Science Notes.

M. Brunetière has retired from the editorship of the Revue des Deux Mondes, which will give satisfaction to scientific circles, as he changed the Revue from a liberal to a clerical organ and had adopted an attitude somewhat hostile to modern science.

The discoverers of quinine and strychnine, MM. Pelletier and Caventou, are to have a monument erected to them in Paris, and contributions are being solicited from pharmacists all over the world to aid in this worthy object. In this country the movement has been taken up by the Philadelphia College of Pharmacy, and Prof. Trimble, the editor of The American Journal of Pharmacy, has issued an appeal for funds in order that the United States may be worthily represented in the undertaking. Pharmacists who contribute to the fund will honor their vocation, says The American Druggist, while honoring the memory of two distinguished pharmacologists. The monument is to take the form of statues which will be erected in front of the High School of Pharmacy, in Paris.

The color of school exercise boards is a matter of great importance, but has been strangely neglected, says The Pharmaceutical Era. For, from time immemorial, it has been a fact of common knowledge, even among uneducated people, that black is the worst of colors for the eyes; hence, it has long been a custom with tailors to charge more for making a black suit of clothes than for any other color. For many years an exchange has given school room hygiene much special study, and taught that school exercise boards should not be black. The best color for such boards is some shade of cream white, a dead surface of soft, mellow tint, varied in its degree of whiteness to suit the quality and quantity of light afforded. The crayons for exercise boards, for ordinary daily use, should be a clear sky-blue color; the extra colors a canary orange and a clear dark green.

The remarkable property which some alloys of nickel and iron possess of having a coefficient of expansion nearly equal to zero suggested the desirability of employing these alloys for the construction of measuring instruments. With this object in view, M. Guillaume, in Comptes Rendus, has determined the densities and moduli of elasticity of a series of alloys of iron with 4 to 45 per cent of nickel. One curious result in the case of alloys with 25 per cent of nickel is that a rule made of this alloy and annealed at a given temperature continues to elongate when it is kept at a lower temperature. He also finds that an alloy containing 22 per cent of nickel expands when it is heated considerably more than ordinary steel, but an alloy of iron with 37 per cent of nickel hardly expands at all, so that the presence of an additional 15 per cent of nickel in nickel-iron alloys is sufficient to entirely change the nature of the metal.—Engineer.

According to a statement in the Revue Scientifique, the chemical adulteration of milk is one of the hygienic factors now to be dealt with. It seems that M. Denigès, of Bordeaux, having obtained possession of three samples of yellow powder used by certain milkmen of Bordeaux to preserve their milk, made a chemical analysis of it. This analysis showed that two of the powders were composed wholly of neutral chromate of potash, that the third was a mixture of one part bichromate of potash and two parts neutral chromate, and that the suspected milk had been adulterated with the last substance in the proportion of 0·30 gramme to the liter, say five grains to the quart. The alkaline chromates are, in fact, powerful antiseptics, capable, even in small quantities, of retarding lactic fermentation very noticeably, if not of stopping it entirely. But because of the deleterious action of these salts on the organism, the Revue calls emphatically for their complete exclusion from food substances, and particularly from milk, of which so many young children drink relatively large quantities.

The suspicion of important astronomical discoveries recently made at the Lowell Observatory, at Flagstaff, Ariz., which has prevailed among men of science for the last few months, was confirmed on November 29, says The New York Tribune. Briefly summarized, the work of the year at Flagstaff includes the discovery of about five hundred new stellar systems, the measuring of some seven hundred systems noticed by previous observers, the careful examination of five thousand stars in the zone between 20 and 65 degrees south declination all brighter than the tenth magnitude; the rotations of Jupiter's third and fourth satellites, resulting in valuable facts; an exhaustive generalization of the stars in space; an investigation, with excellent results, of the phenomenon known as the twinkling of the stars; a generalization of many double stars, etc. There arrived in Boston recently Dr. J. J. See, who is largely responsible for many of the discoveries in the heavens made at the Lowell Observatory. Dr. See has charge of the double-star observations; Mr. Lowell has charge of the planetary experimentations. Dr. See went to Boston with all of his records for the year. He went to consult with Mr. Lowell about the preparation and publication of these records.

Miscellaneous Notes and Receipts.

Distinction between Catechu and Gambier.—For distinguishing the dyestuffs obtained from Acacia catechu and Uncaria gambier, the author (K. Dieterich) recommends the following fluorescence test: Dissolve 3 grammes of gambier in 25 c. cm. of water. Then add 50 c. cm. of benzine (specific gravity 0·700) and pour the whole in a separatory funnel. After having been left to stand, the layers separate and it will be observed that the benzine shows a more or less intensive green fluorescence according to the duration of the action. Acacia catechu does not produce this reaction.—N. Pharm. Centralhalle.

