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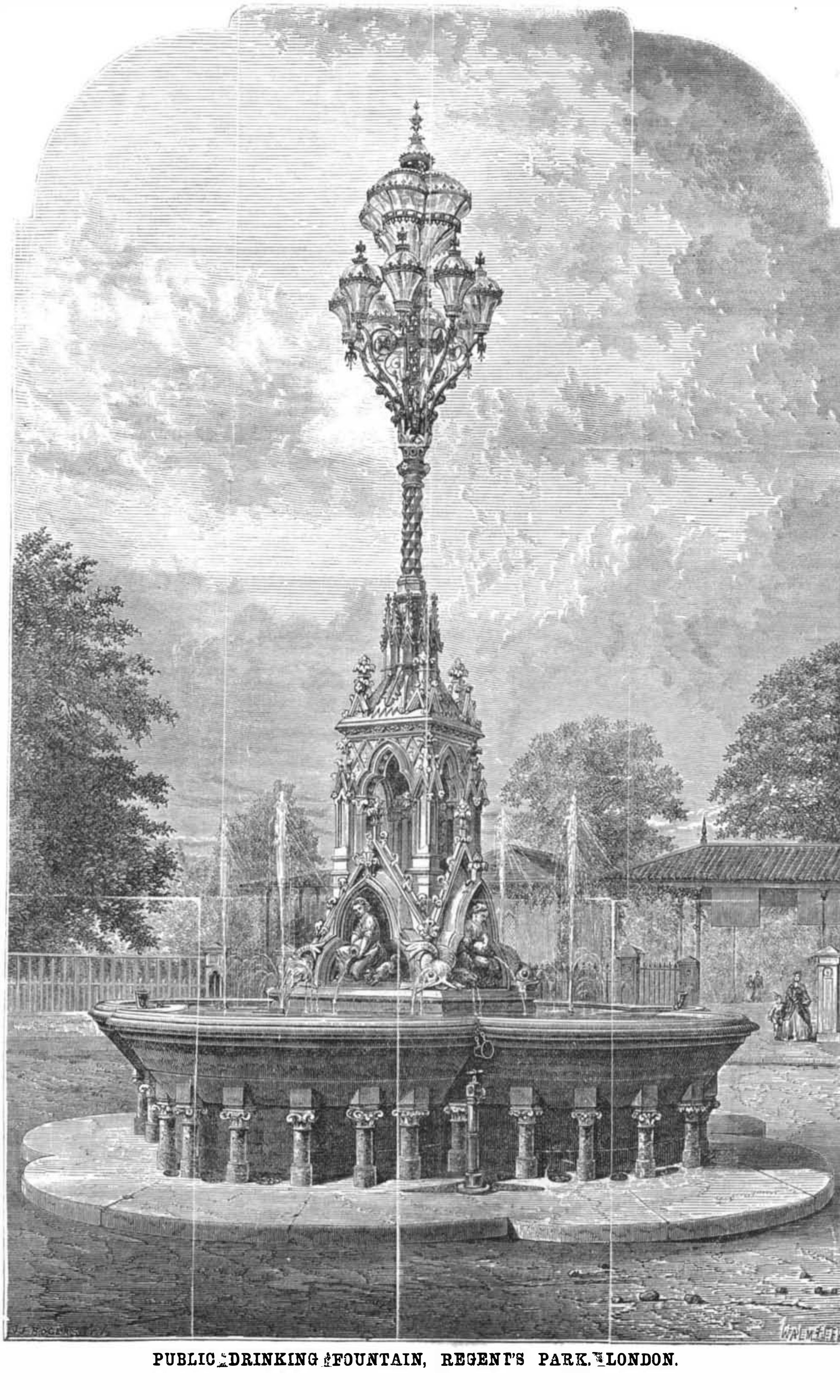
A PUBLIC DRINKING FOUNTAIN.

