

Scientific American.

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.

One copy, one year, for the U. S., Canada or Mexico. \$3 00
One copy, six months, for the U. S., Canada or Mexico. 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00

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.

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 architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of La America is profusely illustrated. It is the finest scientific and industrial trade paper printed in the Spanish language.

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

NEW YORK, SATURDAY, DECEMBER 8, 1894.

Contents.

(Illustrated articles are marked with an asterisk.)

Table listing various articles such as Athletics as a mental training, Army, 71st Regiment, Books and publications, new, Bread, aerated, Brooklyn City R. R. power station, Buildings, tall, steel foundations, Bullet, the small caliber, Cast iron, liquid, sulphurization, Cantilever, the, in building, Compass field glass, the, Dead Sea of America, Earthquakes in Mexico, Electrical effects on wood, Electric car builders, advice for, Electric conduit railways, Electric traction in Paris, Electricity as bait, Elm tree, a double, Eyesight, influence of occupation on, Fox and the eagle, the, Freude, James Anthony, Gelatine sheets, making (6316), Helograph patent, expiration, Hydrogen, phosphoreted, Inventions, recently patented, Lactola, Urabus, artificial, Literature, early history of, Machinery effects of, Maxims, good, Meat, frozen, thawing, Monkey in man, the, Mortar batteries, Sandy Hook, trial of, Mosquitoes, experience with, Navy yard improvements, New York City enlargement, Notes and queries, Patent decision, Patents granted, weekly record, Photographic reproduction of chalk drawings, Photography, prevention of halitosis (6315), Plaster center piece industry, Railroad accident, English, Ruins of cliff dwellers, Signaling, military, experiments, Steam as a defense, Swordfish, a ship pierced by, Tenement house, a model, Torpedo boat Ardent, Water jet pumps (6313), Water power of Niagara.

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 988.

For the Week Ending December 8, 1894. Price 10 cents. For sale by all newsdealers.

Table listing detailed contents of the supplement, including I. AGRICULTURE, II. ANTHROPOLOGY, III. BIOGRAPHY, IV. CHEMISTRY, V. ENTOMOLOGY, VI. HORTICULTURE, VII. MECHANICAL ENGINEERING, VIII. MISCELLANEOUS, IX. NAVAL ENGINEERING, X. PHOTOGRAPHY, XI. PHYSICS, XII. PSYCHOLOGY, XIII. TECHNOLOGY.

A TORPEDO BOAT THAT RATES OVER THIRTY-THREE MILES PER HOUR.

The British Admiralty is adding a large fleet of fast torpedo boats to the navy, several of which, already completed, are faster than any boats in the world. The latest example is the Ardent. This boat is 200 feet long, 19 feet wide, 14 feet deep. Her engines are 5,000 horse power, built by Thornycroft & Co. On trial November 9, making two runs with and against tide, her mean speed was 29.18 knots per hour, or a little over 33 1/2 miles per hour—the fastest velocity ever attained by a steam vessel. At the above speed there was an absence of the usual vibration and but little flame at the tops of the chimneys. The Ardent is a wonderful boat. We need not enlarge upon the importance to our own navy of the possession of vessels equal in speed to those of other nations, and it is to be hoped Congress will lose no time in providing for their construction.

THE NEW BROOKLYN BRIDGE STATIONS.

The work of enlarging the terminal stations of the Brooklyn Bridge is being rapidly advanced, and something of their ultimate design is already apparent. With the new system of tracks and platforms, trains may be run across the bridge every 45 seconds, instead of every 90 seconds, as at present. The present carrying capacity of the cars is 16,000 per hour, and this will be increased to 32,000 persons per hour. There will also be an entirely new arrangement of stairs and passageways for reaching the street and the elevated railroad stations. The exacting requirements of the new stations and the limited amount of space available for carrying them out make the work very interesting from a mechanical standpoint.

The platforms in the new stations will be much wider than the present ones, and tracks will be laid on 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 present the work on the station at the Brooklyn end of the 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 southern end, thus forming a continuous loop and avoiding the trouble of switching. According to Superintendent Martin, it will not be possible to run bridge trains on the new system before next spring.

The roadways on the bridge have been widened near the stations on both sides of the river to prepare for the 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.