Exhalation of Blue or Green Wall Paper.—The unpleasant exhalations of papered walls mostly emanate from such wall papers as have a blue or green ground, but also occur with such where the blue or green color constitutes the largest part of the pattern, the dyestuff being chiefly composed of blue or green ultramarine. The latter is perfectly harmless, but has the property of becoming decomposed by slightly sour liquids and to spread a most disagreeable odor of rotten eggs, i. e., to develop sulphureted hydrogen during the slow progress of decomposition. The paste used for fixing wall paper is frequently of a faintly sour or readily souring character, and quickly penetrates the paper, causing the above mentioned effect, as a very slight degree of fermentation suffices to bring about the said unpleasantness. The latter appears more markedly if the walls are slightly damp and already covered with several layers of paper, so that the lime plastering cannot have a neutralizing effect on the lactic acid in the paste, etc. In such cases, therefore, where it is necessary to affix wall paper upon a ground of old paper, as well as in all cases where green or blue wall paper is used, it is recommended to employ only such gluing agents as either do not sour or, if they are inclined to decomposition, contain slight quantities of lime, milk or soda solution, before use, thus excluding the occurrence of the said drawbacks.

Leather Varnish.—Caoutchouc 100, petroleum 100, carbon bisulphide 100, shellac 400, bone black 200, alcohol 2,000 parts. First the caoutchouc is brought together with carbon bisulphide in a well closed bottle and stood aside for a few days. As soon as the caoutchouc is soaked add the petroleum and the alcohol, then the finely powdered shellac, and heat to about 125° F. When the liquid appears pretty clear, which indicates the solution of all substances, the bone black is added by shaking thoroughly and the varnish is at once filled in bottles, which are well closed. This pouch composition excels in drying quickly and produces upon the leather a smooth, deep black coating, which possesses a certain elasticity.

A New Combustible.—In the island of Barbadoes large quantities of a mineral have been found which the natives call "manjak." It is of a bright black color and occurs at a very slight depth, sometimes on the surface in beds 1 to 2 feet thick; it generally appears under an angle of about 40 degrees and in the immediate vicinity of rock. It is presumed to be solidified petroleum, which is often seen there exuding from the earth or floating on the water. In its composition this mineral is similar to the pitch of Trinidad, to the gilsonite of Utah, and the Canadian albertite, but it is of a much better quality. The best varieties of "manjak" contained 2 per cent of water, 70·85 per cent of volatile organic substances, 26·97 per cent of ditto solid ones, and 0·18 per cent of mineral parts. A more general grade showed 5 per cent of water and mineral substance. Trinidad pitch contains 21 to 30 per cent of water and about 38 per cent of ashes; hence the "manjak" mineral is much richer in natural bitumen. It is used, among other purposes, for the insulation of electrical conduits, for varnish, bituminous concrete, and for fuel, mixed with peat, etc. It is expected that it will supplant gutta percha as an insulating medium. —Wallmann's Vers. Zeit.

Official Examination of Foods.—During the month of September, 1897, 202 samples of edibles and drinkables were chemically examined in Berlin, and 57 of them were rejected. Among the rejected articles were milk, butter, lard, flour, fresh eggs, sweet oil, lemon oil, chocolate, green tea, medicinal Hungarian wines, and denaturized alcohol. Remarkable was the large number of the butter samples which were found to be objectionable. Among 25 samples, 2 were pure margarine, 12 were mixed butter containing from 25 to 75 percentum of margarine and 2 samples were greatly suspected of an admixture of margarine. The milk control extended over 1,446 stores and led to the detection of 89 cases of adulteration, etc.; the butter control extended over 549 stores and 56 cases were detected.

Cracking Coal for Cutting Glass.—90 parts powdered charcoal, 2 parts saltpeter, 1 part gum benzoin and 2 parts tragacanth powder. Pulverize all finely, knead with water into dough, roll little rods from it, which are dried. Light these, pass slowly over the glass, and cause a drop of water to fall on it, whereupon the glass cracks off. To be used for cutting off glasses and bottles.

THE EDISON MAGNETIC CONCENTRATING WORKS.

Before describing the remarkable process of crushing and magnetic separation at Mr. Edison's concentrating works in the mountains of New Jersey, it will be well to speak of the elaborate system of prospecting which was carried out to determine the location of the various bodies of low grade iron ore which it is proposed to work by the new process. In iron mining, just as in gold mining, there is a limit to the grade or richness of ore which it is profitable to work in the existing state of the art. Hence the prospectors who for many years have worked over the Eastern iron ore districts have made no record of the existence of deposits which were not fairly rich in iron. As the Edison process was designed to render the hitherto neglected low grade ores commercially profitable, it was necessary to make a systematic prospect of the belt of magnetite deposits. The work was done by means of the dipping needle, and the survey was the most complete ever carried out. It embraced a strip of country twenty-five miles wide, reaching from the Canadian border to the mountains of North Carolina. Several corps of surveyors ran lines across the magnetite belt at intervals of a mile, and wherever the dip of the needle showed indications of ore, a more thorough search of the locality was made. The results were plotted on a map which is the most unique and thorough work of its kind in existence. When this was completed, the company proceeded to purchase or lease the most desirable properties, their holdings at present amounting to some 16,000 acres.

