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EDITORIAL.

THERE is promise of a tin-mining industry in South Africa. Prospecting has been stimulated by the high price of the metal during recent years. In Swaziland several companies are at work, exploiting lodes of unusual size and irregular mineralization. In the Pretoria district, some sensational finds were made in April. Tin is in demand, and the development of such an industry in South Africa would be of industrial importance.

IT IS MATTER for regret that the new mining laws and regulations to be issued by the Chinese Department of Mines appear to be indefinitely postponed. The minister under whose direction they were being prepared went into official mourning for his father, and during this period of a year the work has been sacrificed to the exigencies of a complex official system. It is uncertain now whether these regulations, based largely on the mining laws of Mexico, will be promulgated; for Chinese sentiment toward British and American enterprise has suffered severely by the scandals arising from the Chinese Engineering Company and the recent litigation in London. This affair has made it increasingly difficult for foreigners to secure mining concessions, and not even the evident justice of the decision given by the British court is likely, for some time to come, to allay the suspicions of the Chinese. Mining laws without mining will be of no service.

WE HAVE repeatedly referred to the open willingness of the Mexican government to lay excessive and unjust burdens on mining in its various phases. The last topic that we were called upon to consider—and to criticize—was that of the dynamite tariff. We took occasion to get our facts at first hand and from engineers of long experience in that country. In another column of this issue we publish an interesting letter from one who writes of further disasters to Mexican mining, or rather—for it amounts to that—to American mining in Mexico. There is but little to be added to the description of hardship endured by many others beside Mr. "Director"; but it is interesting to note that the new basis of exchange seems to be virtually a skillfully and malignantly conceived burden for the miner. Is it not high time for those officials who have the good of their Mexico

at heart to plan a broader and more generous policy of concession and encouragement to foreign capital?

THE ARTICLE giving data on pumping, and appearing on another page, represents the kind of information which is of greatest use to mining engineers. At the present time the biggest pumping operations are under way at the Tasmania mine, in the island of that name, and at the group of shafts which are engaged in unwatering the deep-leads of Victoria. In the last-mentioned instance four units will pump 13,000,000 gallons per 24 hours, from a maximum depth of 350 feet, while at the Tasmania one equipment has a capacity of 8,000,000 gallons *per diem*, from a depth of 2,000 feet, to which two other pumps of equal size are, we understand, to be added immediately. To those engaged in this branch of mine operation, Mr. R. Gilman Brown's contribution will be of especial value.

SHIPMENTS of iron ore to furnaces from the Lake Erie docks during the past winter were unusually large, amounting to 3,491,768 tons. This reduced the stocks on docks on May 1, which is usually counted as the opening of the navigation year, to 2,271,631 tons, the lowest figure for five years past. The fact that there were any stocks left at all, however, shows that the little scare with regard to ore supplies, to which some reference was made earlier in the season, was unwarranted. Ore vessels are now coming in freely, and there is no further chance of a scarcity. Shipments have begun well, and there is no doubt that during the coming season they will exceed any previous record. It is understood that the United States Steel Corporation has gone back to its original policy, and that there will be a very heavy movement from its mines this year, with a view to having a large stock at furnaces at the close of the season.

THE THERMO-ELECTRIC property of quartz crystals, a notable field of fascinating research in molecular physics, finds renewed interest in its relation to radio-activity. Sections of smoky quartz, decolorized by heating, were re-colored by a 10-day exposure to radium rays. On warming and sprinkling with flour-of-sulphur and red lead (the sulphur clinging to the electro-positive, and the minium to the electro-negative, parts of the quartz twin), the smoky tint was developed in three tri-

angles (the segments of one of the twins), which were found to be negatively electrified. The work was described by M. Egeroff in a recent number of the *Comptes Rendus*. A related question of equal interest concerns the nature of the smokiness that is eliminated and re-developed. It may be carbon. It may be something else.

THE DEEPEST profitable gold mining is at 4,161 feet, for that is the depth at which pay ore has been recently found in the New Chum Railway mine, at Bendigo. A winze sunk 305 feet below the 3,856-ft. crosscut has shown 'fair gold' for the last eight feet. All gold is fair to a miser; it is fairer than a pretty face; but, when our Australian friends use such peculiar terms as 'good gold,' 'fair gold' and 'rich gold,' they refer not to the quality, but to the quantity of the precious metal. It is said that the government geologist of Victoria has described the conditions from a geological standpoint as "just as favorable for finding rich stone at 4,156 feet, or even greater depths, as they were in the shallow workings of the mine." This is a good example of the parting of the ways between the geologist and the mining engineer. The latter knows by recognition of brutal facts, more forcible than any constructive imagination, that conditions are *not* as favorable at 4,156 feet, at Bendigo or elsewhere, as they were at four or five hundred feet below the surface. Geological conditions may serve as the basis for a scientific investigation; they cannot constitute a mine, which is a hole in the ground yielding mineral at a profit.

IN THE STUDY of ore deposits, this student or that may commit himself to some view which gradually becomes fixed for him, so that he can no more change than the theologian who declared that "that which is new is not true; and that which is true is not new." Elsewhere in this issue we abstract another contribution from Mr. James Park, who, curiously enough, quotes an authority not often referred to. The name is that of Hawes, the pioneer, in America, of systematic petrography in the study of rock alteration. It will be remembered that Mr. Hawes worked out, at New Haven, some of the more knotty problems in Hitchcock's report on the geology of New Hampshire; and that almost before his work was well finished he met an untimely death, at a time when we needed him. Later, another genius in American petrography ap-

peared, the lamented George H. Williams, of Johns Hopkins, and associated with the United States Geological Survey, who freely acknowledged him as the most careful and exact authority in the country. All this is nothing in disparagement of our many eminent petrographers; but with only scanty reference to the classic work of such pioneers as Hawes and Williams, how can it be said that the facts are fully correlated? A recent official pamphlet on cleavage contains not a single reference to the work of Williams on secondary cleavage and paramorphosis by pressure.

Clearly we are busy taking stock. The facts are not all in. The story of ore deposits may be half-written; but any day may add a chapter that will change the plot. The fascination of it all is that the story is continued—but not completed—even "in our next."

An Anthracite Strike.

The anthracite country is just now the scene of a strike which may end without much friction, or which may possibly develop into a serious matter. Over 600 men and boys, working in No. 1 colliery and the Mountain colliery of the old Pennsylvania Coal Company—now owned by the Erie—at Dunmore, went on strike May 12. Their action is now before the local miners' union, and it is quite probable that, if the union upholds them, the strike may spread to all the mines controlled by the Erie, through the Hillside Coal & Iron Company. The reason given by the miners for their action is that they are unduly docked in weight mined, and those who make complaint are disciplined or laid off for a time. They assert that the company's check-weighmen and 'boney' bosses are unjust to the miners, and also that the petition for a check-weighing boss to represent the miners has been disregarded. The company denies the specific proof of these claims, and says that it has raised no objection to the appointment of a check-weighing boss, when asked for by a majority of the miners. The main grievance, however, seems to be the amount of refuse for which the miners have been docked. A miner's car holds about two tons, but the men claim that in many instances they have been docked for 1,000 and even 1,500 lb. of refuse in a single car. The company's statement is that such instances are exceptional, and that the fact that so much refuse is found shows the necessity for careful supervision.

The fact is, that there would be less trouble about 'boney' bosses and check-weighmen if the miners superintended or helped to load their own coal. The majority of the mine laborers in the anthracite country are foreigners, many of them raw, and most of them neither can, nor do, care to discriminate between coal and refuse. When the miner has cut as much coal as he thinks a fair day's work for his laborer, he leaves, and it often happens that a man can cut as much coal in a short day as will occupy his laborer for two days. The laborer, left by himself, gets through his work as quickly as he can, and does not take much care as to what he shovels into the car. The docking does not affect him, and he will not spend overtime to pick out slate and waste.

No doubt some mistakes in checking do occur. Car inspectors and weighing bosses are not infallible, but in all probability there is no foundation for the charge that their errors are deliberate, or that they dock men in order to show their authority. They have been miners themselves, and as their positions are relatively more thankless than remunerative, it very frequently happens that, after a short experience in such service, they return to their previous occupation as miners. One proof that they are not inclined to side against the miners is that during the last strike they refused to work for the company in any position, and threw in their lot with the miners entirely. It should be remembered, also, that while an occasional docking boss may be rather too rigid in condemning cars with an undue amount of 'bone' and waste in them, the majority of them are quite as partial to the miners as they are to the operators. In fact, it is to their personal interest not to be unjust to the miners. They are paid fixed wages, promotion is limited, and those appointed to higher positions are seldom selected from the dockingmen or weighmen. In every point it is to their personal interest to stand well with the miners.

It is possible, though not altogether probable, that this strike will bring up again the discussion of the check-weighmen matter which caused so much trouble last fall. While the operators do not object in principle or in fact to the employment of a check-weighman, they do protest against the obligation to take part in his payment or appointment. The award

of the Anthracite Commission lays it down that where a majority of the miners at a particular colliery desire to have a check-weighman installed, the company shall stop his wages *pro rata* from the wages of the miners in that colliery. By this award the operators claim that they are compelled to stop money from men who may object to the check-weighman, and who are not willing to share the expense.

The trouble at Dunmore is purely local at present. The main point about it is that it is a symptom of existing feeling, and that it is probable that we may see a succession of small strikes, engineered largely for the purpose of keeping up the interest of the men in the unions, and preparing them for the struggle that may come next spring.

Mining Activity.

Where there is smoke, there is fire; and when the daily press exhibits an increase of advertisements dealing with mining ventures, there is good reason to suppose that the interest in that particular form of speculation is reviving. Apart from such indirect evidence we know, through our correspondents, that the present summer is destined to be one of unusual activity. Nor will it be localized; on the contrary, the energy directed to the delving after ore will be of continental extent. In the zinc and lead regions of Missouri and Kansas there is a prosperity born of favorable metal markets; these also, as regards another metal, have favored Michigan, where the copper mines of the Lake Superior region have passed a production of 200,000,000 pounds and maintain an increase, the end of which is not yet in sight. If the brawling of a financial Thersites is not suffered to influence honest industry, the copper mines by the great Lake will long stand for all that is best in American mining. Of coal and iron we do not speak on this occasion. That is another story. In Colorado, lately conspicuous through unfortunate causes, the megaphone of the politician has been laid aside for the pick of the miner; there is less talking and more doing; new discoveries at Cripple Creek have stimulated development, Leadville is proving for the *n*-th time that exhaustion is indefinitely postponed; the old camps in Gilpin and Clear Creek are hopeful, and in the mountainous San Juan the whistle of the hoist and the glad acclaim of the burro are echoed through cañons of—Tertiary andesite. In Utah,

the growth of a great copper industry, based upon pyritic deposits, large in extent and enriched by the precious metals, is being fostered by an advance in metallurgical treatment and a widening ore market. The mines of Bingham and Tintic have more than fulfilled the hopes of those who undertook their exploitation. To the north, in Montana, there is an abatement of the vendetta at Butte, and a probability of less diversion of energy from the actual work of mining. Southwestward, in the desert region of Nevada, men are finding ore amid a desolation which had previously barred the footstep of the explorer. The encroaching arm of the railroad and the oases of Mormon settlements have enabled prospectors to penetrate sandy wastes which Nature had marked as her unfinished work, to be invaded at man's peril. Tonopah and Goldfield are becoming important mining centers.

In Alaska, the romance of arctic adventure is giving place to the commoner actualities of business. The skimming of natural concentrations of gold in placer bonanzas is on the wane; but the systematic hydraulicking and dredging of widely distributed gravel deposits is now backed by engineering skill and patient capital. Discoveries of coal, tin and copper have supplemented the search for precious metals. Across the international line, in British Columbia, there is coincident progress. While the conditions underlying the mining of silver-lead ores remain discouraging, the copper industry is highly prosperous, and with it the winning of gold and silver. In the Boundary district, there is a series of low-grade deposits of such dimensions as to afford the basis for the soundest kind of speculation; indeed, it is likely that the Granby Company and its affiliated interests will shortly expand into an undertaking of a magnitude excelled by but few mining and smelting enterprises on this continent. Not far south, in the district once befouled by un-American tyranny, the mines of the Cœur d'Alene are giving proof of great vigor; and the old Bunker Hill & Sullivan can claim to be the greatest producer of lead, the Broken Hill Proprietary not excepted. Nor is California backward; that great mineral tract which stretches between the Sierras and the sea is attracting the energy of the mining men who, first trained in California, are now returning from South Africa rich in experience and the money which gives momentum to that experience.

At present, the expansion of the dredging industry on the Feather and Yuba rivers is the dominant feature; but lode mining also is receiving a new impetus, from Randsburg to Yreka.

And so our observation travels over a mineral empire and, disregarding the barrier of the Rio Grande, sees this wave of activity sweep into Spanish America. There has been an immense amount of capital expended in Mexico during the last five years, and the results have impelled not only the creation of a vast smelting industry but also the steady outspreading of the railway lines essential to economic operations. The region is too wide for summation in a paragraph, so that it is practicable only to emphasize the more obvious feature, which is presented by the development of a series of big mines close to the boundary, at Bisbee, Nacozari and Cananea. Of late, much attention has been directed to the States of Sonora and Chihuahua, partly through the re-opening of old mines and the formation of companies to work them under concessions, the wisdom of which is open to doubt. Concessions alone will not develop a country; it is a worn-out device for attracting capital. Actual resources are enough; among them is oil, the presence of which, lately proved, should benefit several railroads which have reached the Sierra Madre and which must cross to the Pacific before the development of Mexico can proceed unimpeded. Thus from the arctic to the tropic zone, and between two oceans, the natural resources of North America are being benefited by a mining industry which is at once the advance guard and the great forger of that complex state of living which we call modern civilization.

Market Conditions.

May 17.

The metal markets continue generally quiet. A little more inquiry is developing for copper among domestic consumers, while foreign trade is also slightly better. There is little difference from last week's report. Tin has shown the usual fluctuations. Lead is unchanged in position and demand; very much the same can be said of spelter.

The iron markets generally are in a waiting condition. The mills and furnaces are busy, and this condition is assured for some months to come. There is a degree of hesitation, however, about contracting

for the closing months of the year, and this is beginning to have an effect on prices. The greatest activity at present is in structural material.

The coal markets in the West are a little depressed. Lake trade is coming in slowly, and there is still a surplus production being urged upon the market. In the East, both anthracite and bituminous trade is quiet, but without any special features.

Metallics.

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

According to Troost and Hautefeuille, carburated iron evolves more heat when dissolved than iron nearly free from carbon.

Both in annealed and hardened steel, the higher the carbon the less the heat evolved when the metal is dissolved in a calorimeter.

According to recent observation, platinum (which is not dissolved by a constant direct-current) is electrolyzed by a varying direct-current or by an alternating current.

Faraday, in 1822, first showed that steel, when suddenly cooled, dissolves completely in hydrochloric acid, but when annealed leaves a carbonaceous residue when thus dissolved.

The quantity of carbon with which iron can combine varies with the amount of manganese, silicon and sulphur contained. Manganese raises the saturation point for carbon; silicon and sulphur lower it.

Carbon has a remarkable power of diffusing itself through iron, tending to uniform distribution, not only through the particles of a solid piece, but also between separate pieces in contact.

Each of the four 19-in. cables of the Williamsburg Bridge over the East river, New York, is composed of 7,696 steel wires. Each wire is 0.192 in. (about 3-16 in.) in diameter, and of a tested tensile strength of over 200,000 lb. per square inch.

Pouring oil upon troubled waters is easy enough except ahead of the vessel, where most wanted. Shells filled with oil, and fitted with an explosive portion and detonator or time fuse, fired from a cannon, have given but indifferent results, and they are now superseded by hollow wooden projectiles, with one end covered by a waterproof fabric, or even stout paper, that yields on impact and allows the oil to escape.

Electrolytic Refining of Lead.

Concerning the electrolytic refining of lead in solutions of fluo-silicic acid, an elaborate contribution thereto is given by Hans Senn in a current issue of the *Zeitschrift für Elektrochemie*. Some of the more definite results are as follows:

1. From a fluosilicic-acid solution it is possible to refine both lead and cadmium electrolytically, so that they can be obtained in coherent plates on the cathode.

2. An addition of gelatine to the electrolyte prevents the formation of crystals or separate growths on the cathode.

3. The desirable properties of the metal deposit are lowered with increasing dilution of the electrolyte and with increasing current density.

4. Conditions favorable to a good deposit of lead or cadmium are found in the following: Free fluo-silicic acid in the electrolyte, 11%; amount of metal, 4 to 8% of lead, or 2.5% of cadmium; current density, 0.8 to 1 amp. per sq. decimeter; amount of gelatine, in one liter of electrolyte, 0.1 gram for lead, and 0.3 gram for cadmium.

5. In an electrolytic solution of fluo-silicic acid, from an anode consisting of lead-copper alloy containing the maximum of dissolved copper, and with a current density of 0.5 to 1.5 amp. per sq. decimeter, it is possible to refine to pure lead at the cathode, leaving at the anode a slime containing 10% of lead.

6. An alloy of lead and bismuth, containing 12% of the latter, in the same electrolyte and with the same current density as in the last, can be refined to pure lead, leaving an anode-slime containing 20% of lead. If the tenor of bismuth is as high as 26%, the refining of lead can still be carried on, but the current density must not go above 10 amp. per sq. decimeter.

7. From antimony-lead alloys as anodes, pure lead may be obtained only with a current density of 0.5 to 1 amp. per sq. decimeter; and under these conditions, about 30% of lead remains in the anodic antimony slime. With current increasing to 1.5 amp., antimony goes with the lead.

8. Anodes consisting of lead with 10% of platinum, in the same solution as heretofore, allow the lead to be deposited pure on the cathode, leaving an anodic slime consisting of the crystalline compound $PtPb_2$ (32% Pt), and from which not much more lead can be removed electrolytically.

9. In connection with the electrolytic refining of lead alloys, there comes a gradual decomposition of the electrolyte, in that $PbSiF_6$ is decomposed at the anode into SiO_2 and PbF_2 , which mix with the anode slime.

10. When using pure lead, the cathodic total averages 98%; the anodic, on the other hand, rather over 100%, due to a slow consumption of the fluo-silicic acid in the electrolyte.

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.

ON THE AMOUNT OF AIR REQUIRED IN PYRITE SMELTING.

The Editor:

Sir—Seven years ago the ideal of the metallurgist working with sulphide copper ore was to roast it in mechanical roasting furnaces, after such preliminary crushing as was necessary, to press the fine calcines into briquettes and smelt these with coke. Today we are smelting these sulphide ores, coarse or fine as they come from the mine, with no other combustible than the iron and sulphur they may contain.

The chemistry of pyrite smelting is the chemistry of iron and sulphur. It is the oxidation of this iron and sulphur by the air pumped in the base of the furnace that provides the heat required to maintain the temperature of the furnace at that degree which is necessary for the digestive process of pyrite smelting.

The human body is a blast-furnace and its temperature must be maintained at a living grade by the oxidizing action of the air pumped in and out by the lungs; because, if the production of heat fall below the amount required to compensate for loss of heat by radiation and other sources of loss, its temperature will fall below the initial temperature of the chemical reactions; productions of heat will cease and the body will 'freeze up.'

An interesting study in pyrite smelting (and by pyrite smelting I mean the smelting of crude sulphide without carbon) is the amount of air required. This branch of the subject has been too much neglected. The metallurgist in charge of the pyrite blast-furnace must stand literally with one eye on the blower, and the other on the furnace with its charges, its slag and matte.

The blower turns should be as closely watched and recorded as any other of the incidents of the operation. The air is the breath of life of the furnace.

The heat losses are considerable, and a certain temperature must be maintained to allow the slag and matte not only to flow out of the furnace, but in many cases to be held a little while in a molten state. There will be, for any furnace, a certain minimum rate of heat production required to maintain this minimum degree of temperature; and this in pyrite smelting demands a certain rate of oxidation and a certain supply of air.

The rate of heat production is expressed by two factors, the weight of charge smelted, and the proportion of the oxidizable materials in the charge (the iron and sulphur) oxidized. The former is the rate of running, or the speed of the furnace, and is expressed in tons per hour or day, or number of charges per hour or

tons smelted per square foot of furnace area per 24 hours. The latter factor is the 'concentration,' the 'sulphur elimination,' or the 'oxidation.' The product of the two factors is the rate of heat production, and this can also be conveniently expressed in terms of weight or volume of air or oxygen used in a given time.

In the human economy the air which is inspired with the oxygen content of 20.8% is expired with 16% of oxygen. The efficiency of air is thus in the human blast-furnace not very high, being only about 25%. I have been at some pains to determine its efficiency as an oxidizing agent in our pyrite-smelting practice, and have found it to be as high as 70 per cent.

It is now time to discuss the amount of oxygen or air required by pyrite in its oxidation. The pyrite in this process is the fuel. When FeS_2 is heated in a neutral atmosphere, one-third of its sulphur volatilizes, thus: $3(\text{FeS}_2) = \text{Fe}_3\text{S}_4 + \text{S}_2$. It is said that, under certain circumstances of limited oxidation, one-half of the sulphur is recovered as such. I have not yet had an opportunity of confirming this statement, the belief in which must be the origin of the metallurgist's 'volatile atom.' In pyrite work we do see signs of free sulphur in the furnace gases.

The amount of air required for the complete oxidation of pyrite in smelting is $\text{FeS}_2 + 5\text{O} = \text{FeO} + 2\text{SO}_2$, or 120 parts by weight of pyrite require 80 parts by weight of oxygen, or 1 lb. FeS_2 requires 0.66 lb. oxygen.

A pyrite furnace, with area at tuyere level of 43.75 sq. ft. and running well, smelts its charge at the rate of 11 tons of total burden per sq. ft. of furnace area per 24 hours, or 20.5 tons of charge per hour, or 683.3 lb. per min. The amount of air used is most conveniently dealt with on the basis of the minute. I take as an example a case from actual practice. The charge consists of pyrite containing some chalcopyrite, the requisite fluxes, the converter slag resulting from the second operation, and flue dust in the proportion as normally produced. The pyrite operation is ideal and there is no coke on the charge. The FeS_2 charged (calculating all the iron in the ore as FeS_2) is at the rate of 343 lb. per minute, and is close to 50% of the total burden. The composition, the texture of the charge, and the air supply are properly adjusted and the oxidation is high in consequence. The degree of oxidation of the FeS_2 is 90%. Thus, $343 \times 0.9 = 308.7$ lb. of FeS_2 being oxidized every minute. The furnace gases contain 12% of SO_2 immediately on top of the charge. Each pound of FeS_2 requires, for complete combustion, 0.66 lb. oxygen.

A pound of oxygen is contained in 55 cu. ft. of air at 72°F. The efficiency of the air is 70%; therefore, 78.6 cu. ft. of air is required to furnish 1 lb. of oxygen. On this basis, 52.4 cu. ft. of air will be required for 1 lb. of FeS_2 oxidized; $308.7 \times$

52.4, or 16,176 cu. ft. of air per min., are therefore required by this furnace. The amount of air actually measured by the displacement of the blowers was, in the instance I cite, found to be 16,985 cu. ft. per min. In this case, 0.21 of iron and 0.24 of sulphur were oxidized per unit of charge. This expresses the degree of oxidation. The rate of oxidation was 308.7 lb. FeS_2 per minute.

A pyrite furnace is doing good work when it is using per min., for each sq. ft. of area, as many cu. ft. of air as there are days in the year, and oxidizing as many pounds weight of FeS_2 per minute as there are days in the week; and when the furnace gases on the top of the charge contain as many percentages of sulphur dioxide as there are months in the year. This, though it may sound cabalistic, is the true *memoria technica* of the pyrite smelter.

LEWIS T. WRIGHT.

Keswick, Cal., May 1, 1905.

GOLD IN SEA WATER.

The Editor:

Sir—I note with much pleasure the letter of L. K. in the JOURNAL of May 11, 1905. The points raised by L. K. are such as show that he knows his chemistry and can think, only he has not applied what he evidently knows about ions. Such communications savor of mutual and courteous helpfulness; and it is in this spirit that I will proceed—not to refute the illustration of L. K., but rather to extend it as far as may be, and to show how his own illustration defines some of the limitations in our present knowledge regarding ions.

But before proceeding to that, I wish here to make a saving remark, in partial criticism of my own general statement. The molecules of gold chloride are largely dissociated, in dilute solution, to ions of gold and chlorine, but not necessarily entirely dissociated, except 'at infinite dilution,' which limit has never been determined for such a complex as sea water. Moreover, the presence of any other ionizable chloride, bromide, or iodide (and such exist in sea water) would hinder the dissociation, and stimulate the association, of molecules of auric chloride. However, let us suppose for argument (what is perhaps not literally true) that all the molecules in question (auric, stannous and stannic chlorides) are in the limit of complete dissociation. And, further, let us assume the conditions implied in the lucid and logical illustration of L. K.; what then? There is much to ask. We have the picture of an ion (let us talk in terms of simple units) of gold with three electro-positive charges, balancing three ions of chloride chlorine, each with its single electro-negative charge. Then comes in the stannous ion with its two electro-positive charges, and the two implied chloride-chlorine ions, each with its single electro-negative charge. There follows the precipitation of gold, with the tetrad stannic ion in so-

lution, 'balanced' by the four chloride-chlorine ions, each with its single electro-negative charge. The illustration of L. K. is elegant in its simplicity and directness. It only remains for us to join hands in following out the application of the terminology of the ion theory to the logical conclusion.

What is the difference between an atom of gold in solution as an ion and that same atom as a precipitated metal, say, at the cathode? I once asked Ostwald that very question (only I asked it about sodium, but the same applies). The great Leipzig teacher of physical chemistry drew himself up and said: "Ah, Herr Blank, it is only a difference of electrical charges; the atom, as ion, has the charge or charges; the precipitated atom is destitute of the charges." L. K. will see this at once; but he may be as vexed as the writer was in getting an answer couched in terms of the ionic dialect. "So?" I said; "then, Professor Ostwald, the atom of sodium (in sodium hydroxide solution, for example) as a cation has an electrical charge; but it is in a lower scale of energy than the same atom removed from ionism to the cathode. Metallic sodium at the cathode has more available energy than the same would have as an ion; but the free metallic atom at the cathode has no charge, only a capacity for receiving an electro-positive charge. Is that so, Professor?" "Ja, Herr Blank, das ist so. It is only the symbolism of the dissociation theory."

If L. K. and I, and forty other good fellows, could smoke this out over some good nicotine, we should probably all agree that our trouble is that we do not take time to follow out our concepts to the limit of mental analysis. We take too much for granted, because it takes time to analyze mental concepts, and time is needed for other work. But there is another phase of the difficulty presented by the illustration of L. K. That is the picture of the stannous ion floating 'free' with a dyad electro-static charge in suspended and arrested development, ready to be 'oxidized' to the stannic ion with its tetrad electro-static charge, and also in a state of 'free' and uncombined arrest. The picture is true as far as mere statement can make it, and L. K. has well stated it. The answer, as far as answer can be given, throws us back to analyze our concept of variable valence. The difference between stannous and stannic tin, between ferrous and ferric iron—it amounts to a modified conception of the transmutation of alchemy, only with this proviso, that stannous and stannic tin swing back and forth under the touch of oxidation and reduction, as do ferrous and ferric iron; each is transmuted in its own narrow limits, and stays in those limits. Stannous and stannic tin are always tin, never iron; and ferrous and ferric iron are always iron, never tin. There is much to know; indeed, we know almost nothing. May the time soon come when L. K. can join with

us to analyze the ionic charges into the terms of the electronic dialect, and to touch and color the picture with pigments borrowed from the chemistry of radio-activity; but that, as Mr. Kipling says, "is another story," a story not of today, but of tomorrow.

I wish to thank L. K. for his able criticism of my poor pen, and to hope that the future may allow us to know each other in person.

ALCHEMIST.

Boston, May 12, 1905.

PRECIPITATION OF GOLD FROM CYANIDE SOLUTIONS.

The Editor:

Sir—I note in your issue of April 20 the paper on 'Precipitation of Gold from Cyanide Solutions,' read by W. J. Sharwood, before the California Miners' Association. I do not think Mr. Sharwood does justice to zinc shavings. His experiments did not show good results, and he drew conclusions that in my opinion are hardly warranted.

In well-managed plants in this district (El Oro, Mexico), zinc-box tailing is kept to the low average of 3c. per ton, and if the box is watched closely, the tailing can be kept to a trace. Tailing running 20c. is the result of ignorance or carelessness. Solution from slime-leaching, carrying 0.03% KCy, is as easily precipitated as the stronger solutions from the sand-leaching tanks. Creek water has been successfully precipitated here, carrying 0.01% or less KCy, and a value of 0.15c. per ton. During eight years' practice at cyaniding, I have not found a solution from which all the values could not be precipitated in a zinc-box. When, as in Mr. Sharwood's experiments, the solution carries copper, the copper-coated shavings can be washed in a strong solution of cyanide, and the most heavily coated shavings transferred to the strong-solution boxes, and all fresh zinc added in the weak-solution boxes. When the shavings become very foul, I have found that a dip in a dilute solution of H₂SO₄ and a couple of water-washes, remove all copper and make the shavings more active than before.

Mr. Sharwood recommends the consideration of some of the other methods of precipitation, when planning a large mill. The cyanide man will dismiss, in a moment, sodium or hydrogen sulphide, as non-practical. The Pelatan-Clerici process has had a thorough trial. How many large mills are using it? I do not know of a mill using the electrolytic process of precipitation (such as the Siemens-Halske), that gets as low a tailing as the zinc-box. Some mills are using the electrolytic method successfully, but they also use a compartment of zinc shavings, to help out. We all know the advantages of the electrolytic method, though, and it well deserves consideration. Personally, I have had no experience with the charcoal method, but the trouble and expense of

handling charcoal in a mill precipitating 1,500 tons or more of solution in 24 hours must be appalling. Should one of your readers have had some actual and favorable experience with the charcoal method, I should like to hear his opinion.

Mr. Sharwood seems to favor the zinc-fume method. With a gold-bearing ore, when the pay ore is soluble, it will work well. A weak point is that, when a tank of solution is ready for precipitation, lime must be lost, while the solution is assayed and the proper amount of zinc fume needed to precipitate a given amount of ore calculated; otherwise an excess of zinc fume would have to be added, to be on the safe side, causing a needless consumption of zinc and increasing the difficulties of refining. Here in Mexico, where, as a rule, our ores carry silver with the gold, I consider the zinc-fume method impracticable. To get good results we are compelled to use as high as five tons of solution to treat a ton of slime, and a proportionate amount on the sand. In a 300-ton mill, this means that, in 24 hours, from 1,500 to 2,000 tons of solution must be precipitated. Taking Mr. Sharwood's figures that 100 sq. ft. of filtering surface in the press will filter six tons per hour, a large mill handling, say, 1,500 tons of solution per day, with the zinc-fume method, would need eight or nine presses such as used by Mr. Sharwood. Larger presses of course could be used, but anyone who has handled cyanide product in presses, and knows the trouble, care and labor required, will not be anxious to try it on such a large scale.

As to the acidulation and filter-producing method, it should appeal to anyone having to treat gold-bearing tailing carrying an unusual amount of copper.

GEO. F. BRIDGER.

El Oro, Mexico, April 30, 1905.

SILVER-BEARING GALENA IN BARITE.

The Editor:

Sir—The successful treatment of this class of ore will undoubtedly interest many of your readers who have had to deal with similar problems.

The ore in the Whale mine, in Park county, Colorado, of which Claude E. Street, of Webster, Colorado, is manager, consists of a gangue of barite (barium sulphate) carrying galena accompanied by silver. The ore assays: Lead, 5.5%; copper, 0.43%; silver, 12 oz. per ton. It is evident that the ore must be concentrated in order to raise the percentage of lead and to get rid, as far as possible, of the undesirable barite, and thus obtain a product fit for smelting. The barite, however, makes water concentration impracticable, therefore concentration by oil was tried.

Tests by the Elmore process resulted as follows:

First Test.—Ore ground to 30-mesh and pulp subjected to slight agitation with oil, obtaining a ratio of concentration of about 5.4 tons into 1. Assay of concen-

trate: Lead 30%, copper 2.1%, silver 57 oz. Extraction obtained: Lead 98%, copper 95%, silver 90%. At the prices paid by smelters for lead, copper and silver, the values remaining in the tailing would be: Lead, 6c.; copper, 4c.; and silver, 60c. This shows an extraction of 93% of the total value of the ore.

Second Test.—Ore ground to 30-mesh and pulp subjected to still less agitation and a higher ratio of concentration obtained, namely, about 7 tons into 1. Assay of concentrate: Lead 40%, copper 2.5%, silver 71 oz. Extraction obtained: Lead 97%, copper 85%, silver 86%. Owing to the greater ratio of concentration, the second test yields a higher grade of concentrate, but the loss in the tailing is increased by 38 cents per ton. Taking into account, however, the cost of freight and smelting charges on the concentrate, these costs show to the advantage of the second test, to the extent of 60c. per ton of original ore, thus giving to the second test the net advantage of 22 cents.

In the first test the greater agitation caused the oil to pick up more of the middling product, consisting of particles in part gangue and in part metallic. By crushing to a finer mesh, it would be possible to obtain the higher grade of concentrate yielded in the second test, together with the higher extraction yielded in the first test. The advantage thus obtained would have netted 38c. additional profit per ton, from which there would have to be deducted the extra cost of finer crushing. Allowing the price paid by smelters for lead, copper and silver, the assay-value of this ore is \$10 per ton. Loss in treatment, 70c.; cost of freight and smelting the Elmore concentrate, 75c. (freight \$4.50 per ton, and no smelting charges on concentrate assaying 45% lead), thus leaving \$8.55 per ton to cover mining and milling expenses and profit.

