

### CASTING PIG IRON BY MACHINERY.

Among the many improvements in blast furnace practice, one of the most recent and not the least important is in the method of casting the metal. Almost from the first inception of the blast furnace, and until recently, the practice has been to cast the metal in open sand molds on the floor of the cast house. This, however, entails enormous expenditure of physical energy to break the pigs from the "sows" and load them on the cars for transportation. Although some attempts have been made to perform this work by mechanical operation, such as by the introduction of traveling cranes to pick up the sow and pigs and carry them forward to a cracker, which broke the pigs off and dropped them into a railroad car, still at the time of the introduction of the casting machine, practically all of the iron made which was not used direct, was lifted from the floor and loaded by hand at a cost of 16 to 20 cents per ton. The work is of such a nature as to require considerable practice before a man became proficient, and it was a rather difficult matter to keep up a force of men for this work when there was a heavy demand for labor. The quite general adoption of the direct process in making Bessemer steel, by which the liquid metal during six days in the week was taken to the conveyers from the blast furnace by a ladle, still required the maintenance of a force of men to handle the sand mold pigs on Saturday night and Sunday. As it is not usual to operate a steel works on Sunday, the keeping of this force at such wages as they received in the cast house during the other six days, when performing only common labor, was a very large expense. Again, while the capacity of the furnaces in 1869 was from 50 to 100 tons per 24 hours, the capacity in 1899 is 200 to 600 tons per 24 hours. With this enormous increase in production it has become a serious matter to lift the iron from one cast before the next cast was ready to top off. The very large and increased demand of recent years for open hearth steel created a demand for pig iron free from sand. These disadvantages have been overcome by casting machines, of which several types have been devised. While the direct saving in the use of pig casting machines is from 10 to 15 cents per ton, like most other improved methods the indirect savings are very large. These will probably bring the total up to at least 20 cents per ton.

The machines shown in our engraving are built by Messrs. Heyl & Patterson, of Pittsburg, Pa., for the Cambria Steel Company, of Johnstown, Pa. One casting machine such as is illustrated will handle 1,500 tons in 24 hours, loading it on the railroad cars ready for transportation. In a plant where the direct process is used, the only increased equipment is in the casting machine, as the ladles in the furnace and the steel works are used during the week for transporting the liquid metal, and perform the same service on Saturday night and Sunday between the furnaces and the casting machines. There are, of course, several points to be kept in view in designing casting machine. Thus, the crystalline texture must be as good as that now cast on sand beds. The apparatus must be simple in construction, with few working parts, so that it will not be liable to get out of order under the rather severe usage to which it is necessarily put, and the machine should be capable of application to existing plants and should be operated by a small force.

The accompanying engravings give an idea of the arrangement of the plant. The apparatus consists of a steel frame combining a water tank and upper and lower parallel tracks, a pair of chains carrying pressed steel molds or pans into which the molten metal is poured from a ladle through intervening runners so arranged that the stream to two or more lines of the molds can be equalized. The iron is poured into the molds while they are traveling at such a level as to be partially immersed in the water, in which condition they continue to travel for a sufficient length of time to allow the metal to become "fixed" for the molds should not be cooled too rapidly. They are then submerged and travel through the balance of the length of the water tank, by which the pigs are sufficiently cooled to allow of their being loaded on wooden cars. One of our engravings shows the water in the tank and the molds just passing down to be submerged. Our diagram shows the curve in the path of the molds to cause their submersion. On the end toward the head or discharge end the molds are carried up a considerable incline and are then ready to discharge their contents—the cooled pigs—into chutes, which