The New Jersey and Pennsylvania Concentrating Works are located on the site of the old Ogden mines, one of those many abandoned iron mines of New Jersey from which the veins of richer ore have been worked out during the century or more in which iron mining has been carried on in this district. The body of ore averages about 200 yards in width, and extends for a distance of over two miles. The average richness of the ore is about 20 per cent of iron. It should be mentioned that although the works at Edison witnessed the first attempt to carry out magnetic concentration on a commercial scale, Mr. Edison had conducted a series of preliminary experiments at Llewellyn Park, N. J. The operations at Edison commenced about six years ago, and the characteristic energy and lavish expenditure with which they have been carried on have resulted in the present enormous and extremely interesting plant.

The visitor to Edison who is familiar with the scope of Mr. Edison's inventive genius—and who is not?—in the design and perfecting of such delicate or complicated devices as the incandescent lamp, the phonograph or the vitascope, will find that in the totally different fields of mining and milling, with their massive machinery and vast operations, Mr. Edison has shown a characteristic originality and freedom from the trammels of tradition. This is evident, not merely in the application of an entirely new system of concentration, but in the preliminary work of mining and crushing, where, surely, most men would have been content to follow the beaten track.

To carry out the process of magnetic separation called for the design of an entirely new plant in itself, and involved long years of patient and costly experiment; and, with a view of cheapening the work of getting out the rock and crushing it to the desired fineness for the magnets, an entirely new method of quarrying and crushing was devised and put in successful operation.

The works are situated approximately midway of the length of the deposit. A system of tracks runs from the crusher house to two powerful steam shovels which are working their way into the ore bed in two different directions. One of these weighs 60 tons and the other—a magnificent fellow weighing 93 tons—is the biggest of its kind ever built. In getting out the rock ready for the crushers, no attempt is made to shatter it to the usual size of say 100-pound lumps by the free use of dynamite. The latter is used merely to loosen up the rock sufficiently for the great shovel to tear it loose and load it on the cars. Consequently it is frequently dug out of the cut in solid masses weighing as much as 5 and even 6 tons apiece and sent to the rolls in this shape. A double track, with a switch at the far end, runs through the cut on a slight up grade. The empties are pushed up and allowed to run back, by gravity, past the shovel, where the rock is deposited on 5-ton skips, of which there are two to each car. The tracks run on each side of the crusher house, and here the skips are picked up by a pair of 10-ton electric traveling cranes and placed on an inclined table in front of the hopper above the "giant rolls." At the foot of this table is a revolving cylinder controlled by the operator, over which the material is fed to the rolls. This arrangement is clearly shown in our front page engraving, where a load is shown falling from the skip into the rolls.

The giant rolls are what might be called the spectacular feature of the whole plant, and to see them seize a 5-ton rock and crunch it with less show of effort than a dog in crunching a bone gives one a vivid sense of the meaning of momentum—for it is momentum that

