well sweep so common in this country. A pole works upon a fulcrum, is weighted at one end, and carries a rope or pole and bucket at the other. A workman draws down the bucket and fills it, and allows the heavy counterpoise to carry it up. He then empties it into a reservoir or canal. If one man cannot raise it high enough, it is dipped out of the canal by another shadoof, and carried to a higher point. In some cases a regularly terraced arrangement of shadoofs is seen.

These, of course, are intermittent in supply. But where the endless rope or revolving wheel is used, a fair approach to continuous operation is attained. The wheel is called *na'urah* in Arabic. We illustrate in the engraving one of the largest, from a photograph of the city of Hamath.

The city, the ancient Epiphania or Hamath, lies about 120 miles north of Damascus, and on both sides of the river Orontes. The city is supplied with water by about six of these wheels, which deliver water into elevated conduits. Each wheel and conduit is owned by a separate company. They are undershot water wheels. The river is partially dammed, a combined causeway and dam securing the necessary difference of elevation or head of water for the running of the wheels. A portion of this causeway appears in the foreground of the view. A chute or flume is thus formed, and the great wheel towers up from the flume and ceaselessly rotates.

Around its periphery is a series of buckets. As these descend on one side into the water they become filled. The wheel turning carries them up full on the other side until a point near the top is reached. There they are discharged into an elevated aqueduct through which the water flows into the city.

The city has a population of thirty or forty thousand souls. Of these, three-quarters are Moslems, and most of the rest Greeks or fellahs. This great population depends upon these wheels for its water supply. They are, despite their great size, of quite primitive workmanship and of low efficiency. They are constructed entirely of wood. Much of their expense is involved in the cost of repairs. This item is necessarily large.

The whole region is far from modern civilization. There are no railroads for the transportation of heavy material, and there is no supply of fuel. Hence steam pumps are not available. The population of the country parts are largely devoted to agriculture, and could use any quantity of water. It would seem that in this great plain a field for enterprise [illegible] found for some of our hydraulic engineers.

In Egypt, the introduction of improved machinery for raising water has had the most beneficial results. In the plain of Hamath, with its cities of Horus—the ancient Emesa—and Hamath is another region adapted for such work.

The city of Hamath is now insufficiently supplied, both as regards quantity and head of water. From a letter recently received from Mr. John Baetzner, who had recently visited the city, we hear that the authorities and citizens alike are complaining of the deficient supply. When a place so completely Oriental as this makes such a complaint, it indicates an unmistakable want. By the dams a head of about eight feet of water in the river at the city is secured. There would appear to be but little trouble in causing this to work improved water wheels, turbines or undershot, which might be made to drive pumps; or some system of hydraulic rams might be available.

Our correspondent believes that such improvements could be advantageously introduced. While Turkey and its dependencies are very poor, it is under such conditions that economy is imperatively necessary. Improved machinery always effects an ultimate saving, though its first cost may seem great.

Our view of the wheel is taken from a photograph sent to us by Mr. Baetzner. The picture, taken in the clear Syrian air, is a marvel of photographic perfection. By a magnifying glass the smallest details of distant objects can be discerned.

Hints to Employes.

There is only one spirit that achieves a great success. The man who seeks only how to make himself most useful, who aim is to render himself indispensable to his employer, whose whole being is animated with the purpose to fill the largest possible place in the walk assigned to him, has in the exhibition of that spirit the guarantee of success. He commands the situation, and shall walk in the light of prosperity all his days. On the other hand, the man who accepts the unwholesome [illegible] of the demagogue and seeks only how little he may do, and how easy he may render his place and not lose his employment altogether, is unfit for service. As soon as there is a supernumerary on the list, he becomes disengaged as least valuable to his employer. The man who is afraid of doing too much is near of kin to him who seeks to do nothing, and was begot in the same family. They are neither of them in the remotest degree a relation to the man whose willingness to do everything possible to his touch places him at the head of the active list.

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NEW YORK, SATURDAY, JANUARY 29, 1887.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 578.

For the Week Ending January 29, 1887.

Price 10 cents. For sale by all newsdealers.

DEFEAT OF THE OBNOXIOUS PATENT BILL.