convey the pigs directly to the cars. This grade may be made steeper if necessary to gain a greater height. The plant illustrated is a double one, but each conveyer is, however, entirely complete in itself. The first engraving shows the discharge end. The mechanism is very simple and consists of devices for keeping the train of molds in motion. A 14 horse power engine at the Johnstown plant actuates the two trains of molds by means of a pinion shaft, each pinion having a friction clutch, so that either set of molds can be operated at will. The ends of the track will also be noted. The wheels which run upon them are 8-inch chilled traction wheels. After the molds are inverted, they are carried underneath and over furnaces, as shown in our diagram, which shows the reverse position of the molds. The furnaces are mounted on cars so that they can be withdrawn in case the machinery has to be stopped. Coal, gas, or crude oil is used as fuel. The molds are still damp when they reach the furnace, so that a heavy deposit of soot adheres to the interior and the lips of the mold, the heat, of course, being sufficient to dissipate any remaining moisture. The makers say that owing to the deposit of carbon they are able to use molds with large overhanging lips, as the deposit of carbon prevents the iron which falls on the lip as it passes through the stream from adhering to, or coming to rest and chilling on, the lips. The pigs all discharge freely at the head end. There seems to be a considerable field for these machines, as they tend to decrease the labor expense and at the same time give an improved product.

### The Grape Belt and Its Product.

BY WALDON FAWCETT.

Grape culture is one of the industries in which the prosperous conditions of 1899 have worked an immense improvement. For several years past the fruit of the vine has been practically a drug on the market, and

each a packing house is located at some point readily accessible from all parts of the tract.

Despite the low prices at which grapes are sold, the work of picking is accounted a fairly profitable job in the rural districts. Every person around the vineyard including all the members of the owner's family usually assist in preparing the crop for market, but a majority of the professional pickers are girls and women. These regular pickers are paid at the rate of one cent per basket, which is supposed to be equivalent to at least one dollar per day. New hands are usually hired on the piece work plan for obvious reasons, while the more expert pickers almost invariably demand it. Many of the latter will earn from \$1.50 to \$1.60 per day.

The women pickers wear short skirts, large aprons, gloves with the thumbs cut out, and large hats or sun-bonnets. As a rule, the pickers work in pairs, each worker giving attention to one side of the row of vines, so that not a single bunch shall be overlooked. The women sit by the vines, either on boxes or on the earth itself, hold baskets on their laps and clip off clusters of grapes with small sharp scissors prepared especially for the purpose. No picking is done in wet weather.

The two enemies of the vineyard owner are decay and destructive worms. The former is not regarded as especially dangerous, for the reason that the grower can virtually prevent it by a system of spraying the vines in the springtime of the year. The process entails quite an expenditure, but it is of course economical in the long run. The worms constitute a more perplexing problem. The advent of the worm is of comparatively recent occurrence, and when the cultivators have had more experience with the pest, they may be enabled to devise some means to eradicate the nuisance. The worm falls from the leaves of the grapevines to the ground and then burrows downward, attacking the roots and sapping the vitality of the vine.

The 1899 crop of grapes was very light in Ohio, but proportionately heavy in New York State. The improvement in market conditions may be imagined when it is stated that the growers received for their grapes an average of nearly ten cents per basket, whereas a year or two ago grapes sold at retail as low as five and six cents per basket.

Three large railroad systems traverse the grape belt, and they have been instrumental to a very large extent in