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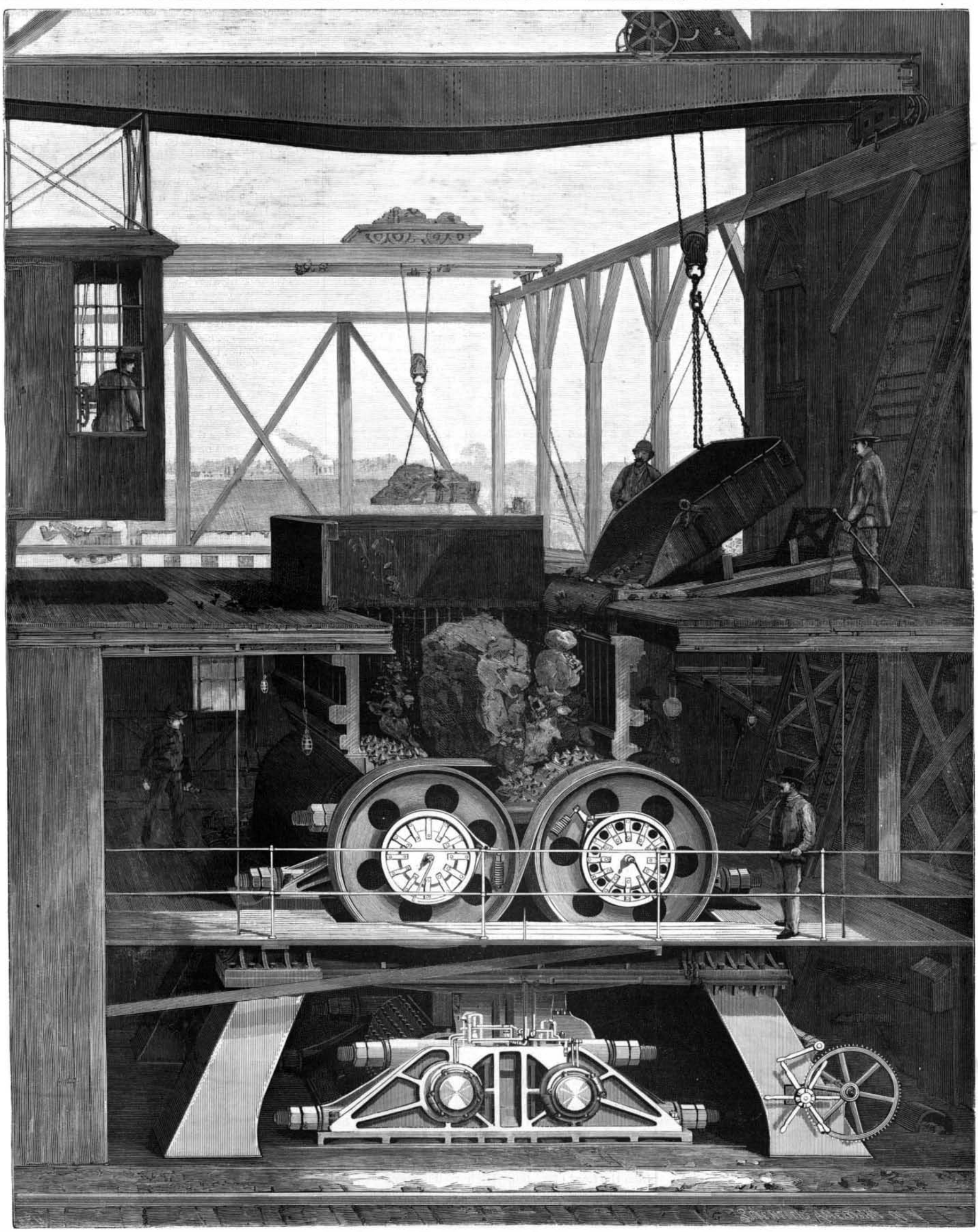

THE EDISON MAGNETIC CONCENTRATING WORKS—THE GIANT ROLLS.—[See page 55.]

does the work. The rolls are 6 feet in diameter, with a 6-foot face, and when they are running the masses in motion weigh about 70 tons. They are spaced 7 ft. 2 in. between centers, having a 14 inch space between their faces. The faces are covered with heavy cast iron "slugger plates," which consist of a soft backing with chilled 2-inch knobs. There are also two lines of massive knobs on opposite sides of one roll, which project 4 inches from the face. It is these which strike the smashing blows upon the large masses of rock and break them up for the smaller knobs to act upon. The rolls are run at a normal circumferential speed of 3,500 feet a minute, and it is the energy stored up in the 70-ton mass at this speed which does the work. The rolls are driven by a belt, which serves to speed them up to the desired velocity, but is not depended upon to do the crushing. The pull of the belt is transmitted to the rolls by means of a strap brake acting on the neck of the rolls—as shown in the engraving—which is adjusted by means of a coil spring.

The 93-ton shovel and the giant rolls combined do the work which in the ordinary methods of mining is done by a freer use of dynamite, and it is just here that the first notable economy of this plant is realized.

The rock falls now upon the "intermediate rolls," shown immediately below the "giant rolls." They are 4 feet in diameter, have a 5-foot face and are covered with knobbed plates. Their faces are 7¼ inches apart. The two sets can handle 3,000 tons of rock in a day of 10 hours. After passing through the intermediate rolls the rock is lifted by a wire rope elevator, in which the usual side links are replaced by side ropes in sets of four —an Edison invention, designed to reduce weight and lubrication and facilitate fast running—to a set of 36-inch rolls faced with chilled corrugated iron plates, the aperture between faces of which is about 2½ inches. Unlike the giant rolls these are positively driven; but to avoid breakage connection is made through a split wabbler, which is held together with shearing bolts whose total cross section is such that they will shear off before any breaking strain can be transmitted to the rolls. From the first set of 36-inch rolls the rock passes down to a second set which is similar to the first but spaced with a 1½-inch aperture. From these it falls into a third set, which are 24 inches in diameter with a 20-inch face. These are not positively fixed, but are kept in place by coil springs.