We have much pleasure in announcing the defeat in the House of Representatives, on the 17th inst., of bill H. R. 4,458. In our paper of January 8 we gave the full text of the bill. Its fundamental idea was the emasculation from the patent laws of the right of inventors to collect damages for infringement, thus practically giving to infringers free liberty to make use of and sell any patented invention they might desire. The passage of the bill would have injured almost every industrial establishment in the country.

The bill was defeated by the very decisive vote of 156 nays to 81 yeas; not voting, 82. The thanks of the nation are due to the 156 representatives who knew their duty, and when the vote came did not hesitate to do it.

In December last, when the bill came up in the House, Mr. Townshend, of Illinois, the father and most able advocate of the bill, and a member of the Patent Committee, stated that the Committee unanimously asked that the rules might be suspended and the bill passed. Only thirty minutes were allowed for debate; and when the allotted time had passed, an adjournment took place, which carried the vote on the bill over until the present time.

It now appears that of the thirteen members of the committee only five were in favor of the bill, four were against it, and four did not venture to vote.

Several other unsatisfactory amendment bills are still pending. We trust they will be carefully scrutinized and defeated.

TWO USEFUL LIVES.

The close of the year 1886 has witnessed the death of two Frenchmen whose names are intimately connected with the later history of grape culture, especially in relation to the grapevine phylloxera.

On the 25th of November, 1886, Louis Bazille died at his home in Montpellier. Born October 23, 1828, he inherited from his father a strong taste for agriculture as well as commercial affairs. Modest, retiring, beloved by every one who knew him, he has left an honored name, but will be chiefly remembered for the deep interest he took in all matters relating to phylloxera, his own grounds at St. Auns having become, from 1873, an experimental station for American vines. In 1876, he translated into French Bush & Son & Meissner's Catalogue of American Grapevines.

Five days later, on the 30th of November, 1886, Jules Lichtenstein departed this life. To entomologists he was well known the world over for his original researches in the life habits of plant lice (Aphididæ). Grandson of the naturalist George Lichtenstein and nephew of the scientist Henri Lichtenstein, who was inspector of Museums of Natural History in Prussia, Jules had a great fondness for natural science from a boy, and always possessed a passion for the study of insect habits. In 1868, just at the time when the then new plague of the grapevine in France was being discussed and attributed to one cause or another, it was Lichtenstein, who suggested that the insect which was found to be the cause of the trouble was the same as that described by Asa Fitch under the name of *Pemphigus-vitifoliæ* in the United States. It was on the 10th of August that this suggestion was first made by Lichtenstein and subsequently, in 1869, he reiterated the opinion with more confidence after having received Professor C. V. Riley's illustrated article on this insect in the *American Entomologist* for August, 1869 (Vol. I., p. 248). This hypothesis was confirmed by correspondence with Riley, and more particularly by the latter's visit to France in 1871, when he had occasion to carefully study phylloxera in France; and, upon his return to America, found it affecting our vines upon the roots also. Learning from Riley's writings of the immunity of some of our vines from phylloxera in this country, thus confirming the prior observations of Laliman at Bordeaux, Lichtenstein may be said to have been contemporaneous with Riley in urging the use of these resistant vines as stocks on which to graft the more susceptible European varieties—a recommendation which has been fraught with such vast benefit to the phylloxera-infested portions of Europe and of California, and which has reacted so beneficially to grape growers in this country. Lichtenstein was a man of fine figure, whole souled and amiable almost to a fault. All those who came in contact with him bear evidence to his enthusiasm and his lovable nature. He had also a poetic temperament, which sometimes led him astray in matters of exact science, but it may confidently be said that there are few Frenchmen who have done more toward advancing our knowledge of the difficulties which the grape grower has to contend with, both in Europe and here.

Dr. William Perry.

Dr. William Perry, the oldest person in Exeter, N. H., and the oldest graduate of Harvard College, died there, January 11, aged ninety-eight years. He was the sole survivor of the passengers on Fulton's first steamboat ride down the Hudson, seventy-nine years ago. He was born in Norton, Mass., in 1788, and was a member of the class of 1811 in Harvard.

