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EXHIBITION OF PUMPING ENGINES BY C. H. DE LAMATER & CO. AT THE NEW ORLEANS EXPOSITION.

The accompanying illustration shows the exhibit of pumping engines manufactured by the De Lamater Iron Works, foot of West 13th Street, New York city. It is particularly noticeable on account of showing the great variety of pumping engines manufactured by this one firm, which extends from the smallest practicable hot air pumping engine to the largest size steam pump.

These works for several years past have been extensively engaged in the manufacture of pumping engines of every variety. They have given pumping engines for domestic use a vast amount of attention, and their exhibit attracts very much notice for this reason, as it contains several machines designed for that special purpose, and they all show the result of skill and thought combined with the knowledge of the varied requirements of the numerous conditions of water supply and the duties to be performed by domestic pumping engines. These pumping engines use atmospheric air for a motive power. The air is alternately compressed, heated (which expands it, thus furnishing the power), and cooled. The same air is used over and over continuously. There is no exhaust or noise of any kind, and there are no valves in these engines, except in the water pump.

Of these hot air pumping engines exhibited there are two varieties, styled respectively the *Ericsson* and the *Rider*. The *Ericsson* hot air pumping engines, which have been widely introduced within the last few years, are built, as are all the pumping engines manufactured by this firm, under a very rigid system of gauges, which makes the parts perfectly interchangeable, and they are made in such quantities that the cost of one of the smaller sizes comes within the reach of even the smallest property owner. They are particularly adapted for use in private dwellings, and, as they can be operated by either a gas jet or a wood or coal fire, they are among the most complete and convenient, as well as the cheapest, arrangements for raising water.

The *Ericsson* hot air pumping engine is a single cylinder engine in which are two pistons, one called the "main" or air piston, which receives and transmits the power, and the other is called the "transfer" piston, the office of which is to transfer the air contained in the machine alternately, and at the proper time, from one end of the cylinder to the other.

The cylinder is provided at its upper end with a water jacket, through which all the water passes on its way from the well to the tank. This keeps the upper end of the cylinder cool, while the lower end is exposed to the fire and becomes as hot as is practicable to make it. By the peculiar arrangement of connections between the air and transfer pistons, the proper relative motions between these pistons are obtained. The operation is as follows: After the lower end of the cylinder has been sufficiently heated, which usually takes only a very few minutes, the engine must be started by hand, by giving it one or two revolutions. The air contained in the machine is first compressed in the cold part of the cylinder; it is then transferred to the lower end, where it is instantly heated and expanded, thus furnishing the power. This engine, like all other hot air engines, is only single acting. The momentum of the fly wheel continues the revolution until it receives an additional impulse by the repetition of the above mentioned conditions, which occur once in every revolution. The same air is used continuously, and is cooled, compressed, heated, and expanded in the regular order and without noise.

Figure 3 in the illustration shows one of these engines with a furnace adapted for burning coal, and Fig. 2 the same adapted for burning wood. Several of these engines are now at work in suburban residences, using wood for fuel, and the owners speak of them in the highest terms. As the furnace is small, the chips from the wood-pile can be used, and the fuel really costs nothing. For use in cities where a gas supply can be obtained, and the water has not sufficient force to flow to the tops of the houses, they are arranged with a gas furnace, as shown in Fig. 5. We are informed that this firm has sold in New York city alone several thousand of these engines, which are so simple and safe that their care is usually intrusted to the hands of the cook or the coachman. A great many suburban residences are unfortunately situated with respect to obtaining pure water, and the owners are obliged to resort to very deep wells, being often compelled to sink artesian wells to a depth of several hundred feet in order to obtain pure water for cooking and drinking purposes. One of these engines at the exposition is provided with a very neat and suitable device, by which the pump can be lowered down into the well a sufficient depth to reach the water, the engine standing on the surface, where it can be easily attended to.