By this time the rock has been crushed to a size of not over ½ inch. It falls onto an elevator which carries it to the top of the "drier," a structure 9 feet square and 50 feet high which is filled with a series of cast iron plates 7 inches wide, which reach across the interior from wall to wall, and are arranged one above the other at an angle of 45 degrees, the successive plates facing in opposite directions. The ore is then elevated to a conveyor which runs along the top of a stock house 75 feet wide by 300 feet long, whose storage capacity is 16,000 tons.

From the stock house the material is carried to the three-high rolls in the concentrating mill. This consists of three rolls, the center one of which turns in fixed bearings, while the upper and lower rolls are carried in bearings which are free to slide vertically in the housing. The lower roll is driven through a shearing wabbler, of the kind already described, and the bearings at each end of the upper and lower rolls consist of loose sleeves, on the outside of which are seven grooves. Around the grooves, that is to say, below the grooves of the lower sleeve and over the grooves of the upper sleeve, is wound an endless ½-inch wire rope, which is finally carried up over a single sheave which is acted on by a pneumatic piston. By this means the strain on the rope, and therefore the pressure of the movable rolls on the center fixed roll, may be closely regulated, and an elastic adjustment is provided which removes all danger of breaking the rolls. The ore is fed between the upper and middle rolls and returned between the middle and lower rolls. The faces of the three-high rolls are smooth and they are trued up in place when worn by means of a removable tool carriage mounted on the housing. There are four sets of these rolls in all.

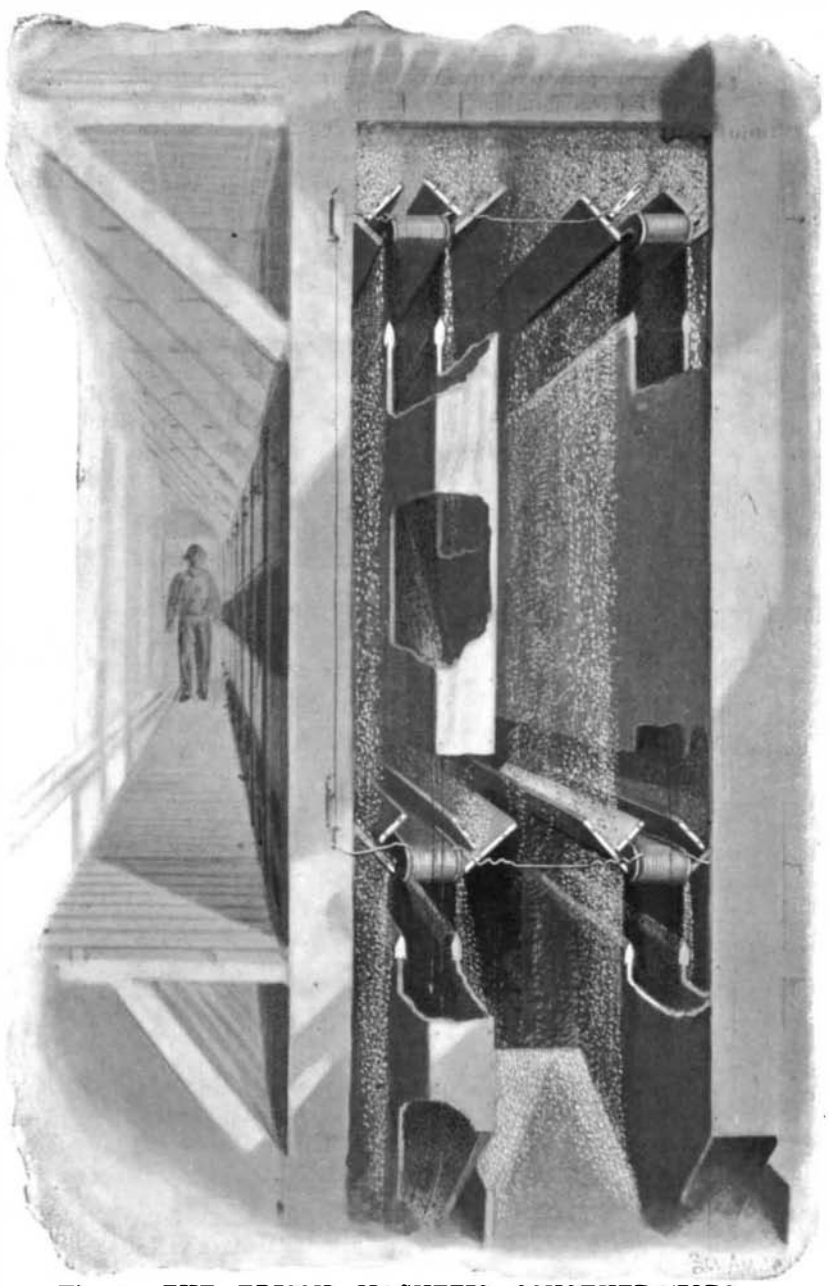

Fig. 1.—THE EDISON MAGNETIC CONCENTRATORS.