The adaptability and value of the Elmore process to ores of this class is clearly manifest, and especially so since there appears to be no other method by means of which such ore can be commercially treated.

F. H. PRENTISS.

San Francisco, Cal., May 8, 1905.

Brick from Mill Tailing.

The *New Zealand Mines Record* says: "A sample of brick made from tailings from the Waihi Company's battery has been recently forwarded to the Mines Department. The tailings were ground in one of the new tube-mills, and afterward treated by the cyanide process, before their conversion into bricks. The sizing tests of the tailings, after passing through the tube-mill, show that on an average 92% will go through a 200-mesh sieve, and this is the material from which the sample brick was made. The brick was submitted to Alexander McKay, who states that in appearance the brick is everything that could be desired, and its

weight indicates a probable just proportion of lime. More closely examined, the brick was found to be soft, and so friable that it yielded to very slight friction, under the fleshy part of the thumb being again rendered into fine sand. If a proper admixture of cement, or hydraulic lime, and sand or slime were made, the result would be, on mixing with the due amount of water, a cement flag such as is used in the city of Wellington for pavement, or the same might be press-molded into the form and size of an ordinary brick; finished, this would be a flag or block of cement, according to circumstances. The other method of using dry-slacked lime would simply result in a pressed slag, or brick, of mortar material, and this would require some time to mature. There is no difficulty in the method of the manufacture either as regards materials or the mechanical mixing of them. The trouble is that very fine material requires much labor to bring the lime to all the surfaces, and then to be sure that moisture or steam reaches all parts of the compost. This is the difficulty which in the least degree is manifested in the making of rough concrete for foundations, walls, etc., and, perhaps, in its greatest degree in the brick made from Waihi tailings."

Sault Ste. Marie Canal Traffic.

The locks at the Sault Ste. Marie opened this year on the Canadian side on April 10, and on the American side on April 14. At a later date in the month, however, there were vexatious delays caused by ice, which prevented traffic from moving freely. The total number of vessels passed through the locks up to May 1 was 706, and the total freight carried was 1,300,166 net tons, of which 920-497 tons were east-bound and 379,669 tons west-bound. The mineral freight carried included 806,838 net tons of iron ore, 5,542 tons of pig and manufactured iron, 5,319 tons of copper, and 52,226 bbl. of salt. The coal freight carried westward included 121,940 tons of anthracite, and 219,602 tons of bituminous coal, a total of 341,542 tons. No comparison is possible with last year, as there was no navigation in April, 1904.

Ore is moving rapidly, and the May tonnage will undoubtedly be very heavy. The stocks of ore at the upper lake docks are excellent, and in good shape, so that there is no delay whatever in shipments. The coal movement, however, has been very light so far, and a good many boats are going up in ballast. For April and the first part of May, ore carried practically the whole lake trade.

All important engineering works cost many lives, directly or indirectly. The tale of death for the Williamsburg Bridge over the East river, New York, was 20, of which, oddly enough, only two occurred in the actual process of putting the structure in place.

Coal Production of the United States.

In the issue of the *JOURNAL* for January 5 last, we estimated the total production of coal in the United States for the year 1904 at 350,376,319 short tons. At that early date, of course, it was impossible to obtain full returns from a number of the States, and in all cases the production for the month of December had to be estimated. The United States Geological Survey has now published a preliminary statement of the figures of coal production which it has collected for the year. The total given is 351,196,953 tons, of which 278,040,244 short tons were bituminous coal, and 73,156,709 tons anthracite. Assuming these figures to be approximately correct, it shows that our estimate erred on the conservative side; but it differs from this statement by only 820,634 tons, or 0.23 per cent.

The production by States is given by the Survey as follows:

COAL PRODUCTION OF THE UNITED STATES IN 1904, BY STATES.

State.	Production.
Alabama.....	11,163,194
Arkansas.....	2,009,451
California and Alaska.....	75,388
Colorado.....	6,594,295
Georgia and North Carolina.....	400,191
Idaho.....	3,330
Illinois.....	35,990,796
Indiana.....	10,929,908
Indian Territory.....	3,011,972
Iowa.....	6,542,005
Kansas.....	6,322,875
Kentucky.....	7,559,940
Maryland.....	4,819,171
Michigan.....	1,338,447
Missouri.....	4,187,197
Montana.....	1,359,409
Nevada.....	150
New Mexico.....	1,452,183
North Dakota.....	269,297
Ohio.....	24,415,054
Oregon.....	111,540
Pennsylvania.....	97,916,733
Tennessee.....	4,782,302
Texas.....	1,072,194
Utah.....	1,491,607
Virginia.....	3,576,092
Washington.....	3,135,757
West Virginia.....	32,332,385
Wyoming.....	5,177,381
Total bituminous.....	278,040,244
Pennsylvania anthracite.....	73,156,709
Grand total.....	351,196,953

The estimate of the value at mines of the total output is \$445,643,528. This value, however, is not a very important figure, as estimates of the return at individual mines are often given on an uncertain and varying basis.

The statistics of bituminous coal production comprise all varieties except Pennsylvania anthracite, and include semi-anthracites, semi-bituminous, cannel, splint and block coals, and brown and black lignites. The small production of anthracite in Colorado and New Mexico is also included in the bituminous output.

Among the 31 States included in the table there were only 10 in which there was an increase of production in 1904, and these 10 include the State of Nevada, which is credited with 150 tons in 1904 and had no production during the preceding year. Of the more important producing States, West Virginia, Indiana, Kentucky, Iowa, Kansas, and Wyoming were the only ones that showed an increase in production in 1904.

Improved Appliances for the Cyanide Clean-up.*

BY D. V. BURNETT.

At the Crown Deep mine, a 2-in. centrifugal pump, driven at 1,600 rev. per min., is used to pump the solution out of the boxes, from which the coarse zinc above the tray has been previously removed, the box being then cleaned out by hand. The solution is pumped into a tank capable of holding the contents of at least half the total number of boxes. A box 20 by 5 by 2 ft. is pumped out completely in eight minutes. The fine zinc and gold slime are conveyed by hand to a washer, which is a cylindrical trommel of circular plates connected by narrow steel plates, between which the fine mesh screening

tion hose of a filter-press is attached. When a small amount of acid solution is run into the box and the pump of the press started, all liquid in the box will be pumped out and filtered, and returned to the box. If the trommel is at the same time rotated, the gold slime from the inside is washed into the filter-press and the acid solution returned quite clean to begin the circuit again. An agitator, B, is rotated inside of the box, under the trommel, in order to keep the slime in suspension.

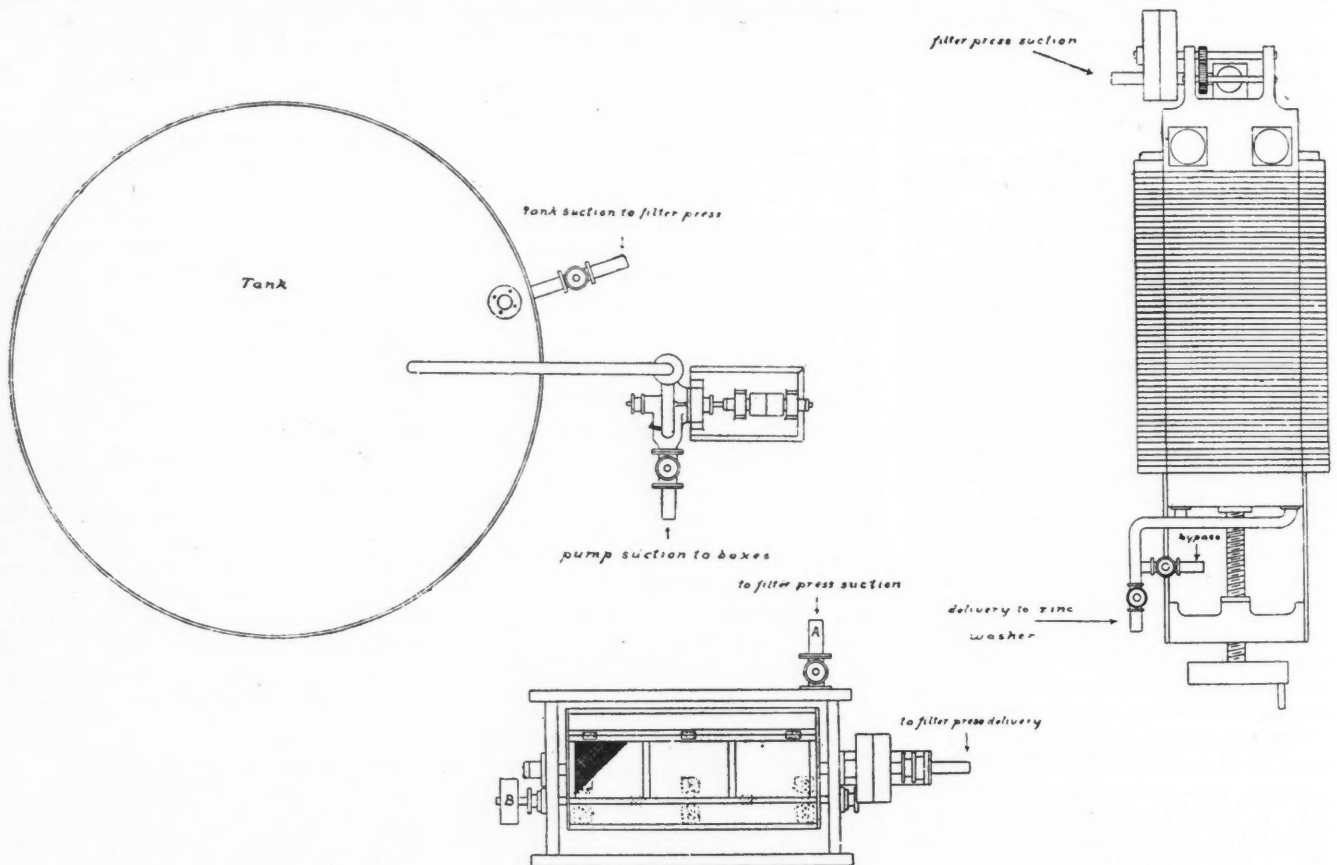
By keeping the solution in the washer slightly acid, the zinc washed in the trommel and left on the screen is thoroughly cleaned. As compared with hand washing, there is a saving in time and labor, to say nothing of sore fingers, while the

West Virginia Coal.

The report of James W. Paul, chief mine inspector of West Virginia, which has just been published, shows that the mines of the State during the fiscal year ending June 30, 1904, produced a total of 26,984,715 long tons of coal, which was an increase over the previous year of 4,071,017 tons. The disposition of the tonnage reported was as follows:

Shipped from the mines.....	22,922,574
Sold to local trade.....	400,858
Used in making coke.....	3,333,861
Used in operating mines.....	327,422
Total.....	26,984,715

The tonnage of coal by districts was as follows: Potomac, 1,619,340; Monongahela, 7,396,161; Wheeling, 553,984; Kanawha-New River, 9,293,771; Norfolk &



PLAN OF CYANIDE WORKS.

forming the sides of the cylinder is attached with a hinged door, through which the material to be washed is introduced.

The trommel is wholly contained in a wooden box, in which it rotates on a spindle, resting on bearings outside the box. The trommel is 3 ft. 9 in. long and 20 in. diameter. Eight buckets of precipitate can be washed at each filling. It is rotated by a small belt passing over a pulley at one end of the spindle. The spindle is hollow, with perforations, so that wash-water can be introduced by suitable connections.

To the lower part of the box, at the point marked A in the drawing, the suc-

pulverization of the zinc by scrubbing is prevented, and it is possible to make a more complete separation of zinc and slime. With two white men and four or five coolies, 12 extractor boxes, 20 by 5 by 2 ft., can be cleaned up thoroughly in about six hours, leaving all the slime ready for drying.

The working temperature of the fused cryolite bath in electrolytic reduction of alumina is 1,650 to 1,740° F. (899 to 940° C.).

In the new rare-earth incandescent lamps pure material is desirable for the direct current, but not always for the alternating current.

Western, 7,951,459; small mines, 170,000. Each geographical district, except the Potomac, shows an increase, but the production of small mines fell a little short of that for the previous year.

Of the total coal mined, 18,667,023 tons were pick-mined, and 8,317,692 tons were machine-mined. Machine mining has shown a considerable growth during the year. At its close mechanical coal cutters were in use at 248 mines, and 988 machines in all were employed. The average tonnage produced by each machine was 9,052 tons for the year, or 40.4 tons per day worked, the average day's run being 224. The coal produced per employee on the machines were 990.7 tons for the year. In the pick mines the average output per

* Abstract of a paper in the *Journal of the Chemical, Metallurgical and Mining Society of South Africa.*

year for each miner, not counting for employees, was 979.7 tons.

It is estimated that during the year the coal was worked out from under 3,968 surface acres.

The accident report for the year is given in the table below. The total number of inside, or underground, employees was 36,316, and the average number of days worked was 209, giving, approximately, 7,590,044 days' labor. Using these totals, the following averages are obtained:

	Killed.	Injured.	Total
No. of employees.....	123	191	314
No. per 1,000 employed.....	3.3869	5.2594	8.6463
No. per 1,000 days' work.....	0.0162	0.0251	0.0413

West Virginia mines are no exception to the rule that the most frequent cause of death by accident is found in falls of coal or roof. The report gives a statement of fatal accidents and their causes for eight years. We give below the figures for the fiscal year 1904, and in comparison the totals for the eight years, 1897-1904, inclusive:

	—1904—		Eight Yrs.	
	No.	%	No.	%
Falls of roof or coal.....	95	77.2	585	68.9
Mine cars.....	12	9.8	78	9.2
Gas explosions.....	3	2.4	88	10.4
All other.....	13	10.6	98	11.5
Total.....	123	100.0	849	100.0

It will be seen that more than three-quarters of the fatal accidents were due to fall of roof and coal, and there is little doubt that a very considerable proportion of these accidents are the result of carelessness or neglect to furnish proper support to the roof as the work progresses. The experience of West Virginia, however, is not unlike that of other States in this respect.

With regard to transportation, by far the greater proportion of the West Virginia coal is handled by rail. The total rail shipments from the mines included 24,033,424 tons of coal, and 2,467,368 tons of coke. Shipments by water on the Great Kanawha river amounted to 1,332,430 tons of coal and 1,500 tons of coke.

During the year, 2,276,451 tons of coke were made, showing an average production of 1 ton of coke from 1.46 tons of coal. There are 15,857 coke ovens within the State, nearly all of the old beehive pattern. During the year there were 8,536 ovens operated, an average of 222 tons, employing 3,511 persons.

Wages generally declined during the year from the high level established in 1903. The average payment for pick-mined coal, on a run-of-mine basis, was 49.5c.; for machine-mined coal the average payment, on a run-of-mine basis, was 35c. per ton in headings and 30c. in rooms. There were strikes in the Wheeling district, and in some mines in the Kanawha valley. This, however, affected only a small part of the men employed in the State.

The State inspector represents that the number of district inspectors is now insufficient, owing to the increase in the number of mines. It is impossible for

any of the inspectors to make a full examination of the mines under his charge.

It is recommended that the number of district inspectors should be increased.

Lake Ore Movement.

According to the port statistics, which are carefully kept and collected, the *Cleveland Marine Review* says that the quantity of ore on Lake Erie docks May 1, of the present year, is less than it has been any year since 1900. The amount is 2,271,631 tons for May 1, 1905, as against 3,317,627 tons for April, 1905. The amount on docks December 1, last, was 5,763,399 tons, so that during the winter season (December 1 to May 1) 3,491,768 tons have gone forward to the furnaces. The total amount of ore moved over Lake Erie docks to furnaces in the full year ending May 1, 1905, was 20,057,070 tons, as against 18,739,995 tons in 1904 and 21,905,251 tons in 1903.

Figures showing the total ore passing to furnaces over Lake Erie docks in the year ended with the first of the present month are found in this way: We know that on December 1, 1904, Lake Erie docks contained 5,763,399 tons; deducting from this 2,271,631 tons, the amount of ore now on dock, we find that shipments to furnaces during the winter period (December 1 to May 1) amounted to 3,491,768 tons, which, added to 16,565,302 tons, the amount shipped to furnaces during the navigation season of 1904, gives 20,057,070 tons as the entire consumption of ore from Lake Erie ports during the year ended May 1, 1905, as against 18,739,995 tons for the year ended May 1, 1904, and 21,905,251 tons in the year ended May 1, 1903; 17,216,065 tons in the year ended May 1, 1902; 14,468,260 tons in the year ended May 1, 1901; 15,882,881 tons in the year ended May 1, 1900; 12,122,982 tons in the year ended May 1, 1899, and 10,209,488 tons in the year ended May 1, 1898.

April shipments from upper lake ports this year were 1,195,173 tons and to preserve the comparative value of the May 1 dock figures, the amount of ore on dock April 1 is, therefore, given as follows: Sandusky, 51,233 tons; Cleveland, 741,612 tons; Erie, 297,726 tons; Buffalo, 108,058 tons; Lorain, 201,251 tons; Fairport, 503,366 tons; Conneaut, 323,164 tons; Ashtabula, 886,713 tons; Toledo, 104,287 tons; Huron, 100,217 tons; total, 3,317,627 tons.

The following table shows the stocks reported on Lake Erie docks on May 1 of each year for 10 years past:

Year.	Gross tons.	Year.	Gross tons.
1905.....	2,271,631	1900.....	1,720,656
1904.....	4,534,103	1899.....	2,073,254
1903.....	3,592,367	1898.....	3,167,915
1902.....	2,848,194	1897.....	3,256,497
1901.....	3,050,183	1896.....	1,949,698

There are no means of ascertaining the stocks in furnace yards at the parallel dates; but it is altogether probable that they were light this year. This is supported by the fact that ore is being taken from the docks almost as fast as it is unloaded.

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.

Quartz.—I desire to inquire what is the quality of quartz used for wood filling, crockery, etc.?—N. K. V.

Answer.—It is customary to employ an opaque or milky quartz in 'filling' wood, and a clear glassy mineral in the manufacture of crockery. The quartz used for these purposes should be crushed, bolted and freed from foreign matter. The market price depends largely on the quality of the quartz and its adaptation to special purposes. Ordinarily the lump mineral, when of good quality, will sell at \$2.50 to \$4 per short ton, f. o. b. New York; when ground, the price varies from \$9 to \$12 per ton, according to purity and fineness of mesh. It would be advisable to send good samples to Hammill & Gillespie, 240 Front street, New York, and Fuerst Brothers & Co., 2 & 4 Stone street, New York, leading dealers in quartz.

Strontium Salts.—What quantity is manufactured in the United States; how much is imported, and what use are the strontium salts put to?—C. A. N. C.

Answer.—Considering the limited consumption in this country by reason of the few uses found for strontium salts, their manufacture has not been encouraged. The imports from Germany—principally strontium carbonate and nitrate—amounted last year to about 480 tons, which has been employed chiefly in the manufacture of pyrotechnics. These imports would have been larger, no doubt, if the beet-sugar industry in this country were as extensive as it is in Germany. In that country appreciable quantities of strontium carbonate are used at the beet-sugar works to precipitate the sugar from the so-called molasses. It is customary to accumulate the strontium carbonate residuum, and by special treatment to utilize it as a lining material for the sugar-melting furnaces.

Recent Legal Decisions.

SPECIALLY REPORTED.

TITLE TO ORE UNDER TREATMENT.—A decision of the United States District Court for Colorado, rendered May 3, affects the title to a quantity of ore under treatment, and is of general interest. The suit was brought by the Eagle Ore Sampling Company, of Victor, Col., to recover certain ore which had been shipped by the company for treatment. The Eagle company had a contract with the Telluride

Reduction Company, which was merged in the General Metals Company, for the treatment of its ores. When the General Metals Company went into bankruptcy, the Eagle company made a demand for the value of the ore then in the hands of the Telluride Reduction Company, claiming that the contract was one for treatment only, and that the title in the ore remained with the Eagle company. The referee in the case ruled that the ore had been sold to the company, so that the claim became one against the General Metals Company, and would have to take its chances with those of the other creditors. The court now decides that the contract was a treatment contract only; the title to the ore remained in the Eagle company, and the ore, therefore, could not be considered as an asset of the General Metals Company. The claim of the Eagle company, therefore, becomes a preferred claim, which takes precedence of the ordinary claims in bankruptcy.

Abstracts of Official Reports.

Tonopah Mining Company.

The mines of this Nevada company have until recently been under the supervision of John Hays Hammond, the Mizpah and the Valley View being the two properties upon which the underground work is being done. Development during the year ending Feb. 28, 1905, in both mines comprised 1,739 ft. of crosscuts and drifts and a small amount of winzes and raises; of the total distance driven, 1,733 ft. was in ore. Work on the Mizpah vein has consisted in extending to the west the 400-ft. level and connecting it with the Mizpah shaft. In the Valley View mine all the development, on four levels, has been toward the west. Stopping has been confined entirely to the west slope driven from the 340-ft. level, where the vein is exceptionally wide and its value unusually high. It is proposed to sink a shaft near the intersection of the north line of the Buckboard claim with the south line of the Red Plume claim. This will enlarge the capacity of the company's mine and aid in economy and operation; it will also test the extension into the company's territory of a 6-ft. vein of good value which has been traced, on the Red Plume property, to within 40 ft. of Tonopah company's ground.

The principal work on the surface has been to extend railroad spurs to various productive points. The tracks have been laid with a special view to the handling of loaded cars of gravel, sufficient standing room having been provided for enough empty cars to hold a day's output. Shaft houses have been begun at the Mizpah and the Silvertop shafts, having capacities of 600 and 200 tons respectively. Both will be provided with grizzlies, crushers and sampling machinery. The present hoisting capacity is about 150 tons per day.

Material hoisted during the year amounted to 11,363 tons, of which 1,840 was waste. Ore amounting to 15,707 tons was shipped and 5,637 tons was put on the dumps, the estimated total amount of ore now in stock being 18,832 tons. Having delayed the erection of a reduction plant until some success had been attained by other mines in the treatment of similar ores, the directors have decided to build a 100-stamp mill immediately. A contract has also been entered into for the construction of a steam plant to generate electricity for use in the mines; this should be completed in September of this year. It will be placed at a point 13 miles west of Tonopah, on the railroad line, and near the point at which the reduction plant will be installed. Underground water is known to be abundant at this place.

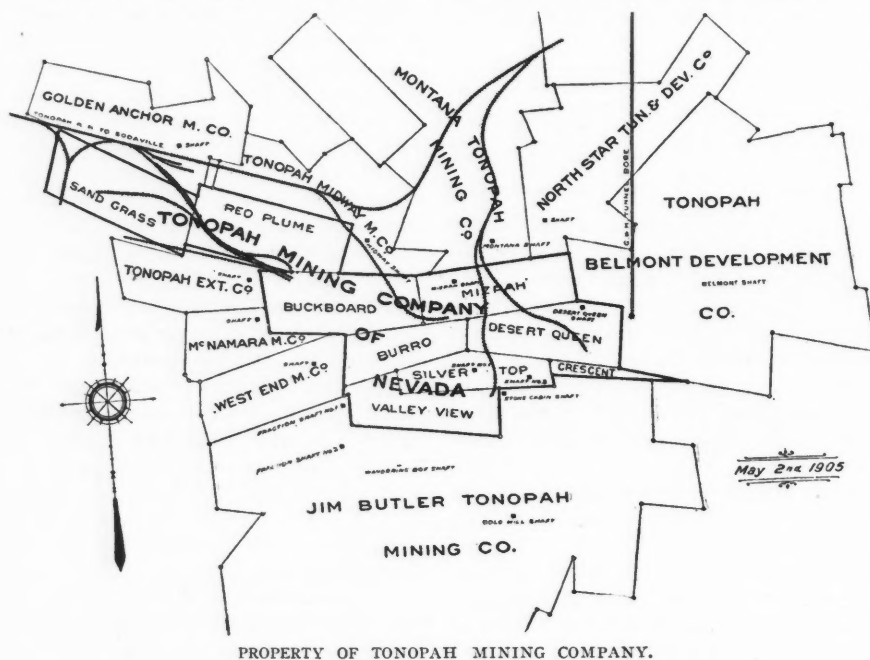
The first-mortgage bonds, received by the company as part payment for the con-

and general expenses, together with fixed charges for interest, taxes, etc., amounted to \$620,418, showing a profit of \$55,509 during the year, which, with the balance brought forward, gives a surplus of \$270,792. From this the directors determined to declare a dividend of 25% on the outstanding capital stock.

Tamarack Mining Company.

The report of this copper company, covering the year 1904, while rather disappointing from a financial standpoint, owing to causes which will be explained, still gives reason to expect a prosperous future, inasmuch as the successive levels on the several lodes show continuous improvement in richness as depth is gained.

The total amount of development work during the year was 8,697 ft., made up as follows: Sinking on shafts No. 3 and 5, 122 ft.; drifting on conglomerate, 6,420 ft.;



struction of the Tonopah Railroad, have been sold and the proceeds were applied to the retirement of the outstanding preferred stock. The operation of this railroad, aside from the facilities that it offers in the handling of the company's ore and supplies, seems likely to prove a highly remunerative investment. Its net earnings for a period of nine months ending March 1, 1905, were \$233,238, while its fixed charges and sinking fund amounted to \$45,575 for the same period. The entire line will be widened to standard gage in order to connect with the branch of the Southern Pacific north of Sodalville. An entirely new equipment of standard-gage rolling stock will be obtained and the entire expenses of the alteration will be borne from current net earnings.

The receipts from ore shipments to the smelter were \$658,316, and \$17,611 was received in royalties. Operating equipment

drifting on Osceola amygdaloid, 623 ft.; crosscutting, 788 ft.; winzes and raises, 744 ft. The deepest shaft, No. 3, has reached a depth of 5,066 feet. Three other shafts average 4,500 ft. and a fifth has reached 3,400 ft. in depth. Shaft No. 3 was in operation continuously except for a few days in January when the shaft-house was partially burned, although the hoisting plant suffered no injury. The damage has now been entirely repaired, and the average tonnage hoisted throughout the year was 28,742 per month. Drifting from this shaft has developed ground of good grade and the new openings have sufficed to maintain the ore reserves. The 16th level has been extended 400 ft. during the year and has shown an improvement over the 15th level, which in turn was better than the 14th level. The prospects are thus materially improved. At shaft No. 5, drifting has been mainly directed toward the south, on levels between the

30th and the 39th. This ground compares favorably with any that has been opened from this shaft and is all good stoping ground. Results of drifting to the north are disappointing on the whole, although some good stoping ground was met. The hoist and compressor plants at this shaft were completed in August. At No. 2 shaft, 500 ft. or more of timbering showed signs of weakness and entire replacement was determined upon. A space of 3 ft. was excavated on all sides of the shaft and a double set of timbers was put in around the inner set, to which the hoisting way was attached, so that any future movement of the ground will not affect the alignment of the guides. This process involved the removal of 8,000 tons of rock and the use of 300,000 board ft. of timber, and was completed without a single accident. Its cost—\$40,000—was charged to operating expenses, which, with the entire cessation of hoisting during a period of five months, raised the cost per ton to an abnormal figure. Since the repairs no sign of failure of timbering has been seen.

The results of operations during the past two years may be compared as follows:

	1903.	1904.
Rock mined, tons.....	750,189	750,189
Rocks stamped, tons.....	642,320	642,320
Mineral obtained, lb.	24,065,519	22,662,070
Refined copper in mineral, per cent.....	63.545	66.022
Refined copper per ton rock stamped, lb.	23.2	28.3
Product fine copper, lb.	15,286,093	14,961,885
Cost per lb. for mining, cents.	9.97	10.54
Cost per lb. for construction, cents.....	0.15	1.08
Cost per lb. for smelting, freight, selling, etc., cents.	1.88	1.36
Total cost per lb., cents.	11.50	12.98
Cost of mining per ton stamped	\$2.06	\$2.20
Cost of stamping per ton.....	0.262	0.260

In the mill, it has been decided to instal a set of rolls auxiliary to each head of stamps, in order to crush the oversize from the trommels instead of returning this material, as has been the practice, to the stamps. One set has been in operation for a sufficient length of time to prove its value in this connection and their general introduction throughout the mill will increase the stamping capacity and reduce the stamping cost. One stamp is to be converted into a steeple-compound, the necessary cylinders having been ordered from the manufacturers.

The profit and loss account may be stated briefly:

Sale of copper (14,961,885 lb. @ 13.24 c.)	\$1,981,362
Mining and operating expenses.....	\$1,576,924
Smelting, transportation, commissions, etc.....	203,628
Construction.....	161,958
Total expenses.....	\$1,942,510
Profit for the year.....	\$38,851
Balance brought forward.....	777,031
Balance for dividends.....	\$815,882

One dividend, at the rate of 6%, was paid during 1904, absorbing \$90,000. The company is capitalized at \$1,500,000, all of which has been issued for the last nine years.

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, 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 May 9, 1905.

- 789,133. APPARATUS FOR DISTRIBUTING MOLTEN SLAG IN BLAST-FURNACES.—Ralph Baggaley, Pittsburg, Pa., and Charles M. Allen, Lolo, Mont.; said Allen assignor to said Baggaley.
- 789,134. COPPER-POURING SPOON AND SPLASH-SHIELD.—Ralph Baggaley, Pittsburg, Pa.
- 789,135. APPARATUS FOR CHARGING FURNACES.—Ralph Baggaley, Pittsburg, Pa.
- 789,146. APPARATUS FOR ELECTROLYZING LIQUIDS.—Leon Dion, New York, N. Y., assignor to The Americus Electro-Hermetic Company, New York, N. Y.
- 789,160. APPARATUS FOR FEEDING AND DISTRIBUTING MOLTEN MATERIAL IN BLAST-FURNACES.—Edward W. Lindquist, Chicago, Ill., assignor to Ralph Baggaley, Pittsburg, Pa.
- 789,167. DEVICE FOR CLEANING COAL-BREAKERS.—Jesse L. Miller, Pittsburg, Pa., assignor to Heyl & Patterson, Pittsburg, Pa.
- 789,215. APPARATUS FOR GALVANIZING OR OTHERWISE PLATING WIRE OR OTHER METALLIC BODIES. George A. Goodson, Providence, R. I., assignor to Goodson Electric Galvanizing Company, Minneapolis, Minn.
- 789,252. BLASTING COMPOSITION.—Max Bielefeldt, Berlin, Germany.
- 789,266. APPARATUS FOR MANUFACTURING GAS.—Byron E. Eldred and Carleton Ellis, New York, N. Y., assignors to Eldred Process Company, New York, N. Y.
- 789,298. ROLLING-MILL FEED MECHANISM.—Edwin E. Slick, Pittsburg, Pa.
- 789,303. ORE-ROASTING FURNACE.—Peter A. Wagner, Carrville, Cal.
- 789,322. CRANE AND BLOCK FOR DREDGE-BOATS.—George W. Gerhart and Joseph B. Gerhart, Lawrence county, Ill.
- 789,325. DEVICE FOR TREATING SLIMES.—Robert A. Kerr, Salt Lake City, Utah.
- 789,353. PLANT FOR THE ELECTRO-DEPOSITION OF METALS.—Anson G. Betts, Troy, N. Y.
- 789,371. ORE-ROASTER.—John W. R. Laxton, Lynn, Mass.
- 789,381. COAL-CHUTE.—Daniel S. Post, Painesville, Ohio, assignor to Harry A. Post, Painesville, Ohio.
- 789,413. OVERLOAD CUT-OUT FOR HOISTS.—Phillip J. Darlington, Glenridge, N. J., assignor to Sprague Electric Company.
- 789,438. PROCESS OF TREATING PHOSPHATE-ROCK.—Florentine J. Machalske, Brooklyn, N. Y., assignor to Frederick Darlington, Great Barrington, Mass.
- 789,439. PROCESS OF TREATING PHOSPHATE-ROCK AND PRODUCING COMPOUNDS OF PHOSPHORUS AND NITROGEN.—Florentine J. Machalske, Brooklyn, N. Y., assignor to Frederick Darlington Great Barrington, Mass.
- 789,440. PROCESS OF TREATING PHOSPHATE-ROCK AND PRODUCING PHOSPHOROUS CHLORIDES AND ALKALIMETAL CYANIDES.—Florentine J. Machalske, Brooklyn, N. Y., assignor to Frederick Darlington, Great Barrington, Mass.
- 789,451. MANUFACTURE OF METALLURGICAL VESSELS.—Augustin L. J. Queneau, South Bethlehem, Pa., assignor to The New Jersey Zinc Company, Newark, N. J.
- 789,452. METHOD OF MAKING COMPOSITE-WALL METALLURGICAL VESSELS.—Augustin L. J. Queneau, South Bethlehem, Pa., assignor to New Jersey Zinc Company, New York, N. Y.
- 789,453. METALLURGICAL VESSEL.—Augustin L. J. Queneau, South Bethlehem, Pa., assignor to New Jersey Zinc Company, New York, N. Y.
- 789,484. CRUSHING-MACHINE.—Charles G. Buchanan, New York, N. Y.

