightly increas- plied and reveals the element carbon. This rather dised that there was no danger of its sticking or jamming concerts the upholders of the cometary origin of meteorites.

It was then sent to Reddington, to Lieut. J. F. | An extraordinary thing is noted by Langley. Sir Meigs, United States navy, who fired it again on No- Isaac Newton, he says, made one of his "guesses" in vember 10. He gave it a velocity of 1,660 feet per sec- this connection that take the nature almost of proond, firing at a soft nickel-steel plate of 14 inches thick- phecy. Two hundred years before the spectroscope ness. It penetrated the plate to a depth of 9¼ inches was invented, and a century before the work of Black and raised a front bulge of 21/2 inches in height and 16 had borne its fruits, Newton surmised that comets inches in diameter. The shot hole was surrounded by might supply the atmosphere with its carbonic acid a large combing wave fringe. The projectile rebound- gas. Our atmosphere in a few days may receive a new

The comet of 1680 was subjected to heat two thouprojectile was lost, and no doubt that part was broken sand times greater than that of red hot iron, according to Newton's calculations. From the neighborhood of The point and ogival head were in splendid condition the sun the comet flew into the regions of almost aband were highly polished. The cylindrical part of the solute zero. These great alternations of temperature, projectile had split longitudinally, one part remaining it is probable, disintegrate the nucleus, and to that extent make it a possible source of meteorites.

The size of meteorites is generally small. In view of their high velocity this is a fortunate circumstance for us, who have to stand their bombardment. They are slight distortion, completely through one plate, and on also very widely dispersed. In a shower of meteorites, its second firing did not break up badly. A number of it is probable that the individual masses are ten miles distinguished men witnessed the trial, among them apart. Some of them are no larger than a pea, and are being Mr. G. W. Childs, of Philadelphia, and Baron probably two hundred miles in average distance from their nearest neighbors. Our present visitor may be disseminating such particles along its orbit.

When the earth meets these asteroids, which are of A day or two after the date of this issue of the far more than icy coldness, they fly through its atmo-SCIENTIFIC AMERICAN the earth will be on intimate sphere with enormous velocity. As certainly as the terms with a celestial visitor from far-off regions. For impact with an armor plate heats an iron cannon ball, on November 26 and 27 it is calculated that Biela's so the friction with the atmosphere heats the celestial comet will be probably within one million miles of the projectile. The mere friction is supposed to dissipate earth. This is about four times the distance of the | most of them in the upper regions of the air, leaving moon, and about one hundredth of the distance of the them to slowly descend as cosmic dust. Many tons of this dust is supposed to reach us daily.

our orbit at this remarkably small distance from The meteorites which reach us intact are masses of the earth, as distances are astronomically consider- | nickel and iron. Curiously enough, one of the very ed. The chemist has analyzed meteorites, the petro- alloys proposed for use in making projectiles for guns grapher has examined their structure; their con- and armor for war ships is a nickel-steel alloy, so that stitution, and even shape, have been the objects of we are not yet much in advance of the celestial artil-

ance of what is possibly a producer of meteorites. In Leaving this aside, we may assume that, however meeting Biela's comet we may observe phenomena large the nucleus of a comet is, it is composed for that will elucidate some of the perplexities of meteor- the most part of carbon and of easily disintegrated ites. The equal perplexities that hedge what we know materials to which our atmosphere will offer a real of the nature of comets may also be diminished by this resistance. Then we may suppose an exceedingly small part of it to be of sufficiently solid material to resist

III. MECHANICAL ENGINEERINGImproved Gas EngineAn English gas engine of very simple construction, with notes as to its economy of operation3 illustrations	3
 IV. MEDICINE AND HYGIENE.—Calomel in Hæmorrhoids.—A simple treatment of hæmorrhoids by direct application thereto of calomel	2
V. MISCELLANEOUS.—Cane Contrivances.—A most curious article, with many illustrations, describing the different uses that can be made of canes in the way of articles carried in their heads, or of purposes they are made to subserve by appliances connected with them.—22 illustrations	6 9
VI. NAVAL ENGINEERINGThe French Cruiser Stax-A deck- protected cruiserOne of the largest in the French navyHer engine, construction. and armanent1 illustration	2
VII. RAILROAD ENGINEERING.—The "Alley" Elevated Road, Chicago.—The novel features of the Chicago elevated road.—De- tails as to the structure and operating plant	2
VIII. OPTICSSome Optical IllusionsSome curious and simple optical illusions discussed, with reasons for the phenomena13 illustrations	9
IX. TECHNOLOGY.—Cold Storage Temperatures.—A very valuable table, giving the proper temperatures at which different articles should be preserved in cold storage	•