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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 386,

For the Week ending May 26, 1883.

Price 10 cents. For sale by all newsdealers

OPENING OF THE GREAT BRIDGE.

The time of our going to press slightly antedates the day of the opening of the great bridge connecting New York and Brooklyn; but our readers will be interested in knowing the intended order of proceedings.

The initial ceremonies have been appointed to take place in the Brooklyn station of the bridge on Sands Street, at 2 P. M., on Thursday, May 24, 1883.

The marshal of the day will be Major-General James Jourdan. The President of the United States and Cabinet, the Governor of the State of New York and staff, with others, will be escorted from the Fifth Avenue Hotel to the New York anchorage by the 7th Regiments, Colonel Emmons Clark commanding, and there received by the trustees and escorted to the Brooklyn anchorage, from which point the 23d Regiment, Colonel Rodney C. Ward commanding, will act as escort to the Brooklyn approach.

Seats will be reserved for the President and Cabinet, the Governor and staff, United States Senators, members of Congress, Governors of other States, members of the Legislature, the Common Councils of New York and Brooklyn, city and county officials of New York and Brooklyn, Army and Navy, the National Guard, the Press, especially invited guests, and the employes of the bridge.

At 2 o'clock the exercises will begin at the bridge station, Hon. James S. T. Stranahan presiding. The programme is as follows:

1. Music ..... 23d Regiment Band.
2. Prayer ..... Bishop Littlejohn.
3. Presentation address in behalf of the trustees, William C. Kingsley, vice-president.
4. Acceptance address in behalf of the City of Brooklyn, Seth Low, Mayor.
5. Acceptance address in behalf of the City of New York, Franklin Edson, Mayor.
6. Oration ..... Abram S. Hewitt.
7. Oration ..... Richard S. Storrs, D.D.
8. Music ..... 7th Regiment Band.

In the evening a grand display of fireworks from the bridge takes place, and also a reception, at the Brooklyn Academy of Music, to President Arthur and Governor Cleveland.

But these exercises, however interesting to the comparatively few who can witness them, will be as nothing compared to the great popular pageant, the sight of the millions of the two cities increased by the multitudes of strangers who will march over the bridge on the opening day.

PLACING THE STATUE OF LIBERTY.

Attention is called to the description and illustrations, published on another page, of the method proposed by Mr. John C. Goodridge, Jr., C.E., of New York city, to erect the Bartholdi statue of "Liberty Enlightening the World," and to build the pedestal upon which it is to stand. There is a reason for speaking first of the "erection of the statue," for that, by Mr. Goodridge's plan, will precede the construction of the pedestal.

Although no comprehensive or detailed plan has been accepted and published for the work of building the pedestal and raising the statue, it is generally supposed that it is to be done in the usual way of constructing the masonry—by means of false work, or staging, extending not merely to the top of the pedestal, 150 feet, but also to the top of the statue, and beyond, another 150 feet or more. At the best, this will be a very costly job, requiring much time and money, probably more than the cost of the entire statue.

Mr. Goodridge, however, proposes to dispense with the staging, and he proposes also to remove the apprehensions of those who fear the weakening and overthrow of the statue from the effects of the wind in its very exposed situation. It is claimed—and with good show of reason—that the statue, being composed of plates of comparatively light weight, and yet presenting a large surface to the wind, will be unable to sustain itself on its proportionally narrow base, and will require some internal support to give it the required rigidity. This is considered in Mr. Goodridge's plan; and he also proposes to make the use of the statue a present possibility instead of a future probability. He would erect and equip the statue at once with the electric light; and hereafter carry up the pedestal, the statue being lifted and taken up with the pedestal. The plan is simple, economical, and apparently very practical. This latter—the practical—is a quality for which the works of this engineer have always been especially distinguished.

THE DRIVE WELL PATENT.

In a recent trial in the United States Circuit Court, Des Moines, Iowa, the judge decides that the original drive well patent of N. W. Green is null and void. This decision might be important if it were not contrary to a number of other previous decisions by eminent judges of the United States courts, by whom the patent has heretofore been upheld. The present case will now go on appeal to the Supreme Court of the United States.