In our issue of November 10 we published an article entitled "Small Caliber Projectiles." Since the appearance of this article the world has learned of the terrible wounds produced by the small bullet in the war between China and Japan. It has been known for a long time that the small caliber bullet would necessarily increase the death rate in war. In Germany the number of litterbearers has been largely increased, so that every corps now has 1,168 litterbearers; this increase was made in view of the fact that greater mortality might be expected. As far back as the battle of Gravelotte, in 1870, the superiority of the French chassepot of 11 mm. over the Prussian needle gun of 14 mm. was noted. From 1866 on experiments have been conducted to ascertain the efficiency of the new projectiles and the nature of the wounds produced by them. In the lecture delivered to the cadets at Annapolis "On Gunshot Injuries Produced by the New Projectile of Small Caliber," by Henry G. Beyer, Surgeon U. S. N., printed in the Proceedings of the U. S. Naval Institute, thirty-four references were made to literature on the subject, no title being earlier than 1881. The experiments were made on cadavers and animals, and showed that a great deal of the tissue was destroyed and the bones very finely comminuted. The destruction wrought by the new bullet is largely the result of the so called "explosive action." By this term we are to understand the injury produced by projectile, which is out of proportion to the size of the projectile itself. Thus if the tissues are destroyed or pulped and the bone pulverized, the injury would be more extensive than if the bullet had merely plowed through the flesh and fractured the bone.

tion wrought by the new bullet is largely the result of the so called "explosive action." By this term we are to understand the injury produced by projectile, which is out of proportion to the size of the projectile itself. Thus if the tissues are destroyed or pulped and the bone pulverized, the injury would be more extensive than if the bullet had merely plowed through the flesh and fractured the bone.

The captain of one of the American warships on the Asiatic station has written home of some very interesting things that he has seen. Describing a visit to the Japanese field hospital, near Nagasaki, he says:

"There I got a fair conception of the killing and wounding qualities of the new small bore rifle that all Europe is adopting. The Japanese infantry arm is the Murata, the invention of Gen. Murata, now chief of ordnance of Japan. The caliber of the gun is 0.315 and the bullet weighs 235 grains.

"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 bullet had broken and the joint was simply a mass of finely comminuted bone splinters. The knee was perfectly soft, without a bone in it unbroken an inch long. Of course the leg had to be amputated."

The caliber of the new United States magazine rifle is 0.30 and the bullet weighs 220 grains. When this bullet was first decided upon, there was considerable talk about the new bullet lessening the mortality in war. Many persons claimed that the new projectile would, in a large number of cases, simply put the soldier hors de combat, and some even went so far as to call it a "humanitarian" bullet; but it is difficult to see wherein humanity is benefited, in view of the facts mentioned above, unless it is to assist in extirpating war, for after all a battle is a "bestial frenzy," as Leonardo da Vinci has well remarked.

A Model Tenement House.

Plans are being discussed by a number of philanthropic 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 fire-proof. 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 the tenement houses are a necessary evil, and that charity should be expended to the end of making them as wholesome as possible. A novel feature of this establishment will be the distinct divisions into which the house is to be divided, in order to provide separate apartments for Germans, Jews and Italians.

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 them a distance of 50 or 60 feet. It is claimed that these would prevent any person from approaching nearer than this distance. Similar pipes could be run to the rear of the train and be supplied with nozzles, rendering it impossible for any one to reach the rear platform. Other pipes could be arranged at the car doors, while by the use of flexible pipes or hose the steam could be carried and discharged from the windows at will. These pipes need not be so large as to be unsightly or inconvenient in any way.

A further use of steam as a means of defense, the inventor claims, would be in protecting banks against thieves. Since banks are usually heated with steam, the attachment could readily be made. Small jets of steam might be so arranged at the windows of the tellers that they could be projected into the faces of the robbers. These jets might be operated by hidden levers or by electrical attachments.

A more ambitious plan, however, is to utilize steam in the defense of forts, armories or arsenals. Powerful jets of steam could be discharged at doors and windows of arsenals. Forts could be protected in a similar manner, and as long as the supply of steam held out, the inventor claims, they could not possibly be carried by assault.

The Early History of Literature.