Prof. Edward Livingstone Youmans.

On Tuesday, January 11, this well-known scientific writer and lecturer died, at his home in this city, of catarrhal fibroid consumption. Two years ago he suffered from an attack of pneumonia that permanently affected his lungs. His life is an interesting and typical one. For about forty years he was closely connected with the house of D. Appleton & Co., as their scientific adviser. Their list of scientific works may be regarded as largely the outcome of Prof. Youmans' counsel. He was born at Coeymans, N. Y., on the 3d of June, 1821. At the age of 13 he had ophthalmia, which for a while left him totally blind. His eyes were never again perfect, and he often lost the use of them. Notwithstanding this obstacle, he studied and experimented in physics and chemistry, enjoying the assistance of his sister, Anne Eliza Youmans, herself a well-known scientific writer. He invented a writing machine to render him as little dependent as possible upon his eyes, and with it began his work as a writer. From the University of Vermont he received the degree of M.D., but he never practiced medicine. He filled the chair of chemistry in Antioch College, Yellow Springs, Ohio. This institution under the auspicies of the Unitarian Church was founded in 1852. His duties here commenced in 1866, and after that he was always known as Professor Youmans.

Led by his sister, the almost blind scientist is said to have called upon the Appletons over forty years ago, to make arrangements for the purchase of books for his own use. This visit brought about his connection with the firm, and in 1852 his "Class Book of Chemistry" was published by them. This had a great success, and in 1860 was translated into Spanish. He rewrote the work in 1875, a period when the new system of chemical equivalents and symbols was firmly established. His list of works also include the following: "Alcohol and the Constitution of Man," 1853; "The Chemical Atlas," with text, 1855; "The Handbook of Household Science," 1857; "The Correlation and Conservation of Forces," 1864; and "The Culture Demanded by Modern Life," 1867.

He was a succes ful popular lecturer, evincing a strong leaning toward the doctrines of Darwin and Spencer. He arranged with Prof. Tyndall for the latter's lecture course in this country. He himself was most cordially received in London by the scientific circle, including Huxley, Tyndall, and others. In 1871 he took up the international copyright system and organized ultimately, after several visits to England, the "International Science Series." The works in this collection are published in London, New York, Paris, Leipsic, Milan, and St. Petersburg. Fifty-seven works have been issued already. In 1872 the *Popular Science Monthly* was founded by him. He has ever since that period been editor in conjunction with his brother, Dr. W. J. Youmans, who has assisted in the work.

He leaves a wife, but no children. His father nd mother, both extremely advanced in age, still survive him.

He was noted as one of the early advocates of the doctrines of the "Conservation of Force" (or "of Energy," under its modern acceptation) and of the "Correlation of Forces." The bent of his mind may be clearly discerned in the columns of the *Popular Science Monthly*.

For upward of six months he had been practically absent from his office, and for many years had done much of his work at home. His record as a worker under his natural obstacles is a most creditable one.

Drilling Holes in Plate Glass.

The last volume of the "Transactions of the American Society of Mechanical Engineers," recently issued, contains a discussion on the best method of drilling holes in plate glass. which contains some points of interest to our readers.

Mr. Durfee mentioned his successful experience in drilling holes three-sixteenths of an inch in diameter through glass plates about one-eighth of an inch thick, by the use of an ordinary bow drill, with spirits of turpentine as lubricant. The holes were drilled from one side until the drill just punctured the opposite side of the glass; then the glass was turned over and the holes finished by drilling from the opposite side.

Mr. Oberlin Smith recorded fair success with a very hard drill and the same lubricant in drilling holes one-half inch in diameter in plates one-quarter of an inch thick; but instead of turning over the glass, he put a piece of perfectly flat cast iron under the glass, with a little piece of paper between, clamping all firmly together, and permitted the drill to puncture the iron a little.