- 789,523. PROCESS OF ELECTROLYTICALLY REFINING COPPER-NICKEL ALLOYS.—Anson G. Betts, Troy, N. Y.
- 789,530. ART OF UNITING METALS.—Wilson L. Fenn and John W. Conway, Hartford, Conn.; said Conway assignor to said Fenn.
- 789,577. BRICK-KILN.—Marcellus S. Storer, Nelson, Nebr.
- 789,600. PAINT COMPOUND.—Louis S. Fiatau, St. Louis, Mo.
- 789,610. OBJECTS OF ARTIFICIAL MARBLE AND PROCESS OF PRODUCING SAME.—Robert Hulsberg, Sonneberg, Germany.
- 789,615. HOISTING APPARATUS.—Augustus L. Le Grand, Pittston, Pa.
- 789,624. DUMPING-CAR.—Herman A. Peiler, Koloa, Hawaii.
- 789,634. PROCESS OF RECOVERING SULPHURIC ANHYDRID AND SULPHURIC ACID VAPORS FROM GASES.—Max Schroeder, Berlin, Germany, assignor to New Jersey Zinc Company, New York, N. Y.
- 789,647. PROCESS OF MAKING DIBASIC CALCIUM PHOSPHATE.—Richard Arens, Marxloh, Germany.
- 789,648. METHOD OF CONTINUOUSLY PRODUCING MATTE BY DISSOLVING ORES.—Ralph Baggaley, Pittsburg, Pa.
- 789,664. CENTRIFUGAL PUMP.—Luther Look, Los Angeles, Cal., assignor to New Standard Concentrator Company, Los Angeles, Cal.
- 789,671. PROCESS OF MAKING ALKALINE FLUOSILICATES.—Julius A. Reich, Vienna, Austria-Hungary.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Week Ending April 22, 1905.

- 3,962 of 1904. SLIME AGITATOR.—R. K. Evans, London. Improved method of agitating slime and solution by air blast, and an improved continuous filtering apparatus operated by suction through the filtering medium.
 - 7,478 of 1904. BINDER FOR IRON ORE BRIQUETTES.—T. Rouse and H. Cohn, London. Use of alum and water glass, as binding mixture for making briquettes of fine iron ores.
 - 10,682 of 1904. MUFFLE FURNACE.—F. Heberlein and W. Hommel, London. A rotary muffle furnace having a rotary ore chamber with a rotary heating chamber underneath, and a stationary heating chamber above, the heating gases circulating first through the lower chamber and afterward through the upper.
 - 11,559 of 1904. MINE-CAR SAFETY STOP.—B. H. Williams, Merthyr Tydvil. Improved apparatus for preventing mine trucks running down an incline.
 - 14,337 of 1904. TUYERE.—L. Bigallet, Isere, France. Improved arrangement of tuyeres for melting furnaces and cupolas.
- Week Ending April 29, 1905.
- 8,174 of 1904. MINE-CAR SAFETY STOP.—W. Ford, Mansfield. Improved arrangement of levers and springs for clamping a pit cage in case the winding rope breaks.
 - 9,482 of 1904. REFINING IRON.—J. B. Nau, New York, U. S. A. In refining iron by the admixture of ores, methods for keeping the ores in thorough contact with the iron and not merely floating on top.
 - 11,943 of 1904. MINER'S LAMP.—J. P. Rees, London. Improvements in the methods of mounting incandescent lights in miners' safety lamps.
 - 12,604 of 1904. COAL-WASHER BELT.—W. O. Wood, Durham. In coal washers where the coal travels up a moving belt, means for altering the inclination of the belt according to the specific gravity of the mineral matter to be removed.
 - 19,053 of 1904. BASIC CONVERTER.—O. Massenez, Wiesbaden, Germany. Modification in the basic Bessemer process, whereby the silicon is first eliminated and the slag poured off and afterward the phosphorus eliminated.
 - 24,682 of 1904. MINE SWITCH.—J. Whitehead, Farmington, Ill., U. S. A. Improved method of making points and crossings for rails laid in mines.
 - 3,554 of 1905. DETONATOR.—F. Render, Manchester. An improved detonator fuse for electric blasting.

Special Correspondence.**San Francisco.** May 10.

The Miners' Alliance is being organized at Nevada City, in Nevada county, to promote the mining interests of California; to obtain favorable legislation for the mining industries; to protect and assist miners; and to allay the hostility heretofore existing between the mining and farming interests of the State. Temporary organization has been perfected, with the following officers: William McGuire, of Lowell Hill, president; George W. Starr, of Grass Valley, vice-president; E. T. R. Powell, of Nevada City, secretary; and H. J. Wright, of Nevada City, treasurer. The membership is composed of all persons in sympathy with the mining industry. Any person, whether he be a miner or farmer or follows any other business, may become a member on complying with the requirements of the constitution. The Alliance is not to be a county organization, but membership is expected from all parts of the State. The scope of this new organization is apparently as wide as that of the California Miners' Association, now in the 13th year of its existence, and it looks as if the same functions are to be performed. As there is no necessity for two associations of similar character and purposes, one of them will doubtless cease further effort. That the older one will quit is probable. There is much less interest manifested than in former years, and the funds are by no means as liberally subscribed. In fact, the California Miners' Association has no funds on hand, and its recently published annual report was only made possible through the money obtained from advertising, although the papers contained in it are of great practical value.

Nevada county, where the new association or alliance has been formed, practically drew out of the California Miners' Association two years ago, and sent no delegates to the convention, though it is the leading gold-producing county of the State.

The latest new dredge to start operation is that on the El Dorado Gold Dredging Co.'s property near Fair Oaks in the American river district. This boat is the latest improved Risdon type, and is one of the largest and most powerful machines of its kind yet constructed. It has a maximum capacity of 4,000 yd. per 24 hours from a depth of 40 ft. below water line. The buckets are each 7 cu. ft. capacity, and the ladder travels at the rate of 13 buckets per minute. Every operative piece of machinery on the boat is driven by independent motors. The hull is 96 ft. long and 44 ft. wide. The gaudies are of steel structure, in place of the old-fashioned wooden posts, and the hull is reinforced by steel I-beams. It is in every way a modern and model piece of machinery.

A number of the stockholders visited the

property last week, and the governor of the State, with his secretary, accompanied them to see the dredge at work. Some of the people interested in this new enterprise are: Hennen Jennings, of London; Coleman brothers, of San Francisco; the Sloss brothers, John Martin, Curtis Lindley, John A. Britton, Edward H. Benjamin, H. E. Picket, Senator Belshaw, Squire Mooney, of John A. Roebing's Sons Co.; R. S. Penniman, of the California Powder Works; S. C. Irving, of the Paraffine Paint Co.; H. C. Norton of the Pacific Coast Rubber Co.; Henry Eickhoff, R. H. Postlethwaite, J. W. Phillips, and several other prominent local capitalists. The company has 550 acres of dredging ground, and expects soon to construct two, or possibly three, more of these powerful machines.

Gold has now been found in the Yolo basin in Yolo county by a dredge which is throwing up a levee on the *tule* lands on the lower Lovdal ranch. This is an ordinary clam-shell dredge, not intended for mining, and it was not suspected that any gold would be found in that vicinity. It is thought the dredge may have struck the buried channel of an old river, as much black sand is found.

Another big clam-shell levee-building dredge, working in the Feather river at Yuba City, Sutter county, has also brought up gold, with sand which is coarse and free from 'slickens.' The water where the dredge has been working is from 25 to 60 ft. deep, so that mining dredges could easily operate in that locality. There are no boulders found in the bed of the stream, and the deposit of sand and gravel seems quite deep.

Denver. May 12.

A number of mine operators in the Cripple Creek district have declared their willingness to close the mines on Sunday, if all the mines do the same, and strong influences are being brought to bear to carry out the plan.

The Telluride plant at Colorado City was not sold on May 10, as the starting bid was not sufficiently high. The Eastern stockholders will probably make a determined effort to secure the property, which has been appraised at \$309,000.

The Golden Cycle Co. will probably soon begin the construction of a 200-ton plant for the treatment of its ores. It has already purchased a site for this at Colorado City, but operations have been delayed by the possibility of a sale of the company's properties.

The El Paso Consolidated Mining Co. has increased its regular monthly dividend from 2 to 3 cents per share and will pay \$73,000 this month. This mine is keeping up its reputation, and a surplus of \$400,000 has accumulated.

Considering the continued severe weather in the Leadville district and the strike at the smelter at that point, the camp showed up well during the month of April, when

it produced nearly 70,000 tons of ore, making a total of about 750,000 tons for the four months of the current year.

The senior class of the State School of Mines has left on a trip to the smelters, mills and mines of different mining districts. It is in charge of three professors of the school and until the time of graduation, the students will study practical mining and metallurgical operations.

During the past week, incorporation papers have been filed at New Orleans, for an extension of the Colorado & Southern system, south to the Gulf of Mexico and west to the Pacific coast. At the meeting of the stockholders, to be held in this city on June 15, it is understood that a bond issue of \$100,000,000 will be considered, in furtherance of this project. The new company is incorporated under the name of the Colorado & Southern—New Orleans & Pacific Railroad Co.

During the month of March, the profit on the operations of the Camp Bird mine, near Ouray, amounted to \$158,590; the mill crushed 6,519 tons of ore, yielding 12,248 oz. of bullion and about 500 tons of concentrate, the whole producing an aggregate of \$220,550.

The Colorado Fuel & Iron Co. is said to have received large orders recently because the United States Steel Corporation was not able to fill orders for rails and for structural steel. Frank J. Hearne, the president of the former company, will probably leave for Washington within a few days, to appear before the Inter-State Commerce Commission in regard to the alleged rebates to the company.

As there is enough ore on hand and in sight to run the plant for some time, the Southwestern smelting plant, near Gunnison, will start up within a few days.

The affairs of the former Lillie Gold Mining Co., whose mines are now owned by the Vindicator people, were recently settled up, when a final dividend of $3\frac{2}{3}$ ¢ per share, amounting to \$72,750, was paid to the stockholders.

Scranton. May 15.

It is reported that Scranton will probably have another coal breaker before long. It will be located in the twelfth ward, in the vicinity of the "cinder dump," and will be erected by the Scranton Coal Co. When that company purchased all the mining rights of the Lackawanna Iron & Coal Co., it was supposed that the coal under the land in the twelfth ward had been mined to the outcropping on the mountain side, but certain investigations showed that this was not so. There is a large piece of coal on the eastern side of the twelfth ward that has not been touched, and how to best mine this has given the Scranton Coal Co.'s engineers some thought and study. The Pine Brook colliery workings extend under the center of Scranton, and it was at first thought that it would be possible to drive

a tunnel through the abandoned mine works that separate the mined coal from the Pine Brook workings, but it has been decided that such an undertaking would be too expensive, and the alternative of erecting a breaker will have to be resorted to. It is estimated that in the unmined tract, and from the rich pillars that can be reached from the openings that will be made in it, that 1,000,000 tons of excellent coal can be secured.

According to the report of sliding scale commissioner C. P. Neill for the month of April, there will be no increase in the rate of wages for coal mined during last month. This is because the average price of coal for the month was only \$4.44. An increase of one per cent in wages is allowed for every increase of five cents a ton over \$4.50 received by the operators according to the provisions of the award of the anthracite coal commission. There was also an increase in March.

Twenty miners engaged in robbing pillars in the William A. colliery of the Lehigh Valley Coal Co., at Duryea, went out on strike Monday, necessitating the closing down of the colliery. The men were being paid at the usual rate of wages paid to miners working chambers, but this was not satisfactory, as they maintained that they were entitled to extra compensation, owing to the hazardous occupation of robbing pillars. They asked for an increase and upon being refused threw down their tools and left the mine. District Superintendent Thomas was at the colliery in hopes of reaching a settlement with the men, but did not offer to grant the demands and as a result the miners refused to go to work. The colliery is in operation, but is running short-handed. An early settlement of the trouble is looked for.

If the board of conciliation, at its next meeting, which will be held in Hazleton, May 23, fails to satisfactorily adjust the check-weighman question the miners will appeal, it is reported, to Judge Gray, the chairman of the strike commission, to appoint an umpire to decide the matter. The question was to have come before the board May 12, but there was considerable other business on hand and action on it was postponed until the next meeting. The question has been hanging fire for a long time.

The examination of mining cages has been carried on by the force of mine inspectors during the week throughout the anthracite coal regions. Not a single instance of the dogs having failed to act has been reported from any quarter. The inspectors have done their work very thoroughly, and are altogether satisfied with the safety of the cages.

A large body of gas was set off in the rock tunnel at Pittston, of the sixth vein of the Twin shaft, and as a result three men were injured. The men were badly burned, one of them perhaps fatally.

Duluth. May 12.

A ship that will probably make a record as a fast unloader, and that is what all the vessel owners of the lakes are now striving for, is the *Hoover & Mason*, just launched at Detroit, for G. A. Tomlinson, of Duluth. This ship differs from other iron ore-carriers of the lakes in that her cargo hold is arranged as a series of hoppers crossways of the ship, one hopper for every hatch, thus making the centers 24 ft. apart the full length of the cargo hold. In other words there is a series of great inverted V-shaped steel walls rising across the ship every 24 feet. They do not come to the decks, but are so high that all ore will finally run between them where the unloading machine can pick it up without hand labor. This ship is to carry about 9,000 gross tons and will be out in a few weeks. The designers of this ship claim that her enormous cargo can be taken out in 150 minutes, rivaling the speed of the upper lake loading ports, and far exceeding anything that has ever been done at the unloading docks. The advantages of various types of hulls and interiors of great ships will be threshed out this year and determined.

The old mine of the Minnesota Iron Co. at Soudan has begun loading out ore and has a steam shovel in the stockpile that has accumulated since the mine reopened. The old stockpile of about 200,000 tons will probably all be shipped away this year, and the stock decks be clear for the first time in many years. Every mine on the Vermilion range, where the Soudan is also located, is now busy shipping from the daily hoist and from stock, and the movement to Two Harbors from the range is as large as during 1902, when over 2,000,000 tons were shipped.

All exploratory work at Section 30-63-11 on the Vermilion range has ceased and the drills have been taken off. This mine has been somewhat of a disappointment, and though more than \$1,100,000 has been spent there, first and last, in litigation and exploration, it is not yet known that it contains a large body of ore. That there is a mine on the property has been ascertained, but as to its size there is uncertainty, and it is probably not nearly so large as was hoped a year or two ago. The work has been done of late by G. N. Lonstorf, of Milwaukee, son of Margaretha Lonstorf, one of the fee owners of the tract. The other owners are all Duluth men. This property is located four miles east of the Ely group of mines, and has been supposed by many to be a part of the same foundation.

On Pine island, Lake Vermilion, which is under option to one of the Merritt family of Duluth, there is to be about 1,000 ft. of drill work done at once, by the firm of Cole & McDonald. This firm is doing a very large amount of diamond-drill work in the Lake Superior region now and has drills in the Cuyuna range, at

Baraboo, and elsewhere, including distant parts of Canada.

The Kloman Mining Co., Marquette range, has been in the hands of a receiver, to dispose of the difficulties of dividing the \$10,000 paid the company by H. M. Flagler, of Chicago, who was buying the mine. The Kloman is idle and there is no sign of life about the place, though it has been expected that Flagler would long ago have begun shipping some of the ore his engineers found there.

A few men have started work at the old Jackson mine, at Negaunee, which is now in the hands of the Cleveland Cliffs Co., and it is hoped that considerable activity will result.

Spokane. May 12.

Charles Sweeny, president of the Federal Mining & Smelting Co., who is back from a trip to the East, announces that he is holding office only temporarily, until his successor shall be named. Mr. Sweeny recently sold his interest in the Federal company for \$2,660,000 to the American Smelting & Refining Co. At the same time the Rockefeller and the Gould interests in Federal were absorbed by the same corporation, which give it a control of Federal. Mr. Sweeny got \$120 a share for his common stock, and \$100 for his preferred. The common carries the voting power. At the same time he made an agreement not to operate further in the Cœur d'Alenes. He says that Fred. Bradley, of San Francisco, the young head of the Bunker Hill & Sullivan-Alaska-Treadwell interests, is prominently mentioned as the new president, to succeed him. Mr. Sweeny is inclined to credit the reports that the American Smelting & Refining interests are negotiating for the Bunker Hill & Sullivan at Wardner, Ida. That great mine is rivaling the whole Federal group for its production and profits, and it would make a notable addition to Federal. For a long time there has been feeling between the Bunker Hill & Sullivan and the Federal company, and their rival suits, involving the big lode at Wardner, have made precedents in many phases of mining law. Now, however, the Tacoma smelter, in which the Bunker Hill & Sullivan had an interest, has been taken over by a holding company allied with the American Smelting & Refining Co. For a year past the Bunker Hill has been selling its surplus ore to the smelter combine. All these conditions indicate that the old feud of the Bunker Hill & Sullivan is being extinguished, and people here would not be at all surprised to see it merged with the American Smelting & Refining Co., or with its branch, the American Smelters' Securities Co. The acquisition of Federal by the American Smelting & Refining Co. gives that great corporation a hold of mining in British Columbia. Mr. Sweeny recently bought for the Federal the control of the bonds of the Sullivan Group Mining Co., operating a big low-grade

silver-lead mine and a smelter near Marysville, B. C., in the East Kootenay district. The control of Federal by the smelter combine gives it control through these bonds of the Sullivan group mine and smelter.

A. Burch and Fred. Burbidge, lately with the Bunker Hill & Sullivan Co., who are now operating here in mining on their own account, are pushing work on their Crane Flat placer property in eastern Oregon.

A mortgage for \$40,412 on the Monarch group of mines in Placer center district, in the Cœur d'Alenes, has been recorded at Wallace, Ida.

The 2,000-ft. tunnel driven under contract on the Rambler-Caribo group in the Slocan has been completed. A second contract for 2,000 ft. has been let.

Stockholders of the White Swan Mining Co.—Letson Balliet's notorious promotion—have issued a call for a meeting in San Francisco, June 6, to plan for the future. One scheme is to dispose of all the company's property. The other is to issue mortgage bonds to get money for development.

Reports from Poplar creek, in the new goldfields of the Lardeau district of British Columbia, say that the Great Northern Mines, Ltd., will put in a stamp mill this summer and will resume operations on the Lucky creek, long interrupted by litigation.

Owners of the Farmer Jones mines, a promising gold prospect on Priest Lake, near Spokane, say that enough ore has been taken out in development to recoup them for their expenses. A 400-ft. tunnel is being driven to cut the ledge.

Butte. May 10.

T. F. Cole, of Duluth, J. Morgan Clements, of New York, John G. Brown, of Chicago, and other men interested in the North Butte Copper Co. are in Butte to close the deal by which the property of the Speculator company is to become the property of the North Butte. Mr. Cole is the promotor of the deal, Mr. Clements is his expert engineer, and Mr. Brown is one of the stockholders in the new company. They went through the workings of the mines yesterday, and have expressed themselves as being well satisfied with the purchase. The transfer will likely be made before they leave the city. Of the purchase price, \$1,100,000 has been paid, and there is still \$3,900,000 due. The output of the mine is large at present, the quantity of ore being raised daily aggregating from 500 to 700 tons.

Michael Hecht, S. Kirkup and Charles Lenz, of New York, with H. J. Gibbon, of Spokane, and Frank C. Lavigne and August Urbain, of Butte, have organized the American Goldfields Co. to work placer ground in Goodrich gulch, 50 miles southeast of Butte. The company intends to instal machinery for hydraulic work at a cost of \$15,000. The gravel has been washed by the sluice-box method for years, all the work being done by hand,

and is said to have yielded good pay. The property was owned by Messrs. Lavigne and Urbain.

Amalgamated is making rapid progress with its work of development on the Indian Queen copper property in Beaverhead county. It is sinking a two-compartment shaft 800 ft. from the tunnel entrance. Some ore is being extracted from another part of the mine.

Jesse Huddleston, Frank Spidel and L. Snyder have adopted a novel method of precipitating copper in the water of Silver Bow creek, into which the water from the copper mines and smelters of Butte flows. They have erected a tower 20 ft. high, 20 ft. long and 8 ft. wide, and equipped it with seven lattice shelves for holding old iron and tin. Near the tower they have planted an electric pump, and are throwing from the creek into the top of the tower 1,000 gallons of water per minute. Two troughs extend the entire length of the tower. The bottoms are full of auger holes to permit the escape of the water. None of the iron escapes constant contact with the water, with the result that the copper is caught. Two wide troughs at the bottom of the tower carry the water off. These are also full of iron. The water thrown by the pump is green, but when it emerges from the end of the troughs, after flowing through the tower, no evidence of copper can be detected in it with the naked eye. The operators have made one clean-up and realized several tons of precipitate. Other persons are now preparing to catch some of the copper on the same plan, having bought seven acres of ground on the creek, just below the established plant. Experts are also engaged in experimenting with another new device for treating the tailing of the Colorado company's smelting, which carries a large percentage of copper.

Bisbee. May 10.

Although it has now a pumping plant capable of raising about 3,000,000 gal. a day, from the 900-ft. level, the Tombstone Consolidated is now putting a second plant, which is to be installed at the same depth and will have capacity for nearly the same amount of water. Ore shipments from Tombstone are increasing steadily and are now running better than 100 cars a month, and gaining at the rate of 25 cars monthly. These are rich silver-gold ores and are sent to the smelters of El Paso and Douglas. Since pumping began here the water levels in the various shafts have been reduced 175 ft. and are going down every day, though slowly. These ores carry large values in gold and silver, and there is no doubt of their continuance in richness below water level, for it has been proved. There is no reason to doubt that in a few years the Tombstone mines will take their place again as among the large producers of the precious metals, and will rival any mines now operating in the extent of

their output. Not less than \$40,000,000 have been taken out of the mines that are now consolidated and in which the new company is operating. Other than these mines are working in the district, and the old Grand Central and Luxure are both shipping rich ore weekly. The old slime dumps of the Charleston mills, that worked Tombstone ores, have now been worked over for the last time, and shipped, the last of the tailing going forward this week.

Production of the Copper Queen smelter at Douglas for April was 7,755,000 lb. of copper, a trifle less than for March, but better than in any month up to that time. Construction proceeds steadily on the enlargement of the plant, and in a few months the new furnaces will be in operation. In the meantime the Gardiner shaft, here, has been completed and put into commission, and is now sending ore to surface in quantity. This is one of the main avenues of the mine. This shaft is but 600 ft. from the Calumet & Arizona line, and close to the Irish Mag shaft of that company.

Calumet & Arizona's copper production for April was 2,640,000 lb. This company's new work is progressing well, and the fourth furnace, to work on Lake Superior and Duluth ores, will be ready in a couple of weeks, about the time that the mines are in shape to produce steadily. The foundation is in for a fifth furnace, and it will be installed shortly. There has been considerable wonder at the fact that this company does not construct smelting capacity to keep pace with its underground development, but it is probable that the consolidated smelter that will in time care for the product of all the Cole group here will be a new and complete plant, possibly not at Douglas, and at any event will be planned from the beginning for a large product. The present smelter is not of a character to be indefinitely added to economically, and four or five furnaces are probably all it can well take care of. If the company were to put in furnaces for the mines it is developing it would require two 300-ton stacks for each one of seven shafts. This would mean a daily copper output of, say, 280 tons blister copper.

Shattuck & Arizona is making more encouraging signs than for some time. The shaft is now down 690 ft. and in porphyry. On the 500 a drift was started south to cut what ore was hoped for there, and is now in iron and manganese. The water is slowly increasing and is now about 2,500 gal. per day. Ore is hoped for in a short time.

Saginaw Development, which lies in the general southeast trend, is now down 900 ft. vertically, but is not yet getting anything more than encouraging indications. There are occasional bunches of copper, but no mine drifting will be done as soon as water level is struck. A large double drum hoist has been ordered.

Toronto. May 11.

Numerous reports have been in circulation recently respecting discoveries of gold in the Timiskaming district. A find was reported in the neighborhood of the silver-cobalt mines, and another at Round lake, some 40 miles to the northwest of Lake Timiskaming. The officials of the provincial bureau of mines state that there is no foundation for these stories and that no discoveries of gold in that region have been made so far. An assay of ore alleged to have been produced near Cobalt was made at New Liskeard with favorable results, but inquiry showed that the ore did not come from the district. Up to the end of April the number of licenses issued to prospectors going into the silver-cobalt district was 72, and the rush still continues.

The Tip-Top copper mine, in north-western Ontario, near Kashabowie station, on the Canadian Northern railroad, which was recently advertised for sale by auction, has been secured by Mackenzie & Mann, of the Canadian Northern, under a private arrangement with the creditors of the company. Plans are being prepared for its development on a large scale. Nearly 20,000 tons of ore have been uncovered and a copper smelter is likely to be erected at Port Arthur, to be operated in connection with the blast-furnaces shortly to be built there.

Dr. Thompson, member of parliament for the Yukon, now in Ottawa, announces having received news of a rich strike of placer gold on Hight creek, a tributary of Mayo river, about 250 miles from Dawson. On No. 84, below Discovery, Hector Morrison has struck 6 ft. of pay that will average \$600 to the cu. yd. Claims have jumped in price from a few hundred dollars up to as high as \$5,000 each. Thomas E. Heney, Henry Tobin and John A. McDougall are Ottawa men who have claims near the strike.

William Whyte, second vice-president of the Canadian Pacific railway, and manager of their western lines, when passing through Medicine Hat last week, on his way west, was seen by Mayor Forster, of that city, who submitted to him a proposition for the utilization of the natural gas at Medicine Hat for the smelting of low-grade ores. The railway owns a natural-gas well at this point, now practically idle, capable of producing 1,000,000 ft. per day, and it is contended that the cheapness of this fuel would offset the item of freight haulage.

News has been received from the War Eagle and Centre Star gold mines that in a 100-ft. crosscut being run from the 6th level of the Centre Star to the 9th level of the War Eagle, a new vein has been discovered 100 ft. up the mountain. Fifty-two carloads of ore were extracted in driving the crosscut through the ledge, returns on which gave \$25 in gold, besides silver and copper values. During the first three months of the year the Centre

Star and War Eagle have made a profit of over \$60,000.

Victoria, B. C. May 8.

The *Lardeau Mining Review* states that more mining work will be done this year in the Trout Lake mining division and other parts of the Lardeau district than in any previous year. The Kootenay Consolidated Mining Co., a Minneapolis consolidation of five companies that owned mineral claims mostly on the Duncan slope—that is, on the main Duncan river and its west fork—plans extensive development work. The Guinea Gold Co., whose property is in the same part of the Lardeau, will resume operations when the snow shall have melted sufficiently to admit of its doing so with advantage. The Surprise group, on Surprise creek, will probably be equipped with a concentrating mill, and have its claims opened up sufficiently to maintain a supply of ore. Up the south fork of Lardo creek and Gainer creek, the Mohican and the Badshot will be worked. At the Triune—owned by the Metropolitan Gold & Silver Co., of Minneapolis—a producing mine in which further development has been in progress during several seasons, the reconstruction between the mine and Ten-Mile of the aerial ropeway and the extension of the underground workings, admit of the payroll number being increased to about 50 men. The Ferguson Mines, Ltd., a British consolidation of the Silver Cup Mines, Ltd., and the Great Western Mines, Ltd., owning the Silver Cup and Nettie L. group of mines, has passed through the winter and early spring without having similar disastrous experience of snowslides to that which at the beginning of last season partially wrecked its aerial ropeways and otherwise seriously damaged its property, causing a long delay and much loss. Work has already been resumed in the Silver Cup mine, and the company's 20-stamp combination silver mill at Five-Mile is in excellent order, so that a season of profitable operation is anticipated with confidence. Another organization which has to be financed in Minneapolis has announced its intention to carry out important development work in Ferguson camp, its project being the driving of a long tunnel at a low level into the mountain on which the Nettie L. group and other mining properties are situated. About Trout lake the Lucky Boy and Horseshoe, both producers of high-grade silver-lead ore, are to be worked on a larger scale than in the past, while of the smaller properties the Willow Grouse, Winslow, and I. X. L. are all to be developed. In Fish River camp, the Beatrice, Silver Dollar and Mammoth, among the silver-gold claims, and the Eva and Oyster-Criterion gold mines, are likely to make the production from this part of the Lardeau total more in 1905 than in any previous year. The Beatrice and the Eva have been producing throughout the winter,

and the Mammoth will resume shipping immediately the snow at its high altitude shall allow of the breaking of the trails. In Poplar camp, too, preparations are being made for the season's work, the Spyglass, Great Northern, and other companies, besides a number of private owners, intending to open up their respective properties.

The zinc plant added to its sampling works at Kaslo by the Kootenay Ore Co. is completed, and zinc ores are being received for treatment so as to raise their grade and make them more marketable in zinc-smelting centers of the United States. The new 100-ton concentrating mill the French company owning the Cork mine, on the south fork of Kaslo creek, lately built near the mine, has been started and the expectation is that it will be run throughout the season. There are in this mine large bodies of silver-lead ore of a grade that it is believed can be profitably concentrated.

Mexico. May 8.

In connection with the stated intention of the Mexican government to advance money to miners and producers on silver bars, the announcement has now been made public that the government will henceforth advance 90% of the market value on silver bullion, act as a selling agent, and when sale has been made settle up the balance of the account, deducting therefor only the 2½% stamp tax. A number of leading banks and other concerns have signified their intention to do likewise, so that the fear regarding the disposition of silver bullion, after the closing of the mints to free coinage of silver by the government has been mitigated.

The report of the Lucky Tiger Gold Mining Co. shows that the total production of the mine since its beginning, late in 1903, has been 1,396 tons, with a gross value of \$269,231 gold, from which there has been paid \$98,800 on the purchase price of the mine, and \$20,000 in other expenses. In all, the company has paid \$317,000, leaving still unpaid \$283,000. The new concentrating mill is in operation. At Puchacho de Bacoache it is reported that the Guadalupe mines of that place have been sold to C. E. Conway and associates of Pittsburg for \$100,000 gold, and that a 20-stamp mill will be at once erected. The furnaces of the Transvaal Smelting Co., 15 miles west of Cumpas, in the Moctezuma district of Sonora, have been blown in under the management of Leo Cloud and superintendence of O. Meahr. A subsidiary company of the Washington-London Guarantee Co., known as the Benedictine Mining & Milling Co., is having tests made on the ores from the recently acquired Woodward properties near Nacozari, and as soon as satisfactory results are obtained the erection of a plant for treating the ores will be rapidly pushed.

At Caborca, in the Altar district, a rich copper property is being opened up by

John Henderson and associates, of Nogales, Arizona under the name of the Sonora Copper Queen Mining Co. The unwatering of the Klondike, in the Magdalena district, has been accomplished, the ore is being milled and the Raya de Oro, an adjoining property, probably will soon be acquired by the Klondike. The Swansea Mining Co. has completed its 16-mile wagon road, as has also the Phelps-Dodge people, of the Copper Queen Consolidated Mining Co., its 40-mile road from Pichacho to the Turicachi station of the Nazcozari railroad.

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Sydney. April 17.

The gold yield of Queensland for the month of March was 50,763 oz. fine, and for the first three months of the year, 133,922 oz. fine; this represents a decrease of 11,105 oz. fine, as compared with the March quarter of 1904. The returns from the Charters Towers and Gympie fields fall short of those of last year, and for the month of March the decrease in the yield from the former field was very marked. It is satisfactory to note, however, that the output from the Mount Morgan mine exhibits a substantial increase.

In New South Wales the returns for the first quarter of the year show that the gold production totaled 69,907 oz. fine, which is 17,141 oz. less than for the same period in 1904. The partial suspension of operations at the Cobar Gold mines, pending completion of arrangements to treat the sulphide ore, is largely responsible for this result. The last crushing of 375 tons by the New Hillgrove Proprietary yielded 1,128 oz. of gold. At the Wyalong field, the developments at the deep levels continue to give satisfactory returns, ore recently treated yielding 9 oz. of gold to the ton.

In Victoria, much interest is being evinced in the discovery of auriferous quartz in the New Chum Railway mine, Bendigo, at a depth of 4,156 ft. The director of the geological survey, E. J. Dunn, reports that the winze at the depth mentioned has passed through 20 ft. of quartz carrying sulphide and gold. The quartz resembles a broken saddle reef, and is in 'center' country, but further work is necessary to determine whether there is sufficient gold present to be payable. On the question of working at this depth, Mr. Dunn states that at the bottom of the winze the rocks and water are cool, while the supply of air is excellent, and, judging from present conditions, he sees no reason why, with up-to-date methods, operations should not be conducted to a depth of 5,000 ft. without undue stress on the miners.

The output from the Tarcoola Blocks mine, South Australia, is assuming encouraging proportions, and during the past month a consignment of 4,277 oz. of gold was received, which brings the value of the gold contributed by this mine to about \$400,000.

The progress which the Broken Hill silver field is making is shown by the fact that at the end of March there were about 7,250 men employed in and about the mines, the Broken Hill Proprietary Co. alone employing over 4,700 men. This is the largest number employed on this field during the past decade, and as the northern group of mines are not yet fully manned, this number should be further augmented. The proprietary company has again put in operation the salt-cake plant for the production of zinc-concentrate. The directors are to visit the smelting works at Port Pirie, when the matter of the completion of arrangements for the production of spelter is to be fully gone into. The smelting return of this company for the first 12 weeks of this year is: 1,107,757 oz. (fine) silver, 15,538 tons soft lead, and 138 tons antimonial lead.

The Great Cobar Copper Syndicate (N. S. W.) is arranging to considerably augment the output from its mines, and the erection of larger furnaces at an early date is foreshadowed. The report of the Wallaroo & Moonta Smelting Co., South Australia, shows that the production for the year 1904 was 6,278 tons copper, 19,411 oz. silver, and 3,163 oz. gold, exclusive of by-products. The disastrous fire at Taylor's shaft, which occurred during the year, has so far involved this company in an expenditure of \$390,000 for the work of restoring the mine to its ore-producing condition. At the Mount Lyell mine, Tasmania, developments of considerable importance have taken place at the 600-ft. level from the North Lyell shaft, a new body of ore having been struck, which has a width of about 20 ft., and averages 9% copper. This has added considerably to the ore reserves. The returns from the smelters are also very satisfactory, and during the past 12 weeks the converters have produced 1,815 tons of blister copper, containing 1,795 tons copper, 167,831 oz. silver, 5,049 oz. gold.

