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EDITORIAL.

ANTICIPATIONS OF an early opening of Lake navigation have proved futile, owing to the cold weather of the second half of April, which consolidated the floating ice around the Sault. The fleet of vessels which started from Lake Erie ports early in the month was delayed for two weeks, and some of the boats were seriously damaged in trying to force their way through. Other vessels were held back in consequence, and probably it will be well toward the middle of May before the iron-ore movement is fairly started. Meantime the stocks of ore on the lower Lake docks have been drawn upon heavily, and the docks will be nearly bare before the first shipments of the new season arrive.

WE ARE GLAD to note that the question of standardizing the use of the term 'mesh' has been advanced by Mr. George T. Holloway in a recent paper read before the Institution in London. Most assuredly it is time something were done, for the term threatens to become discredited through carelessness in the use of it. A Colorado man who reads of a stamp-duty of six tons per day through 200-mesh will credit his South African friends with impossibilities, and when he reads of re-grinding to 3,600 mesh he feels like resigning from the profession. He must take the square root to make sense of it. In the first place, 'mesh' stands for the number of apertures per linear inch; but this is not enough, because it does not specify the size of the aperture. In fine screens the thickness of the wire is an important factor, the difference between mesh and aperture being emphasized. It is the size and the number of the holes which mainly determine the character of the crushing. Therefore, in describing screens of punched metal the size of the holes and the number per linear inch should be given; in speaking of wire-cloth screens the diameter of the wire and the number of holes is required. There are other finer points to be considered, such as the shape of the apertures in a slot-screen, but attention to the two factors mentioned will go a long way toward an intelligent use of a much-abused term.

IT IS KNOWN that the great Cullinan diamond, of a size beyond the dreams of avarice, is not a whole crystal; it is a fragment from a stone nearly twice as large. Was it fractured deep down and in

a geologic past, or was it broken in the course of mining? It is stated that Jonathan Wells found it in the face of the blue ground at a depth of only 18 feet below the surface. He said that he was attracted by the flash from the bright cleavage surface. Is it possible that the remainder of this fabulous gem was crushed by the excavating machinery? The policy of the Premier Company has been one of haste to get rich, which is proper enough; but it can defeat its purpose. The company is installing gyratory crushers in order to break up the blue ground at a rapid rate, instead of adopting the De Beers method of disintegration merely by weathering. Is there no danger of cracking the stones, and is it not possible that the original Cullinan diamond was broken, by a blow from the excavating machinery, into small fragments which became scattered amid the general product of the mine? Our engineering friends in South Africa will be able to answer our query.

AMONG OTHER methods of applying the State control of mining in Australia, we note that in Victoria it is now enacted that, in the case of 'tributers' or lessees, the cost of all exploratory work, which the 'tributers' agree to do under their agreement with the owners, and which, in the opinion of the inspector of mines, will be of permanent value to the mine, shall be borne in equal proportions by the owners and the lessees. As a suggestion of the troubles in store for the inspector, comes the question of defining 'dead work.' What is 'dead work'? Can it be judged except by the result?

THE MINE OPERATORS in the Joplin district are beginning to recognize the fact that the sale of Western ores in competition with their own depends, not so much upon the prices in the district, as upon the fact that Joplin is not able to supply the demand from the smelters. A significant fact is that the Ozark Oxide Company has been getting a supply of ore for the manufacture of zinc oxide from the Graphic mine in New Mexico, for two years past, although its factory is at Joplin itself. Other smelters have been looking into the resources of British Columbia and Mexico, and the demand for Colorado ores has been constantly increasing. The zinc oxide works at Mineral Point, and near Chicago, are drawing their supplies chiefly from Wisconsin, though they have also taken

some ore from Colorado. In fact, the demand for these ores has been so considerable that the foreign buyers of Western ores have been practically crowded out of the market. Making allowance for the quantity of spelter now being manufactured, and also for the zinc oxide, the Joplin mines cannot supply more than 60 per cent of the ore required. It is not improbable that the foreign buyers will find before long that British Columbia ores are as difficult to get as those mined in this country.

THE EDITORSHIP of the *Canadian Mining Review*, which was closely allied with the Canadian Mining Institute during the lifetime of the late Mr. Bell, will continue in the same connection. Mr. John E. Hardman, who has had charge of the *Review* since Mr. Bell's untimely death, at a considerable sacrifice to his own immediate interests as an engineer, has retired, and the position passes to Mr. H. Mortimer Lamb, who was chosen secretary of the Institute at the last meeting. Mr. Lamb has had extended editorial experience in British Columbia, and is well posted on the mining interests of the Dominion, which the *Review* has so ably represented in the past. Mr. Lamb has also done excellent service for the JOURNAL as its British Columbia correspondent, and we wish him all success in his new position.

APRIL DIVIDENDS of the mining and metallurgical industries in America, although amounting to \$7,971,199, paid by 56 companies, are less than half those reported in March. However, the dividends for the four months this year sum up \$45,631,001, a gratifying profit. An increasing consumption and remunerative market prices for the commercial metals partly explain the growth in earnings, while economic management of low-grade mines has also swelled the treasuries of companies which are now paying monthly or quarterly dividends.

In April the dividends of \$7,971,199 were distributed as follows: 24 gold, silver and lead properties, \$2,864,709; 4 copper, \$2,389,879; 1 quicksilver, \$30,000; 3 zinc, \$27,167; total metal mines and works, 32, paying \$5,311,755. Two iron and steel companies disbursed \$319,750; 3 coal and coke, \$770,084; 14 oil and natural gas, \$398,560; 5 chemical and mineral, \$1,171,050; total industrial companies, 24, reporting \$2,659,444. The largest payers were

the American Smelting & Refining Company and the Boston & Montana Copper Company, each \$1,500,000.

In addition to the above dividends, Americans shared in the disbursements of \$418,700 by Mexican, Central American and Canadian companies.

THE LATEST development of the zinc problem at Broken Hill is the issue of a circular to the shareholders of the Broken Hill Proprietary Company announcing the erection of a plant to smelt the zinc concentrate. It is stated that 15 months will be required, wherein to build the first unit, and that it is estimated to produce 100 tons of spelter per week, equivalent to the treatment of less than one-third the output of the existing concentration plant. This move on the part of the owners of the great Australian silver mine looks as if they intended to fight the European smelters and find a market for their spelter, as they did for their production of lead and silver.

Professional, or Not?

Observations by Mr. Bryce on things American always command respect. In his series of articles, entitled 'America Revisited,' he comments shrewdly on the tendency of our lawyers to become men of business. He might have extended the remark to mining engineers who become promoters. It is a fact that lawyers, in the exercise of their profession, serve as trustees and executors; they acquire a knowledge of the world and an acquaintance with finance, until they are able to add to legal advice the aid of minds familiar with the intricacies of business. So far, so good. But shortly they have their finger in the pie; they use information gained professionally to speculate on their own account; they become entrusted with knowledge, given to them as lawyers, which they utilize as promoters. The profession of gentlemen becomes the career of buccanniers. New York exhibits many such; when the shipbuilding scandal was under inquiry one of these lawyer-promoters was cross-examined by another promoter-lawyer, and the unseemliness of the episode became spicy by reason of an undercurrent of feeling such as exists when Greek meets Greek. In the profession of mining engineer, also, there is a tendency for men who are engaged as advisors, to become principals; many good engineers lose

their reputations in trying to promote mining undertakings; most of them fall by the wayside; but some succeed. The great successes of the profession, as measured by those outside the profession, have been achieved by men having the financial instinct and that power of playing upon human nature which characterizes the born promoter, until finally the engineer, like the lawyer, has broken with professional ethics and adopted the commercial code. Modern industrial development makes use of various tools, and it is useless to condemn some of them because they are soiled with the dirt into which they dig. But apart from this aspect of the matter—a matter as complex as the morality of the money donated by Mr. Rockefeller to foreign missions—there is room for regret that two such professions, as those of law and engineering, should serve as incubators to the piracy that rules the high seas of finance.

Pensions for Professors.

The hand that rocks the cradle rules the world of infancy, but for the development of mental capacity in the youth of a nation we look to professional teachers. One great stimulating instructor is worth more than a battleship, and one luminous expositor of the sciences is of greater value than the best gold mine that was ever found. Was there ever a battleship or a mine so productive of results, measured even in the unit of money, as the teaching of an Emerson or a Huxley? And, though it be not given to many to reach such commanding heights, it is within the province of every college professor to mold the essential man in the youth whom he instructs. The educational period should last all a man's life; we remain pupils ever, we die learning, but in the years which precede the stress of life the mind is plastic, and the professor is as a sculptor. He has to take the material as it comes, but he can shape it, he can give it form and expression. Many a great teacher leaves no record in literature, achieves no discovery in science, makes no claim to the paucity of the hour; and yet his influence on the future men of action is transmitted through deeds which make history. Jowett, of Oxford, was not much known to the vulgar, but to his teaching England owes today the mental characteristics of several of her pro-consuls of empire.

Therefore we join with our contempo-

raries in applauding the beneficence of Mr. Carnegie. The donation of \$10,000,000, earning \$500,000 per annum, affords a fund the usefulness of which is even greater than at first sight appears; because, while there may be 3,900 individuals among the institutions to be benefited, there are many professors who, through private means of their own or the property of their wives, will not draw upon this fund, leaving an amount sufficient to furnish half-pay to four or five thousand teachers on their retirement from active service. For libraries that disseminate infectious diseases and a cheap fiction that carries mental microbes we have no friendly feeling; hero funds that accentuate the cheaply spectacular side of life call for little respect; but this latest benefaction of the great ironmaster has elicited, as it deserves, unanimous appreciation.

The Pennsylvania Miners' Certificate Law.

The appeal taken in the Shalleen case from the district court at Scranton was argued before the Superior Court at Pittsburgh last week. The case affects the validity of the miners' certificate law of Pennsylvania, which prohibits anyone from working as a coal miner unless he has previously secured a certificate from the board of examiners established by the law. One of the conditions required to secure the certificate is that the applicant must have had two years' experience in a coal mine in Pennsylvania, as a mine laborer, or in other subordinate capacity. Work in other States does not count, and it is chiefly on this point that the law was assailed. It is argued that the clause in question is in contravention of the fourteenth amendment to the Constitution of the United States, which secures the rights of a citizen of one State in all other States—including the right to work and to choose his vocation.

In this case Shalleen was arrested for working in a coal mine of the Delaware & Hudson Company without a certificate. He was convicted on the charge—which was not denied—but defended on the ground that the law is unconstitutional. The district court held that the law was in accordance with the fourteenth amendment, inasmuch as its requirements are binding on citizens of Pennsylvania, as well as on those of other States. The appeal now on trial was taken on this point. In all

probability the decision, whatever it may be, will not be final, and the case will be taken to the Supreme Court of the United States on the Constitutional point.

The real significance of this case is found in the fact that the lawyers who are arguing against the law are the counsel of the anthracite coal companies, while those who are supporting it represent the United Mine Workers. The certificate law, which requires two years' experience in the mines of Pennsylvania, will, in the case of a strike, prevent the companies from bringing miners from other States. Such men, no matter what their experience in coal mining may have been in other States, cannot get certificates, and cannot legally work in Pennsylvania coal mines. The advantage, therefore, will remain with the miners if the law is upheld. In other words, it is a skirmish for position, as the tacticians say, in case a new contest should arise next year, when the present agreement will expire.

To a layman it looks as if the law was, in spirit and intent, a violation of the fourteenth amendment. The requirement of experience is entirely justifiable, and the supervision of the persons to be employed in a mine is within the police powers of the State, and necessary to secure the safety of citizens working in a hazardous employment. To this there is no objection raised. To require experience to be gained in the mines of a certain State does seem, to the ordinary mind, a restriction of the right of citizens to seek employment for which they are qualified. This is said without any prepossession or prejudice in favor of either party. The nice distinctions of the law are not always clear to the outsider, however, and we do not venture to predict the final results.

Chemical Engineering.

In another column there appears an abstract of a paper by Dr. E. H. Miller, professor of analytical chemistry in Columbia University, on a new four-year course in chemical engineering, the first year of which is to be offered in the fall semester of 1905. The advertisement of this course, by so prominent an engineering school, marks a distinct advance both in the educational and also in the practical field. At the present time the positions of superintendents of the large chemical plants of the world are mostly filled by men who are executive engineers, and who may, or may not, be well-trained chemists.

It is obvious that their individual usefulness would be vastly improved if they could have added to their equipment a thorough discipline in chemistry. On the other hand, there are scores of good chemists who have the requisite knowledge to superintend chemical factories, but whose instinct for the mechanical and the engineering side of the problem was never developed either by study or practice. We offer our hearty endorsement to the plan for the specific training of this newly recognized group of engineers; and whatever issue might be taken in ungracious and petty criticism of details of the course (as printed in the current number of the *School of Mines Quarterly*), yet to the broad proposition, as wisely discussed by Dr. Miller, this JOURNAL has only congratulation to offer for the far-sighted plan "to provide a kind of chemist, not now produced, for whom there is a demand by the chemical manufacturers of America."

Market Conditions.

May 3.

The metal market continues generally quiet, and in fact a little dull. While the position of copper is known to be strong, domestic buyers are still holding back, apparently in the hope of securing future contracts at somewhat lower prices. Foreign buyers are kept in suspense by the political situation, and very little business is being done.

In the other metals tin shows a downward tendency. Lead is steady, with an excellent consumptive demand. Spelter shows little change, while zinc ore prices are somewhat lower.

Silver has been dull and a little weak, though the demand for India seems fair.

The iron markets have not yet recovered from the comparative quiet which settled upon them a few weeks ago. A renewal of activity, however, may be expected, as present supplies are worked down and manufacturers feel the necessity of contracting for the second half of the year. The greatest activity of the week has been in plates and structural material, for which a large number of contracts are pending. There is also a good deal of inquiry for girder rails, and other material for trolley roads.

In the West the coal markets are chiefly affected by the opening of lake navigation, which is causing an active movement of coal towards the lower lake ports. In the

East the coal markets are without special feature, but business generally is very good for the season, both in bituminous and anthracite.

Metallics.

Culled from all sources. Our readers are invited to assist this department by sending similar material.

Stars containing the argonoid element helium are found largely in the constellations *Orion* and *Argus*, thus forming a milky way of their own.

The composition of the Welsbach mantle has much to do with the effective temperatures in and about the burning zone of gas. The maximum, according to V. Lewes, is reached with 99.9% thorium oxide, and 0.1% cerium oxide.

The mill of the Village Main Reef mine at Johannesburg has crushed 13,000 tons at an average duty of 6.1 tons per stamp. This result is attributed to the use of anvil blocks placed under the mortar-boxes.

The tower of Mount Pélée in Martinique seems to have grown up at the rate of 20 to 30 ft. per day, the greatest height of this 830-ft. monolith being 5,200 ft. on May 31, 1903; on that day it lost 180 ft. The composition of the tower was a pumiceous andesite. It may represent a part of the consolidated plug of an older eruption.

Chemically pure iron, produced by electrolysis, has recently been made by Prof. C. F. Burgess, of the University of Wisconsin. The metal is said to be free from all foreign contamination, with the exception of a little hydrogen.

Red beryl represents a new mineralogical anomaly. The crystals are small but distinct; they are colored by some manganese compound, and are found near Simpson Springs, Utah, in the Dugway range. The matrix is rhyolite, and topaz, bixbyite and altered garnets are associated. W. F. Hillebrand is sponsor for this chromatic novelty.

A choke-coil, or a choker, is a coil of many heavy turns, and may be used as a lightning arrester on the theory that a coiled conductor presents more resistance in the case of a current of high frequency of variation than in one of relatively low frequency.

Reinforced concrete is the coming material in modern construction. According to some authorities, it is one of the monumental blunders of this mechanical age that the arches of the New York subway should be made of steel rather than of reinforced concrete.

Fighting a Mine Fire.

SPECIAL CORRESPONDENCE.

Ever since last fall, a fire has been raging in the abandoned workings of the Colebrook colliery of the Delaware & Hudson Company, near Carbondale, Pa. The fire has cost the company a good deal of money, aside from the risks taken in trying to subdue it. In one instance, indeed, the work almost ended in a calamity. This was last winter, when a score of miners had to flee for their lives before the deadly gases generated by the burning coal in the old workings. Several men were overcome, and were preserved from death by suffocation only through the active work of two of the mine bosses. Only a short time ago a miner had a narrow escape while leading several engineers who had lost their way in the abandoned mine. At the present time, however, the officers in charge of the colliery are looking forward with satisfaction to the prospect of subduing the fire within a short time. The working gangs, who are approaching the seat of the fire from different sides, are expected to meet in a few days, and meantime they are carrying on the work by double shift, day and night. The engineers believe that the fire will then be subdued, if no unforeseen accident happens.

The great problem which the company has been trying to solve for months, was to prevent the fire spreading from the old to the new workings. The old workings were exhausted and abandoned some 40 years ago, but they are connected with the new openings, which are now being actively worked. Every measure which it was thought would overcome the fire has been tried, with varying success. At the present time two drills are boring holes from the surface, and culm is flushed through these holes. Four large fans have to be kept constantly in operation to secure proper ventilation, and to furnish sufficient air to the gangs that are fighting the fire. The intensity of the heat resulting from this fire, which has continued stubbornly burning for over six months, is shown by the fact that pieces of rock, taken from the tunnels that are being driven to reach the seat of the fire, have been literally calcined, and can be readily crumbled to dust under the pressure of the fingers.

Sodium 'sesqui-carbonate,' so called, is a union of one molecule of the carbonate, two molecules of bi-carbonate and two molecules of water.

The 'rotor' in the steam turbine is that part which turns on the main shaft, as contrasted with the 'stator,' which is made of fixed and immovable plates, intermediate between the blade-wheels of the rotors, and circumferential to the rotor shaft. The stator gives the fixed basis for the reaction of the rotor.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of THE ENGINEERING AND MINING JOURNAL.

THE HAURAKI GOLDFIELDS, NEW ZEALAND.

The Editor:

Sir—I have read with pleasure and profit Mr. Waldemar Lindgren's article, 'The Hauraki Goldfields, New Zealand,' which appeared in your issue of February 2 (page 218), and trust that a few remarks in the way of discussion from a resident of the goldfields will prove of interest to your readers.

Mr. Lindgren's statement that the western side of the volcanic ranges that constitute the Hauraki goldfields is marked by a great fault, forming the eastern side of the Firth of Thames and the Thames valley, is one with which I quite agree. The existence of this fault is fairly obvious, and it seems strange that no previous writer has ever referred to it, or appeared to suspect that the Thames valley might be a downthrow area, or *graben*, to use the German expression quoted by Mr. Lindgren, comparable in size with the Jordan valley, so often quoted as a typical example of a valley formed originally by trough-faulting.

Mr. Lindgren's tentative conclusion that the rich shoots and patches of the Thames goldfield are due rather to primary deposition by ascending waters than to secondary changes produced in the already formed veins by descending waters, seems to me to be contrary to the bulk of the evidence. Some of the 'specimen leaders' of the Thames are clearly younger than the main lodes, which they often intersect, and, since they are usually rich at, and near, the point of intersection, they may have derived part of their gold from the older veins, either at the time of their formation or at a later period. A diagram showing an auriferous leader crossing a large 'buck reef' is given by S. H. Cox in his report on the 'Goldfields of the Cape Colville (Hauraki) Peninsula.'

Again, many rich patches are connected with small faults (locally termed 'slides,' or, when of minor consequence, 'breaks'), which dislocate the lodes. The obvious conclusion is that these rich patches are younger than the faults, and must therefore be of secondary formation. This relationship between faults and the richer parts of the lodes is still more noticeable at Coromandel, 40 miles north of the Thames. Mr. Cox, in the report mentioned above, gives several diagrams illustrating this relation. The nature of the country is considered by Thames miners to be of very great importance in connection with the occurrence of rich ore. As it can hardly be doubted that the country enclosing the lodes (even if propylitized)

must have been of substantially the same character over considerable areas during the period of lode formation, it is difficult to understand its influence at that time in causing the extremely irregular and localized distribution of the Thames specimen 'stone.' One can better conceive the country as controlling the formation of rich ore at a later period, when descending surface waters, acting in conjunction with faulting agencies and surface erosion, would cause a great variety of local changes.

To me it seems that the bonanzas of the Thames are examples of secondary enrichment, caused mainly by descending waters. Some of the values are probably derived from the ancient outcrop portions of the lodes, now removed by denuding agencies. The extreme richness down to the 500-ft. level of the 120 acres on the seaward side of the Moanataiari fault—ground that has been eroded at least 1,000 ft. since the period of lode formation—favors the view of enrichment with help of denudation. The localities where concentration of values occurs have been determined partly by faults, partly by the nature of the country, and partly by lode intersections.

A noteworthy fact discussed by Mr. Lindgren is the occurrence of hackly, cellular and laminated quartz in the mines of Waihi, Waitekauri, Karangahake, and elsewhere in the Ohinemuri district. As he points out, this appearance is produced by the removal of original calcite. Since the quartz is either molded on the calcite, or replaces the latter mineral, it may be considered pseudomorphous (using this term in a wide and perhaps loose sense). Such quartz is always of low grade. In the deeper levels of several mines calcitic ore, probably more or less original, appears, and is sometimes (as in the Waihi mine, where, however, it does not occur in large quantity) of payable quality. In the Waitekauri mine, on the other hand, the upper portion of the main lode carrying a large body of dividend-paying quartz was succeeded by a zone with smaller amounts of pay ore, but abounding in huge 'vugs' or cavities. Finally came a level in which the lode was solid, but consisted of an unpayable mixture of calcite and quartz. Boring operations did not disclose the existence of better ore at lower levels, and the mine at present is practically closed down. Several mines in neighboring districts have also found that the presence of much calcite means low-grade ore. In consequence, calcite is not looked on with favor in any part of the Ohinemuri goldfield. It may be mentioned, in passing, that at the Thames the occurrence of pearlspar (carbonate of lime and magnesia, that is, dolomite) is regarded as a favorable indication.

Mr. Lindgren, it is pleasing to notice, appears to take a very hopeful view of the calcite ore, explicitly as regards Waihi, and

implicitly as regards other districts. While agreeing to some extent with his statement that "these developments (in the Waihi mine) must be accepted as a favorable sign for the permanence of the orebodies to greater depth than yet attained," one must admit that the evidence from neighboring districts is not encouraging. I am inclined to believe that the calcite zone of the Waitekauri mine has been produced by the deposition of the calcite leached from the upper levels, concurrently with solution of gold and perhaps quartz, and that at lower levels the ore will consist of quartz with less calcite and probably more gold, but this view is based mainly on theoretical reasoning, and does not appear to have received much support from the boring operations lately conducted.

With regard to the treatment of the ore from the Waihi mine, it may be stated that the majority of the 330 stamps are now dropping on sulphide ore. The pulp passes over copper plates, and then over vanners, the concentrate from which is ground extremely fine in a tube-mill, and then agitated with cyanide solution for some days. The concentrated slime is finally filter-pressed, and a good extraction of the metal is obtained. The tailing (one would like, from force of habit, to say 'tailings,' but you, Mr. Editor, I note, prefer the singular)² is separated into sand and slime (singular again) by means of spitzkasten; the former is cyanided by the usual methods, the latter is filter-pressed to expel excess of water, then the cakes are broken up, agitated with cyanide solution, and again filter-pressed in accordance with Westralian practice.

The geological features of Waihi are perhaps not quite so simple as Mr. Lindgren's brief description would imply. The Martha hill (on the highest ridge of which there outcrops the great Martha lode) has rhyolite (not rhyolite tuff) on two sides only. On the other two sides, there is andesite of a slightly different original character from the lode-bearing andesite, which latter might perhaps be more correctly called quartz-andesite or dacite. It is, as Mr. Lindgren states, much altered, and even the tolerably fresh-looking rock of the lower levels of the Waihi mine has undergone much change. The andesite to the west and north of the Martha hill, as well as that found underlying the rhyolite on the eastern sides, is evidently younger than the proved lode-bearing country which again underlies it east and west of the Martha hill outcrop, but the question of its age in relation to the lodes is a very difficult one to decide, on the evidence at present available. There are also two distinct flows of rhyolite overlying the andesites. The older has a remarkable flow structure, which causes it to assume a brecciated appearance; and, when decomposed by surface agencies, it

² I am much obliged to Mr. Morgan for his courteous recognition of my effort at precision.—THE EDITOR.

¹ New Zealand Geological Reports, 1883, p. 25.

looks for all the world like a rhyolite tuff. Mr. Lindgren's conclusion that the Waihi lodes are older than the rhyolite is no doubt correct. At Waihi beach, six miles away, a period of lode formation after the rhyolite eruptions is indicated by the occurrence of gold-bearing lodes in spherulitic rhyolite of perhaps slightly older age than the Waihi rhyolites. Mr. Lindgren's references to the petrographical features of the country and the leading characteristics of the orebodies in the Waihi mine are most interesting. It is to be regretted that he did not stay longer in the district, and himself make the more detailed examination which he recommends to the New Zealand Geological Survey.

One or two of Mr. Lindgren's statements regarding the sulphide ore of the Waihi mine are not altogether correct. He says, italicizing the first clause, that "the value of the sulphide ore is very nearly the same as that of the oxidized ore. If anything, the grade is somewhat higher." As a matter of fact, the average value of the sulphide ore so far developed is considerably higher than that of the oxidized ore, especially if the low-grade portions as yet unstopped are taken into account. Not only does the sulphide ore contain more gold, but also considerably more silver than the oxidized ore. The first sulphide ore found in the Waihi mine at the second level on the foot-wall of the Martha lode was of high grade, averaging 1 to 2 oz. of gold and 30 to 60 oz. of silver per ton. The richest portions assayed up to 25 oz. gold and 1,000 oz. silver per ton. Some very rich sulphide ore lately obtained in one of the deeper levels assayed nearly 42 oz. gold and 1,203 oz. silver to the ton. This was, of course, from a picked sample. Mr. Lindgren was probably informed that at one particular place there was oxidized and sulphide ore side by side of nearly the same value, but this does not apply to the whole mine. Of course the ore classed as 'sulphide' varies much, some of it being largely affected by oxidizing agencies, some containing but a mere sprinkling of pyrite; and much so-called sulphide ore is no richer than the average of the oxidized ore; still, Mr. Lindgren's remark that "apparently the formation of secondary sulphides does not always imply enrichment" can hardly be said to be borne out by the evidence of the Waihi mine. The oxidized ore has undoubtedly been affected by descending waters in the manner described by Mr. Lindgren. The surface portions have in places been enriched by the removal of pyrite, calcite, etc., and also by receiving gold from parts of the original orebody which have disappeared through erosion. At times much of the original silver content of the surface ore has been dissolved and removed by descending water, probably to be re-precipitated by the sulphides at deeper levels.

The sulphide ore of the Waihi mine contains a little selenium, but the state-

ment that tellurium is present, evidently quoted from Prof. Park's paper on the Hauraki goldfields, requires confirmation. The numerous tests made by myself and others in this district have invariably given negative results. While cobalt is present, nickel occurs in more noticeable quantity in the bulk of the oxidized ore. The oxides of these metals appear to be associated with the black oxide of manganese which is so abundant in the oxidized zone.

Mr. Lindgren appears to think that the lodes of the Hauraki goldfield will persist to a considerable depth, carrying payable sulphide ore. At Waihi, as he says, the developments support this view, but in most other districts the mines at a certain depth enter a poorer zone. The lodes are there, but the values disappear. Whether in all cases this condition of things will continue, or whether it will be replaced at greater depth by a second zone of payable ore, is quite uncertain. In no district have the deeper levels been tested except by the unsatisfactory method of boring. This has nowhere given results of any practical value, if one excepts a borehole put down by the Waihi Grand Junction Company, which penetrated a large and payable body of quartz (a continuation of the Martha lode) at about 1,000 ft. from the surface.

It is interesting to know that the Waihi mine and the De Lamar mine in southern Idaho bear a striking similarity in many respects to each other. Judging from a description by J. E. Spurr, which appeared in *THE ENGINEERING AND MINING JOURNAL* of May 2, 1903, the Tonopah district, Nevada, also has many points of similarity to the Waihi goldfield. In both localities the prevailing rocks are andesite and rhyolite, each of two or more ages; in both, the older andesite carries auriferous quartz veins; and in both districts these lodes are to a great extent buried by the younger volcanic flows, occupying, in part at least, valleys of erosion. In both places, the gold occurs in the ore in a very finely divided condition, so as to be seldom visible to the naked eye. Finally, there is a curious resemblance between the general view of Tonopah given in connection with Mr. Spurr's description, and Waihi from a certain point of view which may, or may not, be altogether accidental. Another mining district which, I have been informed, bears a close resemblance to Waihi is Redjang Lebong, in Sumatra. Samples of the ore from Redjang Lebong mine, which I have seen, can hardly be distinguished from that of Waihi and neighboring districts.

PERCY MORGAN.

Waihi, New Zealand, March 28, 1905.

THE METRIC SYSTEM.

The Editor:

Sir—As you have reopened your columns to a discussion of the metric system, I would like to say a few words regard-

ing the proposition of Mr. Willmot to immediately abolish troy weights by law.

Undoubtedly the largest single user of troy weights is the United States Mint service. Under instructions from the Director of the Mint I recently made a careful study of what would be the practical effect of substituting metric weights for troy weights in the every-day work of the Mint service. At that time I was firmly convinced that the use of metric weights would be a great advantage, but the hard logic of the absolute facts in the case has compelled me entirely to reverse my position. The mere substitution of metric weights for troy weights, which might possibly be made under present laws, would be a great disadvantage to the service and require a considerable increase in the Mint force; while even if our whole coin system were entirely reorganized so as to bring it into the best possible relations to the metric system, which would be a most serious and difficult undertaking, the metric system would still be inferior to the troy system, requiring more labor, and be of a distinct disadvantage to the service.

The chief objections to the metric system are two—the added labor required in the actual weighing, and the increase in the calculations necessary for Mint work; and they both grow out of the fact that the numbers required to express weights are practically three times as large with metric weights as they are with troy weights.

As a general proposition, it might be thought that the mere weighing of a given piece of bullion would be the same, irrespective of the system of weights used, but practically this is not so. For instance, we now weigh gold bullion to 0.01 oz., and we would have to weigh to 0.1 gram on the metric system. Mint weights now run from 0.01 oz. to 500 oz. troy, and a practical set comprises 44 pieces. A corresponding metric set would run from 0.1 to 10,000 grams, and require 45 pieces. Practical limitations preclude the use of a weight as heavy as 20,000 grams. At random I put down 4,863.72 oz. as the weight of a lot of gold bullion. This can be weighed by the use of 16 troy weights, but would require the handling of 23 metric weights, and the weight would be expressed by 151,278.6 grams. Such a difference on a single weighing may not be much, but the difference between the two systems becomes an important matter on the many thousands of weights made in a single year in our Mint work.

If the above bullion is of the simplest kind, containing only gold and copper, and fit for coinage purposes, the calculations necessary for its conversion into standard gold require the use of 95 figures, while in the metric system 107 figures must be used. If, however, the bullion be base and carry silver, the increased number of figures necessary in the calculations with metric weights will be very much greater.

The use of metric weights in the Mint

service would require the handling of from 4,000,000 to 6,000,000 more figures yearly than are now required with troy weights.

FREDERIC P. DEWEY.

Washington, April 25, 1905.

THE METRIC FALLACY.

The Editor:

Sir—In your issue of April 20 Mr. Harpur, of Nenthead, England, asks for information regarding the estimate of 6.8 weeks as devoted to the study of compound numbers, weights and measures in the New York schools. A week includes the five daily sessions of 300 minutes each, making 1,500 minutes of attendance at school. The claim of a saving of one to three years as made by Lord Belhaven and Hon. James H. Southard, chairman of the Committee on Coinage, Weights and Measures, included the entire course of study in the school life of a child. In making the above estimate, which refutes this claim, the time occupied with compound arithmetic was reduced to full weeks. The result, 6.8 weeks, is not claimed to be exact. It is a wildly extravagant estimate in favor of the metric system, and is presented to show the absurdity of the educational argument, which, however, is as reasonable as the general metric proposition.

Since the publication of this estimate of 6.8 weeks, an attempt has been made to construe the original claim of one to three years as covering only the study of mathematics. In exposing this new fallacy it is unnecessary to dwell on the fact that the study of weights and measures in the school is merely very superficial memorizing, and that the real knowledge of weights and measures is acquired only by using them; nor on the fact that the 34½ weeks covers geometry and algebra, from which the special study of weights and measures is excluded. We can ignore these considerations because the fallacy of the new claim is due chiefly to the assumption that the use and study of weights and measures can be confined to decimals. That is impossible because the universe is not built that way. To save time by abolishing the study of vulgar fractions is to promote ignorance, not knowledge. Such a policy of saving, carried to its legitimate conclusion, would do away with all study and award diplomas for what the graduate from the school of ignorance does not know.

The earth, from which the French scientists a century ago thought they had derived the meter, persists in revolving on its axis 365 $\frac{8}{100000}$ times during one revolution around the sun. Everything, from the chemical combinations of the atoms to the arrangement of the planets and fixed stars, proclaims the eternal verity which John Quincy Adams thus expressed to Congress in 1821: "Decimal arithmetic is a contrivance of man for computing numbers, and not a property of time, space or matter. Nature has no partialities for the

number ten, and the attempt to shackle her freedom with them will forever prove abortive."

Evidence of how the French in their attempt to decimalize everything have come in conflict with the laws of the universe is found in Joseph Garnier's arithmetic, 'Traité d'arithmétique théorique et appliqué au commerce, à la banque, aux finances et à l'industrie.' This book includes the following chapters: *Système métrique*, 43 pages; *Anciennes mesures*, 12 pages; *Comparaison des mesures anciennes avec les nouvelles*, 13 pages; *Des nombres complexes*, 22 pages; *Fractions ordinaires*, 36 pages.

This French arithmetic, published in 1900, 107 years after Robespierre's decree establishing the metric system in France, fails utterly to supply any confirmation of the claim that the introduction of the metric system means the abolition of compound numbers. In spite of the evidence it furnishes, which is available in unlimited quantity to all who will only look that way, the preposterous claim of a saving of one to three years is reiterated on the authority of English and American educators and shouted from the tops of the Parliament House at London and the Capitol at Washington. Shutting their eyes to natural law and the evidence in French schools, the metricites even go so far as to claim that the adoption of the metric system means the abolition of vulgar fractions.

SAMUEL S. DALE.

Boston, Mass., April 26, 1905.

A METRIC MYTH OF 1905.

The Editor:

Sir—In your issue of February 23 a correspondent signing himself "Decimal" repeated the familiar statement that the weights and measures of Germany were changed quickly and without difficulty about 35 years ago. This claim has been frequently advanced in but a slightly modified form and backed by more or less high authority. Thus:

Lord Kelvin, in the House of Lords, February 23, 1904: "In Germany, France and Italy no inconvenience resulted from the introduction of the metric system, and there was no such thing as a complaint. The change in Germany occupied only two years. Sir W. Ramsay wrote: 'I was in Germany during the change there; it gave no trouble whatever, and was recognized within a week.'"

A witness before the Committee on Coinage, Weights and Measures at Washington, February 6, 1902: "In talking to my head man about it—strange to say, we have one employee in a very important position, a German, who was in Germany in a somewhat similar position at the time the metric system was made compulsory there—he informed me that there is no real difficulty in making the change."

William Mauer, Secretary of the Germania Mills, Holyoke, Mass.: "The

writer lived in Germany in 1871, when that country adopted the metric system, which gave great satisfaction, and the German population regretted at that time that they had not had the system long before."

Under any conditions, such a radical change in the weights and measures of a country would be a cause of wonder. The very rapidity with which it is said to have been effected excites incredulity. This well founded doubt is further strengthened by testimony as to present conditions in Germany, of which a few examples follow:

Friedrich Frowein, Barmen, 1901, 'Kalkulator für Artikel der Textilbranche,' a handbook for textile workers. Gives complicated formulas for converting different standards, including the Prussian, Württemberg, Baden, and Bavarian ells. Gives calculations of cost, all involving a variety of standards. In the one for cotton tape there are the French inch, the English yard, the French line, and the English pound and the meter.

Leipziger Monatschrift, Oct. 31, 1902. A yarn-calculation table based on the Vienna inch, English yard, the English pound and the meter.

The same journal, July, 1903. An article on textile calculations in which are found the Saxon inch, English yard and pound and the metric standards.

Donat, 'Methodik der Bindungslehre,' Leipzig, 1901. Gives a list of standards in use in Germany which include the following: Leipzig, Bohemian, Berlin, Brabant, Vienna, English and French ells; English, Leipzig, French and Vienna pounds; Leipzig, English, Vienna and French inches.

Sixteen different systems of numbering yarn are in use in Germany based on the Berlin pound, the kilogram and half kilogram, the English yard, the Berlin, Brabant and Leipzig ells and the meter.

Muenchner Allgemeine Zeitung, 1902: "At the session of the tariff commission on June 24, 1902, the introduction of the metric system for cotton yarn came up for discussion. According to Abgeordnete Muench-Ferber, who is a manufacturer of cotton and woolen goods at Hof, Bayern, the introduction of the metric system would throw the German weaving industry into *heillose Verwirrung* because the German machinery is based on the English system."

In the light of this evidence as to the present conditions as German standards, those who seek the truth about the metric system have a right to ask for something more convincing than a repetition of the old story about the miraculous change in Germany 35 years ago. The evidence in conflict with that story cannot be laughed to one side. The fact that the weights and measures of a great German industry are in a state of chaos today is proof that what we are asked to accept as the miracle of 1870 is, in fact, a myth of 1905.

SAMUEL S. DALE.

Boston, February 27, 1905.

Mining Stocks.

(See quotations on pages 871 and 872.)

New York. May 4.

There has been quite a reaction in quotations. Amalgamated Copper has weakened to \$77.75, Anaconda to \$26.31, and Greene Consolidated to \$25. Some attention is given to United Copper, the common moving at \$22@25.50, and the preferred at \$71@74.

The gold and silver shares were quiet, and show little change in quotations.

American Smelting & Refining shares are lower, but United States Steel shows some improvement. An interesting transaction was the purchase of \$25,000,000 of the \$30,000,000 series B 5% cumulative preferred stock of the American Smelters Securities Co. by Kuhn, Loeb & Co., bankers, of New York.

Boston. May 2.

As might be expected, copper shares suffered declines in keeping with the New York market. Wednesday of last week was high day, and from that time the market has been a drooping one until to-day, when prices commenced to mend again. The weakening of copper is thought to be only temporary, and can hardly be ascribed as the reason for the short decline witnessed in some cases. At the present time there seems but little prospect of a good copper share market, but it may come from an unexpected source and without warning. Utah Consolidated has been conspicuous for one of its strength even in an otherwise heavy market. It is well supported at \$42.50, but from this it advanced steadily to \$45, closing \$1 better than a week ago, at \$44. Lawson covered a heavy short line at the first-named figure. It is now estimated that the so-called Standard Oil crowd own a majority of this stock, having accumulated about 50,000 shares recently.

