Scientific American.

ESTABLISHED 1845.

MUNN & CO., - - - EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

TERMS FOR THE SCIENTIFIC AMERICAN.
(Established 1845.)

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, postage prepaid, £0 16s. 5d. 4.00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner Franklin Street, New York.

The Scientific American Supplement
(Established 1876)

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, or £1 4s. 8d., 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, *eight dollars and fifty cents a year*, or £1 14s. 11d., postage prepaid.

Building Edition of Scientific American.
(Established 1885.)

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendidly illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To architects, builders, and all who contemplate building this work is invaluable.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign countries, $3.00 a year, or £0 12s. 4d. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign countries, $6.50 a year, or £1 6s. 9d. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN, and SUPPLEMENT, $9.00 a year. To foreign countries, $11.00 a year, or £2 5s. 2d., postage prepaid.

Export Edition of the Scientific American
(Established 1878)

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN, published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 100 pages, profusely illustrated. It is the finest scientific industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. $3.00 a year, or £0 12s. 4d., postpaid to any part of the world. Single copies, 25 cents.
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, FEBRUARY 6, 1897.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

Scientific American Supplement

No. 1101.

For the Week Ending February 6, 1897.

Price 10 cents. For sale by all newsdealers.

THE HARLEM RIVER SPEEDWAY.

The Harlem River Speedway, which is now within measurable distance of completion, will show what good engineering, coupled with a discriminating treatment of the natural features of the site, can do in giving at once grace and dignity to a public work of this magnitude; and in this respect it should give genuine satisfaction to the critics who have lately been calling for a closer collaboration between the engineer and the architect.

It is not necessary to recount the history of this undertaking, nor call up the untoward circumstances attending the first abortive attempt to carry it out. Suffice it to say that the present Board found themselves confronted with a difficult problem in the shape of a costly, incomplete, and in many respects poorly planned and worse constructed engineering work, which they were expected to revise and largely reconstruct and carry to a satisfactory completion.

Elsewhere in this issue will be found a detailed description of the undertaking, in the preparation of which we have been offered every facility by the engineers in charge of the work. Our readers will be able to judge for themselves of the value of the modifications in the original plans which have been made by the new Park Board. The improvements are well conceived and, with one exception, well carried out; they will give to this handsome public work both permanence and beauty, essential qualities which it would never have possessed if carried out on the lines of the original plan.

It is greatly to be regretted, however, that where the general design for the improvement of the Speedway was so well conceived, especially in the matter of giving it landscape treatment, the methods adopted in carrying out one of its most important features should have been marked by such blundering and costly extravagance. Reference is made to the construction of some miles of masonry and concrete trenches, whose sole purpose was to hold together the necessary soil for the planting of shade trees and shrubbery.

We are informed that this altogether unique and original device was rendered necessary by the loose character of the cinder filling of which the roadbed is largely composed; that the tide water, percolating through the cribwork and bank, would have been liable to wash away the planting soil, and that on the river side of the Speedway some form of box was necessary to hold this soil in place, and incidentally to keep the salt water from the roots of the trees.

But the parties responsible for this work should have known, as they readily might on inquiry, that where the surface of the ground is from eight to ten feet above mean high water, the majority of hardy trees and shrubs will thrive perfectly well without any precautions having been taken to protect the roots from salt water. A notable instance of this is to be found in the trees and shrubbery of the park which was laid out in the Fens of Boston, whose plantations are carried down to water level. The result in this case speaks for itself and shows that the alleged peril to the shade trees of the Harlem Speedway is purely imaginary.

With regard to the possible washing away of the loam from below, if it were laid in an open trench, it is certain that the crevices of the underlying material would soon have been filled up, and any resulting settlement could have been remedied by laying fresh mould on the surface. But admitting for the mere sake of argument that the looseness of the surrounding fill made it necessary to insert some form of box to hold the loam temporarily in place, why was this temporary expedient built of solid masonry and concrete at an enormous cost to the city. The roughest kind of planking, loosely laid and held in place by light scantling, would have served the purpose equally well, and, indeed, for the future accommodation of the spreading roots of the trees, infinitely better. Moreover, if the masonry was necessary to prevent the washing of the mould by the tidewater, why was it put in at such points as that shown in the views on another page, where there are ten feet of bank and ten feet of first-class cement masonry between the planting space and the river? The question becomes yet more pertinent when applied to the planting space adjoining the bluffs on the inner side of the Speedway and from seventy-five to a hundred feet distant from the river. Surely, one would think, the soil was safe from its enemy when sheltered behind earthworks one hundred feet thick. But it seems not. So remorseless are the waters of the Harlem that even where the sidewalk has been blasted out of the solid side hill, as will be seen from the photograph, the impregnable masonry fort is built upon this rocky bed.