The invention of the drive well was made in 1861, by Nelson W. Green, an officer in one of the New York regiments then serving in the war. There was a rumor that the enemy had poisoned the wells. To make sure of a pure supply of water for his own regiment and for the Union forces generally, wherever they might march, he conceived the idea of driving into the earth small tubes of iron, perforated at the bottom, and of attaching a pump to the upper end of the tube. He reasoned that, when the pump was worked and suction produced, the water would rise in the tube, and thus serviceable wells might be made anywhere, by a few minutes' work, at small cost. His invention was found to be completely successful, was immediately adopted in the army, and our troops seldom lacked for good water wherever it was practical to drive down Colonel Green's tubes. From the army the use of the invention quickly spread through this country, then to foreign countries; it was adopted by the British army; it is now an adjunct of the military equipments of all nations, and is in common use throughout the world.

The patent to Col. Green was not issued to him until 1868, owing to the inability of the inventor to attend to the business of taking the patent until after his relations with the army were finally closed. Such, in brief, is the history of the drive well patent. It is one of the most useful inventions of the day, and has conferred vast benefits upon the people of this country and the world in general.

When Col. Green received his patent, he became entitled to demand compensation for the use of his invention from that time onward for seventeen years, and he established a general tariff or patent fee of ten dollars for each well made in accordance with his discovery. Many thousands of the Green drive wells were put into use before his patent was granted; for such prior use he could make no claim; but for the continued use of these wells after the grant of the patent, he was entitled to demand payment.

There are regions of country where every farmer has from one to ten of the Green wells on his premises; where, in fact, people have them in their kitchens, cellars, yards, and fields; wherever they want water, they drive a tube and put on the pump.

These people knew nothing about the patent when they put in the wells; and the appearance of the patentee's agents, asking for ten dollars' payment on each tube, with threat of a law suit if the demand is refused, naturally excites surprise and indignation. They feel as if their rights as American citizens were being invaded. What business, they ask, has the Patent Office to grant a patent to prevent us from pumping water out of the ground? We have always been accustomed to stick a tube with its pump into our cisterns and cellars to draw water; and we claim a free right to stick the tube into the ground and get water wherever we can. For reasons such as these many have refused payment; but the courts have decided adversely in various test cases, and the legality of the patent has been fully sustained.

But the costs of the law suits, and the expenses of collecting the royalties have greatly diminished the patentee's receipts. The patent will expire by its own limitations on January 14, 1885. If the Supreme Court should decide adversely to the patent in the present case, the inventor and his associates will probably lose more money than they have received from the invention. If the court sustains the patent, they may possibly realize a profit, as they will be enabled hereafter to collect damages from all who made use of the patent during its lifetime.

USES OF PAPER.

Under the generic term of paper, other substances used in combination with paper pulp are comprehended in general descriptions and occasional notices. When some wonderful story is read of the substitution of paper for wood, stone, the metals, for mortar, and plaster, and concrete, and other compositions, the reader should not understand that it is the material defined by Webster as "a substance formed into thin sheets or leaves, made of pulp obtained from rags, straw, bark, or like materials, pressed and dried." Paper, for so many and so differing uses as are attributed to it, must have something besides a vegetable pulp in its composition. In fact, the term "paper" is a misnomer for products that derive all their special qualities from foreign materials, held together by the paper pulp acting as a matrix. Thus, asbestos, in filaments, or powder, may be mixed with paper pulp to form a convenient uninflammable and possibly an incombustible material, shaped while plastic to convenience for special uses. So, clays in almost impalpable dust may become a part of the paper pulp production, and be a substitute for other materials. Other mineral substances may be mixed with the pulp, and, in short, there appears to be scarcely any limit to the uses that may be made of paper pulp mixed with foreign substances, moulded and pressed to form.

BELT WIDTHS.

An exchange says that "the true way to belt up machinery, and have it to do good service and last well, is to get a belt a little wider than your machine calls for; instead of getting a three-inch belt where you ought to get four, get five-inch instead, if you can possibly use it."

Indefinite advice of this character is of little value. Not only is it impracticable in most cases to substitute a five-inch belt for a four-inch, but in most cases, also, the builders of machinery have adapted the width of the pulley faces to the work the machine should be called upon to perform. Of course, no more work can be got out of a five-inch belt on a pulley with four-inch face than from a four-inch belt, and all the overplus in width is a weight and drag to be carried. There was a time, in the early history of manufacture in this country, when the home-made (shop-made) leather belts were run, at first, as wide as possible to allow for stretch and consequent narrowing. But belt-making is now an art, and the belts come from the factory fully stretched and of exact, unvarying width, a width that will

be retained as long as the belt lasts. If the transmitting power of belts has not yet been formulated into unvarying and trustworthy rules, under all circumstances of diameters of pulleys, distances between pulleys, relative positions of pulleys—horizontal, vertical, or diagonal—enough is established to render unnecessary such a variation in the width of a belt for doing a certain amount of work as that of one inch in four.