At the recent meeting of the New Chil-lagoe company, Queensland, it was stated that better appliances would have to be installed if profits were to be earned, and to do this a call would have to be made on the shareholders, and substantial concessions allowed by the debenture holders. It was represented that the average content of the ore sent to the furnaces was not more than 3¼%, and that the erection of a suitable concentration mill was therefore necessary. The extension of the company's line of railway to the Etheridge mineral field has received the support of the government, which guarantees 2¼% interest on its cost; but the question of the right to purchase same at the end of 15 years is the subject of negotiations. This company's smelting return for the month of March is as follows: Ore smelted, 3,584 tons; matte produced, 167 tons, containing 132 tons copper and 12,976 oz. silver.

Auckland. April 19.

During the past few weeks the Molyneux river has continued to fall, and shareholders in dredging companies owning river claims are hopeful that the coming winter will see some large returns. Meanwhile, the weekly production in Otago is between 1,200 and 1,500 oz., averaging from 25 to 30 oz. per dredge.

West Coast.—The Consolidated Goldfields Co. reported that during the month of March the Progress mines crushed 5,310 tons of ore for a total return of £8,197 from copper plates, chlorination of concentrate and cyanidation of coarse sands. At the Golden Fleece mine 1,280 tons of ore were treated for a return of £2,343.

In the Wilberforce district, near Hokitika, prospectors have discovered a number of promising quartz lodes. In one case a drift has been put in 170 ft. below the outcrop, and has intersected 15 ft. of solid quartz which is said to be highly payable. It is expected that the government geologist will shortly visit and report upon the find.

Hauraki.—At Waihi the Grand Junction Co. is busily engaged in the erection of its 40-stamp battery. It is intended to instal a central power plant with three large dynamos, operated by steam turbines. The whole of the mine and battery machinery is to be driven by motors supplied with electricity from the central station.

The Waihi company's last return was even better than usual, and brings the total output of the mine to £3,977,374. By the time this is printed the next return will have swelled the total to over £4,000,000.

At Karangahake, the Talisman mine is reported to have struck some rich ore, and the prospects of the Crown mine appear to improve.

The rich patch struck in the Waitotahi mine at the Thames, a short time ago, continues to yield good returns, and in consequence mining in this district has revived considerably. Active prospecting is being carried on in several of the mines with some promise of success. The Thames-Hauraki pumping plant, lately taken over by the drainage board, is doing excellent work, and the water has already been lowered in the pump shaft to the 650 ft. level, which will enable the May Queen and other companies to develop considerably deeper ground than their present workings.

The chief returns during the past three weeks are as follows: Waihi, £55,310 from 22,435 short tons, equal to £2, 9s. 3½d. per ton; Talisman, £10,510 from 3,550 tons, equal to £2 19s. 2½d. per ton (working expenses £1 10s. 1d. per ton); Waitotahi, £3,640, chiefly from picked stone; Komata Reefs £3,557, from 1,260 tons.

Personal.

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

Mr. H. C. Hoover is at San Francisco.

Mr. Robert T. Hill has returned from Texas.

Mr. R. T. White is at Lead City, South Dakota.

Mr. J. W. Mercer is now at Telluride, Colorado.

Mr. Hennen Jennings sailed on the *Caronia* for London.

Mr. W. H. Tibbals has returned to Salt Lake City from a trip to the East.

Mr. Willard F. Snyder has returned to Salt Lake City from San Francisco.

Mr. G. F. Rendall, of New York, was recently in Humboldt county, Nevada.

Mr. W. J. Slee, of Walaroo, Australia, is visiting mining camps in the West.

Mr. Thos. H. Leggett and Mr. W. A. Prichard have been examining mines in Spain.

Mr. Frank J. Toussaint, of Milwaukee, has returned from a visit to mines in Mexico.

Mr. J. S. Steel, manager of the Jack Lake Gold Mining Co., was recently in Toronto.

Mr. Arthur Wilkinson passed through New York on his way from Mexico to London.

Mr. Edwin Ludlow, manager of Las Esperanzas coal mines, Mexico, is visiting New York.

Mr. B. F. Graham has retired as president of El Tigre Combination Gold Mining Co., of Mexico.

Mr. A. H. Ackermann is with Mr. Charles M. Rolker examining mines in Western Australia.

Mr. P. Kenyon has left Mexico to become mine superintendent for the Zaruma Mining Co., in Ecuador.

Mr. F. Johnson, of the Dominion Geological Survey, is examining the coal deposits of Alberta, Canada.

Mr. W. G. Nebeker has returned to Salt Lake City from Mexico, where he has been examining mining properties.

Mr. Louis Eggers is superintending the construction of a cyanide plant in the mill of Los Reyes Mining Co. at Peras, Mexico.

Mr. D. A. Lyon, instructor in geology and mining in Stanford University, has been promoted to an assistant professorship.

Mr. J. V. Bohn, lately at Butte, has been appointed superintendent of the Mammoth Mining & Power Co., at Mammoth, Montana.

Mr. S. E. Bretherton has returned to Val Verde from southern Arizona, where

he has been engaged in examining copper mines.

Mr. J. N. Scott has been appointed general manager for the Dundee Mining Co., which is operating near Nelson, British Columbia.

Mr. George K. Fisher, chief of the engineering staff of the United States Mining Co., has returned to Salt Lake City from the East.

Mr. Frank L. Nason, who has recently returned from Virginia, is now in Vermont, reporting on properties for New York capitalists.

Mr. James Griffin has been appointed general manager for the Cripple Creek Homestake Mining Reduction Co., at Cripple Creek, Colorado.

Mr. C. E. Allen, general mine superintendent for the United States Mining & Smelting Co., of Utah, was recently at Newhouse, Nevada.

Mr. William R. Rust, of Tacoma, will be business manager for the company which has consolidated the Tacoma, Everett and Selby smelters.

Capt. C. Henry Thompson, of Los Angeles, has returned from Oroville, Cal., where he has been examining properties for an Eastern syndicate.

Mr. E. C. Sooy has been elected president of El Tigre Combination Gold Mining Co., of Mexico, to succeed Mr. B. F. Graham, who has retired.

Mr. J. N. Conner has been appointed superintendent of the smelter of the American-Mexican Mining & Development Co. at Valardeña, Mexico.

Mr. T. F. Cole, president of the Oliver Iron Mining Co., was recently at Butte, inspecting the property of the North Butte Mining Co., of which he is the organizer.

Mr. Theo. T. Swift has returned to Safford, Ariz., from the East, where he has been for several months in the interest of the Michigan-Arizona Mining Company.

Mr. Alfred von Der Ropp will have charge of smelting and metallurgical operations for the company which has consolidated the Tacoma, Everett and Selby smelters.

Mr. Herbert Hass is metallurgical engineer in charge of the reduction works of the Great Western Mining Co., California. Mr. A. Bosch is assistant in the laboratory. This is a correction.

Major R. Boyd Magee has returned from South Africa to Toronto. He reported on the property of the Premier Diamond Co., from which the Cullinan diamond was taken, shortly before its discovery.

Mr. F. W. McNair, president of the Michigan College of Mines, has been appointed councilor to the mechanical science and engineering section of the American Association for the Advancement of Science.

Obituary.

William F. Hyatt, a pioneer of '49, died at Brooklyn, N. Y., May 12, aged 81 years. Mr. Hyatt invested money made in California in the hardware business and built up a fortune. He was president of the Brass Manufacturing Company.

Societies and Technical Schools.

Franklin Institute.—At the meeting of this society, on May 17, F. Lynwood Garrison read a paper entitled: 'Observations on the Geology and Mineralogy of San Domingo.'

Society of Chemical Industry.—The last meeting of the session of the New York section will be held at the Chemists' Club, May 19. The following papers will be read: D. Wesson and N. J. Lane—'The Quantitative Analysis of Lard.' J. Merritt Matthews—'Influences of Various Scouring Processes on the Strength and Elasticity of Wool.' Walter S. Williams—'Valuation of Tannic Acid from the Point of the Dyer and Calico Printer.' Martin Schwitter—'Tin in Alaska.'

Associated Societies of Engineers.—Plans have been filed for a 15-story building to cost \$975,000, which Andrew Carnegie is to present to the Associated Societies of Engineers of New York, of which A. R. Ledoux is president. It is to be erected on the large plot from 25 to 33 West Thirty-ninth street, and immediately adjoining it in the rear, facing at 32 and 34 West Fortieth street, will be a 13-story clubhouse, which is to cost an additional \$375,000, and which is also part of Mr. Carnegie's gift. The Thirty-ninth street building will be a fireproof edifice, 212 ft. high, with a frontage of 115 ft. and a depth of 88.9 ft. It is to be of the French Renaissance style, and will be lighted by five rows of tall, decorated windows, paneled in bronze. The entrance will be adorned with giant doors of decorated bronze. The façade is to be of granite and limestone, trimmed with terracotta.

Trade Catalogues.

The Fulton Iron Works, of San Francisco, Cal., has prepared a descriptive circular of its crushing rolls for dry or wet crushing.

Bulletin No. TE 19, issued by the Holt Manufacturing Co., of Stockton, Cal., is devoted to a description of the Holt Bros. traction engine.

The C. H. Wheeler Condensing Pump Co., of New York, successors to the Barr Pump Co., of Philadelphia, Pa., has issued an attractive catalogue of the Barr pump.

The Kinsman block system for the automatic control and stoppage of trains in motion is described in a circular issued by the Kinsman Block System Co., of New York.

'Graphite' for May, published by the Joseph Dixon Crucible Co., of Jersey City, N. J., contains much readable matter concerning the graphite products of that company.

Bulletin No. 46, prepared by the Northern Electrical Co., of Madison, Wis., describes the Northern generators, and illustrates a number of the applications especially suited for the requirements of mining work.

A handsome catalogue, No. F, prepared by the Urie-Snyder Dredge Co., of Kansas City, Mo., is devoted to a description of the placer dredges made by that company, and contains many handsome photographs of these dredges in operation.

General catalogue L, issued by the Thomas Carlins' Sons Co., of Allegheny, Pa., is a volume of nearly 300 pages, and is devoted to a careful description and illustration of this company's rolling mill, brick plant and hoisting machinery.

The Ingersoll-Sergeant Drill Co., of New York, has prepared a description of the central air plant, as exemplified in the compressed-air power system of the Cleveland Stone Co., of North Amherst, O., which was installed by this company.

Industrial.

Owing to increase in business, F. E. Pfannmueller & Co., dealers in new and reconstructed power equipment, have removed to larger quarters, and are now located at 1134 First National Bank Building, Chicago.

The firm of Pratt, Vandemoer & Warburton, mining, mechanical and civil engineers, has been established in Denver, each of the three members representing one of the different branches of the engineering profession.

The Arizona Copper Co., of Clifton, Arizona, has ordered from the Allis-Chalmers Co. an addition to its plant at Morenci, Arizona, in the shape of a crusher, Huntington mills and rolls. The increasing number of orders of this kind is significant of the activity of present operations in the copper districts of the Southwest.

Articles of incorporation have been filed at Albany by the Bausch, Lomb, Saegmuller Co., the object of the new corporation, as set forth in the papers, being the manufacture of engineering, astronomical, physical and other instruments of precision. The manufacturing plant of the company will be located in the north end of the new addition to the Bausch & Lomb factory, and the Bausch & Lomb Optical Co. will be the sales agents of the new company.

The Vulcan Iron Works Co., of Toledo, O., has shipped three more "Little Giant" steam shovels to South Africa. The Vulcan company has in the past shipped quite a number of this type of shovels into the diamond fields in the Kimberley district,

and has reports from their work in that territory that are gratifying. Five "Little Giant" shovels are at work in close proximity to the mine where the largest diamond ever discovered was recently found, and the three shovels they have just shipped go on to this property.

Economical power is one of the primary essentials of commercial prosperity, and water properly utilized is one of the best, cheapest and most reliable. This has been demonstrated many times since the introduction and general use of Pelton water-wheels. These wheels utilize small streams under varying heads and develop at little cost a marvelous amount of power. They have been successfully installed in all parts of the world, and are noted for their exemption from accident and the economy of their operation.

The Colorado Iron Works Co., of Denver, reports the following orders and shipments: Copper smelting furnace and equipments for the Cooke City Smelters Co. in Montana; smelting equipments, consisting of one carload of jackets, etc., for the Selby Smelting & Lead Co. in California; six carloads of the machinery for the Compagnie Francaise de Mines du Laurium smelting plant, operating near Laurium, Greece; three carloads of concentrating machinery for the Poland American & Lincoln Mining Co.'s plant in Arizona; sampling machinery, screens, etc., for the Holmes Sampling Works in Colorado; concentrating machinery, consisting of four simplex Bartlett concentrating tables, impact screens, etc., for James Richardson & Sons, Ontario, Canada; experimental concentrating plant for the Imperial Copper Co. in Arizona; and machinery and supplies for the Guanajuato Reduction & Mines Co., Ltd., in Old Mexico; etc.

In few lines of industry has the recent introduction of mechanical appliances as substitutes for hand labor been more extensive or effective than in the manufacture of cement. The rotary kiln, fed under forced draft with powdered fuel, is in effect the essential feature of the new method. In the recently completed plant of the National Cement Works at Martin's Creek, Pa., the apparatus for the coal-burning system in the kilns includes three 42-in. Sturtevant centrifugal blowers, which deliver through a system of ducts into 5-in. branch pipes leading into each kiln. The air handled by each blower is partially heated by being drawn through the rotary clinker coolers and thence through the passages where the hot clinker falls from the kiln to the rotary cooler. At the bottom of the pulverized coal bin is provided a special controllable feed device which regulates the quantity of fuel and the proportionate volume of air. Compressed air at 48 lb. pressure is also introduced into the center of the 5-in. pipe near the kiln end. The entire coal-burning apparatus was furnished by the B. F. Sturtevant Co., of Boston.

General Mining News.

American Smelters Securities Co.—This is the amended name of the recently organized American Smelters Exploration Co. It is controlled and managed by the American Smelting & Refining Co., and its properties include the Selby Smelting & Lead Co., the Tacoma Smelting Co., and the Puget Sound Reduction Company.

Mineral Oil Exports.—In April the United States exported 9,519,772 gal. crude oil; 1,355,720 gal. naphthas; 76,277,920 gal. illuminating; 3,620,011 gal. lubricating and paraffin; 6,950,573 gal. residuum; total, 102,723,996 gal., which compares with 97,241,371 gal. in the same month last year. In the four months ending April 30, 1905, the exports amounted to 356,173,180 gal., as against 306,066,142 gal. in the corresponding period of last year; showing an increase of 50,107,038 gal. in 1905.

ARIZONA.

GRAHAM COUNTY.

Arizona Copper Co.—The production for April was 1,164 tons of copper.

YAVAPAI COUNTY.

Arizona Smelting Co.—This company has acquired the property of the Bradshaw Mountain Copper Mining & Smelting Co., at Val Verde. This includes the smelter site, machinery and buildings.

CALIFORNIA.

AMADOR COUNTY.

Climax Mining Co.—They have commenced grading for a 10-stamp mill at this property.

Zeila Mining Co.—It is reported that the orebody in this mine at Jackson is reaching into the Fleming ground, which may necessitate the sinking of a new shaft.

CALAVERAS COUNTY.

Essex Consolidated Mining Co.—On the 150-ft. level of this mine (formerly the Jones) they have found a 5-ft. ledge of high-grade ore.

Turkey Gulch Mining Co.—This company is about to build a gold-mining dredge to be placed on the Calaveras river near Jenny Lind. They have about 40 acres which drill-prospecting has proven of value.

Sheep Ranch Mining Co.—Sinking the shaft has been completed and the full force of miners is being gradually put at work. The orebody at the 1,400-ft. level is said to be of excellent character.

EL DORADO COUNTY.

Lone Star.—A 10-stamp gravel mill is running steadily at this mine at Smiths flat and another one on the Gardner & Mullan mine, at Reservoir hill.

Union.—This quartz mine at El Dorado is reported as having shown up another rich ledge, and is now running a full complement of men.

Roundabout.—In this mine, Blair's district, owned by Fairchild & Richards, a bench of rich gravel has been encountered.

Prospector Gold Mining Co.—This new company has bought 200 acres of the lava-capped ridge adjoining the old Patterson mine, two miles south of Indiana Diggings and work on the gravel will commence June 1.

North Weber Land & Mining Co.—This company is about to instal a hoist on its gravel property near Newtown.

KERN COUNTY.

Gold King.—At this mine, owned by H. W. Manby, of Johannesburg, the shaft is down 80 ft. with ore at the bottom, but the principal values would be in the drift at the 50-ft. level. Some of the quartz shows free gold. Mr. Manby has some tungsten claims that show good values.

MENDOCINO COUNTY.

Eel River.—Men are clearing the débris from the tunnel of this coal mine, six miles from Covelo, and the deposits are to be thoroughly prospected. No work has been done on them for some years. The tract of coal lands, about 25,000 acres in extent, belongs to the Nevada Bank of San Francisco.

NEVADA COUNTY.

Inkmarque.—In this property, now in the hands of John Rosenfeld's Sons, of San Francisco, an excellent body of ore has been uncovered in a drift below the 200-ft. level.

Norambagua.—The tunnel in this mine is being reopened under supervision of A. Maltman, and new timbers are being put in.

PLACER COUNTY.

L. F. Trumbull and others have made three locations of 160 acres each, covering about six and a half miles of the bed of the middle fork of the American river, and below the Cash Rock mine.

NEVADA COUNTY.

C. L. Canfield has secured possession of 2,700 acres of gravel land extending from the Blue Tent claim along the main Red Dog and You Bet channel to Scott's flat, a distance of three miles. A bedrock tunnel 3,000 ft. long will be run to Sailor ravine, and a 40-stamp mill is to be erected at the mouth of the tunnel. Very large hydraulic mining operations were formerly conducted in this section of the county.

Morning Star.—This mine at Badger Hill, being opened by Philip Diedesheimer and associates, is to have the machinery from the Great Dane mine, at Selby flat.

SAN DIEGO COUNTY.

Sickler.—A valuable find of kunzite has been made in this mine, which is a mile and a half east of the Salmon mine.

SIERRA COUNTY.

Mountain.—In this mine, near Sierra City, a new vein has been found 150 ft. east of the old one. The ledge is about 5 ft. thick and is of good ore. There is a 40-stamp mill on the property.

Sovereign Mining Co.—This company is working a group of claims discovered in 1903 in Ladies cañon, 10 miles from Downieville. There are 11 claims, and good ore is being taken from several of them. The owners are Geo. McGee, H. A. Morse, G. B. Morse and Ernest Farrell, all of whom are at work on the property.

Alta Sierra Mining Co.—This company, owning the Keystone mine, near Sierra City, has just completed a tunnel nearly a mile long and built a 10-stamp mill. An up-raise is being made to connect the tunnel with the old works to give ventilation.

Sierra Buttes.—This mine at Sierra City, which has been worked continuously for 55 years and has produced about \$14,000,000, is now being operated by the Hayes brothers, of San Jose. A cyanide plant has been put in recently and a new mill is to be built.

SAN LUIS OBISPO COUNTY.

D. McEwen, of Cambria, has discovered a deposit of asbestos on his property.

Klau.—Instead of closing down, as reported, it has been decided to reduce the force at this quicksilver mine for the present.

TRINITY COUNTY.

Quimby Gold Mining Co.—The Merralls Mill Co. is engaged in installing a 9-stamp mill for this company at New river.

TUOLUMNE COUNTY.

Soulsby.—A duplex air-compressor is being installed and sinking will shortly be resumed on this property at Soulsbyville.

New Calico.—They have resumed the work of shaft-sinking on this property at Stent.

Crescent.—R. L. Potter and Wm. Prange have commenced to develop this mine on the South fork of the Stanislaus river.

Santa Ysabel.—The three-compartment shaft is down 800 ft., and drifting is being done on the 400 and 600 levels.

Jessie Gold Mining Co.—This company has taken an option in the Buckeye placer mine for \$20,000.

COLORADO.

BOULDER COUNTY.

New York Mining & Developing Co.—New York parties have become interested in the Porphyry tunnel at Jamestown. The reported price is \$100,000, and it is reported that they will spend a large sum of money in extending this tunnel a further distance of 3,000 ft. New machinery is to be installed and Theodore Craig, Jamestown, Colo., is in charge of the operations. The Easterners are also negotiating for property in the San Juan section of this State.

CLEAR CREEK COUNTY.

Big Five Tunnel, Ore Reduction & Transportation Co.—Bids are being asked for extending the Central tunnel a further distance of 5,000 ft., which will carry the heading into Gilpin county. The company has been purchasing valuable prop-

erty along its tunnel lines, running from above Idaho Springs to Russell Gulch in Gilpin county. W. B. Stewart, Idaho Springs, is superintendent.

Sun and Moon Mining & Milling Co.—The annual meeting of this company was held at Idaho Springs, for the year ending March 31, the receipts for ore showing a net revenue of \$148,280. The officers elected were as follows: President, W. J. White; vice-president, C. A. Wimpheimer; secretary and treasurer, N. Westheimer; directors, M. Nathan, J. Manheimer, A. F. Ries and F. C. Goldsmith, all of New York City; C. S. Britton and G. G. Sowden, of Cleveland. R. C. Bonney, Idaho Springs, has been retained as manager.

Dictator.—A rich find of silver ores has been found in the Shaffer lease of this mine at Lawson, a test run giving values of 4.724 oz. for first class and 916 oz. per ton for second class.

Mint.—A rich strike is reported on this property at Empire. It is operated under lease by Messrs. Lundstrum and Blue and owned by Denver parties. The ore-shoot is eight feet wide with considerable smelting ore carrying values of from \$60 to \$100 per ton in gold, besides some silver.

St. Paul Mining Co.—A controlling interest in the holdings of this company on Green Lake mountain, near Georgetown, has been sold to Clyde W. Miller, a banker of Osage City, Kansas. A large plant of machinery is to be installed and heavier developments will be carried on.

Lebanon.—A one-half interest in the lease and bond on this group near Georgetown has been purchased by Leroy Storms of Hartford City, Ind., and increased operations are to follow, and it is reported that the bond will be taken up at an early date. W. H. Maxton, Georgetown, Colo., is interested.

GILPIN COUNTY.

East Notaway.—A shipment from the 420 west level brought returns of 11 oz. gold per ton, or over \$200 net per ton, shipped by lessees.

Nemaha.—A shipment of concentrate from a run of ores taken from recent high-grade find brought values of 48.20 oz. gold, 17 oz. silver and 2% copper, or \$973.25 per ton. E. S. Moulton, Central City, is manager.

Chase.—Employment is being given to 40 men, on leasing account, some of whom are shipping good grade ores, one carload this week to Denver giving returns of 8.83 oz. gold, 14 oz. silver per ton, and a good find is reported in the third east level, after passing through a large porphyry dike. St. Louis parties are owners, with J. A. Gilmour, Central City, Colo., as manager.

Gold Run.—New York parties have given a contract to drive their main tunnel and intend to instal machinery, the property being located in Wisconsin district. D. L. Webb, Continental Bldg., Denver, is agent.

Crown Point.—It is reported that this property on Mineral hill, in the Phoenix district, has been sold by Peterson & Co. to outside parties, the consideration being \$7,000. Developments consist of 50 ft. shaft and 150 ft. tunnel.

LAKE COUNTY—LEADVILLE.

The weather continues so disagreeable, with snow falling nearly every day, that the roads are almost impassable, and the mines depending on having the ore hauled by wagon are tied up and the product is being stacked, and in some instances nothing but development work is being carried on.

Yak Tunnel.—Several weeks ago a lateral was started about a mile from the portal running through the Silver Cord ground and then on to the Belgian about 1,500 ft. from the starting point. After the lateral was a few hundred feet a good body of ore was encountered in the Cord ground and when the lateral was driven further ahead a winze was sunk on this ore to ascertain the depth and also the value. Considerable work, sinking and drifting, has been done on it, and some of the ore runs as high as 6,000 oz. silver to the ton. There is a large amount of this ore which is shipped separately and was opened to the northeast of the main ore shoot that has been worked for years. It is one of the most important strikes made this year and proves without a doubt that a large area of Iron hill has never been systematically prospected. The Belgian lateral will pass through several good claims and the extension of this rich ore shoot may be opened further to the north.

Lower Rock Hill.—The Frank and Parson shafts in this section are passing out of the wash and entering the lake bedding, when the shafts will go down more rapidly. At the Mike sinking through the lake bedding proceeds favorably. At the three shafts a little inconvenience is felt from surface water, which is handled by a bucket.

New Monarch.—A good body of ore has been opened in one of the drifts in the Winnie, about 1,500 ft. from the shaft, and the output from the group amounts to about 300 tons daily. The property is working 150 men, a number of them being engaged in development work. The ore all goes to the Salida smelter.

Sunday.—Work on the new shaft to the north is progressing favorably and at present a gallows frame and a new plant of machinery are being installed. This shaft will be made the main working one on the property, and, when down deep enough, connections will be made with the old workings. The ore being shipped from the property comes from the old workings and this will continue until the connections are made.

Brattelboro.—At the bottom of the shaft in this well-known mine ore is being broken in the northeast drift, but the roads being impassable, the ore is stacked. The vein is of fair size and the values are

good. On the other side there is good body of ore that runs well in gold but carries considerable zinc. Arrangements are being made with the smelter to take this ore.

Corona.—This fraction of a claim lies near the A. Y. & Minnie and Colonel Sellers, and last week a five-foot body of galena ore was opened in the lower drift, 320 ft., and 15 ft. from the shaft. Near the surface the same body of ore was opened, but it was only considered a pocket and no work was done to prove its continuity. The drift will be run to the end lines and then stoping will commence to prove how far it goes up. The ore runs over 50 per cent lead and carries good values in silver. In the drift above a good body of sulphide is in sight and being shipped.

Mammoth.—This shaft on Big Evans gulch is down a little over 60 ft., and sinking with a windlass will cease in a few days, as the plant of machinery is nearly installed.

Ruby.—Red mountain, Twin Lakes district, is ready to ship the output for the winter whenever the roads are passable. This summer the company will erect a mill to treat the low-grade ore that is in the property.

TELLER COUNTY—CRIPPLE CREEK.

Golden Wedge.—The new plant of machinery on this mine has been installed, and the property is now ready to do considerable work at depth. Quite a large amount of ore has been shipped from the property in the past. It is situated on Raven hill, adjoining the property of the Doctor-Jack Pot.

Golden Cycle.—The deal for the purchase of this property, with the Theresa and a part of the Gold Knob, has been declared off. It is understood that the reason was that a reduction in the price given by the owners was asked and refused. An examination of the property has been in progress for some time.

W. P. H.—The Harrison and Seaver lease on this property expires on May 10. It is rumored that the owner, which is one of the companies controlled by the Woods people, will work it themselves. This, however, is not certain. This property has produced a very large amount of ore during the past year. The present lessees were limited to a certain depth. The property is situated on Ironclad hill.

Granite Gold Mining Co.—It is understood that sinking will soon be commenced on the Granite claim of this company. The shaft is already down to the depth of 1,000 ft., and it is understood that it will be sunk 200 ft. deeper. The property has shipped a very large amount of ore. It is situated on Battle mountain, near the properties of the Portland and the Ajax.

INDIANA.

Coroner M. P. Hollingsworth, of Gibson county, has returned a verdict in the mat-

ter of the mine disaster which occurred in this county March 22, when seven men were killed and four were fatally injured.

The coroner says that the blame for the accident rests jointly with Roscoe Heddrick and the Princeton Mine & Coal Co. Heddrick is designated as the one who placed the fatal shot, and he is regarded as an incompetent miner. The coroner further states that the company failed to keep the mines in the proper condition, as the evidence showed that they had not been sprinkled for over a year. The company is also blamed for keeping in its service an incompetent miner, who did not abide by the rules of the mine in placing a shot. It is stated that Heddrick placed the shot into six feet solid, when the law prescribes that one foot shall be the limit.

The report says that Harry Targett fired the fatal shot, thereby bringing death to himself and his companions.

Heddrick, who is 21 years of age, is now under bond for his appearance in the circuit court to answer to a charge of illegally drilling and blasting in the local mines.

LOUISIANA.

CADDO PARISH.

Shreveport.—The Producer Oil Co. will likely be abandoned as an oil producer, and the gas utilized to supply fuel for drilling purposes—the pressure is strong enough to supply Shreveport.

Dodge Brothers, of Beaumont, have purchased five acres of the Holt tract for immediate development. The Shreveport Petroleum Co., C. H. Harris, secretary, with capital of \$30,000, has been organized and will drill a well.

CALCASIEU PARISH.

Jennings.—The Foley Oil Co. is drilling two miles north of Iota and is down 2,100 ft. Oil in paying quantity has not been struck. Lovegrove well No. 1 has been deepened and is said to be flowing 1,000 bbl. daily. Morse Oil Co. No. 2 is again flowing. The Wilkins well, which has produced over 1,400,000 bbl., was drilled deeper and flowed 7,000 bbl. daily for a few days.

The daily output is about 27,000 bbl., of which the Bass and Benckenstein wells produce 9,000; Morse Oil Co., 5,000; Flynn, 4,000; Heywood, 2,000; Moonshine Oil Co., 1,500.

MONTANA.

SILVERBOW COUNTY.

Cora.—Seven men were killed in an explosion in this mine at Butte on May 12. According to the information obtainable, one of the men was handling powder in the magazine on the 1,500 ft. level, when the grease from the candle in his cap dropped into a box of the explosive at his feet. When it exploded three other boxes, a total of 200 lb., it is estimated, went off. The Cora mine is owned by the Montana Ore Purchasing Company.

NEVADA.

EUREKA COUNTY.

Ruby Hill.—It seems probable that parties interested in the Eureka Consolidated and Richmond will soon effect such arrangement as will enable these two properties to resume operations under one management. Both are on Ruby hill, two miles from Eureka, and were great producers of silver-lead ores from 1870 to 1883. On both properties shafts reach 1,200 ft. in depth. The plan is to unwater the mine and sink to greater depth. The orebody stands between a shale-hanging wall and a quartzite foot-wall, and consists of a line gangue, carrying silver-lead carbonate and oxide. The ledge is 600 to 1,000 ft. in width. There are here some arsenides of lime. Wm. Fries, of San Francisco, is president of the Eureka Consolidated Mining Co., and recently visited the property.

HUMBOLDT COUNTY.

Ohio-Nevada Co.—This company, under management of W. G. Adamson, is developing its property, 16 miles from Winnemucca. Steam boiler, hoist and pumps were recently installed. The ore carries silver and lead.

Hot Springs.—The Lone Mountain Gold Mining Co., of Carthage, New York, is developing properties at Rabbit Hole and Hot Springs, 75 miles northwest of Lovelock. Geo. R. Sims, manager, is on the ground and says the survey of the Western Pacific railway crosses his property.

WHITE PINE COUNTY.

New Moon.—A property of this name, owned by Cleveland, Ohio, people, and managed by F. C. Williams, of Leadville, Colo., is being developed and equipped at Osceola.

OREGON.

BAKER COUNTY.

Gold Cliff.—G. L. Baumgardner, O. C. Howson, D. J. Hart and C. G. Carson have sold to an Indiana syndicate this mine in the Weatherby district, 16 miles east of Baker City.

Belmont.—T. E. Gilkey, who with his partner, S. O. Kershaw, is the owner of this mine in the Greenhorn district, where the big strikes have been made which have excited so much attention and caused so many people to rush into that camp, makes the personal statement that within the two weeks which they have been operating since the strike was first discovered they have taken out \$4,000 in actual cash besides the \$750 in nuggets. The ledge has been worked only two feet below the surface and the quartz, which is decomposed, is first washed out by a giant and then pounded up in hand mortars. It is said that Gilkey has already been offered a large sum for the property.

Monumental.—Considerable excitement has been created over the strike just made in this mine in the Granite district,

the ore being principally ruby silver, which is found in the winze sunk from lower workings.

Iron Dyke.—The machinery is on the ground for the 50-ton smelter soon to be erected, and which is expected to be in operation within 30 days. With the completion of the railroad to this point the principal town will be established there, and it is also stated that the Landore smelter will soon be removed and established at Ballard's landing, near Homestead.

Cornucopia.—These mines, formerly the property of John E. Searles, of New York, have now been transferred through Receiver Beattys and H. H. Rogers of the Standard Oil Co., to Robert M. Burdette, of Southborough, Mass., the consideration in the deed being \$98,686. The entire property has just been covered by a blanket mortgage for \$100,000 to a New York trust company, and it is understood here that steps have been taken to re-open the property and again put it on a producing list.

Mattoon.—At this mine, 7 miles west of Baker City, in the Pocahontas district, Manager Butler has decided to put on a new hoist of modern design, and has ordered the machinery.

TEXAS.

HARDIN COUNTY.

Batson.—New wells in are Hoskins, Solinsky & Ellis No. 5, flowing 2,000 bbl.; E. G. Christian & Co. No. 5, Ada Belle No. 2, B. L. Autrey No. 4. There are 16 producing wells on the Millhome tract and five wells drilling. No dusters have yet been drilled.

Saratoga.—C. G. Hooks has commenced suit against the J. M. Guffey Petroleum Co. for possession of the Champion & Hoat league at Batson new wells. Rio Bravo Oil Co. No. 220 has an initial capacity of 1,000 bbl., Santa Fe No. 11 an initial flow of 2,000 bbl. Guffey Petroleum Co. Harington No. 2 has been abandoned. Rio Bravo wells No. 214 and 219 and International Oil Co. No. 4 are being deepened.

HARRIS COUNTY.

Humble.—This field is being gradually extended but the daily output remains between 40,000 and 50,000 bbl., with daily rail shipments of 180 cars. New wells are: Simms & Armstrong No. 3, flowing 10,000 bbl.; Moonshine Oil Co. No. 4, 3,500 bbl.; Dean No. 3, 1,000 bbl.; Big Hill Co. No. 3, 3,000. Moonshine Oil Co. No. 20 came in a gasser.

UTAH.

BEAVER COUNTY.