We present herewith an engraving of an unusually ornate drinking fountain, presented to the people of London by the wealthy and charitable Baroness Burdett Coutts. The lower portion has a plan quatrefoil in shape, and is of polished Aberdeen granite, the four basins being each six feet four inches in diameter. These rest on detached shafts, thirty six in number, of the same stone, the capitals being carved of Sicilian marble. The plinth whence these shafts spring rises four inches above the ground, and in it are four sets of drinking troughs for dogs, made of gun metal. These are supplied by the overflow from the upper basins, and between the troughs are placed standpipes to supply water for the use of the horses. There is a fountain in the center of each basin, and in the middle of the group is placed a canopied pedestal, six feet high and of three feet six inches span, with dolphins placed at the angles From these flow the water for drinking. This pedestal is of Sicilian marble, and, a few inches above the general water level, is divided into four richly molded niches, containing groups of figures and animals, the former holding vases, from which the basins derive their chief supply of water. Above the niches the pedestal becomes pedimented, and is enriched with crocketed pinnacles and terminals, so as to serve as an ornamental base for a lamp standard, which, at the hight of fifteen feet from the ground, branches into eight foliated bracket lamps. A larger and more ornamental lamp rises from the center of these, and terminates the composition, which is altogether twenty-four feet high.

The workmanship is, throughout, remarkably good. The metal work is fine and cleanly cast, and richly gilt, and the granite and marble work is some of the best which has been executed in London. Underneath the fountain itself is a roomy subterranean chamber lighted with gas, which contains all the pipes and valves that regulate the supply and discharge of the various water services.

This elaborate fountain is from the design of Mr. H. A. Darbishire. Of its beauty, our readers can judge for themselves; and the solidity of its construction and the genuine character of the decoration mark it as one of the most ornamental works lately erected in the fountain line. Its elegant design makes it an ornament to the locality in which it is placed; but its value must certainly be considered to consist in the useful purpose for which it was given to the public. It is only one of several handsome benefactions of the same charitable donor, whose enormous wealth could scarcely be employed in a more worthy manner.



PUBLIC DRINKING FOUNTAIN, REGENT'S PARK, LONDON.

Photo-Chemical Engraving.

It has been found by M. Merget and M. Gourdon—and, indeed, has been long known to physicists and chemists—that zinc covered, or in contact, with platinum or certain other metals, is readily acted upon by acids which have little or no effect upon pure zinc. If a plate of chemically pure zinc be plunged into sulphuric acid diluted with ten times its volume of water, it is but very feebly acted upon; but if partly coated with metallic platinum, by drawing a line with so lution of tetrachloride of the metal across the plate, and then, after the complete reduction of the platinum salt by the zinc, the plate be plunged into the acid, the latter will be found to act energetically along the platinum line. This action is essentially electro-chemical.

If a plate of ordinary zinc, carrying an image in platinum, be plunged into an acid containing one part of sulphuric acid in two thousand parts of water, the metal will only be attacked when it happens to be in contact with the platinum, and an etching of any desired depth can thus be obtained.

But the production of a good image on the zinc is the real difficulty, and under this head we have yet little information. The plan pursued by M. Gourdon is to place a fixed and washed positive silver print on paper face downwards on the zinc, and then to moisten, first with ammonia and then with cyanide of potassium. A certain amount of the silver forming the image is thus transferred to the plate, which can then be etched by acid containing the one two-thousandth of its volume of sulphuric acid.

These and other experiments hitherto made do not appear to have been very successful, as half tones were not rendered; still the plan is not only interesting, but appears to contain the germ of a good and simple process of photo-chemical or electro-chemical etching, and is well worth the attention of those interested in this branch of our art. Before we close these remarks we may offer a suggestion which may aid in the solution of the difficulty. Any process depending on the solution of the silver of a print, and its subsequent deposition on the zinc by reduction from a liquid, could not be expected to produce satisfactory results; we would therefore suggest that the silver print should be toned with gold or with platinum, and, when washed and dry, exposed to the action of chlorine gas. Soluble chloride of gold or platinum and insoluble chloride of silver will be formed. The print should then be pressed into close contact with the zinc.

Now, since the chloride of gold or platinum carried by the print is deliquescent, we should expect that a sufficient amount of moisture would be absorbed from the atmosphere to enable the zinc to decompose the gold or platinum salt, and reduce upon its surface the noble metal, and so spreading or blurring of the image be avoided by limiting the action to the right place. By some such plan, we should think it quite possible to obtain a tolerably sharp impression in gold or platinum on a zinc plate, and from a sensibly dry paper print, provided the action of the chloride in the first instance is properly regulated, and the pressure to which the print and plate are together subjected is sufficiently great.—*British Journal of Photography.*

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Contents.