In a most interesting article by Amelia B. Edwards, in the Contemporary Review, entitled "The Art of the Novelist," the author says:

One of the most ancient examples of fiction in the world, one which has survived the rise and fall of many an ancient and many a modern empire, is an Egyptian romance entitled "The Tale of the Two Brothers." We have the original manuscript in the British Museum. It is written on nineteen sheets of papyrus, in a fine hieratic hand, and it was penned some three thousand two hundred years ago by a Theban scribe named Ennana. This Ennana was Librarian of the Palace to King Merenptah, the supposed Pharaoh of the Exodus; and he appears to have written the tale by order of the Treasurer, for the entertainment of the Crown Prince, Seti-Merenptah, who subsequently reigned as Seti II. This prince has signed his name in two places on the back of the manuscript, these being probably the only autograph signatures of any Egyptian king which have come down to our time. This most venerable and precious document was purchased in Italy by Madam d'Orbiney, who sold it in 1857 to the authorities of the British Museum; and it is now known as the d'Orbiney Papyrus.

That the ancient Egyptians were novelists and readers of novels was what no one suspected till Madam d'Orbiney purchased her famous papyrus in 1857. The Egyptologists of Europe were, in fact, fairly scandalized to find that these "grave and reverend signiors," whose mummies were so eminently respectable, had tastes as frivolous as our own. Since that time many more specimens of ancient Egyptian fiction have come to light, tales of adventure by land and sea, tales of enchantment and magic; even historical romances and ghost stories.* These discoveries have cast a new light upon the early history of literature. They show us that Egypt was not only the birthplace of all our arts and all our sciences, but that the Valley of the Nile was in truth the cradle of romance. It was from Egyptian sources that Herodotus derived many a narrative which he innocently accepted for fact and repeated as history; and it is from these sources that the Arab story-tellers of the middle ages draw many an incident familiar to us all in the pages of "The Thousand and One Nights." "The Shipwrecked Mariner"† (who, by the way, performs the astonishing feat of sailing up the Nile as far as Nubia, and thence gaining the open sea) is cast, like Sinbad the Sailor, upon an island peopled by serpents. General Tahuti, in a story called "The Taking of Joppa,"‡ introduces his soldiers into the beleaguered city by means of a stratagem less successfully attempted in after-ages by the "Forty Thieves;" that is to say, he conceals a certain number of men in big jars which are carried by others of their comrades, disguised as captives laden with booty.

We modern novelists are well pleased when our stories find favor in many lands, and are translated into many tongues; but if tried by this test, the second part of "The Tale of the Two Brothers" throws all our modern successes into the shade. We find it reproduced in every age and in every civilized land.

The fact that novels and tales were written by the scribes of Egypt before Hebron and Zoan were founded, is indeed very extraordinary. And we must remember that these ancient romances are the parent-source of all the light literature of mediæval and modern times. The great Mesopotamian nations had apparently no school of fiction. The clay cylinders and tablets of Borsippa, of Warka, of Babylon, of Nineveh, have as yet yielded nothing in the shape of a popular tale or a popular song. Legends of gods and heroes, chronicles of victories, cold-blooded records of hideous tortures inflicted on prisoners of war, calendars, contracts, accounts, magical formulæ, and the like, have come down to us in abundance from the libraries of these grim, practical and eminently disagreeable people; but nothing, absolutely nothing, which brings them into touch with ourselves, upon the common ground of imagination or sympathy. When, therefore, we lose sight of fiction in Egypt, we lose sight of it for a long time in the East, and follow it to the West, to Greece and to Rome.

Trial of Mortar Batteries at Sandy Hook.

A very interesting series of experiments were conducted recently at Sandy Hook by the Board of Ordnance and Fortification to ascertain the value of mortar batteries in repelling the attack of an enemy. The idea was to determine how far and with how much accuracy they could be thrown when it was desired to perforate the deck of an enemy's war ship. A battery of mortars consists of sixteen pieces, and the trial consisted in setting these off singly and in groups of four. By carefully adjusting the angle of the gun, the single shots were made to hit the target repeatedly. The purpose of discharging four guns at a time was to ascertain if the shots could be made to fall at the same point. The

* An English translation of certain ancient Egyptian tales, in illustrated form, will shortly be issued by Professor Flinders Petrie.

† From a Twelfth Dynasty papyrus.

‡ From a papyrus of the Eighteenth Dynasty.