The next step is the screening, which is carried on over ten sets of 14-mesh screens. The rejections are sent back for recrushing in the three-high rolls, and the material which passes through the screens is now ready for the process of magnetic separation.

This process, which takes the place of what is known as the jig process of concentration, is the distinctive feature of the Edison plant. The crushed material is allowed to fall in a thin sheet in front of a series of magnets, which deflect the magnetic particles but allow the non-magnetic rock to fall in a practically vertical line. A thin knife-edged partition board separates the magnetic and non-magnetic streams, technically known as, respectively, the concentrates and tailings, the concentrates being taken to the drier and subjected to further screening and magnetic separation and the tailings, in the shape of sand, being sold as building sand in the open market. The latter, on account of its sharpness, is in great demand, and the company readily disposes of all that the works produce.

There are three sizes of magnets: The 12-inch, the 8-inch and the 4 inch. The crushed ore is first allowed to fall in front of a series of three 12-inch magnets (Fig. 1). The tailings, or the crushed particles of rock which are not drawn over by the magnets, are allowed to go to the sand heaps (Fig. 2), while the concentrates, which have been drawn out of the falling stream by the magnets, are carried to a drier or sent back to the three-high rolls for recrushing. The dried concentrates are then passed through 50-mesh screens and allowed to fall in front of a series of three 8-inch magnets. The tailings again go to the sand heap and the concentrates are taken to what is known as the dephosphorizing room, where they are treated by a special process, invented by Mr. Edison, for reducing the phosphorus. From this room the concentrates are allowed to fall in front of a series of 4-inch magnets, the tailings being sent to the sand heap and the concentrates being taken back for recrushing or being stored in concentrate stock houses. The stock in these houses carries a percentage of 68 per cent of iron.