Mr. Ashworth referred to the remarkable efficacy of the sand blast steam jet in drilling holes through glass, and Mr. Towne stated that that was, undoubtedly, the best method where the work is to be done in large quantities and can be sent out to be done. But for doing the work in small quantities in one's own establishment, he instanced the method employed in the works of the Yale & Towne Manufacturing Company for drilling holes seven-sixteenths of an inch in diameter through glass one-eighth of an inch thick. The best tool for the work was found to be a brass tube five one-hundredths of an inch thick, the cutting agent being emery, No. 5 H, and the lubricant simply water, which they had found as efficient as oil or turpentine, and much less troublesome.

Thus the workman was able to drill thirty to forty holes per hour, the drill being run at 2,000 revolutions per minute, and the drilling of forty holes through the one-eighth inch glass using up about one inch of the tube. Mr. Towne added that it was important to keep the emery well washed and cleaned, that is, with the dust removed from it which results from the abrasion of the glass.

For small holes, Mr. Stetson could conceive of nothing better than the diamond drill.

The Arthur Kill Bridge.

The plans of the Baltimore and Ohio Railroad for a bridge over the river or Arthur Kill, near New York, are not approved by the War Department engineers. This kill is one of the waterways between New York Bay and Raritan Bay.

The Secretary of War has lately transmitted to the Senate, in response to a resolution of that body, a report of the Board of Engineers for Fortifications and River and Harbor Improvements on the proposed bridge across the Arthur Kill, Staten Island Sound. The report is accompanied by voluminous documents, giving in detail the data on which the report is based. It says that the amount of freight which annually passes the site of the proposed bridge across the Arthur Kill will approach 5,750,000 or 6,000,000 tons of actual freight, an amount in excess of the tonnage of foreign commerce cleared from New York for 1885. It is thus seen, says the report, that so far as tonnage is concerned, this is one of the great waterways of this country, and indeed of the world. Of this vast amount of freight, probably nine-tenths is in tows, sometimes reaching 70 vessels to one tow. The tows are usually made up of five vessels abreast, and are eight vessels long, and their dimensions are 100 to 125 feet in width by about 800 feet long. Under the plan submitted by the Staten Island Rapid Transit Company, such masses of vessels are to pass through a clear opening between piers about 200 feet wide.

The report says that the experience at the draw at the mouth of the Raritan River, through which only about one-third as much freight passes as through the Arthur Kill, and which has 207 feet draw openings, shows that the draw at that place is a serious obstruction to navigation, and has caused considerable losses from delay and collisions. The tows to go north through the Arthur Kill pass the proposed site of the bridge while the tide is running flood, and when any collision would produce great damage. They are much larger than those passing through the Raritan draw, and it is impracticable for these large tows to anchor, as the smaller ones do at the Raritan draw. The board is, therefore, of the opinion that if a bridge were constructed as proposed, with a pier in the middle of the Kill, it would make necessary a large reduction in the size of the tows and the consequent increase in the cost of transportation; and it is of opinion that if there were a natural obstruction so serious as a pier in the middle of the stream, its removal would be urgently and rightfully demanded, even at great cost. The obstruction is not there now, and should not be placed there to the injury of navigation in order to save a few hundred thousand dollars to the railroad company.

The proposed bridge, the report says, is also of insufficient height, the lowest part of the superstructure being only 34 feet 8 inches above mean low water. For these reasons the board recommends to the Secretary of War a bridge at the site proposed, the channel face of whose east pier shall be on the Staten Island bulkhead or shore line, and whose channel span shall give a clear opening of 450 feet; whose span next west shall be a draw span, giving 125 feet clear opening, the lowest parts of these spans being 50 feet above mean high water. The foundations of the pier should be so arranged as to admit future deepening of the kill to 20 feet.

"Such a bridge will be an obstruction and an inconvenience," the report says, "but will not in any serious degree increase the cost of transportation. It involves some increase of cost to the railroad company, but no more than it should bear rather than infringe on the pre-existing rights of navigation."

The Sealing of Letters.

How were letters sealed before the invention of gummed envelopes? In one of the last numbers of *Le Livre*, Mr. S. Blondel has an interesting article upon this subject, in which he describes all the methods of sealing that have been successively employed from the remotest antiquity. The first seals consisted of a ring that was affixed to clay or bole, and later to chalk or *creta asiatica*, a mixture of pitch, wax, and plaster. The use of wax did not begin to become general till the Middle Ages. Beeswax, rendered yellow by time, was the first material used. Then came sealing wax mixed with a white substance. Red wax began with Louis VI., in 1113; and green wax made its appearance about the year 1163.

