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

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 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 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 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. To builders and all who contemplate building 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, $5.00 a year; combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign countries, $11.50 a 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 typography with the SCIENTIFIC AMERICAN. Every number of *La America* is 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, 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, 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, NOVEMBER 14, 1891.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 828.

For the Week Ending November 14, 1891.

Price 10 cents. For sale by all newsdealers

AMERICAN INSTITUTE FAIR.

The fair of the American Institute, which is now in full blast, presents a very creditable array of exhibits, but it shows no marked improvement over the exhibitions of former years. In the great city of New York and the surrounding manufacturing towns, there ought to be sufficient material for an exhibition greatly superior to the present show. What is wanted is a fair exhibition of the manufacturing products of this city and vicinity. Few novelties are presented; from year to year we notice practically the same exhibits of steam engines and accessories, electric lighting apparatus, wood working and iron working machinery, and manufactures in general.

Among the exhibits of steam machinery we notice the Payne Tandem Compound Engine, the vertical and horizontal engines, made by B. W. Payne & Sons, New York. They are constructed on scientific principles and appear to be rendering good service.

A novelty in steam engines is the compact, self-contained, well balanced engine made by the I. P. Chase Engine Company, of New Britain, Conn. This engine has an oscillating cylinder which does not swing on trunnions in the usual fashion, but the exterior of the body of cylinder is in the form of a cylinder with its axis at right angles to the bore of the cylinder, the outer surface forming the bearing upon which the cylinder swings. These engines are so small and compact as to be well adapted to direct application to line shafts, and to various kinds of machinery, such as dynamos and other high speed machines.

The Woodbury Automatic Steam Engine, made by Stearns Manufacturing Co., of Erie, Pa., is shown. It is especially adapted for work requiring high speed and close regulation.

Gas engines of various types are well represented. The Otto embodying the latest improvements is shown. We notice in this engine the substitution of the electric igniter for the old flame-carrying slide; there is also an improvement in the governor.

The White & Middleton gas engine is on exhibition, driving a dynamo supplying its full complement of incandescent electric lights. This engine has a very sensitive and simple governor. The piston receives an impulse at every stroke, except when the explosive charge is intermitted by the governor. The builders claim great economy in the use of gas, the consumption being stated at a small fraction over 19 cubic feet per brake horse power per hour.

The Daimler Gas and Petroleum Motor, illustrated not long since in our pages, is shown detached and also in connection with a small boat. This engine is adapted to both gas and naphtha vapor. We understand the application of this motor to boats has been very successful. Two forms of the Hartig gas engine are shown.

The Priestman Standard Oil Engine is exhibited for the first time; the one here in use driving an electric light plant and a large rotary pump is 6 horse power. The fuel used is refined petroleum or kerosene oil. The cost of working the engine is about one cent per horse power per hour. This engine has been adapted to the propulsion of boats, and is largely used as a motive power for driving machinery of all sorts in Europe, and we understand it is being rapidly introduced here.

The Otis Electric Pump presents some novel features. It is provided with two pistons, which are driven with a variable motion in such a manner as to cause a continuous flow of water through the pump, the movement of the pistons being alternately quick and slow, one piston making its rapid motion while the other is making its slow movement. This movement of the pistons is effected by a novel arrangement of the crank and a pair of rock shafts and connecting rods. The pump is driven by an electric motor, and is entirely automatic, stopping when the tank is full and starting when the water is low.

The E. & H. T. Anthony Co. have a fine exhibit of photographic apparatus, embodying all the latest improvements. The Scovill Manufacturing Co. have a creditable exhibit, in which are found some of the newer forms of hand cameras.

The Garvin Machine Co. have a fine exhibit of iron working machinery, and the Glen Cove Machine Co. show a variety of woodworking machines especially adapted to rapid, first class work.