How Cable Messages are Received.

Until the fore part of November the French cable, having its terminus at North Eastham, Mass., employed the flash system of signaling. Now the cable is worked duplex on the Sterns system, says the *Journal of the Telegraph*, using an automatic recorder, by which the messages are received in ink on a narrow strip of paper.

By the system which has been displaced the messages were spelled out by flashing a ray of light back and forth across a standard line, the right and left flashes corresponding with the dots and dashes of the ordinary telegraphic alphabet.

In this system the light is flashed by reflection from an extremely light mirror, which is turned to right and left by the opposing influences of positive and negative impulses. This system has the advantage of being operated with very slight electric impulses, but also the disadvantage of leaving no permanent record.

To secure the latter very important end the recording instrument has been adopted. The press dispatch announcing the change states that in the new recorder the ink is discharged by the agency of electricity and "not by capillary attraction as in other cable recorders." This statement is incorrect, electricity being now similarly employed in the recording instruments used at Heart's Content, the Newfoundland station of the Anglo-American Company's cables.

A recent visitor to Heart's Content describes as follows the method of receiving messages at that point. The recorder is a horseshoe magnet, electrified by the usual circles of fine wire, and attracting a small metallic coil. The coil is hung between the magnetic poles, and by a light lever and a thread almost as fine as the strand of a cobweb is connected with a delicate siphon hung in a little reservoir of ink. The ink is electrified, so as to produce a repulsion of the particles, making it flow more readily through the siphon, which outside is about the size of a darning needle, and the interior tube scarcely larger than a hair. The lower end of the siphon rests against a paper tape playing perpendicularly through rollers. The whole machine is almost of gossamer fineness and flexibility, so as to minimize the electric strain necessary for working the cable.

Let us imagine now that a coming message has been signaled from far across the ocean at Valentia. The operator at first opens the simple machinery that works the brass rollers. On the center of the tape, as it passes between the rollers, the siphon at first marks only a straight line. Suddenly the line swerves to the right or left. The message has started, and the end of the siphon has begun its record. Worked by two keys, and positively or negatively electrified, the coil swings the siphon point now to one side, now to the other, along the tape. Responsive to the trained hand of the operator, the filament of ink marks out one notch, two notches, three notches; then suddenly it may be a high elevation or depression, until the delicate line traced on the tape looks like the tiny outline of a mountain range.

But it is a range whose every hilltop, peak, and valley means an alphabetical symbol to the telegrapher's eye. The recorder is the invention of the famous electrician Sir William Thomson. How delicate an interpreter it is may be inferred from the fact that ten jars work 1,800 miles of cable between Valentia and Heart's Content, while twenty-five jars of the same electric power would be needed to work 350 miles of land wire; in other words, the recorder is more than twelve times as efficient for its purpose as the ordinary Morse instrument. The recorder traces its character on the tape about as fast as a slow penman copies a letter. Besides its delicacy of work, the recorder, as its name imports, has the merit of leaving the record of the message.

Telegraph or Telephone.

Despite the fact that recent experiments have demonstrated the possibility of telephoning over long circuits, it is to be doubted if the instrument will be used otherwise than locally. It is too sensitive to induction, to atmospheric electricity, and to grounds for circuits exceeding a few miles in length. The experiments have been tried under the best, not under the worst conditions, and through a complete metallic circuit—in other words, a double line. It is hardly possible for the telegraph business of two large cities to be conducted by telephone by the senders of messages themselves, for five hundred wires might not suffice to prevent a block in busy hours, and merchants could not and would not wait.