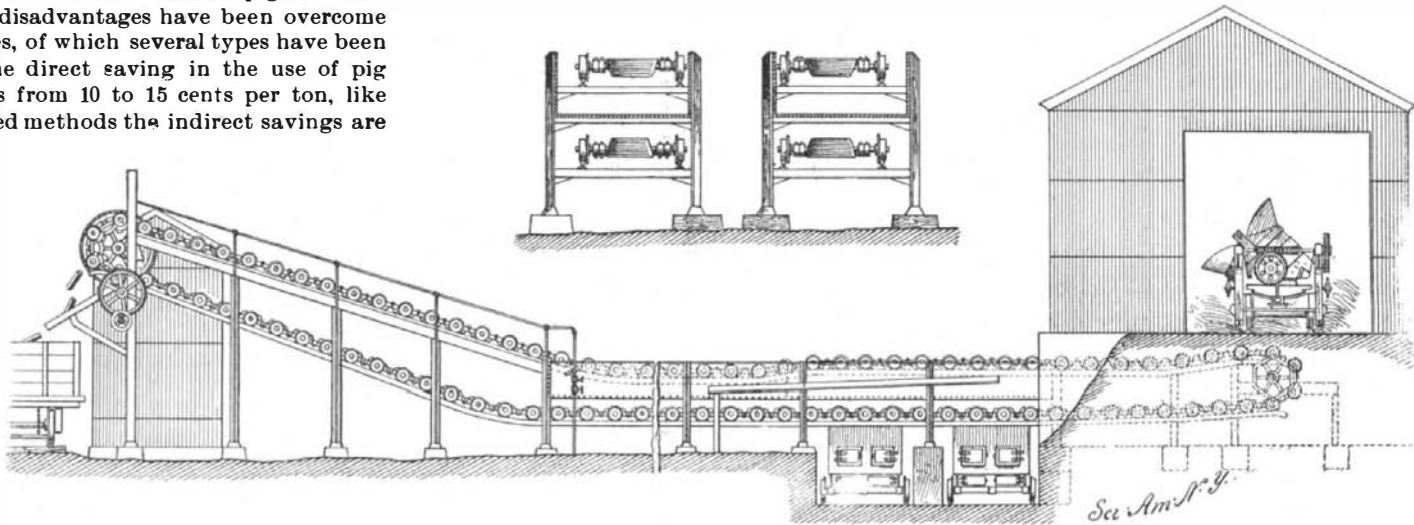
the development of the traffic to its present proportions. Grapes cannot be transported successfully in cars of the ordinary type, but require instead refrigerator or ventilated cars. After the loading of a car has been completed it is moved to what is known as an icing station, where the ice boxes are filled to overflowing before the car is sealed and sent on its way.

Many of the grapes are shipped west and south to points as far away as the Pacific coast and New Orleans, to say nothing of all the large cities in the country, and it is of course highly essential that the preparations for shipment be made with the greatest care. Too much heat will cause the grapes to fall from the stems, and of course any failure to get good dispatch in transportation makes the fruit practically worthless. Naturally, nobody wishes to shoulder any responsibility which belongs to some person else, and as a consequence the grapes are subjected to a most rigid inspection when they are placed aboard the cars, and another when the point of unloading is reached.

In view of these necessities it may be imagined that the car famine which has affected all industries during the latter half of 1899 has made its presence felt in an unusual degree in the grape country. In order to insure prompt dispatch, three or four hundred extra cars should be kept in reserve in the "belt;" but this has seldom been done during the season just closed. The problem in the grape-growing world for next season—and already it is under discussion—is whether "trusts" or individual growers shall control the output.

### The Nobel Prizes.

Candidates for the Nobel prize for scientific achievements are being considered by the Swedish Academy of Science, at Stockholm, which must award the prize this year for the first time. Among the names already proposed are Prof. Roentgen, Marconi, Baron Nordenskjöld, and Henri Dunant, the founder of the Red Cross Society.



ELEVATION OF PIG IRON CASTING PLANT, WITH LADLE IN POSITION.

all through the "grape belt" of western New York and northern Ohio the grapes were allowed to decay upon acres of vines simply because the prevailing prices would not compensate the vineyard proprietors for the outlay necessary for picking and packing the fruit and for the cost of the light baskets in which it is shipped.

Conditions finally became so bad that vineyards which a few years ago netted their owners a profit of \$1,500 on a season could not be leased outright at \$400 per annum. The present year has witnessed the beginning of the improvement. The more prosperous conditions prevalent throughout the country have of course been primarily responsible for this, but contributory influences have assisted. Notable among the latter has been a considerable decrease in the size of the crop, and the formation among the growers of associations for the mutual protection of interests and the maintenance of prices. There are in the "grape belt" perhaps a dozen different organizations of this character, but their object is a common one.

The "grape belt" may be said to extend from Silver Creek, New York, along the shores of Lake Erie to Sandusky, Ohio, although, to be sure, there are several breaks in this territory. In width it nowhere exceeds fifty miles, and throughout the greater portion of its extent has a breadth far less. The yearly product of this land of vineyards foots up in the aggregate to fully seven thousand five hundred car loads, and as the capacity of a car may be estimated at two thousand baskets, it will be seen that the season's harvest represents pretty close to fifteen million baskets, each weighing about ten pounds.