The same gentleman is known to have covered a short line of Osceola up to \$98. From this it dropped to \$91.75, but closes \$1 above a week ago at \$94.50. Allouez, which has varied from \$21.12½ to \$19, is \$1 higher now than a week back at \$21. There has been considerable Lake buying of this stock. Atlantic broke \$2.37½ to \$13, but is back to \$14. Greene Consolidated was freely offered and broke \$3.62½ to \$25.25, but recovered to \$26.87½. Isle Royale also slipped off \$3.50 to \$21, but is back to \$23, and Centennial fell \$3 to \$17, recovering to \$18.50. There was some good buying of Mass and Michigan early last week, the former rising to \$10, and the latter to \$12.75. Mass, however, fell to \$8.25, rallying \$1, and Michigan fell \$2 to \$10.75, recovering to \$12. Mohawk fell \$3 to \$48, but is back to \$50.50. Parrot is off \$1 to \$24, Wolverine \$1.75 to \$106.50, and United States fell \$2.87½ to \$30.12½, recovering \$1.75.

Old Dominion went off with the rest of the list \$2.50 to \$23.25, but is back to \$25 again. Copper Range went off almost \$5 to \$70.12½, recovering almost \$2. The annual report, issued this week, is a lengthy affair, but shows a prosperous condition of affairs. The report tells of negotiations for a two-year option on two sections of land forming a part of the so-called Globe property, immediately adjoining the Champion on the south. If developments warrant, another mining company will be organized and owned by the Copper Range Consolidated.

Colorado Springs. April 28.

The local exchange has been quite active during the past week, but the prices of Cripple Creek stocks have remained about the same as one week ago. The driving down of Findley seems to be at an end, and the stock has remained in the vicinity of 75@78 during the week. It is claimed that the differences between the president and superintendent of this company have been settled. Five of the largest mines of the district have declared dividends during the past thirty days amounting to \$404,000.

El Paso has remained about stationary, selling for \$2.14. Portland sold down to \$2.10 and \$2.08. Elkton is selling at 53c.; Gold Sovereign at 13½@13¾c.; Isabella at 29c. Work went down to 10¼c. United Gold Mines is selling at 22½c.; Jerry Johnson at 21c.; Vindicator at 90@91c.; Gold Coin at 20c. per share.

Salt Lake City. April 29.

During the month of April a total of 838,975 shares of stocks were sold on the floor of the Salt Lake Stock and Mining Exchange, for which was paid the sum of \$248,932; this was an improvement over March. The dividend record, however, was not as good by considerable, only two mines making distributions—the Silver King for \$100,000, and the Grand Central for \$12,500. Trading during the past week has been fairly brisk, especially in the Tintic stocks. Two of them—Carisa and Lower Mammoth, recorded advances in both cases about 100%, but the end of the week found them wavering. May Day has rather strengthened its position, but it displayed signs of a serious break. Consolidated Mercur found some demand at stiffer figures.

San Francisco. April 27.

The market has been strong and active, with a good deal of buying, but some halts for profit taking. Ophir sold at \$11@11.25; Hale & Norcross, \$2.65; Mexican, \$2.75; Best & Belcher, \$2.40; Consolidated California & Virginia, \$1.95; Silver Hill, \$1.15; Savage, 70c. At one time during the week Ophir sold up to \$12 per share.

On the San Francisco & Tonopah exchange business is also quite active, chiefly in the more speculative stocks. Gold Anchor sold at 98c.; Bullfrog, 79c.; McNamara, 42c.; Original Bullfrog, 35c.; Big Bullfrog, 11c. per share.

On the California exchange business continues rather dull. Claremont sold at 73c.; Monte Cristo, 75c.; Oil City, 65c.; Independence, 32c. Business continues heaviest in the low-priced shares.

Coal Trade Review.**NEW YORK, May 3.****ANTHRACITE.**

The hard coal market shows no particular features. It is too early to learn definitely how the past month compares in size of anthracite shipments with previous Aprils, although the general feeling is that the first month of this mining year will not show any improvement over those of previous years, and may, indeed, show a considerable shortage. This is due more than to any other reason to insufficient car supply at the mines. This lack of cars may be explained by two reasons, aside from the natural difficulty in handling the normally increased output at the opening of the year: the demand for cars needed for bituminous shipments to the lakes, the transportation on which opened last week,

and the comparatively modern tendency to send anthracite into New England by all-rail lines. Considerable difficulty is experienced in the return of cars from this region.

In accordance with the established custom, prices at terminal points were increased by 10c. per ton last Monday. The local dealers will retain their present prices for two months longer, probably, when an advance of 25c. may be looked for. Quotations, f. o. b. New York harbor shipping points, for the month of May, are as follows: For domestic sizes, \$4.35 for broken and \$4.60 for egg, stove and chestnut. Steam sizes: \$3 for pea, \$2.25@2.50 for buckwheat, \$1.45@1.50 for rice, and \$1.30@1.35 for barley.

BITUMINOUS.

Prices in the Atlantic seaboard soft coal market remain about as low as they have been, although some signs of improvement are shown. Nearly all the speculative coal, which was oppressing the market is now disposed of, and this will relieve the situation. The serious nature of these past conditions has led to conferences in the trade, in the attempt to discover the best way to overcome the difficulties brought about by the speculative practice of shipping abnormal quantities, which, except in specially advantageous circumstances, are sure to remain a burden on the market for a long period of time. The railroads even have been approached with a view to obtaining their assistance in rendering a repetition of this state of affairs impossible. Meetings of shippers along the Chesapeake & Ohio and the Norfolk & Western have taken steps to persuade these roads to make their through rates from mines to tide a firm rate for the year, instead of only for one month at a time. It seems to be a question whether the railroads are not feeling the pressure of a possible government inquiry as to the reason of the smaller charge for the longer haul to Norfolk and Newport News. A good many producers state that their contract books are well filled.

Trade in the far East shows only a small amount of business, but in spite of this, the tonnage arriving at New England ports is far in excess of the discharging facilities, while delays in unloading are deterring some orders for shipments at the present time. Trade along the Sound is quiet, being interfered with not only by the strict attention to anthracite but also to the heavy all-rail shipments to this territory. New York harbor trade shows more coal on hand than can be disposed of promptly. Prices for the poorer grades have been as low as \$2.20, f. o. b. shipping ports, but the better grades cannot be had under \$2.40@2.50, while the specialties are selling for \$3@3.20.

The all-rail trade is quieter than it has been, and the volume going forward is less. Prices are weaker than they have been in this trade. Transportation from mines to tide is better than schedule; in some instances, coal comes through in two days. Car supply is well up to demand.

The coastwise vessel market shows boats scarce, and in great demand; the smaller vessels appear to be entirely out of the market. Philadelphia quotes on large vessels as follows: To Boston, Salem and Portland, 75c.; to Providence, New Bedford and the Sound, 65c.; to Lynn, 85c.; to Newburyport, 90c.; to Portsmouth and Bath, 80c.; to Saco, \$1 and towages; to Bangor, 90c., and to Gardner, 90c. plus towages.

An agreement among the larger interests in the Lake trade has been reached, and the following opening prices have been

made for coal on docks, at points on Lake Michigan and Lake Superior: Hand-picked splint, \$3.25; Kanawha splint, \$3.15; Hocking and Eastern Ohio, \$3 for lump, \$2.70 for run-of-pile, and \$2 for screenings; Youghiougheny and Fairmont, \$3 for lump, \$2.70 for run-of-pile, and \$2.35 for screenings; smokeless, \$4.50 for lump and \$3.05 for run-of-pile; smithing coal, \$4 per ton. These are the opening prices, and not contract rates for the entire year. It is understood that they have been made low to promote early buying, if possible.

Birmingham. May 1.

The production of coal in Alabama is very healthy, and there appears to be demand for all that is being mined, despite statements of some commercial producers that inquiry is not so brisk as it has been. The coke production is better now in Alabama than at any time this year, with a sharp demand.

Negotiations said to have been on for a merger of the properties of the Alabama Consolidated Coal & Iron Co. and the Pratt Consolidated Coal Co. are now off. The Pratt concern is still acquiring coal properties in Walker county, and it is understood extraordinary development will take place during this summer. The railroads are giving assistance to the plans to develop coal lands by building tracks to the properties to be developed.

Chicago. May 1.

The most significant feature of the last week in the coal trade has been the increase in contract sales for bituminous. Apparently users of coal have become convinced that the future is full of perils—strike troubles and other possibilities of evil—and have determined to order their coal for a year on the contract plan. It is a fact indisputable that the present situation, as regards labor and the delivery of coal, as well as other standard products, is full of peril for the average seller of coal. Large houses in the coal business are confronted with the prospect of a fight for existence in the teamsters' strike, and this situation has stirred contract business generally, though it has discouraged some lines of non-contract business.

Indiana and Illinois bring \$1.85@2.15 for lump, \$1.60@1.90 for run-of-mine, and \$1.40@1.50 for screenings. The demand for fine coals is much firmer, and seems indicative of a better tone to the market for western bituminous. For eastern bituminous the market is quiet but firm. Hocking sells at \$3 on most orders, with slight discounts on large sales; smokeless brings approximately the same price, and Youghiougheny sells for \$2.90@3.10, being the only gas coal that is active.

Sales of anthracite, according to leading dealers, will not be so large for April as were expected from the indications of the beginning of the month. It looks now as if the trade would be light for the summer, despite efforts to impress on the consumer the necessity of ordering early. The first cargo of anthracite by lake arrived last Thursday—2,700 tons of egg coal consigned to Coxé Brothers & Co. on the steamer *E. M. Peck*. Several cargoes have been received by other firms. To judge from present indications, the total coal receipts at this port will be heavy this year, and the probability is that most of the coal will be held in dock storage for shipments next winter, thus insuring a full supply for the winter.

Cleveland. May 2.

The salvation of the coal trade in this territory at the present time is the fact that most of the operators are reducing output. With the mines running full blast, nothing could prevent a serious slump in prices. The charge of \$1 a day demurrage soon eats up profits and forces the mine to throw the coal on the market for what it will bring. The mines have adopted the alternative of running their mines about up to the market demands. This has worked out a steady price on steam coal, until run-of-mine is selling at 95c. at the mines. There is a good demand for slack. The situation is complex; many of the mills are using a good quantity. In addition, the shipment of 3/4-in. coal up the lakes is still slow, and this restricts the amount of slack. As a result, though prices were expected to break, Ohio slack is bringing 75c. at mine and Pennsylvania slack 60c. at mine.

The lake coal situation is still dull. A good many of the northwestern consumers have not covered their needs, expecting a serious break in prices as a result of the quarrel between the two big companies. The failure of this quarrel to bring the expected results is not yet fully realized, and consumers are holding back their orders. In addition, the movement of coal to the lakes has not been very rapid, and the movement up the lakes has consequently been backward. Lake rates hold at about 35c. to the head of the lakes and 45c. to Milwaukee.

The coke situation is weak, as some of the ovens are sacrificing to unload their surplus. The best grades of 72-hour foundry coke are selling at \$2.75@2.85 at the oven, and furnace coke is selling at \$2.25@2.40 at the oven.

Pittsburg. May 2.

Coal.—The mines in the Pittsburg district are fairly active, and some large shipments are being made to lake ports. Prices are about the same, on a basis of \$1@1.10 for run-of-mine at the mine. Official figures on the production of coal in this district in 1904 have just been made public and are interesting. The output was over 1,000,000 tons less than in 1903, although the production of the independent companies was almost 2,000,000 tons greater. The heavy loss was by the Monongahela River Consolidated Coal & Coke Co., which is controlled by the Pittsburg Coal Co. Its output in 1904 was 4,234,364 tons, and in 1903 was 7,070,160 tons. The Pittsburg Coal Co.'s production was 10,999,283 tons, and in 1903 was 12,115,071 tons. The total output of the Pittsburg Coal Co. and its subsidiary companies including the Monongahela, New York & Cleveland, Mansfield and Pittsburg Terminal companies, was 18,423,747 tons, compared with 21,708,764 tons in 1903. The total production in the Pittsburg district in 1904 was 36,437,859 tons, compared with 37,911,300 tons in 1903.

Connellsville Coke.—Prices are a trifle lower this week, furnace coke being quoted at \$1.90@2.10, and foundry at \$2.70@2.85. The H. C. Frick Coke Co. has purchased the 1,072 ovens and 17,000 acres of coal of the Hecla Coke Co., which gives it practically full control of the strictly Connellsville coke. The deal gives it 16,417 ovens out of 23,109 ovens in the Connellsville region proper. Besides operating its own ovens, the Frick Co. has a long-term contract for 65% of the production of the 1,019 ovens of the Oliver & Snyder Co., and has purchased the output of several independent concerns. The only large interest not controlled by the Frick Co. is

the W. J. Rainey Co., which owns about 2,800 ovens. The Frick Co. also owns 2,248 ovens in the lower Connellsville region known as the Klondike. The production of coke for the week was 261,440 tons, and the shipments aggregated 11,940 cars, distributed as follows: To Pittsburg and river points, 4,621 cars; to points west of Pittsburg, 6,128 cars; to points east of Everson, 1,191 cars.

San Francisco. April 27.

The coal trade has been quiet, with moderate demand only. Prices are unchanged, being held down by the competition of fuel oil, which continues to sell well.

For Coast coals, in large lots to dealers, prices are as follows: Wellington, New Wellington and Richmond, \$8; Roslyn, \$7; Seattle and Bryant, \$6.50; Beaver Hill and Coos Bay, \$5.50; White Ash, \$5.25. For Rocky Mountain coals, in car lots, quotations are: Colorado anthracite, \$14; Castle Gate, Clear Creek, Rock Springs and Sunny Side, \$8.50. Eastern coals are nominal at \$14 for Pennsylvania anthracite and \$13 for Cumberland. For foreign coal quotations are, ex-ship: Welsh anthracite, \$13; cannel, \$8.50; Wallsend and Brymbo, \$7.50 per ton.

Foreign Coal Trade. May 3.

Exports of coal and coke from the United States for the three months ending March 31 are reported by the Bureau of Statistics as follows, in tons:

	1904.	1905.	Changes.
Anthracite.....	328,939	356,731	I. 27,792
Bituminous.....	1,088,363	1,288,302	I. 199,939
Total coal.....	1,417,302	1,645,033	I. 227,731
Coke.....	124,535	128,397	I. 3,862
Total.....	1,541,837	1,773,430	I. 231,593

The coke went chiefly to Mexico, though some was also shipped to Canada. The coal exports were distributed as follows:

	1904.	1905.	Changes.
Canada.....	850,134	1,059,592	I. 209,458
Mexico.....	280,590	249,148	D. 31,442
Cuba.....	113,150	132,703	I. 19,553
Other West Indies.	68,478	71,962	I. 3,484
France.....	4,908	95	D. 4,813
Italy.....	2,090	11,151	I. 9,061
Other Europe....	12,705	5,076	D. 7,629
Other countries..	85,247	115,306	I. 30,059
Total.....	1,417,302	1,645,033	I. 227,731

Canada is naturally our largest customer. The exports to that country in detail were as follows:

	1904.	1905.	Changes.
Anthracite.....	320,180	342,427	I. 22,247
Bituminous.....	529,954	717,165	I. 187,211
Total.....	850,134	1,059,592	I. 209,458

The increase in anthracite this year was 6.9%; in bituminous, 35.3%; and in the total, 24.6%. This indicates a much heavier movement early in the year.

The imports of coal into the United States for three months ending March 31 were as follows:

	1904.	1905.	Changes.
Canada.....	367,456	333,548	D. 33,908
Great Britain.....	30,205	18,892	D. 11,313
Other Europe.....	50	113	I. 63
Japan.....	18,384	15,624	D. 2,760
Australia.....	63,640	24,500	D. 39,140
Other countries..	890	157	D. 733
Totals.....	480,625	392,834	D. 87,791

Of the coal imported this year, 2,985 tons were classed as anthracite; the balance was bituminous. With the exception of some Nova Scotia coal which comes to Boston, the imports from Canada were British Columbia coal, received at California ports. There was a large decrease this year in Australian coal, which comes to California. Nearly all the Japanese coal is received at Manila.

Iron Trade Review.

NEW YORK, May 3.

Very little change is to be noted in the condition of the markets during the week. New business is not much in evidence; at the same time mills and furnaces are very busy, and specifications on contracts are coming in very freely, so that there is no cessation in the activity of work.

In raw and semi-raw material, only moderate-sized transactions are noted. The Steel Corporation is understood to be negotiating for some more outside iron, but other large buyers are not doing much in that way. There is talk of some concessions on large orders for second-half delivery, but it cannot be traced to a definite point. Steel billets are still bringing from \$3 to \$4 above the pool price.

In finished material the only special points are the negotiations in progress for some large orders for structural material, and an increased demand for electric railroad material. It is quite probable that some larger structural contracts will come forward later.

There has been talk of importing pig iron to meet pressing orders, but it does not seem probable that any large quantity will be taken of this kind of material.

Exports and Imports.—Exports of iron and steel, including machinery, from the United States, for March and the three months ending March 31, are valued by the Bureau of Statistics of the Department of Commerce and Labor as follows:

	1904.	1905.	Changes.
March.....	\$10,633,720	\$12,446,800	I. \$1,813,080
Three Mos..	27,565,761	30,583,913	I. 3,018,152

The increase for the three months was 10.9%. This is a considerable gain, but is less than was expected at the opening of the year. The chief items of the exports for the three months were as follows, in long tons:

	1904.	1905.	Changes.
Pig iron.....	14,125	21,352	I. 7,227
Billets and blooms.....	82,213	50,905	D. 31,308
Bars.....	9,882	16,166	I. 6,284
Rails.....	31,790	59,328	I. 27,538
Sheets and plates.....	4,687	10,131	I. 5,444
Structural steel.....	7,121	17,625	I. 10,504
Wire.....	26,970	27,337	I. 367
Nails.....	9,942	10,999	I. 1,057

There was an increase in all items except billets and blooms, which declined nearly 40%. The more important gains were in rails and structural steel. The exports of iron ore were 30 tons in 1904, and 1,063 tons in 1905, an increase of 1,033 tons.

The imports of iron and steel into the United States for the month of March and the three months ending March 31 are valued as follows:

	1904.	1905.	Changes.
March.....	\$1,894,650	\$1,929,892	I. \$35,240
Three months..	5,445,793	5,743,780	I. 297,787

The increase for the three months was 5.5%. The leading items of these imports for the quarter were as follows, in long tons:

	1904.	1905.	Changes.
Pig iron.....	27,053	40,326	I. 13,273
Billets, blooms, etc.....	4,499	4,854	I. 355
Scrap iron and steel.....	3,641	3,975	I. 334
Bars.....	4,690	6,734	I. 2,044
Rails.....	10,818	1,028	D. 9,790
Wire-rods.....	3,822	3,503	D. 319
Tin-plates.....	15,316	18,626	I. 3,310

The most notable increase was in tin-plates. The imports of iron ore were 80,102 long tons in 1904, and 171,548 tons in 1905, an increase of 91,446 tons. Imports of manganese ore were 172 tons in 1904, and 36,545 tons this year, an extraordinary increase.

German Iron Trade.—Exports of iron and steel from Germany for the two

months ending Feb. 28 were as follows, in metric tons:

	1904.	1905.	Changes.
Pig iron.....	124,925	034,701	I. 9,776
Other iron and steel...	313,920	322,059	I. 8,139
Totals.....	438,845	456,760	I.17,915

Exports of iron ore were 576,206 tons in 1904, and 592,653 tons in 1905, an increase of 16,447 tons. These exports were chiefly minette ores from Luxemburg, sent to France and Belgium.

Imports of iron and steel into Germany for the two months were as follows, in metric tons:

	1904.	1905.	Changes.
Pig iron.....	29,753	23,736	D. 6,017
Other iron and steel...	15,061	16,901	I. 1,840
Totals.....	44,814	40,637	D. 4,177

Imports of iron ore were 751,666 tons in 1904, and 666,729 tons in 1905, a decrease of 84,937 tons. These imports were chiefly from Spain and Sweden.

Birmingham. May 1.

There is a little lull in the pig iron market in the Southern territory, but the deliveries are just as strong as they have been at any time this year. The sales are not as active as they might be, but the furnacemen are not inclined to be in the least worried, having sold ahead a large quantity of iron. The Tennessee Coal, Iron & Railroad Co. has blown in No. 6 furnace in the Ensley group. This made the fourth furnace in the Birmingham district to go in blast during April. Two other furnaces at Bessemer, belonging to the Tennessee Co., are ready for the torch, while the little Williamson, in the city, and the new furnace of the Woodward Iron Co., will go in blast before May 20.

The quotations remain firm, as follows: No. 1 foundry, \$14; No. 2 foundry, \$13.50; No. 3 foundry, \$13; No. 4 foundry, \$12.50; gray forge, \$11.75@12; No. 1 soft, \$14; No. 2 soft, \$13.50. The steel situation in Alabama is still very satisfactory. The production at the Ensley steel plant of the Tennessee Coal, Iron & Railroad Co. shows up pretty well for the month of April. The steel plant at Gadsden of the Alabama Steel & Wire Co. is making a good quantity of steel.

During the past week directors in the Tennessee Coal, Iron & Railroad Co., among them J. T. Woodward, of the Hanover National Bank, of New York, and John Henry Smith, of New York, visited the Birmingham district and inspected some of the properties of the company. A report was current Saturday that further improvements were proposed. The annual meeting of the stockholders of the Tennessee company will be held tomorrow, in Tracey City, Tennessee.

Chicago. May 1.

The iron market continues firm, with little of the sensational in its record for the last week. Sales have been fair, and inquiries are indicative of a heavy business in the near future. Indeed, it is significant of a possible change in the market that inquiries are numerous and much in advance of actual needs of consumers. The users of iron are watching the progress of iron keenly, and as soon as they become satisfied that prices are not going to drop, but rather to advance, they will pile in their orders and cause a sharp advance in prices. Certainly there are no indications of a decline in prices, under a continuance of present conditions, as seems probable.

Northern iron has been especially in demand and promises to continue so. The price of Northern is \$17.50, as last week, with possible shadings on large orders.

Southern sells for \$13.50, Birmingham, or \$17.15, Chicago, on nearly all orders; cut prices may obtain for exceptional sales, but the standard quotation is the actual price on most business. Charcoal iron is in demand, and malleable bessemer is eagerly sought, the supply being inadequate to the demand. Finished products of all sorts are strong; this condition tends to strengthen the market for raw materials in the iron trade.

Coke is not quite so firm, Connellsville 72-hour selling for 10c.@25c. less than the \$5.65 standard price quoted last week. Other cokes are in large supply and comparatively small demand, and should not be shipped to Chicago until the market improves.

Cleveland. May 2.

Iron Ore.—The movement of iron ore has been slow, due to the fact that the ore is frozen in the pockets in the upper lakes, and the docks are working slowly on the lower lakes. This is partly due to a shortage of railroad cars, the supply not being adequate to the demand for a quick movement of the material. The wild rates are about as they have been, being even with the contract rates of 75c. from Duluth to Ohio ports; 70c. from Marquette, and 60c. from Escanaba. The buying of ore is light, as many of the purchasers are waiting until after July 1 before committing themselves any further than they have already. The prices range at \$3.75 for bessemer Old Range; \$3.50 for Bessemer Mesabi; \$3.25 for non-bessemer Old Range, and \$3 for non-bessemer Mesabi, all f. o. b. Lake Erie ports.

Pig Iron.—The pig iron situation is rather dull. Most furnaces in the foundry trade are waiting developments, having sold far ahead and not being concerned about the activity of their plants. There is not so much buying for second half as there has been here of late, and the trade is rather easy. Prices have not broken, since no material is being forced upon the market, quotations holding at \$16 in the Valleys for No. 2. There is a good demand for basic at \$15.50 in the Valleys, some of the buying being for second half delivery. The Steel Corporation has placed an inquiry for bessemer iron for May sale, and the understanding is that the price will be unchanged at \$15.50 in the valleys.

New York. May 3.

The market generally has been quiet, with the exception of structural steel.

Pig Iron.—Sales have been small and in moderate-sized lots. Quotations are unchanged, though some less desirable brands have sold off a little. For Northern brands we quote, in large lots, as follows: No. 1X foundry, \$17.75@18; No. 2X, \$17.50@17.75; No. 2 plain, \$16.75@17; gray forge, \$16@16.25. Virginia foundry is a little higher, being quoted at \$17.90@18.15, tidewater. On Southern iron quotations are, if anything, a little weaker, and the talk of \$14, Birmingham, for No. 2 as a basis is no longer heard. We quote for large lots, on dock, as follows: No. 1 foundry, \$17.50@17.75; No. 2, \$17@17.25; No. 3, \$16.50@16.75; No. 4, \$16@16.25; No. 1 soft, \$17.50@17.75; No. 2 soft, \$17@17.25; gray forge, \$16@16.25.

The warrant market on the Produce Exchange has been very quiet and rather weaker. The latest quotations are \$15.85 bid, \$16 asked, for May and June; \$16 bid, \$16.10 asked, for July, regular warrants.

Bars.—Bar iron is in only moderate demand, quotations for large lots being 1.645

1.745c. Steel bars are quoted at 1.645c. The iron trade is fair, and prices are 1.75@2c., delivered.

Plates.—The demand for plate continues in small lots. Tank plates are 1.745@1.845c.; flange and boiler, 1.845@1.945c.; universal and sheared plate are 1.645c. up, according to size.

Structural Material.—Structural material is selling better, and some large contracts are pending. Beams under 15 in. are 1.745c. in large lots; over 15 in., 1.845c.; angles are 1.745c. Extra prices are charged for small lots.

Steel Rails.—The regular quotation continues \$28 per ton at mill for standard sections. Very little business is done in this market. Light rails are quiet. Sales have been made as low as \$24 for 12-lb. rails, while 25-lb. to 35-lb. can be had at \$21, for large orders. There is a good deal of inquiry for rails for electric roads.

Old Material.—Demand is moderate, but prices are steady. Railroad wrought is quoted \$19@19.50; yard wrought, \$16@16.50; machinery cast, which is not in as good supply as other kinds, remains \$14@15. Heavy steel melting scrap is \$15.50@16. These prices are on cars, Jersey City or other terminal delivery.

Philadelphia. May 3.

The chief activity during the past few days has been shown in basic iron, for which a strong demand still exists, and sales running into some thousands of tons have been reported. The sales of other kinds of iron have been unimportant, but the inquiries which are coming to hand and the offers of business asking for concessions indicate to pig iron makers that there is still a good deal of business in the air, and that it can be had if suggested concessions were made. In not a single instance has business been done on this basis. The simple reason is that our furnace people have sold as much pig iron as they are anxious to sell, and they are quite willing to lay on their oars, so to speak, and take their chances. Our information from Virginia and Alabama sources strengthens the view of pig iron makers that there is no occasion for yielding in price. Consumption is going on at an enormous rate, and preparations are being made to increase capacity. Quotations are about as follows: No. 1X foundry, \$18.50; No. 2X, \$18; No. 2 plain, \$17.50; standard forge, \$16.25; basic, \$17; low phosphorus, \$21.

Billets.—A somewhat similar condition prevails among buyers of billets. One or two large contracts have been quietly placed, concerning which no details have been had as to prices or dates of delivery. Some special billets have been sold at \$33. The average quotation is \$28 at mill, but premiums are demanded and readily paid on early deliveries.

Merchant Bar.—The oversold condition of the bar mills of this State still continues, and car-building requirements are threatening to crowd the bar mills still further. Some very attractive contracts have been entered into for delivery during the summer. The tone of the market is very strong, and best iron bars are quoted at 1.80; steel, 1.70c.

Pittsburg. May 2.

Contrary to expectations, the United States Steel Corporation has not closed contracts for outside pig iron for May delivery, but it is generally accepted that it will buy a block of 35,000 or 40,000 tons.

The pig iron market has been remarkably quiet lately, and there are reports of shading on foundry and forge, although sales in these grades have been for small lots only. One sale of 2,000 tons of bessemer is recorded, and it is said a concession was made from the current quotation of \$15.50, Valley furnace. The Carnegie Steel Co. is now operating all of its blast furnaces, 51 in number, the old furnace at Zanesville, O., which has been idle for over a year, having been put in blast. Some furnaces are running short of ore, and if shipments are delayed beyond this week several may be seriously incommoded. The report that six furnaces will be forced to go out of blast this week if a supply of ore is not received has been denied. It is certain, however, that a number of furnaces will make close connection between last season and this season's ore. Trouble with the workers has been prevented by a voluntary advance of about 10% in wages, which became effective yesterday. At the furnaces of the Steel Corporation the advance went into effect on April 1. Mable furnace, at Sharpsville, which was bought by the Shenango Furnace Co. about six months ago, will be turned over to that company tomorrow, pending contracts having prevented an earlier transfer. This will give the Shenango Co. four furnaces at Sharpsville, and make it the largest independent pig iron producer in the Valleys. The world's record for production has again been broken at the Edgar Thomson works of the Carnegie Steel Co. In the 24 hours ending Friday morning the production at the 11 blast furnaces was 5,200 tons, which exceeds the famous run of these stacks last March by 88 tons. At the same time a record was broken in the steel rail plant, the output in 24 hours being 3,678 tons, beating the former record of any mill in the world by 749 tons. The steel plants and furnaces of the Carnegie Co. at Homestead and Duquesne are being operated to capacity. Work on the new bar mill at Clairton and the blast furnace at Mingo Junction is being rushed. Other extensive improvements are contemplated by the company, but no official announcement has been made. It is reported that 24 open-hearth furnaces are to be added to the Edgar Thomson plant.

There is but little change in the markets for finished steel products. But little new business is being booked, while specifications on old contracts continue heavy. Demand for wire products and other lines of iron and steel products, which are handled by jobbers, has improved, and stocks are rapidly being absorbed. This is expected to bring the jobbers into the market at the opening of the fall season, which will result in the mills being kept busy the rest of the year. The cotton tie market opened last Thursday at the price recently fixed, 85c. a bundle, and nearly all the season's business has been closed. The price likely will be advanced to 95c. in a few days to protect contracts. This trade stands by itself, as cotton ties are handled almost entirely through brokers in the cotton districts, who close contracts between mills and consumers.

The thirtieth annual convention of the Amalgamated Association of Iron, Steel & Tin Workers opened this morning in Detroit. It will be an interesting session, as some radical changes have been proposed by the different lodges, and will be urged by the delegates. The wage committee has been in session since Friday, and there is but little doubt as to the report it will make to the convention. The sentiment of the lodges is strongly in favor of a restoration of the wage scale of 1903-04, which calls for an advance over the present tin-

plate and sheet scales of about 20%, and an increase of the base of the puddling scale from \$4.90 to \$5 a ton, with a proportionate increase in the finishing mills. It is probable the convention will declare all strikes off, as they have been lost, and it seems useless to continue to pay strike benefits. Late last week it was announced that the strike at the Whitaker-Glessner Co.'s sheet and tin-plate plant at Wheeling had been won by the association, as a conference had been held. The report was incorrect, and was denied by the company in a statement that all that had been agreed to was the taking back of union men who had not participated in any of the disturbances since the strike was declared, at the terms and conditions originally offered by the company. More non-union men were engaged to-day, as the strikers refused to return to work at less than the Amalgamated scale. The company insists that it can prove its claim that the scale is being violated at a number of union mills, and that the Amalgamated Association is unable to control its members.

Pig Iron.—The market is quiet, the total sales for the week not exceeding 5,000 tons. The Steel Corporation and several independent interests are expected to place large contracts at any time. Prices remain about the same, but it is reported that forge and foundry prices can be shaded 15 and 25c. Quotations are as follows: Bessemer, \$15.50, Valley furnace; foundry No. 2, \$16.85, Pittsburg, and gray forge, \$15.85, Pittsburg.

Steel.—The steel market is unchanged. Bessemer and open-hearth billets are still held at from \$3 to \$4 a ton above the pool price of \$21 and sheet-bars are quoted at \$27. Merchant bars are firm, at 1.50c., and plates at 1.60c.

Sheets.—Shipments on old contracts are good, but there has been little new business placed lately. No. 28 gauge black sheets are firm, at 2.40c., and galvanized at 3.45c.

Ferro-Manganese.—There is no change in the market, and domestic 80% remains at \$50@51 a ton.

Chemicals and Minerals.

NEW YORK, May 3.

Trade is generally quiet, and prices show few changes.

The foreign trade of the United States in March is shown below:

Imports.	March.	Jan.-Mar.
Asphalt, tons.....	9,272	20,243
Bleaching powder, lb.....	9,115,501	23,094,070
Brimstone, tons.....	7,586	24,740
Cement, lb.....	29,777,383	77,482,735
Clays or earths, tons.....	15,798	150,436
Graphite, tons.....	1,575	4,176
Potash, chlorate, lb.....		3,367
Potash, muriate, lb.....	6,032,156	37,390,613
Potash, nitrate, lb.....	1,033,859	2,335,540
Potash, all other, lb.....	5,827,536	20,482,548
Pyrite, tons.....	34,664	125,922
Phosphates, etc., tons.....	9,981	34,151
Salt, lb.....	35,432,549	78,460,461
Soda, ash, lb.....	1,258,540	3,931,536
Soda, caustic, lb.....	156,678	528,721
Soda, nitrate, tons.....	17,138	64,746
Soda, sal, lb.....	56,000	462,995
Soda, other, lb.....	944,461	3,032,997

Domestic exports for the three months were:

	1904.	1905.
Ashes, pot and pearl, lb. . . .	62,121	150,249
Cement, bbl.	54,262	134,516
Copper sulphate, lb.	4,718,193	11,494,134
Gunpowder, lb.	611,510	714,920
Lime, bbl.	6,065	17,065
Lime, acetate, lb.	3,246,845	12,239,109
Phosphates, tons.	101,186	205,454
Salt, lb.	3,954,448	12,060,811

Domestic exports show a substantial increase in cement, gunpowder and salt. Imports of heavy chemicals continue to shrink.

Copper Sulphate.—Second hands are disposed to ask more, while makers quote \$4.75@55 per 100 pounds.

Acids.—Uninteresting. Prices firm. Nitric acid, 36°, 100 lb. \$5.00; 38°, 100 lb. 5.25; 40°, 100 lb. 5.50; 42°, 100 lb. 5.75. Oxalic acid, com'l, 100 lb. \$5.00@5.25; Sulphuric acid, 50° bulk, ton \$13.50@14.50.

Sulphur and Pyrite.—New orders are few. Domestic prime sulphur is quoted \$21 per ton, and seconds \$20.70 at New York. Pyrite, lump, varies from 9 to 11c per unit of sulphur, and fines from 8.5@10c., according to grade, f. o. b. Atlantic ports.

Nitrate of Soda.—Strong. Refined quality on spot is worth \$2.50 per 100 lb.; July to December, \$2.225@2.275; 1906, \$2.20, and 1907, \$2.15. Cable advices give the shipments from Chile to Europe in April at 1,738,500 qtl., and loadings May 1 for the same trade at 701,000 quintals.

Sulphate of Ammonia.—Some business has been done in gas liquor at \$3.15@3.17 per 100 pounds.

Phosphates.—Florida shipments so far this year show quite an increase. Tennessee trade is quiet, and a slight falling off is reported in exports. South Carolina prices are firmer, and the superphosphate trade better.

Table with 3 columns: Phosphates, F. o. b., C. I. F. Gt. Britain or Europe. Lists various phosphate types like Fla. hard rock, Tenn., Tunis, Algerian, etc. with prices.

*F. o. b. Florida or Georgia ports. †F. o. b Mt. Pleasant. ‡On vessel Ashley River, S. C

Liverpool. April 19.

Messrs. Joseph P. Brunner & Co. report that there is not much animation in the export demand for heavy chemicals, while at the same time quotations are practically unchanged.

Soda ash in tierces is quoted as follows: Leblanc ash, 48%, £5@£5 10s.; 58%, £5 10s.@£6 per ton, net cash. Ammonia ash, 48%, £4 5s.@£4 10s.; 58%, £4 10s.@£4 15s. Bags, 5s. per ton under price for tierces. Soda crystals are in request at generally £3 7s. 6d. per ton less 5% for barrels, or 7s. less for bags, with special terms for a few favored markets.

Bleaching powder is rather lifeless as regards general export business and for hardwood £4 15s.@£5 per ton, net cash, is still nominal range, as to market.

Sulphate of ammonia is quiet, at £12 10s. 3d.@£12 18s. 9d. per ton, less 2.5% for good gray 24@25% in double bags, f. o. b. here.

Nitrate of soda is moving fairly well on spot at £11 2s. 6d. for ordinary, up to £11 7s. 6d. per ton for refined, packed in double bags f. o. b. here, less 2.5 per cent.

Metal Market.

New York, May 3.

Gold and Silver Exports and Imports.

At all United States Ports in March and Year.

Table with 4 columns: Metal, March, Year. Rows include G'ld Exp, Imp, Exc, Silv Exp, Imp, Exc E.

These exports and imports cover the totals at all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, N.Y.

For the week ending April 29 and for years from January 1.

Table with 4 columns: Period, Gold Exports, Imports, Silver Exports, Imports. Rows include Week, 1905, 1904, 1903.

Gold exports this week were principally to the West Indies; imports chiefly from France. Silver exports were largely to London; imports mostly from Central America.

General business is rather quiet, but generally steady. A little hesitation as to the future is apparent, but is not threatening. The speculative markets are rather depressed.

The statement of the New York banks—including the 53 banks represented in the Clearing House—for the week ending April 29, gives the following totals, comparison being made with the corresponding week of 1904:

Table with 3 columns: 1904, 1905. Rows include Loans and discounts, Deposits, Circulation, Specie, Legal tenders, Total reserve, Legal requirements, Balance surplus.

The following table shows the specie holdings of the leading banks of the world. The amounts are reduced to dollars:

Table with 2 columns: Gold, Silver. Rows include New York, England, France, Germany, Spain, Netherlands, Belgium, Italy, Russia, Austria.

The returns of the Associated Banks of New York are of date April 29, and the others April 27, as reported by the Commercial and Financial Chronicle cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

Shipments of silver from London to the East for the year up to April 19 are reported by Messrs. Pixley & Abell's circular as follows:

Table with 3 columns: 1904, 1905, Changes. Rows include India, China, Straits, Totals.

Receipts for the week were £179,000 in bar silver from New York, and £7,000 from Australia; total £186,000. Shipments were £43,600 in bar silver to India, £2,500 to Colombo, and £15,000 to Hong Kong; total, £61,100.

Indian exchange continues rather easy, but all the Council bills offered in London were taken at 15.97d. per rupee, the same price as last week. There has been some increase in the buying of silver for India, but this has been on all private account, no sales being made for coinage.

The coinage executed at the mints of the United States in April is reported by the Bureau of the Mint, Treasury Department, as below:

Table with 3 columns: Denomination, Pieces, Value. Rows include Double eagles, Half-dollars, Quarter-dollars, Dimes, Total silver, Five-c. nickels, One-c. bronze, Total minor, Total coinage.

In addition there were coined 1,500,000 peso pieces for the Philippines.

The Treasury Department's estimate of the amount and kinds of money in the United States on May 1 is as follows:

Table with 3 columns: In Treasury, In circulation. Rows include Gold coin, Gold certificates, Standard dollars, Silver certificates, Subsidiary silver, U. S. notes, Currency certificates, National bank notes.

Totals.....\$275,972,834 2,578,006,686

Population of the United States May 1, 1905, estimated at 83,026,000; circulation per capita, \$31.05. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the Treasury, and is not included in the account of money held as assets of the Government. This statement of money held in the Treasury as assets of the Government does not include deposits of public money in national bank depositaries, to the credit of the Treasurer of the United States, and amounting to \$79,579,614. The total amount in circulation shows an increase of \$19,013,703 over April 1, and of \$45,361,551 over May 1 of last year.