Figure 4 is an illustration of the *Rider* Hot Air Pumping Engine. For the present these engines have only been adapted to using either coal or wood as a fuel. They are somewhat more expensive than the engines previously mentioned, and are intended to do more severe work. This style of engine is extensively used in the large flat houses in this city, and also in the numerous summer hotels at the watering places in all parts of the country, and great numbers of them have been exported to different foreign countries. They are

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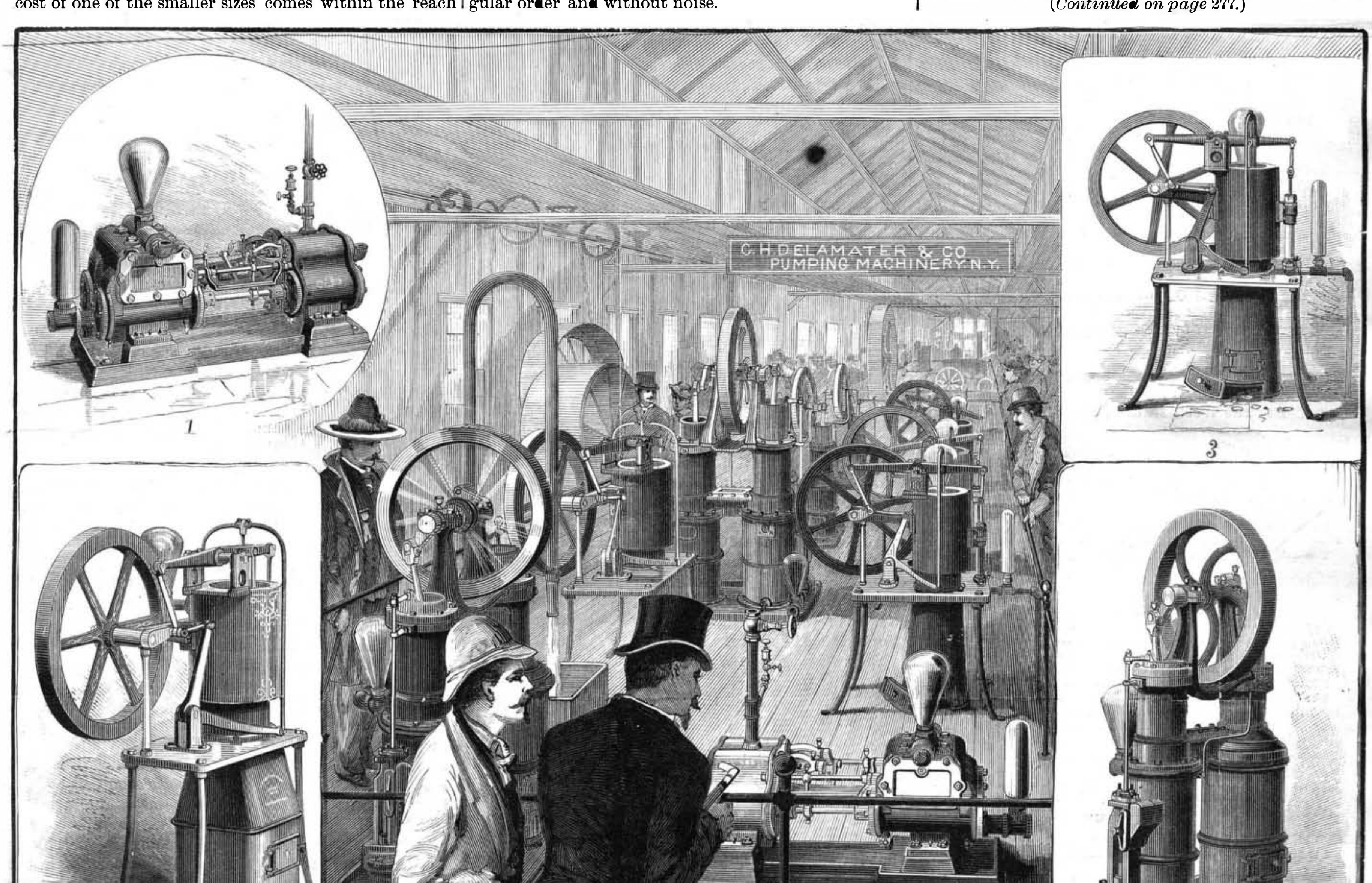

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also provided with deep well pumps for artesian and other deep wells, are noiseless, and may be run by unskilled labor.