Although the harvest season is of comparatively brief duration, a vineyard to be made thrifty and profitable requires considerable attention throughout the entire year. The vines require looking after, and the ground must be kept in the best possible condition at all times. Vineyards range in extent all the way from five to half a hundred acres, and in the case of

## Science Notes.

Sir John Lubbock has been honored by a peerage and has selected the title of Lord Avebury. He has certainly won the distinction by his studies and writings.

Paris possesses 80,000 trees in the streets and public places. There are 26,000 plane trees, 17,000 chestnut trees, and 15,000 elms, the remainder consisting of sycamores, maples, lindens, etc.

We regret to note the death of Henry A. Hazen, professor of meteorology and one of the chief forecasters of the Weather Bureau. He developed the psychrometer tables for the reduction of barometric readings to sea level and he devised various fittings for meteorological instruments. He was also a celebrated aeronaut.

To open a book properly, hold it with its back on a smooth or covered table. Let the front board down, then the other; now hold the leaves in one hand while you open a few leaves at the back, then a few at the front, etc., alternately opening back and front until the center of the volume is reached. If this is done two or three times, there will be no danger of breaking the volume.

Mr. Harry Wells, assistant professor of chemistry of Wesleyan University, has taken up a residence in Prof. Atwater's respiration calorimeter, which we have already described, and will remain there nine days. He will have a rest of nine days, and will then go back for another period of nine days. His food will be either mixed with alcohol or will be composed largely of alcohol during the entire time.

H. Thoms has detected in tobacco smoke a poisonous, oily substance which produces violent headache, trembling, giddiness, etc. By treatment with a 2 per cent potash solution a phenol-like body may be separated which has an odor resembling creosote. To the presence of this oil, the observed toxic effects of tobacco may be attributed, since it is known that those are not altogether dependent upon the proportion of nicotine in the tobacco.

The pine needles of South Oregon are being utilized. The needles are first boiled and then run between horizontal wooden rollers, which extracts the juice. This is called pine needle oil, which is supposed to possess medical properties. The pulp is used as a medicated material for upholstering, and is also said to be a good substitute for horsehair. It is said that insect pests will not live in furniture that has been upholstered with pine needles.

The general rules and regulations governing exhibits at the Pan-American Exposition, Buffalo, 1901, have been issued. The Government Board created by Congress has made provision for including in the government representation at the Exposition exhibits from Porto Rico, Hawaii and the Philippines. Adequate provisions will also be made for a splendid exhibit from Cuba and adjacent islands. One American nation and colony after another, and one State after another, has already declared its intention of being represented, making it now certain that this exposition will furnish manufacturers and producers the most auspicious opportunity they have had for developing their trade relations throughout the western hemisphere.

Fish scales are being utilized in France, where a chemist has discovered that the scales may be used in the manufacture of artificial pearls, and our consul at Lyons has found that the supply is inadequate and that there is an actual demand for large quantities of the scales in his consulate, where good prices are paid for them. The scales should be sprinkled with salt as soon as they are removed from the fish and packed in tin cans. Any specimens sent to Mr. Covert at Lyons will receive careful attention, and the results, with any suggestions that may be made, and particulars of price offered, will be duly reported. As the American sturgeon has the most beautiful and largest scales of almost any fish in the world, this may be of considerable importance to fishermen who engage in catching sturgeon.

The London Lancet has recently cited some instances where diseases were communicated by holy water, and many samples were taken from churches in different towns in Holland. The result was the discovery in most cases of abundant bacterial growth, with the occasional presence of staphylococci and other pathogenic forms. Two guinea pigs that were injected with the sediment from a font of a church in Amsterdam died in thirty hours. Mr. Bruns, of Arnhem, Holland, devised a means of completely avoiding contamination. The water is stored in a narrow-necked jar inverted in a shallow basin, so that the overflow from the jar ceases as soon as the water in the basin covers the neck of the jar. One end of a bent tube filled with hair is immersed in the water in the basin, and the other end overhanging the edge delivers a constant stream of small drops raised by the capillarity of the hair. All these parts are inclosed in an ornamental open case so that the congregation have merely to hold their fingers for an instant in the stream. The apparatus has been sanctioned by ecclesiastical authority.

