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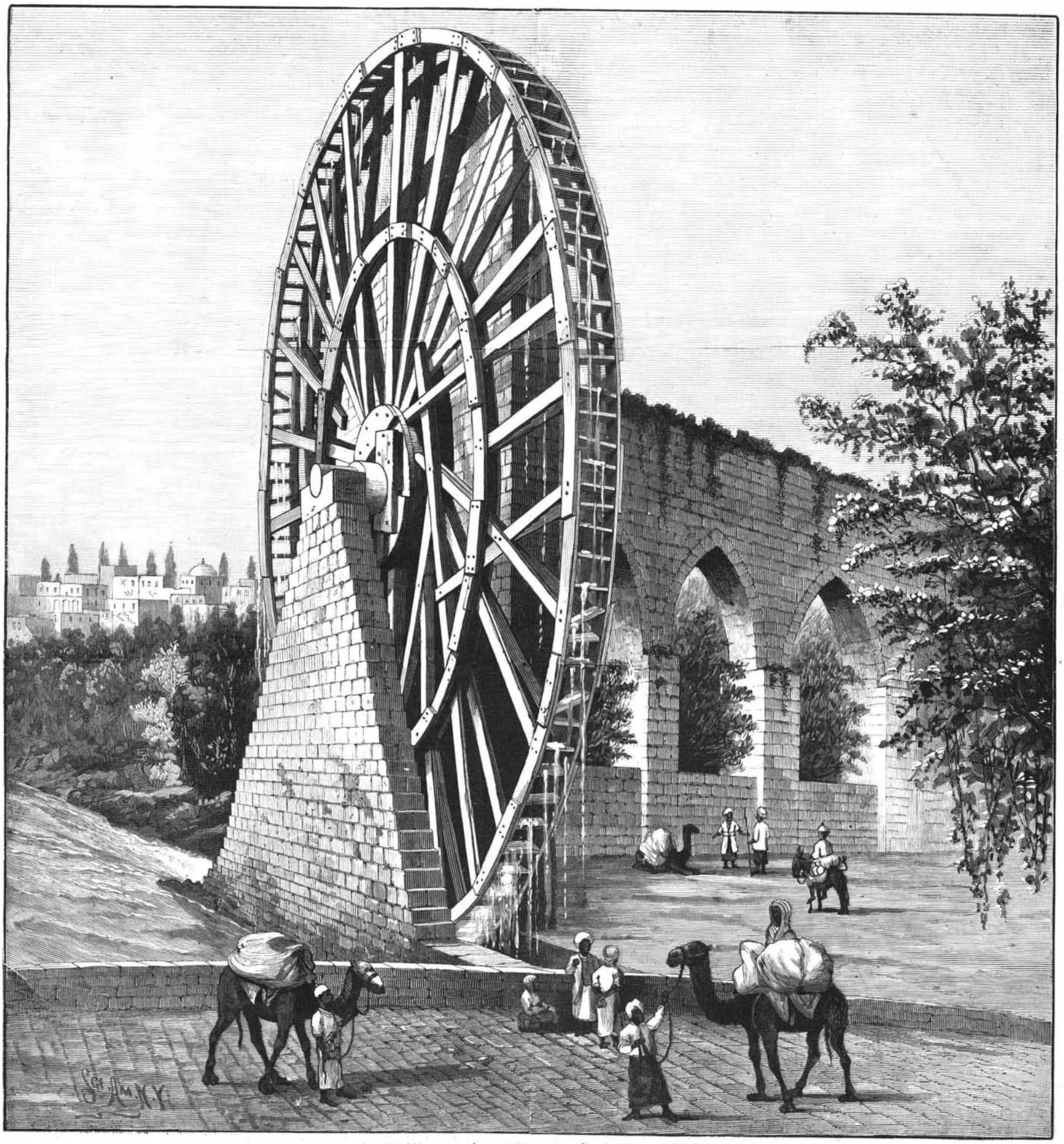
THE WATER WHEELS OF HAMATH.

Through the plain of Hamath, in Syria, following a general northerly direction, runs the river Nahr el Aasy, or Orontes. It is fed by the waters of Lebanon. Near the end of its course it bends to the westward, and passing through the Valley of Antioch, discharges into the Mediterranean nearly opposite the island of Cyprus. It is the main reliance of the great plain for its water supply. Hundreds of water wheels, some turned by the current, others caused to revolve by animal power, are situated upon its banks. The region depends upon these for its agricultural prosperity.

Where water is to be raised from wells of some depth, an endless rope carrying buckets is caused to descend on one side and ascend upon the other into and out of the well. The rising portion carries up the buckets filled. As they reach a certain point they are emptied into an aqueduct and descend again empty. The rope is often made out of branches of the myrtle, as that is so rough that it does not slip. A camel walking round and round in a circle turns a vertical spindle, which by rude gearing works the endless rope of the buckets. Considerable quantities of water can be thus raised. But the characteristic wheel of the "land of Hamath" is different from this. The river itself is the great source of power, and water wheels turned by the current are largely used. At the principal cities of Horus and Hamath many are employed to supply the personal needs of the inhabitants, and these cities are quite famous for their wheels. The whole region is of great interest in its relation to the books of the Old Testament. Many allusions to the land of and to the "entrance into Hamath" occur there.

The wheels vary not only in character, but in size. Some, such as that just described, are adapted to be turned by a single draught animal, while others are of vast dimensions, sometimes over eighty feet in diameter. They are an important advance upon the Egyptian "shadoof." The latter is a version of the old-fashioned



THE GREAT WATER WHEEL AT HAMATH, TURKEY.

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 might be 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 advice 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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Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

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 1872, 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.