The Pyrogravure Wood Co., of this city, have an artistic pavilion constructed of wood carved, or rather embossed, according to their method. The wood is ornamented by means of embossing dies, which are worked at a sufficiently high temperature to char the surfaces which contact with the dies, leaving the other surfaces of the natural color. The work done by this company is very fine, and some beautiful effects are shown in wainscoting, floors, mouldings, and furniture.

The National Embossing Machine Company, of this city, show a machine in operation, embossing mouldings by means of hot rotary dies. According to this method, mouldings equal to the finest carved work are produced readily and economically.

The building is lighted, as heretofore, by arc lights supplied with a current from several United States dynamos, and with incandescent lights operated by Mather dynamos. Among the interesting features in the way of lighting is the Clark search light, made by the Clark Electric Company, of this city. The light is mounted upon an elevated platform, and its brilliant beam is thrown into the dark corners of the building and upon groups here and there, evidently creating much interest in this particular method of illumination.

Docking Horses' Tails.

Fashion seems to have performed a complete revolution in its orbit and has brought in once more in full force the cruel and absurd practice of docking horses' tails. Just at present the custom is in full force, and the unfortunate animals appear with the shortest possible tails. As a question of beauty, it must be conceded that there is a loss instead of a gain. The horse's glory, like that of woman, is in his hair. The abbreviated representatives of the flowing tails are a poor apology for the sweeping locks that should grace the animal. The proportions of the members are destroyed by removing the tail. It throws the horse out of balance so that his long neck and heavy head seem out of proportion. It produces the effect of the horse pitching forward on his nose. The animal when docked looks harmonious from no point of view.

The loss of the tail as a weapon against flies and other insects that so torment the horse, peculiarly sensitive in his skin, is one of the greatest injuries done him in the docking process. Again, however humanely the process of amputation can be conducted, it is certain that it is generally an occasion of great cruelty, and that ignorance is the cause of the infliction of great suffering.

One consolation underlies the matter. It is that fashion is perpetually changing and that a new generation of horses may be spared the infliction. The horse with docked tail, as he grows old, will descend to ignoble uses, and when the once fashionably mutilated creature appears in the lower roles of commercial work, the cultured rider may be willing to accept nature as the exponent of beauty unadorned.

New York Pasteur Institute.

Dr. Paul Gibier, director of the New York Pasteur Institute, in his half yearly report (February 18, 1891, to August 18, 1891) says 415 persons applied for treatment.

In the case of 345 of these persons it was demonstrated that the animals attacking them were not mad. Consequently the patients were sent back after having had their wounds attended to during the proper length of time.

In 70 cases the anti-hydrophobic treatment was applied, hydrophobia of the animals inflicting bites having been evidenced clinically, or by inoculation at the laboratory, and in many cases by the death of some other persons or animals bitten by the same dogs.

One death after treatment is reported, namely, a child five years old, of South Framingham, Mass. Badly bitten in nineteen places by a dog recognized to be mad. Treated from July 15 to August 1. Symptoms of hydrophobia appeared six days later.

Three other persons (two sisters of the patient and a man) bitten by the same dog, who received the same course of treatment, are now enjoying good health.

Kite Electricity.

The most important recent experiment regarding atmospheric electricity in England, carried out by Mr. Alexander McAdie, seems to take one back to the very infancy of electrical science; for, though the conditions were somewhat different, the operation was substantially identical with Benjamin Franklin's historical experiment with the kite. What Mr. McAdie has demonstrated is that electricity can be drawn from a kite high in the air in a cloudless sky. The kite, Mr. McAdie states, discharged sparks from the lower end of an insulating wire reaching to the earth, where an electrometer partly measured the increasing electric force. So nearly did the quantity of electricity in the upper air correspond to the height of the kite above the earth that the experimenter could usually determine whether the kite was rising or falling by simply looking at the needle of the electrometer. This is an experiment that almost any of our young electricians may easily try, and they will find it very interesting.

Trade Mark—Form of Package.