Horn Silver.—The Centrifugal Separating Co., W. H. Peck, general manager, has acquired the mill tailing at this mine, at Frisco, and has erected a plant for treating the material by centrifugal separators, invented by O. B. Peck. The ma-

terial is passed through a mixer, hydraulic sizer, settlers, density tanks, with agitators, thence to the separators. The separator is a cylinder 8 ft. long, 44 in. diameter at one end, 34 in. at the other. The interior is a smooth shell, with a 5/8-in. rim. Within is a cone-shaped core, 11 in. shorter and 1.5 in. less in diameter than shell, the latter revolving at a high rate of speed, throwing the heavy material against the outer rim and discharging it at opposite end from which it is fed. This tailing is reported to contain as high as 10% lead, 9 oz. silver to the ton, 10% zinc and small values in gold and copper. F. W. Rosburg is superintendent of the plant.

WASHINGTON.

OKANOGAN COUNTY.

Grand View.—This company has about completed the construction of an electric power plant on Cecile creek. From the mines to the mill a tramway is being built down the slope of the mountain.

Copper World Extension Co.—All the machinery is now at this mine and is being rapidly put in place. With the machinery in place more active development work on the property will be begun and the shaft which is now down 100 ft. will be sunk to the 500-ft. level and the ledge crosscut at each 100-ft. level.

Foreign Mining News.

ASIA.

INDIA—MYSORE.

Kolar Goldfield.—The output for the month of April is reported at 53,374 oz. bullion, the highest figure ever reached in one month. For the four months ending April 30, the total production was 208,429 oz. bullion, which compares with 203,882 oz. for the corresponding period in 1904, showing an increase of 4,547 oz. The bullion reported this year was equal to 187,586 oz. fine gold, or \$3,877,403 in value.

AUSTRALIA.

WESTERN AUSTRALIA.

The Mines Department reports the gold production of the State for the month of April at 172,136 oz. fine gold. For the four months ending April 30, the total was 652,539 oz. fine gold. The department, since the beginning of the year, has reported the production in fine ounces.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary Ore Shipments.—Shipments for the week ending May 6 were as follows, in tons: Granby, 11,725; Mother Lode, 3,636; Brooklyn, 2,940; Rawhide, 750; Mountain Rose, 188; Brooklyn and Stemwinder dumps, 150; Oro Denoro, 100; Sulphur King, 33; Providence, 20; Last Chance, 55. Total for week, 19,597 tons. Total for year, 325,085 tons.

Late News.**ARIZONA.**

Clifton-Morenci mines are now making about 5,000,000 lb. a month. This is apportioned to the Detroit, Shannon, and Arizona companies. The Old Dominion is making 2,600,000 lb. a month and Bisbee-Douglas about 10,000,000 lb. Jerome is now turning out not less than 2,650,000 and smaller mines and smelters throughout the territory about 500,000 lb. This makes an annual product, if this rate is maintained, of not less than 24,500,000 pounds.

It is reported that in the ground of the American Holding Co. a diamond drill has been driven to the depth of 1,000 ft., and that ore formation has been discovered there. There is much importance to the estimates that are being made as to the extent of the camp. It is also reported that native copper has been cut in the workings of the Houghton Development Co., on the south side of Gold Hill, and in the same general course that the mineralized district would take if it followed the gulch past American ground. This is not, however, any indication that there is a continuance of the copper bearing formation between the two; indeed that is scarcely possible, for there is at the very crest of Gold Hill a great vertical schist dike that cuts the mountain in two and forms its peak.

Junction is making about 800 gal. of water per minute now, and Calumet has fallen off to about 2,000 or 1,900. It is not believed that the two facts have any precise correlation, for there is enough water coming into Junction from its own ground to account for all it is pumping. The shaft on this property is now down to the 1,000-ft. level and a station will be cut there and the pumping plant dropped from the 900. Calumet, in spite of repeated and persistent reports to the contrary, is not making any progress in sinking, indeed is not starting to get down.

CALIFORNIA.

Lands on the American river, in the Folsom dredging district, are being freely bonded at an average price of about \$300 per acre, and are in demand at that. Some land, several miles from the river, has been recently bonded at those figures.

The consolidation of certain dredging interests at Oroville, previously referred to in one of these letters, has not been entirely completed, but has gone so far that the sum of \$1,000,000, to be paid on May 1, was deposited on that date.

The consolidation of the Selby, Tacoma and Everett smelters is an accomplished fact, but all the details have not been completed. The entire stock of the Selby Smelting & Lead Co. has been taken over and settled for. Wm. R. Rust, of Tacoma, is to be the business manager, and Alfred von Der Ropp, of the Selby company, is to attend to the metallurgical and technical features. The deal has been very

profitable to the holders of the Selby company's stock, and doubtless to those of the other companies as well. It is expected that several millions of dollars will be expended in building additional furnaces, etc., at the different smelters, in order to extend the business operations.

The State supreme court has affirmed the decision of the lower court in favor of the Standard Quicksilver Co. in a suit brought against it by Theresa Bell, as administratrix of the estate of Thomas Bell, deceased. The object of the action was to obtain a decree declaring invalid an assessment upon the stock of the defendant corporation, and to set aside a sale under said assessment of 7,000 shares thereof, belonging to the estate of the deceased. The principal point relied on by the plaintiff was that the assessment was void, for the reason that it was made at a special meeting of the board of directors which was not regularly called.

MINNESOTA.

M. A. Hanna & Co. will operate the silicious orebody of the Richmond mine, Cascade range, very heavily this year, and will inaugurate a plan of mining new to that section. The mine is stripped, and is a large deposit of hand ore. At present there is a face of ore in the stope, 70 ft. high. This will be drilled down from the top and the hole broken out with explosives, throwing an immense amount of ore down into the pit, crushing it somewhat and loosening a large tonnage at low cost. The ore will then be crushed in a centrifugal crusher now going in, and shipped to Marquette docks. A loop track has been put in and ore will be trammed by power from the pit to above the railway cars for loading. The size of some of these bodies of lean ore on the Cascade range has never been properly appreciated, except by a few companies. This Richmond, for instance, is so far as can be told, a solid 40 acres of ore, extending to a depth that is not known, for no effort has ever been made to drill it through. The Oliver company's Moore mine, nearby, is of enormous size, and in neither of them is there surface enough over the ore to make it a difficult matter to strip them.

There is renewed interest in lands near Biwabik, that had been considered of little value until recently. The finds of G. A. St. Clair on lands belonging to the Hale Mining Co., and just south of the old open pit, which had been abandoned as worthless, has affected others, and exploration has commenced on other lands near by. The Oliver Iron Mining Co. is putting drills into lands it holds east of the Hale, and the old Kanawaha, abandoned some time ago, is to be re-explored. Other tracts in this vicinity, that had been condemned, will be reopened and examined. Drills have been started south of the Biwabik deposit on old Cincinnati lands, where it had not

been supposed the ore existed. The Biwabik district has been suffering from neglect and there has been a general supposition that the small deposits first found there and mined out, were all there was of the immediate properties thus mined. It now seems to be different.

TEXAS.**LIBERTY COUNTY.**

Liberty.—Work has been resumed on the Stevens-Pickett well, but progress is slow on account of strong gas pressure.

JEFFERSON COUNTY.

Beaumont.—The crude market is quiet and shipments decreasing; prices practically unchanged except Humble crude, which is down 2c. to 18c.

The new pipeline charges of the Texas company are as follows:

From Batson and Saratoga district to Saratoga, 5; Sour Lake, 6; Beaumont, 12; Port Arthur, 15. From Sour Lake district to Sour Lake, 5; Beaumont, 6; Port Arthur, 12. From Beaumont district to Beaumont, 5; Port Arthur, 6. From Humble district to Humble, 6; Houston, 10; Sour Lake, 22; Beaumont, 25; Port Arthur, 27.

WASHINGTON.**OKONOGAN COUNTY.**

Douglass Mountain Gold Mining & Tunnel Co.—A tunnel has been run on this property 210 ft. through strongly mineralized rock. The course of the tunnel has been veered to the west and a survey indicates that ledge will be encountered within a distance of not more than 45 ft.

Otter.—This property consists of two claims: The Otter, and the Otter No. 1. A shaft has been sunk on a ledge varying in width from 5 to 12 ft., and a tunnel has been run 300 ft. to crosscut the same vein. At a distance of 275 ft. this vein was encountered, showing a width of 15 ft. Assays made range in value from \$6 to \$15. The property is on Aeneas mountain, between the towns of Loomis and Conconully.

Gladstone.—This property consists of four claims, on Porphyry mountain, near Chesaw. A tunnel is being run on a parallel ledge and is showing good prospects. The company has been organized only a short time and it is their intention to push development work actively the present season.

MEXICO.**ZACATECAS.**

El Oro Mining & Milling Co.—This company has completed the installation of its new 100-stamp mill, making a total of 200 now operated by this company. The company's new cyanide plant is to be up to date in every respect. It will have four times the capacity of the old plant for the same number of stamps. Blaisdell exca-

vators are to be used for the discharge of the tailing from the sand vats to Robins belt conveyors, which will take them to the dump. The whole product of the mill is to be passed through a tube-mill for fine grinding before treatment, and it is hoped that by this means the extraction of the gold will be increased from 83 to 93 per cent and that of the silver from 47 to 80 per cent.

Dos Estrellas Co.—This company is putting in 150 stamps more, making a total of 250. When completed the plant will be the largest in the camp. Regular shipments of very rich ore are being made from this extraordinarily productive mine. One such shipment of only 18 tons recently netted \$15,000 at the smelter. Few mines in the world have a record equal to that of *Dos Estrellas* for large production of rich ore in a short time from its first development.

Mexico.—This mine will shortly be equipped with a 100-stamp mill. The San Rafael vein will soon be cut in the 5th and 6th levels, and the ore production will then be greatly increased, justifying the erection of such a mill. This company has had considerable trouble in the past, but the prospects for a brilliant future for the property are excellent, and it is thought that the mine will become one of the best producers in the camp within a short time.

Victoria y Anexas.—This property, which lies between *Dos Estrellas* and *El Oro* mine, is now being opened up vigorously under the management of Hedley D. Crowder. A new 175-h.p. hoist has just been installed and preparations for systematic development have been completed. The *Victoria* vein has just been cut on the 4th level. A very favorable arrangement has been made with *El Oro Mining & Milling Co.*, whereby the latter company has the right to use the *Victoria* shaft for the development of the extension of the *Victoria* vein in its *Somera* property, which lies to the north. The future of the *Victoria* mine will be watched with great interest, since it is one of the few mines floated during the boom of two years ago, which have proved capable of returning the capital invested or of becoming a mine of any importance.

AUSTRALIA.

At the *Vulcan tin mine* in the *Walsh and Tinaroo field*, *Queensland*, the lode has recently been opened up at the 900-ft. level. This lode is practically a huge pipe, and has been worked up to 65 ft. in length by 40 ft. in width. At the 900-ft. level the orebody is 25 ft. by 27 ft., and has fully maintained its average value. This mine was opened in 1890, and up to February, 1905, had produced 7,055 tons of black tin, which realized \$1,771,000, out of which \$451,000 have been declared in dividends. The present output is at the rate of 90 tons of black tin per month. The *Mount Bisch-*

off Tin Mining Co., *Tasmania*, has declared its 336th dividend of \$1.80 per share, which brings the amount paid by this company up to \$9,907,500.

Mining Stocks.

(See quotations on page 983.)

New York. May 17.

The local mining stock market has relaxed, and the interest shown in the copper and industrial shares recently has given way to an anticipatory feeling. Transactions have not been large; in fact, they are somewhat smaller than customarily, because commission-house business is less than it has been. The feature in the copper section is *Amalgamated*, which fluctuated between \$80.625 and \$84.125, primarily because holders expect an increase in the next quarterly dividend. *Anaconda* has come forward at \$27.125@27.75 on slightly larger dealings. *Greene Consolidated Copper* found buyers at \$26 to \$26.125, and *Tennessee* at \$24.25 to \$24.50.

Speculation in the gold and silver shares is uninteresting, and prices for the Comstocks are softer.

Boston. May 16.

While this market has not shown any particular activity during the past week, it is noticeable that there is no urgent liquidation. In fact, the action of some stocks indicates that the buyers are not influenced by general stock market conditions, but rather by merit. An attempt is being made to revive interest in some mining shares, and this may meet with success, particularly if the price of the metal does not yield much. The producing mines are now getting the benefit of the high prices, and increased dividend payments may be looked for, while others will undoubtedly start or soon resume payments. *Utah Consolidated* continues to be pegged at \$42.50, although the buyers do not have much stock put to them. It is now expected that the next dividend will be \$2 for the six months. As a matter of record, it sold in the board Monday at \$1.87½ on 1,000 shares. The stock has varied from \$43.75 to \$43.25 during the week.

Centennial was given a smart rise of \$3.37 to \$21.37½, reacting less than \$1. Matters at this mine are improving, and the management feels greatly encouraged. A 1,000 share lot that was offered at \$21 was quickly taken. *Allouez* advanced \$1.50 to \$21.25, *Isle Royale* \$2.25 to \$23.25, *Mass* 50c. to \$8.50, *Michigan* 87½c. to \$12, *Mohawk* \$1.25 to \$50, and *Trinity* \$1 to \$9. *Osceola* is well taken and records a \$2 advance to \$93.50. This mine is expected to increase its dividend, and it is now likely that the *Tamarack* will resume payments by declaring a \$2 semi-annual dividend in July. The latter stock is up \$4 to \$119.

United Copper has been in good de-

mand, having advanced \$3.50 to \$26.25. The talk here is bullish on this stock. *Parrot*, which fell \$1.50 to \$23.50, is back to \$25.25 on the announcement that the mine had resumed after a 33-day close down from the *Nipper* injunction suit. *Old Dominion* spurted \$2.75 to \$26.25, but reacted to \$24.75. There is no news at hand to account for the rise. *United States* rose \$1.25 to \$32, but lost it. *Copper Range* varied from \$70.75 to \$73, closing at \$72, and *Amalgamated* rose \$3.37½ to \$84.25. It is felt here that this stock will sell materially higher on increased dividend payments. *Greene* has been soft, yielding \$1 to \$26. The declaration of a 2½c. quarterly dividend by the *Consolidated Mercur* was discounted in the market, the price touching 75c. and subsequently falling back to 60c. *Daly-West* is up \$2 to \$15 for the week. During April the latter received \$102,400 for ore sales and added \$14,000 to the surplus after allowing for dividend requirements. *North Butte* mining stock has been receiving some attention on the local curb, having risen over \$6 to \$30.50. The properties are in *Montana* and the company is capitalized with 400,000 shares, for \$15, full paid. The principal owners are the *United States Steel*, *Amalgamated* and *Calumet & Arizona* people.

Colorado Springs. May 12.

The market on the local exchange has been somewhat more active than for the previous week, but nothing sensational has occurred. The prices of *Cripple Creek* stocks have not fluctuated materially. *El Paso* has declared its monthly dividend of 3c., making a total of \$775,750 paid by this company. *Stratton's Independence Co.* has declared a dividend of \$125,000, making \$250,000 paid so far this year, and all their property is under the leasing system.

Elkton is selling for 53c.; *El Paso*, \$2.18; *Portland*, \$2.12; *Findley*, 78½c.; *Gold Sovereign*, 11¾c.; *Work*, 11c.; *United Gold Mines*, 21c. per share.

San Francisco. May 11.

At the opening of the week the Comstock market was unsettled and not very strong. Later, however, values hardened, and at the close there was a fair business done. *Ophir* closed around \$9.50@9.75; *Hale & Norcross*, \$2.05; *Mexican*, \$2; *Consolidated California & Virginia*, \$1.75 per share.

On the *San Francisco & Tonopah* exchange business was pretty active, especially in the low-priced stocks, and prices were generally firm. *Montana Tonopah* brought \$2.05; *Tonopah Midway*, \$1.55; *Tonopah Belmont*, \$1.30; *Tonopah North Star*, 75c.; *Diamondfield*, 55c.; *Original Bullfrog*, 33c.; *Rothwell*, 26c.; *Black Butte*, 30c.; *Bullfrog Belle*, 8c. per share.

On the *California* exchange dealing in oil stocks was quiet, as usual, and shows little signs of reviving. *Kern River* was

quoted at \$10.50; Oil City, 64c.; Monarch, 14c. per share.

The sworn statements of the mining companies, as filed in their offices this week, show cash on hand May 1, as follows, with all expenses paid, unless otherwise mentioned: Alta, \$267, with indebtedness of \$3,989; Andes, \$3,248; Belcher, \$6,809, with April expenses partly unpaid; Best & Belcher, \$109; Bullion, \$234; Caledonia, \$6,650, with April expenses unpaid; Crown Point, \$504; Confidence, \$1,571, with April expenses unpaid; Chollar, \$177; Challenge Consolidated, \$878; Con. Imperial, \$563; Exchange, \$1,830; Gould & Curry, \$502, with bills receivable of \$390; Hale & Norcross, \$1,185; Julia, \$2,636; Justice, \$208, with indebtedness of \$1,200; Mexican, \$8,568; Consolidated New York, \$1,757; Ophir, \$46,134, with two carloads of ore in transit; Overman, \$4,182, with April expenses unpaid; Potosi, \$621; Savage, \$6,348; Segregated Belcher, \$931; Sierra Nevada, \$51, with indebtedness of \$3,000; Scorpion, \$475; Silver Hill, \$16,198; Standard Consolidated, \$24,211, with April expenses and April clean-up to be accounted for; Syndicate, \$48; Union Consolidated, \$57, with indebtedness of \$3,000.

The following companies report no cash on hand, with debt as given: Alpha Consolidated, \$15; Consolidated California & Virginia, \$19,985. Both the last-named companies have assessments under collection.

Coal Trade Review.

NEW YORK, May 17.

ANTHRACITE.

The hard coal trade is moving with nearly its customary activity although not quite so briskly as in the first months of last year. April orders have all been filled and already some shippers are refusing to guarantee deliveries before the end of the present month, and at May prices, thus indicating that their orders on hand will absorb all of their immediate supply. The all-rail trade is growing beyond all expectations, in spite of insufficient supply of rolling stock, inadequate terminal facilities and even the inability of the bridges on some of the connecting roads to carry the 40-ton cars, now coming into universal use. As a result of congestion at junction points, arising from this condition, the line trade suffers greater delays than the tide-water deliveries, while for the same reason, production is being limited by the diminution of its car supply at the mines.

It is announced that John Mitchell will start this week on a two-months' tour of the anthracite fields, beginning in the North and ending in the Schuylkill region. While denying the specific expectation of a strike next Spring, at the expiration of the present agreement, it is his idea to stimulate union interests and

to organize the anthracite workers. The operators do not declare their intentions, but in general, they are said to be inclined to avoid trouble so far as they can.

May quotations remain at the same level, f. o. b. New York harbor shipping points: 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.

The Atlantic seaboard soft-coal trade shows slightly better conditions. There seems to be a slightly increased demand and stocks at tidewater points are no greater than normally. Prices are maintained fairly well. A few indications show that consumers are inclined to take on coal now that it is easy to get, and by so doing to secure advantages. Production at mines is proportionally curtailed at this moment, while the increased demand has caused a slight shortage of coal at tidewater in some individual cases.

Trade in the far East shows an increased demand. Coal has accumulated at some of the ports, but stocks are now being disposed of. Trade along the Sound is quiet, consumers apparently working with what coal they have on hand. This is the usual state of affairs in this territory, as consumers are in the habit of leaving their principal shipments until the usual rush, losing thereby the advantages that other territories secure. Trade in New York harbor shows a better tone, while prices remain at the same level—\$2.35@\$2.45 f. o. b. New York harbor shipping points for the ordinary grades of steam coal. Transportation from mines to tide is good, although showing slight irregularities. Car supply is up to demand, provided that the receivers take prompt care of their cargoes upon arrival.

Vessels in the coastwise trade are scarce and in demand; accordingly, they are asking for the loading and discharging clause and when this is declined, the association bill of lading is accepted. Philadelphia quotes as follows: To Boston, Salem and Portland, 75c.; to Lynn, Newburyport and Bangor, 90c.; to the Sound, 65c.; to Portsmouth and Bath, 80c.; to Saco, \$1 and towages.

Birmingham. May 15.

There is no let-up in the coal production of Alabama, and every ton being produced is finding a ready sale, despite the warm weather which has set in. The coal producers anticipate a steady summer trade. The commercial coal companies have a number of orders on hand yet for delivery. It is believed that during the summer many bins and other receptacles will be well stocked in anticipation of a demand in the fall and winter which cannot be met readily.

Much development is still going on in

this State. The Tennessee Coal, Iron & Railroad Co. has equipped another mine in the Ensley section with electrical haulage, and in the next few weeks will have the third mine in the same district similarly equipped. The electrical haulage in mines No. 4 and 5 will prove more valuable than it did at first in mine No. 3. The output at these places with the modern haulage system will be increased considerably.

The Pratt Consolidated Coal Co., the largest independent coal company in Alabama, will begin in the near future developing its recently purchased property in Walker county. At least half a dozen new mines will be opened. The Pratt company has purchased two mines which have been in operation for some time in the extreme western portion of Jefferson county.

James D. Hillhouse has been reappointed assistant State mine inspector.

The coke production is not equal to the needs in this district. Considerable coke is being brought into the State. Good prices obtain for coke.

Chicago. May 15.

Apprehension over the teamsters' strike and its possible spread has diminished notably the sales of both bituminous and anthracite in the last week. At the present writing the indications are for an indefinite continuance of the strike, and probably its extension, and another week of trouble has begun. Under these circumstances, dealers will be cautious, and shipments of coal to Chicago doubtless will be generally curtailed. Last week several Western mines shut down for a day or two, and the same course probably will be followed this week. Yet the actual trouble with coal deliveries so far has been small.

As regards general trade, the situation for dealers in bituminous seems unchanged except by the strike. Complaints are made everywhere about oversupply and too low prices. The only upward movement is in fine coals from Indiana and Illinois mines; screenings are firm, bringing \$1.30@\$1.70, or about the same as run-of-mine. Lump coal from Western mines is very weak.

Eastern bituminous is in better condition than Western, but buyers of this are fearful of trouble about deliveries, and sales consequently are not so good as dealers say they would be without the apprehension of labor troubles. Smokeless is not now troubled with too much coal on track, and prices hold up well to the list prices—\$2.95@\$3.15. The demand is not great for smokeless, but steadier than it has been for a long time. Hocking also is well regulated as to shipments and is in good demand, the list price of \$3 being fairly well maintained. Youghieny is in light demand at about \$3.

Contract business continues to improve, but the record so far for 1905 is below the record of 1904, and it seems probable that this condition will continue.

Cleveland. May 16.

The coal trade is down about to rock bottom. The lake business has hardly started to move, although the Pittsburg Coal Co. is planning to resume operations shortly, and the movement will in consequence be heavier. The 3/4-in. coal, which is shipped up the lakes, is being sold now at \$1.90 a ton f. o. b. lake boats, which is 10c. a ton below the best prices which were paid at any time last year. The demand up the lakes has been easy, because there was such a good supply on hand at the opening of the season of navigation this year.

Steam coal is also in the dumps. The ruling price is now about 95c. a ton at mine, for both Ohio and Pennsylvania coal. A good buying order would put the price down to 90c. with but little difficulty. The mines have all been running short-handed to keep down production to the demands of the present time, and it is only now that some of them are resuming operations to meet the requirements of the lake trade. The slack situation is still fairly strong, with Pennsylvania slack selling at 60c. at the mines and the Ohio mines being able, on account of the difference of freight rates, to sell their material at 70@75c. at the mines.

The coke situation has not weakened perceptibly, but there is still evident an over-production of material, with difficulty in adjusting supply to demand. The best grades of 72-hour coke are still selling at \$2.60 to \$2.75 at the oven, while furnace coke is selling at \$2 to \$2.25 at the oven.

Pittsburg. May 16.

Coal.—The Pittsburg Coal Co. started a number of its idle mines yesterday and before the end of the week expects to have all in full operation. All differences over prices at the lake docks caused by the Hanna interests cutting the price of fuel coal from \$2.50 to \$2.10 a ton, the rate for cargo coal, have been adjusted. The reduced rate has been withdrawn. Shipments to the lakes for the north-western markets will be rushed to the close of the season. John H. Jones, president of the Pittsburg-Buffalo Co., the largest independent producer in the Pittsburg district, declared to-day that production for the year will exceed the record tonnage by from 10 to 20%. The rivers were navigable again on May 12, and about 6,000,000 bush. of coal were shipped to the Southern markets. All the river mines are in full operation and will continue to run steadily for several months as there are plenty of empty coal boats and barges in the pools and harbors and a large number will be returned from down river ports this week. Prices remain about the same on a basis of \$1@ \$1.10 for run-of-mine.

Connellsville Coke.—Both production and shipments fell off last week. Prices are about the same, strictly Connellsville

furnace coke being quoted at \$1.90@ \$2 and foundry at \$2.65@ \$2.80. The production for the week is reported at 258,000 tons, a decrease of 2,600 tons and the shipments aggregated 11,998 cars, distributed as follows: To Pittsburg and river points, 4,629 cars; to points west of Pittsburg, 6,173 cars; to points east of Ever-son, 1,196 cars. This was a decrease of 259 cars compared with the previous week.

San Francisco. May 11.

The market is quiet, with sufficient supplies and no change in prices. Fuel oil is in good demand.

For Coast coals, in large lots to dealers, prices are as follows: Washington, 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. May 17.

The imports of coal into Germany for the three months ending March 31 were as follows, in metric tons:

	1904.	1905.	Changes.
Coal.....	1,229,210	2,530,517	I. 1,301,307
Coke.....	133,075	192,944	I. 59,854
Total.....	1,362,285	2,723,461	I. 1,361,166

The large increase in imports this year was the result of the miners' strike, which caused a shortage in home supplies.

Exports of coal from Germany for the three months ending March 31 were as follows, in metric tons:

	1904.	1905.	Changes.
Coal.....	4,423,776	4,097,854	D 325,922
Coke.....	639,950	589,431	D 50,519
Total.....	5,063,726	4,687,285	D 376,441

The strike caused less decrease in exports than was anticipated.

The official statement of coal production in France for the full year is as follows, in metric tons:

	1903.	1904.	Changes.
Coal.....	34,217,661	33,838,130	D 379,531
Lignite.....	688,757	664,159	D 24,598
Total.....	34,906,418	34,502,289	D 404,129

The small decrease was chiefly due to a falling off at several of the large collieries. No new mines were opened during the year.

Iron Trade Review.

NEW YORK, May 17.

There is still a certain hesitation about the market, so far as future business is concerned. Some people say that this is due to a probable falling off in trade; others—sellers chiefly—claim that it is part of a carefully engineered plan to bring down prices. Certainly there are

indications that business will continue good. Money is plentiful, construction plans are being formed with every prospect that they will be carried out, and the present probabilities are for abundant crops. All these point to good business. Dullness in the speculative markets is due largely to the fact that most people are too busy to do much speculation.

It may be said, however, that the amount of business on contracts placed for the first half of the year was so large, that it is not at all unnatural or unexpected that there should be a lull in new business. It is a lull only, for orders continue to come in, more especially in structural work, and the prospects are that this branch will do very well for the balance of the year. There is also a demand for new equipment on the part of the railroads, which will doubtless require a large amount of material.

The best proof of the continued strong demand is that nothing is now heard about export business, of which there was so much talk in the latter part of last year. Of course, some business of this kind is kept up, but there does not seem to be enough iron and steel to spare, to make exports on a large scale at all probable for some time to come.

Pig Iron Production.—The reports from the furnaces show a slight increase in the capacity of the coke and anthracite furnaces in blast. The total number of active stacks on May 1 was 283, with an estimated weekly capacity of 451,400 tons. This shows an increase of six furnaces in number, and of 11,800 tons in weekly capacity. The number in blast is now very close to the limit of possible activity. The *Iron Age* estimate of production for April is 1,922,000 tons, to which is to be added about 35,000 tons for the output of the charcoal furnaces. Stocks of unsold iron reported on May 1 were 336,650 tons, which is an increase of 17,400 tons over April 1; but a decrease of about 67,000 tons, as compared with January 1. These stocks do not include iron held by the large steel companies for their own use.

Birmingham. May 15.

Alabama pig iron manufacturers admit that the iron market is quiet, in fact it is as dull as it has been at any time in the past two or three years. Despite this dullness there is no great amount of apprehension. But few of the iron makers in the Southern territory have been accepting business or seeking orders at quotations under the prices which have prevailed for several weeks. The production has been cut down a little by the blowing out of Little Belle furnace at Bessemer, of the Tennessee Coal, Iron & Railroad Co. The coke supplies have not been steady and so as not to disturb the steady operation of the furnaces at Ensley, the supply was taken from Little

Belle furnace. Before the end of the month it is likely the furnace will again be in operation.

Quotations are given as follows: No. 1 foundry, \$13.50@14; No. 2 foundry, \$13@13.50; No. 3 foundry, \$12.50@13; No. 4 foundry, \$12@12.25; gray forge, \$11.50@12; No. 1 soft, \$13.50@14; No. 2 soft, \$13@13.50.

The steel production in Alabama is steady. The demand for steel billets and finished steel is most active. All the rail that will likely be manufactured this year has been sold already and there is an inquiry being received for the make of the coming year. Strong quotations prevail. The steel rod, wire and nail mills are in full operation and heavy shipments are being made of the products.

The cast-iron pipe works are busy. The United States Cast Iron Pipe & Foundry Co. is shipping pipe from the Bessemer, Ala., plant to New Orleans on a large order. Alabama made pipe is being shipped in all directions in the United States. Good prices obtain.

There is no change in the rolling mills' situation in Alabama. The big Birmingham mills are still idle. The Bessemer, Gate City, Anniston and Sheffield rolling mills are giving employment to a fairly good sized force of men.

Chicago. May 15.

The last week has been a light one for the Chicago iron market, as regards pig iron and most finished products. Sales have been comparatively few in number and for small amounts. Probably not more than 12,000 to 15,000 tons of pig iron were sold. By some dealers and many users of iron it is held that the prices of pig iron cannot remain at the standard quotations of the last two months—\$13.50 Birmingham or \$17.15 Chicago for Southern, and \$17.50 for Northern—unless something wholly unexpected happens to boom the market. It is reported, indeed, that Southern can be bought now in large or small quantities, for the second half of the year, at 25@50c. below the standard quotations. Northern iron, also, according to rumor, is fully 25c. off the quotation on actual sales. The situation undoubtedly is worse for sellers of Southern than Northern, the latter being in steadier demand for mixing and being well sold up toward the end of the year.

In the opinion of certain sellers the furnaces are producing more pig iron than the melters can normally use, and the rest of 1905 will not show so well for the seller as the user of iron. There seems to be generally a feeling on the part of the foundrymen that they can well hold off from contracts in the present uncertainty about prices. The first four months of the current year have been very irregular, however, and there is no good reason for unqualified pessimism about the future.

Coke is weak, and shipments should be cautiously made. Connellsville 72-hour sells for \$5.15@5.25, against \$5.65 a few weeks ago.

Cleveland. May 16.

Iron Ore.—The movement of ore during May will establish a record for that month. Boats are running light to head of the lakes, bringing down ore cargoes. They are delayed not more than a day at the lower lake ports on the average, the supply of cars being abundant, and are able thereby to make more trips. This, together with the increased vessel capacity, makes for a freer movement of material. The movement to the furnace stock-piles is heavy with indications that the ore is being used at once. Wild and contract rates remain at 75c. from the head of the lakes; 70c. from Marquette and 60c. from Escanaba. The prices have not changed, being based on bessemer Old Range which is selling for \$3.75 f. o. b. Lake Erie ports.

Pig Iron.—The situation is especially weak in foundry. Many are concerned about the future and the tendency is to make sales, even at a sacrifice of prices. The buying has been so light that nothing has disturbed the last quotation of \$15.75 @ \$16 for No. 2 in the valleys, although no buyer placing a good order would have difficulty in cutting under either quotation. Southern furnaces are offering their material here freely at \$13, Birmingham, for No. 2, but not selling much. The basic and bessemer trades are about at a standstill, the market being especially dull.

Finished Material.—There is increased weakness in bar iron. Mills coming in competition with Western producers have withdrawn from competitive markets, saying they cannot sell on a price parity with Western mills. They are holding for 1.55@1.60c. Youngstown, although a good order could be placed easily at 1.50c. Youngstown. A report has it that 1.25c. has been accepted, but this is probably an error. Small mills are eating into the sheet business, leaving the larger interests only the business out of stock, which is rather good. The prices are being cut by the small concerns \$2 to \$3 a ton. The structural business is increasing. Big mills cannot offer material and the jobbers and small concerns are doing most of the business, resulting in better prices being paid. The rail trade is light, but billets are strong, selling at a premium.

New York. May 17.

The iron market continues rather quiet for spot and short-time business. There is a little more inquiry for future contracts, which has not yet materialized in orders.

Pig Iron.—There has been some buying by local foundries, and one or two good-sized orders have been placed for Eastern pump plants. The most active demand

at the present time is from the cast-iron pipe makers. While prices are rather easy, there is no quotable change, and we give the following: For Northern iron, No. 1 X foundry, \$17.25@17.75; No. 2, \$16.75@17.25; No. 2 plain, \$16.25@16.75; gray forge, \$15@15.50. Virginia foundry is a little lower, and can be obtained around \$17.15@17.65. Southern iron is weaker, and reports continue to be heard of sales on a basis of \$13 for No. 2 foundry, though the large companies insist that they have not cut prices. For large lots on dock, New York, we quote as follows: No. 1 foundry, \$17.25@17.50; No. 2, \$16.75@17; No. 3, \$16.25@16.50; No. 4, \$15.75@16; No. 1 soft, \$17.25@17.50; No. 2 soft, \$16.75@17; gray forge, \$15.25 @ \$15.25, according to brand.