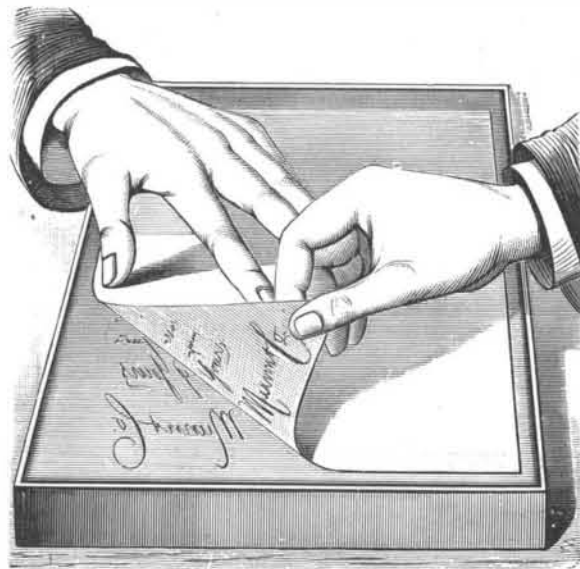
experiments on land showed that the shots fell within a distance of thirty-two feet of each other after traveling a distance of 3,000 yards. In the case of the shots fired at a target on the water, it was found that the four shots fell so close together as to make a single splash, and every shot hit the target or came within a few feet of doing so. The experimenters declare that they were well satisfied with the result.

EXPIRATION OF THE HEKTOGRAPH PATENT.

The invention known as the hektograph (from the Greek ekaton, hundred, and graph, write) consists in making a pad or cake of gelatine, glycerine and water. This forms a stiff jelly, and if a sheet of paper having lines drawn or written with aniline ink is lightly pressed upon the jelly, a reversed copy of the lines or writing will be received thereon. The ink is absorbed by the jelly to such an extent that many successive copies of the lines or writing may be taken by simply pressing successive sheets of dry blank paper upon the inscribed jelly. It forms a most convenient and excellent method of duplicating letters, sketches, etc. The mode of use is illustrated in our engraving.

A United States patent for this invention was granted June 1, 1880, to the Austrian inventors, Messrs. Kwaysser and Husak, and under the ordinary term of the law the patent would expire June 1, 1897. Section 4,887 of the United States Statutes, however, provides that "every patent granted for an invention which has been previously patented in a foreign country shall be so limited as to expire at the same time with the foreign patent, or, if there be more than one, at the same time with the one having the shortest term."

Several foreign patents were granted for the above invention prior to the American patent, among them an English patent, which expired November 13, 1894; consequently, the American patent expired on that



date, and the invention is now the property of the public, and any person may now freely make, use, and sell the hektograph.

An approved formula is as follows:

THE COPYING PAD.

Gelatine, by weight.....	1 part.
Glycerine.....	4 parts.
Water.....	2 parts.

THE INKS.

1. Methyl violet.....	1 part.
Water.....	7 parts.
Alcohol.....	1 part.
2. Rosaniline.....	2 parts.
Water.....	10 parts.
Alcohol.....	1 part.

To prepare the pad for use it is necessary to pass a wet sponge lightly over the face of the gelatine and allow it to nearly dry before taking the first copy. If this precaution is neglected, the face of the pad will be ruined by the first transfer.

Electric Traction in Paris.

Two electric tramways, both operated on the accumulator system, are at present in successful operation in Paris. One runs from St. Denis to the Madeleine and the other from St. Denis to the Opera, both lines belonging to the Compagnie des Tramways de Paris et du Departement de la Seine. The length of each line is about 5¾ miles. The electricity generating station is situated at St. Denis, where the accumulators for both lines are charged. The generating plant comprises three Desrozier's dynamos driven by three Corliss engines, each of 125 horsepower. The dynamos, which were supplied by the Maison Breguet, of Paris, run at 600 revolutions per minute, and give 230 amperes at 260 volts pressure, being arranged in quantity.