Prices of Foreign Coins.

Table with 3 columns: Bid, Asked. Rows include Mexican dollars, Peruvian soles and Chilean pesos, Victoria sovereigns, Twenty francs, Spanish 25 pesetas.

Other Metals.

SILVER AND STERLING EXCHANGE.

Table with 6 columns: April, Sterling Exchange, New York Cents, London Pence, May, Sterling Exchange, New York Cents, London Pence. Rows include 27, 28, 29.

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver. .925 fine.

Daily Prices of Metals in New York.

Table with columns: Copper, Tin, Lead, Spelter. Sub-columns include Lake, Electrolytic Cts., London, Cts. per lb., New York, Cts. per lb., St. Louis, Cts. per lb. Rows show prices for various grades and dates from April to May.

London quotations are per long ton (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b. s. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. The quotations for cathodes are usually 0.25c. below the price of electrolytic copper.

The silver market has been steady, with good inquiry but current offerings are satisfying buyers, and no great changes are in sight.

The United States Assay Office in New York reports receipts of 43,500 oz. of silver for the week.

Copper.—The copper market has been so exceedingly narrow that it can be best termed entirely nominal. Demand is still in such small proportion that prices yield somewhat to what little pressure there is to sell.

The standard market has shown considerable weakness, but at the close there is a slight recovery, the quotations on Wednesday being cabled as 65 1/2 i. for spot, 65 1/2 i. for three months.

Statistics for the second half of April show an increase in the visible supplies of 900 tons.

Refined and manufactured sorts we quote: English tough, £70 10s. @ £71; best selected, £71 15s. @ £72 5s.; strong sheets, £79 10s.; India sheets, £75 10s.; yellow metal, 65 1/2 d.

Exports of copper from New York and Baltimore for the week ending May 2, were 3,748 long tons. Imports for the week of April 28 were 670 tons copper, and \$27,831 worth of ore (quantity not given).

Copper Exports and Imports.—Exports of copper from the United States in the three months ending March 31 are reported as below by the Bureau of Statistics of the Department of Commerce and Labor; the figures given being in long tons, of 2,240 lb. each:

Table showing 1904, 1905, and Changes for Copper and Copper ore.

The copper contents of ore are not given. Estimating them, chiefly on the basis of values, we find that the total exports of material this year were equal to 59,465 tons of fine copper. The decrease in exports in March was 4,098 tons; in February there was an increase of 1,030 tons. Exports to China so far this year have been 7,709 tons.

Imports of copper and copper material into the United States for the three months ending March 31, with re-exports of foreign material, were as follows, the figures giving the equivalents of all material in long tons of fine copper:

Table showing Metal In ores, etc. Total. Mexico, Canada, Great Britain, Other countries, Total imports, Re-exports, Net imports.

In the three months of 1904 the equivalent copper imports were 19,481 tons, showing an increase of 1,676 tons this year. The net imports were less than the exports given above by 38,308 tons.

Tin.—The market is steady at the lower level, and while buying on the part of consumers is still very much restricted, prices are holding quite firmly. Quotations at the close are 30 @ 30 1/4 for spot, 29 1/2 @ 29 3/4 for futures.

The foreign market has been moving within narrow limits during the entire week and closes firm on Wednesday, the quotations being cabled as £138 i. for spot, £134 15s. for three months.

Statistics for the month of April show an increase in the visible supplies of 700 tons.

Imports of tin into the United States for the three months ending March 31 are reported as below, the figures given being long tons, of 2,240 lb.:

Table showing 1904, 1905, and Changes for Straits, Australia, Great Britain, Holland, Other Europe, Other countries, Totals.

The large increase this year indicates a gain in consumption, as no considerable stocks have accumulated. The tin received from British ports is chiefly Straits tin.

Lead.—There is an active demand, and the metal is moving steadily at the current prices. Quotations are unchanged, at 4.42 1/2 St. Louis, 4.50 New York.

The market abroad has been very steady during the entire week, and the quotations at the close are £12 i. 3d. for Spanish lead, £12 13s. 9d. for English lead.

Imports of lead into the United States for the three months ending March 31, with re-exports of imported lead, are given by the Bureau of Statistics as follows, the figures being in short tons:

Table showing 1904, 1905, and Changes for Lead, metallic, Lead in ores and base bullion, Total imports, Re-exports, Net imports.

Of the lead imported this year, 25,699 tons were from Mexico and 4,189 tons from Canada, the balance from other countries. Receipts from Canada have shown a large increase this year. Exports of domestic lead were only 31 tons in 1904, and 36 tons in 1905, an increase of 5 tons this year.

St. Louis Lead Market.—The John Wahl Commission Co. telegraphs us as follows: Lead is quiet, with Missouri brands selling in a retail way on a basis of 4.50c., East St. Louis.

Spelter.—Renewed pressure to sell has brought about a further decline, and the closing quotations are reported as 5.55 @ 5.60 St. Louis, 5.70 @ 5.75 New York.

The foreign market is also somewhat lower, the quotations at the close being £23 10s. for good ordinaries, £23 15s. for specials.

Exports of spelter from the United States for the three months ending March 31 were 563 short tons in 1904, and 1,261 tons in 1905, an increase of 698 tons. Exports of zinc ore were 7,383 tons in 1904, and 5,660 tons in 1905, a decrease of 1,723 tons this year.

St. Louis Spelter Market.—The John Wahl Commission Co. telegraphs us as follows: Increased offerings and lack of support from the larger buyers have caused spelter to decline fully \$2 per ton since our last report. Latest sales are on a basis of 5.62 1/2 c., East St. Louis.

Antimony continues firm, and common brands are quoted 8 1/2 @ 8 3/4 c., f. o. b. New York.

Imports of antimony into the United States for the three months ending March 31 were as follows, in pounds:

Table showing 1904, 1905, and Changes for Metal and regulus, Antimony ore.

There was a small increase in metal, but a considerable decrease in the ore imported.

Nickel.—Producers quote 40 @ 47c. per lb. for large quantities down to ton lots, according to size and terms of order. For smaller quantities as high as 60c. is asked.

Exports of nickel, nickel oxide and nickel matte, from the United States for the three months ending March 31 were 687,552 lb. in 1904, and 2,075,669 lb. in 1905; an increase of 1,388,117 lb. Imports of nickel ore and matte were 2,270 tons in 1904, and 3,342 tons in 1905, an increase of 572 tons this year.

Platinum.—Quotations are firm at \$20.50 per oz. Gas engine sparking points vary from 87c. each for "A," to \$1.80 for "B."

Platinum in manufactured forms is strong. Messrs. Eimer & Amend, of New York, quote for different forms as follows: Heavy sheet and rod, 75c. per gram; foil and wire, 80c.; crucibles and dishes, 85c.; perforated ware, 90c., and cones, \$1 per gram.

Imports of platinum into the United State for the three months ending March 28 were 1,831 lb. in 1904, and 2,197 lb. in 1905, an increase of 366 lb. this year.

Quicksilver.—Quicksilver is easy, at \$38 @ \$38.50 per flask in large lots, while \$40 is the price for smaller orders. San Francisco prices are \$37.50 @ \$39 per flask for domestic orders, with some discount for export. The London price is £7 12s. 6d., with the same figures quoted by second hands.

Exports of quicksilver from the United States for the three months ending March 31 were 759,268 lb. in 1904, and 295,810 lb. in 1905, a decrease of 463,458 lb. this year.

Cadmium.—Metallic cadmium, guaranteed 99.5%, is selling in quantities of 100 kgs. or over at 710 marks per 100 kgs., packing included, f. o. b. Hamburg. This is equivalent to 76.6c. per lb. Prices are for net cash.

Minor Metals and Alloys.—Prices for manganese alloys in Germany are given by Herr Paul Speier as below. The prices are for orders of not less than 500 kgs., delivered in Bremen, and are as follows, per 100 kgs.: Manganese copper, No. 1, guaranteed 30% manganese, 265 marks; No. 2, 28 to 30% manganese, for bronze, etc., 175 marks; No. 3, 25 to 20% manganese, with 2 to 4% iron, 165 marks. Manganese tin, No. 1, free of iron and guaranteed 55% manganese, 365 marks; No. 2, 55% manganese, with some iron, 225 marks. Manganese nickel, No. 1, free of iron, 450 marks; No. 2, carrying some iron, 270 marks.

Thalium is quoted at 60 @ 65 marks per kg. at Breslau, Germany. Manganese metal is quoted at 360 marks per 100 kg., f. o. b. Bremen, Germany.

For other minor metals and their alloys, wholesale prices are, f. o. b. works:

Table listing various metals and alloys with their prices per lb. or per ton. Includes Aluminum, Nickel-alum, Bismuth, Chromium, Copper, Ferro-Molybdenum, Ferro-Titanium, Ferro-Chrom, Ferro-Tungsten, Magnesium, Manganese, Molybdenum, Tantalum acid, Phosphorus, and Tungsten.

Variations in prices depend chiefly upon the size and conditions of orders.

Missouri Ore Market.

JOPLIN, April 29.

Prices on zinc ore were generally advanced a half dollar per ton, in the face of a weaker and lower spelter market. The highest price paid was \$48.50 per ton, and the assay basis price \$44.50 per ton of 60% zinc. Prices are higher than it was expected to send them when the temporary limited restriction in output was inaugurated the first of April, and for two weeks the restriction has been eliminated and all of the mines have been outputting to their full capacity.

Following are the shipments of zinc and lead for the week:

Table showing shipments of zinc and lead from Joplin, Cartersville, Webb City, Duenweg, Galena-Empire, Carthage, Alba, Aurora, Granby, Oranogo, Badger, Prosperity, Baxter, Neck, Zincite, Spurgeon, Diamond, Reeds, and Beef Branch. Includes totals and four-month averages.

Monthly Average Prices of Metals.

Table showing monthly average prices of silver in New York and London for 1904 and 1905.

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

Table showing monthly average prices of copper in New York, Electrolytic and Lake, for 1904 and 1905.

Prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars; cathodes are usually 0.25c lower.

Table showing monthly average prices of copper in London for 1904 and 1905.

Prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

Table showing monthly average prices of tin in New York for 1904 and 1905.

Table showing monthly average prices of lead in New York for 1904 and 1905.

Table showing monthly average prices of spelter in New York and St. Louis for 1904 and 1905.

Dividends.

Table listing dividends for various companies including Alaska-Treadwell, Amalgamated Copper, Anaconda Copper, Annie Laurie, Claremont Oil, Camp Bird, Central Eureka, De Lamar, Doe Run Lead, El Paso, Esperanza, Grand Central, Greene Con. Gold, Greene Con. Copper, Hecla, Homestake, Imperial Oil, Iron Silver, Jamison, Kendall, La Belle Iron Works, Lightner, Lehigh Coal & Nav., Mines Co. of Am., National Carbon, New Century Zinc & L., New Central Coal, N. Y. & Hond. Rosario, Oil City Petroleum, Pacific Coast Borax, Penna. Con., Penna. Salt, Pennsylvania Steel, Peerless Oil, Phila. Gas, Pittsburgh Coal, Pochontas Coll'r's, Portland, Providencia, Rock Run Fuel Gas, San Rafael, Santa Maria de la Paz, Silver King, Spearfish, Stratton's Independence, Tenn. Coal & Iron, Tenn. C. & I., Thirty-three Oil, Tonopah, United Copper, United Gas Imp., U. S. Steel, United Zinc, Va.-Carolina Chem., Victoria y An., Vindicator Con., and Work, Colo.

*Monthly. †Bi-monthly. ‡Quarterly. §Annually.

Assessments.

Table listing assessments for various companies including Alpha Con., Alta, Alta Sierra, Bullion, Caledonia, Canfield, Centennial Copper, Chollar, Con. Cal. & Va., Con. Imperial, Crown Point, Diamond Creek, Emerald, Fairview, Golden West, Grape Vine Cañon, Holland, Joe Bowers, Juno, Lady Washington Con., La Palma, Loon Creek, Lower Mammoth, Mt. Diablo, Santa Rita, Sierra Nevada, South Columbus, St. John Con., Trinity, Union Con., and Yellow Jacket.

Colorado Springs (By Telegraph.)

Table showing Colorado Springs prices for May 1 and May 2, including companies like Anaconda, C. K. & N., Cripple Creek Con., Doctor Jack Pot, Eltkon, El Paso, Isabella, Moon Anchor, Old Gold, Portland, Vindicator Con., and Work.

STOCK QUOTATIONS.

Table with columns: Company, May 2, Company, May 2. Lists companies like Camp Bird, Con. Gold Fields, De Beers, Dolores, East Rand, El Oro, Esperanza, Modderfontein, Rand Mines, Rio Tinto, Simmer & Jack, Tomboy.

* Furnished by Wm. P. Bonbright & Co., 24 Broad St., New York. † Ex-dividend.

Table with columns: Company, Par Val., Apr. 26, Apr. 27, Apr. 28, Apr. 29, May 1, May 2, Sales. Lists companies like Allis-Chalmers, Am. Agri. Chem., Cambria Iron, Col. Fuel & Iron, General Chem., Lehigh Nav., Mong. R. Coal, National Lead, Phila. Nat. Gas, Pittsburg Coal, Republic I. & S., Sloss: Shef. S. & I., Standard Oil, Tenn. C. I. & R. R., U. S. Steel, Va. Car. Chem.

Total sales, 1,885,737.

Table with columns: Company, Shares Issued, Prices, Mex., Company, Shares Issued, Prices, Mex. Lists companies like DURANGO: Penoles, San Andres de la Sierra, GUANAJUATO: Cinco Senores y An., HIDALGO: Amistad y Concordia, ZACATECAS: Asturiana y An., MISCELLANEOUS: Bartolome de Medina, Naica (Chihuahua), Natividad (Oaxaca).

Table with columns: Company, Location, Par value, Latest dividend, Prices, Opening, Closing. Lists companies like Acieries de Creusot, Anzin, Biache-St. Vaast, Boleo, Bruay, Courrieres, Escumbrera-Bleyberg, Huanchaca, Laurium, Malfidano, Metaux, Cie. Fran. de., Mokta-el-Hadid, Nickel, Penarroya, Vielle Montagne.

Table with columns: Company, Par Val., Latest dividend, Quotations, Buyers, Sellers. Lists companies like American: Alaska Treadwell, Anaconda, Camp Bird, Copiapo, De Lamar, El Oro, Frontino & Bolivia, Le Roi, Le Roi No. 2, Montana, Stratton's Indep'd., St. John del Rey, Tomboy, Tye, Utah Con., Ymir. European: Libiola, Linares, Mason & Barry, Rio Tinto, Rio Tinto, pf., Tharsis. West Australian: Associated, Cosmopolitan, Golden Horseshoe, Great Boulder, Gt. Boulder Perse, Great Fingall, Ivanhoe, Kalgurli, Lake View, Orova-Brownhill. Miscellaneous: Brilliant Central, Brilliant & St. Geo., Brises Tin., Broken Hill, Mt. Lyell, Mt. Morgan, Waihi. Indian: Champion Reef, Mysore, Nandydroog, Oregum, Oregum, pf. South African: Anglo, Bonanza, British So. Africa, Cape Copper, Cape Copper, pf., City & Suburban, Consol. Gold-Flds., Crown Reef, De Beers, preferred, De Beers, deferred, East Rand, Ferreira, Geldenhuis, Geduld, Henry Nourse, Heriot, Jubilee, Jumpers, Knights, Langlaagte, Meyer & Charlton, Modderfontein, Namaqua, New Goch, New Kleinfontein, New Primrose, Premier, def., Premier, pf., Rand, Randfontein, Robinson, Robinson Deep, Rose Deep, Salisbury, Sheba (fully paid), Simmer & Jack, Village Main Reef, Wemmer.

*Ex-dividend.

Table with columns: COMPANY, Par Val., High, Low, Last Sale. Lists companies like American Dev., Black Mountain (\$3 paid), Black Mountain (full paid), Calumet & Arizona, Calumet & Pittsburg, Junction Dev. (full paid), Lake Superior & Pittsburg, Manhattan (\$1 paid), North Butte, Pittsburg & Duluth (full paid), Wolv. & Ariz.

* By The Wallace H. Hopkins Co.

Questions and Answers.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc. Preference will be given to topics which seem to be of interest to others beside the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

Bullion.—Will you kindly tell me whether such a bullion as the following has been treated successfully by electrolysis, and, if so, what is the process, the time, the cost, the royalty, etc.? The assay shows: Gold, 80.4 to 86.5%; Cu, 15 to 20.5%; Ag, 1 to 2.3%; Fe, 0.75 to 1.5%; and Pb, 0.4 to 1.2%.—S. B.

Answer.—We do not know of any successful electrolytic process for the direct recovery of value from such a bullion as you describe. The successful methods, both of mint and refinery practice, are the old standbys. The orthodox methods would imply common scorification to remove the copper, iron and lead, with subsequent parting of the gold and silver. That great improvement over present practice is possible and desirable is not to be questioned; but it would lead too far afield to discuss here the theory of the direct electrolysis of such an impure, but high-grade, bullion as that mentioned. We suggest that you consult W. G. McMillan's 'Electro-Metallurgy,' and especially 'Electric Smelting and Refining,' by W. Borchers and W. G. McMillan. The problems suggested by your query are many.

Recent Legal Decisions.

SPECIALLY REPORTED.

DETERMINING CHARACTER OF COAL LANDS ON PUBLIC DOMAIN.—In answer to several inquiries, we give the following statement of the law from Lindley's 'Treatise on the American Law Relating to Mines and Mineral Lands,' Section 496, new edition. In this section the established rules are formulated as follows:

"1. All classes of coal deposits, whether anthracite, bituminous, lignite, or cannel, are embraced within the coal-land laws.

"2. It must be shown that, as a present fact, the land is more valuable for the purpose of its coal product than for any other purpose; that the substance exists therein in paying quantities, or that it is sufficiently valuable to be worked as a mine. These facts must be shown by the actual production of coal, or by satisfactory evidence that, taking the tract as a whole, coal exists therein in sufficient quantities to make the same more valuable for mining than for agricultural purposes. The extent of the deposit may be shown by the testimony of geological experts and practical miners, taken in connection with the actual production of coal from some portion of the tract. In determining these

facts, means of transportation cannot be taken into consideration as affecting the value of the coal shown to exist.

"That lands in the near vicinity, or even those directly adjoining, are shown to contain coal, is insufficient to establish the character of a tract upon which no coal has been developed. Mere outcroppings or other surface indications will not, in the absence of proof of commercial value of the deposit, prevent the entry of such lands under the pre-emption or homestead laws. But it is not necessary to show actual development on each 40-acre subdivision, nor upon all parts of a 40-acre tract. When, however, a conflict arises between an agricultural and coal claimant, the character of the land to the extent of the entire conflict area is involved, and, necessarily, proofs of a more specific character would be required than in the case of an *ex parte* application to enter under the coal laws.

"The discovery of coal in paying quantities on land embraced within a homestead claim precludes the completion of the entry; but discovery after purchase, under commuted homestead entry, will not defeat the issuance of the patent.

"The system regulating the pre-emption and sale of coal lands has substantially the same geographical scope as the general mining laws. It is in practical operation wherever coal is found in the precious-metal-bearing States and Territories, and in Arkansas, Mississippi, Louisiana, Florida, and in certain parts of Oklahoma. The States of Alabama, Michigan, Minnesota, Wisconsin, Kansas and Missouri are excepted from the operation of the Federal mining laws, except as to the location of salines. The coal-land laws were extended to the district of Alaska by act of Congress approved June 6, 1900."

Eskers (kames or 'hog-backs') are ridges, roughly comparable in form and size with railroad gradings. They extend in a longitudinal direction generally parallel with the glacial drift of the country considered. Formerly they were regarded as caused by subglacial streams; but recent opinion suggests that, in some cases, they may be residues of supraglacial streams.

At its Duquesne plant the Carnegie Steel Company is now operating two machines double turn on the manufacture of spiral bars for reinforced concrete work. The machines by which these bars are produced are still somewhat crude in construction, but yet answer well the purpose for which they were designed. One end of the bar is clamped into place and held firmly, while the other end is rapidly rotated. The operation is performed on cold steel, and it has been found that a soft-steel bar readily lends itself to this twisting process without scaling or cracking. The demand for this material is very heavy at present.

Abstracts of Official Reports.

Central Mining Company.

Expenses during the year 1904 were directed to the payment of taxes and the maintenance of a small force to protect the property, no developments in the vicinity having offered inducements to further exploration. A railroad has been projected between Calumet and Copper Harbor, which, if built, will cross the company's lands; applications for the right of way have been made and it is possible that the entire property can be disposed of by sales of land.

Receipts were \$2,832 and expenses \$8,276, which, with the deficit from last year, made a total indebtedness of \$5,954. Since its organization, the company has sold \$9,770,529 worth of copper and has paid \$1,970,000 in dividends.

United Alkali Company, Ltd.

The net profit in 1904 of this British chemical combination amounted to £349,053, after providing £26,435 for income tax, and £36,096 for general expenses. The debenture interest of £130,034, and the addition of £15,000 to the debenture redemption fund, together absorbed 41.6% of the year's net profits. The debenture stock held on December 31, 1904, was £2,768,400 at 5% interest per annum. The usual 7% annual preferred dividend, amounting to £188,084, was paid; but again—the eighth year—the common shareholders have been forgotten. Adding to the balance of £15,935 the sum of £80,047 carried forward from 1903, and deducting £52,219 for the reserve fund, etc., leaves £43,762 to be transferred to next year's account. It is interesting to mention that from 1891 to 1904 inclusive, the company paid preferred dividends aggregating £2,663,178, and common dividends, from 1891 to 1896 (the last payment), of £548,958; making a total of £3,212,136 from profits (after providing for debenture interest) of £4,078,189. Thus it will be seen that the dividends absorbed nearly 80% of the profits; the preferred shareholders received fully 11 times the amount that was divided among the holders of ordinary shares, although better results had been expected when the combination sought an absolute monopoly in the alkali industry about 13 years ago.

In recent years the high traffic in the more remunerative export markets, to encourage local chemical manufacturing industries, occasioned keen competition, to the detriment of the British combination. America, at one time the best consumer of British heavy chemicals, is now almost independently supplying much of its own requirements and permitting some exports. A few years ago the United Alkali Company built works in Michigan, to retain American trade. Only chlorate of potash is being manufactured at this plant, and in the spring of 1904 floods caused

damage, greatly curtailing the earnings of the parent company.

In line with its policy of economy, the United Alkali Company purchased two copper pyrite mines in Spain, as it uses considerable quantities of sulphur for making acid for its own consumption. More debentures will be issued to pay for these properties, and to properly equip them. No benefit may be expected from this direction, however, until the expiration of the contracts for pyrite that have still more time to run.

Allouez Mining Company.

This company's property lies in the group north of Calumet, Michigan. The financial report covers the year 1904. Work up to date has consisted in sinking a shaft, the objective point being the Kearsarge lode, whose outcrop, entirely off the Allouez property, extends from Ahmeet, southward through Wolverine and Osceola ground. On February 17 of the present year the lode was cut by the shaft at a depth of 1,400 ft., and two days later by both No. 1 and No. 2 crosscuts at depths of 1,260 and 1,348 ft. respectively. Drifting on the lode was immediately begun at these two points, and the results of exploration have been most encouraging, masses up to 400 lb. having been taken out.

Both skip roads, equipped with 5-ton skips, extend to the bottom of the shaft, and the 32 by 72-in. Nordberg hoist will soon be in operation. The steel rock-house is nearly complete, and the power plant, which is now being installed, will permit large scale operations.

No. 2 shaft has been equipped with a temporary plant, but sinking has been postponed until a trench can be dug to drain the swampy ground in the vicinity. The main shaft was sunk 1,025 ft. during 1904.

Receipts from installments of capital, sales of treasury stock, and interest amounted to \$320,237. Balance brought forward increased to \$348,473. Payments for working expenses, office and management, and for construction and equipment, amounted to \$159,224, leaving a balance on hand of \$189,249, mainly in cash. The company is capitalized at \$2,500,000, of which \$2,225,000 has been called on installments.

Mysore Gold Mining Company, Ltd.

This central Indian mine has been under the present ownership for 25 years, in which time it has yielded gold to the value of £7,503,558, and earned £3,986,042 for its stockholders. The report covers the year 1904.

Development has progressed with great activity, particularly on drifts. The lowest shaft has reached a vertical depth of 2,175 ft., where the reef carries over 1 oz. of gold. Work during the year comprised 1,286 ft. in shafts, 17,813 ft. of drifts and crosscuts, 2,982 ft. of rises and 2,299 ft. of winzes. Rock excavated from stopes

and shaft stations amounted to 11,585 cu. fathoms. Reserves are estimated, without including anything below the bottom levels, at 523,000 tons, an increase of 13,000 tons over the available resources a year ago, and in the face of an output greater by 18,230 tons than that of the previous year. An average of 110 drills have been at work every month, mainly in the hands of native contractors, and the average monthly force employed for all purposes has been 157 Europeans and 8,063 natives.

Ore mined and crushed amounted to 191,000 tons, being the largest output on record. The average assay value was 1.05 oz.; the recovery was 185,295 oz. of fine gold (£787,133), or 0.97 fine oz. per ton, representing an efficiency of 92.38%. Of the total recovery, all but 8.01% of the gold was recovered at the batteries; the sand treated by cyanide was 154,833 tons. One cyanide plant took 107,809 tons—average assay, 3.3 dwt.—and extracted 1.9 dwt. gold and a total of 759 oz. silver. Consumption of cyanide was 65,632 lb.—0.608 lb. per ton—and of zinc, 6,897 lb.—0.064 lb. per ton. The other plant treated 47,024 tons of sand averaging 3.5 dwt. gold, and extracted 2.1 dwt. gold per ton and 316 oz. silver altogether, with a consumption of 0.77 lb. cyanide and 0.086 lb. zinc per ton.

The income and dividend accounts may be combined:

Sales of gold.....	£787,133
Miscellaneous.....	6,053
Total receipts.....	£793,186
Mining.....	£202,032
Milling.....	34,801
Cyaniding.....	12,108
Royalty.....	39,087
All other.....	81,730
Total expenses.....	£369,758
Profit for the year.....	£423,428
Balance from previous year.....	161,816
Balance for dividends.....	£585,244
Three dividends in 1904.....	420,500
Surplus.....	£164,744

The first of these dividends—£159,500—was paid from the earnings of 1903. The latter two—£261,000—and a third, to be paid this year, total £420,500, and representing 145% on the capital stock, distributed from the earnings of 1904. The company is capitalized at £290,000, all paid in.

Alaska Mexican Gold Mining Company.

The report of operations at this Douglas Island mine, of which Robert A. Kinzie is superintendent, covers the year ending December 15, 1904, and is made out in admirable detail.

Total development during the year amounted to 8,544 ft., comprising 5,609 ft. of drifts and crosscuts and 2,679 ft. of raises. The shaft was deepened 178 ft., and a normal volume of stations and chutes was excavated. This represents the greatest annual development activity since the opening of the mine, 10 years ago. The reserves, definitely proved by this work, were estimated at the close of the year at 412,930 short tons, of which 74,814

tons is broken ore lying in the stopes. This estimate includes nothing tributary to the two lowermost levels, the 990- and the 1,100-ft., upon which sufficient exploration has not yet been finished. Averages of assays on 2,068 samples taken, in every case, across the full width of the vein, range from \$4.19, on the 880-ft., to \$2.05 on the 440-ft. level. Development yielded 44,070 tons of ore.

The whole amount of ore mined was 227,838 tons, of which 183,768 tons was supplied by stopes, the 350-ft. level affording more than half the stoped ore, and only three other levels contributing to the output. The stock of broken ore in stope was diminished by 23,601 tons during the year. The total yield was raised, crushed and delivered to the mill bins at a cost of \$1.2926 per ton, including development.

An average number of 14.5 air drills were at work during the year, about equally divided between drifting and stopping. A 7-ft. hole was the standard, and the average depth drilled by one machine in 10 hours was 37.6 ft., being uniformly greater with machines used in drifting than with those used in stopes. The average cost of explosives, including that used in shaft sinking, per ton of ore broken was 26.20c. for powder, 1.48c. for fuse and 0.51c. for caps. The execution averaged 0.55 ton of rock broken for each foot of hole drilled.

The mill of 120 stamps ran for 352 days, using water-power on 152 days and steam-power the rest of the time, crushing 227,838 tons, or 5.39 tons per stamp per day. Sulphurets saved on vanners totaled 4,747 tons, or 2.08% of the ore crushed. The consumption of quicksilver was 57,218 oz., of which only 993 oz. was added outside of the batteries. Consumption of the principal supplies was 410 shoes, 425 dies and 10 vanner belts; 392 stamp-stems were replaced. The yield of free gold, copper and base bars was \$1,3889, and from sulphurets \$1,5131 per ton—total, \$2,9020, at a cost of \$0.2601 per ton milled.

The costs in all the departments are elaborately itemized, but we can condense the profit and loss account, giving totals and amounts per ton of ore milled, as follows:

	Totals.	Per ton.
Sales of bullion.....	\$661,175	\$2.902
Interest and dividends.....	3,185	0.014
Total receipts.....	\$664,360	\$2.916
Mining and development.....	\$294,500	\$1.293
Milling.....	59,260	.260
Sulphuret treatment.....	36,994	.162
Construction.....	17,523	.077
Office and general expense.....	14,114	.062
Total operating expense.....	\$422,391	\$1.854
Profit for the year.....	\$241,969	\$1.062
Balance brought forward.....	212,644	.....
Available for dividends.....	\$454,613	.....

From this six dividends, aggregating 24% of the issued stock, were paid during the year, leaving \$238,613 for surplus. The company is capitalized at \$1,000,000, of which \$100,000 worth of stock is retained in the treasury.

Metallographic Apparatus.

Metallography, or the microscopic and photo-microscopic study of polished metal surfaces, followed close on the heels of petrography, the study of rocks in thin section. The latter science, itself a specialty long delayed "in the birth of time," was largely the creation of Sorby, a wealthy English dilettante who passed it on to Zirkel, and he to Rosenbusch. But metallography, though a daughter of petrography, was largely developed, in its method and result, by the great French authority, Osmonde. The essential instruments for the study are (1) a grinding and polishing machine; (2) a microscope for the study of the plain, the etched and the stained parts of the exquisitely polished metal surface, and (3) a photo-micrographic apparatus for copying and recording the various amorphous or crystalline individuals observed. The first apparatus, the grinder and polisher, is essentially a set of rotating wooden disks, or lap-wheels, covered with successively finer grades of emery, terminating in the finest jewelers' rouge. The microscopic and photo-micrographic apparatus are made to perfection by the firm of Carl

Zeiss, of Jena, Germany. This requires such a close working distance that a nice arrangement is required for illumination, which is accomplished by a side-reflecting mirror obliquely set in the axis of the objective; for the metal is opaque and all light must come from the front. There are also other ingenious devices for suitable illumination. Both time and space are lacking for a suit-

sally known in America for their reputable business methods, but, still more—and this is thoroughly German—they are noted for their genuine scientific spirit.

A New Mining Rod.

The accompanying engraving shows a new leveling rod, devised and made by

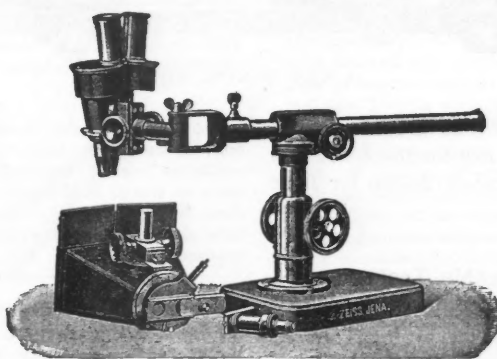


FIG. 1. LOW-POWER BINOCULAR MICROSCOPE.

able description of the methods and results of metallographic investigation. But two words are in point: One is that no study of a metal or alloy is complete with-

the Keuffel & Esser Company, of New York, especially for use in mines and where there is limited head-room. It is 3 ft. 10 in. long when closed and reads to

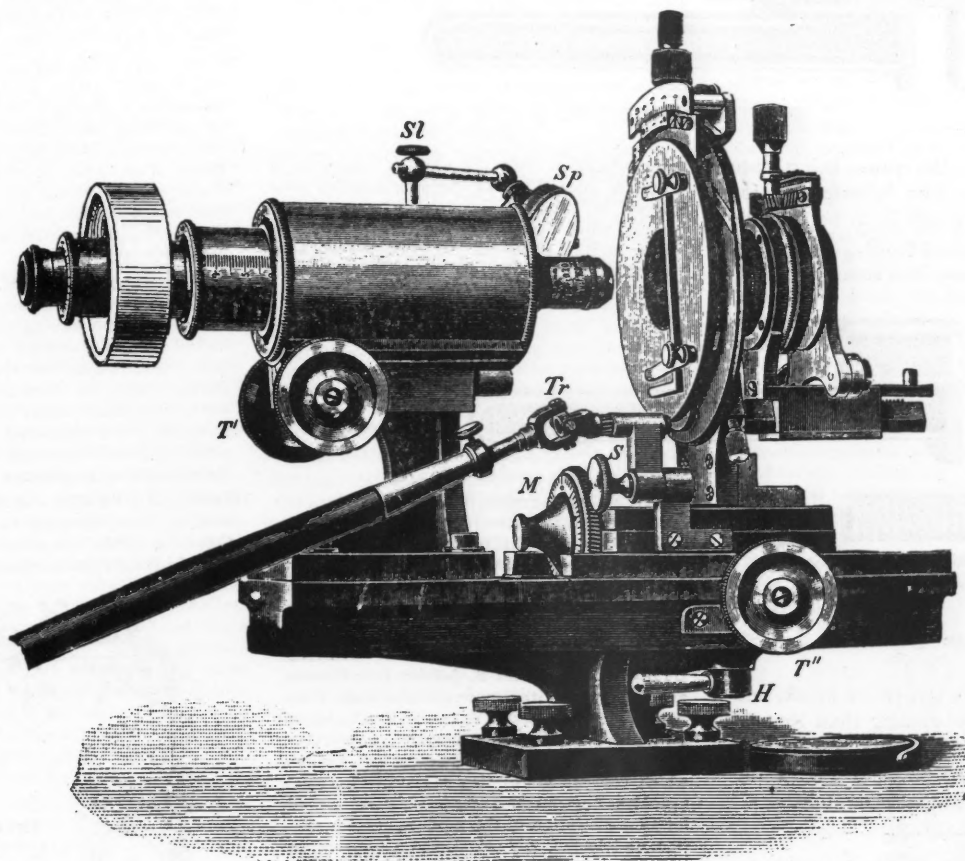


FIG. 2. PHOTO-MICROGRAPHIC STAND.

Zeiss, of Jena, Germany. A low-power binocular microscope (for preliminary study in grinding the surface) is shown in Fig. 1. The photo-micrographic stand is shown in Fig. 2. For the careful examination of the metallic individuals and alloys a high power is required ($\frac{1}{4}$ -in. to

out a careful study of its micro-structure; in fact, herein is an almost individual specialty. The other is that the full equipment for this study, with the best apparatus therefor, can be obtained from the well-known house of Eimer & Amend, of New York City, a firm not only univer-

6 ft. when extended. The graduations are continued from the lower section to the full height of the rod, on a metal band supported on a self-winding spring reel at the upper end of the rod.

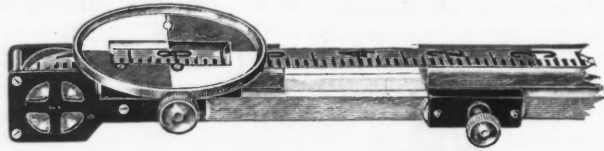
When the upper section is extended, the graduated metal band is drawn off its reel,

thereby presenting consecutive graduations and numbers at any extension, such as a rod of the usual construction presents only when extended to its full height. This rod is graduated to one-hundredths of a foot, and reads by vernier to one-thou-

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects.



A NEW MINING ROD.

sandths of a foot. The graduations are in black, with red foot-numbers. It is a practical and convenient device for mine surveying.

A Serviceable Tool.

The accompanying cuts show a new pattern of wrench made by the Tremont Manufacturing Company, of Roxbury, Mass. It is especially serviceable for rough and hard work, as around mines and mills. It has three pieces only, all of



FIG. 1. WRENCH.

drop-forged steel, the jaws being case-hardened. As the jaw is extended forward when a large nut is to be handled, the length of the wrench, and consequently the leverage, is increased. There

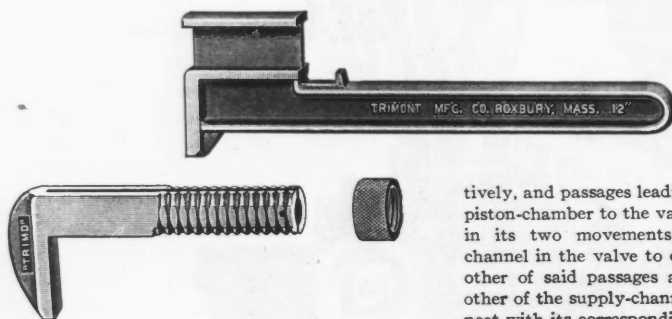


FIG. 2.

are no wooden parts to split or break, and the strength is 25% greater than that of the ordinary wrench, by actual test. Fig. 1 shows the tool complete, and Fig. 2 the three pieces composing it, separately.

According to William Dinwiddie in the *Electrical Review*, the Japanese are making excellent dynamos, motors and transformers, at a cost 30% below what any American firm can lay them down, duty free, in Yokohama. This is only an instance of the remarkable mechanical instinct of this progressive nation of the Pacific.

issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ending April 18, 1905.

787,376. ROCK-DRILL.—John M. Hamor Philadelphia, Pa., assignor to John M. Rogers, Wilmington, Del. The combination, with the cylinder, the piston-chamber and piston therein, and the rotary valve and its casing, of a passage in the valve-casing adapted to be placed in constant

communication with the exhaust, channels in opposite sides of the valve-casing adapted to be placed in constant communication with the supply, three channels in the valve adapted in either position of the valve to communicate with the three channels in the valve-casing, respec-

tively, and passages leading from the ends of the piston-chamber to the valve-chamber, the valve, in its two movements, causing the exhaust-channel in the valve to connect with one or the other of said passages and causing one or the other of the supply-channels in the valve to connect with its corresponding passage.

787,380. PROCESS OF MAKING ALKALI CYANIDES.—Charles B. Jacobs, Port Chester, and Robert A. Witherspoon and Nathaniel Thurlow, Niagara Falls, N. Y., assignors, by mesne assignments, to Cyanide Company, Jersey City, N. J. A process of obtaining alkali cyanide which consists in reacting upon alkaline-earth cyanides or cyanamides with an alkali compound, forming a solution of the product of such reaction, and cooling said solution to a temperature where the alkali cyanide formed separates out, leaving the impurities in the solution.

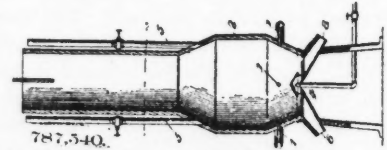
787,458. ARTIFICIAL FUEL AND PROCESS OF MAKING SAME.—Frederick W. Meeker, Rye, N. Y. A process of making artificial fuel comprising: mixing comminuted fuel with a substance exemplified by resin; molding the mass into briquettes; artificially heating the briquettes to a temperature below the melting-point of the resin and for the time required to dry them; and afterward heating them to the temperature re-

quired to melt the resin and holding them at such temperature for the time required to diffuse the resin throughout the briquette.