To operate telephones as the telegraph is now used would be equally impracticable. Even were the instruments as little liable to disorder as the Morse, the greater danger of errors would weigh against them. There is no system of signals as clear as the present Morse code as interpreted by the "sounder." Each letter of a word is given, and ordinarily good operators seldom err in the record. By telephone it is the sound of a word, and not its vowels and consonants, which the operator receives, and a mistake can easily happen even under the best conditions. It is to be doubted, too, if the rapidity of transmission by telephone, where the message had to be written down at the receiving station, would even approximate that of the Morse system. Proper names, scientific terms, and phrases in a foreign language, etc., would have to be carefully spelled out, and even then would fall wide of accuracy.

By the Morse system good operators will receive at the rate of forty-five words a minute, which is almost the limit of rapid penmanship, and will often take a 2,000 word message without once interrupting the sender. The lines, too, will work in the heaviest weather, and are only interfered with by serious electrical storms, or by actual accident to the wires. Again, by the quadruplex system, four messages can go at once over one wire, while the long distance telephone requires two wires for one message. All in all, there seems to be but little prospect of the present series of experiments resulting in a practical good, however gratifying from a scientific standpoint.—*N. Y. Sun.*

New and Remarkable Chemical Experiments.

The liquefaction of oxygen gas and nitrogen, the freezing of alcohol and sulphide of carbon, are the latest achievements of chemical science. This news comes to us from the laboratory of M. Wroblewski, in Cracow, Poland, who has given some interesting particulars in a dispatch to M. Debray, published lately in *Comptes Rendus*. By the use of liquefied ethylene, M. Wroblewski and K. Olszewski obtained the remarkably low temperature of —136° C., equal to —212·8° F. Oxygen gas subjected to about this temperature, and compressed under a pressure of about 25 atmospheres or 375 pounds to the square inch, was readily liquefied in glass tubes, and formed a colorless and transparent liquid, very mobile, and resembling carbonic acid.

Nitrogen was also liquefied, forming a colorless liquid.

Alcohol was solidified at —130·5 C. or —202 9° F., forming a white body. Sulphide of carbon froze at about —116° C. or —176·8° F.

These are certainly very interesting and remarkable experiments. Air contains by weight, approximately, 23 parts of oxygen and 77 parts nitrogen. It is common to compress it to a far greater degree than above mentioned. For motive power, in driving compressed air locomotives, a compression of the air to 1,000 pounds to the square inch is in some cases employed. The difficulty heretofore experienced in the liquefaction of oxygen and nitrogen has been to obtain a sufficiently low temperature in conjunction with compression. This obstacle now appears to be removed, and a variety of new and valuable observations concerning the nature of gaseous substances may be expected.

Artistic Type.

It must be confessed that while a modern press can turn out a vast number of volumes with great credit, scarce any book nowadays can vie in beauty with the old Alding books, with many printed in Italy in the seventeenth and eighteenth centuries, or with those printed by our English Baskerville in the last century, between the years 1756 and 1775. One reason of this is that our types are not so beautiful. In old days each type founder was desirous of getting designs for his letters from men of real artistic feeling; nor did these disdain to design a comma, any more than they would scorn to make a beautiful leaf or flower in a picture devoted to saints or historical personages. There is a tradition that Hogarth designed Baskerville's types, which is likely enough; at any rate, they were the last English types of originality or beauty.

The best now existing are copies of copies, reproduced mechanically, which have long ceased to have the human brain infused, as it were, into the molten metal. The best existing types at this moment are French, and they, not ours, are the true descendants of Baskerville's; for at his death in 1775 his types were sold to France, and used to print an edition of Voltaire, still well known, and most excellent in its workmanship. The modern French types of the best fonts are reproduced, as it would seem, from these, but with less of exact mechanical copying and more of human variation and fancy. There could scarcely be a better work for the artistic future of books than that which might be done by some master of decorative art, like Mr. William Morris, and some great firm of type founders in conjunction, would they design and produce some new types for our choicer printed books.—*Fortnightly Review.*

A Fishway for the Potomac River.

For the Potomac at Great Falls, in order to facilitate the movements of shad, an appropriation of $50,000 has been made by Congress, and the United States Fish Commissioner, Professor Spencer F. Baird, invites suggestions as to the construction of a proper fishway. There are certain engineering difficulties which would have to be overcome, due to the rocky nature of the bed of the river and ice accumulations in winter. Maps of the river can be had of Professor Baird, necessary for a thorough acquaintance with the contour and grade found at the falls.