These engines have two cylinders, one of which is kept cool by the water in a similar manner as the *Ericsson*, and the other is heated. The compressing is done in the cold cylinder, and the expanding in the hot cylinder. The air is alternately transferred from one cylinder to the other, and in its passage it passes through a regenerator, which is situated between the cylinders. This regenerator is for the purpose of saving as much as possible of the heat which remains in the air after it has done its work and is ready to be cooled and compressed. It is composed of a series of thin plates placed on edge and having thin spaces between them. Through these spaces the air flows. The heated air on its way to be cooled heats these plates to a high degree, and consequently parts with the greater part of the heat contained in it. These plates remain heated until the air, after having been cooled and compressed, returns through them, when the plates give up the heat contained in them to the air. This arrangement effects a very great saving in fuel. These engines, like the *Ericsson* above described, use the same air over and over. They, however, compress the air to a higher degree. The operation of obtaining the power is theoretically the same in both engines.

Accompanying these engines are several varieties of pumps, each adapted for a particular service, such as deep well pumping, forcing water to extreme heights, etc. The pump usually furnished is intended for what is called "surface pumping," and is secured to the cold side of the engine; it is double acting. The main portion consists of two parts of cast iron. The working barrel is a brass cylinder, and the piston is packed with two cup leathers made of sole leather pressed into shape. The four valves, two for suction and two for discharge, consist of cylindrical pieces of rubber, and, being free to roll with the action of the current of water, the wear is even throughout the entire length. The valve seats are milled smooth to fit the valves. The ports covered by the valves are not, as usual, a series of small openings, but consist of a single port without bridges or grating, thus preventing the inconvenience arising from the seats becoming clogged with grass, etc. The suction valves are situated at the bottom part of the pump, as near the base of the engine as possible. The discharge valves are placed in the upper portion. In designing this pump, great care was exercised in order to prevent the possibility of any "air trap." The pump rod works through an ordinary stuffing box, which is packed in the usual manner, and provided with a neat cup to catch any leakage; tapped in the cup is a pipe for leading away the water which collects in it; this makes it easy to keep the engine and surroundings dry and clean.

In addition to the above mentioned hot air pumping engines, Messrs. C. H. De Lamater & Co. manufacture an extensive line of steam pumping machinery, both single and duplex. Figure 1 represents one of their duplex steam pumps, which has many novel points about it, and in which the workmanship and material appear to be of the highest standard. These duplex steam pumps are used for pumping water for hydraulic elevators in large office buildings and hotels, where it is imperative to prevent all noise, as the steady flow of water through the pipes is perfectly noiseless and without the slightest jar.

They also manufacture and have on exhibition a very handsome single steam pump, which for smooth working and general design and appearance is quite attractive. These pumps have been made on an extensive scale, and some very large ones have been built. The new steel cruisers recently built by the U. S. Government are fitted with these pumps.

The De Lamater Iron Works have been long and well known throughout the United States, and are at present one of the largest establishments of their kind. The pumping engine department is only one of many in their business, and they make a specialty of surface condensers for all purposes, and manufacture general machinery of all kinds. The "De Lamater" propeller wheel is well known to all steamboat men throughout the country. The works are situated at the foot of West 13th Street, and their general offices are at 16 Cortlandt Street, New York. They also have a branch house at 40 Dearborn Street, Chicago.

IT has been asserted that the quality of tea may be approximately estimated by the weight of ash which it yields, the value of tea being inversely proportional to the ash. M. Nikatinski has lately, says the *Grocer*, made a series of experiments with the view of testing the truth of this assertion, and finds that the ash is a very fair index of the quality of the tea. Thus a good Shanghai tea gave 5·16 per cent ash, a cheap green brick tea 6·87, and two Orenburg teas, which are known to be adulterated with rose leaves, and of which the price was 115s. and 48s. per cwt., yielded respectively 7·87 and 10·42 per cent of ash.

Velocity of Projectiles.