787,489. CONTROLLER FOR PNEUMATIC COMPRESSORS.—Bror F. Bergh, New York, N. Y. In a pneumatic-pump controller, the combination of a motor-controlling vibratory member subjected to reservoir pressure, a single spring opposing said pressure, means normally restraining said member against movement under reservoir pressure, and a releasing device for said means and actuated by reservoir pressure of a predetermined degree, whereby the said vibratory member is actuated by the difference in pressure between that of reservoir and spring.

787,539. APPARATUS FOR GENERATING GAS.—George W. Parker, New York, N. Y. In an apparatus for distilling coal and the like, the combination of a substantially vertical retort, and a tube constructed to collapse within the retort for collecting the gas.

787,540. PROCESS OF ROASTING ORES.—Seely B. Patterson, Phillipsburg, N. J. A process which consists in establishing and continuously roasting a body of ore, intermittently feeding charges to the top of the body, intermit-

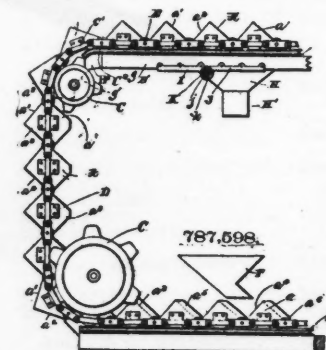


tently subjecting the body throughout its length to the action of hot air, in the intervals repeatedly subjecting the lower portions of the body that have been subjected to the hot air to the action of steam, and withdrawing the roasted ores from the base of the body.

787,541. PROCESS OF CONVERTING LEAD SULPHATE INTO LEAD HYDROXIDE.—Alexander S. Ramage, Detroit, Mich. A process of converting lead sulphate into lead hydroxide, which consists in treating lead sulphate with an excess of an alkali hydroxide and directly producing lead hydroxide and a solution containing lead, separating said lead hydroxide and solution, and treating said solution with another portion of lead sulphate.

787,593. GAS-PURIFIER.—Alfred Steinbart, Carlstadt, N. J. In a gas-purifier, the combination with a vessel having tubes, each containing a helical duct, of means for conducting water into said vessel, means for conveying gas to said ducts, means for conducting water from the above-mentioned vessel having tubes, and a spraying device connected with said means for conducting water from said vessel and located in the gas-conduit in advance of the said ducts.

787,598. CONVEYER.—Alfred J. Webster, Columbus, Ohio, assignor to Joseph A. Jeffrey, Columbus, Ohio. In a conveyer, the combination of a chain at each side of the conveyer, a sub-



stantially endless series of buckets, each closely adjacent to those next to it, each rigidly connected to the chains, and each having a closed side which projects upward at a forward inclination relative to the loading "run" of the chain, and an open receiving side projecting upward and backward and extending substantially en-

tirely to the upper edge of said side, whereby the material begins to escape from the bucket immediately upon its passing the upward wheel of the conveyer, and whereby the said side can serve as a flight or scraper upon the emptied material.

787,601. PORTABLE CONVEYER.—Freeman R. Willson, Jr., Columbus, Ohio, assignor to Joseph A. Jeffrey, Columbus, Ohio. In a portable conveyer for loading ore and coal in mines, the combination of a low railway-carriage, a horizontally turning frame thereon, an inclinable conveyer mounted on said frame on a horizontal transverse axis at a relatively small elevation above the carriage and having a series of digging and conveying buckets and ore-retaining chutes between the buckets, and an engine on said frame for actuating the conveyer.

787,602. ELEVATOR.—Freeman R. Willson, Jr., Worthington, Ohio, assignor to Joseph A. Jeffrey, Columbus, Ohio. In an elevator, an under-acting endless bucket conveyer bodily adjustable vertically and adapted to have the buckets scoop up their loads at the lower end of the elevator and to move upward to the emptying-point, and then horizontally to cause the buckets to discharge their loads under the action of gravity and to move from said emptying-point upward and outward, and then again upward and outward and downward on the outside of the path of the upwardly rising loaded buckets.

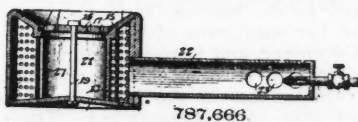
787,604. ORE-CRUSHER.—Frederick E. Woodbury, Milwaukee, Wis. The combination with an ore-crusher comprising a receptacle in which ore is crushed, means for crushing the ore and a grate through which the pulp is discharged, of a catch-box having an opening into said receptacle inside of the grate, an opening below provided with a screen, and means for producing an upward pulsating current of water through said screen and catch-box into said receptacle.

787,605. CAR-HAUL.—Alfred M. Acklin, Pittsburg, Pa., assignor to Heyl & Patterson, Inc., Pittsburg, Pa. In a car-haul, the combination of a cable, means for driving same, a car having a gripping device extending out from the side thereof, and means for causing said gripping device to grip said cable by the traction of said cable.

787,612. METHOD OF SHAPING METALLIC INGOTS BY TRANSVERSE ROLLING.—Leonard D. Davis, Erie, Pa. A method or process of shaping metallic ingots, which consists in first piercing the ingot, with a relatively small opening and smoothing and compacting the walls of the opening so made, and then transversely rolling the ingot without axial movement of the ingot so pierced for shaping its outer surface.

787,621. ADJUSTER FOR DEEP-WELL SUCKER-RODS.—Edwin R. Graham, Bakersfield, Cal., assignor to one-half to William M. Graham, Santa Barbara, Cal. A device having in combination a walking-beam, a sucker-rod, a rump-barrel, the upper and lower valves of a deep-well pump, a swivel union connected to the sucker-rod, a threaded rod connected to the union, and a yoke from which the threaded rod is suspended, said yoke consisting of a single piece of metal folded upon itself and with its bight spread or open to receive and embrace the end of the walking-beam, and having its side arms converging downwardly, and opposing clamp members on said arms and adapted to clamp the threaded rod.

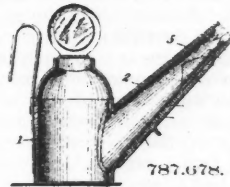
787,666. TUYERE.—Robert M. Downie, Beaver Falls, Pa., assignor to Keystone Driller Company, Beaver Falls, Pa. A tuyere having an air-inlet,



an air-outlet and an open water-outlet, means for introducing steam into the tuyere and entraining air thereby through the inlet, and means located in the tuyere and the path of movement of the steam for condensing and collecting the moisture thereof and directing the same to the outlet.

787,672. APPARATUS FOR FEEDING WIRE-NAIL MACHINES.—George Jewett, Pittsburg, Pa., assignor to American Steel & Wire Company of New Jersey, Worcester, Mass. An apparatus for continuously feeding wire to a nail-machine from a plurality of stationary coils or reels, said apparatus comprising an arm pivoted to the machine and extending to and overhanging the coils, and adapted to be swung by the wire from one to another of said coils, said arm carrying a wire-guide at its free end.

787,678. MINER'S LAMP.—Ferdinand Koch, West Hazleton, Pa. In a miner's lamp, a wick-spout having a longitudinal slot, an inner fixed tube having a slot and provided with inwardly



turned teeth, a bar mounted to slide between the spout and tube and having a finger-piece extended outward through the first-named slot, a wick-engaging plate slidable within the inner tube, and a part extended through the second-named slot and connecting said plate and bar.

787,736. FILTERING-CELL FOR SEPARATING SLIMES IN ORE TREATMENT.—Gustavus A. Duncan, Deadwood, S. D. In a filtering-cell, in combination with a filtering-bag, a frame lodged in the bag for holding it extended, comprising vertical spacing-bars at relatively short intervals in the length of the cell; nipples set through the bottom bar of such frame and extending through the bottom of the bag and made water-tight thereat, and an exhaust and supply pipe to which such nipples are connected, extending underneath the cell.

787,737. DRIVING DEVICE FOR PENDULUM-MILLS.—Jacob Dürnholtz, Kalk, Germany. In a driving device for pendulum-mills, in combination, a grinding-pendulum resting on springs by means of disk in the center over the grinding-surface, and of a single rolling body inserted between the disk and another disk, near the periphery, the disk being rotated from the outside and the pendulum, being by springs pressed against the rolling body, is moved thereby out of its perpendicular central position into an inclined position with regard to the grinding-surface, which position is, in consequence of the rotation of the disk and the rolling around in a circle of the rolling body, constantly changed.

787,742. METHOD OF WELDING.—Otto Eigen, Duisburg, Germany, assignor to Duisburger Maschinenbau-Actien-Gesellschaft, Duisburg, Germany. A method of welding by means of rolling pressures, which consists in providing the members to be welded with bevels, heating said members, placing said bevels together face to face, and subjecting said members to rolling pressures which force said members directly toward each other in two independent directions crossing the general direction of the bevels.

787,743. MOLD FOR FORMING CEMENT BUILDING-BLOCKS.—Billy Ely and James I. Taylor, Rock Rapids, Iowa. A knockdown mold for building-blocks, comprising a base, sides, and ends, the latter having openings, longitudinal bars or filling-pieces adapted to be inserted and supported in said openings and spaced from the top, bottom, and sides of the mold, and upright blocks secured to the base and spaced apart and from the filling-pieces in the longitudinal middle of the mold, the two end blocks being located close to the ends of the mold-box.

787,758. PROCESS OF TREATING PRODUCTS CONTAINING VANADIUM, MOLYBDENUM, TITANIUM, AND TUNGSTEN.—Henri L. Herrenschmidt, Le Genest, France. A process of treating ores or products containing vanadium for the purpose of obtaining vanadic acid, the same being characterized by the following oper-

ations: the refining of a vanadate-of-soda liquor by evaporation and crystallization; the precipitation of the vanadium contained in the purified liquor by the action of concentrated sulphuric acid upon said liquor, previously concentrated to a syrupy condition; and the process of reduction by a reducing agent.

787,770. PROCESS OF MANUFACTURING FIRE-BRICKS, CRUCIBLES, RETORTS, OR OTHER REFRACTORY ARTICLES.—Paul Klein, Riga, Russia. A process for manufacturing refractory articles, consisting in pulverizing chrome ore, separating the easily fusible admixtures therefrom, mixing the chrome ore thus obtained with pulverized fire-clay and with pure hydrate of alumina, molding and pressing and then burning such mixture.

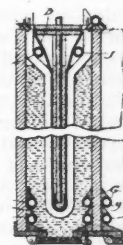
787,814. SEPARATION OF METALS FROM THEIR ORES.—Jacob D. Wolf, London, England. A process of separating metals from their ores which consists in agitating pulps with oil until the oil has taken up all the metallic-mineral contents with some gangue, separating the mineral-bearing oil from the pulps, removing suspended particles of gangue from the oil by passing it through warm water and separating metallic minerals from the oil.

787,842. WELL-DRILLING MACHINE.—John R. Griffith and Leslie G. Cosper, Independence, Kan. In a well-drilling machine, a frame having side members, a driven main shaft, a tubular bull-shaft mounted upon said main shaft, means for connecting said bull-shaft operatively with and disconnecting it from the main shaft, a crank at the end of the latter, a rock-shaft journaled upon the frame and having a crank at its outer end, a pitman connecting said crank with the crank upon the main shaft, a crank upon the rock-shaft between the side members of the frame, and a drill-rope-engaging pulley supported by said crank.

787,868. TUYERE-IRON.—George A. Walter, Prescott, Wis. A tuyere-iron comprising a tubular casing provided with a relatively large central opening and a series of smaller openings on either side thereof, and a valve rotatably fitted within said casing and curved to conform thereto said valve being formed with an opening to register with said large outlet-opening, and with openings to register with a portion of the smaller openings upon both sides of the large opening while said large opening is closed.

787,869. METHOD OF MAKING REFRACTORY ORES.—Edward G. Acheson, Stamford township, Ontario, Canada, assignor, by mesne assignments, to North American Trust Company, trustee. A method which consists in shaping a material consisting essentially of silicon, oxygen and carbon, in chemical combination, and firing it to form a coherent self-bonded mass.

787,878. PROCESS OF TREATING SLIME IN ORE REDUCTION.—Gustavus A. Duncan, Deadwood, S. D. A process of treating ore slime, which consists in accumulating the slime upon the exterior of a filtering-cell immersed in



the slime-bearing liquid, by suction from within the cell, and exhausting the liquor from about such accumulated slime surrounding the cell having the slime, thus accumulated thereon with fresh metal-solvent liquor, and drawing such liquor by suction within the cell through the slime so accumulated on its exterior, and subsequently detaching the residual slime from the cell.

Special Correspondence.

San Francisco. April 27.

As has been already noted in these letters, there has been more or less litigation about smelter fumes in Shasta county, and prospective suits against the Selby people for the same reasons in Contra Costa county. But it has remained for Fresno county farmers and vineyardists to "cry out before they are hurt." They are said to be anticipating with considerable anxiety the erection of a copper smelter by the Copper Mine Co., nine miles north of Clovis. Already operations looking to the construction of the smelter have been begun on a large scale. The bed of the smelter is now under way, and railroads are being laid out to carry the ore. Some eighty men are engaged in the work. It is contended by the owners of orchard and vineyard property that the smelter fumes when the plant is in operation will destroy all vegetation. A number of large land owners will in the next few days confer with representatives of the company to see if the smelter cannot be located further back in the hills. But even if it were there would be others also "located further back" who would object. The great difficulty about these matters is that in litigation before the courts the mining industry usually gets the worst of it, when farmers or other agriculturists are the complainants.

The famous La Grange mine on Oregon Gulch mountain, Trinity county, known as the largest hydraulic mine in the world, has been sold to Eastern capitalists. It has long been owned by Frenchmen, of whom Baron La Grange was the principal. Pierre Bouery is general manager. Since the French company purchased the property some 10 years ago they have spent several hundred thousand dollars in improvements, including 30 miles of ditch and flume for water supply. One tunnel on the ditch line is over 8,000 ft. long. The ground has been rather difficult to work, the bedrock being rough and steep and the bank kept sliding toward the giants. All sorts of exaggerated notions prevail as to the immense annual yield. The gravel deposit is high up on the mountain.

Owens valley, Inyo county, has attracted several hundred miners and investors in the past few weeks. As in southern Nevada, the ground has hardly been scratched and there is still a large field for the prospector and miner, who are not so handicapped as in the Nevada desert. There is a great variety of metals to be found all along the White mountains and the high Sierras, and although the ore may not be of very high grade, yet it usually occurs in large bodies and can be easily worked. Water, grub and feed are plentiful and cheap. A good deal of prospecting is going on at present in the Yellow Dog district, near Benton, around Bishop, near Big Pine, in the Alabama mountains, around Keeler, in the Cactus flats, and in the Coso range. The number of well-opened-up properties is still limited.

A deposit of sulphur has been found on the western mountain edge of the Colorado desert, northeast of Coyote wells. John F. Schwartz, of San Diego, states that the deposit is in an old crater of an extinct volcano which is about 200 ft. in diameter. Six claims have been located.

The owner of several mines in Grass Valley district has issued an order which men working in tribute vigorously object to. The first order was at the Wisconsin mine, where 50 tributaries are at work. They made a contract with the owners of the mine that they were to receive one-half of all the ore that was taken out by them,

the company to receive the other half. Some of the miners did very well, making as high as \$5 a day. Some made less, but nearly all made the average wages. The company now demands 50% of gross output on all \$8 ore, but in all which runs from \$8 to \$10 they demand 55%. On rock over \$10 the company wants 60%. Under the prevailing system the company furnishes tools, provides the powder, sharpens drills, and hoists and mills the ore.

A decision in Sonoma county in the matter of the Socrates quicksilver mine, long in litigation, is of interest. The suit was one brought by the Socrates Investment Co. and the Socrates Mines Corporation against Frank A. Huntington and 50 other defendants. Among other things, the court was asked to partition certain portions of the Socrates mine to the plaintiffs, who claimed to own some of it, to appoint a receiver during the pendency of the suit, compel each alleged owner to make an accounting of the amount of the quicksilver that had been produced and sold by the defendants, etc. Judge Burnett's decision wipes the action from the records—at any rate, as far as the complaint on file is concerned, for he sustains the demurrers interposed by all the defendants. Frank A. Huntington, of San Francisco, the first defendant, is perhaps the principal owner of the great mine. Among other things, the court says, after reviewing the contention of the demurrers:

"I feel entirely satisfied that there is a want of sufficient averment in behalf of the Socrates Investment Co. to constitute a cause of action, and hence, at least, the objection of a misjoinder of parties plaintiffs is well taken. If a plaintiff in a case does not know whether or not he owns the property in controversy, and he is in such uncertainty that he does not even dare to affirm positively his ownership, he must have a good deal of assurance to invoke the aid of a court in dispelling his doubts. The disposition of the demurrer renders it unwise to consider the motion to strike out. It may be considered, however, as denied without prejudice. The demurrer of each of the defendants is sustained."

Denver. April 28.

A petition for a receiver has been filed by Austin C. Dunham and L. A. Barber, of Hartford, Conn., stockholders of the Magnolia Mining & Reduction Co. and the Gold Ingot Leasing & Milling Co. It is alleged that the affairs of the concern have been mismanaged.

The following companies have decided to file separate suits against the Western Federation of Miners as an organization, and against its officers and prominent members individually, involving about \$1,000,000: The United States Reduction & Refining Co., the Elkton Consolidated Mining & Milling Co., the Vindicator Consolidated Gold Mining Co., the Granite Gold Mining Co., the Mary McKinney Mining Co., the Stratton's Independence, Ltd., the Findley Gold Mining Co., the El Paso Consolidated Gold Mining Co. and the Golden Cycle Gold Mining Co. Some of the leading firms of attorneys of the State have been retained in these cases.

The jury in the famous Hindry suit could not agree after a trial lasting nearly two months, and the case will have to be tried again. The Bank of Clear Creek County will, it is said, within a few days, file a similar suit for damages against the Globe Smelting & Refining Co. on account of damages sustained on the Hamill ranch, which is owned by them, and is situated in close proximity to the Hindry property.

During this month the Cripple Creek mining companies have paid more than \$400,000 in dividends.

It is stated on good authority that on May 1 the United States Reduction Works at Canyon City will start operations again. This plant has been idle for about a year.

Leo von Rosenberg was in Denver a few days ago on his way to New York to submit his final report on the consolidation of the Theresa and the Golden Cycle properties, which comprise nearly 85 acres in the Cripple Creek district.

Upon the recommendation of Secretary Wilson, Secretary Hitchcock has instructed the commission of the general land office to withdraw from entry, except under the mineral laws, about 1,500,000 acres of public land for the so-called Holy Cross reserve.

The old Calumet iron mines in the Hematite district, about six miles from Salida, owned by the Colorado Fuel & Iron Co., will be operated again; new machinery has been installed. This company has announced that, beginning with May 1, the employees of the Minnequa plant in Pueblo will receive an increase in wages ranging from 7 to 20 per cent.

In consequence of an unusual fall of rain and snow during the past few days, all the streams east of the continental divide are very high, and an abundant supply for mining and irrigation purposes is assured.

On April 28 the science section of the Colorado State Teachers' Association begins a session at Colorado Springs. President Alderson of the Colorado State School of Mines will preside. It is expected that about 200 scientists and professors from colleges will be present.

It has been officially announced that E. I. Jeffery, so long connected with the Denver and Rio Grande railroad, will be president of the Western Pacific railroad, the 'Gould' line to the Pacific coast. Construction on this line is expected to be commenced at once. Three leading New York firms—Blair & Co., Salomon & Co. and Read & Co.—will finance the enterprise and will place \$50,000,000 of Western Pacific bonds, insuring the completion of the road as rapidly as possible.

Scranton. May 1.

Work has been resumed at the Cayuga colliery at Scranton after a suspension for the purpose of concreting and improving the breaker. The work was carried out in 21 days. The breaker will now be able to handle a large quantity of coal, and much better results are expected from the colliery. For many years the Cayuga was at the head of the Lackawanna collieries for production, and held the record until it was passed by the Woodward, which is now the leader in the anthracite region. The Cayuga is now expected to hold second place easily.

Extensive improvements are being carried on at the Storrs shaft, which is being sunk in the Dunmore veins. This work will be completed in about a month.

Two grievances will be presented at the next meeting of the miners' conciliation board to be held in Hazleton. One is from the employees of Coxe Bros. & Co., at Derringer, and is an important one, and one, it may be assured, that the miners' representatives on the board will vigorously urge to have sustained. The complainant is a contract miner who, prior to accepting such a position, was employed as driver and company man, the duties of which he performed so satisfactorily that he has frequently been called upon by the company to discharge this work in the

absence of the regular employees. He had no objection to this, but he was not compensated as a miner, but as a driver, company man, or in whatever capacity he happened to be employed. He contends that this is a violation of one of the essential principles of the award of the anthracite strike commission, and as the grievances apply to other employees of the company, the miners' representatives on the board will press for an affirmative decision. The other grievance is as follows: The mine workers at the Truesdale colliery have made the complaint that the size of the car is 6 in. longer, 2 in. higher and about 4 cu. ft. larger than the one used at the sister mine, the Bliss, and the price remains practically the same. Two members of the board, as soon as they can find time, will go to the mine in question and make the necessary measurement. If the contention of the miners is right their grievances will be referred to the conciliators.

Two men were killed on April 28 by the breaking of the cable on a cage in which they were descending to work at the Conyngham mine, on North Pennsylvania avenue, Wilkesbarre. This mine is operated by the Delaware & Hudson company. The victims fell a distance of 400 ft. The company officials claim that the cable had been inspected on April 27 and pronounced safe. It was the third time that the cage was lowered for the day shift. The engineer was William Cunningham, one of the oldest employees of the company, and a man who has always been recognized as a careful workman. The men stepped upon the carriage with their dinner buckets in their hands and descended out of sight. When the indicator in front of the engine showed that the cage was nearing the Hillman, or top vein, he slowed it up so that some of the men could alight. As he did so he was startled to notice that there was no 'give.' Then he realized in an instant that the rope had parted. He stopped the engine and ran first to the speaking tube and called the men near the bottom of the shaft to the rescue. Then he ran out and notified the men who were waiting to be taken down that the cable had parted. All the officials within reach were notified at once, and hastened to the scene. A party of experienced miners were formed at once and the work of recovering the bodies was commenced. Entrance to the mine was effected by another shaft. When the cage struck the bottom it was crushed into fragments. The top of it was jammed down upon the bodies of the men and rendered the work of recovering the latter extremely difficult. After the bodies had been removed a number of officials descended the mine. Among those who went down to make a personal inspection were Division Superintendent C. R. Pettibone, Mine Inspector O'Boyle and General Superintendent C. C. Rose. They examined the remnants of the cage and the ends of the broken cable. The engineer was exonerated from all blame by the officials. None of them seemed inclined to place the blame on anyone in particular. They explained the failure of the safety "dogs" to work by stating that the weight of the 250 ft. of cable which was below the break was too much for them to bear in addition to the weight of the carriage and the men.

Owing to the great volume of coal traffic on their systems, no arrangements are being made by the Lackawanna and Erie railroads for excursions this summer. Both the Lackawanna and Erie roads are experiencing the busiest year of their history, the volume of coal transferred being the greatest on record. In the case of the Lackawanna the new rolling stock is pressed into service as fast as it is received.

Just at present the coal business on both roads is unusually heavy, due to the great demands for coal for stocking purposes.

Houghton. April 29.

Suitable weather for surface exploratory work has arrived and this week marked the beginning of the investigation of values at a number of points. The Mass Consolidated, Franklin, Erie-Ontario, Miskwabik and other companies have started preliminary work on undeveloped portions of their properties. This work will be watched with great interest, as in some instances it may have an important effect on future operations and add greatly to the value of the mines. There is no mistaking that the present price of copper is a strong incentive to investigate undeveloped lands. In the case of some of the producing mines, the present metal market enables this work to be done from current earnings, where, under a lower priced market, the work would cut into the treasury reserves.

Plans for the season's exploratory work presumably will be made at the meeting of the interests of the Keweenaw Copper Co. to be held in Boston next week. W. W. Stockley, of Hancock, chief engineer for the Keweenaw Central railroad, will have charge of the diamond drill explorations. He has had extensive experience in this work and superintended the diamond drill operations which were conducted on Isle Royale, Lake Superior, by the English corporation that owns practically all of that island. It is understood that the board of directors of the Keweenaw Copper Co. will be elected at the Eastern meeting, when important announcements regarding the future policy of the company will be made.

Operations in "C" shaft of the Michigan mine in Ontonagon county have been resumed and a policy of vigorous development work will be put into execution during the coming months. "C" shaft is 1,350 ft. northeast of "B" shaft, and had attained a depth of 350 ft. previous to the discontinuance of development work five years ago. Although the formation is more settled in "C" shaft than to the westward, and the copper showing better than was secured in the other shafts at the same depth, progress of development was arrested shortly after the organization of the present company, owing to the questionable title at that time to the ground which it was soon to penetrate. In a large measure the re-opening of the shaft has been hastened by the rapid and consistent improvement in the drifts making toward it from "B" shaft. Several of these drifts, including those on the eighth, ninth and tenth levels, have been extended more than 1,000 ft. in the direction of "C" shaft, and the copper output from these drifts constitutes a large part of the Michigan's production.

The diamond drill recently purchased by the Mass Consolidated Mining Co. of Ontonagon county has been installed at the fifteenth level of "B" shaft, and will be used in exploratory work at that point.

The machine which has been secured is small and designed especially for use in underground exploration. The principal shafts of the Mass mine, "A" and "B," are sunk on the Evergreen lode, but the parallel beds of the Evergreen range are tapped by crosscuts at various levels. It is mainly with a view to exploring the lodes paralleling the Evergreen that the diamond drill has been secured. Short holes will be bored and ground tested to learn where the work may be carried forward with the greatest dispatch and the most satisfactory results. As the drill cores will indicate just

where copper-bearing ground of commercial value is likely to be found and where it is not likely to be found, a great deal of unnecessary crosscutting and drifting should be avoided. In this manner many openings which would have burdened the tramping and hoisting facilities will not be necessary and, therefore, considerable economy should be effected.

Work on the Bohemian Range tract in Keweenaw county is confined to driving crosscuts north and south from the shaft, which is bottomed at a depth of 75 ft. on an incline of 80 degrees. The south crosscut is in 50 ft. and has penetrated trap rock for its entire length, no copper of any sort having been found. The crosscut which is being carried northward is in 60 ft. and has passed through considerable mineralized ground. Inasmuch as the Bohemian Range company is operating in a district entirely new and regarding which there is little or no exact knowledge, its operations are being carried along purely with the idea of locating the most desirable point for more extensive development.

Duluth. April 29.

Shippers are hustling ore down the lake as fast as possible, for there are indications that a shortage exists at furnaces and that the Lake Erie ports are about dry of many grades. It is said that May 1 figures will show only about 2,000,000 tons of Lake ores on dock, which is a smaller quantity than has ever been there, relatively to the amount now consumed, and actually less than for any year in the past five or six. However they might hustle, though, there was little chance of making anything of a record for April, as the ice has but now given way sufficiently to permit the passage of ships with tows, and the amount of ore landed during the month by boats running alone has been a mere bagatelle.

The indications are that labor troubles in Minnesota mines are over, though labor is so inconstant that predictions should have a string to them. The strike of two weeks ago is over, at all events. It has petered out completely, and a more inglorious and weak fizzle has not been known in the annals of the Lake trade. The strike was absolutely without leadership, though some Western Federation men seemed to try to gain what reputation they could out of it, till it was seen to be so foolish a thing, when they quickly got into the background and disclaimed any connection with it.

Mines that have been practically idle for years are being reopened, that is, steam shovel mines, and it is probable that the lesson of the strike has not been lost on employers. The Oliver, which has been mining only its 5,000-ton minimum for some time, is now to be pushed; as it is a large property it can make a big record at low cost. The Ohio, adjoining it, will also be mined this year and by shovel.

Frantz mine, of M. A. Hanna & Co., Mesabi range, is to mine about 125,000 tons this year and already has a nice stockpile on the surface. It is a state lease and has been well developed during the past year. The same company has the Yates, a small state lease in section 11, T. 58, R. 19, and is to strip and mine steam shovel. Two 70-ton shovels of the Bucyrus make were taken into the mine this week.

Three steam shovels will be worked this year on the Stephens mine, in section 28, T. 59, R. 15, the most easterly of all large properties on the Mesabi. Two of these will mine ore and the third will continue the stripping that was carried on prior to last year, and which has already resulted

in opening an immense mine there. This is near the new village of Aurora; indeed, the village limits cover four square miles, a shrewd move on the part of the incorporators to secure from the mines about them the major amount levied in taxation. A small village started a mile from Aurora is now being moved to that place and the two combined. In this town are the Miller mine, of the LaBelle Iron Co., the Mohawk, of Pickands, Mather & Co., the Stephens, of the Oliver Iron Mining Co., and a considerable amount of other ores. The Miller is now working about 200 men, and the Mohawk is being opened for underground mining on a fairly liberal scale. The Mohawk shaft is now resting at bottom, and drifting in the ore is commencing.

The Oliver Iron Mining Co. is working 200 men in its new operations on the western Mesabi, in T. 56, R. 24, where it has recently purchased the Canisteo lands. It is sinking a shaft, has another down 160 ft. and is pumping 1,200 gal. a minute therefrom, and at a third, which is down 145 ft., drifting is being pushed on the lower level. Experiments have been made in dressing this ore, and have been fairly satisfactory, enough so to assure the company that there will be no trouble in taking care of the excess silica contained in ores from this part of the Mesabi range.

Salt Lake City. April 28.

The injunction suit against the several smelting companies operating in the Salt Lake valley, in which something like 600 farmers and citizens of the rural districts figure as plaintiffs, has been filed in the federal court. The contest to be waged will, in all probability, be a long and tedious one. The case is important for the reason that the farmers demand a shutting down of the smelters if a remedy or solution of the smelter fume problem is not immediately forthcoming.

Some time ago the directors of the Utah Consolidated Mining Co. authorized R. H. Channing, Jr., the manager, to proceed with the construction of a plant for the abolishment of the smoke and fumes arising from ores in the process of reduction, at a cost of \$150,000. The water spray was to be used, in accordance with plans submitted by Dr. Franz Meyer, the New York chemist. Considerable preliminary work has been done, but before proceeding further the question of how to get rid of the acid water is being considered and presents a problem almost as serious as that of the smoke trouble itself. The company has a force of chemists engaged in conducting a series of tests to determine what is to be done. Until this is accomplished the construction of the plant will be withheld.

It is expected that official announcement will be made during the next few days as to the site selected for the new Boston Consolidated mill, the construction of which is to commence in the near future. Managing Director Newhouse has announced that the initial unit may be considerably larger than 2,500 tons a day.

The preparations for the building of the Utah Copper Co.'s 6,000-ton mill, at a point about 15 miles west of Salt Lake City, near the shores of the Great Salt lake, are progressing. The engineering staff has the plans in hand, the railroad survey to the mines at Bingham is completed, and, it is expected, a camp will be established and ground broken before the end of May.

The announcement made during the past

week that the building of another line of railway to the Pacific coast from Salt Lake City has been received with great satisfaction. The announcement has been followed up by action. On April 28 the first grading was commenced on the Salt Lake end of the road, and it was also officially announced that 25 carloads of steel rails had been shipped from the works of the Colorado Fuel & Iron Co., at Pueblo. The construction of the Western Pacific road is of importance to the mining industry, for the reason it will be the means of opening up many new mining districts in Utah and Nevada. The line will pass around the southern end of the Great Salt lake, thence westward to Winnemucca, Nevada, at which point it will cross the San Francisco-Ogden line of the Southern Pacific. In Utah the road will probably bring about the early development of the Deep Creek mining district, a region believed to have great possibilities. In Nevada, the camps of White Pine, Elko, Eureka, Lander, Humboldt and Washoe counties will be benefited.

Spokane. April 26.

Net profits of the biggest Cœur d'Alene silver-lead producers in 1904 reached \$2,922,411, according to the sworn reports which the mine managers submitted to the county assessor, in putting their properties on the tax rolls. The gross yield was \$10,019,375, so that the profits were more than 25% of the output. These figures on profits were obtained after allowing for the costs of mining, shipment, and reduction, and for betterments at the mines.

The Bunker Hill & Sullivan company is giving the Federal Mining & Smelting company a close race for profits. The Bunker Hill's gross yield was \$2,887,996, and its net profits were reported at \$938,868; while the Federal, operating three groups of properties, had a gross yield of \$4,760,181, and net profits of \$1,169,036. The Hercules, which is still shipping only crude ore, pending the completion of its concentrator, made the phenomenal record of earning profits of \$430,418, out of ore with a gross value of \$928,877, and that profit was achieved even after spending nearly \$150,000 on betterments—the largest sum expended by any company in the district.

When the concentrator for the Hercules is done, there is reason to believe that the mine will even equal the wonderful record of the Bunker Hill. Now all ore is being hauled by wagon two miles to the railway. During 1902 the Hercules' production was 4,998 tons, yielding a net profit of \$169,527. In 1903, the production has increased to 10,043 tons with a net profit of \$438,746. That was about \$8,000 more in net profits than in 1904, but nearly \$50,000 more was spent in betterments than for the preceding year, so that the showing is really much to the advantage of last year.

The Bunker Hill & Sullivan seems entering upon a new and glorious period of productivity. Under the management of Stanley Easton, the long Kellogg tunnel, is opening tremendous bodies of rich ore at a depth of \$3,000 ft., and this rich ore zone is putting the mine among the very leaders of the silver-lead producers of America.

After being operated for nearly 20 years at a profit, the net returns for 1902 dwindled down to \$67,891.10, and it was the general opinion that the best day of the Bunker Hill had passed. But the dis-

coveries in the Kellogg tunnel upset all the pessimists.

OUTPUT OF THE COEUR D'ALENES FOR 1904.

Mine.	Tons extracted.	Gross yield.	Net profits.
Federal	672,669	\$4,760,181	\$1,169,036
Bunker Hill	318,122	2,887,996	938,868
Hercules	12,271	928,877	430,418
Hecla	*13,670	671,251	207,510
Morning	235,775	1,292,903	175,196
Frisco	1,434	78,167	1,470
Totals	1,253,941	\$10,619,375	\$2,922,411

* Concentrate.

Manager Guigan, of the Alamo Mining Co., a Spokane corporation, operating the Alamo mine in eastern Oregon, is expected to start operations again in a few days. Work on the Oro Fino group, controlled by Glass & Witherop, of Spokane, in the same district, is also to be revived shortly. The Morning mine, of Greenhorn, Ore., has been sold to parties for \$20,000 on debts which were incurred by the four original owners while doing development. They made a fine showing for a while, but lost the ore and in pushing exploration got beyond their means. Attorney Butcher, of Baker City, Ore., will satisfy the creditors and take over the property.

The big steel stack, 105 ft. high, which was erected on the ill-fated cyanide mill of the Republic company, at Republic, Wash., has been taken down and shipped to the Canadian Metal Co.'s zinc smelter at Frank, Alta.

Butte. April 26.

The Raven and Old Glory companies have entered into an agreement by which 400 ft. will be added to the shaft on the Buffalo. The expense of the work will be borne equally, and when finished each company will drive a crosscut from the bottom into its own ground, tapping the veins at a depth of 1,200 ft. The Buffalo is owned by the Anaconda company, and the shaft is 800 ft. deep. The Old Glory company has been conducting its work in Old Glory ground through it. The property of the Raven, consisting of two claims, and that of the Old Glory is close to the Buffalo. The arrangement will facilitate the development of the two properties and save both a considerable sum of money. The work is to be commenced as soon as a larger hoisting engine than the one now in use can be secured.

The Columbia and Amazon claims, 18 miles northeast of Butte, have been leased and bonded to H. Ray, of Butte, for a year. The Columbia is owned by the Columbia Mining Co., composed of Lee Mantle, the Largey estate, Robert D. Grant and eight other Butte men. It was put in at \$35,000. The Amazon belongs to J. K. Heslet and others. The claims adjoin each other. The ore carries gold and silver and some of it is good. Ray is now preparing to develop the property.

The Belmont, owned by the United Copper, is not yielding ore now. Early in March a small streak was struck 250 ft. north of the 1,000-ft. station and followed east and west, but it gave out. A crosscut is now being driven towards a vein supposed to lay farther north. The shaft has not been sunk any recently.

The Pittsburg & Montana Co. has now resumed mining. The new pumps bought recently are now working satisfactorily, the second one having been started Saturday. The Reins company is having more trouble with water. It tapped its 6-ft. vein under the bed of the creek a few days ago and a rush resulted.

The Montana Zinc Co. is installing several Wilfley tables in its mills and will operate them in conjunction with a patent jig brought out by Manager Humphreys since the enterprise was launched. The jig has a double motion, that of jig and Wilfley table.

Minnesota men are still bonding claims in the northern part of the district. They have recently tied up nine and are now working on four more. These claims have not been worked on an extensive scale, but have been prospected near the surface. Recent developments on other claims there is responsible for the desire to tie them up.

The Berlin company, organized recently, is preparing to begin the development of its group of five claims. W. D. Thornton, its president, says the property is to be equipped with substantial machinery and a shaft sunk deep enough to determine the value of the ground.

Bisbee. April 28.

Significant in connection with the probability of continued depths of ore bodies in this camp is the fact that all new machinery to be ordered hereafter for the deeper mines of the Calumet & Arizona group will be designed for a depth of 2,500 ft. It is but a few years since James Douglas, president of the Copper Queen Consolidated, stated that no ore would ever be found at greater depth than 500 ft., and the camp certainly looked that way to the best experts here. But the upper limit of ore in the Calumet & Arizona was about 750 ft., and a few days ago native copper was found at 1,250 ft. in this company's Mag shaft, an indication of very considerable further depth. The work of the diamond drill which has been used by this company in testing the formation has now shown, it is stated, that the ore-bearing formation extends to more than 2,000 ft. from the surface, how much more the drill has been unable to prove. So the decision to equip for much deeper mining than ever before.

This deeper work is having its effect on the Copper Queen, and it, too, has been putting in machinery for heavier and deeper work than before. The Holbrook shaft, which is now the chief producer of ore in the company's group, was recently equipped with very heavy and powerful machinery for greater depth than before, and is now mining more ore than was produced from the entire property of the company two years ago. Then the Queen was making about 4,000,000 lb. copper monthly, now it is turning out a little more than twice that. The company has been 20 years in getting to a production of 4,000,000 lbs., but it has been but two years in doubling that. It is still increasing and will in a very short time have a materially larger output.

At the deep shaft of the Pittsburg, where they have been unable to sink for months on account of water, they are now going down slowly. The water has decreased to about 2,000 gal. per minute, probably from the assistance Junction pumps are giving, and it really begins to look as though the difficulty was about over and that ore might be shown shortly. Hoatson shaft at this mine is now about 75 ft. deep and is going down three ft. daily. It is a large four-compartment and is expected to cut ore above the 1,000-ft. level.

Junction is making about 700 gal. of water per minute. On account of the fact that the formation about the 10th level is very much broken it has been decided to sink to the 11th before drifting and to cut

a large station there and replace the main pumps in a room at that point. This room will be about 40 by 60 ft. in size. The pumps to be put there include Prescott compound condensing of a rated capacity of 3,500 gal. a minute. This shaft is going down 10 to 15 ft. a week, and is now about 975 ft. deep, vertical. For some time sinking has been through lime that looked as though it was above ore, and the work has cut through into excellent ore running about 10% in copper. This is the third lense cut in this shaft, but no attention has been paid to any of them, as the work in progress is getting down. It is believed this mine will in time get all the water from Pittsburg.