But perhaps it is the rock that is at fault, and there is a danger lest the precious soil should percolate through the gneiss formation of Manhattan Island!

That this amazing device should ever have been adopted is rendered more puzzling when we reflect—and it is evident to the veriest novice in plant culture—that this waterproof box will defeat the very end at which it is supposed to aim; for in winter the impervious concrete floor will hold whatever surface moisture passes down, producing decay at the roots such as would occur in an ordinary flower pot that had no hole in the bottom; and in the hot summer months the heated stone work will merely hasten the drying up of the soil, and the concrete floor will prevent that attraction of moisture from below which is the chief object of surface cultivation.

If the material of the roadbed was altogether unsuitable for the purpose, the simplest and most reasonable course would have been to dig a trench of the same cross section as the present box and place the mould within it. Every benefit and none of the pernicious features of the present suicidal device would have been secured; and as the trees increased in size, their roots would have been free to reach out and take hold of the surrounding material of the roadbed.

That the trees would grow under such circumstances and flourish in spite of rocky surroundings and salt water at their roots (if it ever reached them) is proved by the size and vigor of the trees which are now growing down to the very water's edge on the rocks of the adjoining bluffs.

At a moderate estimate this superfluous masonry has cost the city from $30,000 to $40,000, and it stands there as a menace to the growth and life of the very trees which, forsooth, it was designed to protect. We are informed by prominent landscape architects that a masonry box of the size provided will dwarf the growth of the trees and limit their life to twenty-five or thirty years at the most—from which it is evident that the Harlem Speedway will never be graced with the avenue of stately timber which, presumably, it was in the minds of the Board to provide.

PROPOSED PATENT LEGISLATION.

A bill (H. R. No. 3,014) for amending the patent laws in certain particulars is pending in Congress and is now in the hands of the House Committee on Patents, having passed the second reading. We simply review the nature of the proposed amendments, reserving any comment for a future issue.

The first amendment relates to section 4,886 of the revised statutes, and provides that any person may obtain a patent for an invention not known or used by others in this country before his invention or discovery and not patented or described in this or any foreign country before his invention or discovery thereof, *or more than two years prior to his application*. The second amendment relates to section 4,920, and provides that in an action for infringement it is a good defense if it can be proved that the invention had been patented or described *more than two years prior to his application for a patent*.

The next amendment provides that, if the inventor or his legal representatives or assigns shall have patented an invention in a foreign country, this shall not be a bar to patenting in the United States, *unless the application for said foreign patent was filed more than seven months prior to the filing of the application in this country*. This amendment fixes a term of seven months, similar to the clause touching countries beyond the sea, which is embodied in the International Convention for the Protection of Industrial Property.

The next amendment puts into statute form the present Patent Office rule of practice requiring action upon an invention on the part of the applicant to take place within six months of his last action. If the period of six months is exceeded, the application is to be treated as abandoned. It also provides for putting the case in condition for final action within eighteen months, at the end of which time the Commissioner may require the applicant to show cause why the case has not been more diligently prosecuted, after which hearing he may issue an order requiring applicant to complete his case within six months.

The bill next provides that the assignment, grant, or conveyance of a patent shall be open to acknowledgment before notaries public, United States commissioners, secretaries of legation and consular officers authorized to perform notarial acts. This species of acknowledgment is to constitute a prima facie evidence of the transfer.

The last section limits the periods of accountings to six years before the filing of the bill of complaint. There is to be no recovery of profits or damages for any infringement committed before such period. This it will be seen is in the direction of enforcing diligence in the protection of patent rights. The inventor has long been held to a measure of diligence in prosecution of his claims. The proposed amendment *obliges* him to be vigilant in maintaining the rights awarded him. We feel sure that the amendments will receive careful consideration by the committee.

THE GAS EXHIBITION IN NEW YORK CITY.