The manner of ascertaining the velocity of a projectile was lately described and illustrated at the meeting of the New York Electrical Society by Henry A. Sinclair, electrician at the United States Ordnance Proving Ground at Sandy Hook. One of the Boulenge chronographs used at the proving ground was set up in the lecture room, and Mr. Sinclair demonstrated its quickness and accuracy in determining the velocity of a pistol ball. The instrument was described as being very simple and very easy to work. It consists of an upright brass tube, supporting two electro-magnets, one above the other. When a test is being made, an electric wire connects one of the magnets with the point of firing, and another electric wire connects the other magnet with the target or objective point of the projectile. A long rod is suspended from the first magnet, and a short rod hangs from the second one.

The projectile in leaving the gun cuts the first wire, and the broken circuit releases the long rod, which drops downward. When the projectile strikes the objective point, the second wire is broken and the short rod falls, striking a spring which causes a knife blade to mark the descending long rod. The space from the base of the long rod to the indentation is then measured, and by the fixed law of falling bodies the time taken by the projectile in going from the gun to the target is ascertained, and from that the velocity is figured. Mr. Sinclair took a good sized revolver, loaded it with 3½ grains of powder and a bullet weighing 133 grains, and fastened one end of the wire attached to the first electro-magnet across the muzzle. He then fired at a wired target in a tubular shooting gallery about 4 feet long. The time of the transit of the bullet was determined from the mark on the long rod, and it was speedily announced that the velocity of the bullet was 156 feet per second. A second trial with the same instrument showed a velocity of 207 feet per second.

"Why is it desirable to ascertain the velocity of a projectile?" asked a member of the society.

"Because," replied Mr. Sinclair, "it is a means of comparing the power of a gun, of comparing different kinds of powders and projectiles, of determining their energy, and approximately their range and penetration into iron plates. Had the officer in command of the Monitor at the time of her memorable encounter with the Merrimac known what his guns would stand, he could have sent projectiles clear through the iron-covered sides of the ram. He used only six or seven pounds of powder in a charge when his guns would have stood charges of fourteen or fifteen pounds. Few persons realize how much energy a large projectile possesses. A 12 inch shot weighing about 700 pounds, and traveling with a velocity of 1,500 feet a second, would strike as hard a blow as a railroad train consisting of locomotive and five or six cars (weighing about 100 tons) moving at the rate of 57 miles an hour.

Attempts were made to ascertain the velocity of projectiles as early as 1740, and in 1840 electricity was first used for that purpose. By the Schultz chronoscope, which Mr. Sinclair said was the most accurate instrument of its kind, intervals of time can be measured from thirty seconds to one five-thousandth part of a second. Mr. Sinclair exhibited specimens of the fuses used to fire large guns, and also showed several varieties of powder. Some of the grains were as large as a hen's egg. The method by which the pressure exerted by an exploded charge on the inside of the gun was measured was explained. The lecturer said that guns had been tested at Sandy Hook up to a pressure of 107,000 pounds per square inch, but that was extraordinary. The average pressure on a gun was about 40,000 pounds to the square inch. The velocity of projectiles from large guns ranged from 600 to 2,400 feet per second.—*New York Times.*

American Competition.

The London *Globe* says:

"A reduced American tariff means closer competition against this country in the neutral markets of the world. Every diminution of that tariff will give new impetus to American productions, and will be equivalent to additional tightening of the screw of international competition. Unfortunately for this country, there are other elements in the industrial condition of the States which will act to our detriment. One of these is the silver question, the other is the superior mechanical equipment of American industry and the more satisfactory relations prevalent between capital and labor in that country.