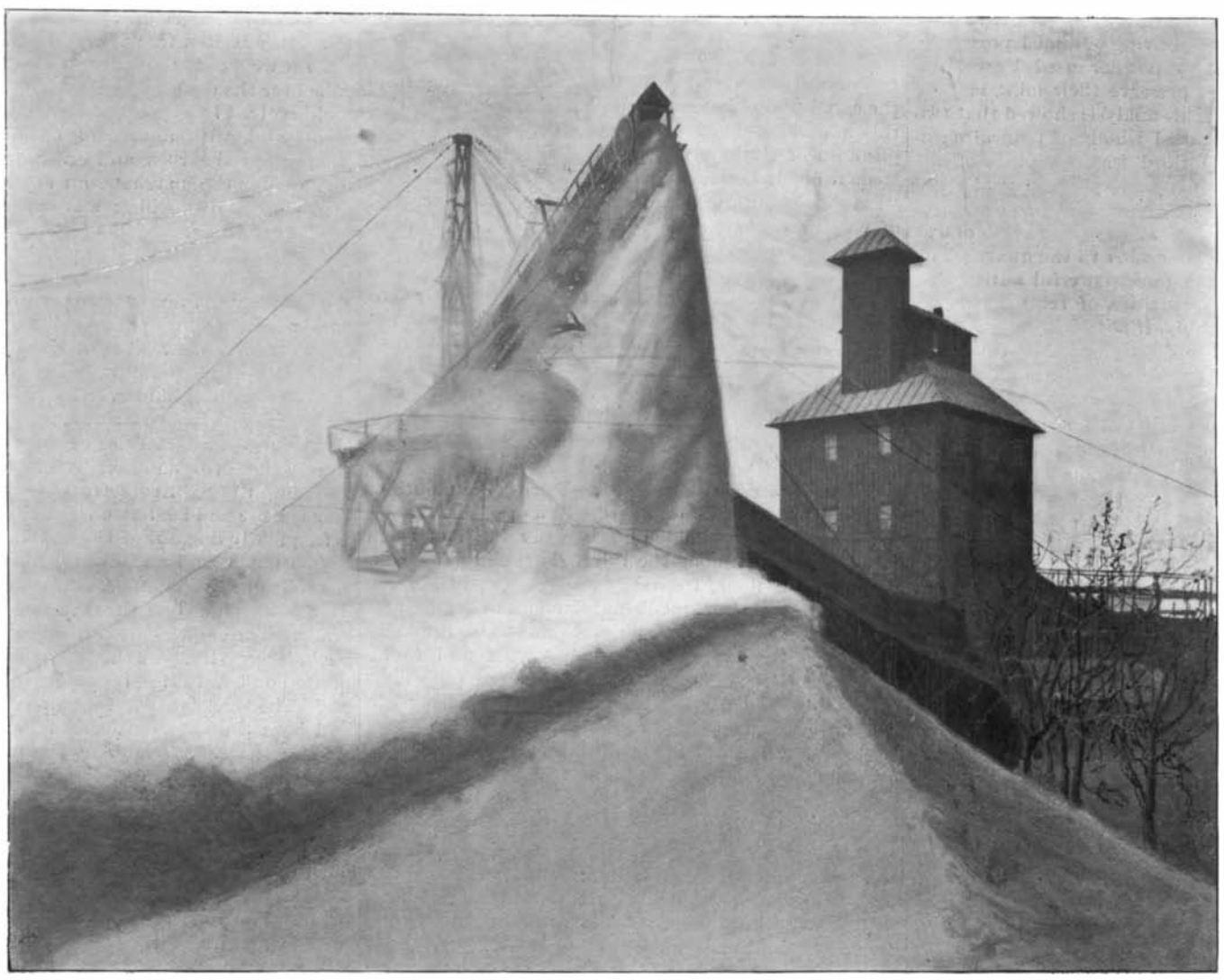

Fig. 2.—THE SAND DUMP—EDISON MAGNETIC CONCENTRATING WORKS.

It was at this point in the process that a difficulty was encountered which called for an extended series of experiments and much costly work before it was overcome. The process of smelting in the blast furnaces demanded that, for the best results, the ore should not be delivered in the

finely divided state which characterized the concentrates from the Edison plant. It was necessary to furnish the material to the furnaces in a condition which would allow the furnace gases to act upon it to the best effect. The Edison concentrates, on account of their fine subdivision would be apt to choke the furnaces and prevent the rapid reduction of the ore.

In order to meet this requirement, it was decided to compress the concentrates into briquettes and deliver them in this form to the blast furnaces. A complete briquetting plant was therefore designed, which has fulfilled all requirements. The concentrates are carried to a mixing house, where a suitable binding material is added, the mixture being carried by means of a trough conveyor in front of a series of briquetting machines. The mixture is forced into dies and compressed in them by means of three plungers, acting in rotation. The first fills the die under a pressure of 800 pounds to the square inch; the next plunger exerts a pressure upon the briquette of 14,000 pounds to the square inch; and the last plunger exerts a pressure of 60,000 pounds per square inch. Two sizes of briquettes are produced—3 inch and 2½ inch; the larger sizes weighing about twenty ounces each.

The briquettes are carried by a bucket conveyor to the baking furnaces, where the conveyor passes up and down through five vertical loops, the briquettes being retained in the furnace for one hour and nine minutes, and exposed to a temperature of 500°. After they have been thoroughly baked, they are unloaded onto a conveyor, which carries them to the railroad cars, by which they are taken direct to the blast furnaces.

The behavior of the briquettes in transit and at the furnaces has been eminently satisfactory. They do not absorb moisture, they do not break in handling and they present sufficient voids in the blast furnaces to insure a complete circulation of the gases around them for smelting.

An analysis of the briquettes shows the following results:

	Per cent.		Per cent.
Iron	67	to	68
Silica	2	to	3
Alumina	0·4	to	0·8
Manganese	0·05	to	0·10
Phosphorus	0·028	to	0·033
Binding material	....	to	0·075

with traces of lime, magnesia and sulphur.

It will naturally be asked, What results have the Edison briquettes shown at the blast furnaces when tested in actual practice? This was determined in 1897 by a trial which was carried out at the Crane Iron Works, Catasauqua, Pa. In these tests various percentages of briquettes were tried in a furnace which produces an average of 105 tons of pig per day when using the ordinary burden. The test was started with 25 per cent of briquettes and extended over five days, 100 per cent of briquettes being used on the last day. With 25 per cent of briquettes the output was 104 tons of pig, and with 100 per cent of briquettes the output rose to 138½ tons per day.

From a study of these figures the reader will see that the yield of pig is largely increased by the use of the briquettes over that secured by the use of the usual ores. Moreover, the trial proved that the consumption of limestone is reduced from 30 per cent to 12 per cent of the charge of ore, with a corresponding reduction in the quantity of fuel used.

The question has frequently been asked: How can this system of concentration be made commercially profitable with its elaborate plant and its frequent rehandling of the material? The answer is that the principle of labor saving, by the adoption of automatic appliances, which has enabled American industries to compete successfully against the world, is here carried out to its fullest development in every part of the works. In the mining, with its giant 93-ton-shovel; in the "giant rolls" crushing; in the elevators running at a speed of 250 feet per minute; and in the system of magnetic separation, there is a minimum of manual and a maximum of mechanical labor.

Costly and elaborate as the plant may be, it is noteworthy that about 5,000 tons of ore per twenty hours can be mined, crushed and concentrated with a working force of only 125 men per shift. From the time the deposit of ore is loosened by blasting ready for the steam shovel to the time when the concentrated result is shipped on the cars in the shape of briquettes ready for the blast furnaces, the material never once calls for manipulation by hand.