According to the decision of the Supreme Court of Pennsylvania, in the case of Hoyt et al. vs. Hoyt et. al., the size, shape, or mode of construction of a box, barrel, bottle, or package into which goods may be put is not a trade mark, and if a manufacturer has a right to use a certain label, he may use it on any kind of bottle that is not patented, and he will not be restrained from combining his own label with a particular shape or style of bottle for the mere reason that the latter had been previously adopted by some other producer of similar goods.

A Perfect Electric Motor.*

BY H. A. EVERETT.

In his report upon "A Perfect Electric Motor," Mr. Everett gave a brief history of the electric motor, its imperfections, and the steps taken to overcome them, and, after bringing the subject down to date and discussing the usages of various railways, summed up his idea of a perfect motor as follows :

Taking the trolley wheel, pole, and stand, I think it desirable to have a wheel that is capable of following the wire at any angle, with a trolley pole brittle enough to break should it become entangled in the wires, without pulling them down, and a trolley spring rigid enough to give good, steady pressure on trolley wire, and so constructed that when the car is in the car house or going under a low bridge, the pole could come very close to the roof of the car, also flexible enough to give good pressure when the trolley has to be 21 or 22 feet high at the railway crossings.

The car should have a lamp circuit, with plenty of lamps distributed properly.

The perfect motor ought to have, as hereinbefore suggested, a reliable fuse plug, that will invariably blow before injury is done to the machine.

Have on each car the best lighting arrester that can be secured in the market.

In coming to the motor proper, it is desirable to use a controlling switch that is easily operated and readily reversed, in case of accidents. The simpler the controlling device the better, and it should be constructed with a view to guard against any possible disarrangement of the parts, so that it will be reliable in all cases, both electrically and mechanically.

The rheostat should also be carefully looked after, and properly protected to keep it from injury, by reason of water, snow, or dirt getting upon it. It should only be available in starting the car to avoid the lunge of a start, and should be so arranged as to be cut out as soon as the car is started, and give the entire efficiency of the motor proper.

The motor should be well protected in all its parts from any outside interference, so that in running along the street it will be impossible to pick up nails, wire, or anything that would short-circuit it, at the same time observing that a motor must be properly ventilated to keep it from heating while in use. The cover should be made so as to be readily removed.

I deem it very advisable to have an armature of a large diameter, making a small number of revolutions per minute, with the bearings made of extreme width with proper grease cups, and in such a condition that they can be readily re-babbitted when slightly worn.

The diameter of the commutator should also be large, and to have the brushes easy of access is very desirable. The winding of the armature ought to be of the simplest kind, and the size of the wire and insulation of same should be carefully looked after. I think the insulation of wires in armatures is at present one of the weakest points in the motor.

The armature gears should have a wide face, and run in oil. The armature shaft ought to be of ample diameter, and there is nothing gained by having the keyway too small for the securing of the commutator to the shaft. The commutator should be carefully insulated, so that there will be no grounds between it and the case. The box in which this gear runs ought to be constructed of copper, or some light material that is somewhat flexible, so that if struck from the outside it will bend rather than break. The fields should also be wound with a wire of better insulation, and of ample size to take the current. Of course, in this particular, I do not intend that the wire of either the field or armature should be great enough to take more horse power than ought to be used by the machine. To my mind it is very desirable to have the armature in such a condition that it can be readily taken out from the machine and put in again.

One of the serious disadvantages to operators of electric roads is the expensive labor necessary in winding the armatures and fields, also in regard to high-priced mechanics who ought to be employed to attend to the machines. There is nothing gained in employing a cheap class of labor to handle an electric equipment either as electricians, armature or field men, or mechanics. This proposition is a self-evident truth, as can readily be observed in many roads now in operation.

At present, I think the single-reduction motor is the nearest perfection of any on the market

I think it very desirable that the electric companies should devote some time to the perfection of an electric brake to stop the car with the same power that runs it. This could be readily done, and would be a satisfactory improvement.

Electric heaters are now used in quite a number of places, and I think will prove quite satisfactory.