Cole shaft enlargement is completed, the skip tracks are in, but there are some minor matters that will delay hoisting ore in quantity from this shaft for a month, possibly two months. After that it will begin production of about 20 tons of copper daily.

Houghton Development is in 1,900 ft. with its tunnel, and is getting copper, not yet in quantity, but enough to make it look very favorable. The company has been working two years and more, and is the only concern in the immediate vicinity that is still at it, the Hecla, Glance and others that started out with a good deal of a flourish there having long ago passed in their checks.

Toronto. April 28.

The Ontario Bureau of Mines has issued Part II of its annual report for 1904, consisting of a report on the limestones of Ontario, by Willet G. Miller, Provincial geologist, containing 143 pages. This report is a valuable contribution, both to scientific and industrial literature, as it gives the characteristics of the principal limestone formations with special reference to their adaptability to the numerous and rapidly growing industries in which limestone furnishes a portion of the raw material. A full account is given of the varied uses of limestone with reference to the leading industries dependent upon it. The prominent limestone occurrences are given by counties and districts, the text being illustrated by a geological map of southern Ontario indicating the local formations. The industrial value of this publication lies in the readiness with which it can be ascertained whether a particular discovery of limestone will be available for a specific commercial purpose—as if it is known what formation exists in the district it is easily determined whether the limestone is magnesian or non-magnesian in character.

The Bureau has also issued a map of the cobalt-nickel-arsenic-silver area of the Timiskaming district—an account of which, by W. G. Miller, appeared in THE ENGINEERING AND MINING JOURNAL of December 10, 1903—to accompany Prof. Miller's report now in preparation for the annual report of the Bureau. The map is accompanied with notes which will be of much value to those interested in the district, giving a synopsis of its geological features and accounts of the ore deposits. The location of the working mines is shown. The rocks of this area consist of Laurentian, Keewatin, Lower and Middle Huronian and later basic eruptives. There are also outcrops of the Niagara limestone. This map adopts for the first time the classification of rocks recommended in the report of the International Commission on the terminology of the pre-Cambrian formations of the Lake Superior region.

The Big Master gold mine in the Wabigoon district has re-opened under the management of Thomas Armstrong, after having been closed for about a year. A force of some twenty men is employed who are pumping out the mine and engaged in development work. Owners of other propositions in the neighborhood are making preparations to develop them.

The La Rose mine, one of the largest producers in the silver-cobalt region, has recently had its capacity increased by the installation of an air-compressor and other plant.

In view of the establishment by the Atikokan Iron Co. of a smelter at Port Arthur operations are being vigorously pushed on the iron property of Hunter Bros., of Duluth, and McKellar Bros., of Fort William, on the Atikokan iron range. A force of thirty men are at work, in charge of Capt. Wood, engaged in stripping the surface and working the diamond drill. The systematic use of the drill has shown that one orebody is 1,800 ft. long by 200 ft. in depth, and prospecting is being further carried on by a tunnel driven right through the hill showing the deposit. The result shows that the value of the ore increases with its depth. The location of these deposits is three miles from the Canadian & Northern railway and 130 miles from Port Arthur.

The Manitoba Peat Co., Ltd., of Winnipeg, has begun installing a peat plant near Fort Francis, Ont., Wilson Irwin, of Toronto, promoter of the enterprise, being in charge of construction operations. A spur is being run from the Canadian Northern railway to the site. It is hoped to have the plant in working order by Sept. 1. The plant will have a capacity of 50 tons per day and will employ about 30 men.

Sudbury. April 25.

The Rock Lake Mining Co. has been sold to an American company for \$250,000, and it is expected that the new owners will shortly resume operations there. At a recent meeting of the directors of the company held in New York it was arranged to place an expert mining engineer in charge. At present there is a shaft sunk upon this property to a depth of 500 feet.

Negotiations are pending between the United States Steel Corporation and the Lake Superior Corporation for the purchase of the steel plant at Sault Ste. Marie. So far, nothing definite has transpired. A meeting of the directors of the Lake Superior company was recently held in New York city for the purpose of discussing the offer. There would be many advantages obtained by the establishing of a plant in Canada; the American corporation would not only save the export duty but would also be entitled to the benefits accruing from the bounty of \$5.50 per ton, and with the import duty added thereto of \$7 per ton on steel rails, gives the Canadian manufacturer an advantage of no less than \$12.50 per ton over the steel rail manufacturers of the United States.

The long-standing suit between M. J. Scott and several others regarding the disposition of the large copper deposit north of Blind river has finally been adjusted and portioned out to the several claimants by the Court of Appeal at Toronto.

An exploring party will leave Sudbury about the middle of May for the Hudson Bay coast, and expects to be absent for several months. Another expedition is being fitted out from the Province of Quebec with a similar purpose.

Victoria, B.C. April 25.

The contract for the steel trestle and tippie which the Crow's Nest Pass Coal Co. has decided to erect across the valley in place of that destroyed by fire at its Coal Creek colliery on March 11, has been awarded to Heyland & Patterson, of Pittsburgh, Pa., who are stated to have agreed to have the structure and plant in readiness to ship coal up to 2,000 tons per day by July 18 next. The *Fernie Free Press* states that about 850 tons of steel will be used in the trestle and tippie. The former will be 30 ft. wide and about 880 ft. from bank to bank, while the tippie, which will form part of the structure, will be 234 ft. long by 44 ft. wide, with right-angle extensions for picking tables, there being no coal-washing at Crow's Nest Pass collieries, only dry cleaning. From end to end the trestle will be roofed with corrugated iron, and the tippie will be enclosed with metal siding, save where windows shall be necessary for lighting purposes. The metal columns supporting the trestle will be on cement piers. All through, the material will be fireproof as far as possible. The tippie will be equipped with modern coal-handling machinery, including revolving dumps, shaking screens, traveling picking belts, etc. Two Smith gravity box-car loaders, recently described in *THE ENGINEERING AND MINING JOURNAL*, will be installed. The Crow's Nest Pass Coal Co. has been using one of these loaders at its Carbonado colliery for about two years and has found it an expeditious and satisfactory loader. The total cost of trestle, tippie and coal-handling plant to be put in is stated at about \$200,000. While present provision is for an output capacity of about 4,000 tons daily, the structure is designed for an eventual extension to 8,000 tons per day.

Information received from Frank, which is in southwestern Alberta, about 50 miles east of Fernie, is to the effect that a fire has been burning in the Canadian-American Coal & Coke Co.'s mine for several days. It is supposed to have been started by an explosion of gas, and has gained considerable headway along the main entry of the mine, the timbers in which have admitted of its burning its way. Latest reports state that the part of the mine affected has been closed, and that the fire has been pretty well smothered. If it can be kept from the vertical shafts in the mine the damage will be restricted chiefly to the destruction of the timbers of the main entry. The company is once again unfortunate in having its operations interrupted, for it is not a great while since the damage done to the mine by the big landslide in the spring of 1903 was fully repaired.

In the Lardeau district there is a deal of activity being displayed, and the outlook for a busy mining season is promising. The Eva is sending down gold-quartz regularly to its stamp mill at Camborne and is recovering gold in payable quantity. The Beatrice, in the same part of the Lardeau, has been shipping high-grade silver-lead ore for some time. About Ferguson, the Triune, owned by a Minneapolis company, is making preparations for a resumption of shipping and the road from the mine will shortly be in fair condition for hauling. The combination silver mill of the Silver Cup and Great Western companies is stated to be turning out six cars of lead concentrates and from 20,000 to 30,000 oz. of silver bullion per month. The Lucky Boy and Horeshoe, both in the neighborhood of Trout Lake, are sacking high-grade ore for shipment to the smelters, and several Poplar Creek properties have resumed work.

F. L. Underwood, president of the British Columbia Copper Co., and W. H. Thomas, the company's consulting engineer, lately reached the Boundary district from New York, on one of their periodical visits to the company's mines and smelting works. Messrs. J. K. Schon and W. N. Merrill, of Duluth, have since accompanied them on a trip to the Similkameen district, to which a railway line is about to be constructed from Midway Boundary. It is stated that the New York visitors are looking into the mining situation west of the Boundary for the purpose of ascertaining what the prospects are for a sufficient ore supply, after transportation facilities shall have been provided, for smelting works at Midway.

Mexico. April 25.

The Mexican government has announced that, in order to assist the miners in the disposition of silver, it will, from the closing of the mints to free coinage until further notice, loan money on silver bars and seek a purchaser for the same, acting thus as selling agent for the producer, but charging no fee or commission more than the actual expense incurred. This will greatly aid matters until the new conditions have adjusted themselves.

The action of the United States government in announcing that after May 1, 1905, the Mexican dollar would be received at the custom houses for 49.8 cents American money has also given strength to the Mexican currency and consequently to the mining interests.

The American Smelting & Refining Co. has completed its survey for a new plant at Tabaloapa, just outside of Chihuahua at the crossing of the Mexican Central railroad and the Mexico, Kansas City & Orient. Very little has been heard about the independent plant since the company's engineer, J. M. Knight, made the surveys.

In the State of Mexico some Maine capitalists, as Las Arcos Smelting & Mining Co., have taken over the mines and smelters of Las Aztecas Mining & Smelting Co., at Arcos, Almoloya and Zacualpan, near Toluca, and Samuel James, who has lately been in charge of the Salida, Colo., plant of the Ohio & Colorado Smelting and Refining Co., will be superintendent of the smelters. J. D. Rook is endeavoring to organize a company, with \$2,500,000 gold capital, to take over the San Ignacio copper mines, near Zacualpan. In connection with this a 200-ton smelter may also be built. German Roth is contemplating an aerial cable or a railroad between Malacoto and Hacienda de Guadalupe, where he has a little 50-ton smelter. C. G. Jackson has sold his Coronas mine of 26 pertinencias, near Zacualpan, (62.4 acres) to an American company for \$50,000 gold.

The annual meeting of the Dos Estrellas Mining Co., at El Oro, showed a gross output for the year valued at \$3,577,526 Mexican, of which \$2,123,881 was profits. It was reported that after Oct. 1 everything would be run by electricity from the Mexican Light & Power Co., under 10 years' contract for 2,500 h.p. at \$50 gold per h.p. per year. An arrangement has also been made with the McArthur-Forrest cyanide people for the use of their process during the future life of the company, on the payment of \$39,000 gold.

The Consolidated Mexican Syndicate, Ltd., is a new company with £20,000 capital, to carry on a prospecting, developing, mining and smelting business in Mexico.

London. April 22.

Some time ago, your readers may remember, I referred to the case of the De Beers Co. being the victims of the income tax commissioners. The latter claimed that the tax was payable on the whole of the company's profits. The company appealed to the High Court, where the judge has just given his decision upholding the commissioners' contention. The company will, of course, appeal to higher courts and eventually to the House of Lords. The case shortly is this: Income tax is payable by all individuals and corporations domiciled in the United Kingdom. The De Beers Co. is not exactly domiciled here. It is formed under the laws of Cape Colony, and its head offices are at the mines at Kimberley. It has a London office and also one at Cape Town. Its shares are held all over the world, as largely on the continent of Europe as in Great Britain. In fact, some of the stalwart British radicals make themselves objectionable by calling the De Beers an "alien gang." The argument adopted by the judge of the High Court was that though the mines were at Kimberley, the actual business of selling the diamonds was in London, and therefore the company was in fact domiciled here. I believe, however that the disposal of the diamonds is not actually in the hands of the company itself, but is managed by a syndicate of diamond merchants, some of whom, notably Messrs. Werner, Beit & Co., are certainly leading members of the company. In England the disposal of the products of mining companies is rarely in the hands of the companies themselves. The marketing of gold bullion, copper, lead, etc., is almost always in the hands of commercial agents or merchants. Many such merchants and agents are, of course, intimately connected with the various companies themselves. But the idea I want to convey is that the detailed negotiation for the disposal of the company's products never appear in the books of the companies, nor are they discussed at board meetings. From this point of view, it is obvious that the De Beers people have strong arguments in their favor, and it is conceivable that a higher court will reverse the decision. The income tax is at the best an objectionable way of collecting revenue. A too harsh method of enforcing it has driven many mercantile ventures from our shores. A notable case was that of the Kodak Co. The British and American businesses were amalgamated into a British company, but almost immediately transferred to America, owing to the company having to pay income tax on the whole of its profits accruing both from the British and the American businesses. Possibly some similar course will be adopted by the De Beers Co. if the House of Lords decides against them, for it is hardly likely that the host of French and German holders of its shares will submit quietly to a British income tax.

At this time of year the leading Western Australian gold mining companies issue their reports for the previous 12 months. The Oroya-Brownhill, the Golden Horseshoe and the Ivanhoe reports have made their appearance this week. All three show excellent results for 1904, and the prospects are uniformly encouraging. In the case of the Golden Horseshoe, the year's profits were £307,000; and £270,000 has been distributed as dividends. The revenue came partly from stamps, cyanide, filter-pressing and sulphide ore and concentrate. The stamps treated 163,000 tons of ore yielding bullion valued at £123,457; the cyanide process treated 28,000 tons of tailing yielding £36,970; filter-presses treated 126,900 tons of slime yielding £155,000;

while 24,000 tons of sulphide ore and concentrate sold to smelters realized £334,000; bringing the total receipts to £650,000. The ore reserves are estimated at nearly a million tons, averaging 18 dwt. The Ivanhoe Gold Corporation showed a profit for 1904 of £285,000, of which £240,000 was distributed as dividend. At this mine the reduction operations are in a transition stage. Less work is done by the stamps and more grinding pans are being put in. The ore reserves are reckoned at about three-quarters of a million tons averaging 15 dwt. per ton. At the Oroya-Brownhill the profit during 1904 was £380,000, out of which £290,000 has been distributed as dividends. At this mine there is a large amount of high-grade ore, and the reserves of this quality are reckoned at 78,000 tons averaging 4.25 oz. per ton; there is also some 250,000 tons in reserve averaging 19 dwt. per ton.

Perth. March 17.

Kalgoorlie—The Hidden Secret Bonanza, continues to furnish rich ore; the last parcel of 26 tons sent to the Fremantle smelters yielded bullion to the value of £6,000. This makes the total of 16 parcels since last September of 280 tons treated for return of £24,000. Driving south on the cross lode tapped in the Associated, 1,000-ft. level shows good values.

The Boulder loop lode has been tapped in the Ivanhoe at the 707-ft. level. The ore at this point is 3½ ft. wide, but value is low. Driving south has been started to cut the better part of the lode. The February output was 12,641 tons treated for 9,673 oz. fine gold. Working costs were 22s. 1d. per ton.

It is announced that R. Nichols is to return shortly from London to resume management of the Boulder Perseverance mine. The February yield was 8,511 fine oz. gold and 1,264 fine silver, from 11,713 tons treated. The ore reserves in the Golden Horseshoe are as follows: Actually blocked out and in sight, 954,631 tons, containing 860,545 fine oz. gold. This does not include estimated reserves. The ore reserves in the Lake View Consols are over 70,000 tons.

The Kalgurli February output was 5,141 tons for 3,862 fine oz. gold. Working costs 21s. 8d. per ton.

The Oroya-Brownhill treated 8,340 tons for 12,673 fine oz.

At Kookynie the Cosmopolitan is doing much prospecting with diamond drill, but nothing of importance has been found.

At Leonora Merton's Reward is opening up very well, and promises to recover its old prestige. February yield was 1,241 fine oz. from 1,542 tons treated. The Sons of Gwalia treated 9,727 tons for 5,300 fine oz. gold.

The Westralia Mt. Morgans is at present quiet—the management question is still unsettled—the mine is to be reported upon by a well known mining engineer and Bewick, Moreing & Co. are also said to be willing to undertake the control. A. E. Morgans is very confident of the future, but it is most probable that a new main shaft more to the west will be necessary. The Laver-ton district is going ahead—the Lancefield is pushing erection of additional treatment plant. February output was 4,049 tons for 1,439 fine oz. Ore in sight amounts to 225,000 tons. Assay value 34s. 6d. per ton.

In the Murchison field, The Great Fingall main shaft is down 1,400 ft. All the working levels are looking well. The new power and milling plant is nearing completion. February yield was 14,032 tons treated for 13,667 fine oz. Working costs 16s. 5d. per ton.

A good many properties are being taken under option on these fields.

The northwest fields are quiet, but some good crushings are being obtained at Marble Bar and elsewhere.

Auckland. April 6.

There is little to report concerning the dredging industry in the south island. The Molyneux river, though nearly stationary, has been at a fairly dredgable level for some time, and a number of idle dredges have again been put in commission. As soon as the river lowers a little all the gorge dredges will be enabled to make a start. The returns of the past few weeks have been very satisfactory, comparing favorably with those of former years, and running from 1,700 to 2,000 oz. per week for the combined Otago and west coast fleets.

Reefton.—It is stated that a lode of good thickness and quality has been intersected by the diamond drill 108 ft. below No. 10 level (the lowest) in the Progress mine. The Consolidated Goldfields Co. of New Zealand reports for the month of February as follows: Progress mine. 4,567 tons of quartz were crushed in the 65 stamp mills, yielding bullion valued at £5,936, 90 tons of concentrate were chlorinated, yielding £963, and 3,035 tons of tailing were cyanided for a yield of £839. Total return, £7,738. Golden Fleece, 1,150 tons of stone were crushed at the 20-stamp mill for a total return of £2,220. Wealth of Nations, 950 tons of quartz were crushed for a total return of £1,425 (\$7,125).

Hauraki.—A satisfactory return is reported from the Waihi mine. The total production is now approaching £4,000,000 sterling. Other mines in the Waihi district continue to develop satisfactorily, though somewhat slowly. The Grand Junction mine is being rapidly opened out so as to enable ore to be supplied to the 40 stamp battery now being erected. The Waihi Extended shaft has been sunk almost to the point required for opening out a new level 630 ft. from the surface. This level, it is expected, will command the lodes which are buried beneath flows of younger volcanic rocks, and were just reached on the boundary at the 500 ft. level.

At Karangahake the prospects of the Crown mine have much improved. Payable ore is now being developed, and the 60-stamp battery is expected to be crushing full time by next May. A good report is on hand also from the Talisman.

At the Thames the rich patch in the Waitotahi mine continues to yield good results. The drainage board has taken over the Thames-Hauraki pumping plant from the government and put it in commission in place of the "Big Pump," which appears to be worn out with its 30 years or more of continuous work. The new plant is working splendidly, and the economy in fuel consumption seems to have surprised the officers of the drainage board. It is proposed to lower the water to the 650 ft. level, which will enable the May Queen and other mines to resume operations in the lower workings.

A new quartz-reef has been discovered near Macetown, Otago, half a mile on the east side of the old Tipperary mine, on a line of reef locally known as the United. A crushing of 25 tons gave a return of 52 oz., 10 dwt. of gold. A drive has been put in about 25 ft. below the outcrop of the reef. A number of claims have been pegged out in the neighborhood.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Mr. Ben. S. Revett is at Murray, Idaho. Mr. Frank Klepetko is on his way to Peru.

Mr. B. B. Lawrence has returned from Cuba.

Mr. Hennen Jennings, of London, is in Mexico.

Mr. M. B. Place, Pittsburg, is in Mexico on business.

Mr. G. C. Blackwell, of Pittsburg, is in Oaxaca, Mexico.

Mr. P. P. Furber, of New York, is in Oaxaca, Mexico.

Mr. J. W. Mercer has returned to New York from Ecuador.

Mr. Theodore Douglas has returned to New York from Mexico.

Mr. George W. Maynard has returned from Guanacevi, Mexico.

Mr. E. M. Rogers, of New York, has been at Goldfield, Nevada.

Mr. E. W. J. Edwards is manager of the San Albino mine in Nicaragua.

Mr. Edwin C. Holden, of New York, has returned from the West Indies.

Mr. Alfred Schwartz, of New York, is making tests at Cananea, Mexico.

Mr. R. A. F. Penrose came to New York from Philadelphia during the week.

Mr. P. M. Furber, president of the Mexican Oil Fields, Ltd., is in New York.

Mr. George W. Middleton has returned to New York from Prescott, Arizona.

Mr. S. H. Brockunier is engaged in construction work at Catskill, New York.

Mr. Wm. R. Boggs, Jr., of Winston, N. C., is home on a visit from Argentina.

Mr. J. H. Curle has gone to Buenos Ayres for the benefit of the sea voyage.

Mr. F. J. Falding, of New York, is engaged in professional work in Tennessee.

Mr. G. A. Troye is consulting engineer to the South African Land & Exploration Co.

Mr. Frank Bulkeley, of Denver, was recently in New York on professional business.

Mr. Walter E. Koch, manager of Lustre Mining Co., Durango, Mex., is at Pittsburg.

Mr. Eugene L. Fuller, of Chicago, is examining copper properties at Autlan, Mexico.

Mr. Clarence M. Lewis has returned from Canton, China, and is now at Pasadena, California.

Mr. John Hays Hammond sailed on the *Deutschland* to spend a couple of months in Europe.

Mr. W. A. Wilson, of Salt Lake City, was recently engaged in professional work at Hailey, Idaho.

Messrs. J. J. Mann and R. C. P. Smith, of Los Angeles, are examining mines at Etzatlan, Mexico.

Mr. Richard Rosskelly, of Calumet, Mich., has been examining mining property at Cananea, Mexico.

Mr. Nathaniel Thayer has been re-elected president of the St. Mary's Mineral Land Co., of Michigan.

Mr. T. A. Rickard is attending the meeting of the American Institute of Mining Engineers at Washington.

Mr. Frank L. Nason is at Pulaski, Va., engaged in examining the property of the Bertha Mineral Company.

Mr. John H. Wattson, of Colorado Springs, Colo., is inspecting mines in the State of Guerrero, Mexico.

Mr. V. P. Strange, who has been for several months at Goldfield, Nev., returned to Salt Lake City on May 1.

Mr. Samuel James is superintendent of the smelter of Las Aztecas Mining & Smelting Co., at Arcos, Mexico.

Mr. H. W. Hague, representing the Miracle Pressed Stone Co., of Minneapolis, has established an office at Toronto.

Dr. J. McIntosh Bell has assumed his duties as geologist to the Mines Department of the government of New Zealand.

Mr. J. T. Morris is in charge of a prospecting expedition in the Sudan. He expects to return to London at the end of May.

Mr. George A. Packard is temporarily acting as consulting engineer to the Canada Corundum Co., at Craigmont, Ontario.

Mr. Martin Schwerin is with the Colonial Copper Co., at Cape D'Or, Nova Scotia. This will be his address until September.

Mr. N. C. Bonnevie, of Denver, has just returned from Washington and British Columbia, where he has been making mine examinations.

Mr. Merideth E. Lawson, managing director of the Boston Investment Co., is at the property of the company at Guadalajara, Mexico.

Mr. W. H. Freeland, of the Ducktown Smelting Co., sailed by the *Minnetonka* on his way to Scotland. He will be absent several months.

Mr. M. J. Heller, of San Francisco, manager for Capt. J. R. De La Mar, has been appointed consulting engineer to the Nipissing cobalt-silver mines in Ontario.

Mr. Robert H. Sayre, president of the Sayre Mining & Manufacturing Co., recently inspected the properties of the company in the Birmingham district of Alabama.

Mr. J. H. Helm, formerly with the Guggenheim Exploration Co., Santa Barbara, Chihuahua, Mex., has opened an agency for the Power & Machinery Co., at Mexico City.

Mr. Charles H. McMahon has resigned as general superintendent of the Moctezuma Lead Co., of Chihuahua, Mex., and will devote himself hereafter to private engineering practice.

Mr. Robert K. Mackey, for 20 years assistant general coal sales agent for the Delaware & Hudson company, has severed that connection and will consider proposals for a similar position.

Mr. R. R. Gamey, of Toronto, was recently at Detroit inspecting a new 50-ton plant for refining nickel-copper ores by a chemical process which separates the constituents of the ore by precipitation.

Mr. John E. Hardman, who has been in editorial charge of the *Canadian Mining Review* since the death of Mr. B. T. A. Bell last year, has retired from that position, his work as mining engineer requiring all his time.

Mr. H. Mortimer Lamb, formerly editor of the *British Columbia Mining Record*, on May 1 took charge as editor of the *Canadian Mining Review*, with office at Montreal. Mr. Lamb, it will be remembered, was chosen secretary of the Canadian Mining Institute at the meeting in March.

Obituary.

James Russell, chairman of the board of directors of the Waihi Gold Mining Co. of New Zealand, died recently in London.

Georges Forestier, an eminent French engineer, died in Paris, April 5, aged 67 years. Mr. Forestier was related to the famous mathematician Hermite and to Joseph Bertrand.

Victor Streich, who held many important positions in the management of mines in Western Australia, died at Coolgardie, W. A., on March 18, from heart failure. Mr. Streich was born at Stuttgart, Germany, and had been engaged in practice in Australia for about 20 years.

Societies and Technical Schools.

University of Iowa.—An ore concentrating mill is being installed in the mining department of this university, at Iowa City. It is an exact model of the largest mills in use in Western mines.

Lehigh University.—The Drown Memorial Hall, in memory of the late Thomas M. Drown, president of this institution, is projected. A fund of \$80,000 is to be raised for the erection and equipment of this building. A committee has been appointed, of which Robert H. Sayre is chairman and P. A. Lambert is secretary, to further this project.

Trade Catalogues.

'Plants and Types' is the title of a handsome catalogue of electrical products issued by the National Electric Co., of Milwaukee.

The B. F. Sturtevant Co., of Boston, Mass., has prepared an illustrated circular, describing Sturtevant generating sets.

The American Steel & Wire Co., of Chicago, Ill., has issued a partial bibliography of data, covering the uses of sulphate of iron on the farm.

The Brunn-Löwener system for softening water is described with illustrations in a pamphlet issued by the American Water Softener Co., of Philadelphia.

No. 2 of 'Air Power,' published by the Rand Drill Co., of New York, contains a variety of interesting information concerning the pneumatic products of that company.

The hoisting machinery made by Rawson & Morrison Manufacturing Co., of Cambridge, Mass., is described and illustrated in a 140-page catalogue 'E,' issued by the company.

The April number of the 'Progress Reporter,' published monthly by the Niles-Bement-Pond Co., of New York, is filled with excellent reproductions of photographs of the company's plant.

The Crane Co., of Chicago, Ill., has issued its advance circular, describing Crane steam and oil separators, for the separation of water from live steam and the elimination of oil from exhaust steam.

Catalogue No. 6-B of the Colorado Iron Works Co., of Denver, describes the stamp-milling machinery made by that company. It contains many excellent reproductions of photographs of the company's plant and products.

The Browning Engineering Co., of Cleveland, Ohio, in bulletins No. 9 and 15 describe and illustrate the automatic grab bucket, locomotive cranes for steam power plants and the lumber industry, standard locomotive cranes Nos. 1, 2 and 3, and the coil spring friction clutch.

Industrial.

Clement & Strange, mining and mechanical engineers, now represent the Colorado Iron Works in Salt Lake City, Utah.

The Economy blast-hole loaders formerly manufactured by Cope & Cornelius are now manufactured by the Cyclone Drilling Machine Co., of Orrville, O. Orders for loaders are coming in rapidly from the United States, Mexico and Canada. The company also has many orders for the Cyclone contractor drills and coal and water-well machines. It expects to run its factory overtime, commencing April 17.

The Jeanesville Iron Works Co. reports the following recent shipments from its Denver branch: Victor Fuel Co., one compound pump, 800 gal. capacity, 650 ft. lift, through 10,000 ft. of pipe; one mile pump, compound 800 gal. capacity; one high lift station pump to Boulder county, Colorado; two sinkers to local dealers; four Wyoming steam separators to Mexico; five to Arizona; two to Salt Lake; two to coal mines in Colorado.

The Denver Engineering Works have secured a contract for the construction and equipment of the largest concentration plant ever built in Colorado. It will cost about \$500,000, and will be located in Animas Forks, Colorado, near the Sunnyside extension mine, whence the ore will be transferred to the mill by a 2½-mile tramway. The complete plant will be run by electric power, furnished by the plant now in course of construction between Durango and Silverton. This firm has lately shipped eight box drills to the Andes Development Company at Orura, Bolivia, and M. L. Salter has been engaged to have charge of their installation and operation.

The A. S. Cameron Steam Pump Works, of New York, have transferred their agencies from the Mine & Smelter Supply Co. to the following companies: Cary & Fielding, 1711 Tremont street, Denver, Colo.; Utah Mining, Machinery & Supply Co., 228 South, West Temple street, Salt Lake, Utah; Ingersoll-Sergeant Drill Co., El Paso, Texas; Victor M. Braschi & Co., Cadenas street, 2, Mexico City, Mexico. These firms will carry a full line of the Cameron pumps and repair parts in stock, and will be able to fill all orders on shortest notice. Three carloads of pumps and parts have been received by Cary & Fielding, and a carload each by the Utah Mining, Machinery & Supply Co., the Ingersoll-Sergeant Drill Co., and Messrs. Victor M. Braschi & Co. These new representatives have always had close business relations with the Cameron company.

Clifton H. Wheeler, the former president and general manager of the Wheeler Condenser & Engineering Co., of New York, is now identified solely with the C. H. Wheeler Condenser Co., of Philadelphia. The personal services of Mr. Wheeler, ample capital, modernly equipped works, and an up-to-date engineering staff, place the company in a position of unusual strength on condenser apparatus and pumps of any size or description. Inquiries are solicited for surface, jet or barometric condensers; vacuum and circulating pumps, electric, geared or steam driven; water cooling towers; pumping engines and all auxiliaries for complete stern plants for both stationary and marine service, including highest vacuum guarantees for turbine requirements. The company's principal office is in Philadelphia—Lehigh avenue and 18th street, with a branch in New York—26 Cortlandt street.

General Mining News.

ARIZONA.

COCHISE COUNTY.

Paradise.—At the Savage work is progressing steadily. They are now in about 150 ft. in the adit which they are driving in the ledge about 200 ft. below the apex of the mountain. At the Holburn group, adjoining the Savage on the southeast, work of development on a small scale was started about three weeks ago. After this year's assessment work is finished development will be started in two places. The Monday claim has been leased for one year by Joseph Brown, who is taking out shipping ore and expects to make regular shipments.

The Chiricahua Mining Association is meeting with success in its undertaking to benefit the district. Membership is increasing, and it is the hope of the association that it may be of benefit by furnishing reliable information and thus keeping down the 'wildcating' that usually follows new districts.

YAVAPAI COUNTY.

Arizona Smelting Co.—The directors of the Bradshaw Copper Mountain Mining & Smelting Co. have authorized the transfer of its smelter at Val Verde to this company. The temporary injunction pending against J. L. Elliott to prevent him from voting 300,000 shares of stock of the Bradshaw company has been dissolved.

CALIFORNIA.

AMADOR COUNTY.

Defender.—At this mine the old engine has been displaced by a new one. The mine is being worked successfully by lessees.

Elliott.—S. K. Thornton will shortly resume operations on this mine near Oleta. He has also half of the Cooper mine adjoining the Elliott, and will work that, too.

Rhetta Consolidated Mining Co.—At this property at Plymouth, W. W. Worthing superintendent, they are now running the mill on ore from the Rhetta claim, rich rock having been found. The mill has been running for some months in Bay State ore. The last payment on the indebtedness of the old company has been made.

CALAVERAS COUNTY.

Gwin Mine Development Co.—At this mine, Gwinmine P. O., David McClure, superintendent, they have commenced to sink the shaft 200 ft. deeper.

Easy Bird.—Active operations have been resumed at this old mine near Mokelumne Hill, W. T. Robinson superintendent. The mine has been closed for some time.

Melones Mining Co.—A new air-compressor has been placed on this property. With the new forty stamps about to be added this mine will have 100 stamps running day and night.

Benson.—The shaft at this mine, Angels, is to be enlarged to a three compartment, and a lot of new machinery is to be installed.

South Bank.—This mine is in Indian Creek district, between Sheep Ranch and Murphy. W. H. Clary has been developing it for some time, and is shortly to erect a 10-stamp mill.

California Placer Mining Co.—Owing to litigation, this mine has been closed down, the men laid off, and the pump taken out. Work will not be resumed until the suit is decided.

EL DORADO COUNTY.

Gravel Hill.—At this mine, Georgetown, S. G. Sturman, superintendent, the tail

race has lowered 17 ft. through hard slate bedrock to put the property in shape for hydraulicking.

Live Oak.—At this mine, near Placer-ville, the new mill has been completed. Good gravel has been found in the 500-ft. tunnel.

MARIPOSA COUNTY.

Mariposa.—The mill of this mine was destroyed by fire on April 13, with a loss of some \$30,000. The last clean-up was just being finished, and the mill was to have been moved to some other property on the Mariposa Grant.

NEVADA COUNTY.

Golden Gate Consolidated Mining Co.—This company, A. Maltman superintendent, has now taken legal possession of the Norambagua mine, Grass Valley, and new machinery is to be at once installed.

Sierra Queen.—A movement is on foot to reorganize the company owning this mine at Nevada City, and to resume active operations.

Chicago.—The owners of this mine at Gold Flat have bought the 10-stamp mill of the Spanish mine, Washington township, and will move it.

New York-Grass Valley Mining Co.—This company at Grass Valley, G. W. Root superintendent, has bought the 20-stamp mill of the Pennsylvania mine at Browns Valley, Yuba county.

Morning Star.—P. Deidesheimer and associates who have bought this mine at Badger Hill are to put up a hoisting and pumping rig.

PLACER COUNTY.

Soldan Mining Co.—This company has completed a suspension bridge across the American river, so that now their pack train can make the through trips from Towles to the mine. Formerly a wire cable was used, necessitating pack trains on both sides of the river.

SHASTA COUNTY.

American Mining Co.—In this mine, near French Gulch, a number of miners have been put at work, cleaning out the old tunnel, laying track, etc. The mine has been for some time worked by leasers, but Superintendent Thomas is about to employ miners to work for the company at regular wages.

Dobrowsky.—It has been decided to put a 5-stamp mill on this mine near Shasta. The mine is under lease to F. M. Johnson, W. H. Nofinger and H. O. Cummins.

SAN DIEGO COUNTY.

Julian District.—In this old district considerable development work is being done. The Los Angeles Mining Co. is running a tunnel on the Warlock, and is now in 800 ft. where they have cut a 14-ft. blende ledge of good ore. They are also running a tunnel on the Chapparral claim. A new shaft is being sunk on the High Peak and another new one is in progress on the Helvetia.

TULARE COUNTY.

Bright Star Mining Co.—At this property, White River, the mill is nearly completed, and buildings for the miners are being put up.

TUOLUMNE COUNTY.

Harvard.—Arrangements have been made to resume work on this mine.

Rawhide.—This famous old mine at Jamestown, owned by Captain W. A. Nevills, is again in bonanza. Much of the ore is being boxed before it reaches the surface, and it is rumored that over \$100,000 was taken out last week.

Longfellow Mining Co.—This property at Groveland has its main shaft down 600 ft., and employs 20 men. A new roller mill is being added. The mine is paying dividends.

Utopia.—This mine has been bonded by Hastings & Block, who have bought the 4-stamp mill at Campbell Flat.

COLORADO.

LAKE COUNTY—LEADVILLE.

The strike at the Arkansas Valley smelter, caused by the wheelers and weighers demanding eight hours, and which lasted for two days, the men returning on the old scale of 12 hours, caused all of the large producers to curtail shipments for a week. The short strike allowed several of the mines to do some necessary repair work, but as the smelter is again running full blast, the mines are again turning out the usual quota of ore.

Sunday.—This company has opened the vein on the apex to the north and found the vein at that point about eight feet wide. The new shaft is several hundred feet north of the main shaft, and the opening of the vein at this point proves it to be continuous and a true fissure. A plant of machinery will be placed on this shaft, and it will be made the main working one on the property. As depth is reached, drifts will be run to connect with the present workings, giving a large area for stoping. The ore in the new find is the same in character as that in the old workings, carbonate of lead running well in gold. From the old shaft 30 tons daily of good ore is being shipped.

Gilt Edge.—This mine adjoining the A. Y. & Minnie and Colonel Sellers, California gulch, was sold during the week to Eastern and local parties, the consideration being \$200,000. The property has been in litigation for several months, but this has been settled and the new company will start work at an early date. The company is known as the S. M. P. Mining Co., with J. H. Crawford, Mendota, Ill., as president. There are two shafts on the property and both will be sunk to the sulphide zone, which has never been prospected. A heavy tonnage of iron has been shipped, and there are still large reserves of this class of ore in the old workings.

Dome.—The prospect work that has been carried on from the bottom of this shaft, has resulted in the opening of a small streak in one of the drifts, but as it is dipping down, the company has decided to do considerable prospecting with the diamond drill to locate the main ore channels. This work will be carried on from the bottom levels.

Rock Hill.—On account of the conditions of the roads, the Reindeer and Murphy shafts have been obliged to curtail shipments. In both properties development work is being carried on and the ore shoots blocked out. Several shafts are at a standstill on account of the accumulation of surface water, and will remain closed until the ground dries up. At the Mike, Frank and Parson shafts work is proceeding satisfactorily. When the roads again become passable, work will be started on the Sullivan and Lucky Joe shafts of the Nisi Prius.

Penrose.—Good headway is being made with the unwatering of the shaft and the water situation is now under control, with the water being lowered at the rate of 5 ft. every 24 hours. At the Coronado there is a slight let-up in the flow of water that was recently opened in one of the drifts. With the amount of work done in the ore

body the ore in the upper reaches is drying out, and is being handled easier. The large body of sand carbonate, opened in the center of the body of lead silicious carbonate, holds its own and the end has not been reached yet.

Ballard-President.—The work of retimbering the Ballard shaft is being pushed, and by the middle of May the work should be completed, when a force of men will be put to work prospecting and breaking ore in the lower levels. A few men are at present at work on the President, following up the small but rich streak of ore that is expected to lead to the main ore shoot.

Penn.—In addition to the work being done by the company, several sets of lessees are doing very well and shipping about 50 tons daily of a good grade of silicious ore. A great deal of the work is being carried on in new territory.

TELLER COUNTY—CRIPPLE CREEK.

Considerable trouble is being experienced by surface water caused by the spring snows. These are, however, about over, and the trouble will soon begin to subside.

Gold Sovereign Mining & Tunnel Co.—The report of this company for 1904 shows: Net tons sold, 6,555; gross smelter returns, \$153,103; net returns, \$100,455. A satisfactory condition in all its properties is reported.

Norfolk.—Deemer and associates are installing a hoisting plant on their lease on this property. It is the intention to do considerable work in sinking and drifting on the property. The property is situated next to the Forest Queen and W. P. H. mines.

Burns-Doyle.—This suit which involved title to a large amount of Portland stock, has been settled in favor of the defendant, Jas. F. Burns. The suit was tried in Council Bluffs, Iowa, and was in progress for a long time. It is understood that Doyle will appeal the case. The suit was the outcome of a misunderstanding with regard to a grub stake agreement a number of years ago.

Forest Queen.—Sinking has been commenced in this mine for another level below the fourth, and when it is completed it is expected that it will open up a considerable amount of ore. The property is being worked under lease by Jas. K. Walsh and associates.

IDAHO.

LOGAN COUNTY.

General Petit.—A 100-ton cyanide plant has been ordered for this mine at Atlanta. New exploratory work is being done on the property, and it is expected that the new plant will be in operation by July 1.