"But our great fear as to the industrial future of this country, in its inevitable rivalry with the United States, lies in the more perfect organization of our competitor. The American is *par excellence* a mechanical inventor. His natural ingenuity, fighting against the artificial enhancement of prices resulting from the prevalent fiscal system, has driven him to seek relief in mechanical assistance. He had compensated for dearness of material in cheapness of production. Every workman in every manufacturing center is stimulated to study and master the machine under his charge, with a view to improving it. Mechanical development is part of the character of the nation. We may be sure that the country which produced the grain elevator, the oil pipe pumps, machine-made watches, the high speed printing machines, the ring frame, and other inventions without end, will develop still greater creative powers under the stimulus of a growing export trade. Where shall we be then? The relations also between the capitalist and labor classes in the States are more of a nature to encourage production and to develop the capacities of rising generations. Greater attention is given to the physical and moral well-being of the American artisan than is considered to come within the sphere of duty of the British or European manufacturer. A certain spirit of emulation pervades the laboring classes on the other side of the Atlantic, in the place of the leveling down to a general average which prevails in this country. The American artisan works for himself, knowing that his success will be recognized and encouraged. He seeks to rise, and his industry progresses with him. Are we doing all we should and all we might do on this side to keep pace with this progressive movement? We fear not, and yet such social advance leaves an indelible mark on its generation, and expresses itself industrially in good merchandise and low prices."

Zinc in Drinking Water.

A paper on the above subject is given in the *Journal of the American Chemical Society*, by Dr. F. P. Venable. It has long been known that zinc dissolves in water, and that soft water, such as rain water, dissolves it more easily than hard water. Water containing carbonic acid is specially able to dissolve it. The use of galvanized iron for pipes and tanks being so much on the increase, the subject becomes more and more important, and it is desirable to ascertain, as far as possible, to what extent solution of the zinc coating takes place, and how far water contaminated by zinc is injurious to health. The author quotes several investigators as to the latter point, the evidence being to some extent conflicting, but giving a very decided balance on the side of the view that such water is considerably injurious. Investigations made on behalf of the French Government resulted in the prohibition by the Ministry of Marine of the use of galvanized iron tanks on board men-of-war. Professor Heaton has given an analysis of a spring water, with a further analysis of the same water after it had traveled through half a mile of galvanized iron pipe. It had taken up 6·41 grains of zinc carbonate per gallon. Dr. Venable gives the results of an observation of his own, where spring water passed through 200 yards of galvanized iron pipes to a house, and took up 4·29 grains of zinc carbonate per gallon. It seems pretty clear that drinking water should not be allowed to come in contact with zinc.

Chiccory with Coffee.

The chiccory root, which was used more with coffee when the latter brought a higher price than it does now, but which is still greatly used on the Continent, somewhat resembles a parsnip. The stem rises to a height of two to three feet, the leaves round the base being toothed, not unlike those of the dandelion—indeed, it is closely allied to that plant. The preparation of chiccory, as carried out in Belgium, is very simple. The older white roots are selected, cleaned, sliced, and kiln-dried, and are then ready for the manufacturer. It is roasted in an iron cylinder, called a drum, which revolves over a coke furnace. When taken out it is of a dark brown color, and while hot it is soft and pliable, but after being raked out and subjected to a draught of cold air, it becomes hard and crisp, and is then ready for the mill. From the mill the powder is passed through a cylinder sieve, from which it emerges as fine as the finest flour; and the partially ground pieces, or foreign matters that may have found their way into the chiccory, drop into a separate bin. The shades of color vary occasionally to suit the taste of the purchaser. The chiccory root is cultivated in Belgium, Holland, France, and Germany. In Belgium, where it is also used as a vegetable, it is very extensively grown, its culture and its manufacture (both of which are unrestricted) forming two of the greatest industries of that country; and its infusion is largely drunk as an independent beverage. For home consumption it is put up in small round and square packets of various weights, with highly colored and attractive looking labels attached, and so dispensed to the public, who can also purchase it in a loose state. To preserve it in good condition, chiccory should be kept in a tightly closed tin box and in a dry place; otherwise, it will become lumpy and rank, and unfit for use. Instead of being ground down to a fine powder, chiccory is sometimes granulated—that is to say, ground into grains or small lumps. This is often done when it is intended for export, as in this state it can be packed loosely in barrels, and is less likely to deteriorate. When exported in powder it is packed in tin cases, which are hermetically soldered down to prevent injury from atmospheric changes. The London *Grocer* says that large quantities prepared in both ways are annually shipped from Belgium to all parts of the world.