The car chest is supported on two single-axle trucks connected together by an arrangement of springs to allow of passing round curves. Each car will accommodate fifty passengers. The accumulators, which are of the Laurent Cely type, supplied by the Societe pour

le Travail Electrique des Metaux, of Paris, are placed under the seats of the car. Two batteries are allotted to each motor car, each battery consisting of 108 cells having 11 plates, inclosed in ebonite cases. The dimensions of the plates are: Depth 200 mm., width 200 mm., or 8 inches square, and thickness 0.006 mm., while the weight of the active material is 38½ pounds per cell. The accumulators are rapidly charged at a constant potential of 260 volts. The capacity of a battery of accumulators is 230 ampere hours, equal to 52 horse power hours, sufficient to run the car for a period of six hours, equal to from four to six consecutive journeys. The average distance traveled by each car is 135 kilometers per day, or about 83 miles. The efficiency of the accumulators is said to be 70 per cent. The average yield is 35 amperes on the level and 55 amperes on grades of 25 mm. per meter. In practical operation deep grades occur which necessitate a yield of 70 amperes, equal to 4 amperes per kilogramme of active material. The track consists of both Vignole rails and Broca grooved rails, the former, weighing 48½ pounds per meter, being laid in the suburban roads, while the Broca rails, weighing 92½ pounds per meter, are laid within the city limits. One charge of the accumulators would suffice for a journey of 120 kilometers on the Vignole rails and only 65 kilometers on the Broca rails. The upkeep and the charging of the accumulators is done under contract by the Societe pour le Travail Electrique des Metaux, at the rate of 16 centimes (a little over 3 cents) per car kilometer, or not quite 5 cents per mile.

Coming now to the motors, these are two in number, and of the Manchester type, with Gramme ring inductors. They are excited in series, while the brushes are composed of four carbon blocks. Connection is made between the motors and the axles by two systems of gear wheels in the ratio of 12 to 1, the first series running in an oil bath. Each motor can develop, at 1,350 revolutions per minute, a total of 10,000 watts at 230 volts pressure. Under these conditions the efficiency between the terminals of the dynamo and the axles of the trucks is said to reach 73 per cent. It should be added that both the trucks and motors were supplied by Messrs. Averly, of Lyons, and that the total weight of a motor car, including accumulators, motor, and the full number of passengers, is nearly 13½ tons.

Effect of Machinery.

In mechanical weaving the progress, says the Manufacturers' Gazette, has been great, not only in the quality and character of the work done, but in the amount of production. There is scarcely a woven design that cannot now be produced on the power loom. But the advancement in power loom weaving is more appreciated in the speed at which the loom can be run and the facility with which it can be tended. In this, England is much ahead of the Continent, and the United States of the world. In 1830 the average speed of the cotton loom on plain goods was 80 to 90 picks in England, while to-day it is 195 picks. In some instances the speed is run up to 240 picks a minute. These speeds are theoretical, and indicate the possibilities of the machine. As a fact, the effectiveness of the loom is 8 to 16 per cent less, due to stoppages from various causes. The difference between the theoretical and practical efficiency of the loom is owing in an important degree to the efficiency of the operative that operates it. This is seen, somewhat, in the number of looms that one person runs, which is considerably greater in the United States than in England, and greater in the latter country than on the Continent. The records of a large weaving mill in Hyde, which has remained in the hands of the same family for the period covered, 1832-90, show an increase in the weekly production per operative of over 140 per cent, and at the same time a decrease in the unit cost of labor, while the earnings per weaver have been increased nearly 90 per cent, notwithstanding a reduction in working hours, per week, of over 24 cent. Not only have the earnings increased in this proportion, but their buying power has increased even more, or 220 per cent, based on the price of flour. According to Ellison's statistics, the productive capacity per operative increased 2¼ times from 1844 to 1880, and the cost of labor per pound of cotton manufactured declined nearly 35 per cent.

Desulphurization of Liquid Cast Iron.

The author has solved the problem by the use of the non-oxidized salts of barium, especially the ferrocyanides, which are easily decomposed by heat into iron, carbon and barium. Barium ferrocyanide is obtained by mixing the concentrated and boiling solutions of yellow prussiate and of barium chloride. A double barium and potassium ferrocyanide, obtained by mixing equivalent weights of the two salts in solution, has generally given the best results. The reaction must be effected in the exclusion of air and of every oxidizing action. On melting in a lined crucible, with the cover luted, a mixture of the sulphurous cast metal and of barium prussiate, with the addition of fluor-spar, it is easily perceived that all the sulphur passes into the slag around the ingot.—A. De Vathaire.