(Illustrated articles are marked with an asterisk.)

LATENT HEAT.

According to the material theory of heat, there is a certain substance called caloric, which makes bodies that contain it hot, and causes them to become cold when it is withdrawn. It was observed, in converting solid bodies into liquids and liquids into vapors, that the bodies took up a great deal of heat that was not indicated by the thermometer, and on this account the heat of liquefaction or vaporization was said to be latent, a name that it retains at present. Though this heat cannot be shown by the thermometer, its existence can readily be proved. Water is a substance which can easily be made to assume the condition of a solid or a vapor, being called ice in the former and steam in the latter state. Suppose that we have a pound of ice, at a temperature of 32° Fah., and that we mix it with a pound of water at 212°, the ice will be melted, and we shall have two pounds of water at a temperature of 51°. Now take a pound of water at a temperature of 32°, and mix it with a pound of water at 212°; the resulting mixture of two pounds will have a temperature of 122°. Hence we see that the ice, in melting, has absorbed enough heat to raise two pounds of water through a temperature of $122-51=71°$, or one pound through 142°, and we say that the latent heat of the liquefaction of water is 142°. The latent heat of the vaporization of water can be determined in a similar manner by condensing a pound of steam at 212° with a given weight of water at a known temperature, and also by mixing a pound of water at a temperature of 212° with the same amount of water as was employed in the case of the steam, and observing the difference of temperature of the resulting mixtures.

Thus, a pound of water at 212°, mixed with ten pounds at 60°, gives eleven pounds at 74°. A pound of steam at 212°, mixed with ten pounds of water at 60°, gives eleven pounds of water at 162°. In other words, the steam, on being condensed, has given out heat (which was not previously sensible to the thermometer) enough to raise eleven pounds of water through a temperature of $162°-74°=88°$, or one pound through 968°, and we say that the latent heat of the vaporization of water is 968°.

The mechanical theory of heat is now generally adopted; it considers that heat and work are interchangeable, and on this theory we shall be able to explain what becomes of the latent heat. All solid bodies are supposed to be made up of molecules, which are not in contact, but are prevented from separating by a force called cohesion. If a body is heated to a sufficient temperature the force of expansion becomes equal to that of cohesion, and the body is liquefied; and if still more heat is applied, the force of expansion exceeds that of cohesion, and the liquid becomes a vapor. But in each of these changes work is performed, and the heat that is supplied is converted into this work. For instance, if ice is at a temperature of 32°, and heat is applied, this is converted into the work that is developed in changing into water, and we say that heat becomes latent; and when water is at 212°, and we continue to apply heat, this is converted into the work that must be done in changing the water into steam. From this statement, it will appear that what is ordinarily known as latent heat would be more properly called converted heat, since it has been changed into work.

We can readily determine the amount of work that is performed in any given case, and will now show how the calculation is made. A unit of heat is the amount of heat required to raise a pound of water one degree in temperature. The mechanical equivalent of heat is the amount of work that is performed by the conversion of one unit of heat into work. This has been determined to be equal in amount to the work required to raise 772 pounds one foot high, or one pound 772 feet high. And as heat and work are mutually convertable, if a body weighing one pound, after falling through a hight of 772 feet, were to have its motion suddenly arrested, it would develope sufficient heat to raise the temperature of a pound of water one degree. Let us apply these figures to the work done in changing water into steam. Two kinds of work are here performed. If a pound of water at a temperature of 212° is converted into steam, the latter will have a volume of about $27\frac{1}{4}$ cubic feet. Suppose that the water is evaporated in a long cylinder, of exactly one foot cross section, open to the atmosphere at the top. Then when all the water has disappeared, we shall have a column of steam $27\frac{1}{4}$ feet high, which has risen to this hight against the pressure of the atmosphere. The pressure of the air being nearly 15 pounds per square inch, the pressure per square foot is 2,115 pounds; and the external work performed by the water, in changing into steam, will be an amount required to raise 2,115 pounds to a hight of $27\frac{1}{4}$ feet, or about 57,644 foot pounds. And since 772 foot pounds of work require one unit of heat, the external work will take up $57{,}644 \div 772 = 74 \cdot 67$ units of heat. But we have seen that the total number of units of heat required to change water into steam is about 968 (more accurately, 966·6); hence the internal work will be equal to an amount developed by the conversion of $966 \cdot 6 - 74 \cdot 67 = 891 \cdot 93$ units of heat into work; and this will equal $891 \cdot 93 \times 772 = 688{,}569$ foot pounds.