## Engineering Notes.

The annual dinner in memory of James Watt was held on January 20, at Glasgow, under the auspices of the Institution of Engineers and Shipbuilders of Scotland.

A company is buying lignite coal mines in North Dakota, says Public Improvements, and is arranging for the construction of plants to render this material a satisfactory fuel in the form of briquettes.

As far back as 1770, on a royal visit to Woolwich, a 12-pounder brass gun was filled twenty-three times with shot in a minute, sponging between each fire and loading with great safety. This surprised every spectator.

A new railway bridge is in course of construction over Loch Etive, at the Falls of Lora, in Scotland. When completed, its span of 500 feet will be the second largest in Europe, coming next to that, of the Forth Bridge. It is designed by Sir J. Wolfe Barry.

The Houston and Texas Central Railway has recently created the office of Chief Gardener, says The Railway Review, the incumbent of which will have charge of making and taking care of the depot grounds and flower gardens at all points along the line from Groesbeck and Dallas, Texas.

The paper famine in England is getting to be very serious. It is caused by the difficulty in getting wood pulp, by the rise in the price of coal, and by the enormous increase in demand and stoppage of supplies from America. The South African war has naturally increased the circulation of newspapers, so that they are now using from 20 to 100 per cent more paper in London than they were a few months ago.

According to the last report, the Pasadena Sewage Farm is yielding a considerable revenue. The total receipts are \$3,029 in spite of a severe drought, and the total expense including labor and tools was \$2,375, says The Engineering Record. There are 60 acres of walnut trees, 25 acres of alfalfa, 20 acres in oats, and 35 acres in barley. Thirty more acres will be set out with walnut trees of the soft shell species. There is some talk of planting corn and beets.

More than \$100,000,000 worth of paper is produced in the United States annually. A third of this is used by the newspapers, and the wrapping paper used amounts to two-thirds as much as that consumed by the newspapers. About half as much is used to manufacture books as to print newspapers. Paper boards amount to 300,000 tons a year. Builders use 60,000 tons of paper and 45,000 tons of wall paper is produced annually.

The Dickson Manufacturing Company received an order a year ago from the South African Republic for five locomotives to be added to the Boer war equipment. They were completed and boxed for shipment when orders were received to postpone sending them until further notification. The engines were constructed specifically for use on armored trains and are built on the same lines as the locomotives which proved such effective aids to Kitchener in the Soudan.

Alfred Brandt, engineer and contractor for the Simplon tunnel, died recently. He had great experience in tunneling, being employed as a mechanical engineer for the St. Gothard Railway. He devised ingenious hydraulic drilling machines for use in the St. Gothard tunnel, and he was also employed as engineer and expert in other great tunnels. The Simplon tunnel, which is the greatest, and perhaps the last, of the Alpine tunnels, gave him an admirable opportunity for the display of his skill.

The Eighth International Congress of Navigation will be held at Paris, July 28 to August 3, and the programme is a most attractive one, dealing as it does with a large number of subjects which might at first not be considered germane to the work of a congress of navigation, such as the effect of regulation works on the regimen of rivers, especially inundations; the progress in feeding of canals; the utilization of natural navigable waterways, the latest improvements in lighting and buoying coasts and harbor entrances, port works, etc.

A bill creating a new cabinet office has been favorably acted upon by the House Committee of Mines and Mining. It provides for a cabinet officer to be known as the Secretary of Mines and Mining. He is to have entire charge of affairs relating to mines, and the Geological Survey will be placed under his care. The Secretary is to have the same rank and salary as other cabinet officers, and he is to have an assistant, who will have the same relative rank as the First Assistant Secretary of the Interior. Another mining measure which was acted upon favorably was for the establishment of mining experiment stations in each of the mining States somewhat similar to the agricultural experiment stations, and provides for a government geologist at \$3,500 per annum, and an assistant at \$2,500 per annum in the mining States. These officers are to furnish assays, conduct explorations of mining regions and issue bulletins for the public.