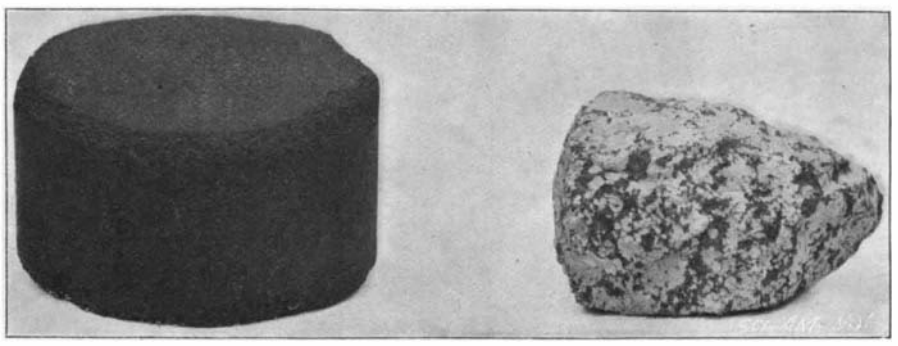

Fig. 3. A BRIQUETTE, 68 PER CENT OF IRON. A LUMP OF IRON ORE, 20 PER CENT OF IRON.

Herein lies the promise and potentiality of this latest and most radical development in the mining and metallurgy of iron.

THE FUR SEAL.

BY DR. BENJAMIN SHARP, ACADEMY OF NATURAL SCIENCES.

The fur seal, a century ago, was without doubt the most numerous mammal on the face of the globe. To-day, like the bison of our Western plains, it is fast becoming extinct. The rookeries of the north were small compared to the vast areas covered with fur seal in the southern oceans, yet we now hear only of the Commander and Pribylov rookeries, and a small one near the mouth of the Rio Plata, protected by the government of the Argentine Republic.

The history of the seal fisheries in the two polar oceans is interesting, as it shows the effect of lawless slaughter and careful protection. The destruction of the southern seal was accomplished when the Bering Sea fisheries were yielding without injury their maximum number of skins.

The habits of the fur seal* are so regular and so well known that, with intelligent care, the largest rookery could be made to yield a definite annual number of skins, with no diminution of the numbers required to keep up the supply, as nature always produces a large surplus, and from this surplus the skins could be drawn.

As soon as the winter snows have melted from the shores of the islands, the adult males assemble there to obtain a secure footing for the season. Now a fierce and continuous battle ensues for about a month, the "fittest" obtaining the best positions along the shore, the less powerful holding a station back of these, until the whole breeding ground is mapped out, with the strongest bulls of the rookery in definite positions, which they hold and never leave for two or three months. The weaker, generally those under six years, are driven from the rookeries, or not allowed to land, by their pugnacious elders, and are compelled to form a rookery of their own.

The fat, sleek bulls of five or six hundredweight and six or seven feet long, having gained their stations, await the coming of the cows. Nothing can drive these animals from their positions. They stand guard day night, without food,. without drink, and, it might almost be said, without sleep. When they return to the water at the close of the season they are thin and haggard, covered with honorable scars. Such endurance is unparalleled among warm-blooded animals.

Bears sleep for months during the dead of winter. Fattening in the fall, they creep to some cave or hollow tree and pass there into a state of hibernation, which reduces them, physiologically speaking, to the condition of cold-blooded animals. The vital activities of their bodies are reduced to a minimum, and yet they appear in the spring, lean and exhausted by this long fast. The bull seal, on the other hand, during his fast, is passing through the most active and violent period of his whole life, and were it not settled beyond question, these facts would scarcely be believed.

This long period away from their natural element is made possible only by the climatic conditions of their resting places. Dense fogs completely envelop the islands during the months when the seals are there, changing with violent winds and heavy rains. In a manuscript journal of a sealing voyage to Cape Horn in 1818, I find that there were only three pleasant days during three summer months. Rain with spits of snow, dense fogs, tremendous hurricanes, is the climate chosen by the fur seal for its breeding grounds, both in the north and in the south.

So completely are the northern seal islands veiled in fog that it took Pribylov eighteen years to find them. After the hunters had exhausted the sea otter on the shores of Kamtschatka, and the fur seal about the Aleutian Islands, this hardy son of one of Bering's crew set about the discovery of new haunts of the fur seal, knowing them to exist from the vast numbers which he had seen about the waters of this part of the world. He finally discovered them in 1786 by means of the seals themselves. Hearing the roar from the enormous rookeries through the fog, he was led to the islands which now bear his name, close to which he had often undoubtedly been. He endeavored to keep the discovery secret from the world, but he was followed and soon the rookeries were common property. Even to-day steam vessels provided with the most improved instruments for

SEAL FISHERIES, PRIBYLOV ISLANDS—BACHELORS ON THE BEACH—ST. PAUL IN THE BACKGROUND.

* The northern form is Callitaria (Callorhinus) ursina; the southern, Arctocephalus australis and other species.