We have received, of late, quite a number of inquiries on the subject of latent heat, and have endeavored in this article to present the matter in so broad a light as to answer all these questions. It is exceedingly important that those who are endeavoring to effect improvements in the economical working of prime movers should understand these things clearly, so that they can work intelligently, knowing in what direction improvements are needed. We shall probably refer to the use of the steam in a subsequent article.

FRENCH TELEGRAPHY AT THE EXPOSITION.

A correspondent of the New York *Evening Mail* writes to that paper from Vienna as follows:

"I am sorry we are not represented in telegraphic apparatus, as we have several things in America that would be worth seeing. The French telegraphic department is the best in the exhibition, and some of the inventions are exceedingly interesting. There is a machine that prints an autographic despatch, not chemically like the other autographic instruments, but on white paper with printers' ink. It cannot be described in writing, and so I will not attempt to say how it is made, except that there is synchronous action of two rollers; one may be in New York and the other in San Francisco, or in any two other places connected by a telegraph wire. A written message, a draft, a sheet of music, the portrait of a burglar, anything that can be drawn with a pen—not with a pencil—may be telegraphed from one end of the world to the other and reproduced with printers' ink on white paper, like that whereon the patron of the *Mail* reads this letter.

"Then they have a machine by which four operators can work over a single wire at once in one direction, just as one operator does with us; and by putting on four operators the other way, you can make the capacity of one wire equal to that of eight by the old system. We are now using in America a system by which a wire may be operated both ways simultaneously. The French machine is exactly four times ahead of us. They have, also, an electro-magnet that works over a hundred miles of wire."

It is evident that this correspondent is not fully posted in regard to the state of telegraphy in his own country.

The instrument first above described is the "autograph telegraph" of E. Lenoir of Paris. It is a modification of the Bakewell and Casselli instruments, invented years ago. The message to be transmitted is written on a prepared slip which is placed on a roller and turned, under a transmitting stylus. Every line in the original message produces a corresponding dot in ink on the paper at the other end of the wire. By turning the roller often enough and so repeating the transmission, the letters are dotted out at the receiving office. In an example now before us, done on the instrument described by the correspondent of the *Evening Mail*, each letter is composed of a number of dots and dashes, each representing a telegraphic-signal. In making the capital letter B, for example, some forty-two signals were employed. It is almost needless to say that instruments that involve the making of so many signals to form a single letter cannot compete in rapidity with the simple system of Morse, or the various printing instruments in common use here. The Lenoir machine is more of an electrical curiosity than a business machine.

In respect to the other instrument, by which it is alleged that eight operators can work at once on one wire, this is the invention of M. Meyer, and its capacity is greatly overrated. Mr. George B. Prescott, electrician of the Western Union Telegraph Company, during a recent visit to the continent, made an examination of this Meyer instrument. The capacity claimed for it by the inventor was only one hundred messages of ten words each per hour, which is slow work for eight operators.

The double system, referred to by the correspondent as in use here, is the Stearns duplex instrument, by which two operators may work in contrary directions over one wire. One hundred and forty-six messages have been sent per hour over a single wire by this system, using the Morse key. The American system is therefore about fifty per cent faster, although employing only two operators, than the Meyer French plan with eight operators.

The Stearns duplex system is only limited in its rate of transmission by the skill of the operators. The fastest operator has been able to reach a rate of 2,500 words per hour. Two operators having this ability would be able, by means of the Stearns instrument, to send over one wire 5,000 words per hour, or 2,500 words each way. A rate even higher than this has been experimentally obtained.