The warrant market on the Produce Exchange still continues quiet, and prices are somewhat easier. Latest quotations range around \$15.30 bid, and \$15.80 asked for June and July delivery, regular warrants; \$15.50 bid, and \$16 asked, June and July delivery, foundry warrants.

Bars.—Bar iron continues in moderate demand, with no large orders in sight. Quotations are unchanged at 1.595@1.645c. large lots on docks. Steel bars are still held at 1.645c. Store trade continues pretty steady, with quotations 1.75@2c., delivered.

Plates.—Plates are in a little better demand, and buyers who ask for concessions are not getting them. Tank plates are 1.745@1.795c.; flange and boiler, 1.845@1.945c.; universal and sheared plates, 1.645c. up, according to width.

Structural Material.—Business in small lots continues good. Prices remain unchanged. Beams under 15 in. are 1.745c. for large lots; over 15 in., 1.845c.; angles are 1.745c. tidewater.

Steel Rails.—Standard sections continue \$28 per ton at mill, but hardly any business is done in this market. Girder and trolley rails are in better demand, and it is possible that quite a good deal of business will be done. Light rails are quiet, prices ranging from \$24 for 12-lb., up to \$21 for 35-lb. rails.

Old Material.—The market is a little more steady, but there are still good supplies, which are being slowly absorbed. Under the circumstances, dealers are not pressing sales. No. 1 railroad wrought can be had for \$18@18.50; yard wrought, \$15@15.50; machinery cast, \$13.50@14; heavy steel melting scrap is lower at \$14.50@15. These prices are on cars, Jersey City or other terminal delivery.

Philadelphia. May 16.

The pig-iron brokers and agents of eastern Pennsylvania furnaces have received this week a good many inquiries as to the delivery of foundry, forge and basic iron during the Summer. There is also inquiry for quite a number of special brands for which there appears to be

an urgent demand. The actual business has not been very light since last week, but the spirit of inquiry is having a strengthening effect upon prices though there has been no sign of any advance. Furnace men in speaking of this turn of the market explain it by saying that their customers are booking a good deal of new business and are simply preparing to protect themselves by contract for delivery when the material will be needed. Notwithstanding this increase in inquiry rumors are afloat concerning the possibility of lower prices, but these rumors do not appear to have any good foundation. Quotations are for No. 1 X foundry, \$18.25; No. 2, \$17.75; No. 2, plain, \$17.25; standard gray forge, \$16.25; basic \$17.

Billets.—Two or three orders for billets were taken late last week at \$28.50, and offers are now under consideration for large lots at \$28. The smaller consumers are running short of material and will soon be heard from.

Merchant Bar.—Merchant bar at retail and at stores is as high as ever and the only intimation of weakness comes from mills who are bidding upon some big contracts where deliveries can be made to suit their convenience. There is no actual drop in bars and the manufacturers say there is no room for any even though scrap iron is little lower.

Quotations continue at 1.73½ to 1.80 for best refined and steel bars at 1.63½ to 1.70.

Sheet Iron.—The present activity is for small lots of best grades of sheet iron which range from 2.00 for 22 to 244 gauge to 3c. for 28 gauge; the mills are well supplied with business and they are quite well supplied for some time to come. The managers do not look for any weakening in any kind of sheet iron for some weeks, even at all.

Structural Material.—The structural mill people report extraordinary activity. The Philadelphia Rapid Transit Co. has placed orders for 24,000 tons of structural steel and the Pennsylvania people have today, it is reported, placed orders for 21,000 tons, although the placing cannot be verified. There are a great many small orders coming in from builders and contractors and there are also further inquiries to-day concerning which details cannot be had, but it is said that these inquiries mean the early placing of very heavy orders.

Steel Rails.—One of the encouraging features growing out of the efforts of rail makers made some time ago abroad is the receipt of inquiry from Mexico and South American countries, where the rail people say they expect to do a large business this summer.

Old Rails.—Old iron rails are now wanted at \$22 but the asking price is \$23.

Scrap.—Some of our scrap dealers bought scrap for future delivery at figures which they find is no easy matter to

obtain. They are confident that the situation is altogether in their favor, especially for railroad scrap for which they want \$19.50 and for No. 1 steel scrap, which they are selling in a slow way at \$15.50.

Pittsburg. May 16.

The iron and steel markets have been decidedly quiet during the past week, but little new business of any consequence being placed. Sales of pig iron did not aggregate 5,000 tons for all grades. The United States Steel Corporation has not come into the market for May iron, and is not likely to do so, but is expected to place a large order for delivery during June. Despite the apparent dullness in the pig-iron trade, bessemer iron is held firmly at \$15.50, Valley furnaces, but foundry and forge iron continue weak. The price of Southern foundry, which has been maintained at \$13.50, Birmingham, for several months, has declined and offers have been made in this market at \$13.25, Birmingham, and it is believed as low as \$13 could be done. The high point in the country's pig-iron production probably will be reached this month. Reports for April showed an increase over March in actual production, and on May 1 the operative capacity of the furnaces was greater than on April 1. There is but little idle capacity. The United States Steel Corporation is operating 97% of its furnaces, and most of the independents are running. It is likely that some of the furnaces will have to go out for repairs in a short time.

In finished lines, mills are busy on orders for structural material that will keep them going throughout the summer. There has been an important improvement in demand for wire nails and other wire products. Some shading of prices had been reported, and a meeting of independent interests was held during the week to consider the situation. It was decided to maintain prices, and as there is new business in sight, it is likely that shading will be stopped, as it was pointed out at the meeting that this might lead to a serious decline. In merchant pipe, sheets and tin plate, new business is very slack, and it is reported that prices are being shaded. The plate market is one of the strongest on steel products. An order for 300 coal and coke cars was placed yesterday by the Morgantown & Kingwood railroad with the Standard Steel Car Co. The car-building companies of the country have enough business on their books, it is reported, to keep them running for the rest of the year. Steel-rail orders placed during the past 10 days aggregate 60,000 tons, including 33,500 tons by the Pennsylvania railroad, and increases that company's orders for the year to 136,000 tons. This is considerably less, however, than the tonnage taken for 1904 by that road.

A movement has been started here for a consolidation of the independent sheet

and tin-plate interests which may prove successful. At a preliminary meeting held on Friday, fully 90% of the independent concerns were represented and nearly all signed an agreement to give options on their plants before June 1. If the prices fixed by the owners are not too high, the promoters are confident the scheme can be carried out. It developed at the meeting that a consolidation of the sheet interests would make a combination as strong as that branch of the American Sheet & Tin Plate Co. There are 35 independent sheet concerns with a total of 155 mills. The American has 164 sheet mills. The independent tin-plate mills number 101, while the American has 242 tin-plate mills. Great interest was manifested in the project, particularly as it is to arrange for a supply of sheet and tin-plate bars. The plans were not made public, but it is understood that a deal will be made to include the Republic Iron & Steel Co. in the combination. This company has just completed a large bessemer steel plant which is now in operation.

The bi-monthly examination of the sales sheets of the Republic Iron & Steel Co. to determine the wages of the puddlers and finishers in the union mills of the country for May and June was held at Youngstown on May 12. The examination showed that the average price on deliveries during March and April of bar iron was 1.5c. This gives the puddlers a rate of \$5.37½ a ton, an increase of 25c. and the finishers get a corresponding increase. According to reports from Detroit, where the annual convention of the Amalgamated Association of Iron, Steel and Tin Plate Workers is being held, a demand is to be made for a restoration of the wage scales of 1903-4. This will mean advances in all lines ranging from 10 to 20 per cent.

Pig Iron.—The pig-iron market is very quiet, sales for the week not amounting to more than 5,000 tons. Prices are about the same as quoted a week ago, as follows: Bessemer, \$15.50, Valley furnaces; foundry No. 2, \$15.75@ \$16, Valley, or \$16.60@ \$16.85, Pittsburg, and gray forge \$15.60@ \$15.85, Pittsburg.

Steel.—Demand for billets is not as great as during the past few months, but all quotations are above the pool price of \$21 for billets and \$23 for sheet bars. For May and June delivery \$23.50 is quoted for billets and \$26@ \$26.50 for sheet bars. No quotations have been made for third quarter. Merchant steel bars are firm at 1.50c. and plates at 1.60c.

Sheet.—There is but little new business in sheets, as jobbers have become very well loaded. Some shading is reported, but the price quoted for black sheets No. 28 gauge continues at 2.40c. and galvanized at 3.45c.

Ferro-Manganese.—There is but little change in the market, 80% domestic being quoted at \$50@ \$51.50.

Cartagena, Spain. April 29.

Iron and Manganiferous Ores.—Messrs. Barrington & Holt report that the local market remains unchanged. The Easter holidays being over, the production is again active. Freight rates are slightly stronger. Recent rates paid from Cartagena have been 5s. 9d. to Maryport, 7s. to Rotterdam, 5s. 4d. to Philadelphia. Shipments for the week were two cargoes, 5,500 tons dry ore, to Great Britain.

Quotations for ordinary 50% ore are 6s. 4d. @ 6s. 7d.; special low phosphorus, 7s. @ 7s. 8d.; specular ore, 58%, 9s. 4d.; S. P. Campanil, 9s. 1d. For manganiferous ores quotations vary from 10s. for 35% iron and 12% manganese, up to 14s. 7d. for 20% iron and 20% manganese.

Pyrite.—Iron pyrite, 40% iron and 43% sulphur, is quoted at 10s. per ton. No shipments reported.

Chemicals and Minerals.

New York, May 17.

Trade generally continues quiet, and the prospects are that there will not be any marked improvement for some time. Prices continue practically unchanged.

Copper Sulphate.—In certain quarters there is a better demand, but as the larger consumers are well supplied the situation is not bullish. Makers continue to quote \$4.75 to \$5 per 100 pounds.

Acids.—The strength in the raw material markets is reflected in firmer prices for the commercial acids.

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
60°, 100 lb. in carboys..	1.05
60°, bulk, ton.....	18.00 @ 20.00
66°, 100 lb. in carboys..	1.20
66°, bulk, ton.....	21.00 @ 23.00

Sulphur and Pyrite.—Freer arrivals of domestic sulphur, to be delivered on contract, has changed the appearance of the local market, although prices remain at \$21 per ton for prime at New York, Philadelphia and Baltimore; \$21.25 at Boston, and \$21.50 at Portland, Maine. Pyrite is quiet, lump being quoted at 9 to 11c. per unit of sulphur, and fines, 8.5 to 10c., f.o.b. Atlantic ports.

Nitrate of Soda.—The spot market is particularly strong, and holders ask all sorts of prices, even as high as \$2.875 per 110 lb. for 96% quality. Nearby arrivals are quoted \$2.40 to \$2.45, and futures down to \$2.15 for deliveries as late as 1907.

Sulphate of Ammonia.—Further sales of good gas liquor have been made at \$3.10 to \$3.15 per 100 pounds.

Phosphates.—Shipments of Florida high-grade rock from Savannah in April amounted to 16,037 tons, of which Ger-

many received 12,135 tons; Holland, 2,757 tons; and Italy, 1,145 tons.

Phosphates.	F. o. b.	C. I. F. Gt. Britain or Europe.
*Fla., hard rock.....	\$7.25 @ 7.50	\$ 0.67 @ 11.85
land pebble.....	3.75 @ 4.00	7.70 @ 8.40
†Tenn., 78 @ 80%.....	4.35 @ 4.40	10.27 @ 10.67
78%.....	3.75 @ 4.00	.....
75%.....	3.40 @ 3.50	.....
68 @ 72%.....	3.00 @ 3.25	.....
‡So. Car. land rock.....	3.75 @ 4.00	.....
river rock.....	3.50 @ 3.75	6.33 @ 6.61
Algerian, 63 @ 70%.....	.....	7.04 @ 7.71
58 @ 63%.....	.....	6.15 @ 6.60
Tunis (Gafsa).....	.....	6.00 @ 6.60
Christmas Isle.....	.....	13.28 @ 14.11
Ocean Isle.....	.....	13.60 @ 14.45
Somme, Fr.....	.....	11.39

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

Liverpool. May 3.

Messrs. Joseph P. Brunner & Co. write that the demand for heavy chemicals continues quiet and prices are maintained.

Soda ash is firm. For tierces, the nearest range is about as follows: Leblanc ash, 48%, £5 @ £5 10s.; 58%, £5 10s. @ £6 per ton. Ammonia ash, 48%, £4 5s. @ £4 10s.; 58%, £4 10s. @ £4 15s. Bags, 5s. per ton under price for tierces. Soda crystals are in fair jobbing request at generally £3 7s. 6d. per ton, less 5% for barrels, or 7 less for bags, with special terms for a few favored markets. Caustic soda is quiet, at follows: 60%, £8 15s.; 70%, £9 15s.; 74%, £10 5s.; 76%, £10 10s. per ton, net cash. Special quotations for the Continent and a few other export quarters.

Bleaching powder is in limited export request, and for hardwood prices are nominally £4 15s. @ £5 per ton, net cash, as to market.

Chlorate of potash is quiet but steady, at 3 1-16d. @ 3 3-16d. per lb., net cash, as to quantity and market.

Bicarbonate of soda continues to move off at £6 15s. per ton, less 2½% for the finest quality in 1 cwt. kegs, with usual allowances for larger packages, also special terms for a few favored markets.

Sulphate of ammonia is not active, but there is a fair business passing in a quiet way, and £12 17s. 6d. per ton, less 2½%, is about minimum quotation for good gray 24 @ 25% in double bags f.o.b. here.

Nitrate of soda is steady at £11 5s. per ton for ordinary up to £11 10s. per ton for refined, in double bags f.o.b. here.

Metal Market.

New York, May 17.

Gold and Silver Exports and Imports.

At all United States Ports in April and Year.

Metal.	April.		Year.	
	1904.	1905.	1904.	1905.
Gtd				
Exp	\$19,470,157	\$1,303,874	\$23,857,796	\$35,319,138
Imp	10,289,869	2,581,057	32,401,911	11,802,259
Exc	E. \$9,180,288	\$1,277,183	E. \$8,547,115	E. 23,515,879
Silv.				
Exp	3,832,758	2,317,599	16,859,052	14,930,051
Imp	2,115,436	2,559,858	9,059,839	9,075,214
Exc	F. \$1,617,322	L. \$242,259	E. \$7,819,213	E. \$5,854,837

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 May 13, and for years from January 1st.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	\$22,500	\$29,222	\$364,237	\$13,344
1905.....	32,903,625	4,979,478	11,502,218	1,225,625
1904.....	44,459,258	1,805,970	15,529,295	283,806
1903.....	3,936,941	2,815,399	6,500,665	706,101

Gold exports for the week were to Santo Domingo; imports principally from Central America. Silver shipments were chiefly to London; imports mostly from Mexico.

The exports of merchandise from the United States in the month of April are valued by the Bureau of Statistics of the Department of Commerce and Labor, at \$129,358,229. This is a decrease of \$8,281,537 from the preceding month, but an increase of \$19,477,824, as compared with April, 1904. For the four months ending April 30, the statement is as follows:

	1904.	1905.
Exports.....	\$490,614,306	\$497,466,725
Imports.....	346,482,157	407,481,353
Excess, exports.....	\$144,132,149	\$89,985,372
Add excess of exports, silver.....	.....	5,854,837
" " " " gold.....	.....	23,515,879
Total export balance.....	\$119,356,088	

The gold and silver movement in detail is given in the table at the head of this column.

The statement of the New York banks—including the 53 banks represented in the Clearing House—for the week ending May 13, gives the following totals, comparison being made with the corresponding week of 1904:

	1904.	1905.
Loans and discount....	\$1,078,928,600	\$1,099,716,900
Deposits.....	1,129,615,400	1,150,219,700
Circulation.....	36,003,700	44,608,700
Specie.....	218,134,500	219,888,300
Legal tenders.....	77,096,600	84,379,200
Total reserve.....	\$295,231,100	\$304,267,500
Legal requirements....	282,403,850	287,554,925

Balance surplus..... \$12,827,250 \$16,712,575

Changes for the week were increases of \$7,595,000 in loans and discounts, \$6,321,800 in deposits, and \$161,100 in circulation; decreases of \$415,000 in specie, \$21,000 in legal tenders, and \$2,016,850 in surplus reserve.

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

	Gold.	Silver.
New York.....	\$219,888,300	.....
England.....	180,177,150	.....
France.....	570,617,140	\$220,634,660
Germany.....	195,135,000	65,045,000
Spain.....	73,870,000	106,810,000
Netherlands.....	33,370,500	31,173,000
Belgium.....	16,343,335	8,171,665
Italy.....	113,585,000	17,718,500
Russia.....	525,070,000	34,340,000
Austria.....	238,720,000	65,060,000

The returns of the Associated Banks of New York are of date May 13 and the others May 11, 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.

The market for silver has been steady to firm. The absorption of silver has taken care of the output and no large amounts are hanging over the situation.

The United States Assay Office in New York reports receipts of 129,000 oz. of silver for the week.

Shipments of silver from London to the East for the year up to May 4 are reported by Messrs. Pixley & Abell's circular as follows:

	1904.	1905.	Changes.
India.....	£4,086,203	£2,800,490	D. £1,285,713
China.....	100,781	63,070	D. 37,711
Straits.....	58,103	2,800	D. 55,303
Totals.....	£4,245,087	£2,866,360	D. £1,378,727

Receipts for the week were £101,000 in bar silver from New York, £9,000 from the West Indies, £7,000 Australia, and £3,000 from South Africa; total, £120,000. Shipments were £286,300 in bar silver to Bombay, and £40,000 to Hong Kong; total, £326,300.

Indian exchange is a trifle stronger, as better crop reports are coming in. The Council bills offered in London were taken at an average of 15.97d. per rupee. Buying of silver for India continues light, but some has been taken for Chinese account, and there has also been some buying in London by continental banks, which is believed to be on Russian account, for payments to be made in China and Manchuria.

The Mines Department reports the arrivals of gold at Paramaribo, for the month of March, at 96,610 grams. For the three months ending March 31, the production by districts was as follows: Surinam, 53,715 grams; Saramacca, 49,423; Marowijne, 28,867; Lowa, 73,249; total, 205,254 grams. This is equal to 6,599 oz., or \$136,401 in value.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars.....	\$0.44½	\$0.47½
Peruvian soles and Chilean pesos .	.41½	.44½
Victoria sovereigns.....	4.86	4.87
Twenty francs.....	3.87	3.90
Spanish 25 pesetas.....	4.78	4.82

Other Metals.

SILVER AND STERLING EXCHANGE.

May.	Sterling Exchange.	Silver.		May.	Sterling Exchange.	Silver.	
		New York Cents.	London, Pence.			New York Cents.	London, Pence.
11	4.86½	57¼	26¾	15	4.867	57¾	26¾
12	4.867	57¾	269-16	16	4.8675	57¾	269-16
13	4.867	57¾	26¾	17	4.8675	57¾	26¾

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.

May	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.			New York, Cts. per lb.	St. Louis, Cts. per lb.
11	14½ @14½	14½ @14½	65½	30½	4.50	5.40 @5.45	5.25 @5.30
12	14½ @14½	14½ @14½	65½	30½	4.50	5.40 @5.45	5.25 @5.30
13	14½ @14½	14½ @14½	....	30½	4.50	5.40 @5.45	5.25 @5.30
15	14½ @14½	14½ @14½	65½	29½	4.50	5.40 @5.45	5.25 @5.30
16	14½ @14½	14½ @14½	64½	29½	4.50	5.40 @5.45	5.25 @5.30
17	14½ @14½	14½ @14½	64½	29½	4.50	5.40 @5.45	5.25 @5.30

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.

Copper.—The market has dragged along rather listlessly during the week. The business doing is rather insignificant, and there is not enough pressure either way to materially affect prices. The closing quotations are 14¾@14¾c. for Lake copper; 14½@14¾c. for electrolytic in ingots, cakes and wire bars, 14¾@14¾c. in cathodes; 14¼@14¾c. for casting copper.

The standard market is still subject to bear attacks and has been rather unsettled throughout the week. The closing quotations are about at the lowest, being cabled as £64 10s. for spot and three months.

Statistics for the first half of the current month show a decrease in the visible supplies of 1,200 tons.

Refined and manufactured sorts we quote: English tough, £70@£70 10s.; best selected, £71 5s.@£71 15s.; strong sheets, £79; India sheets, £75; yellow metal, 6½d.

Exports of copper from New York and Baltimore for the week ending May 16 amounted to 6,337 long tons. Imports at New York for the week of May 12 were 46 long tons of copper, and \$19,736 worth of ore (quantity not given).

Tin.—There has been a steady business at the parity of London prices, and quotations are firm around 29¾@30c. for spot, and £29 5s. 8d. for futures.

London shows a further decline in the spot position, and the market closes steady at £135 2s. 6d. for spot, £134 7s. 6d. for three months.

Lead.—Business in this metal continues at a very satisfactory rate at the current quotations, which are 4.42½c. St. Louis, 4.50c. New York.

The market abroad has advanced still further under an active demand, and the closing quotations are cabled as £12 18s. 9d. for Spanish lead, £13 for English lead.

St. Louis Lead Market.—The John Wahl Commission Co. telegraphs us as follows: Lead is dull. Missouri brands are now selling at less than desilverized. The latest sales here are on a basis of 4.40c. East St. Louis.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain,

under date of April 29, that silver has been 14 reales per oz. Exchange is 33.29 pesetas to £1. Local quotation for pig lead is 68.50 reales per quintal, which, on current exchange, is equal to £11 10s. 3d. per long ton, f. o. b. Cartagena. Exports for the week were 1,459 tons argentiferous lead to London, and 81 tons desilverized to Marseilles.

Spelter.—The market does not show any signs of recovery, demand being very slack. The closing quotations are lower at 5.25@5.30c. St. Louis, 5.40@5.45c. New York.

The foreign market is unchanged at £23 10s. for good ordinaries, £23 15s. for specials.

St. Louis Spelter Market.—The John Wahl Commission Co. telegraphs us as follows: Spelter is weak and pretty much unsettled. The latest sales are on a basis of 5.30@5.32½c. East St. Louis.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of April 29, that prices continue nominally unchanged at 74 fr. for blende, 35% zinc, and 54 fr. per ton for calamine, 30% zinc. Miners who have not contracted ahead, however, are asking somewhat better prices.

Antimony.—There is no change. Common brands are salable at 8¼@8½c. f. o. b. New York.

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.

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.

Quicksilver.—Quicksilver is a little firmer, at \$38@39 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 a little weaker, at £7 7s. 6d., with the same figures quoted by second hands.

Cadmium.—Metallic cadmium, guaranteed 99.5%, is selling in quantities of 100 kg. or over at 710 marks per 100 kg., packing included, f.o.b. Hamburg. 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 kg., delivered in Bremen, and are as follows, per 100 kg.: 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 metal prices per lb. for Aluminum, Nickel, Bismuth, Chromium, Copper, Ferro-Molybdenum, Ferro-Titanium, Ferro-Chrom, Magnesium, Manganese, Molybdenum, Tantalum, Phosphorus, and Tungsten.

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

Missouri Ore Market.

JOPLIN, May 13.

The highest price paid for zinc ore was \$46.50 per ton, a price \$2 per ton lower than the previous week. The assay basis price was \$43 per ton of 60% zinc, a like decline of \$2 per ton from the prices current the week previous.

The highest price paid for lead was \$61.50 per ton for one bin of especially choice ore, other grades selling at \$59, \$58, \$57 and as low as \$52 per ton.

Following are the shipments of zinc and lead from the various camps of the district for the week:

Table showing shipments of Zinc and Lead from various camps (Joplin, Cartersville-Webb, Duenweg, Galena-Empire, Anrora, Carthage, Badger, Sherwood-Mitcheil, Alba, Granby, Neck, Prosperity, Zincite, Orozogo, Spurgeon, Beef Branch) with columns for Zinc lb., Lead lb., and Value.

Monthly Average Prices of Metals.

COPPER IN NEW YORK.

Table showing monthly average prices for Copper in New York, categorized by Electrolytic and Lake, with sub-columns 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.

COPPER IN LONDON.

Table showing monthly average prices for Copper in London, categorized by month and year (1904, 1905).

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

SILVER.

Table showing monthly average prices for Silver, categorized by New York and London, with sub-columns for 1904 and 1905.

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

TIN IN NEW YORK.

Table showing monthly average prices for Tin in New York, categorized by month and year (1904, 1905).

LEAD IN NEW YORK.

Table showing monthly average prices for Lead in New York, categorized by month and year (1904, 1905).

SPELTER.

Table showing monthly average prices for Spelter, categorized by New York and London, with sub-columns for 1904 and 1905.

Dividends.

Large table listing dividends for various companies, including Alaska-Treadwell, Amalgamated Copper, Anaconda Copper, Bunker Hill & Sullivan, etc., with columns for Company, Payable, Rate, and Amount.

Assessments.

Table listing assessments for various companies, including Alpha Con., Alta Nev., Brnswick Con., Bullion Nev., Canfield, Centennial Copper, Chollar, Confidence Nev., Con. Cal. & Va., Con. Imperial, Crown Point, Emerald, Fairview, Gonld & Curry, Joe Bowers, Jnno. Utah, Justice, Lady Washington Con., Jenny Lind, Lower Mammoth, Potosi, Sierra Nevada, Trinity, Union Con., and Utah Con., with columns for Company, Delinq., Sale, and Amt.

STOCK QUOTATIONS.

Name of Company.	Week, May 16.		Closing.		Sales.
	High.	Low.	High.	Low.	
Alice.....	.50				200
Amalgamated.....	84 1/2	80 1/2	84 1/2	83 1/2	208 100
Anaconda.....	28	27	27		8,600
Con. California & Virginia.....	2.00	1.70	1.90	1.85	550
Elkton Consolidated.....	.53	.52	.53		1 200
Federal.....	114	112			500
Federal Preferred.....	98 1/2	94	96 1/2	96	4,100
Greene Copper.....	27	26	26 1/2	26	9,600
Greene Gold.....	6 1/2	5 1/2	6 1/2	5 1/2	8,400
Homestake.....					
Horn Silver.....					
Iron Silver.....					
Isabella.....	.29	.27	.29		2,000
Little Chief.....	.05				200
Ontario.....					
Ophir.....	8.75	8.50			200
Portland.....	2.10	2.05			600
Quicksilver.....	1.00				300
Quicksilver Preferred.....					
Standard.....					
Tennessee Copper.....	25 1/2	24 1/2			1,000
United Copper.....	26 1/2	24 1/2	26	24 1/2	39 200

Total sales, 254,750.

Name of Company.	Par Val.	Week, May 16.		Closing.		Sales.
		High.	Low.	High.	Low.	
Allouez.....	\$25	21 1/2	19 1/2	21	20 1/2	2,365
Amalgamated.....	100	84 1/2	80 1/2	84 1/2	83 1/2	17,598
Atlantic.....	25	13 1/2	13	13 1/2		595
Bingham Consolidated.....	50	32 1/2	31 1/2	32 1/2	31 1/2	2,267
Bonanza Development.....	10	.50				1,100
Boston Consolidated.....	10	8 1/2	8	8 1/2	8 1/2	3,920
Calumet & Hecla.....	25	650	642 1/2	650		41
Catalpa.....	10					
Centennial.....	25	21 1/2	18 1/2	20 1/2	20 1/2	7,850
Consolidated Mercur.....	5	.75	.60	.65	.60	8,570
Copper Range Consolidated.....	100	73	71	72 1/2	72	4,129
Daly-West.....	20	15	12 1/2	15	14 1/2	1,012
Elm River.....	12	2 1/2	2 1/2			12
Franklin.....	25	8 1/2	8 1/2			170
Granby.....	10	5 1/2	5 1/2			1,155
Greene Consolidated Copper.....	10	27 1/2	26	26 1/2	26	1,691
Guanajuato Consolidated.....	5	5 1/2				930
Isle Royale Consolidated.....	25	23 1/2	21 1/2	22 1/2		1,110
Mass Consolidated.....	25	8 1/2	7 1/2	8 1/2	8 1/2	2,140
Mayflower.....	25	.90	.75	.85		250
Michigan.....	25	12 1/2	11 1/2	12		795
Mohawk.....	25	50 1/2	49	50	49 1/2	330
Old Dominion.....	25	26	24	25 1/2	24 1/2	1,047
Oceola.....	25	93 1/2	91 1/2			675
Parrot.....	10	25 1/2	24 1/2	25 1/2	25	745
Phoenix Consolidated.....	25	2	1 1/2	1 1/2	1 1/2	782
Quincy.....	25	100				35
Shannon.....	10	8 1/2	7 1/2	7 1/2	7 1/2	1,215
Tamarack.....	25	119	118			65
Tennessee.....	25					
United Copper, common.....	100	26 1/2	24 1/2			3,320
United States.....	25	32	30 1/2	31	30 1/2	3,360
United States Coal & Oil.....	25	10 1/2	9 1/2	10 1/2	10 1/2	2,315
Utah Consolidated.....	5	43 1/2	42 1/2	43 1/2		2,165
Wolverine.....	25	108				40

Total sales, 73,794 shares.

MEXICO.		April 28			
Company.	Prices, Mex.		Company.	Prices, Mex.	
	Bid.	Ask.		Bid.	Ask.
DURANGO:					
Penoles.....	\$2,600	\$3,000	San Rafael y An., aviada.....	\$600	\$620
San Andres de la Sierra.....	10,000		Soledad, aviada.....	930	970
GUANAJUATO:					
Cinco Senores y An., aviadoras.....	11	15	Sorpresa, aviada.....	240	275
Cinco Senores y An., aviada.....	32	40	MEXICO:		
Providencia, San Juan de la Luz.....	120	135	Aldebarren.....	35	42
GUERRERO:					
Garduno y Anexas.....	31	35	Buen Despacho.....	42	50
HIDALGO:					
Amistad y Concordia.....	61	63	Dos Estrellas.....	3,580	3,620
Carmen aviada.....	160	175	La Esperanza (El Oro).....	1,500	1,500
Guadalupe Fresnillo Mill.....	170	200	Santa Ana, Esperanza.....	30	60
Guadalupe Fresnillo Mine.....	70	80	NUEVO LEON:		
Maravillas y An., aviador.....	70	100	La Fraternal.....	580	620
Maravillas el Lobo.....	130	180	Norias de Bajan.....	700	750
Refugia, aviada.....	5	7	SAN LUIS POTOSI:		
Sta. Gertrudis y An., aviadora.....	66	69	Concepcion y An.....	20	30
San Rafael y An., Trompillo.....	1,890	1,940	El Barreno, aviadora.....	97	105
			Sta. Maria de la Paz.....	275	276
			ZACATECAS:		
			Asturiana y An.....	8	12
			Candelaria y Pinos.....	65	100
			San Carlos y Annexas.....	15	20
			Sta. Maria de Gaud.....	75	80
			MISCELLANEOUS:		
			Bartolome de Medina.....	75	83
			Naica (Chihuahua).....	11,000	13,000
			Natividad (Oaxaca) aviadora.....	700	750
			San Francisco Hac.....	68	75
			Union Hacienda.....	280	315

Company.	Par Val.	Latest dividend.		May 5.	
		Amt.	Date.	Buyers.	Sellers.
AMERICAN:					
*Alaska Treadwell.....	5 0	2 0	Apr., 1905	6 16 3	6 18 9
Anaconda.....	5 0	2 0	May, 1905	5 11 3	5 13 9
Camp Bird.....	1 0	9	May, 1905	1 13 9	1 16 3
El Oro.....	1 0	9	July, 1904	1 0 0	1 2 6
Le Roi.....	5 0	5 0	Nov., 1899	17 6	1 0 0
Le Roi No. 2.....	5 0	2 0	Jan., 1905	15 0	17 6
Montana.....	1 0	6	Apr., 1899		1 3
Stratton's Independence.....	1 0	6	Apr., 1905	8 9	9 3
Tomboy.....	1 0	1 0	Dec., 1904	1 0 0	1 2 6
Tyee.....	1 0	2 0	Dec., 1904	1 8 9	1 11 3
Utah Con.....	1 0	6 0	Jan., 1905	8 15 0	9 0 0
Ymir.....	1 0	1 0	Mar., 1902	1 3	3 9
EUROPEAN:					
Linares.....	3 0	5 0	Apr., 1905	4 5 0	4 15 0
Mason & Barry.....	1 0	7 0	May, 1905	3 2 6	3 7 6
Rio Tinto.....	5 0	37 6	Apr., 1905	59 10 0	59 15 0
Rio Tinto, pf.....	5 0	2 6	Apr., 1905	6 2 6	6 7 6
Tharsis.....	2 0	7 0	May, 1905	5 5 0	5 10 0
WEST AUSTRALIA:					
Associated.....	1 0	2 6	July, 1904	1 16 11	1 18 1
*Golden Horseshoe.....	5 0	6 0	Apr., 1905	7 2 6	7 5 0
Great Boulder.....	1 0	9	Apr., 1905	1 1 9	1 2 6
Great Boulder Perseverance.....	1 0	9	Mar., 1905	7 12 3	7 12 9
*Great Fingall.....	1 0	7 6	Apr., 1905	7 12 6	7 15 0
*Ivanhoe.....	5 0	9 0	Apr., 1905	7 15 0	7 17 6
Kalgurli.....	1 0	2 6	Apr., 1905	7 3 9	7 6 3
Lake View.....	1 0	1 6	Oct., 1904	1 0 0	1 1 3
Oroya-Brownhill.....	1 0	4 0	Mar., 1905	3 5 0	3 6 3
MISCELLANEOUS:					
Broken Hill.....	3 0	8 1 6	May, 1905	2 5 0	2 6 0
Mt. Lyell.....	1 0	1 3	Dec., 1904	2 18 6	19 6
Mt. Morgan.....	1 0	3	May, 1905	2 15 0	2 17 6
Walhi.....	1 0	2 6	Mar., 1905	6 10 0	6 12 6
INDIAN:					
*Champion Reef.....	10 1	3	Apr., 1905	1 13 6	1 14 6
Mysore.....	10 5	6	Mar., 1905	6 17 0	7 0 0
Nundydroog.....	10 1	6	Mar., 1905	1 11 3	1 12 6
SOUTH AFRICAN:					
Anglo.....	1 0	5 0	Feb., 1905	6 6 3	6 8 9
British So. Africa.....	1 0	rts.	May, 1899	1 18 9	2 0 0
City & Suburban.....	4 0	6 0	Feb., 1905	5 7 6	5 12 6
Consol. Gold-Fields.....	1 0	2 6	Dec., 1904	7 13 9	7 15 0
*Crown Reef.....	1 0	20 0	Apr., 1905	13 10 0	14 0 0
De Beers, preferred.....	2 10	10 0	Feb., 1905	18 3 9	18 6 3
De Beers, deferred.....	2 10	2 0	Feb., 1905	17 6 3	17 8 9
East Rand.....	1 0	4 0	Feb., 1905	8 2 6	8 5 0
Ferreira.....	1 0	2 0	May, 1905	19 0 0	20 0 0
Goldenhuis.....	1 0	5 0	Feb., 1905	4 11 3	4 13 9
Geduld.....	1 0	rts.	Mar., 1902	7 3 9	7 6 3
Henry Nourse.....	1 0	8 0	Feb., 1905	7 7 6	7 12 6
Knights.....	1 0			5 6 3	5 8 9
Langlaagte.....	1 0	2 0	Feb., 1905	3 8 9	3 11 3
Modderfontein.....	1 0	rts.	Apr., 1902	10 6 3	10 8 9
New Kleinfontein.....	1 0	rts.	Apr., 1902	2 3 9	2 6 3
New Primrose.....	1 0	3 0	Feb., 1905	2 15 0	2 17 6
Premier, def.....	2 10	10 0	June, 1905	15 7 6	15 12 6
Premier, pf.....	5 6	3	June, 1905	9 1 3	9 3 9
Rand.....	5 5	0	Aug., 1904	10 10 0	10 12 6
Randfontein.....	1 0	rts.	Apr., 1899	2 13 9	2 16 3
Robinson.....	5 0	8 0	Feb., 1905	9 5 0	9 10 0
Robinson Deep.....	1 0	3 0	Aug., 1904	6 0 0	6 2 6
Rose Deep.....	1 0	3 0	Feb., 1905	7 15 0	8 0 0
Simmer & Jack.....	1 0	6	May, 1905	1 18 9	2 1 3
Village Main Reef.....	1 0	4 0	Jan., 1905	5 15 0	6 0 0
Wemmer.....	1 0	12 6	Dec., 1904	7 0 0	7 10 0

* Ex-dividend.