INDIANA.

The fight for control of the Indiana mining field is narrowing to fewer participants, and it is thought that by July 1 the merging process in Sullivan and Green counties will be completed. This will result in four companies. It is understood that not only is every desirable mine wanted, but thousands of acres of coal land as well. There are 30 mines in the two counties, but the desirable lands are held in many instances independent of the company operating the mine. A prominent operator said that \$10,000,000 is not too high a figure for the valuation of the entire property to be merged.

For more than half a century it has been known that the soil of Morgan and Brown counties contains gold. There are old men in these counties who have spent their lives washing dirt, eking out a comfortable living.

The gold in Indiana is 'free' or placer gold, the particles ranging in size from those too small to see with the naked eye to nuggets whose value is from \$5 to \$6. The gold generally is in flat scales, resembling California gold. A company of Indianapolis men has been incorporated for the purpose of developing the Morgan county field along modern methods. This company has leased 640 acres at the junction of Sycamore and Gold creeks, some 21 miles southwest of Indianapolis, and have built a dam and installed a complete modern placer-mining plant.

INDIAN TERRITORY.

CHOCTAW NATION.

Missouri, Kansas & Texas Coal Co.—Thirteen miners were entombed and probably killed by an explosion, on April 30, in this company's mine near Wilburton. It is suggested from the force of the explosion, which could be heard for miles around and which tore heavy timbers aside and piled tons of dirt into the shaft, that a bad shot set off some dynamite which had been stored conveniently for work in pushing the entries. The shaft is 350 ft. deep. The men were supplied with air fanned from the shaft and by means of compressed air tubes. It is thought that the air pipe was burst by the explosion, but the air has been steadily pumped all day with the remote hope that some of the entombed men escaped the force of the explosion and the after damp.

LOUISIANA.

CADDO PARISH.

Shreveport.—The first two barrels of oil shipped from this field were sold for the fancy price of \$2 per bbl. Six hundred bbl. have been sold for \$1 per bbl. The pipeline from the field and the loading racks have been completed. The Lalex Oil & Pipe Line Company's well is down 1,600 ft.; other wells drilling are the Caddo Oil & Mining Co., J. C. Richardson, C. W. Brown.

CALCASIEU PARISH.

De Quincy.—The Perkins Sulphur, Oil & Mining Co., T. J. McBride, president, has been organized and will develop their property at once.

Jennings.—The supreme court has granted a rehearing in the case of Louisiana Latrielle Oil Co. vs. Jennings Heywood Oil Co. The suit involves the rights to a valuable 40-acre tract in the proven field and was decided in favor of the last-named company by the circuit court. A petition has been filed asking for the appointment of a receiver for the Rayne Planters' Oil & Development Co. New gushers—Mary Ellen Oil Co., Flynn well—new pumper Jennings Heywood Oil Co. The production is about 25,000 bbl. daily.

The Union & Sulphur Co. has installed an additional battery of boilers. They are now using 48 boilers of 150 h.p. each, and employ over 600 men. Shipments are increasing rapidly.

Welch.—After many disappointments and large expenditures of money for wells, tankage and loading racks, this field finally has a gusher. The Terry well is flowing 1,200 bbl. daily, and active development will be much stimulated.

MICHIGAN.

HOUGHTON COUNTY—COPPER.

Copper Shipments.—Shipments of refined copper are now being forwarded east by the mixed lake-and-rail route. For a time the wrecking of the drawbridge over Portage lake at Houghton and Hancock prevented copper shipments going forward by boat. The Calumet & Hecla smelter, which is located on Torch lake, did not start shipping by boat until late.

Elm River.—Operations are confined to driving two drifts on two lodes encountered in the crosscut from the bottom of No. 1 shaft. Last week this crosscut passed through a lode 1,800 ft. from the shaft. From foot to hanging it measures 15 ft. While the quantity of copper exposed is not large, the lode has a healthy appearance, and is deemed sufficiently promising to warrant further investigation. To this end a drift has been started north on its course and another drift will be driven southward. Some 600 ft. from the shaft is a lode encountered in the crosscut some time ago. It has been designated as the "No. 8 Lode," it being the eighth vein which the crosscut encountered coming west from the Winona, in which the shaft is sunk and from which the crosscut starts. This lode, No. 8, showed a fairly large amount of copper in the crosscut and is being opened by a drift to the southward. Where intersected by the crosscut the vein is 35 ft. wide.

Osceola Consolidated.—Operations in the North and South Kearsarge branches were resumed this week. The company had previously discharged 800 men, including all those who struck for a 10 per cent. increase in wages, and in reopening the mine all men were hired anew, irrespective of former positions and under the same conditions as had existed before the strike.

Quincy.—Machinery necessary for the conversion of one head in the mills at Mason to the steeple compound type has been delivered by the Nordberg Manufacturing Co., of Milwaukee, Wis.

Wyandot.—Work is confined to the exploration of the lode revealed in the bed of the Misery river and the Winona lode. The shaft on the Winona lode is 410 ft. deep, on an incline conforming to the dip of the vein. A crosscut has been started from the bottom to intersect the lode, which will be opened by drifts north and south as soon as penetrated. A vertical shaft has been sunk on the Misery river lode on section 16 and crosscutting is under way.

MISSOURI.

ST. FRANCOIS COUNTY.

St. Joe Lead Co.—This company has optioned the 3,000 acres of land belonging to the Big River Lead Co. in this county, and is now testing it with two diamond drills. A new shaft, No. 13, is about to be started at Bonne Terre to open up ground at the northern end of the old mine. Ten additional jigs have been added to the mill at Bonne Terre, to increase the output and improve the quality of the work.

Doe Run Lead Co.—A new large central electric power plant is being installed at Flat river, from which power will be distributed to the four Flat river shafts that will effect a large saving in fuel.

Central Lead Co.—The property of this company has been sold to the Guggenheim Exploration Co. for about \$1,500,000. This adds nearly 2,000 acres of the richest land in the Flat river basin to its already extensive holdings, and will give the company

three operating mines. The Central property has been a very profitable one, as it has continuously declared dividends since it began in 1896, besides paying for its large and very complete plant, mining, milling, smelting and railroad plants.

NEVADA.

LINCOLN COUNTY.

Bamberger-De Lamar.—The ores being mined and milled here equal 11,000 tons per month. E. M. Rogers, of New York, consulting engineer of the company, was recently in Salt Lake City. Steps are being taken to erect on the property a plant to treat the tailing that has accumulated to the amount of about 500,000 tons. The new plant will have capacity to handle 5,000 to 6,000 tons of this tailing per month, by cyanidation.

NYE COUNTY.

Great Bend.—Through negotiations made by Frank B. Cook, of Salt Lake City, one-half of the controlling interest in this property at Goldfield has been acquired by Edsall, Key & Co., of Colorado Springs, Colorado.

OREGON.

BAKER COUNTY.

Monumental.—At this mine a 2-ft. vein of ore has been struck in the first level in the winze on the lower tunnel. It carries 800 oz. in silver and from 3 to 5 oz. in gold, or about \$500 to the ton. The ore ledge is 20 ft. between walls, and besides the rich streak in it all the ledge matter is milling ore. The Monumental is one of the oldest and best known properties in the Granite camp. C. J. Allen is general manager of the property, and the mill now in use was installed 25 years ago and is one of the historical landmarks of the upper camps.

Mattoon.—Manager Butler, of the Mattoon Mining Co., operating a group of claims in the Pocahontas mining district seven miles west of the city, reports that they are progressing at a good rate with a large force of men; that they have put on new men and expect to have shipping ore in a short time.

Belmont.—Gilkey & Kershaw, who have been prospecting in the mountains west of Baker City for a number of years, have struck ore in this mine, Greenhorn district. The property was formerly worked as the Star placer grounds, and from it many thousands of dollars were taken out in placer mining. These men have opened a pair of ledges from the surface of which only a few feet down in two days' operation, and with a hand mortar and pan, they took out \$30,000 in nuggets, which have been placed on exhibition in the banks and stores of Sumpter. Much of the gold is in wire shape, and some of it nuggets. A rush has been made to the camp, and grounds are being staked out in every direction.

PENNSYLVANIA.

BUTMINOUS COAL.

Eleanora.—Twelve men were killed and one man was probably fatally injured in an explosion at this shaft, at Dubois, April 28. Until the official investigation has been made the cause of the explosion cannot be ascertained. The mine officials are emphatic in the assertion that it was not caused by gas. It is claimed that the shaft was exceptionally free from gas. The theory is that a charge of powder was put in a hole surrounded by hard material which resisted the explosion, the charge being blown out.

H. C. Frick Coke Co.—It is announced that this company has purchased the in-

terests and properties of the Hecla Coke Co., in the Connellsville region, at a reported price of \$6,000,000. The deal includes lands, and over 1,000 ovens at Hecla and Trauger.

Sterling.—Operations have been resumed at this colliery after an idleness of about five months, during which repairs have been made.

TEXAS.

HARDIN COUNTY.

Saratoga.—New wells since last report are Sun Oil Co. No. 1, flowing 500 bbl.; Guffy Petroleum Co.; Cotton well drilled in 26 days flowing 2,500 barrels.

HARRIS COUNTY.

Cedar Bayou.—The Cedar Bayou Oil Co. well is down 1,600 feet.

Humble.—The Texas Co. pipe line from the field to Houston is now in operation. The loading racks at Houston accommodate 42 cars and about 10,000 bbl. of crude is being delivered every day.

New Wells.—Simms, flowing 2,000 bbl.; L. M. Hoge, flowing 6,000 bbl.; Guffy Petroleum Co., flowing 6,000 bbl.; House & Beatty 5, flowing 2,000 bbl.; House & Beatty 6, flowing 8,000 barrels.

JEFFERSON COUNTY.

Beaumont.—The Warren Oil Co.'s well north of Spindletop, has been abandoned at 1,400, on account of salt water. The Texas Co. has made a careful estimate of the loss occasioned by seepage and evaporation on crude oil stored in earthen tankage at Humble since the field came in. As a result they have deducted 17 8/10% on all deliveries made to them at that point. The capital stock of the Texas Co. was recently increased from \$3,000,000 to \$5,000,000.

Crude quotations are posted as follows: Spindletop, 34c.; Sour Lake, 30c.; Saratoga, 26c.; Humble, 15c.; Batson, 26 to 28 cents.

Production in Texas and Louisiana in March exceeded the consumption by 1,600,000 bbl., and the oil in store is said to aggregate 18,000,000 barrels.

MATAGORDA COUNTY.

Matagorda.—The Sante Fe Co. has abandoned operations in the Big Hill field.

TYLER COUNTY.

Colmesneil.—The Oklahoma Texas Oil Co., well is down more than 2,000 ft. and is progressing very slowly.

UTAH.

BEAVER COUNTY.

Newhouse Mill.—The plant of the Newhouse Mines & Smelters Corporation, at Newhouse, will be operated up to its maximum capacity of 800 tons within the next 30 days. President Samuel Newhouse has also announced that other units are to be added in the near future, and that he hopes to see the capacity brought up to from 2,000 to 3,000 tons per day within the next two years.

CACHE COUNTY.

Crown Mining Co.—Articles of incorporation have been filed at Logan. The officers are: Leo Nielson, president; H. A. Lafount, vice-president; Fred A. Scholes, secretary; Karl Schaub, treasurer, all of Logan. The company will operate property in Blacksmith's Fork cañon.

JUAB COUNTY.

East Tintic Mining Co.—This company has filed its articles of incorporation with

a capital stock of 500,000 shares of 10 cents each. The company has acquired a group of 10 claims in East Tintic. Officers are: George L. Smart, president; William M. Shepperd, treasurer. The headquarters are at Springfield, Utah.

Utah.—This company is marketing ore regularly, about a carload per week. A lot settled for this week sold on controls showing 144 oz. in silver and 33% lead.

MORGAN COUNTY.

Carbonate Hill.—The tunnel being driven at this property has been completed to the length of 425 ft. It will tap the ledge towards which it is being driven at a vertical depth of 700 ft. Miles Finlen, of Butte, and John A. Creighton, of Omaha, are the principal owners.

WASHINGTON.

FERRY COUNTY.

Ramore.—A fine body of copper-gold ore has been encountered in a crosscut from the winze, 25 ft. below the adit level.

California.—A new deposit of high-grade ore has been discovered on the 100-ft. level.

Ben Hur.—Two cars of ore were recently shipped.

Oversight.—By driving a number of open cuts, the company reports having satisfactorily traced the vein by the exposures made, and there is talk of sinking a deep shaft.

Foreign Mining News.

AUSTRALIA.

QUEENSLAND.

The Mines Department reports the production of gold in February as follows: From quartz mines, 45,210 oz.; old tailing piles, 665 oz.; alluvial workings, 831 oz.; total, 46,705 oz. fine gold. This is a decrease of 4,069 oz., as compared with February of last year.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary Ore Shipments.—Shipments for the week ending April 22 were as follows, in tons: Granby, 9,850; Mother Lode, 3,500; Brooklyn, 315; Rawhide, 180; Mountain Rose, 231; Stemwinder, 70; Oro Denoro, 70; total for week, 17,051; total for year, 284,164. Shipments given last week as for April 8 should have been for April 15.

BRITISH COLUMBIA—ROSSLAND DISTRICT.

Rossland Ore Shipments.—Shipments for the week ending April 22 were as follows, in tons: Le Roi, 2,525; Centre Star, 2,080; War Eagle, 1,170; Le Roi No. 2, 150; Jumbo, 200; Spitzee, 270; total for the week, 6,395, and for the year, 108,952. Shipments given last week as for April 8 should have been for April 15.

QUEBEC.

Calumet Mining & Milling Graphite Co.—An effort is being made to again interest capital in the development of this graphite property, situated at Calumet, in the township of Grenville. Pennsylvania people have promoted the company with a capital of \$1,000,000. The property consists of 258 acres, and the work already done shows a shaft, 12 by 25 ft. sunk to a depth of 80 ft., and an open-cut of 50 ft., from which several hundred tons of good flake graphite have been taken.

DIVIDENDS.

Gold, Silver, Lead, Quicksilver and Zinc Companies—U. S.

Coal, Iron and Other Industrials—United States.

Main table containing dividend data for various companies, including columns for Name of Company and Location, Authorized Capital, Shares Issued, Par Value, Total to Date, Latest Date, and Amount.

Canada, Central and South America, Mexico.

NOTE.—These dividends are published gratuitously. Readers are invited to send any additions or corrections which they think necessary to complete our list.

THE ENGINEERING AND MINING JOURNAL
 MINING AND METALLURGY ESTABLISHED 1866

Modern Crushing and Grinding Machinery.

BY PHILIP ARGALL.

The recent discussions on fine crushing and grinding with stamps, pans and tubemills appear to accentuate the principle of crushing by "successive comminution," a process that, with others, I have for many years not only advocated, but also put into successful operation.

The idea that all the stages of the process can be carried out by one machine, be it roll, stamp or patent pulverizer—and their name is legion—appeals strongly, both to the uninitiated and the so-called practical man, "he who practices the errors of his predecessors," on account of its apparent simplicity. One machine is to do everything, that is to say, take rocks of 2-in. cube and crush them to pass a screen aperture of say 1/50 in.; if it amalgamates at the same time, so much the better; and should it be able to perform other functions, why that simply enhances its value, although adding greatly to its complications. The United States, with more inventors to the square mile than any other country, can lick creation on patent pulverizers and crushers that are able, unaided and alone, to crush and grind coarse rock to infinite fineness; and the list is being momentarily enlarged by well-meaning farmers, backwoods lumbermen and ingenious mechanics, most of whom have never seen a mine, and who often lack even the elementary knowledge of the practical requirements in ore reduction. To these inventors it is as well to clearly state, that the single machine for fine-grinding coarse rock is fast passing into the friendly oblivion such machines are so eminently fitted to adorn.

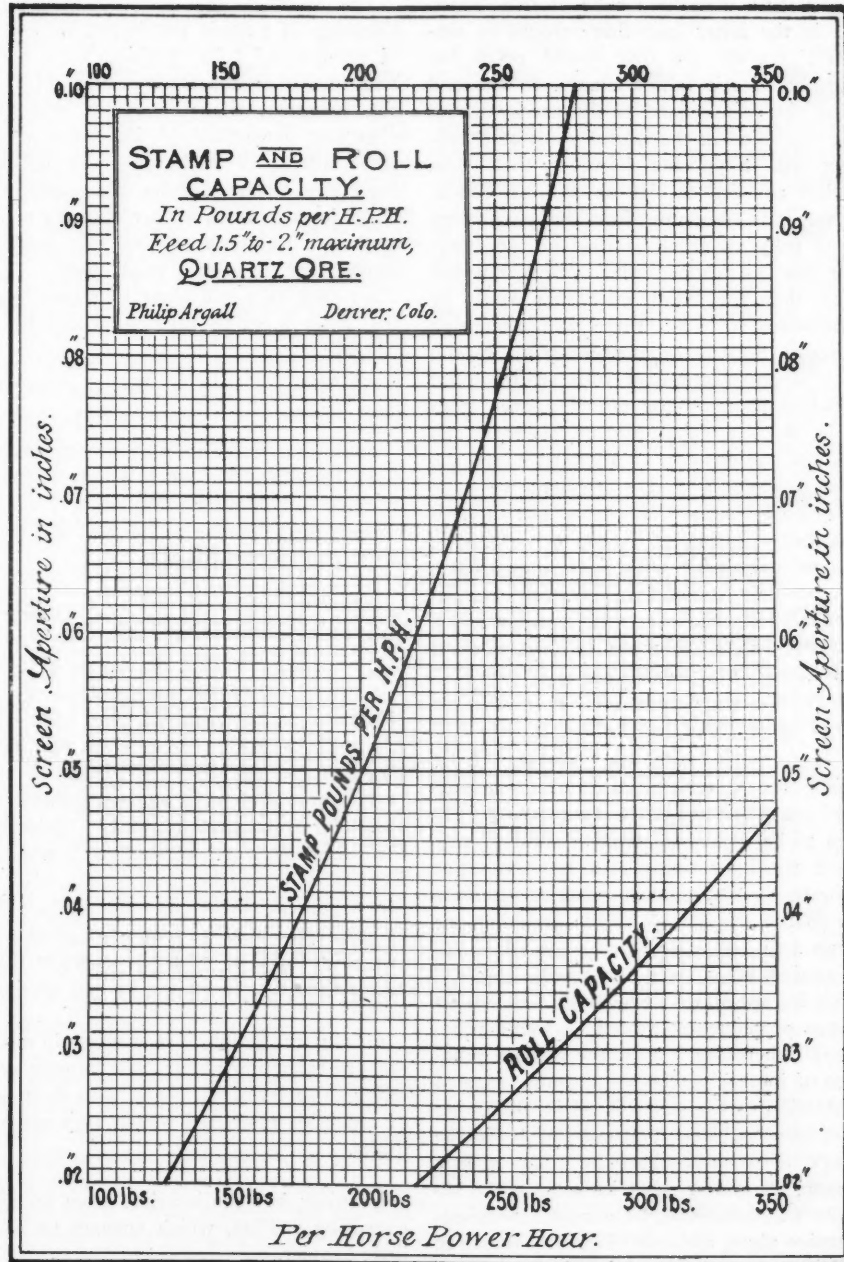
Those of us who have investigated the mechanical efficiency of a given machine, meaning thereby the pounds of ore crushed per horsepower-hour from, and to, stated maximum sizes, know that each machine of value has its economic limit, at which it will give the maximum output in pounds per horsepower-hour, and also that there are fixed ratios of reduction that should not be exceeded. These limits, however, are not in every case determined, yet I have no hesitation in stating that the machine which reduces a 2-in. cube to pass a 1/50-in. screen-aperture, in one operation, is a very inefficient apparatus, even if it should prove to be the most modern 1,350-lb. stamp.

I have elsewhere shown that the efficiency of a rock-breaker falls off rapidly when a reduction exceeding 4 to 1 is attempted, say 8-in. to 2-in. cubes, and the same rule holds good for rolls—that for reducing ores below two inches, rolls are vastly superior to rock-breakers, for the

reason that while both machines work practically on the same principle, one is an unbalanced, or, at best, imperfectly balanced, intermittent-action, reciprocating machine, and the other a perfectly balanced, continuous-action rotary machine. Large rolls could be constructed that would compete favorably with rock-breakers on sizes above two inches, but they would be heavy, cumbersome and difficult to transport to the metal-mining regions, so I hold that the combination of breakers

from 2 in. to about 0.02-in.; below this their efficiency falls off. With average quartzose ores I have reduced with four rolls in series 330 lb. per horsepower-hour from 0.75 to 0.02-in., crushing dry, and I believe practically as high an efficiency can be attained in wet crushing with a properly designed roll, regarding which I hope to have something further to say in the near future.

Now, it may be asked, what is the economic range of stamps? Some say, it



and rolls I have indicated best answers our present requirements in metal mines, where the rock going to the breakers is never of unusual size—as quarry rock, for example.

The reason that a 4 to 1 reduction should not be exceeded in rock-breakers is obvious to anyone, and to a great extent the same rule applies to rolls. The economic limit of rolls, crushing dry, is

matters not whether the ore is fed in pieces up to cubes of 2-in. maximum, or in cubes as small as 1/2-in., the capacity through a given screen-aperture will, in either case, be the same; while others claim a larger output for the 1/2-in. feed; good men can be found supporting either side of the argument. Now, I hold that recent practice has quite wrongly placed on the stamp much of the work that can

be better performed by breakers and rolls, and this error has been intensified by constantly increasing the weight of the stamp, so that it can smash any sized rock that enters the mortar. Passing to the other extreme, the stamp is not an efficient fine-crushing machine—never was, nor from its construction can it ever be. It is just possible that a 1,250-lb. stamp might sink through a ½-in. bed and even strike the die, and so a well-prepared ore might, under these conditions, show even a lower stamp-efficiency than if the batteries were fed with a maximum cube of two inches, as in the latter case there would be material on the die that would resist the weight of the falling stamp, to the end that the greater part of the energy would be expended in the useful work of crushing ore. Supposing, however, that ½-in. cubes are fed to, let us say, an 800-lb. stamp, and the output from the latter stamp was fully as great as that of the heavier one (as in most cases I know it would be), then the stamp advocates would be compelled to admit there was something wrong. So it becomes necessary to reason out, whether stamps or rolls are the more efficient machine for reducing ores from 2 in. to ½ in. cubes, and to this there can be but one answer, as all must admit the stamp is not a coarse crusher; we have previously seen that it is not a fine crusher. Hence, if it has an economic range comparable with modern machines, it must be somewhere between 1/2 in. and 1/50 in., and even within this range I maintain rolls are more efficient, even if the stamps are used in series in order to secure in their operation the benefits of "successive comminution."

The trouble with stamps—apart from their being reciprocating machines in which a dead weight of 1,000 to 1,350 lb. has to be picked up from a state of rest by a rapidly rotating cam 100 times per minute—is that modern practice attempts to do too much with them; crushing ore from 2 to 0.02 in. is a reduction of 100 to 1, against say 4 to 1, for other classes of crushing machines. Surely this enormous range of reduction cannot be sound practice? Therefore, I hold, the modern practice of increasing the weight and range of reduction of the stamp is all *in the wrong direction*, and that in attempting to do the work of rock-breakers or rolls with a stamp, no matter what its weight, the results will invariably be a much more expensive plant, and one of greatly impaired efficiency, as measured by the weight of rock crushed per horsepower-hour.

To lift 1,250 lb. to crush a 2-in. cube of hard rock may be defended, but to use the same weight on, say, 0.08 and 0.04-in. particles to reduce them to pass a 1/50-in. screen-aperture, does not appeal to any sense of fitness. This brings up another point: large pieces of rock yield best to a crushing force, smaller ones to grinding, and while there is some grinding action

between the large and fine rock in a stamp-mortar, it is on the whole insignificant, and for this reason pans and tube-mills are vastly more efficient for reducing sands and fine ore than stamps or any other form of crushing or impact machines.

I do not desire to establish any set figures regarding the weight of stamps or the fineness of the ore fed to them; such factors will depend somewhat on the nature of the ores treated in any given case, and can be worked out by those in charge of stamp-mills.

The accompanying diagram shows the efficiency in pounds per horsepower-hour of stamps and rolls crushing from about 2 in. to 1/50 in. maximum. I would point out, however, that the stamp will give a greater proportion of fine material; in other words, in discharging through the same size screen-aperture the stamp will crush from 10 to 15% finer than the roll—used as a wet crusher—and this must be allowed for, as useful work done.

My idea of a roll plant to reduce ores, dry, from 2 in. to 1/50 in. would be as follows:

Rough rolls.....	from 2	to 0.75 in.
Second "	" 0.75 "	0.24 "
Third "	" 0.24 "	0.08 "
Fourth "	" 0.08 "	0.02 "

Taking a crushing and amalgamating plant in which the ore is finally reduced to 1/400 in. for filter-press work, I would suggest the following as the best and most economical arrangement:

Rock-breakers.....	to 2.00 in.
Rolls in series crushing wet.....	" 0.06 "
Grinding and amalgamating pans.....	" 0.02 "
Tube-mills.....	to infinity

The pan-mill might be depended upon to catch most of the amalgamable gold; plates would be required only after the tube-mill, to catch such gold as had been liberated by the finer grinding. I can even conceive of such an arrangement of plant for amalgamation only. Stopping the tube-mill work at such a degree of fineness as gave the best results—call it for argument 1/100 in.—and it can be demonstrated that with such a plant ore can be reduced to 1/100 in. cheaper than by stamps to 1/50 in. in the best modern mills.

Finally, the stamp, if it survives in modern ore-reduction plants, will be only one unit in a series of machines, with its range of reduction restricted within very narrow limits.

Uranium has the heaviest atom known, excepting radium, which appears to be a little heavier.

The use of phenol-phthalein as an alkaline indicator in examining portland cements, to identify free lime therein, is complicated by the fact of the possibility of the formation of an insoluble salt of calcium oxide with the indicator, which is itself an acid. Hence a negative result (the absence of a red color) does not necessarily indicate that there is no free lime in the cement.

Custom Smelting in Australia.

BY AN OCCASIONAL CORRESPONDENT.

The Dapto plant of the Smelting and Refining Company of Australia is shut down pending reorganization. This is not the first time this company has been in difficulties. Since its establishment the management has passed through several hands, mostly gentlemen of experience and reputation, trained in America, and with a record of success elsewhere. The company has had large sums subscribed and expended, and of late has been favored by the Railway Department with lower rates. It has cheap coal, and is near Sydney. It seems evident that the smelting business has not paid.

This is nothing new in Australia, for not one of the works established for the custom treatment of mixed ores has been a permanent success where dependence was placed entirely upon purchased ore for its business. All the early plants have disappeared, while of those which remain only a tin smelter and a couple of chlorination works can be said to pay. The Dapto, the Tasmanian and the Fremantle works are all frequently in difficulties, while the Queensland Smelting Company, at Aldershot, has never paid a dividend, and probably never will.

What is the cause of this state of affairs? It cannot now be set down to the incompetence of Australian engineers, or to lack of capital. Is it scarcity of ore, or some other factor peculiar to the country? A disinterested observer acquainted with the facts will say that there is something in both these surmises.

Let us examine the ore supply. The ordinary citizen who reads the daily papers, with an occasional glance at the Annual Reports of the Mine Departments of the different colonies, believes that the country teems with mineral wealth of every kind. In support of this idea he will quote the undoubted large gold output of Australia; he will also talk of sundry large mines of world-wide fame, and will refer to the aforesaid departmental reports as witness to the vast mineral deposits to be found in all the colonies. In this there is some truth. The eastern side of Australia consists of elevated land, the backbone of which is granite, and on the edges of this mass of granite mineral veins occur at short intervals, from the extreme north to the extreme south of the continent. And further back, in the interior, outcrops of ancient rocks are frequent, and they all contain mineral veins. But most of these veins are small—disappointingly small—to the mining engineer who has to tramp up and down the precipitous slopes of the mountain ranges, to examine the old and new 'shows' which are constantly being submitted to him as "requiring only capital, sir, to equal" Broken Hill, or Mount Morgan, or the latest sensational crushing reported in the mining columns of the local press.

These small veins, especially those bearing gold or tin, are numerous enough, and have been eroded long enough to furnish extensive alluvial deposits, which have furnished most of our mineral yield, and have made most of our population 'diggers' at one time or another. And a digger, if he has once struck a patch, is a miner ever after. If he becomes a successful publican or politician, he is a standing witness to the mineral wealth of the continent. Is he not a practical man? Such a man will tell the "distinguished visitor" traveling round the country on a free pass that we need more treatment works, not more ore. And the Mine Department reports will give him the same impression.

The officials sent to examine the mines for these reports are, with few exceptions, young and enthusiastic geologists, with no previous experience, and their reports are generally based on a hasty examination of the few shallow shafts first sunk on the lodes in the oxidized zone. Correct as far as they go, they are blind leaders of the blind, if taken as guides to the commercial value of the deposits. The old reports, which purport to give the tonnage and yields, are still more misleading, for the figures have usually been obtained from some local identity whose memory has magnified the figures in proportion to the years which have passed since the work was done, and the floods have washed away the tailing.

But a critical search among even these reports will show very few deposits which, if actively worked, could be made to yield as much as five tons of ore per day. The vast majority would take two men a month to get out five tons, and then it would have to be oxidized ore. On the eastern side of Australia the water level is seldom 100 ft. below the surface; on the coastal slope it is often under 50 ft. from the surface, consequently the enriched oxidized ore is extremely limited, and the decomposed country the same. The veins carry rich ore generally where oxidized, and the small veins are easily worked, but as soon as the water level is reached the value per ton falls off in the usual manner, and the country becomes too hard to make the small veins payable, even if they had maintained their value. Hence the continual finding of fresh 'mines' and the repeated disappointing failure shortly afterward.

Further west the deposits are oxidized to greater depth, and the lodes are found much larger, although further apart. It is in the dry western country that the lasting mines are found, and where they may be expected to be found in the years to come. But these western mines will not supply the custom smelter, for reasons which will be discussed later. He must rely upon the many mines too small to warrant a treatment plant on the spot. It is a very small gold mine which will not warrant a crushing plant of some sort, and it is gold which is the prevailing metal in the lodes of

Australia. The custom smelter looks to ores of lead and copper, with silver and gold intermixed, for his supplies. It is to be feared he will look in vain, for nine-tenths of the veins are too small to supply what a modern plant requires, if they were all worked for its benefit; and the other tenth will not, for reasons which will now be discussed.

Australia is a big place, about as large as the United States, with a population of under four millions scattered over it, but concentrated for the most part on the southeastern seaboard. It is supplied with a few long railways, which are the property of, and managed by, the State. These main lines of railway have not been built for the mineral industry, and, in fact, generally run far from the rough country where the veins of ore are found. In very few cases are there branch lines running to mineral districts. The public policy is to keep the railroads in the hands of the government, and to prohibit privately owned lines; consequently it is almost impossible to get a railway to a mining field. Speculative mining railways have no chance whatever, so that when a mine is considered big enough for a railway it has already proved itself big enough to treat its own ore. If it is not big enough to treat its own ore, it most certainly will never get a railway. In that case it must sell to custom smelters, and one would imagine the opening wide enough for success.

But here the transport difficulty comes in. No railway to the mine means carting from the mine to the nearest railway station, at a cost of from 15c. to 30c. per ton-mile. It is not often that a mine is less than 20 miles from a railway, which means an expense of at least \$4 per ton for cartage; to this must be added cost of bagging and the rail charges. The latter are low in certain colonies, but not nearly so low as in America, and few of the mining districts are under 200 miles from the coast smelters. The total expenses for all these items to any smelter in Australia from any of the well-known mining districts probably average \$10 per long ton.

If a mine can supply 100 tons of ore per week the difference between poor local treatment and the best custom returns will not amount to \$10 per ton; so it pays to erect a small plant and run it indifferently, rather than sell to a custom smelter on the coast. And, further, the markets for metals are in Europe or Asia. Australia uses but a small proportion of its metallic production. Consequently the custom smelter, when he gets his ore, has still to bear freight and realization charges on the metal he extracts, and the miner who treats at home has to pay no more. In fact, once the ore is at the seaboard the largest item in expense has been incurred, and it is cheaper, in any except the lowest grade of ores, to send the material to Europe at once. Smelting rates are cheaper in Europe, and the metal has

to go there in any case. Banking facilities enable these shipments to be financed cheaply. It does not pay to sell any ore worth over \$50 a ton to a custom smelter in Australia, unless the values are wholly in gold or silver. With matte, bullion or concentrate the advantages of selling in Europe are still greater.

The custom smelter is therefore confined to the treatment of dry gold or silver ores or concentrate, which is rich enough to bear the high transport charges, from mines too small to warrant the erection of treatment plants on the spot. For this he has, then, to buy his lead or copper collector at a loss or at no profit. The sole advantage of the coast smelter lies in the cheapness of his fuel. With the metals mentioned above, this is too small to counterbalance the heavy transport charges. Whether it may prove sufficient to lead to a profitable zinc-smelting industry in the near future remains to be seen, but one would think there is more hope of success in that direction, where cheap fuel is of the first importance.

It will be recognized that, under the circumstances above detailed, it is not surprising that custom smelting has not been a profitable business, and it seems unlikely that the American practice can be followed in Australia—at least, not for many years to come.

Spanish Mineral Trade.

Imports of fuel into Spain for the two months ending Feb. 28 were 306,669 metric tons of coal and 26,792 tons of coke. Exports of minerals for the two months are reported by the *Revista Minera* as follows, in metric tons:

	1904.	1905.	Changes.
Iron ore	1,094,641	1,003,606	D. 91,038
Copper ore	157,757	164,480	I. 6,723
Zinc ore	18,949	12,090	D. 6,859
Lead ore	1,662	1,419	D. 243
Pyrites	64,983	92,487	I. 27,496
Salt	52,204	63,060	I. 10,856

Exports of metals included 11,090 tons of pig iron, an increase of 5,287 tons; 3,778 tons of copper, a decrease of 1,369 tons; 338 tons of spelter, an increase of 32 tons; 23,582 tons of lead, a decrease of 4,760 tons from the corresponding period last year.

The power generated in a modern steamship in a single voyage across the Atlantic is more than enough to raise from the Nile and set in place every stone of one of the great Egyptian pyramids.

One cubic foot of dry air at ordinary temperature and pressure weighs about 0.074 lb., or 1.18 oz. Some of the high-efficiency fans throw over 336,000 cu. ft. of air per minute. This means a volume equal to a cube over 59 ft. on a side, and an actual weight of over 12 tons. The weight is not striking, but the volume required to gather this, together with the friction and the heat of compression, all comprise a mechanical condensation of great significance.

The Mesabi Iron Ore Range.—XI.

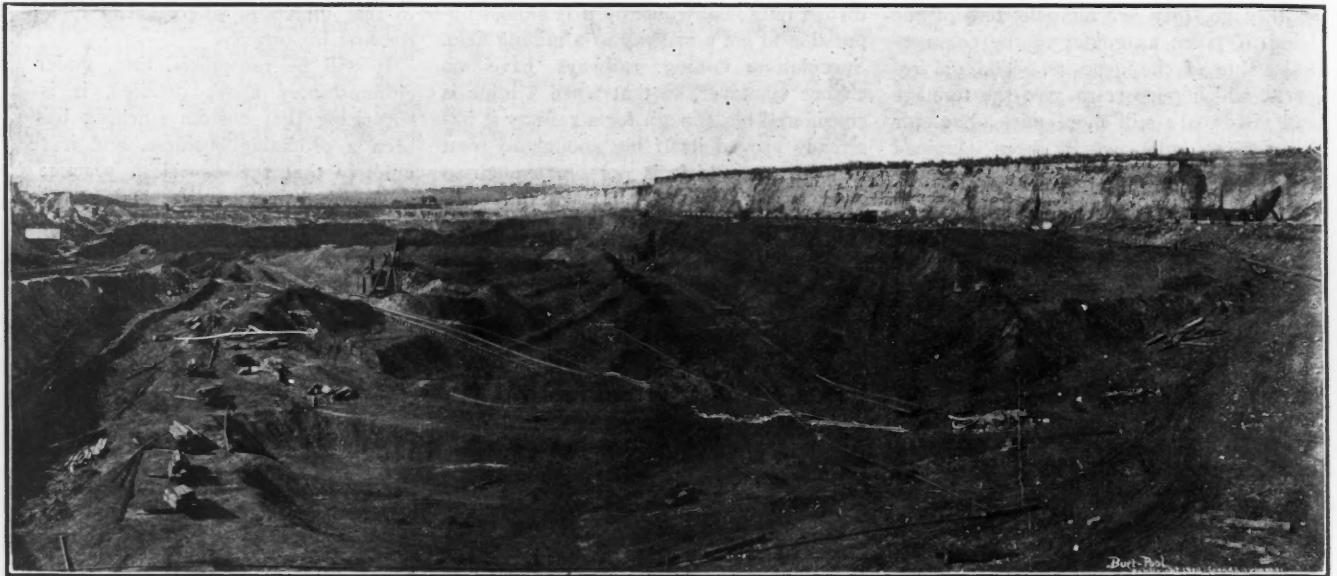
By DWIGHT E. WOODBRIDGE.

Little has been said in this series as to the enormous extent of the Mesabi range. Few have the information requisite to enable them to make an accurate statement, and most of those do not care to be quoted. C. K. Leith said (in Vol. XLIII, *Monographs of the United States Geological Survey*) that "the tonnage of individual properties ranges from a few thousand up to a possible maximum of 70,000,000 tons. Several deposits are known to have between 20,000,000 and 40,000,000 tons of ore. The total amount of ore of present marketable grade, that is, containing above, perhaps, 58 to 59% metallic iron, now in sight on the Mesabi range has been estimated at 500,000,000 to 700,000,000 tons. Six hundred millions is a commonly accepted figure. Of this, with proper mixing, perhaps 60 to 70% is bes-

may not be available, while a 50 to 52%, differing somewhat chemically and physically, may be sought after. This letting down of the bars has brought in a part of the 'enormous tonnage' of which the author speaks. There is, too, no question but that Mr. Leith was quite conservative in his original estimates of the amount of merchantable ore in sight at the time of his monograph, in 1902, as well as in his estimates of tonnage in single mines. Additional discoveries of high-grade ores have been made since then, though in comparatively small volume. A large amount of work has been done in parts of the Mesabi not then considered favorable, and much ore has been found and is now to be developed; indeed, an important operation has already begun. This is in the western end of the range, where the ores

mented in the future by a continuance of the same policy. While it is doubtless true that the large orebodies of the Mesabi have been found, and that deep drilling is not likely to discover the additions to reserve that a few years ago were thought probable, the range has probably not all been found. There are, too, many unopened orebodies, known to their owners, whose size and importance are far more than the public appreciates. These are held largely by concerns whose opened mines are amply sufficient for their present requirements, or by those whose chief interest in the Mesabi is the tonnage it may bring them, and who have no desire to open mines until this can be utilized, not only to furnish the traffic they may contain, but, by outside agreements, to add still further to the tonnage under control of their owners.