I have noticed electric signal bells on some of the cars, and they seem to work very well.

For a dasher gong on a motor car I am in favor of a foot tread, as in testing an electric gong we found that our men used it altogether too freely.

I am in favor of an oil head-light, one that can be removed easily, so that in the event of a trolley being broken or anything happening to the electric part of the car, or a light is desired underneath the car, the oil head-light can be used to better advantage than the electric. There ought also to be one oil light in every car for the same purpose. There is no reason why an electric fare register cannot be made to work successfully.

The durability of a motor is a question which requires very careful attention. The single reduction motor, when properly looked after, ought to last for many years. We have had one in operation for over ten months, and it appears to be in as good condition as when it first went on the road. The car should be of moderate size, constructed with all modern convenience, but without fancy decorations or any unnecessary display.

The cars should be run on frequent headway, and at all hours of the day and night, at as high a rate of speed as the civic authorities will permit. The noise of the motors has been very largely done away with, and by careful attention the old countershaft machines can be used until worn out by simply covering the gearing with an oil box, and by not attempting to run them too many miles without inspection.

* Abstract of a report presented to the American Street Railway Association, at Pittsburg, Oct., 1891.

Engineering at the Fair.

Among the series of congresses to be assembled at Chicago during the exposition season of 1893, engineering will have an important place.

The Department of Engineering includes the construction of railways, canals, and tunnels; river and harbor improvements and waterworks; sewerage and drainage; bridges and other structures; also mechanical, mining, metallurgical, military, and naval engineering.

This department is under the charge of a local committee composed of the following gentlemen : Mr. E. L. Corthell, chairman ; Mr. J. D. Whittemore, vice-chairman ; Mr. E. M. Izæd, Mr. William Forsythe, Mr. G. L. Stroble, Mr. Robert W. Hunt, Mr. John W. Cloud, and Mr. Joseph Hirst.

This committee will be assisted by an advisory council, which will be composed of the eminent engineers of the world, through whose co-operation the general international engineering congresses will be assembled.

The following report has been made by Mr. Corthell, the chairman of the general committee, who was appointed by President Bonney as the special commissioner of the World's Congress Auxiliary abroad :

CHICAGO, October 5, 1891.

HON. C. C. BONNEY :

DEAR SIR : I have just returned from Europe, where I have been engaged during the last four months in making examinations of railroads, railroad terminals, harbors, universities, and technical schools; also in inviting, personally and by letters, the engineers of Europe to the international engineering congress which it is proposed to hold here in 1893 under the auspices of the World's Congress Auxiliary. My professional intercourse with many eminent engineers gave me a good opportunity, whenever I met them, to explain the object and the scope of the congress. The position as chairman of the general committee of the World's Congress Auxiliary on engineering congresses, and that of chairman of the executive committee of the general committee of the engineering societies of the United States and Canada, enabled me to bring this subject in an official manner before engineers and before their various associations. I invited, personally and by letter, thirty-six engineering associations. Although most of the associations were in vacation from June to October, yet I have received from many of the secretaries, and personally from several of the presidents and other members of their councils, not only an assurance that their associations would accept the invitation to participate in the congress, but also expressions of the great interest which these important associations of engineers have in the proposed congress. Not only the engineers composing these associations, but the engineers of the governments especially of France, Germany, Holland, and Belgium, evinced the greatest interest in our congress. The interest in the congress among the engineers of Great Britain and the officers of the great engineering societies of that country was not less than that shown on the Continent, and I received here also promise of support for our congress, and the expression of a desire to attend it which was universal. I might say here that in all the countries which I have visited, nearly all the engineers whom I met promptly signified their intention of coming to the congress and the Exposition. By invitation I attended the annual convention of the Mechanical Engineering Society of Germany, held at Dusseldorf. This society numbers about 6,000 members, the council of which decided to accept our invitations to take part in the congress. I was also informed by the president of the Society of Civil Engineers and Architects of Germany, which numbers about 6,000, that they had acted on the invitation and had gladly accepted it. Letters have been received also from engineering societies in countries which I was not able to visit, expressing a great interest in the proposed congress, and assuring me that their councils would act upon the matter immediately after their vacation.