LONDON (By Cable*).			
Company.	May 16	Company.	May 16
	£ s. d.		£ s. d.
Camp Bird.....	1 14 6	Esperanza.....	1 6 6
Consolidated Gold Fields.....	7 10 0	Modderfontein.....	10 5 0
De Beers.....	17 7 6	Rand Mines.....	10 2 6
Dolores.....	1 9 0	Rio Tinto.....	60 2 6
East Rand.....	7 17 6 1/2	Simmer & Jack.....	1 17 6
El Oro.....	1 0 7 1/2	Tomboy.....	1 0 0

* Furnished by Wm. P. Bonbright & Co., 24 Broad St., New York.

PARIS.					
Company.	Location.	Par value.	Latest dividend.	May 4.	
				Opening.	Closing.
		Fr.	Fr.	Fr.	Fr.
Aciéries de Creusot.....	France.....	2,000	75.00	1,980.00	1,940.00
Anzin, coal.....	France.....		290.00	5,900.00	5,855.00
Bische-St. Vaast.....	France.....	1,000	160.00	3,605.00	3,605.00
Bolec, copper.....	Lower Cal.....	500	104.17	2,078.00	2,065.00
Bray, coal.....	France.....	400	27.50	795.00	785.00
Courrières, coal.....	France.....	500	110.00	3,100.00	3,095.00
Escoubre-Bleyberg, z.....	France.....	350	35.00	720.00	724.00
Huanchaca, silver.....	Bolivia.....	125	2.50	86.50	86.50
Laurium, zinc, lead.....	Greece.....	500	25.00	328.50	333.00
Maifdano, zinc.....	Italy.....	500	50.00	670.00	665.00
Metaux, Cie. Fran. de.....	France.....	500	22.50	546.00	547.00
Mokta-el-Hadid, iron.....	Algeria.....	500	40.00	1,050.00	1,035.00
Nickel.....	N. Caledonia.....	250	22.50	700.00	699.00
Penarroya, coal.....	Spain.....	500	45.00	1,175.00	1,175.00
Vielle Montagne, zinc.....	Belgium.....	30	30.00	833.00	837.00

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

(See also Market Reviews.)

ABRASIVES—		COPPERAS—Bulk.....100 lb.		POTASSIUM—	
Bort as to size.....carat	\$10.00@18.00	In bbls.....	52½	Bicarbonate crystal..... lb.	\$0.08½
Carborundum, f.o.b. Niagara Falls, powd..... lb.	.08			Powdered or granulated..	.14
Grains.....	.10	CRYOLITE..... lb.	.06½	Bichromate, Am.....	.08½@.084
Corundum, N. C.....	.07@.10			Scotch.....	.08½@.08½
Chester, Mass.....	.04½@.05	EXPLOSIVES—		Bromide.....	.15
Craigmont, Ont.....	.05½@.064	Blasting powder, A.....25-lb. keg	.65	Carbonate (80@85%).....	3.50@4.00
Mont. f.o.b. Chicago.....	.07@.07½	Blasting powder, B.....	1.40	Caustic, ordinary.....	.04½
Crushed Steel, f.o.b. Pittsburg.....	.05½	"Rackarock" A..... lb.	.25	Elect. (90%).....	.06½
Emery, in kegs: Turkish flour.....	.03½	"Rackarock" B.....	.18	Chlorate, powder-d.....	.08½@.08½
Grains.....	.05@.05½	Judson R.R. powder.....	.10	Crystals.....	.08½@.08½
Naxos flour.....	.03	Dynamite (20% nitro-glycerine).....	.13	Cyanide (98@99%).....lg. ton.	8.50
Grains.....	.05@.05½	(30% nitro-glycerine).....	.14	Kainit (bulk).....	14.75@15.75
Chester flour.....	.03	(40% nitro-glycerine).....	.15	Manure salt 20%.....	1.16½@1.19½
Grains.....	.05@.05½	(50% nitro-glycerine).....	.16½	Double Manure Salt, 48@53%.....100 lb.	1.16½@1.19½
Peekskill, f.o.b. Easton, Pa., flour.....	.01½	(60% nitro-glycerine).....	.18	Muriate.....	1.90@1.95
Grains, in kegs.....	.02½	(75% nitro-glycerine).....	.21	Permanganate..... lb.	.09½@.09½
Garnet, per quality, sh ton	25.00@35.00	Glycerine for nitro.....	.11@.11½	Prussiate, yellow.....	.13½@.13½
Pumice Stone, Am. Powd., lb.	.013-5@.02	FELDSPAR—Ground.....sh ton.	9.75@10.00	Red.....	.35
Italian, powdered.....	.01½@.01½	FLUORSPAR—		Sulphate.....100 lb.	2.18½@2.21½
Lump, per quality.....	.04	Domestic f.o.b. shipping port:		SALT—N. Y. com. fine 280 lb. bbl.	.72@1.18
Botenstone, ground.....	.02½@.04½	Lump.....sh. ton.	8.00@10.00	N. Y. agricultural.....sh. ton.	4.40
Lump, per quality.....	.06@.20	Ground.....	11.50@13.50	SALTPETER—Crude.....100 lb.	4.00@4.25
Rouge, per quality.....	.10@.30	Gravel.....	4.25@4.50	Refined.....	4.25@4.75
Steel Emery, f.o.b. Pittsburg.....	.07	FULLER'S EARTH—Lump..100 lb.	.80	SILICA—	
ACIDS—		Powdered.....	.85	Ground quartz, ord'ry...sh ton	9.00@10.00
Boracic, crystals.....	.10	GRAPHITE—		Best.....	12.00@13.00
Powdered.....	.10½	Am. pulverized.....	45.00	Lump Quartz.....	2.50@4.00
Carbonic, liquid gas.....	.12½	Best flake.....	150.00	Glass sand.....	2.75
Hydrofluoric, 30%.....	.03	Ceylon, common put.....	.02½@.03½	SILVER—Nitrate, crystals.... oz.	.36½
48%.....	.05	Best, pulverized.....	.04@.08	SODIUM—	
60%.....	.11	German, c-m. puiv.....	.01½@.01½	Bicarb., ord., bulk, f.o.b.	
ALCOHOL—Grain.....gal.	2.38	Best, pulverized.....	.01½@.02	works.....100 lb.	1.30
Refined w. od, 95@97%.....	.70@.75	Italian, pulverized.....	.01½	Extra domes, f.o.b. work.....	3.50
Purified.....	1.25@1.30	GYPSUM—Ground.....sh. ton.	8.00@8.50	Bichromate.....lb.	.06½
ALUM—Lump.....100 lb.	1.75	Fertilizer.....	7.00	Bromide.....	.20
Ground.....	1.85	Rock.....lg. ton.	4.00	Carbonated ash, high test, in bags, f.o.b., works.....100 lb.	.75@.77½
ALUMINUM—Sulphate, com'l.	.75@1.25	English and French.....	14.00@16.00	Foreign, f.o.b. N. Y.....	.85@.87½
AMMONIUM—		INFUSORIAL EARTH—		Caustic, 60@78%, f.o.b., works.....	1.75@1.85
Bromide..... lb.	.22	Ground Am. best.....	20.00	Foreign, f.o.b. N. Y.....	1.90@1.95
Carbonate.....	.08	French.....	37.50	Chlorate, com'l.....	.08½@.08½
Muriate gran.....	.05½@.05½	German.....	40.00	Hyposulphite, Am.....	1.50@1.60
Lump.....	.09½	LEAD—Acetate, white..... lb.	.09@.09½	German.....	1.75@2.00
ARSENIC—White.....	.02½@.03	Brown.....	.07@.07½	Phosphate..... lb.	.02½@.02½
Red.....	.06½@.06½	Nitrate, com'l.....	.06½	Prussiate.....	.09½@.09½
ASPHALTUM—		" granular.....	.08½	Sal soda, f.o.b. works.....100 lb.	.60
Barbadoes.....	.02½@.03	MAGNESITE—Greece.		Foreign, f.o.b. N. Y.....	.85
Cuban.....	.01½@.03½	Crude (95%).....lg. ton.	6.50@7.00	Silicate, concentrated..... lb.	.05
Egyptian, crude.....	.04@.07	Calcined.....sh. ton.	16.50@17.00	Com'l.....	.01
Gilsonite, Utah ordinary.....	.03@.03½	Bricks, domes, per qual.	160@200	Sulphate, com'l.....100 lb.	.65
Trinidad.....	35.00	f.o.b. Pittsburg..... M.	160@200	SULPHUR—Roll.....	1.85
BARIUM—		MAGNESIUM—		Flour.....	1.90
Carb. Lump, 80@90%.....sh ton.	25.00@27.00	Chloride, com'l..... lb.	.01½	Flowers, sublimed.....	2.20
92@98%.....	26.00@29.00	Sulphate.....100 lb.	.25@.95	TALC—North Carolina.....sh. ton.	15.50@23.50
Powdered 80@90%..... lb.	.01½@.02	MANGANESE—		N. Y. Fibrous best.....	10.25
Chloride, com'l.....100 lb.	1.25	Crude powdered:		French, best.....	20.00
Chem. pure cryst..... lb.	.05	70@75% binoxide..... lb.	.01½@.01½	Italian, best.....	30.00
Nitrite, powdered.....	.05	75@85% binoxide.....	.01½@.02½	TAR—Oil bbl. (50 gal.).....bbl.	5.40
Sulphate (Blanc Fixe).....	.02	85@90% binoxide.....	.02½@.03½	TIN—Crystals..... lb.	.22
BARYTES—		90@95% binoxide.....	.03½@.05½	URANIUM—Oxide.....	2.25@3.00
Am. Crude No 1.....sh. ton.	9.75	Ore.....unit.	.18@.20	ZINC—Metallic ch. pure.....	.07@.09½
Crude No. 2.....	8.00	MARBLE—Flour.....sh. ton.	6.00@7.00	Chloride solution, com'l.....	.02½
Crude No. 3.....	7.00	MINERAL WOOL—		Chloride, granular.....	.04½@.04½
Floated.....	16.75@18.00	Slag, ordinary.....	19.00	Dust.....	.05@.05½
Foreign floats.....	18.75@20.50	Selected.....	25.00	Sulphate.....	.02@.02½
Snow-white.....	17.25@18.75	Rock, ordinary.....	32.00	BORON—Nitrate..... lb.	\$1.50
BAUXITE—Ga. or Ala. Mines:		Selected.....	40.00	CERIUM—Nitrate.....	10.00
First grade.....sh. ton.	5.25@5.50	OZOKERITE..... lb.	11½	DIDYMIUM—Nitrate.....	35.00
Second grade.....	4.50@4.75	PAINTS AND COLORS—		ERBIUM—Nitrate.....	40.00
BONE ASH.....100 lb.	.02½@.02½	Litharge, Am. powdered....	.05½@.06	GLUCINUM—Nitrate.....	20.00
BORAX.....	.07½@.07½	English glassmakers'.....	.08½@.08½	LANTHANUM—Nitrate.....	30.00
CADMIUM—Metallic.....	1.40	Lithophone.....	.03½@.06	LITHIUM—Carbonate.....	1.50
CALCIUM—Acetate, gray.....	2.30	Metallic, brown.....sh. ton.	19.00	LITHIUM—Nitrate..... oz.	.60
Acetate, brown.....	1.55	Red.....	16.00	STRONTIUM—Nitrate..... lb.	.07@.07½
Carbide, ton lots f.o.b. Niagara Falls, N. Y. f-r	65.00	Ocher, Am. common.....	8.50@9.00	THORIUM—Nit. 49@50%.....	4.50
Jersey City, N. J.....sh. ton.	65.00	Best.....	16.00	URANIUM—Nitrate..... oz.	.25
Chloride, f.o.b. works.....	9.00@10.00	Dutch, wash-d..... lb.	.02½	ZIRCONIUM—Nitrate..... lb.	8.00
CEMENT—		French, washed.....	.01½@.01½		
Portland, Am 400 lb.....bbl.	.30@1.25	Paris green, pure, bulk.....	.12		
Foreign.....	1.25@1.75	Red lead American.....	.06½@.06½		
" Rosendal" 300 lb.....	.80	Foreign.....	.07@.08½		
Slag cement.....	.75@1.25	Turpentine, spirits.....gal.	.60		
CHLORINE—Liquid.....	.30	White lead, Am. d. y..... lb.	.05½@.05½		
Water.....	.10	American in oil.....	.06½@.06½		
CHROME ORE—		Foreign, in oil.....	.09@.09		
(50% ex-ship N. Y.....lg. ton.	19.00@19.50	Zinc white, Am. extra dry..	.04½@.04½		
Bricks, f.o.b. Pittsburg, M.....	175.00	Foreign, red seal, dry.....	.06@.08½		
CLAY, CHINA—Am. common		Green seal, dry.....	.06½@.09½		
ex-dock, N. Y.....	7.75@8.00				
Am. best ex-dock, N. Y.....	9.00@9.25				
English, common.....	11.00@11.25				
Best.....	16.75				

The Rare Earths.

Note—These quotations are for wholesale lots in New York, unless otherwise specified, and are generally subject to the usual trade discounts. Readers of the ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.

THE ENGINEERING AND MINING JOURNAL

Platinum and Palladium in Certain Copper Ores.

BY THOMAS T. READ.

Platinum is steadily increasing in value, and the source of supply is practically limited to Russia; it is not surprising, therefore, that so much attention has been paid in recent years to the occurrences of this metal in North America.*

The mineral sperrylite, PtAs₂, first discovered in the decomposed gold-quartz ore of the Vermilion mine in the Algoma district, Canada, by F. L. Sperry, was identified and described by Wells and Penfield.¹ Later C. W. Dickson² succeeded in separating it from the sulphide ore of the Sudbury district, finding that it was there associated with the chalcocopyrite. The presence of platinum in the rich copper sulphide ore of the Rambler mine, in Wyoming, was recognized by W. C. Knight³, and the separation and identification of the sperrylite was also accomplished by Wells and Penfield.⁴ It is with this latter occurrence that the present paper deals.

The Rambler mine is situated near the crest of the Medicine Bow range in southeastern Wyoming, some ten miles north of the boundary line between that State and Colorado, and at an elevation of about 8,500 ft. The chief geological features of the orebody have already been described by Prof. J. F. Kemp, and it need be repeated here only for the sake of clearness, that the mine is situated in a high basin where the country rock is mainly a granite-gneiss. Pre-Cambrian quartzite and eruptive granite are of importance, though the exact relations of the above to each other and to the later dikes are obscured by a heavy covering of wash, which masks the outcrop over the greater part of the area. The dikes are large, dark and basic; in one of them occurs the Rambler orebody. "The Rambler dike is a dark granitoid rock where revealed in the mine. It is a typical diorite in mineralogy. It consists of green hornblende as the chief component, with which is associated some brown biotite. The hornblende contains many little inclusions of poikilitic quartz. Plagioclase is present in considerable abundance, and from its extinction angles appears to belong to the labradorite or bytownite series. Apatite is likewise present in the usual relations, and pyrites and magnetite in more than the normal quantity. The last two appear

in the perfectly fresh rock, so far as one may judge from the slides, and with no such evidence of the alteration in the associated minerals as one would anticipate, if the sulphides were of later infiltration. The small metallic minerals appear especially in the dark silicates; they fail in the feldspars."⁵

Beside this dike there are others in which the hornblende is secondary ('meta-gabbro'), and also dikes of hornblende-peridotite. It is interesting to note that in this small area are found all the principal structures and associations which characterize the Encampment district,⁶ on the next range (the Sierra Madre) to the west, and the geological identity of the two is thereby indicated.

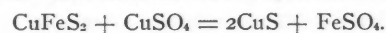
The Rambler orebody occurs in the kaolinized portion of the dike described. So far as known, it extends over about 100 ft. north and south, and the same distance east and west. At a depth of about 30 ft. there existed a dome-shaped body of rich ore, consisting chiefly of the alteration products that might be expected from copper sulphides. These were mixtures of copper carbonate, with cuprite, metallic copper, much hematite and limonite, together with unchanged sulphides. This extended to a depth of 65 ft.; just below occurred other bodies of sulphides, extending to a depth of about 100 ft. No bodies have as yet been found at a greater depth.

As can be inferred from the foregoing, the orebody varies extensively from point to point. Attention will be directed to the sulphides, the oxidized ores being of such variety that it is scarcely justifiable to attempt their description without a more extensive collection of the material than is now available. The most striking and important of the sulphides is covellite, CuS. This has the characteristic indigo-blue color, and shows the perfect basal cleavage that distinguishes it from other minerals of a similar color. Generally speaking, it is rather porous or vesicular. With careful observation, it can be seen that these vesicular openings tend to have a definite hexagonal shape, suggesting the mold of a tabular six-sided crystal. The filling, whatever it may have been, has apparently been completely removed, the only minerals to be seen being a thin film of pyrite, coating the walls, or secondary chalcedonic silica. These are obviously of later origin. A clue to the molds is seen in the chalcocite that is abundant in some specimens, although its identification is not always certain. It cannot be denied that the chalcocite is apparently compact as seen in the ore, but the earlier chalcocite may have been in crystals that, by alteration and removal, have left the casts of their pseudo-hexagonal outlines in the covellite, which has partly resulted from them.

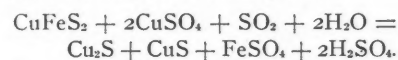
In contrast to the dark colors of these sulphides are the numerous areas of pyrite that are scattered throughout the mass. The relative proportion of pyrite to other sulphides varies, but in general is subordinate. It is rather light in color, and has for that reason been called marcasite in some accounts. Careful microscopic study failed to reveal other than pyritohedral crystals, and there is therefore no reason for believing it to be other than ordinary pyrite. Polished surfaces, examined with a magnification of 87 diameters by reflected light, exhibit the structure better.

In some cases there are, within the covellite, small irregular, often rounded, areas of chalcocopyrite, always within, not between, the covellite individuals. They are seldom larger than a few millimeters in diameter. These relations are shown in Fig. 1. It was found impossible to photograph them successfully. From the structure it appears that the chalcocopyrite is the original mineral and that the covellite is a product of its enrichment; on the other hand, the pyrite constitutes larger areas, that often lie between individuals. Frequently, however, from an area of pyrite there will start thin stringers that cut irregularly across the covellite grains, finally feathering out. This is shown in Fig. 2. It also appears, as previously mentioned, lining the cavities in the covellite. The pyrite is generally well crystallized in the characteristic forms, being contrasted in this respect with the chalcocopyrite, which does not show crystals.

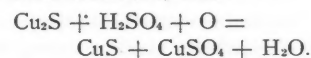
It is apparent that the pyrite is of later date than the covellite; we have, therefore, this succession of minerals: 1, Chalcocopyrite; 2, covellite and chalcocite; 3, pyrite. If we assume that the covellite has been produced by the action of descending CuSO₄ on chalcocopyrite, we may express this action in some such way as follows:



Or chalcocite and covellite may have been simultaneously formed, thus:



Descending acid waters may yield covellite from chalcocite, thus:



All these reactions, of course, are hypothetical, since the behavior of such dilute solutions cannot be determined in terms of thermo-chemistry. They have little value, therefore, except as aids in forming conceptions of what may have taken place.

On attempting to separate the heavy minerals by ore-dressing methods, it was noticed that the finest slime contained an iron-black mineral that was obviously different from any of those already described. On examination under the microscope, it presented the appearance of tetrahedrite; this conclusion was confirmed by the blow-pipe tests. The quantity present, while

*The occurrence of platinum, together with its associates, throughout the world has been most fully dealt with by Prof. J. F. Kemp in *Bulletin No. 193 of the United States Geological Survey*; to which reference should be made. To this treatise Prof. Kemp has added a complete bibliography of the subject.

¹*Amer. Jour. Sci.*, Vol. XXXVII, p. 67 (1889).

²*Amer. Jour. Sci.*, Vol. XV, p. 137 (1903).

³This JOURNAL, Dec. 28, 1901.

⁴*Amer. Jour. Sci.*, Vol. XIII, p. 95 (1902).

⁵Kemp, 'Mineral Resources of the United States,' 1902, p. 246.

⁶Professional Paper No. 25, U. S. Geol. Survey.

appreciable, is not great. Through the courtesy of the secretary of the Rambler Mining Company, some of the slime from the electrolytic refining of the copper was placed at my disposal. In this the presence of a noteworthy amount of nickel

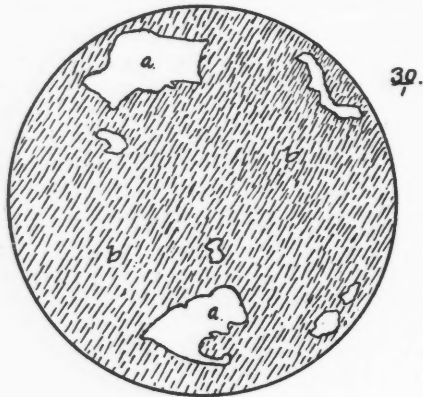


FIG. 1. a. CHALCOPYRITE. b. COVELLITE.

was discovered. It was not found possible to determine the form in which it exists in the ore.

In separating the sperrylite, the general method devised by Wells and Penfield⁷ was followed. In its original form, it is not best suited to this ore, since the copious liberation of sulphur upon the first addition of nitric acid makes the further treatment difficult and tedious. The covellite was therefore first removed by the use of a strong solution of KCN; the remaining sulphides then easily yielded to treatment with acid. Filtering and washing should be kept to a minimum, since, if a water film is allowed to pass over the small crystals, especially in the latter stages of the operation when the other material has been nearly all removed, they are almost certain to be picked up by it and carried off. Lack of attention to this detail may cause the loss of nearly all the crystals in the last washing. The material still remaining, after the final treatment with HF, was examined under the microscope. Besides some fragments of undecomposed silicates, such as zircon, hornblende, etc., it contained a quantity of metallic gold in thin leaves, often preserving the shape of the crystals between which it had existed. More striking and important were the brilliant small crystals of sperrylite, rarely showing faces that were clearly determinable. Their nature was confirmed by dropping a few on red-hot platinum foil, with the resultant liberation of As_2O_3 fumes and the formation of a lump of platinum. In addition to the sperrylite there were present several small rounded metallic nuggets. They were too small to be tested, but their evident metallic nature and platinum color renders it practically certain that they must be platinum, since no other metal of that color could have withstood the treatments with acid which the material had undergone.

⁷ *Amer. Jour. Sci.*, Vol. XIII, p. 95 (1902).

The best assays upon this ore show that rather more than five times as much palladium as platinum is present; but the most careful search failed to reveal any mineral in the residues that appeared to be a palladium mineral. The hypothesis that the palladium is present in the sperrylite is scarcely tenable, since mutual replaceability in a mineral of such simple composition is not probable. The palladium must, therefore, have gone into solution. To test this, 600 to 700 grams of the ore was treated with acid and alkali (to avoid possible unforeseen effects of the KCN); the filtrates were combined and evaporated to dryness. The residues obtained in this way are the same as before. The salts from the filtrate were roasted and assayed, and the presence of the palladium in the filtrate was proved. This may be explained in one of two ways: either the palladium is in the tetrahydrite, as silver frequently is, and platinum is known to be, at times; or it may be present as some definite palladium

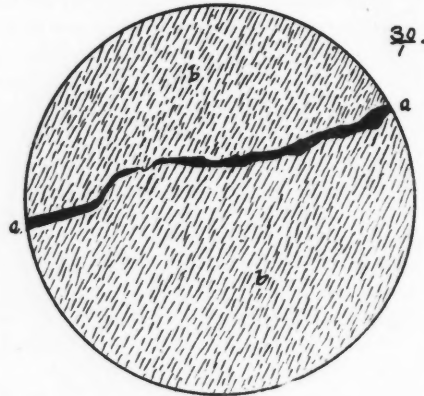


FIG. 2. a. PYRITE. b. COVELLITE.

mineral which is soluble in nitric acid or caustic soda. It was not found practicable to separate enough tetrahydrite to test the former view; and, indeed, the detection of small quantities of palladium in the presence of a large quantity of copper is much too difficult for any chemist not especially skilled in work with these metals. It seems probable, however, since no palladium mineral is known, except a hypothetical PdO credited to Lampadius. The suggestion of various authors that the palladium is present in some mineral analogous to sperrylite is not founded on any evidence; and in fact seems doubtful, since palladium in its chemical behavior is quite as much like copper as like platinum. But any statement in regard to it can, as yet, be only an expression of opinion.

No platinum could be detected in the filtrate, and indeed the quantity found in the residues was as large as could be expected from the comparatively small amount that is present in the ordinary ore. All the platinum is present, therefore, either in the form of sperrylite, or as metallic platinum. In the case of certain other ores, much difficulty has been

met in determining the form in which the platinum exists. In the absence of definite proof, it is safest to assume that this trouble is due to the difficulty of separating minute crystals of sperrylite when present only in small amount, rather than to the existence of the platinum in some new form.

It is impossible to conclude without remarking again the essential similarity of this small area with Encampment⁸ to the west. In that district the same quartzite and granite are cut by apparently identical basic intrusives that have been the sources of the metallic minerals. Platinum and palladium have not, indeed, been identified in the enriched ores of Encampment, but this may be due to the lack of careful assays. At one point in the district we have, in addition, a deposit of pyrrhotite carrying nickel and cobalt, which occurs at the contact of a norite with an earlier eruptive. Taken together, the two areas seem to constitute a sort of petro-economic province. The great general similarity of this province to that at Sudbury will be noticed. Here again we have pre-Cambrian quartzite, granite and granite-gneiss cut by later basic intrusives; and connected with these latter, and apparently derived from them, deposits of chalcopyrite and pyrrhotite carrying nickel, platinum and palladium. The general coincidence of the two provinces would seem to be more than accidental.⁹

Apropos of Heusler's discovery of magnetic alloys of copper, aluminum, magnesium and lead, the editor of *The Electrician* shrewdly remarks: "Meanwhile, we may hazard a guess that complexity of constitution increases the facility of rotation of the amperian currents constituted by the revolving electrons,

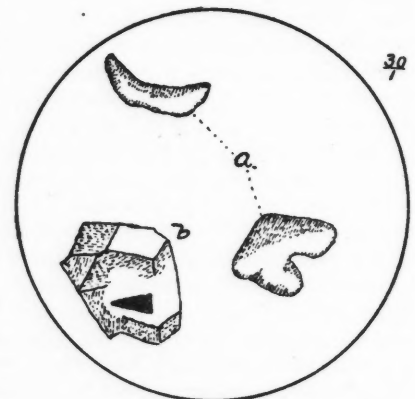


FIG. 3. a. NUGGETS OF PLATINUM. b. SPERRYLITE CRYSTALS.

just as complexity or polymerization of structure, brought about by low temperatures, facilitates the motion of the free electrons and increases the conductivity of the metal."

⁸ Professional Paper No. 25, U. S. Geol. Survey.

⁹ The writer's hearty thanks are due to Prof. J. F. Kemp and Frederick Maehlen for specimens and aid in their study.

The Province of the Fuel Expert.

BY G. A. HUTCHINSON.

The power plants of any large mining or industrial concern are usually in the charge of a master mechanic. It is his duty, with the apparatus furnished him by the designers of the plant, first of all to keep the wheels in motion and afterward to get as good results as he can. If the power, pumping, hoisting, blowing engines and air-compressors installed are of an economical type, the boiler plant need not be so large as it otherwise would, but if the machinery is of an inferior design and wasteful, the master mechanic can do little beyond calling attention to the fact. He will be expected to know that the engine valves, pistons and stuffing-boxes are tight, that there are no bad leaks in the steam pipes, and that the air-pumps maintain the highest degree of vacuum attainable. If these precautions are observed, and the engines are indicated occasionally to make sure that the valves are acting properly, there is not much to be done to improve matters, unless, indeed, ways are found to effect economies by rearranging machinery and correcting obvious defects in the original plans.

In the boiler plant the condition is different. It is true that here, too, the master mechanic must take things as he finds them, correct obvious defects, and if conditions are exceptionally bad, should institute changes. The point of the matter is that it is not a long-winded or difficult task to put an indicator on an engine and adjust the valves, and after this has been done, unless something is radically wrong, there probably will be little difference in the steam consumption. With the boiler plant, however, it not only takes careful preparation and much disagreeable hard work to conduct a test, but a good deal of judgment, experience and technical knowledge are required to rightly interpret the results; indeed, several tests may be necessary under diverse conditions to clear up the disputed points and find out the governing elements.

Losses may arise through too much or too little draft, improper grates, insufficient grate surface, bad coal, careless firing, defective settings, inadequate boiler capacity, short circuiting of the gases, and other causes which can be detected only in conjunction with the use of scales and tanks, thermometers and draft-gauges, coal calorimeters and gas-analysis apparatus. Work of this sort is peculiarly within the province of the technically trained engineer, and the more familiar he is with all phases of the fuel question, and the greater his experience along these lines, the more valuable his services are to his employer or client.

It is true that anyone who has a fair knowledge of steam engineering can conduct boiler tests with a certain degree of success. Reports of tests made by inexperienced persons usually show some

glaring errors or wrong conclusions, due to the unfamiliarity of the engineer with the subject as a whole. There are certain inter-relations of such factors as heating surface, grate surface, character of grates, settings, rates of combustion, character and size of coal, draft, stack-temperatures, percentages of oxygen, carbon monoxide and carbon dioxide in the flue gases, fuel loss in the ashes, etc., which must be learned by experience, observation and comparison.

There are some excellent books on the subject, and much of the information contained is of universal application. What is good practice in the northeastern States with Pennsylvania coals, is hardly a criterion of what can be done in the West with low-grade Western coals, and in such cases experience alone is to be relied upon. It may cost several hundred dollars to run a large-plant test properly, but the results, if wisely interpreted, may show how to save thousands.

Here and there a large corporation, burning thousands of dollars' worth of coal per day, has on its staff a fuel expert who devotes his entire attention to such matters. To hold such a position an engineer must understand both the theoretical and practical sides of his work. He is in a position to learn the actual merits of many of the devices placed on the market, for which great economy is claimed, because his principals are sure to be progressive in their ideas, but to accept nothing on faith. A new installation is tested and made to come up to the guarantee, if possible. If not, it probably will be discarded.

With his intimate knowledge of just what results are being obtained, he is qualified to advise as to the type and proportions of new boiler installations. By making tests under the boilers of any coal offered for sale, he can furnish the purchasing agent with reliable information as to the merits of different fuels before any contract is closed. By running regular calorimetric tests of samples of coal from cars delivered, he can detect inferior shipments. From his experience and observation during his boiler tests he can decide as to the best method of firing the coal, instruct the foreman in charge of the boiler houses, and note whether or not his instructions are lived up to.

Tests run, at odd intervals not only keep the master mechanic sharply on the lookout for good work in the boiler house, but have a great educational value for the firemen, who are often anxious to learn the best methods, but in too many cases have no one well enough posted on boiler economy to teach them.

Perhaps the simplest way to present in its proper light the province of the fuel expert is to discuss in detail some of the facts and fallacies which he encounters. Frequently managers are induced to put in expensive equipment such as economizers, automatic stokers, or forced draft

appliances, or even to dismantle an old boiler plant and put in a new equipment in no way superior, when equally good results, perhaps better, could be obtained by inexpensive changes in grate area, by the substitution of shaking for plain grates, by changing the baffling of boilers, or by instructing the fireman as to the best method of handling the fuel. These suggestions obviously are not to be expected from the man who is marketing his particular device for promoting boiler capacity or economy.