As to the minimum limit of quality that may be shipped from the Mesabi range in



BURT-POOL MINE, WITH SHOVELS MINING AND STRIPPING.

semer ore. These figures are necessarily based on incomplete data, but they are commonly accepted by those best qualified to judge. Ore running below 58 to 59% in metallic iron is known to be present in enormous quantities, but the amount has not been estimated, nor are the data for an estimate likely to be available for some time to come. Within recent years steps have been taken to reserve the best of it. Ores running as low as 50%, while not exploited, are being put away by the large companies for future use. . . . The aggregate amount of high-grade ore in sight on all 'old ranges' of Lake Superior up to 1902 has been thought not greatly to exceed 350,000,000 tons."

Since the publication of this statement there has been a sharp increase in the demands for ore, and today it is not a limit of 58 to 59% that marks merchantable ore, but one several points less, say 55%, this depending more or less on other characteristics of the ore. One 55% iron

are so sandy as to require concentration. Experiments in the washing of these ores have gone far enough to determine that it will be a matter of mere mechanical separation with water, and at small expense, while the product will be an excellent coarse ore of good grade. This knowledge has added many million tons to the reserve of the Mesabi district and is liable to increase it still more, for the development of the western Mesabi is probably still in its early stage.

As a last word in this connection, let it be remembered that those who have based a calculation on the period of existence of the Mesabi range and of those concerns whose basis it is, upon the tonnage estimates that have been commonly accepted, are liable to find themselves unpleasantly mistaken. This is in no way reflecting on such estimates as the naturally conservative one of Mr. Leith, quoted above, but because of the increases that have been mentioned, and that are liable to be aug-

future, there is probably a general misapprehension. It is accepted that, because the merchantable limit has been reduced from 58 or 59% to 50 or 55%, this may keep on, and that even 40% ore may be shipped from the Mesabi in due time. This belief is not borne out by the facts, and it will be many years before any such low grades can be commercially sent forward. There are hundreds of millions of tons of lean silicious ores, largely bessemer, on the Marquette and Menominee ranges that will come in long before any Mesabis of equivalent iron content. This will be for the reasons that these old-range lean ores are excellent physically, being hard and dry; that they are low in phosphorus and high in silica, assaying about 40 to 45% iron, and 35 to 38% silica, valuable therefore as mixing ores; that they can be easily mined, being in large masses and usually quite close to the surface; and that they are about 55c. per ton nearer a market than the Mesabi ores.

Despite the great tonnage of the Mesabi and the opportunities that have existed for getting possession of ample ore reserves, few of the various steel-making companies of the country have, until recently, seemed to appreciate the importance of a large surplus store of iron ore. Some have gone on building great works for the reduction of ores and the manufacture of steel products, without realizing that these required something more than executive ability, money and the brains that it could secure to insure successful operation, and that neither of these most important and desirable factors would make an iron-ore deposit. It has taken countless ages and the processes of Nature in the dim and hidden recesses of her splendid laboratories to lay down the ore that is now so

When the United States Steel Corporation was organized, in 1901, but few large steel-makers had seen the drift of things, and had recognized the preponderating importance of the Mesabi range. Foremost was the Carnegie Steel Company, which held a majority of interest in the Oliver Iron Mining Company, with its splendid groups of mines in all Lake Superior districts. The preceding year the Illinois Steel Company and the Minnesota Iron Company had coalesced, and the resulting consolidation, the Federal Steel Company, had at that time the only complete chain of ownership from mine to furnace. In other words, it owned mines on three ranges, a railway to carry its ores to Lake Superior, and a great fleet of modern ships. The American Steel &

alone upon the iron trade, but upon the business of carrying ore. This was James J. Hill, president of the Great Northern Railway, who acted with his son and associates. They had previously purchased the land and railway holdings of Wright & Davis, and were carrying their own ore. With the advent of the Steel Corporation and its two lines of railway from the mines to the lake, Mr. Hill saw that to save his \$4,300,000 investment in these lands he must have enough under his own control to furnish tonnage permanently, and in sufficient volume to make ore traffic a profitable business. Circumstances favored him, and Mr. Hill is now supposed to have in his control a tonnage of perhaps 250,000,000. Of course, the great bulk of this is leased to mining companies and



MOUNTAIN IRON MINE, 1904.

ruthlessly dug away, and no human agency can assist the operation. This policy of ignoring ore reserves has always seemed, to those conversant with the ore situation, fatuous and shallow in the extreme. Even if other large ore finds are to be made in the future as convenient as those on Lake Superior (which is neither impossible nor, perhaps, improbable), it is hard to believe any can be unearthed that will combine the various advantages of the Mesabi. One would have expected, therefore, that all steel-making concerns depending on Lake Superior for their raw material would long ago have supplied themselves abundantly with the various classes of ores suitable for their metallurgical mixtures. But with a few shining exceptions this had not been done until quite recently; indeed, several important concerns are even now struggling to save ores sufficient for their future, and, of course, at prices far different from what they might have paid a comparatively few years ago.

Wire Company was a mine owner of importance on the Mesabi range, and controlled the largest ore-carriers then afloat. The Rockefeller group of mines upon the Mesabi, and their connecting railway and steamship line, was the chief outside interest. These groups had been secured with care, skill and ripe judgment, and their full value was not generally appreciated, possibly not even by many of those most immediately concerned.

With the formation of the Steel Corporation it secured at once these groups of mines, together with others of less moment, and thus, in one instant, became possessed of such a reserve of high-grade ore as had never been dreamt of. That was the time, if ever, for rivals to strengthen themselves in raw material. Some did so. But the foresight that should have been the part of all was most evident in a man who was neither a miner nor a steel-maker, but who appreciated fully the meaning of the organization of the Steel Corporation, and its effect, not

is valuable to Mr. Hill merely for the revenue from traffic to the lake. On part of it Mr. Hill never owned anything except the traffic.

Probably there is not today a single large pig-iron or raw-steel industry in the region naturally dependent upon Lake Superior that has not some ore reserves upon the Mesabi range. The United States Steel Corporation has the overwhelming proportion, as is natural when its position in the trade is so important. But its ore reserves are far more than commensurate with its proportionate product, and therein lies its fundamental element of strength for the future. It is in the acquirement of these reserves that its mining management has shown the most consummate skill and the most admirable foresight. It is difficult for one who has been more or less acquainted with the work that has been done, has known the far vision into the future and the broad view that has been taken of this matter, to restrain a natural enthusiasm when he re-

views the results, and it is hard to say anything in print that may not be criticized as stock-booming tactics. But the facts are all there; they are plain to those who have watched them unfold, and have seen the steady development of a policy that has now been about completed. It would be difficult to imagine a more brilliant and successful campaign than has been carried on by the Oliver Iron Mining Company, both before and since the organization of the United States Steel Corporation; and in the three or four men responsible for this magnificent work there is an example of high intelligence and broad grasp of affairs not often seen. A company such as this, employing in its Minnesota mines and railways about 11,000 men, is constantly beset by other problems than those of securing ore reserves. This company has met these problems successfully. It has placated a public sentiment once more than ready to be unfriendly, has refrained from political intrigue, has allayed distrust and created a warm and sympathetic friendliness on the part of the communities in which its labor is carried on. In this respect the mining region has been especially favored, for this company has not been alone; but standing in the front, as it must, its acts are more plain and more significant.

Among other iron companies holding and operating Mesabi mines is the Lackawanna Steel Company. Weak in reserves for a long time, it has recently added materially to its surplus tonnage, and is associated with the firm of Pickands, Mather & Company and others in many mines, on the Mesabi and Marquette ranges, both by ownership and ore contracts, and is now quite strong. The Republic Iron & Steel Company, which, on account of the character of its business, is a comparatively insignificant consumer of raw material, has ores sufficient to last it many years. The Jones & Laughlin Steel Company has just added a very valuable and important tonnage to its previously rather slight reserve and is far better equipped than before. With its 50% interest in the great Mahoning mine, and its Menominee properties, the Cambria Steel Company is beyond any danger of ore famine for far into the future. Smaller steel-makers and many foundry furnaces are associated in ore reserves of more or less importance, and there are still some few independent miners. These have been materially reduced recently by sale to some of the steel-makers mentioned, and may be still further cut into later.

For some time almost the sole important independent miners and sellers of Lake Superior bessemers and high-grade foundry irons have been few enough to be counted on the fingers of one hand. The Bessemer Ore Association has for years been controlled by three or four men. There have been the Cleveland Cliffs Iron Company, mining on the Marquette and

Gogebic ranges; the Schlesinger interests of the Gogebic; the Sellwood group of the Mesabi and Gogebic; Corrigan, McKinney & Company, of the Mesabi, Gogebic and Menominee districts, and a few lesser producers. Most of the remaining independents have been so hedged about by conditions and demands of associated interests—so little independent, in fact—that they are hardly worth considering.

One traversing the Mesabi range is impressed at first glance by the enormous holes made in the process of taking out 79,000,000 tons, and by the stupendous effort required to make this product, and move the vast quantity of overburden that has been carried off, all in the brief

borer. One stands at Hibbing, the center of what is probably by far the greatest deposit ever opened on the earth, and views with awe the majestic preparations for a season's business. The word "millions" glides glibly enough off the tongue; it is another matter to move those millions of tons from their primeval bed to the waiting furnaces in the brief space of seven or eight months. None but those who have watched or assisted in the operation can appreciate its magnitude and difficulties. And yet it moves smoothly enough. The directing mind, the long-distance telephone, the perfection of organization and equipment that all large operators must possess—all these make it seem to the cas-

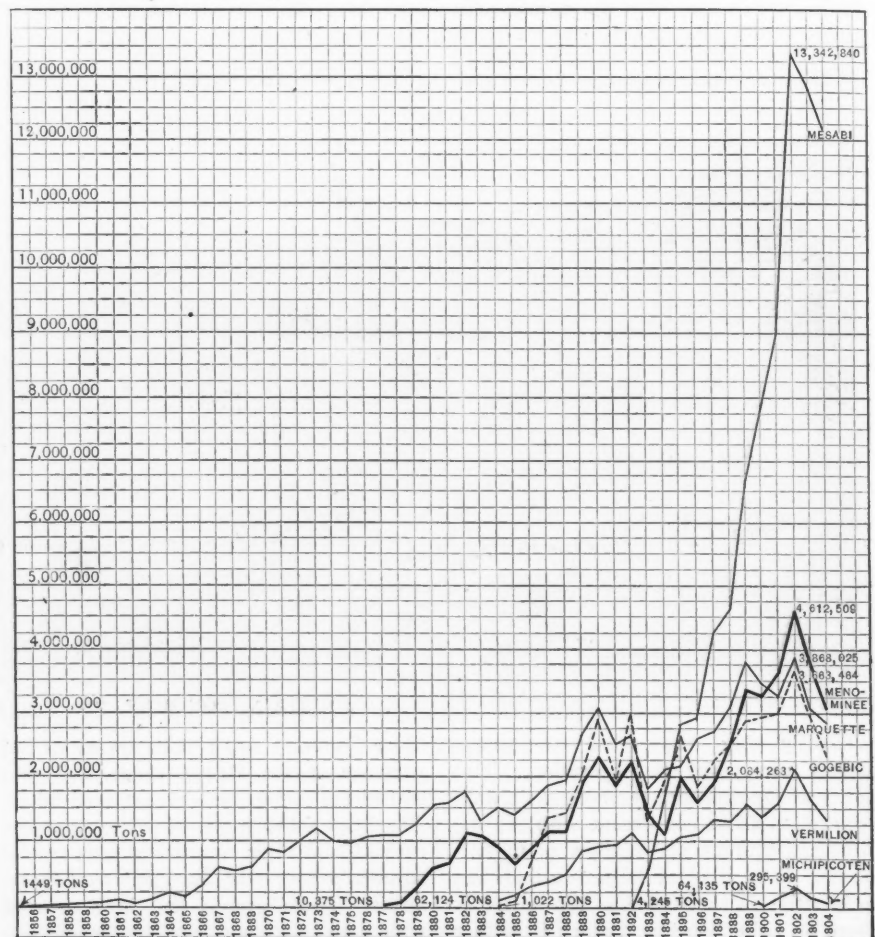


DIAGRAM SHOWING PRODUCTION OF LAKE SUPERIOR IRON RANGES.

span of 12 years. Single piles of stripping can be seen containing up to 4,000,000 cu. yds. The exploration that has strung mines along a narrow and often hidden formation for a distance of 75 miles; the splendid machinery, plants and shops, and the methods of mining so admirably adapted to conditions; the pleasant mining locations, with their comfortable homes and cleanly surroundings; the public schools, remarkably adequate and even luxurious in equipment and housing—all impress themselves strongly upon the visitor. There is no air of temporary occupancy nor of a desire to oppress the la-

ual visitor but a pastime. It would be hard to speak too highly of those directing minds and the organizations they have built up for the various mining and shipping interests, or to undervalue the work they are doing to further the destiny of America and its significance in the world's markets and councils.

Refractory products, according to Arthur Lodin, can be classed in the following groups: (1) Silicious; (2) aluminosilicious; (3) neutral, as graphite, magnetite or chromite; (4) basic, or magnesia.

Dredging at Oroville.*

By L. J. HOHL.

The average running time of the boats varies a great deal in different months and under different circumstances. A new boat will be able to make better running time, as no serious breaks are likely to occur if it has been made strong enough in the first place. A breakdown of any magnitude, such as upper tumbler shaft, lower tumbler shaft or bucket line, will cut down the average running time. Where the boats are influenced by the stage of the water in the river, high water may seriously hamper them at certain seasons, and last winter was an exceptionally severe one in this respect, high water occurring as early as November, 1903, and being with us all through February and March of 1904. To show an extreme case I have taken a selected year in the run of a boat exposed to the high water, so that the year contains all the high water of last season.

Besides high-water troubles, the bucket line was in bad shape and broke frequently, the upper tumbler shaft broke twice during the period under consideration, the lower tumbler and its shaft had to be renewed, also the conveyor-belt, and, to cap the climax, the power was abnormally unsteady and unreliable during most of that year. The running time of the boat, figuring on the basis of 365 days in the year and 24 hours to the day, was 16 hours out of 24. It may seem odd to call particular attention to the fact that in this calculation the year is taken as having 365 days and each day to have 24 hours, but when you look over the records of some of the boats you will find that some of the stoppages are not counted on, such as high water, holidays, etc., the owner or manager arguing that the dredge should not be charged with any delays not originating in the dredge or its appurtenances. The simple fact that the dredge is not earning anything when it is stopped, whether such stoppage originates within or without the dredge, and which fact finds expression on the balance sheet of the company at the end of the year, is sufficient to show the fallacy of the assumption. Returning to the case under consideration, I append a tabulated statement.

Belting	1.3
Bucket line	23.1
Lines breaking and changing	4.8
Cleaning up	1.7
Conveyor	5.3
Elevating machinery	1.5
Frictions and winches	2.5
General repairs	1.7
High water	15.6
Holidays	1.8
Ladder and ladder hoist	1.3
Lower tumbler	8.3
Oiling	3.8
Power off	4.5
Shaking screen	4.5
Stones, roots and stumps	0.7
Upper tumbler	16.2
Water pump	1.4
Total	100.0

*Abstract from paper read before the Thirteenth Annual Convention of the California Miners' Association, December, 1904. From advance proofs.

Another set of figures follows covering the operations of dredges over a period of three years, and it is but fair to state that the high percentage shown under the head of power troubles is not attributable to the present company operating in the field, but to an older electric-power plant.

Moving ahead	5.7
Power troubles	15.6
Repairs and holidays	75.4
Sand pump	3.3
Total	100.0

The average running time for the period given was 16 hours, 56 minutes. From other records extending over long periods of time it is probable that the best average running time of the boats will hardly exceed 18 hours out of 24, taking all causes of stoppages into consideration and figuring on 365 days per year. It is true that in a few cases better running time has been obtained, but where this has been the fact, it was due to conditions surrounding that case, which it is not safe to figure on in every instance.

While the figures so far presented were for Bucyrus boats, I have condensed from Mr. Monroe's paper in the *Mining and Scientific Press* of February 6, 1904, corresponding data for a 5-cu. ft. Risdon boat, which I give below:

Bucketline and ladder	30.7
Clean ups	7.7
General repairs	17.9
Lines	9.9
Power troubles	7.9
Pumps	5.4
Screens	4.5
Stacker	9.4
Total	100.0

The data above extended over a period of one year, but not a picked one, it being a regular calendar year. The bucket line on the boat was renewed during the year, which makes high the percentage of time lost on account of the bucket line and ladder. Comparing the percentage of time lost on account of shaking screens and stacker with the percentage given for the picked year of the Bucyrus boat, we find, curiously enough, that the loss due to the shaking device in either case was exactly the same, while the Risdon stacker shows 9.4% as against 5.3% for the belt-conveyor. The running time of the Risdon dredge for the year amounts to 16 hours, 39 minutes out of 24 hours. The cost of repairs to the conveyor during the year for the Risdon boat amounted to \$1,241.28, an amount which about equals the cost of the belt-conveyor in this particular instance, if the difference in lost time is taken into consideration.

As to the capacity of the different types and styles of boats, no fixed rule can be laid down, for the reason that the same dredge in different ground may not be able to make as much of a yardage, owing to local conditions. To mention one of these conditions, I would say that the washing of very sandy soil is more difficult than that of pure gravel, and it may be necessary to cut down the digging, for the

reason that with full buckets the riffles become crowded.

A fair average of yardage would be about as follows:

	Bucket capacity.	Yd. per month.
Risdon dredge	.3 cu. ft.	25,000 to 35,000
Risdon dredge	.5 cu. ft.	35,000 to 45,000
Bucyrus dredge	.3 cu. ft.	35,000 to 45,000
Bucyrus dredge	.5 cu. ft.	50,000 to 65,000

The above figures would represent the work of a dredge, as now in use in the Oroville district, extending over a long period of time. The maximum obtainable will far exceed the figures quoted, and may be kept up for a short period with any one of the boats.

The cost of production depends to a great extent on the magnitude of the enterprise, which reduces the general expenses by dividing them up among a number of different boats, and by the chance of diminishing the cost of repair by the erection of shops near by. It has to be kept in mind that the operating expenses are influenced by local conditions, such as nature of the ground, general efficiency of digging and washing appliances, adjustment of motors and resistances to their work, extraordinary repairs occurring in short periods of time and a number of other details.

The following statement will give a fair representation of the extremes of the cost per cubic yard of material:

	1.20	1.15	1.61	1.77
Power	1.06	1.20	1.15	1.61
Repairs	2.86	3.03	3.46	2.97
Labor	1.64	1.82	1.85	2.33
General expenses	0.64	0.67	1.23	1.28
Totals	6.20	6.72	7.69	8.19

The data for the above statement were obtained from different operators in the district; the period over which they extend is in each case not less than one year. In some of the figures given the taxes are included under the heading of general expenses, in others they are not. The cost of superintendence in some instances is included under the item of dredge labor, in others it is charged to general expense, but in all cases the totals give all the expenses incident to the working of the dredge and keeping it in good running order.

The life of a boat has not been determined as yet, but with a well and strongly constructed hull, which is taken good care of, it should be not less than 12 to 15 years in this climate. It is self-evident that during that period a great portion of the machinery and appliances will have to be renewed over and over again, such as tumblers, ladder rollers, buckets, shaking screens, pulleys and shafts, spuds, conveyors, etc.; but the item of dredge repairs, as shown in the above statements of cost of operating, will cover these items, and there is no doubt that the experience gained so far, and which will be gained in the future, will have a tendency to gradually diminish such expenses, and, what is even more important, forestall the occurrence of larger mishaps.

Contact Metamorphic Deposits.*

By JAMES PARK.

A molten magma tends to effect changes in the rocks with which it comes in contact. In the case of overflow magmas, the thermal changes are generally trifling, and in many cases hardly appreciable. Even magmas that have cooled in rents in sedimentaries at shallow depths have not always caused great changes in the enclosing rock. The greatest alteration will, naturally, take place in the case of magmas that do not reach the surface, but cool slowly under great pressure.

The greater the mass of the intrusive magma, the slower will be the rate of cooling; and the slower the rate of cooling, the longer will the adjacent rocks be heated. The rate of cooling will be mainly dependent upon the mass of the intrusion, the distance from the surface and the relative thermal conductivity of the adjacent rocks.

The changes effected in the country rock by the intrusion of an igneous magma will be mechanical and thermal. The intruded sedimentaries will be compressed, bent and more or less shattered and fissured along the line of intrusion. The magma will part with its heat by slow radiation into the adjacent rocks. The occluded steam and gases in the magma, together with the steam generated from the water contained in the sedimentaries, will pass into and permeate the latter, and cause a molecular rearrangement of the constituent minerals, resulting in what is termed contact-metamorphism.

As the igneous magma and the heated sedimentaries cool, they will contract in area, and when the temperature normal to the depth has been reached, the contraction will tend to cause the two rocks to shrink from each other, resulting in the formation of cavities along the line of contact.

Above a temperature of 365° C. and a pressure of 200 atmospheres water, and all more or less volatile compounds, will exist as gas. Aqueous vapor, above the critical temperature and under great pressure, will react as strongly upon the cooling magma as upon the adjacent rocks. It will possess a solvent power, which will be greatest at the depth where the highest temperature and pressure are reached. The pressure will cause the heated steam and gaseous emanations carrying the heavy metals to permeate the bedding planes of the sedimentaries, and fill all accessible cracks and fissures. In this way bed-impregnation may be effected, and even orebodies are formed at points some distance from the genetic eruptive magma. A decrease in the temperature and pressure will cause the least soluble substances to be deposited; and as the temperature and pressure continue to diminish, the dissolved substances will be thrown

out of solution in the inverse order of their solubility.

It is manifest that the later phase of the eruptive after-actions will represent, in a modified form, the waning effects of solfataric action. The deep-seated conditions will also favor the action of metasomatic processes in the zone of metamorphism, and veins will be formed, some of which may reach to the surface. It is probable that the circulation of the heated mineralized solutions, in the later phases, will tend to effect a redistribution of the ores and minerals deposited in the earlier stages. In some cases the ascending waters and gases may reach the zone of surface circulation, and mix with the meteoric waters which may then reappear as hot springs, forming orebodies and veins not directly in contact with the eruptive magma.

Weed, and some other writers, have made an attempt to subdivide contact-metamorphic deposits into groups, depending mainly upon the mode of occurrence. But the form and mode of distribution may be due to accidents of density or porosity, composition and hydrous condition of the rocks affected rather than differences in genetic formation. Moreover, the mass of the magma, the weight of superincumbent rocks, the amount of heat and subsequent contraction, and phases of the after-action, are all doubtless contributing factors in connection with the form and distribution of the heavy metals.

Masses of ore, occurring as contact deposits, fissure-veins and bed-impregnations, in the zone of metamorphism, may all be traced to the same genetic causes.

De Launay supports the views of the school of de Beaumont and Daubrée, in respect of the primary influence of volatile mineralizers, emanating from eruptive magmas. The emanations, he contends, must have prepared the way, by introducing into the enclosing rocks, or simply by depositing in the vein-fissures, compounds such as sulphides, fluorides, chlorides, etc., which, subsequently dissolved anew by the circulation of superficial waters, have rendered the latter essential aid in the processes of alteration.¹

The extent of contact metamorphism effected by the granite intrusions of Albany, in New Hampshire, was fully investigated by Hawes.² His analyses showed a progressive series of changes in the schists as they approached the granite. The rocks are dehydrated, boric and silicic acids have been added to them, and there appears to have been an infusion of alkali at the time of contact. He regarded the schists as having been impregnated by hot vapors and solutions emanating from the granite.

Contact deposits frequently lie at the boundary between the eruptive and the country rock; also at variable distances

from the eruptive, but never outside the zone of metamorphism. More particularly, contact ores occur in limestones, marly and clay slates, and are accompanied by the usual contact minerals, garnet, vesuvianite, scapolite, wollastonite, augite, mica, hornblende, etc., and in clay slate, by chistolite, etc.

Contact ores are principally magnetite and specular iron, but sulphides of copper, lead and zinc often occur.

Pyritic contact deposits are typically represented by those of Vigsnaes, in Norway, Rio Tinto, Tharsis, and San Domingo, in Spain. The pyritic ore mass at Mount Lyell, in Tasmania, is generally described as a contact deposit, although its geologic occurrence does not strictly conform to the common definition of such a body. Prof. Gregory describes it as a boat-shaped mass, lying between talcose schist and conglomerates.³ The mine workings have shown that it gradually tapers downwards from the outcrop, being cut off with a rounded base by a great thrust-plane. There are no eruptives in actual contact with the orebody, but dikes of diabase and other igneous rocks occur in the district, at no great distance. The presence of these dikes, and of bands of schist, impregnated with sulphides, forming fahlbands, would lead to the belief that at one time there existed channels of communication leading from the eruptive magmas to the vein cavities. In all probability the Mount Lyell sulphide orebodies and bed impregnations were formed in the later, or solfataric, stages of eruptive after-actions.

Regional Metamorphic Deposits.—To this group belong the deposits of iron ore which occur in altered sedimentary rocks, generally of older Palaeozoic age. The iron, probably, existed originally as sedimentary deposits, and became concentrated and rearranged under the influence of the heat, pressure and solutions, which caused the metamorphism of the enclosing rocks.

The best-known examples of deposits of ore due to regional metamorphism, in which metasomatic processes doubtless took an active part, are many of the valuable magnetic deposits of Sweden, and the vast specular iron and magnetite masses of Michigan. Massive aggregates of magnetite are common in chlorite schist and mica schist, in all parts of the globe. Metamorphic rocks also enclose beds of iron pyrite and pyrrhotite, the origin of which is still obscure.

Recent tests have demonstrated that heavy residues, such, for example, as those derived from the Grosny (Russia) crude petroleum, yield by decomposition 5% gas, about 85% liquid hydrocarbides of different kinds, and 10 or 11% solid hard coke. These results are obtained only by distillation at 400° to 420° C.

*Abstract from 'Mining Geology,' by Professor James Park, director Otago University School of Mines. *The Australian Mining Standard*, February 16, 1905.

¹ L. de Launay, 'The Genesis of Ore Deposits,' 1901. Discussion, p. 616.

² G. W. Hawes, *American Journal of Science*, Vol. XXI, 1881, p. 21.

³ J. W. Gregory, 'The Mount Lyell Mining Field,' *Trans. Aust. Inst. Min. Eng.*, Vol. I, part IV, July, 1904, p. 281. Also, this JOURNAL, Vol. LXXV, May 16, 1903.

The Clinton Hematite.*

BY EDWIN C. ECKEL.

The total production of iron ore in the United States during 1903, as given in 'The Mineral Industry,' amounted to 35,019,308 long tons. In the volume in question, this total is distributed by States and by classes of iron ores, neither of which groupings is an ideal classification.

The figures can be put into much more serviceable form for our present purpose by classing the ores according to their geologic and geographic distribution. As shown below, five distinct classes can thus be formed. Taken together, they will account for over 99% of the total production. The first is, of course, that of Lake Superior. Following this come three groups, all situated in Eastern States, but differing in the character and geologic relations of their ores. The fifth class includes the ores, mostly magnetite and hematite, of the Western States.

The relative importance of these producers is shown in the table below:

	Long tons.	Per cent of total.
Lake ore.....	26,617,768	76.0
Clinton fossil ore.....	3,372,557	9.6
Appalachian Valley limonite..	2,731,329	7.8
Eastern magnetite.....	1,425,182	4.1
Rocky Mountain ore.....	645,151	1.8
Unclassified.....	227,321	0.7
Total.....	35,019,308	100.0

The most important of the Eastern vein-ore deposits are the hematite beds of Clinton (Silurian) age, which outcrop almost continuously from New York to Alabama. Ore of this type was early worked in New York and Pennsylvania, while at present it constitutes the main source of supply for the Birmingham district of Alabama. Aside from its great economic importance, it is of peculiar interest to the geologist, as furnishing the only important example of a series of ore deposits, in sedimentary rocks, formed at the same time as the rocks which enclose them.

As a preliminary to further and more detailed examination, I spent a short time in 1904 in the type area of the Clinton ores—Oneida county, New York. Some results of that investigation are described herewith.

The Clinton ores are well exposed, within a few miles of the town of Clinton, at many openings. The series here shown, when complete, involves the following beds in descending order:

- Shales and thin limestones.
- 18 to 24 in . . . 'Fossil' or 'flux' ore.
- 22 ft Shales and thin limestones.
- 30 to 36 in . . . 'Oolitic' ore.
- Shales and thin limestones.

Of this series the shales and limestones are of characteristic Clinton type (Fig. 1). The shales are bluish-gray, when freshly exposed, often with a greenish tint on weathering. The limestones are in thin layers, rarely over an inch or two in thickness, and full of fossils, which, however, are only well shown on a weathered surface. In color, the limestones are light

gray or pinkish on a fresh surface, weathering a dull yellowish. The ore beds are, of course, the most interesting part of the section. Two of them are always present in this district, though they may not be shown in the same mine or pit, while a thin third bed occasionally comes in below the 'fossil' ore; this fossil ore is the one which has been worked at most of the mines in this region.

The two ore beds furnish distinct types, which are strikingly dissimilar in appearance, composition and origin—the fossil ore and the oolitic ore.

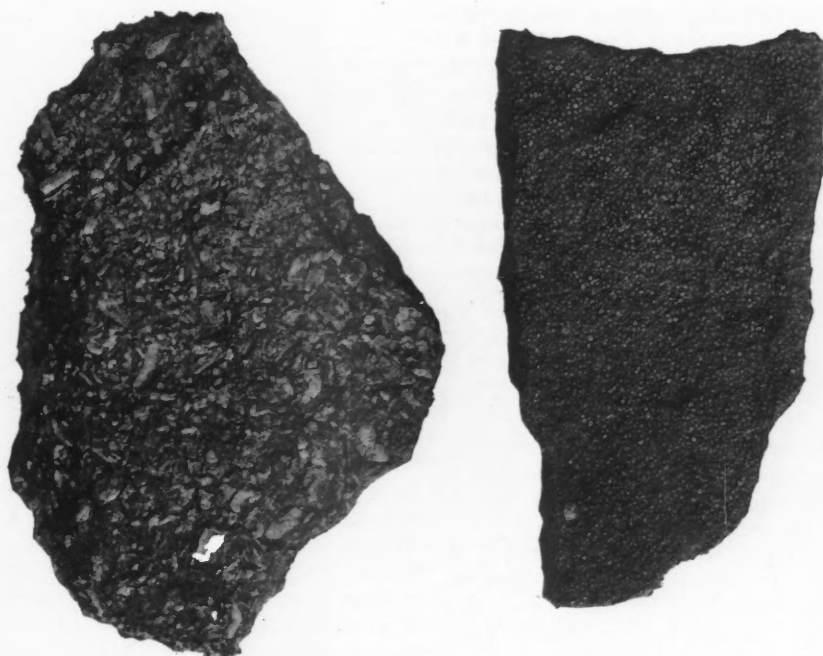
The difference in appearance is shown in the accompanying photograph made from specimens collected by me. The fossil ore is red-brown in color, weathered to yellow (limonite) on old exposed surfaces, and

the materials around and in which the ores have formed.

The difference in composition is brought out by the following pair of analyses. These were made by E. C. Sullivan, in the laboratory of the United States Geological Survey:

	Fossil ore.	Oolitic ore.
Silica (SiO ₂).....	8.71	16.82
Alumina (Al ₂ O ₃).....	3.67	3.54
Iron oxide (Fe ₂ O ₃).....	30.24	46.04
Lime (CaO).....	20.64	9.96
Magnesia (MgO).....	7.84	3.41
Phosphorus pentoxide (P ₂ O ₅)..	0.75	1.29
Sulphur trioxide (SO ₃).....	0.15	0.20
Carbon dioxide (CO ₂).....	24.78	13.62

The sample of oolitic ore is considerably lower in iron than the average, but the striking difference between the two analyses is not in the iron content but in the kind and amount of the impurities. It will



Fossil Ore from Upper Ore Bed.

Oolitic Ore from Lower Ore Bed.

FIG. 1.—TYPICAL SAMPLES OF CLINTON ORE.

soils the hands much like an oily paint. It is composed of little grains, somewhat flattened, and about 1-16 or 1-10 in. in diam. Occasionally larger pebbles are seen, and fossils occur rarely, but this type of ore is predominantly oolitic in appearance. Examination of these oolites by chemical or microscopic means shows that each is made up of a central core of quartz—a little rounded grain—enclosed in successive shells of iron oxide.

The fossil ore, on the other hand, has little of the oolitic character, being mainly composed of fossils, entire and fragmentary, which are in part replaced and in part merely surrounded by iron oxide. In color it is less reddish than the fossil ore, owing to the greater percentage of impurities usually contained in it, and to the appearance of grayish calcite on any fractured surface.

The two types present differences in chemical composition, due primarily to

be seen that the fossil ore is high in carbonates (both of lime and magnesia), while the oolitic ore, on the contrary, is much higher in silica. This difference is original; not due to leaching, which brings about the difference between the 'hard' and 'soft' Clinton ores of the Birmingham district.

Prof. C. H. Smyth, Jr., in a paper¹ which is unfortunately little read by American geologists, has discussed the origin of the Clinton ores of New York with a thoroughness which leaves little to be desired. Prof. Smyth believes that the oolitic ores were formed by the deposition of iron oxide (carried in solution by surface waters during Clinton time) around sand grains in partially or wholly enclosed basins. The fossil ores were formed partly in similar fashion, partly by the actual replacement (by iron oxide) of the lime

*Published by permission of the Director, United States Geological Survey.

¹ Zeitschrift für praktische Geologie, 1894.

carbonate of shells, gathered in such basins. I would merely add that the conditions permitting or favoring such deposition of iron oxide are closely similar to those favoring the formation of saline deposits.

That the Clinton ores are of primary origin, as above outlined, has never been seriously questioned by anyone acquainted with the facts. Early in the history of the Birmingham district, however, some one made the assertion that the ores, rich at the surface, became poorer in depth, and finally changed into limestone with merely a trace of iron. This statement has been carried, parrot-fashion, into many geological and mining text-books, though a visit to the Birmingham district would convince anyone that the 'limestone' worked there in deep mines is still fairly high in iron.

The following analyses, mostly taken from Vol. XV of the Tenth Census Reports, will suffice to give some idea of the range in composition of the Clinton ores as mined at various points in New York. For convenience of reference, it may be noted that these analyses were made on ores from the different beds as noted here:

Upper 'fossil ore' bed: Partial analyses No. 8 and 9.
 Lower 'oolitic ore' bed: } Upper tier: Complete analyses 1, 2, 3, 4 and 6.
 } Lower tier: Partial analyses 1-7, 10-13.
 } Lower tier: Complete analysis No. 5.

When the entire 30 or 32 in. of the oolitic ore bed is worked, the product will usually average 40 to 44% metallic iron. A higher grading can be attained if only the median 18 in. is shipped, for the upper and lower portions of the bed are decidedly more impure. Occasional thin streaks of pyrite occur, mostly along the contact with the enclosing shales.

In a report recently issued,² Prof. C. H. Smyth, Jr., states that during 1902 the Clinton ores of Oneida county were used both as iron ores and for metallic paint, 13,800 tons being mined for iron ore and 2,925 tons for paint. This was during a season of high prices, which caused a resumption of operations at many other Eastern iron mines. At present, however, none of the New York Clinton ore is used for iron. The Borst mines in Oneida county are extensively exploited for material to be used in the metallic paint plant described below, while the Ontario mines in Wayne county are also worked for a similar purpose.

Through the courtesy of Messrs. E. B. Stanley, secretary, and O. J. Roberts, superintendent, I was enabled to examine the plant of the Clinton Metallic Paint Company. It is located near the eastern side of the N. Y., O. & W. Railroad, a short distance northeast of Franklin Iron Works. The ore, shipped down from the Borst mines near Clinton, is passed through the following machines:

1. Blake crusher.
2. Vertical tubular drier.
3. One set Cornish rolls.
4. Six run of French buhr-stones.

²22d Annual Report, New York State Geologist 1902, p. 116, 1904.

Complete analyses of Clinton ores, New York.

	1	2	3	4	5	6
Silica (SiO ₂)	10.14	12.63	9.98	11.34	29.72	11.57
Alumina (Al ₂ O ₃)	3.98	5.45	2.40	3.91	4.13	3.92
Iron oxide (Fe ₂ O ₃)	58.20	63.00	79.98	71.82	42.97	69.17
Manganese oxide (MnO)	0.20	0.15	tr.	1.63	0.37	0.19
Lime (CaO)	6.66	6.20	1.54	3.97	8.57	5.80
Magnesia (MgO)	2.17	2.77	0.30	2.21	1.96	2.27
Phosphorus pentoxide (P ₂ O ₅)	2.557	1.50	1.239	2.096	1.534	1.726
Sulphur (S)	0.51	0.23	.....	.....	0.837	0.28
Carbon dioxide (CO ₂)	15.14	6.15	4.39	2.47	9.47	4.75
Water	.....	2.77	.....	.....	.....	.....
Undetermined and loss	0.443	.....	0.171	0.554	0.439	.....
Metallic iron	41.05	44.10	56.37	50.68	30.08	48.42
Phosphorus	1.117	0.65	0.541	0.915	0.670	0.754
Phosphorus in 100 parts iron	2.721	1.474	0.959	1.805	2.227	.....

1. Ellingwood ore bed, Kirkland township, Oneida Co. J. B. Britton, analyst.
2. Franklin mine, Clinton, N. Y. A. H. Chester, analyst.
3. Clinton " " " J. B. Britton, "
4. Clinton " " " " " "
5. Franklin " " " " " bottom tier. J. B. Britton, analyst.
6. " " " " " C. H. Smyth, Jr., analyst.

Partial analyses of Clinton ores, New York.

	1	2	3	4	5	6	7
Metallic iron	43.76	46.79	45.73	44.22	39.88	42.90	40.40
Phosphorus	1.116	0.640	0.554	0.710	0.665	0.753	0.693
Phosphorus in 100 parts iron	2.550	1.368	1.211	1.606	1.668	1.755	1.715

	8	9	10	11	12	13
Metallic iron	21.85	40.27	41.46	40.73	42.35	38.36
Phosphorus	0.248	0.328	0.578	0.531	0.481	0.471
Phosphorus in 100 parts iron	1.135	0.815	1.394	1.304	1.138	1.254

- | | |
|---|---|
| 1. Davis ore bed, Washington-Mills Oneida Co. | 8. Klein ore bed, Verona, " " |
| 2. Wells ore bed, Kirkland town, " " | 9. Caglin ore bed, " " |
| 3. Butler ore bed, Clinton, " " | 10. Ontario Furnace Co., Ontario, Wayne Co. |
| 4. Franklin ore bed, Clinton, " " | 11. Hurly ore bed, " " |
| 5. Norton ore bed, Clinton Mills, " " | 12. La Frois ore bed, " " |
| 6. Pryer ore bed, Kirkland Furnace, " " | 13. Bundy ore bed, " " |
| 7. Derwin ore bed, " " | |

The drier is a vertical cylindrical shell, 60 in. diam. and 18 ft. high, lined with 2-in. circular firebrick. Inside this shell are set four 14-in. vertical cast-iron tubes ½ in. thick. The ore, crushed in the Blake crusher, is fed into these tubes and passed downward slowly as it is drawn out of the bottom of the tubes, while hot gases circulate in the space between the tubes and the shell. The drier holds four tons, and is drawn at the rate of about 2½ tons per hour. It was designed and constructed by Mr. Roberts.