There has been received also a communication from the president of the Mexican Association of Engineers and Architects, with the information that the association is glad to accept our invitation and that it will send delegates to the congress. It is proper for me to state that while in Europe I was in communication with the director-general, the superintendent of construction, and the chief engineer, who sent me from time to time information of the progress of the work connected with the Exposition, which enabled me to reliably inform all those whom I met in regard to the progress of the work. You will readily see that I would reach places and people which others might not. It would be premature at this time to give names of those who have been of service to me while abroad, but I can assure you that I have been greatly assisted by members of the engineering profession in all the countries which I visited, and have received assurances from them that they would take up the work where I left it and seek by all means in their power to promote its interests. I am, yours respectfully,

E. L. CORTHELL,
Chairman of General Committee on Engineering Congresses.

Enlargement of Small Photos.

The enlargements upon bromide paper have one defect, a cold tone and quite frequently a certain hardness. One is so used to the gloss and tone of the albumen paper that even on enlargements its want is felt. Now, as is well known, it is not difficult to obtain enlargements upon albumen paper, namely, by enlarging the plate. The small negative is copied in the printing frame and by lamp light upon the same size dry plate, and a positive is thus obtained by development which is sufficiently sharp. This small positive is enlarged in the camera to twice and three times its size, and a negative is thereby obtained which in no way is behind the original, if the latter was sufficiently sharp. The expenses connected with the enlargement are essentially restricted to the price of the dry plate of larger size, besides the original negative and a plate for the positive of it. A great convenience has hereby certainly been gained, particularly for tourists, to use a much smaller apparatus. If a size like 9 by 12 cm. is chosen, pictures will be obtained which even in the original size give a handsome print, sufficient for general purposes. The enlargements should not be made from all plates, but only the best and most interesting should be selected. A good lens is, of course, necessary for such enlargements.

Still another method of negative enlargement I would like to mention here, which is much simpler, but permits only enlargements of one-third the size. This method is already known, but has been applied very little. The glass negative is laid in fluoric acid diluted from one hundred to one hundred and fifty times. The film can be stripped very soon and is put in water and washed thoroughly. In the water the film will stretch to one-third of its length and width ; 3¼ by 4½ will then be 4½ by 6 ; 5 by 7 will increase to 6⅔ by 9⅓. In this manner an enlargement is obtained in the simplest way. If the method has been applied so little, the reason is only in the fear of handling the fluoric acid. True enough, this is very dangerous in concentrated condition on account of its etching properties, but diluted it is harmless.—*Dr. H. W. Vogel, Anthony's Bulletin.*

The New Italian Rifle.

The weapon is 1·2 meters long, exclusive of the bayonet; and of 6·5 millimeters caliber. The most important factor in connection with the rifle is the smokeless powder cartridge, which, owing to its light weight and small size, permits the number of cartridges carried by the soldier to be augmented to 160. The initial velocity of the bullet is 720 meters per second, and with regard to its penetrative force, it is said that the ball will pierce two mattresses and two planks 12 centimeters (5 inches) thick, at a distance of 1,200 meters, or 4,000 feet. Loading is effected by means of magazines containing five cartridges so arranged that a repeating fire may be maintained until the magazine is exhausted. A few experts who witnessed the experiments assert that the new rifle is too short ; but the majority were convinced that the weapon is the best and most destructive at present existing among European armies.

Car Fire from Electric Light.

A car of the Great Northern, of England, is supposed to have taken fire from the electric lighting wires with which it was equipped. The accident occurred the last week in August. The cars are lighted by electricity, the current being supplied by a dynamo in the rear guard's van. Flames were discovered issuing from the chamber in which the dynamo stands. The train was stopped and the fire quickly extinguished. It is supposed that the fire was set by defective insulation.