THE New York Belting and Packing Company, probably the most extensive manufacturers of rubber belting, packing, and hose in the United States, have just removed to their new building, No. 13 Park Row, New York. The new quarters of the company have been fitted up with special design for the business, and are most complete in every respect. They are located directly opposite the Post Office and Astor House.

Sunday in New York City.

A recent number of the New York *Tribune* contains an interesting article, showing how Sunday is passed in the great city of New York, with its population now numbering a million and a quarter of people.

The church membership is given at nearly one half the population, or 600,000 members, of which 500,000 are by estimate credited to the Roman Catholics, but of this there is no actual enrollment; there are 100,000 enrolled members among the Protestant churches. The Catholics have 190 churches, the Protestants, 310, total 500 churches. The Protestants have 365 Sunday schools, and 119,000 scholars attend. Catholic Sunday schools not given.

As to Sunday amusements in summer, about 75,000 persons leave the city for excursions into the country and the sea shores. The Germans, of whom there are about 250,000 in the city, visit the beer gardens in large numbers. Central Park receives 100,000 visitors on Sunday. Only one or two libraries are open on this day, at which the attendance is about 2,000. As for drunkenness and other crimes, there is a trifling let up on Sunday; the average number of daily arrests is 193; the average for Sunday is 182. Monday, 227. On Sunday evenings there are a few concert halls and beer song places open, visited, in the aggregate, by about ten thousand persons.

Twenty-four o'Clock.

The *Railway Reporter* says that the Cleveland, Akron, and Columbus Railroad Company have recently issued a new time card, based on the twenty-four hours system—that of numbering the hours of the day from one to twenty-four, instead of making two divisions of twelve hours each designated or distinguished as Ante Meridian and Post Meridian—A. M. and P. M. At present still another designation is used, that of M. when 12 midday is to be distinguished from 12 P. M. The *Reporter* says that this company is the first to employ this continuous system; but in reality the method is a very old one, coeval with the history of clocks, and is still in use in some parts of southeastern Europe. The *Reporter* adds, that "the day begins at midnight, as under the common system, but there is no possibility of confusion between forenoon and afternoon hours. The great advantage of this scheme in a railroad time table will be seen at once: 7 A. M. and 7 P. M. are frequently misprinted or misunderstood, while no one will confound 7 o'clock with 19 o'clock. Any watch or clock can be adapted to the system by simply putting the extension of the hours in a circle just inside of those already on the face. The exterior numbers will then be consulted up to 12 o'clock (noon), and the interior ones for the remainder of the day.

Fuchsias.

Fuchsias like a rich soil, freely drained, consisting of turfy loam, old, thoroughly decayed manure, or leaf-mould in about equal portions, with a good sprinkling of charcoal dust and sand, and, if at hand, a handful of bone-meal may be added at the last shift. Should they be required to bloom for a long time and continuously, they must be well fed. They are often well grown under vines, the moist atmosphere necessary for their proper development and the partial shade of the vine foliage seeming to benefit them materially; bear in mind, however, that where the vines are closely trained and the foliage becomes dense, the shade will be too much for the fuchsias.

New Postage Rates.

On and after October 1, 1883, letter postage will be uniform at two cents for letters to any part of the United States. On and after July 1, 1883, money orders for $5 and under may be obtained for three cents. The order will be payable to bearer, and will be good for three months from date of issue; after that time the holder can get par value only by applying to the department at Washington. On the same date the rate of money orders on all sums will be changed, and not exceeding $10 be procurable for eight cents, and from that to $100, the rate increasing up to 45 cents.

LUMINOSITY OF THE MAGNETIC FIELD.—Professor W. F. Barrett, of Dublin, has been making some interesting experiments to test the correctness of the discovery claimed to have been made by the late Baron von Reichenbach, viz., that a peculiar luminous effect, resembling a faint electric discharge in rarefied air, emanated from the poles of a magnet, and was rendered visible in a perfectly darkened room. These new experiments confirm those of Reichenbach.

W. E. SAWYER the well known electrical inventor and writer, died at his residence in Waverley Place, in this city, on the 15th instant. Professor Sawyer's name is familiar to our readers, as it has on several occasions been presented in our columns in connection with his inventions. He was a tireless worker in the field of electric illumination, and devised many novel things in that line.

NEW subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT, who may desire to have complete volumes, can have the back numbers of either paper sent to them to the commencement of the year. Bound volumes of the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT for 1882, may be had at this office, or obtained through news agents.