On the evening of January 27 there was opened what is said to be the first exhibition exclusively devoted to gas products and appliances to be held in this country. The exhibition is being given in Madison Square Garden, New York, by the Gas Industries Company, which was organized by parties who are interested in many gas companies of this country and the representatives of five State gas associations.

Of course in an exhibition of this kind every source

of light but gas is rigorously excluded, and to supply the thousands of gas burners, and the various motors and appliances domestic and otherwise, it was necessary to lead in one 8 inch and two 6 inch gas mains for the main floor exhibit and the various side exhibitions shown in the basement.

The lighting of the great building is accomplished by a dozen large crowns of gas light suspended from the roof, and by two continuous lines of light which completely encircle the building, the upper line being placed on the gallery front and the lower line on the balcony front. The latter effect is particularly beautiful; the jets being arranged in clusters of seven in frosted globes, and arranged in the position common in the seven-candle candelabra of the cathedrals. The illumination is further assisted by the myriad lights of the various exhibits, in the center of which and dominating them all is the lofty, spire-like tower erected by the Tiffany Glass and Decorating Company, of New York, from the designs of Mr. Louis C. Tiffany.

The tower, soaring 60 feet in the air, the height of a five story building, is composed of eight sections, representing as many periods in the development of the gas illuminating industry. All of these divisions, rising one out of the other, diminishing in size as they ascend, are ornamented with arches, crockets, finials and canopies, all on purely Gothic lines. Colored glass is worked in here and there throughout the entire construction. The pinnacle of this tabernacle of light, the section representing the decade of 1816, is of yellow, passing into a deeper yellow at the commencement of the section which stands for 1836, then passing into an orange, and from an orange to a light red, and from a deep red into a blue.

On the exterior of the construction there are 2,251 lights, while on the interior there are 688 lights, and all arranged so as to form part of the ornament and to illuminate the various colored glasses, and throw the colors upon jets, fountains and showers of water which are flowing through the tower, the water finally passing into steam, escapes from the upper section, and in its turn catches the reflection of the various colors of the glass.

On entering the Garden the most conspicuous exhibit is that of the Welsbach Light Company. It is in two parts, the booths standing on each side of the main aisle. Like the tower, they are from designs by Mr. Tiffany. The walls consist of an open framework which contains groups of mammoth gilded torches, whose flame consists of a bunch of thirty-one or fifty-two Welsbach lights. Adjoining the right hand booth is the exhibit of the Welsbach Street Lighting Company, in which a large number of street lamps of various and generally artistic design are shown. The Welsbach light is, as was to be expected, abundantly in evidence, and its ability to give at once a soft and powerful illumination is seen to good advantage in all parts of the exhibition.

Undoubtedly the most complete and creditable exhibit is that shown by the United Gas Improvement Company, of Philadelphia, which contains a complete model plant for the manufacture of water gas. The company also shows an historical exhibit, in which is traced the evolution of the water gas process, and close at hand is a rack showing the fractional distillation of gas-making oils. In addition to the model above mentioned, the exhibit contains a full-size water gas producing plant consisting of a generator, carbureter, superheater, oil heater, scrubber and condenser, oil pumps, blower, and every detail of this interesting process. In a smaller exhibit of the same firm will be found a complete analytical laboratory for the analysis of gases, a bar photometer for determination of candle power, and a meter prover.

The E. P. Gleason Company, who claim to have made the first brass gas burner manufactured in America, show a handsome assortment of gas fixtures, from the simplest burners to full sized street and hall lamps resplendent in polished metal and colored glass. Near at hand is the stand of the Continental Iron Works, where three gas gate valves, ten, fifteen and twenty five inches in diameter, are shown, which are fitted with a double screw that enables the valve to be opened and shut with greater speed. An excellent design of self-closing mouthpiece for gas retorts is shown side by side with one of the old type. The old mouthpiece consisted of a separate plate, which was held in place by a screw operating through a cross bar held in hooks attached to the mouth of the retort. The joint was made with lime, and considerable time was occupied in the operation. The new mouthpiece is swung open on a side hinge, and the joint is formed by making a coned face to the door and its seating.