In the thirteenth century, yellow, brown, rose, black, and blue were added to the foregoing colors. Black wax is a rarity met with in the seals of the military religious orders.

Among the ancients, ring seals were used not only for sealing letters, but also, as small locks were not common, for sealing caskets and chests that contained valuable objects; and they were even employed for sealing the doors of houses and apartments.

Under the First Empire, people began to use wafers, which were brought from Italy by the soldiers and officers of the French army. These wafers were cut with a punch out of a thin leaf made of flour. Finally, gummed envelopes gradually began to replace sealing wax and wafers nearly everywhere. The first envelopes, which were manufactured in England, date back to 1840. The machine for folding them was invented in 1843, by Messrs. Edwin Hill and Warren de la Rue, and in 1849 was so improved by the latter that it was capable of folding and gumming 3,600 envelopes per hour. Since 1850, the annual production of envelopes has been greatly increasing, and there are now being daily manufactured in Paris alone 1,500,000.

As regards the seals used by certain famous individuals when the use of wax was in vogue, *Le Livre* gives the following information:

Goethe, after his return from Italy, almost always se his letters with an antique head, such as that of Socrates, Minerva, or Leda. The astronomer Lalande's seal had a ship engraved upon it, and Meyerbeer's had a lyre, with the legend "Always in tune." Victor Hugo had a very simple seal. At the sale of his effects in 1 Arsene Houssaye bought a seal with the initials V. H. so arranged that when inverted they formed the cipher A. H.—*La Science en Famille.*

Drain Pipe Traps.

In the convention of the American Institute of Architects, held in New York city, Dec. 1, 2, and 3, a report was presented by Mr. Glenn Brown, architect, Washington, D. C., on the subject of experiments in "Trap Siphonage."

The investigations relating to this subject were carried out at the Museum of Hygiene of the Navy Department, at Washington, D. C.

The experiments have been conducted with the view of obtaining simply facts, without the ulterior object of introducing some patented article, where commercial interests are concerned. There were tests made of existing systems of trap ventilation, and patented traps that claim to need no ventilation. In testing the different forms and manufactures, the fixtures were subjected to a strain equal to what they would receive in actual use, and also strains more severe than ordinary uses, and intended to cover unusual demands. To quote from the report: "The majority of the experiments have been made to test the power of the traps to resist siphonage and back pressure produced by the column of water passing down the vertical pipes. The question of first importance is: *Does ventilation protect the seal of traps in ordinary use?*" Ninety-nine tests of vent pipes and traps are recorded in the report, "in all of which the vent pipes were open and a positive effort was made to break the seal of the traps," except in "the first experiment, when the fresh air inlet at the foot of the soil pipe, and the opening at the roof, were closed, in this way subjecting the traps to the greatest strain which they could possibly have to resist, for either siphonage or back pressure." The deductions arrived at, according to tests, are as follows:

1. The seals of ventilated traps are safe against siphonage and back pressure.
2. The seals of unventilated traps are never safe from siphon action or back pressure, except in deduction four.
3. The vertical vent should be three inches, with a four inch soil pipe.
4. Traps connected on a horizontal pipe and fixtures discharging on the same level into horizontal pipe apparently have no effect on unventilated traps.
5. All varieties of non-mechanical traps are more easily affected by back pressure than by siphonage.
6. The ball traps were not affected by back pressure, but by siphonage.
7. The Sanitas trap withstood siphon action better than any of the patent traps, but was easily affected by back pressure.
8. The sewer air is more liable to enter unawares by back pressure through the seal of the trap, because the seal remains unbroken.
9. Difference in friction of iron and lead pipes made no apparent difference in the effect on the traps.

An Early Subscriber.

In a note accompanying his subscription for 1887, Mr. J. E. Emerson, of Beaver Falls, Pa., claims to be the oldest subscriber to the SCIENTIFIC AMERICAN. His name has been constantly on our subscription list for forty years. No one can claim to have a file of the papers from a much earlier date.