The rolls crush the material to about ⅛ in., after which it is sent to the buhr-stones. These are run separately for a coarse product, or else the material is passed through two or three times to secure fine reduction. A sieve test of this product after passing once through the buhrs gave the following results:

Mesh of sieve	75	100	150
Percentage passing	93	90	60
Percentage residue	7	10	40

A much finer product could, of course, be obtained by passing through the buhrs again. It should be mentioned that the fine is separated out from the product of the crusher, rolls and buhrs by an air-blast, and is sent direct to the packing-room.

About 160 h.p. are developed for crushing and pulverizing this material. This gives a product of 18 to 30 tons in 11 hours, according to the fineness required.

This power consumption is equivalent to from 58 to 100 h.p. per ton of product.

The slag remaining from the iron plant at Franklin Iron Works is utilized by the Commonwealth Slag Roofing Company, situated near the works. The slag is passed through a Blake crusher and then through a set of Cornish rolls. The object is to obtain a product of as near ¼ in. as possible, all below that size being sieved out. The crushed slag is used to scatter on top of tar roofing in place of pebbles.

Geometrography, according to a writer in *Indian Engineering*, is a neglected phase of the application of the triangle to practical measuring and charting of the earth's surface, buildings, etc.

The Cooper Hewitt mercury-vapor converter consists of a large glass globe (9 or 10 in. in diameter), with a little mercury in the bottom, which is the negative pole. The top of the globe carries one or two iron electrodes. Platinum-lead wires carry the current through the glass, making an air-tight joint. The globe is exhausted, and its volume is filled with mercury vapor only, the converter changing alternately to direct currents. The range is now up to 30 amp. and 120 volts for direct current. Its use is in charging storage batteries, running small motors, and the like.

Influence of the Roof in Longwall Working.*

By J. T. BEARD.

In the method of mining coal by longwall, the working-face is advanced by taking out all the coal and allowing the roof to settle down firmly on a uniform building of the waste of the seam, behind the miner. This waste consists of the rock, clay or slate partings, separating the several benches of the seam, such portion of the roof material as falls with the coal, and the underclay that is mined to permit the coal to fall. The waste, owing to its broken condition, has increased by about 60% of its original volume, and occupies, perhaps, 50 to 75% of the original height of the seam, according to its quantity, and

and creviced by the weight of the overlying material, and the over-arching of this weight, that takes place, has also been briefly noted. By this means there are produced two practically distinct and more or less separate masses of roof material above the excavation. The action of these two masses is quite different, and due regard must be had for each, in order that the work may be successfully conducted. An attempt is made in Fig. 1 to represent these rock-masses and the over-arching of the material above the opening at a longwall face. The height of the arch and the fracture of the roof material will vary with the character of the strata and the amount and manner of stowing the waste, or of building the packs; but the practical effect is to divide the overburden into two

is the action of the roof in mining on the longwall plan.

The action of the roof, just described, exerts a powerful influence, both on the mining or under-cutting and the breaking down of the coal. When the roof pressure is properly controlled the work of the miner, when under-cutting, is made comparatively easy; the coal at the face of the cut is fractured by the weight thrown forward upon it, and, at each stroke of the pick, frees itself readily from the solid. The under-cutting is thus performed in a much less time when the coal is properly weighted. It is important, however, to remember that the roof pressure, if too great, will exert a harmful influence by crushing the coal, and at times may cause the roof to break off short at the face, thereby defeating the very purpose of this method. An accident of this kind is both annoying and troublesome, and may necessitate a considerable outlay before the conditions of a successful longwall can be again restored. Again, the influence of the action of the roof may be disastrous when, owing to a lack of uniformity in the line of the working face, a secondary movement is set up in the roof, or the traveling weight is started off in a wrong direction, throwing an irresistible weight or pressure on the road-packs or on some portion of the coal face. This condition or 'creeping' in longwall is very destructive in its effect, as the road-packs may be wholly or partly destroyed and the roadway closed. The traveling weight is thus seen to be a powerful agent for good or for evil.

The control of the roof pressure is the all-important feature of longwall. The first point that the miner should realize is the folly of attempting to resist by any artificial means of support the ponderous weight above him. But, while the movement of the overburden cannot be successfully opposed, it can be controlled by diverting its action in a direction where it will assist the general work of mining. Difficult as the task may appear, it is accomplished in a simple manner by pushing forward the extraction of the coal regularly and uniformly in directions radiating from centers varying from 300 to 600 ft. back from the face. In this manner the working face, though continuous, is divided into sections that unite in forming a loose end between each section, as shown in the general plan (Fig. 2). This arrangement has the advantage of more effectually controlling the traveling weight and concentrating the roof pressure on the working face; secondary movements in the roof are less liable to occur; and if a creep or crush starts at any point it is more apt to be confined to one section, where it will generally spend itself.

In seeking to control the roof pressure, so that it shall be neither too great nor too small, but just sufficient to break down the web of coal that has been mined, it is important to maintain a uniform line of face, and not to permit the work to ad-



FIG. 2.—OLD MINE WORKING IN LOWER ORE BED, CLINTON, N. Y.

the arrangement of the packs, as they are called. When the packs are well built and cover a sufficient area, they are compressed to from 25 to 50% of their original height by the weight coming upon them. Roadways are kept open to the face by substantial road-packs built on each side, and by taking down roof (brushing) over the roads, or lifting bottom, or both. The weight of the roof is thus seen to bear more or less heavily on the coal-face as the extraction proceeds, and is utilized by the miner to break down the coal. It is the action, influence and control of this weight that forms the most vital feature of longwall working.

The unsupported roof strata above an opening have been described as fractured

parts, the underweight or fractured material, *A*, below the arch, and the overweight or solid strata, *B*, above the arch. The underweight rests on the face of the coal and on the timber, while the overweight sets back on the solid coal, from which it arches over and settles down firmly on the packs. This conception of the overweight and underweight assists the mind to a clear understanding of what may be termed the 'traveling weight' in longwall mining. The traveling weight is simply the underweight, rolling forward, as it were, on to the face of the coal as the work advances. As each new web of coal is mined and broken down, this weight is thrown further forward on the face, while the slow, uniform settlement of the overweight on the packs behind keeps an even pace. This, in substance and theory,

*Abstract of paper read before the North of England Institute of Mining and Mechanical Engineers.

vance more rapidly in some places than in others. Better results are usually obtained by advancing the face in sections, the face in each section being the arc of a smaller circle than that formed by the general outline of the entire face; and a

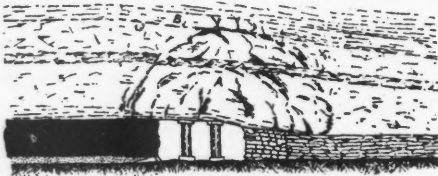


FIG. 1.—SECTION OF WORKING-FACE.

heavy roof pressure is by this means localized and more easily controlled. In order to preserve the proper line of the working face, the most experienced and steady workmen should be placed on the main and cross entries, while others are distributed along the face between them. Fig. 3 shows that the main-entry men, *A*, carry a full face all the time. This is also the case with the men stationed at the temporary-road heads, except as they approach a cross-entry and are cut off, when they are on half face for a portion of the time; the cross-entry men are alternately on full face and half face. These men carry a full face just before starting a new road, *E*, the length of the face being indicated by the small dots. As soon as a new road is started, the cross-entry man divides his face with the new man, each being then on half face, which rapidly expands to full face as the work progresses. At *B* the cross-road is shown as approaching the point where it cuts off the second working place on the cross-road, *C*. It will be observed that the road man in *C2* has lost half of his face, which has been cut off by the approach of the cross-road, *B*; he has, however, one loose end, which is toward the cross-road, and is thereby enabled to mine a larger amount of coal than he otherwise could. At *C* the cross-road is shown as having cut off the roadway, *D4*, and this man is now starting *C4*. The cross-entry man, *C*, is thus left with a half face, but a loose end at his right, which enables him to advance more rapidly. The

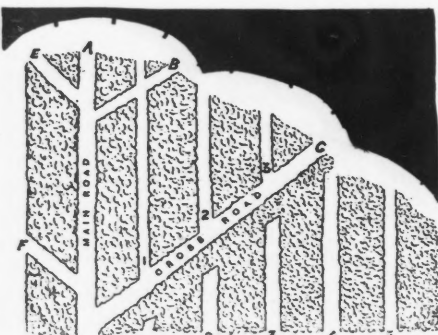


FIG. 3.—PLAN.

face is shown as being advanced in sections, each cross-entry determining a new section, and each section forming the arc of a circle. In Fig. 3 these sections do not appear as expanded, and do not cover as many working places as they would were

the cross-entries shown at their proper distance apart relative to the distance between the rooms. This also gives a sharper corner of projecting coal where the faces of two arcs or sections meet, but it illustrates more clearly the working of the system. It is of the utmost importance that the cross-entry man should always cut in ahead of the road man, in order to maintain a symmetrical line of face, and for this reason all cross-entry men should be experienced and steady longwall men.

The systematic timbering of a longwall face is, if possible, of even greater importance than the maintenance of the uniformity of line previously mentioned. The posts should be set in rows, parallel to the general line of the working face; they are also commonly arranged in rows perpendicular to the face, which, however, is not so important as that the several rows

weight, very much as a ball would be rolled about under an inverted dish. The action of both these weights can be controlled, in so far as to cause each to subserve its purpose. The settlement of the overweight is regulated by the proportion of pack-walls to the entire area of extraction, and the manner of building the packs. A too rapid settlement of the overweight will cause the underweight to bind and throw too much weight on the coal face, besides crushing the timbers. In such cases the proportion of pack-walls should be increased and the packs built more solidly. On the other hand, if the overweight settles too slowly, the progress of the underweight is retarded and the coal breaks slowly.

The distance between the timbers, and the number of rows, will depend on the conditions of the seam, roof, floor, depth

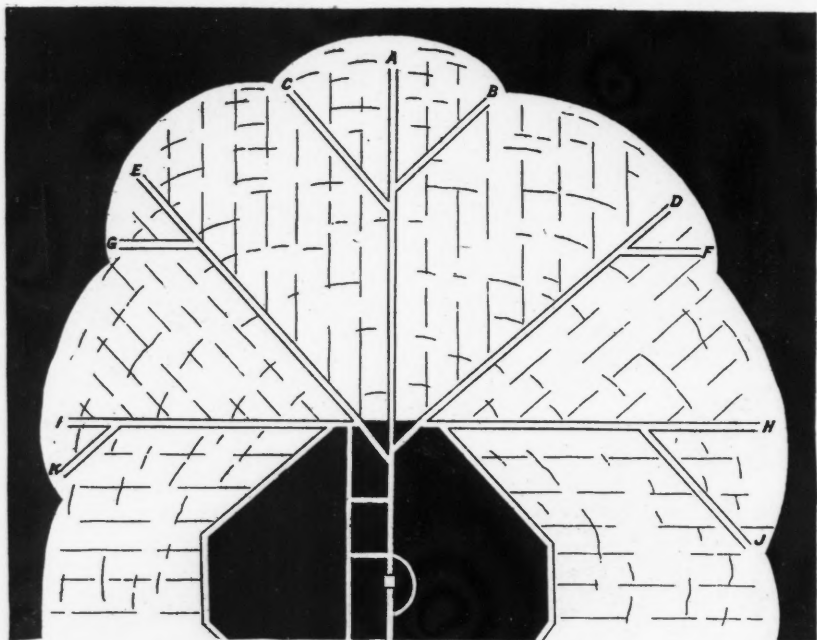


FIG. 2.—PLAN.

should be parallel to the face. In longwall work the timber should never be staggered, as this will generally interfere with the uniform weighting of the coal at the face; timber so placed is also more readily crushed by the weight.

I have referred to the fracturing of the roof, as incidental to the extraction of the coal, and the consequent dividing of the overburden into two portions, the action of each being separate and distinct: (1) An over-arching weight that is irresistible and that rests far back on the solid coal and on the gob-packs; (2) an underweight of fractured material, in part supported by the timbers, and in part resting on the face of the coal and on the packs behind the timbers. It is the action of the underweight that breaks the coal. The regular drawing of the back timber, next the packs, causes this weight to settle forward uniformly on the face of the coal. The underweight rolls forward with a wavelike motion, beneath the settling over-

of cover, etc. Less timber throws more weight on the face of the coal, while more timber decreases this weight. Excessive weight thrown on the face is evidenced by the increased hardness of the underclay or mining dirt, and the nipping and crushing of the coal, or the production of too much fine coal. This excessive weight may be caused by too small a proportion of packs, or packs that are poorly built, allowing a too rapid settlement of the overweight, when the back timbers will show signs of weighting; or by attempting to support too great an underweight; in other words, carrying too wide an area between the packs and the face. In the latter case the timbers will not show the same signs of taking the weight as before. In this case it is necessary to decrease the width between the pack-walls and the working face, or the packs must be more firmly built and the posts set closer together, using heavier timber and wedging it tighter.

Shaft Sinking by the Jetting Process.

BY GEORGE C. MCFARLANE.

The coal measures in Michigan are overlaid by a heavy covering of glacial drift, which consists ordinarily of 70 or 80 ft. of blue clay, underlaid by a stratum of gravel and boulders from 5 to 15 ft. thick. Over a large portion of the productive territory of the Saginaw valley, however, the upper measures have been eroded, evidently by ancient water courses, and are now filled with alternate layers of clay, sand, gravel and boulders, heavily saturated with water. These are locally known as drift channels, and they often attain a depth of 200 or 300 feet.

Until recently these drift areas were avoided by the coal prospector, as the beds of quicksand and the boulders made boring operations difficult and uncertain. During the last few years, boring operations have been simplified by ingenious devices, which permit of raising the casing and blasting the boulders encountered, while at the same time a continuous stream of water is forced down the casing. Using this system of test boring, several fine beds of coal have been located under and in proximity to these drift channels. The sinking of working shafts through this character of material has not been so successful. Several companies have been compelled to abandon sinking operations at depths varying from 70 to 100 feet.

During the past 15 months one company operating near Bay City has expended over \$50,000 in sinking a shaft to bed-rock, a distance of 110 ft. Sand and a heavy flow of water were encountered at a depth of 70 ft. Additional boilers were installed, six large pumps secured to handle the water and an attempt made to jack a steel shoe ahead of the shaft lining. The shoe was hung up by boulders at 87 ft.; in the meantime, the inrush of sand and water into the shaft swung it gradually out of line and caused its final collapse. A new shaft was started near by and sunk to the sand; six holes were drilled around the outside of the shaft, and pumped continuously with deep-well pumps. A 20-ft. section of steel piling formed of interlocking channel and angle-bars, shod with tool-steel cutting edges, was driven inside the timber lining. The sinkers used a 2,600-lb. hammer for driving the channel bars, and several bars were driven right through granite boulders 2 ft. in diameter.

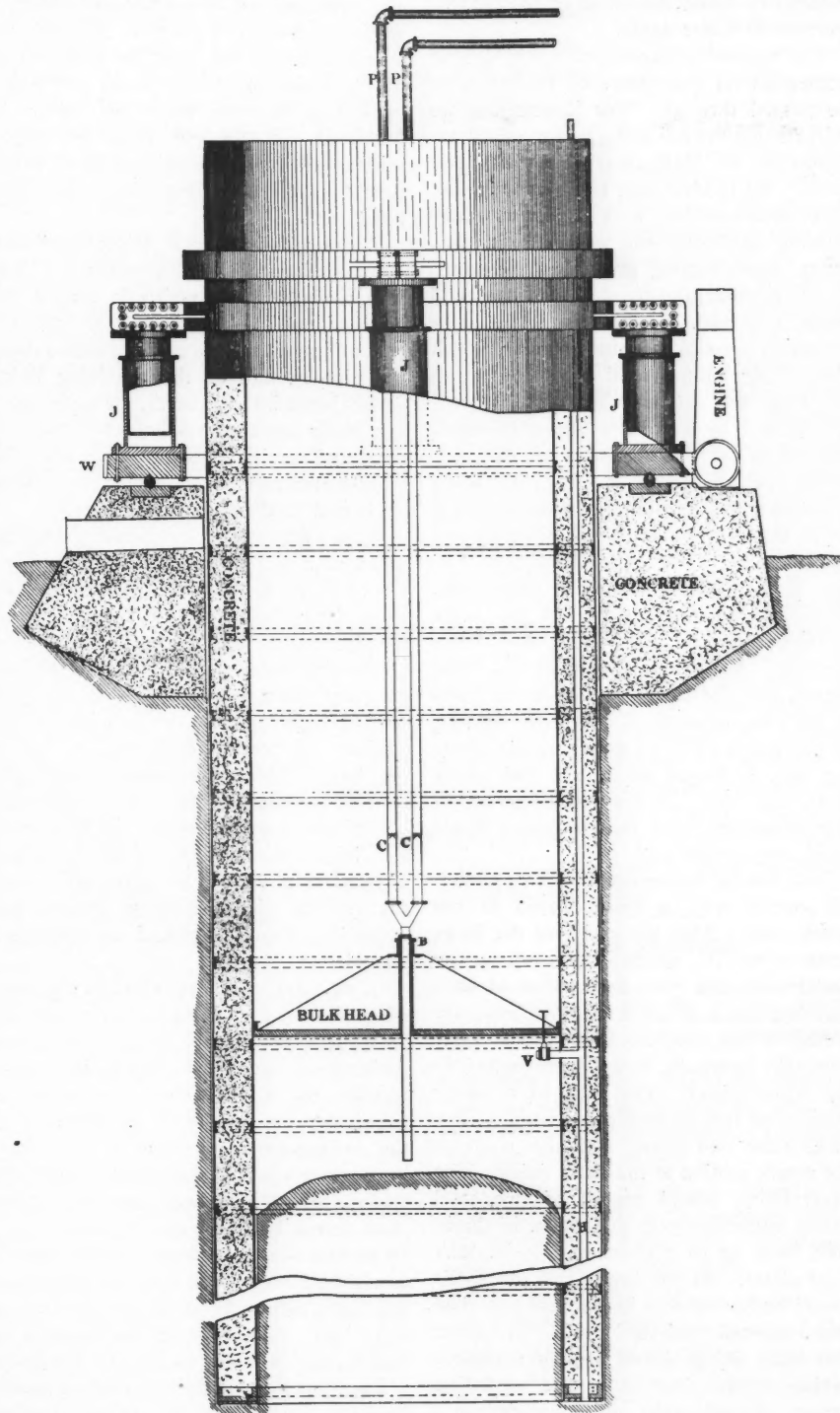
After the first section of steel piling was driven and cribbed with oak timber, it was found necessary to drive a second section inside the first, to reach the hard pan. After five months of continuous struggle with inrushing sand and water, the sinkers have reached the rock, but the area of the shaft is much reduced, and it is considerably out of plumb.

Experience acquired in sinking shafts and bore-holes in the Michigan field has suggested to me a method of sinking illus-

trated in the accompanying sketch. It is based on a system used by me in sinking bore-holes through thick beds of quicksand and boulders, and would be applicable where the bed-rock is overlaid by heavy strata of sand, gravel and boulders, which would cause a flow of 300 or 400 gal. of water per minute into a shaft.

freezing process, however, proved very costly at the one shaft where it was used in Upper Michigan. I understand that it cost nearly \$100,000 to sink through 90 ft. of quicksand.

The plan I have outlined in the sketch contemplates sinking a round shaft lining, of steel-jacketed concrete, provided at the



SHAFT SINKING BY THE JETTING PROCESS.

If test borings indicate such a condition—and it should be remembered that testers generally underestimate the extent of the running ground—it would, of course, be necessary to use some form of drop shaft, or to freeze the strata, if it was desired to sink an ordinary rectangular shaft. The

lower end with a cutting shoe; the sinking to be accomplished by rotating the shaft lining and forcing the cuttings to the surface by pumping water and compressed air down the inside of the shaft. The water, escaping under the shoe and rising to the surface around the outside of the shaft

lining, would carry off the cuttings and permit the easy rotation of the sinking-shaft lining. It is essential that a steady stream of water or compressed air be forced down the shaft when the lining reaches the quicksand. If the current be stopped for two or three minutes, the sand would settle around the shoe and render it difficult to rotate the lining or to start the current of water again.

The method of procedure would depend somewhat on the nature of the strata to be passed through. For illustration, we will assume the following strata, which are typical of the drift areas of the Saginaw valley: 80 ft. blue clay, 10 ft. hard granite and diorite boulders, 10 ft. clay, 20 ft. water-bearing quicksand and gravel, 6 ft. clay, 30 ft. water-bearing gravel and boulders, 10 ft. porous sandstone, 40 ft. slate and shale, 4 ft. coal. In this case it would be necessary to sink all the boulders which the sinking lining would encounter before the shaft was started. This could be accomplished by sinking a series of small bore-holes on the perimeter of the proposed shaft spaced about 3 ft. apart; when a boulder was encountered a charge of 5 or 10 lb. of dynamite would be run down the hole, the casing pulled back 6 or 7 ft. and the dynamite exploded electrically. This will disintegrate any of the large boulders that the shaft lining would encounter. As fast as the holes are completed, pull the casing and plug the holes in the clay about 80 ft. below the surface by driving down a dry pine plug and pouring, say, $\frac{1}{2}$ bushel of cement and wheat down the hole. In the meantime install the permanent mine boilers and a good-sized air-compressor.

The sinking apparatus consists of a double engine with a worm keyed to the crank-shaft. This worm drives the large worm-wheel *W*, which is grooved on the under side, and rests on a series of balls traveling on a grooved circular bed-plate bolted to the concrete foundation. Four powerful hydraulic jacks *J* are bolted to the worm-wheel. The lugs of a heavy clamp-ring rest on each pair of jacks. The jacks raise and lower, and also transmit the rotary motion to the shaft lining. The shaft lining would consist of two steel shells, respectively 15 and 19 ft. in diameter, built up of 7-16-in. and $\frac{1}{2}$ -in. tank steel plates. At the lower end the shells would be riveted to a heavy cast-iron shoe with inserted tool-steel teeth. In order that shaft lining should present a smooth surface to the descending and ascending current of wash-water and suspended sand and detritus, the plates should be riveted to butt straps, the rivet holes in the plates being countersunk, and the rivets plugged down to fill the countersink and cut off flush with the plate while still red hot. The seam between the plates should be split caulked, it being unnecessary to caulk the edges of the butt straps. A line of 4-in. extra heavy gas pipe should be car-

ried up from the shoe between the two linings. The 2-ft. space between the shells would be filled with portland cement concrete. Through the comparatively dry surface soil and blue clay the shaft would, of course, be excavated by hand, and the lining built on from the top and lowered by the jacks to keep pace with the excavation. On reaching the water-bearing strata, a stationary bulkhead would be placed in the lining near the top, and the column pipe in the lining fitted with a tee and nipple projecting into the shaft just under the bulkhead. The nipple would be capped with a gate valve, the stem of which would pass through a stuffing-box in the bulkhead.

The air and water *P P* provided with downward opening check-valves *C C* lead into a single pipe, which is turned and polished and passes through the bulkhead and stuffing-box *B*. Water is pumped down the pipe *P*, and as the revolving lining slowly bores into the earth, the water passing under the shoe washes away the cuttings and carries them to the surface. The wash-water can be conducted to settling pools and used over and over again.

When the strata are heavily impregnated with water, the wash-water will not rise to the surface. When this occurs compressed air should be forced down one of the pipes and the valve *V* opened; then the air passing down the column pipe *M*, and escaping under the cutting shoe, will mix with the water and cause it to rise to the surface. A core of earth will be left in the shaft. The strata outside the shaft will be undisturbed, because the wash-water will rise in a small annular space between the lining and the sides of the hole, and any enlargement of the space will check the velocity of the uprising current, and cause it to deposit some of the suspended material.

In all other systems of sinking, the tendency of sand and water is to run into the shaft, leaving cavities, which often cause destructive slides. In case any large boulder, which might have been missed by the drill-holes, should be encountered by the sinking lining, it could be blasted by lowering a charge of dynamite down the column pipe *M*, and exploding it after the shaft lining had been raised several feet. In raising the shaft lining, compressed air would be forced down until the portion of the shaft below the bulkhead was nearly full of air; this would lighten the shaft so that it could be easily raised with the jacks.

The shaft lining would be sunk to a good hard stratum of slate and the water sealed off by forcing down the column pipe a mixture of portland cement and bran while the lining is slowly rotated, using a very small quantity of wash-water. Then release the jacks and allow the lining to settle down on the mixture; the bran will swell and form a water-tight joint. The core of earth remaining in the shaft can be excavated in the usual manner.

I would estimate the cost of sinking a round shaft, 15 ft. in diameter, from 150 to 300 ft. deep, by this system at \$175 per foot; this includes everything except the boilers and air-compressor, which would be part of the permanent equipment of the mine. Of course, the high first cost of a shaft of this description would be largely counterbalanced by the saving a water-tight shaft would make in the annual expense of keeping the mine free from water.

Books Reviewed.

The Secret of the Circle and the Square.

By J. C. Willmore. Los Angeles, Cal.; published by the author. Pages, 30; with diagrams.

This is an interesting minor contribution to the delightful old question of the rectification of the circle; or, in other words, "the possibility of constructing a straight line equal to any given arc of a circle, and through this problem, to construct a square equal in area to any circle, and a circle equal in area to any square."

Report on the Ontario Bureau of Mines, 1904. Part II. By Willet G. Miller. Toronto, Ont.; Public Printer. Pages, 144; illustrated.

This report, of which a brief mention has already been made, is of special interest and value in view of the expansion of the numerous industrial activities in which lime in some form is employed. The aim of the publication is to present in one volume all the available information as regards Ontario limestones scattered through many publications, together with the latest data secured by original investigation, with analyses showing the chemical composition of the more important occurrences. The introductory portion is devoted to a survey of the economic uses of limestone, in which it is pointed out that several industries in which lime is a prominent factor are of very recent establishment. Calcium carbide, undreamed of twenty years ago, has developed into a world-wide industry. Ten years ago the manufacture of portland cement was almost unknown on this continent. Much capital has now been invested in it in Ontario, and deposits of marl and limestone are eagerly sought for. Within the last two or three years several beet-root sugar factories have been established, requiring lime of a very pure quality. The sulphite pulp process requires a limestone of quite different character, high in magnesia. The rapidly growing smelting industry often requires lime, which has to be brought from a considerable distance. Three or four different kinds of limestone are needed in the varied industries at Sault Ste. Marie, some of which it is now necessary to import. A fairly complete knowledge of the adjacent country might obviate this necessity. If some of the undeveloped iron deposits of the Province are to be

worked, the ore must be smelted on the ground with charcoal, and one of the important by-products is acetate of lime, in the preparation of which a very pure lime is needed. Other industries have arisen since the preparation of the report was begun, which use lime as raw material, including hydrated lime and sand-lime brick, the latter of which appears likely to become a very important interest. The raw materials are sand and lime, well mixed, molded and hardened by the action of steam under pressure. The extent to which this industry is likely to grow is indicated by the fact that, within three years from the time when the first factory was started in the United States, seventy-five or more were in operation. Three companies have now been incorporated in Canada. As the Province possesses in abundance raw materials in connection with the development of which limestone is required or can be used to advantage, especially timber, iron ore and water-power, limestone should be regarded as a most valuable asset. The value of the products of three or four of the industries of which this rock is a prominent raw material, represents about 20% of the total mineral production of the Province.

Descriptions of some of the more extensive of these industries are given, with illustrations, and the various processes briefly touched on. In connection with the use of limestone as a flux in the smelting of iron, lead and other metals, the following note on the stone used at the Hamilton Steel & Iron Company's plants has been furnished by C. B. Fox, M. A., chemist and metallurgist to the company:

"The stone we have been using in our blast-furnace for several years is a dolomite, which is obtained from the mountain about five miles south of the city. An average analysis of this stone for a considerable period is: Silica, 0.75; alumina and ferric oxide, 1.00; lime, 30.24; magnesia, 20.18; phosphorus, 0.021; sulphur, 0.050 per cent. In our steel works we use calcium carbonate for desulphurizing and removing the phosphorus from the steel in the open-hearth process. This has an average analysis as follows: Silica, 2.00; alumina and ferric oxide, 1.10; lime, 51.00; magnesia, 1.10; phosphorus, 0.015; sulphur, 0.05 per cent. This calcite stone comes from the vicinity of Port Colborne, on Lake Erie."

The origin and nature of limestones are concisely treated of and their distribution in Ontario according to formation dealt with. The limestones of Ontario exhibit great variety of character, being found associated with rocks of all ages, from the oldest formations to the marls of the lakes and ponds still in the formative stage. Among the highly crystallized rocks of the Archæan or pre-Cambrian formation, including the rocks occupying the greater part of the surface of the rugged regions of the Province, crystalline limestone is

frequently found. These rocks occupy a large area, particularly in the eastern section, in the counties of Hastings, Frontenac and Lanark. North and west of Lakes Huron and Superior crystalline limestone occurs more sparingly. In addition to being available for building purposes, crystalline limestone can sometimes be burned for lime. Frequently, however, on account of the association of other minerals, the rocks are too impure for this purpose. In addition to the crystalline limestones found among the older Archæan rocks there is another group of considerable economic importance occurring in the Paleozoic formations. The Paleozoic rocks of Ontario comprise three great groups—a lower and older, the Cambrian; a middle, the Silurian; and an upper, the Devonian. Several of these formations are important as sources of limestone and lime—more especially the Bird's Eye, Black River and Trenton formations in the lower Silurian strata. The exposures of limestone of the Bird's Eye and Black River formations extend in a northwesterly direction from Kingston to the Georgian bay and Manitoulin island. This rock carries a high percentage of calcium carbonate, and is consequently well adapted for use in portland cement, lime, calcium acetate and beet-sugar manufacture. A distinguishing feature of the Clinton, Niagara, Guelph and Onondaga formations is the presence of a considerable amount of magnesia. The Clinton formation is well developed on Manitoulin island and at points further south, and has a thickness of 80 to 180 ft., the upper portion being chiefly of dolomitic limestone. It is extensively used for cement. It forms the basis of the Hamilton escarpment, of which the Niagara formation, which enters the Province in Lincoln county, forms the upper part. The latter formation runs northwesterly to Lake Huron. The Guelph stratum, which has a maximum thickness of about 160 ft., attains its greatest development in the counties of Grey, Wellington and Waterloo. It is of magnesian character and affords good building material and a high-class lime. The Onondaga formation, running from the Niagara river to the Sauguen river, near Lake Huron, holds the gypsum deposits, near the town of Paris, and its calcareo-argillaceous shales furnish material suitable for hydraulic cement. Exposures of the lower Helderberg, consisting of thin-bedded dolomites or magnesian limestones, occur in Bertie and Cayuga townships. Two large areas in the western peninsula of the province are occupied by the Corniferous formation separated by a band of the succeeding Hamilton formation. The Corniferous limestones show a great variety in some localities, containing nodules of flint or hornstone, rendering them unfit for lime manufacture. At St. Mary's, Beachville and Amherstberg they produce a very pure lime used in the beet-

sugar industry and for other special purposes. Good building stone is quarried from outcrops of this formation at many points. The Hamilton formation consists mainly of soft calcareous shales associated with which are a few beds of limestone. Those near Thedford and Stony Point have been found to carry a high percentage of calcium carbonate. A sketch-map of southern Ontario accompanies the description, showing the relative positions of the limestone-bearing formations specified, as well as those of other character.

In the regions north of the Height of Land and tributary to James bay, limestone strata of upper Silurian and Devonian age are known to occur. Small areas of the Paleozoic strata have also been discovered at the head of Lake Timiskaming and elsewhere south of the Height of Land, which may be of economic value in the future.

The last section of the report comprises a full description of localities of the limestone occurrences of the Province, showing the particular formations existing in each county, numerous analyses being given, together with information concerning the industries pursued in which lime is used. The value of the data embraced in the volume is evident in view of the increasing demand among manufacturing experts for such information. As limestone varies so greatly in its composition, an accurate knowledge of the kind and quality of the formation—more especially as to whether it is magnesian or non-magnesian—is necessary to determine its adaptability to any specific industry, and hence Prof. Miller's exhaustive and carefully prepared report is calculated to be of great practical service to those engaged in industrial enterprises.

Books Received.

In sending books for notices, will publishers, for their own sake and that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of this JOURNAL.

Presidential Address Before the National Association of Manufacturers, 1905. By D. M. Parry, Indianapolis; published by the Author. Pages, 44.

Hypochlorite und Elektrische Bleiche. By Emil Abel. Halle-a-S., Germany; Wilhelm Knapp. Pages, 112; illustrated. Price (in New York), \$1.60.

Ontario Bureau of Mines. Report for 1904. Part II. The Limestones of Ontario. By Willet G. Miller. Toronto, Ont.; Public Printer. Pages, 144; illustrated.

Practical Information on the Geological Structure of the Tonopah Goldfields, Nevada and California. By John D. Hoff. San Francisco; published by the Author. Pages, 36; with maps. Price, \$1.50.

La Pressione e Chimicamente Mattiva nella Solubilità e Ricostituzione del Quarzo. By Giorgio Spezia, Turin,

Italy; reprinted from *Transactions of the Accademia Reale delle Scienze di Torino*. Pages, 12; illustrated.

Manual of Chemical Analysis as Applied to the Assay of Fuels, Ores, Metals, Salts and Other Mineral Products. By Eugene Prost. Translated into English by J. Cruickshank Smith. New York; the D. Van Nostrand Company. London; Maclaren & Sons. Pages, 300; illustrated. Price, \$4.50, net.

United States Geological Survey. Bulletin No. 259. Report on Progress of Investigations of Mineral Resources of Alaska. By Alfred H. Brooks and Others. No. 250. *The Petroleum Fields of the Pacific Coast of Alaska.* By George C. Martin. Pages, 64; illustrated. Washington; Government Printing Office. Pages, 196; illustrated.

United States Geological Survey. Water Supply and Irrigation. Paper No. 115. River Surveys and Profiles Made During 1903. By W. Carvel Hall and John C. Hoyt. Pages, 116; illustrated. No. 116. *Water Problems of Santa Barbara, California.* By J. B. Lippincott. Pages, 100; illustrated. No. 120. *Bibliographic Review and Index of Papers Relating to Underground Waters.* By Myron L. Fuller. Pages, 128. No. 122. *Relation of the Law to Underground Waters.* By Douglas Wilson Johnson. Pages, 56. Washington; Government Printing Office.

Mine Accidents in New Zealand.

The report of the Mines Department of New Zealand for the year 1903 gives the following statement of the number of deaths by accident occurring during the year:

	Employees.	Deaths.	Deaths per 1,000.
Gold quartz mines	3,597	9	2.50
Gold alluvial workings	6,613	10	1.51
Coal mines	2,852	4	1.40
Totals	13,062	23	1.76

Of the deaths from accident given under the head of gold alluvial workings, 4 were in alluvial and hydraulic mines, and 6 in gold dredges. The number of accidents showed a considerable increase over the years 1902 and 1901. This was due to the employment of an increased number of men, some of them necessarily unfamiliar with mining conditions and regulations.

The boiling temperature of a liquid is that point at which the liquid is able to overcome the external atmospheric pressure. If this external pressure on the surface is varied, the boiling point will rise. If the pressure is lowered, the boiling point will fall. The practical application of this is found in the necessity for more heat to boil water under the high pressure of steam boilers, and the contrary result of obtaining a low-boiling point, by using the diminished pressure of the vacuum pan.

Correspondence.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Letters should be addressed to the Editor. We do not hold ourselves responsible for the opinions expressed by correspondents.

Water Currents.

Sir—We were surveyors, encamped on the bank of Willow creek, where it debouches from the mountain front to reach the Potomac, and whence the rising waters soon drove us to remove our quarters in the rain. In the night sounds as of a heavy wagon rumbling along startled me several times. It was astonishing that a team should be coming down the rough and abandoned road, but the only sound distinguished in the air was that of lashing waters; the booming heard, with one's ear at the ground, was from stones rolling and milling each other.

The transporting force of current varies as the sixth power of the velocity. Thus a body of the same shape and density to resist twice the speed of the full stream must exceed 64 times the weight. It is said that 3-oz. gravel is moved by water running two miles per hour; and that a rate of 20 miles per hour will carry 100-ton masses. It is consistent with this rule that the former are quartz spheres of 2 in. diameter, and the latter are similar polyhedra 1,000,000 times the weight and measuring 200 in. through. In imagination a diminutive may be inferred of sand grains one-millionth the weight of that gravel, 0.02 in. in diameter—that is, passing through sieves of 40 meshes to the linear inch, and still water-borne when the flow is down to one-fifth mile per hour. We have dimensions as the squares of the velocities, and volumes as the cubes of the dimensions; so we derive weights as the sixth powers of the velocities compared.

On the subject of control of current in streams of water as a study for the engineer—of which the jetties constructed at the mouth of the Mississippi under Captain Eads are examples on a large scale—my friend, Lewis C. Weldin, civil engineer, makes suggestions, based also on his experiences as a dweller on tidal river farms. He says:

"The thought of changing the rate of flow in streams and controlling deposit or erosion is not new, but interesting examples may be mentioned. By occupying a portion of the cross-section of the stream with a coffer dam, the current was seen to be so accelerated as to endanger the stability of the dam; then by placing a few bags of sand on one side the current was retarded there enough to cause a deposit of silt and insure protection for the dam.

"I have seen meadows (that were being gradually washed away because of some change in another part of the stream causing the water to flow slightly faster past the point) protected by piles driven 8 ft. apart in rows standing at right angles

to the stream, the rows being as far as 100 ft. apart. The retarding of flow was sufficient to change erosion into deposit, a result seemingly out of proportion to the small expense involved. The protecting of a levee, exposed to chopping waves raised by wind that are so destructive to earth slopes, is effected by such a simple device as chaining in place a floating log or by a barrier of 1-in. boards held in place by driven posts of mere scantling, the purpose being to create slack water next the bank.

"A very slight top barrier on a dam will often hold back considerable impending overflow; for instance, a 12-in. board on edge, strutted with braces, will safely raise the water to its top edge. I have seen a temporary hedge against water made by driving two lines of stakes, say 1 ft. apart, packed between with hay for holding tide water to a height of 3 ft. for a long time, or higher for a short span, with a brace at the rear of each stake. In this way important dikes and dams may often be saved from destruction if the high-water stage be of short duration. Of course, this is all pretty well known to those having care of levees at tide water. For threatened overflow of earth dam, such stakes packed between with hay, leaves, etc., make available means when overflow has begun. A single row of stakes driven 1 ft. apart, their tops reaching above the probable high water, will catch the hay thrown well out into the stream; the lodged hay is then pressed against the soil and more added until the flow is stopped, or the overflow is a harmlessly small volume. A second row of similar stakes outside the first makes the hedge complete.

"When bags enough can be had, these filled with sand and placed at a somewhat wider barrier meet the emergency even better—being water-soaked their weight is increased and their conformation made more clinging."

F. Z. SCHELLENBERG.

Pittsburg, Pa., April, 1905.

The Welsbach glower for gas lamps is 99% of thoria, with a little ceria.

According to earlier experiments, radium when dissolved in water dissociates the latter into hydrogen and oxygen (as hydroxyl). Recently Bergen Davis and C. W. Edwards have obtained the reverse effect, namely, the union or "association" of hydrogen and oxygen into water when the mixed gases are exposed to the action of radium.

In steel carrying manganese, any contained sulphide exists therein as manganous sulphide. This occurs native as the mineral alabandite. In microscopical examination manganous sulphide is a mottled gray color, while sulphide of iron is pale brown. There is also a manganous silicate ('sesqui-silicate') which is not a desirable ingredient; both manganese sulphide and silicate induce fragility in steel.