Gas engines are shown by the Pennsylvania Iron Works Company, known as the makers of the "Globe" engine; by Fairbanks, Morse & Company and others. The Safety Car Heating and Lighting Company show Pintsch compressors, buoy lights, etc., and other exhibits worthy of special notice are those of William M. Crane & Company, the Parker Russel Mining and Manufacturing Company, and Hartlett, Hayward & Company.

Taken altogether, the exhibition is well calculated to impress the public with the vast extent of the gas industry and the high degree of perfection which has been reached, both in its manufacture and application to industrial and domestic purposes.

It is shown in operation in every imaginable kind of stove, whether for cooking or heating, and some very tasteful designs of radiators are exhibited. The gas motors range in size from diminutive engines, suitable for light household work or the amateur workshop, up to the powerful machine for shop use.

The basement has been given up for supplementary exhibits, such as from their nature could not be accommodated on the main floor. Conspicuous among these is a full sized representation of a coal mine, complete with tracks, coal trucks, and the various appliances used in up-to-date mining. The concert hall is used as a lecture room, in which the householder will be startled with facts and figures going to show the wastefulness of cooking by coal and the net saving per year to be realized by using the more cleanly and economical gas stove.

THE STEAM TRIALS OF THE LARGEST CRUISER IN THE WORLD.

The great English cruiser Terrible, a sister ship to the Powerful, the details of whose trial trip were given in our issue of January 2, has also completed her trials and has shown very excellent results, maintaining 22·4 knots on a four hours' trial. She was built from the same plans as her predecessor, and is in every way identical except that the propellers of the Powerful are made of Admiralty gun metal, and those of the Terrible of manganese bronze; by using which it became possible to reduce the thickness of the blades considerably and give their surfaces a fine polish, thereby considerably reducing the loss due to propeller resistance proper.

These two magnificent ships are of such exceptional size and power that they have attracted widespread attention, and the interest has been increased by the fact that they were to be equipped entirely with water tube boilers, whose aggregate horse power was to be 25,000. They are the first war ships to exceed a length of 500 feet, and they are built in agreement with the tendency of naval designers to increase the all around dimensions of naval vessels, and especially that of length. The Russian cruiser Rurik was the first to reach the limit of 400 feet, and she was followed by the United States cruisers Columbia and Minneapolis with a length of 412 feet.

The Powerful and the Terrible are 538 feet long, 71 feet beam and 43 feet 4 inches in depth to the upper deck. Their displacement is 14,200 tons and designed speed 22 knots. On a four hours' trial against a head sea the Powerful averaged 21·8 knots an hour, and on her recent trials the Terrible made 22·4 knots. They have a complete protective deck from 3 to 6 inches thick, which is reinforced with many feet of coal protection. The armament consists of two 9·2 inch guns mounted in barbettes, twelve 6 inch quick-firing guns, twelve 3 pounders and nine machine guns. There are four torpedo tubes.

At the launch of the Terrible it was stated by her builders that she was designed for the purpose of being able to maintain a continuous rate of high speed at sea in any weather. She was to be capable of catching the largest and swiftest ocean steamers, and it was considered that the only way to insure this result was to give her the great length, weight and power of an Atlantic liner. Experience has shown that in heavy weather the longer and larger ship will maintain the best rate of speed, other things being equal. Her greater momentum will cause her to be less affected by the concussion of the waves, and her greater freeboard will carry her over the seas with a dry deck.

In the first of the trials of the Terrible, 14 of the Belleville boilers out of the 48 were used. The horse power was 5,000, coal consumption 2·27 pounds per indicated horse power hour, and the corresponding speed 13·3 knots. The trial at 18,000 horse power lasted for 30 consecutive hours. The coal consumption was 1·7 pound per horse power hour and the mean speed was 21 knots per hour, which, considering that she was only working up to about 70 per cent of her maximum power, was an exceptionally fine performance. In the four hours' full power trial the steam pressure in the boilers was 229·6 pounds per square inch, the mean vacuum in the condensers 26 inches, the mean revolutions 112 per minute, and the indicated horse power 25,572, the mean speed being 22·4 knots an hour.

The enormous coal supply—3,000 tons—carried by these ships would enable them to travel 4,200 knots at a speed of 21 knots an hour.

The Chicago Bicycle Show.