## Electrical Notes.

Wire fences are blamed for damage to live stock by lightning stroke. The director of the Iowa Weather and Crop-service recommends the use of earth wires at intervals along the fences.

Almost all the towns in Siberia are having arc lights for street use and incandescent lights for houses, and the larger proportion of the people in Siberia have never seen gas, which they regard as an illuminant of a past age.

Telephone communication has recently been established between Berlin and Copenhagen by a direct line which is much shorter than the old route by way of Hamburg. The line includes a submarine cable thirty miles long. The cable is made up of four wires, two of which are for the telegraph service and the other pair for the telephone line.

A Boston inventor has invented an antiseptic apparatus for disinfecting razors, shaving brushes, etc. It consists of a conveniently shaped vessel which contains an antiseptic solution. Separated at some distance are battery electrodes connected to a battery and induction coil. Holders for razors, brushes, etc., perforated with holes, enter this antiseptic liquid. The articles are promptly sterilized with its aid.

At the Alexian Brothers' Hospital in Chicago there is an electric water bath, consisting of a heavy porcelain bath tub with copper electrode contact plates at each end, at the sides and in the bottom. These plates are seven in number and vary in size according to the part of the body with which they are designed to make contact. Both Galvanic and Faradic currents are supplied to the bath; an induction coil, etc., is provided, so that the current at 110 volts from the lighting mains can be used for electro-therapeutic work. The bath tub was illustrated in a recent number of The Western Electrician.

In a recent address before the Montauk Club, of Brooklyn, Mr. Charles W. Price stated that over \$600,000,000 had been invested in electric lighting in the United States, and that the total horse power required in the electric lighting of Greater New York was not less than 200,000 horse power, and that in the last thirteen years since the birth of the electric railway there had been an expenditure of more than \$1,700,000,000, and that now any one could travel by electric cars from Paterson, N. J., via New York, to Portland, Maine, with only three insignificant interruptions which collectively amount to less than fifteen miles.

The late Prof. D. E. Hughes left large sums of money to charities. It is a well-known fact that though born in London he spent about twenty years of his youth in the United States and he was educated at Bardstown, Ky., where he afterward occupied the chair of natural philosophy. He obtained his patent for the printing telegraph instrument in 1855, and it was put into practical use by the Western Union Telegraph Company in 1857. He then went abroad, and in ten years succeeded in installing his invention in the telegraph service of nearly all the European nations, says The Western Electrician. His induction balance and microphone were also important inventions, and he received many well deserved honors.

We have already referred to the new telephone system which is being added to the fire boxes in New York city. The system is being rapidly installed, and the work of all of the chief officers of the department at large fires will be much simplified. When an officer wishes to talk to the central office, he hangs the telephone over the door of the fire-alarm box by means of a wire bail attached, and inserts the plug in the tapering hole in a brass block within the box which connects with the wires of the circuit. The officer then signals to headquarters with the telegraph key and is answered over the telephone. This will greatly facilitate the work of battalion chiefs, who formerly could communicate only from the signal box with the telegraph key within the box. It is the invention of Henry F. Blackwell, Jr., chief of the fire-alarm telegraph bureau.

The court at the Pan-American Exposition will be lighted by over 100,000 incandescent lights of 8 and 16 candle power. This will offer a highly diffused illumination with no intense points of brilliancy. In fact, it will be a bright light without shadows. There will be an electric tower 300 feet, and in front and facing the court of fountains will be a niche 70 feet high and 30 feet wide. In this niche will be a most beautiful water display. A large jet of water will be broken into drops by an ingenious device and under the powerful electric lights focused on the jet these drops will appear as prisms permeated with color in limitless combinations. Designs are being prepared for electrical fountains, says The Electrical World. They will be used for the embellishment of the interior courts of the other buildings. Plans are also being considered for the illumination of the Grand Canal, which will have a stretch of several miles. Mr. Luther Stieringer is the consulting electrical engineer of the Pan-American Exposition.