The above French telegraph instruments are not indicative of an advance or improvement over the devices in common use here. Simplicity in the instrumentation is the aim of the American telegrapher for ordinary work. Give him a Morse key and a sounder, and he is ready for instant work anywhere, from the lonely summit of Mount Washington to the crowded Babel of the stock exchange.

The observations of Mr. Prescott were that the French official consumes more time in preparing to transmit a message than is taken here to send a telegram across the continent.

ANOTHER ARCTIC EXPEDITION BEGUN.

The Tigress sailed from this port on the 13th of July *en route* for the arctic regions, in search of the remaining survivors of Captain Hall's expedition and his steamer, the Polaris. On the 15th of October, 1872, in latitude 80°02, this ill fated steamer became jammed in the ice; and in view of imminent danger, a large portion of her crew and provisions were got out upon the ice. Soon afterwards, in a heavy gale of wind, the ship broke adrift. The vessel was at this time destitute of boats, and was in a leaky condition, with thirteen souls on board. The persons left on the ice, after floating southward for several months, were finally rescued by a seal hunting vessel and carried to Newfoundland. The last they saw of the Polaris was on the 16th of October, when she appeared, under sail and steam, heading for a bay in Northumberland Island, a sheltered position where she anchored. It is supposed that here the Polaris was frozen in, as the ice in those regions commences to close in September; so that, if she remained any length of time at her anchorage, she must have been nipped hard and fast until the present month of July, when the breaking up of the floes begins. It is believed, therefore, that unless the ship managed to alter her position before being shut in, she could not move until about this time; and as her coal must of course be exhausted, she cannot have proceeded very far under sail alone. On these grounds, it is conjectured that, if the Polaris be afloat at all, little difficulty will be experienced in finding her.

The Tigress goes to Disco, Greenland, whither the Juniata, another United States vessel, has preceded her, having left New York some weeks ago, laden with provisions and coal. Starting from Disco, the Tigress will begin the important part of her cruise completely stocked, that is, with two years' rations for the forty souls composing her crew, and with all the coal she has room for, sufficient for twenty-two days full steaming. From Disco, the ship will proceed to Upernavik, where dogs, sledges, etc., will be taken aboard, and thence she will shape her course directly for Northumberland Island. If the Polaris is not where she is expected to be, and the search has to be protracted over the vast and dreary wastes in the neighborhood of the pole, there is little chance of the Tigress returning to civilization under a period of some fourteen months.

The Tigress was originally built for the seal-hunting service. She is a bluff bowed vessel, some 150 feet long by 30 feet beam. Her sides are very thick and solid, averaging from 24 to 30 inches through, and her bow is armored with plank and iron plating to enable her to resist the ice. Her motive power is a 60 horse vertical compound engine, and a two bladed propeller, capable of driving her, at best speed, about 7 knots per hour. The *personnel* of the expedition consists of Commander James A. Greer, U. S. N., commanding, Lieutenant Commander H. C. White, Lieutenants Wilkins, Berry and Sebree, two engineers, two ice pilots, one of whom is Captain Tyson of the Polaris, and a surgeon, besides about twenty-nine men, many of the latter being seal fishers and members of the former crew of the Tigress. The Esquimaux who were rescued from the ice go back home in the Tigress. This is the first arctic expedition which has sailed strictly in Government service and under military discipline.

AN AUSTRIAN FARMER'S ENTERTAINMENT.

The special correspondent of the SCIENTIFIC AMERICAN, United States Commissioner Professor R. H. Thurston, has arrived at Vienna, and our readers may shortly expect from his pen some interesting and practical letters concerning the great exposition.

Professor Thurston was lately invited, as one of a select company, to visit the celebrated farm of Herr Ritter Horsky von Horckysfeld, in Bohemia, 200 miles from Vienna, to inspect the methods and appliances of agriculture as there practiced. A special train conveyed the guests to Kolin, where they were received by their farmer host, whose farm is 5,000 acres in extent. His plows, cultivators, seeders, threshers, harvesters and other implements are numbered by scores, and are operated by hand, animals and steam power, according to the nature of the work required or the formation of the ground. The yearly products of the farm amount to $50,000, and the amount invested in machines and other improvements is $500,000. The proprietor has, among other concerns upon the farm, a beet sugar factory which cost $250,000. Briefly, the process consists in macerating