The bicycle exhibition which was held at the Coliseum, at Chicago, last week, shows that in the majority of machines no radical changes have been made, although many new ideas have been incorporated in the structure of the wheel. It must be said, however, that these changes have very largely been introduced by the smaller and less known manufacturers. In general, the wheels are slightly heavier than last year, very few being shown which weigh less than twenty pounds. The frames are practically the same as those used in last year's model. Many of them have ingenious flush joints. The treads are narrower and hubs are larger as a rule. The improvement in the bearings is most noticeable, a large percentage of the wheels being dust proof or nearly so. They are fitted in many cases with ball retaining devices, the balls themselves are larger and the cones are constructed so that the friction is reduced. The crank hanger has a greater drop than last year, and the tendency seems to be toward the simplification of both crank and sprocket. There seems to be a desire on the part of many makers to return to the old form of crank construction, the round crank apparently giving way to the square crank. The easily detachable sprockets and movable bearings are much in evidence. Many of the exhibition wheels are provided with gear cases. Adjustable handle bars still seem to retain their popularity and a number of different grips are on exhibition. The wooden handle bar is also popular.

The desirability of large tires seems to have been demonstrated by the season just passed, and they are provided for in many of the new wheels by proportionately large fork side clearings. A number of puncture proof and non-slipping tires are exhibited.

Tandems and other combination machines are shown in considerable variety, and one of the novelties is the hydrocycle designed for use on the water. Among the sundries, of which there are a large number, lamps are specially noticeable. An acetylene gas lamp is shown, as well as a number of electrical lamps. All kinds of oil and vapor lamps are exhibited, but there are few radical improvements.

The Discharge of the St. Lawrence.

Professor C. H. McLeod, of the McGill University, Montreal, has recently conducted an inquiry as to the discharge of the St. Lawrence River some forty miles below Montreal. The level of the St. Lawrence has been falling for some years past, and last year reached a point below all existing records. It was therefore of interest to ascertain what was the corresponding change in the discharge as ascertained some ten years ago by Mr. Sproule for the Montreal Flood Commission. The section of river selected for the experiments was 3,000 feet long, the width being about the same. A series of tube floats were prepared, ranging from 2 feet to 42 feet 6 inches in length, and the time taken for each to cover the full course of 3,000 feet noted. The path of each float was traced by taking numerous observations of its position, and in all cases proved to be very regular. The cross section of the stream at the time of Mr. Sproule's experiments worked out to 115,298 square feet, and the discharge to 311,101 cubic feet per second. The lowering of the water level in Professor McLeod's experiments had reduced this to 105,432 square feet, and the discharge to 216,621 cubic feet per second. These latter experiments were, however, made in November, when the water stood 10 inches higher than at the end of October, so that apparently the minimum discharge would be about 196,000 cubic feet per second. From the above, it would appear that the mean volocity of the stream is about 2·06 feet per second, and from this it follows that the energy stored in the water passing per second is no less than 895,000 foot pounds per second at the time of Professor McLeod's observations. This would be equivalent to over 1,600 horse power, but, of course, there is no possibility of ever utilizing industrially the flow of such a stream.—Engineering.

An Improved Bunsen Gas Burner.

Dr. K. Bierbach, of Berlin, has made a material modification of the ordinary Bunsen burner, says the Progressive Age. The Bunsen burners now in use suffer from too great rigidity of form, which makes it impossible to use the burner for certain purposes. A lateral heating of apparatus can be accomplished by the ordinary Bunsen burner with difficulty only, while in some cases it is entirely out of the question. Yet it is frequently a necessity, for instance, in the distilling of liquids possessing a very high boiling point, or of those which are violently agitated by boiling; or it is desirable for other reasons to place the burner not under but beside the apparatus. The improved burner is so constructed that its flame can be moved in every direction like the stream of a fire engine. The burner consists of a mixing tube for gas and air bent in a right angle so as to form a long shank and a shorter one. The long shank is so arranged in a ring provided with a screw that it can be turned and moved in the ring. The ring can be turned around the axle of a vertical joint which rests upon a flat plate-shaped foot. By this triple action the knee tube can be put into any position desired and the mixture of gas and air can be conducted through it in both directions by means of an adjustable rubber tube. When the gas is conducted through the lower shank the burner can be placed under the lowest apparatus, when it flows into the shorter shank the position of an ordinary Bunsen burner is obtained; by inclining it lateral heating can be accomplished.