Mechanical stokers are recommended by many engineers as a sovereign remedy for all ills. They are expensive in first cost and in the matter of repairs. They cannot be operated properly with as few firemen as the purchaser usually anticipates, because the fires get dirty and require considerable watching in order to secure fair results. They are advantageous if the boiler capacity is small, in so far as they enable one easily to drive a boiler much harder than the average fireman can be induced to do. The rate of driving is not as readily varied as with a hand-fired grate. There is usually either an excessive amount of cold air admitted through bare places on the grate, or else much coal goes through the furnace unburned, because fed too fast.

A crusher and elevator are required if the coal is not crushed at the mine. Reduction of the coal to a size smaller than a man's fist is just as essential to good results with hand-firing as with automatic stokers. A first-class fireman handling his coal in the most approved way can get just as good results on common grates as any expert can with a mechanical stoker, other conditions being identical. As smoke preventers they are in some cases satisfactory, but, in others, lamentable failures.

Chain grates will not burn the very low-grade fuels sometimes used in the West, nor satisfactorily handle coking coals which form an arch over them, while sloping or stepped grates often cannot be operated successfully with clinking coal. Therefore the owner is limited in the choice of his fuel, whereas, with hand-fired grates, he can burn anything that is offered.

Tests most frequently are run by representatives of boiler or furnace builders in order to fulfil the terms of a guarantee. Naturally, before making the official run, everything is put in prime condition. All scale is removed from the inside, and dust and ashes from the outside. The setting is made as tight as possible, the draft gauge is applied, and the damper set at the best position if there is a strong draft, because too much draft means an increased amount of air going through, more rapid combustion, less time for each pound of gas to remain in contact with the heating surface, less heat absorbed thereby, and consequently a higher stack temperature and needless waste of heat. Very

likely an expert fireman is set at work, who scatters the well-broken coal through the firebox in the best manner imaginable.

The test is run, the report is made, the guarantee is met fairly and squarely, the equipment is accepted, and the manager expresses himself as satisfied that he has an exceedingly efficient and economical plant. Everything has been designed and carefully installed under the direction of experts who after all may or may not have been closely in touch with local conditions, and who may have merely copied the most fashionable New York City designs.

Now ensues the daily operation by the laborer, who opens the damper wide to get full benefit of the strong draft, who takes the coal as it comes, big lumps and small, and throws in ten to twenty shovelfuls at a time, according to the area of the grate, goes off to sit down for 15 or 20 minutes, and then repeats the operation. With such handling temperature readings taken near the damper every minute for an hour, and plotted, would show a wavy curve with differences 100° or more between the maximum and minimum points; whereas, by skillfully firing small amounts at frequent intervals, the stack temperature can be kept practically constant. The result of such hand-firing is probably not so bad as in the case of the mechanical stoker, the operation of which, when the demand for steam slackens, instead of diminishing the speed of the grates, cuts off the coal supply and allows cold air to rush in through the bare grates. If, now, in the case of a large plant an expert runs a careful test for 24 hours, assuming that the plant is in operation night and day, the results are indeed good if within 10 per cent of what was shown at the start.

If the everyday efficiency of a boiler plant is to be determined, it is useless to take one or two boilers and test them independently of the rest. The aim of such a test is to secure average results, under average conditions, and to do this it is necessary to weigh the coal and measure the water delivered to the whole plant for a complete cycle, or in the case of a plant running night and day, for 24 hours. In this way alone can one secure the mean result of the work of two or three different gangs of firemen, differing among themselves in their ability or desire to handle coal economically, and influenced more or less by the character of the shift-boss or foreman.

When a portion of a plant is tested it may carry more or less than its normal share of the load, and an important point remain unsettled should there be reason to believe the plant as a whole to be overloaded. By including the whole installation the results are likely to give the true average of the firemen's work, because, all being under test, the individual realizes that his work does not stand out for comparison, and is therefore likely to go ahead much as usual. If a test is run on a single boiler, using the fireman who

ordinarily attends that particular unit, and, with the hope of securing an average result, he is allowed to work the fire as he pleases, he is likely to force it, in the effort to evaporate as much water as possible. If he goes off shift during the test, and his regular relief takes his place, a desire on the part of the newcomer to evaporate more water per hour than his predecessor frequently manifests itself. For this reason it is desirable to eliminate the personal equation.

In addition to the ignorance of the fireman, to say nothing of the inattention or indifference of his immediate superiors, another difficulty universally encountered with return tubular and water-tube boilers is the defective setting, which deteriorates rapidly on account of the expansion or contraction of the setting every time a boiler is fired up or allowed to cool down. Cast-iron doors warp, and even if a way is provided to fasten them tightly in place, they still need luting as much as any reverberatory-furnace door; but the precaution is seldom taken. If an observer examines the joints around the elaborate cast-iron fronts of many a boiler, he will find a deposit of dust, showing plainly where the dust-laden air of the boiler room is drawn in in a steady flow. An examination with a torch will disclose innumerable cracks and crevices where cold air is sucked in, producing a notable refrigerating effect. To this fact may be attributed the remarkably superior showing uniformly made by internally fired boilers of the locomotive type, when a comparison of the results of tests is made of diverse types of boilers under ordinary operating conditions and working at reasonable rates.

Gas samples taken under average conditions near the damper of any boiler of the locomotive type show more carbon dioxide, less free oxygen, and therefore less free air, than do gas samples taken from adjacent boilers with brick settings. Boilers of this sort, being built usually on old-fashioned lines, are allowed a relatively small ratio of heating surface to grate surface, or, in other words, a relatively large grate, which is very important in the case of low-grade coals. It is easy to put in a fire-brick arch, thus securing an important requisite for good combustion, and as there is no setting to deteriorate, there is no loss of efficiency as time passes on that account. If it is well covered with a non-conducting material the radiation loss is small, and a very large percentage of the heat generated must be taken up by the water, since, if properly designed and operated, the temperature of the waste gases is no higher than in the case of other boilers using the same fuel.

In view of these statements, which are based on the results of tests run at different times, and places far apart, by disinterested engineers, it seems a pity that the propaganda of water-tube boiler makers should be so implicitly accepted that man-

agers frequently speak in rather an apologetic way if their installation does not happen to be of a certain well-known type. It is a well-demonstrated fact that the old-fashioned return-tubular boiler, for moderate pressures, and with the exercise of ordinary intelligence in the choice and care of its setting, grates, etc., will do just as good work as any water-tube boiler, and often better than many of them.

No class of stationary boilers is operated uniformly under such high pressures as are the locomotive boilers behind which we ride on the railroad, nor do any boilers evaporate as much water. With the strong draft due to the exhaust steam entering the stack, a tremendously high rate of combustion is possible, and it is customary to allow 2 or 2.5 sq. ft. of heating surface per horsepower, while 10 sq. ft. is an average allowance for stationary boilers. The secret of the indifference usually manifested toward this class of boilers lies probably in the lack of information in the possession of manufacturers of boilers of the locomotive type as to their remarkably economical performance, and also in the fact that nobody has ever had any monopoly of their manufacture nor corresponding inducement to enter a field in which anybody could compete if a demand were created.

As to scale, I have seen no more trouble with them than with any other kind of a boiler. Negligence in this matter can lead only to burned sheets or tubes, whatever the type. Defective circulation is another talking point used against them. So long as we make more steam with a pound of coal in this sort of a boiler the fear of defective circulation, even if it can be proved, is a harmless delusion. As to not being adapted to large units, it is true that 3,000 ft. of heating surface is probably the most that could well be crowded into a boiler of a size to be shipped over a railroad. Moreover, for hand-firing the grate could not be over 7 ft. long nor 8 ft. wide, inside measurements, which would give a maximum width for the firebox, outside, of about 9 ft., or the limit for rail transportation.

With a coal evaporating 8 lb. of water per pound of coal and 56 ft. of grate area, to work such a boiler at 300 h.p. would entail a rate of combustion of 20 lb. per square foot of grate surface per hour, which is reasonable. If such a boiler were shipped into a Western region where ordinarily 1 lb. of coal would evaporate but 4.5 lb. of water, the rate of combustion must be 36 lb. With shaking grates and a half-inch of draft, this is not an impossible matter by any means, though much higher than any fireman would get except under test conditions. In this instance we might take a rate of combustion of 25 lb. per square foot of grate surface, and figuring back we would find our boiler doing 210 h.p. If it were bought as a 300-h.p. boiler, the purchaser would

naturally be disappointed, and probably would condemn the boiler if tests were not run and the true difficulty located.

The obvious thing to do, in the first instance, would be to have the boiler built with the 56 ft. of grate surface, in view of the poor coal available, but with only 2,000 ft. of heating surface. The boiler would then be rated at 200 h.p. and would be more than equal to the work expected of it. Simple as this precaution would seem, it is frequently neglected by engineers who have not given the matter thought, and the boiler builder stands ready to deliver the same boiler for Montana that he would for Pennsylvania, regardless of the difference in fuel. If the boilers do not do the work expected of them, the builder is usually willing to furnish more boilers for a proper consideration.

The purchaser who pays \$3,000 for a 300-h.p. boiler is paying nominally \$10 per horsepower. If, on account of a low-grade fuel and insufficient grate surface, he can get on an average only 240 h.p., he is actually paying \$12.50 per horsepower. Under such conditions it is obviously inadvisable to instal too large units, because of the tendency to pile up heating surface over a small grate. Yet the heating surface beyond a certain point may represent so much money tied up uselessly. Another objection to too large units is the inconvenience when one is down for cleaning. Suppose a plant has four 250-h.p. boilers, and by reason of an enlargement two 500-h.p. units are added. The machinery may require, when everything is running under full load, 1,750 to 2,000 boiler horsepower. When one of the smaller units is shut down, little difficulty may be experienced, but when 500 h.p. is cut off, the remainder of the plant may be driven from 17 to 33 per cent harder than is desirable for the sake of economy. It is sometimes the case that the coal has a great deal of ash, and the ash carries a good deal of unburned coke. By jiggling the ashes it may be possible to recover as much as 5 tons of good coke for every 100 tons of coal fired. This can be burned in locomotives, or under boilers specially equipped with forced draft.

The above enumeration covers some of the more common problems which are likely to present themselves around any steam plant. If there are cement kilns, gas producers, metallurgical furnaces using gas, oil, coal or coke or other appliances requiring fuel in large quantities, the field broadens immensely, and the services of a fuel expert occasionally, if not continuously, so far from being of questionable utility, are indispensable, if there is a desire to cut down waste and secure efficiency.

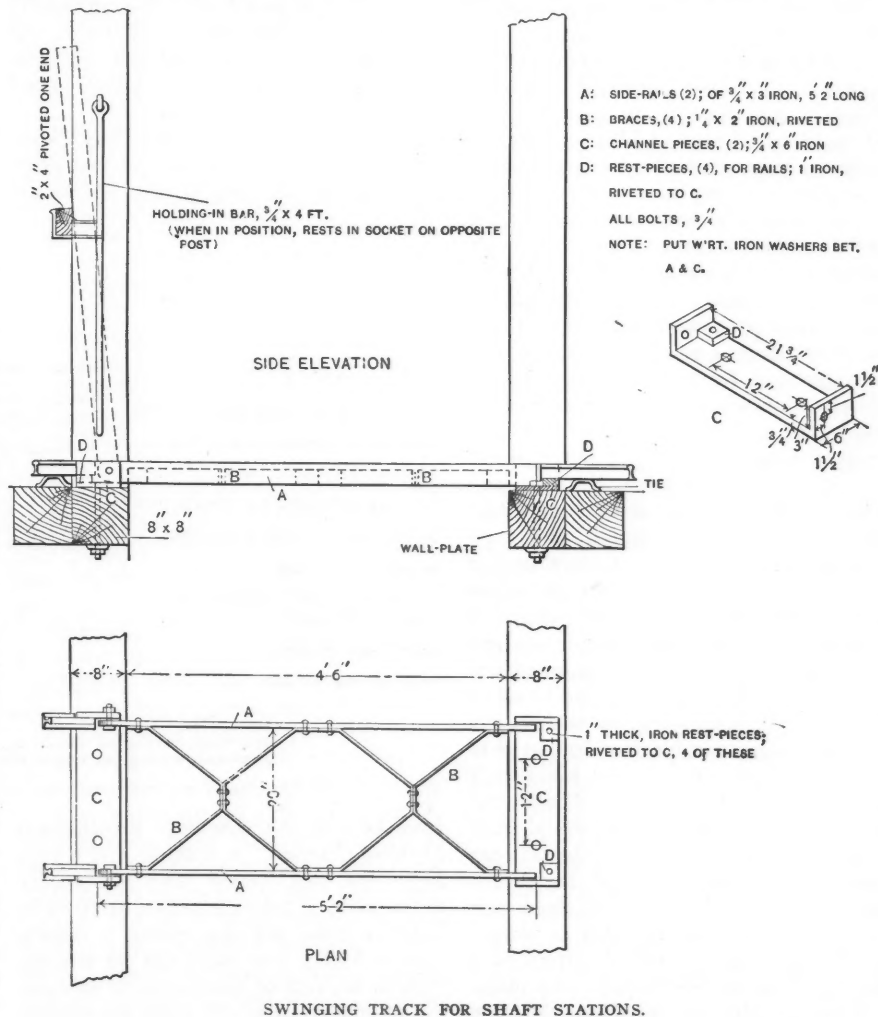
The word 'hysteresis' may have two meanings: (a) The lagging of the induction; (b) the loss due to this lag.

A Swinging Track.

BY W. N. CUMMINGS.

The simple device shown in the accompanying sketch will be found useful in the opening of a prospect, in which the deposit has not been proved to the point where the final method of handling the ore and waste can be decided upon. Used in connection with buckets, running on trucks to the drift faces, or chutes, considerable development can be accomplished, while the expenditure for cars, cage and landing chairs is postponed to such time as the mine or the owners can better stand it. With a single-drum hoist (hoisting speed 400 ft. per min.), 100 tons

the hoisting was finished at that level, meanwhile shutting off all circulation in that compartment—a serious disadvantage in mines with a single entry. I have seen a number of instances where not even doors were used, but where boards were laid across the shaft on to which the bucket was lowered and there filled by shoveling from the station floor; in fact, one of the best-paying mines in Mexico is said still to do this sort of thing. I first devised this track while in temporary charge of a developing mine, where stopping was also going on, and it helped materially in the ventilation and in straightening out the work generally. After



SWINGING TRACK FOR SHAFT STATIONS.

of rock and ore per 24 hours can be comfortably raised, beside the handling of timber and men, from depths of 500 ft. or more.

An empty truck, resting upon the swing-track, receives the empty bucket, is pushed aside and the loaded bucket run under, attached to the rope and hoisted to the surface. The truck remains in place to receive the emptied bucket. While doors are all right at the collar of the shaft, this open-work track is preferable below. The doors prevent pieces of rock falling back into the shaft on dumping the bucket, and are shut only for a minute or two; whereas, below, they would remain down until

chutes had been built the trammers were cut down from 18 or 20 to as few as 4, and the levels were not afterward half buried in waste. Not the least trouble was experienced in handling the rock from the drifts, the ore for a 10-stamp mill, in lowering timber, men, drills, and now and then hoisting water.

The track is light, but stands up to the work. A rope attached to the upper end enables a Mexican miner to handle it easily without counterweights. With heavy truck and loaded 'half-ton' bucket, no deflection can be seen in the track. When not hoisting from that level the position of the track is shown by the broken lines.

The 'back-rest' (2 by 4 scantling) is not absolutely necessary, as the T-rails hold the track in the inclined position. However, for much work it is best to make use of the rest. The holding-in bar guards against any possibility of the track falling into position and closing the shaft at the wrong level. This track is applicable to either vertical or inclined shafts, and can be used as a cross-over where no by-pass has been made around the shaft. In the case of large round shafts, or in untimbered shafts, a couple of cross stulls are all that are needed.

Earthquakes.

On this topic Audubon wrote (quoting from a recent number of *Science*):

"Traveling through the Barrens of Kentucky . . . in the month of November [1812], I was jogging on one afternoon, when I remarked a sudden and strange darkness rising from the western horizon. Accustomed to our heavy storms of thunder and rain, I took no more notice of it, as I thought the speed of my horse might enable me to get under shelter of the roof of an acquaintance, who lived not far distant, before it should come up. I had proceeded about a mile when I heard what I imagined to be the distant rumbling of a violent tornado, on which I spurred my steed, with a wish to gallop as fast as possible to a place of shelter; but it would not do, the animal knew better than I what was forthcoming, and instead of going faster, so nearly stopped that I remarked he placed one foot after another on the ground, with as much precaution as if walking on a smooth sheet of ice. I thought he had suddenly foundered, and, speaking to him, was on the point of dismounting and leading him, when he all of a sudden fell a-groaning piteously, hung his head, spread out his four legs as if to save himself from falling, and stood stock still, continuing to groan. I thought my horse was about to die, and would have sprung from his back had a minute more elapsed, but at that instant all the shrubs and trees began to move from their very roots, the ground rose and fell in successive furrows, like the ruffled waters of a lake, and I became bewildered in my ideas, as I too plainly discovered that all this awful commotion in nature was the result of an earthquake. . . . The fearful convulsion, however, lasted only a few minutes, and the heavens again brightened as quickly as they had become obscured; my horse brought his feet to their natural position, raised his head, and galloped off as if loose and frolicking without a rider. . . . Shock succeeded shock almost every day or night for several weeks, diminishing, however, so gradually as to dwindle away into mere vibrations of the earth. Strange to say, I for one became so accustomed to the feeling as rather to enjoy the fears manifested by others. . . . The earthquake produced more serious consequences in other places."

Air Power in the Quarry.—II.

BY LUCIUS I. WIGHTMAN.

The equipment of the Gray Cañon has been already described. Its success has been phenomenal. The pneumatic engineer may paint a glowing picture, but it is fact and practice which the quarryman wants. The engineers of the Cleveland Stone Company have kindly furnished figures. The table, given herewith, shows the comparative operating costs, averaged per month under the old and the new forms of power; it shows the number of machines of each kind used, 'before and after'; it emphasizes the superior effectiveness of these machines under the influence of compressed air. No attendance is charged against the central station, for the same gang now employed was formerly used in Mill No. 1, which is not listed under the old system.

The figures relating to the Gray Cañon are as found on the records of that property; the Malone and Mussey figures are

The basic principles of power-plant design are the same whether the power of the prime mover is to be converted into that of compressed air or of electricity; these principles are too well known to need amplification here. The air-compressor must be the basis of an air-power system. The steam-driven compressor is a sturdy, reliable and efficient machine; its efficiency is equal to that of a high-grade steam-engine; in fact, the machine itself is simply a high-grade steam-engine, coupled to a high-grade compressor by a method which reduces transmission losses to a minimum. Corliss or adjustable cut-off steam-ends will give Corliss or adjustable cut-off economy. Properly designed air-cylinders give a remarkable compression efficiency. The best compressor builders of today guarantee a mechanical efficiency of from 88 to 92% in their large machines, a record comparable with that of the best electrical-engine units. High-grade boilers

	1903.		1904.	
	Gray Cañon.	Mussey and Malone.	Gray Cañon.	Mussey and Malone.
Coal Consumption.....	50 tons @ \$2.00 20 tons @ 2.00 16 tons @ 10.00	\$100.00 \$40.00	15½ tons @ \$1.60 10 tons @ 1.60	\$24.80 \$16.00
Labor and Attendance at Channelers	7 tons @ 10.00	160.00	12 tons @ 10.00	120.00
Labor and Attendance at Drills.....	15 tons @ 3.00 6 tons @ 3.00	45.00 18.00	5 tons @ 10.00 9 tons @ 3.00 4 tons @ 3.00	50.00 27.00 12.00
Firemen at Hoists.....	9 tons @ 1.25 3 tons @ 1.25	11.25 3.75	.....	.....
Firemen at Pumps and Drill Boilers	2 tons @ 1.25 2 tons @ 1.25	2.50 2.50	.....	.....
Firemen at Mills (12-hour shifts)....	2 tons @ 2.00 2 tons @ 2.00	4.00 4.00	.....	.....
Boiler-Repair Gang.....	.....	5.00	.....	.....
Locomotive Repair and Rental.....	.....	10.00	.....	.....
Coke for Re-heater.....	.....	.....	.....	1.00
Total costs per day.....	.....	337.75	.....	172.80
Total saving per day.....	.....	164.95	.....	78.60
Aggregate saving per day.....	.....	.....	.....	\$227.20
Aggregate saving per year of 300 days.....	.....	.....	.....	\$68,160.00

furnished by the courteous management of those quarries. A striking, and a very significant fact, which does not appear in the table, is this: the output of all these quarries under the new system is largely increased over that under the old scheme, even in the face of these reduced charges.

The conditions which faced the owners of the Gray Cañon, Malone and Mussey quarries and which led to the installation of the plant just described, are the conditions which, sooner or later, will confront the quarry interests of every stone-producing section. Year by year competition grows keener. Operative conditions become more severe as workings widen and deepen. The demand is for production on an ever-increasing scale. The Gray Cañon plant is simply a pioneer of the quarry plants of the future—it has blazed the path along which development must follow. Compressed air is the hope of the quarryman; in its intelligent application lies the solution of many of his problems.

assure economy of steam generation. The true measure of plant efficiency is the fuel consumption per unit of power produced; in electrical plants, per kilowatt hour at the switchboard; in air plants, per 1,000 cu. ft. of air per hour at a given pressure at the primary receiver. It is regretted that, along with the other data in the table, the total volume of air compressed in the period covered was not given; the pressure was 85 lb.; the piston-displacement of the compressors, as indicated by the revolution counters, was not supplied. It is, of course, understood that the fuel consumption listed covers the entire plant, with all auxiliaries. It may be further noted at this point that this fuel includes that required to furnish steam for a 175-h.p. compound engine running Mill No. 1, and connected to the boilers of the powerhouse adjacent to the mill. The Gray Cañon plant is blessed with cheap coal. The table shows that the new boilers permitted the use of a cheaper grade of coal than the old.

The possibilities of water power as applied to quarry work are best developed along lines similar to those just described, by application in a central air-compressing plant. If the water power is close at hand, or within a distance of one to five miles, depending largely upon the nature of the intervening country, waterwheel-driven compressors, direct-connected or driven by other approved methods, will secure the highest economy of compression. Transmission and distribution of the air power must follow the lines of accepted practice, largely as outlined in the Gray Cañon plant. If the water power is far distant from the quarry, whether several scattered powers are to be made use of at one point, or whether one large power is to be applied in several locations, electric generators and electric transmission will deliver the power. At the quarry, motor-driven compressors will convert electric power to compressed air, which will be properly distributed and applied in standard pneumatic quarry-machines, with re-heaters as the last refinement of economy.

In the electrically driven air-compressing plant at the quarry, one or two large units will give place to a number of smaller compressing sets; for the quarry load is a varying load—often widely varying. If the electric motors are alternating-current machines (as they will be in the majority of cases), the compressor unit will be essentially constant in speed. Therefore varying load cannot be handled by varying speeds; hence other schemes, such as air unloaders and controllers, must be used to proportion the effective piston displacement to the load. These devices, however, do not economically provide for load variations exceeding, say, 20% of normal. Greater variation than this must be provided for by the subdivided unit-system and by automatic-relay unit control. But the problems of electrical air compression are distinct, and will not be discussed here. It is enough to say that the electrical compressor is a success—an established fact—and is sure to be a powerful factor in the future of the quarry.

The distribution of compressed air in quarries is so well understood that there need be no appreciable loss in transmission. The loop system, successfully applied at the Gray Cañon, is a solution of the problem of combining maximum flexibility and carrying capacity, with minimum cost and loss of power. Every tee should be protected by a valve in each branch. Gate valves are better than globe valves, and rising-stem types show at a glance whether the valve is closed or open. All lines should be securely anchored, correctly supported, and guarded against strains in expansion and contraction. For this last purpose, offsets are better and cheaper than slip-joints. The importance of proper grading of the lines, and the value of moisture traps in

removing entrained moisture, have already been emphasized. Every receiver aids in this drying process; in fact, it is almost impossible to have too much receiver-capacity in a system. It has been seen how advantageously old boilers can be worked into a distribution scheme. It would seem impossible to avoid leakage in a pipe system; yet the Gray Cañon plant, with its miles of pipe and its countless valves, joints and fittings, retains full air-pressure over night. Seeming impossibilities have been overcome by careful workmanship and watchful attention.

The heat generated in the compression of air represents an equivalent amount of work lost. Re-heating the compressed air before it is used in the engine permits the recovery of this work at small expense; it furthermore gives the advantages of expansive working in the cylinders. It has been conclusively shown that efficient re-heating will give a net gain of power as high as 30%. This is equivalent in effect to a 23% reduction in boiler and compressor capacity, for a given output, and a corresponding decrease in the fuel bill. Of course there is a point at which the cost of re-heating fuel offsets the advantage gained by re-heating; this point is conditioned by too many factors to be discussed here. It is shown, by the table, how insignificant is the cost of re-heating; the re-heaters used are simple structures of pipe and brick, made on the ground. The limit to which re-heating may be carried is fixed by the lubricant used in the engine cylinders. Even with air at 600° F., so short a cut-off and so great an expansion are permitted that the mean cylinder-temperature is maintained well below the charring and flashing points of high-grade oils. The problem of re-heating air has not received its due measure of attention. In the judicious application of heat to the air used, lies an important feature of quarry economics.

I have stated that the old steam-machines were retained under the new system; they were simply put in good condition and were found ready for work. On cut-off engines the cut-off was retained, in some cases actually shortened, thanks to the use of re-heaters; on non-expansive engines heating has been applied simply to secure a greater air-economy. Pressure is automatically maintained under varying load by a cut-off governor on the steam valves.

An examination of the table shows that with air as a power, the number of active machines was reduced from that of the old system; yet the output of the quarry has been increased since the new plant was installed. This apparent paradox is due principally to the increased constant-pressure and the increased 'activity' of the air. Under the old scheme, pipe condensation gave not only a reduced pressure, but also wet steam, and consequently sluggish machines. Under the present system, full receiver pressure is available on the piston of every machine, while re-heating only

adds efficiency. Where formerly 40, 50, 60 lb. of steam pressure were used, depending upon the length of pipe line and the fireman's convenience, today standard air-pressure of 85 lb. is everywhere instantly available at the turn of a valve. The word 'instantly' is deserving of special notice; with the former system, the machine runners often had to wait for steam; pipe lines had to be drained or thawed in winter.

The labor force has been reduced; not only in the number of attendants at boilers and machines put out of commission, but also in the number of general laborers formerly retained for the repair and upkeep of the steam plant. Added to this saving is an intangible but a very real gain arising from the pleasanter quarry conditions. There is no steam and smoke settling in the 'hole,' darkening day into twilight, making more stifling and unbearable the heat of summer, and wetting the clothing and chilling body and spirit in winter. There is, as it were, a spiritual uplift to the small army of laborers. Better men are attracted; old men are glad to remain. The working season knows no weather limitation; the quarries are operated the year round. The quality of the rock product is improved, for there is now no smoke to discolor the rock faces, no coal and ash scattered about to stain the rock surface under rain and snow. There has thus been added to the organization of these three quarries a great flexibility, an over-load capacity, which will be of incalculable value at times of sudden heavy demands, as when a huge contract is secured on early delivery. The success of the Gray Cañon power-system has removed the compressed-air quarry plant from the limbo of experiment and placed it in the field of established fact.

Welds in rails made by the use of thermite may be stronger than those made by electricity, as shown by recent tests by Professor Kirsch, of Vienna. The natural rail took a permanent set at 481 tons and remained unbroken at 687 tons. The joint in an electric weld broke at 40 tons, while the thermite-weld joint broke at 60.9 tons. The average of the electric weld in tensile strength was about half that of the thermite weld, the latter running from 15.5 to 35.6 tons per square inch.

A geological event of much significance, and of recent occurrence, is the tidal wave observed May 11, 1905, on the west shore of Lake Michigan. A wall of water swept in at Kinoshia and Racine, Wis., causing much alarm and actual damage. At Chicago, the wave simply raised the water, and caused such a heavy current down the drainage canal, that boats navigated the river with the greatest difficulty. The wave is ascribed to marked differences in barometric pressure in the disturbed region, the difference being shown also by heavy rainfall and thunderstorms.

Gold and Its Associations.

BY GEORGE P. MERRILL.*

In connection with one of the recent expositions, I prepared a series of specimens illustrating the associations and mode of occurrence of gold and silver in nature. At the close of the exposition the collections were returned to Washington and installed with other collections of their kind in the National Museum.

Some recent discussions in the industrial journals, relative to the associations of gold, have made it appear that the publication of the list of associations in the collection at the present time might not be without interest. It should be noted that in all the cases here enumerated the gold occurs free, or native, and in particles of sufficient size to be recognizable by the unaided eye.

Ores yielding gold on treatment, but in which the form of occurrence is in the least open to doubt, are not given. The specimens, it should be stated, are on exhibition in the National Museum, mainly in the Division of Practical Geology, although a few are in the Mineral Collection. The numbers refer to the Museum catalogue:

1. Native gold with pyrite residue (limonite) and evidently set free through oxidation. Many localities.
2. In compact clean white quartz, without trace of pyrite or its decomposed products. Many localities.
3. With telluride residue, and evidently set free by decomposition of tellurium compounds. Telluride, Colorado.
4. With platinum. Black sand from Condoto river, Colombia, S. A. (73,065.)
5. Native gold with iridosmine. Cross county, Ore. (64,749.)
6. Palladium gold. Near Sutara, Brazil. (14,235.)
7. Electrum. Hungary. (44,384.) California. (49,159.)
8. Native gold with hessite and chalcopryrite. Milky quartz abundantly injected with pyrrhotite and hessite; the gold occurring with the latter. Melones mine, Calaveras county, Cal. (44,051.)
9. With altaite in calcareous rock. The gold plainly visible in small flecks, at times intimately associated with the altaite or again quite free from it. Rock gray-white, with the general appearance of a crystalline limestone. In thin sections. An aggregate of muddy calcites and an occasional quartz granule. King's Mountain, N. C. (63,363.)
10. With altaite and pyrite in quartzite. A vein-quartz thickly injected with the minerals noted. Gold not abundant, occurring in small flecks easily recognized by the pocket lens and evidently more closely associated with the altaite than the pyrite. Providence mine, Nevada county, Cal. (62,779.)
11. With allosclite in calcite. A cleavage mass of calcite with radiating clusters of allosclite and small specks of gold.

The latter occurs both in the mass of the allosclite and free from it. Oravicza, Hungary. (62,855.)

12. With stibnite in quartz. A milky quartz with gold, sometimes with the stibnite, but mostly quite free from it. Rock slickensided, with gold showing plainly on slickensided surface, indicating that movement took place after its deposition. New Zealand. (5,710.)

13. With stibnite on quartz. Drusy quartz with stibnite and gold, the two sometimes together, sometimes separate. Kremnitz, Hungary. (62,810.)

14. With stibnite in quartz. A blue-gray vein-quartz, strongly impregnated with stibnite and with areas likewise impregnated with gold. No evident connection between the two, the minerals being sometimes associated and sometimes distinct. Hopeful mine, Reefton, New Zealand. (11,760.)

15. With bismuthinite, bismuth and galena, in quartz. A coarsely crystalline milky vein-quartz, with bismuthinite and some bismite and abundant galena. Gold mostly with bismuth compounds. Katharinenburg, Russia. (40,304.)

16. With pyrite, arsenopyrite and galena, in quartz. Milky quartz, with pyrite, arsenopyrite and galena. Gold occurs for the most part in the arsenopyrite. (83,811.)

17. With dolomite, arsenopyrite and quartz. Lake mountain, Alaska. (5,656.)

18. With pyrite in calcareous quartzite. A dark-gray quartzite containing some calcite and disseminated pyrite, with free gold. No evident connection between the gold and pyrite. Eldorado county, Cal. (81,786.)

19. With pyrite and quartz in slate. A blue-gray silicious slaty rock, with pyrite and some gold. Gustin mine, Lawrence county, S. D. (20,153.)

20. In pyrrhotite. Massive pyrrhotite, fresh and oxidized, with large enclosures of gold. Some chalcopryrite and quartz. Cable mine, Cable, Mont. (75,528.)

21. In milky quartz, with calcite, pyrrhotite and polybasite. A small mass of milky quartz enclosed in white, coarsely crystalline calcite, and enclosing polybasite and gold in juxtaposition. Small specks of pyrrhotite. Cable mine, Deer Lodge county, Mont. (75,548.)

22. In gangue of sphalerite, galena, pyrite and quartz. White quartz abundantly impregnated with galena, sphalerite and pyrite, and carrying gold. Locality unknown. (62,910.)

23. With tetrahedrite in quartz. Milky quartz, with disseminated tetrahedrite and small flecks of gold. Baker City, Ore. (17,062.)

24. With argentite, in quartz. Takatama, Japan. (61,431.)

25. With galena, in quartz. Milky quartz with galena. Gold closely associated with galena. Montgomery county, Md. (49,527.)

26. With galena, in quartz. Milky quartz, with galena encrusted with gold,

and also gold with no galena. Englehawk, Bendigo district, Victoria. (30,670.)

27. In silicious breccia. A brecciated silicious rock in which the gold seems to serve as a cement. Johannesburg, South Africa. (53,680.)

28. In gangue of quartz, calcite and epidote. Milky quartz so abundantly injected with small epidote as to give the whole mass a greenish color. Some minute pyrite and an occasional small particle of gold in the quartz and seemingly bearing no relation to the pyrite. Siam. (34,420.)

29. On slickensided surface of smoky quartz. A mass of coarsely granular crystalline smoky quartz, with one surface blackened and slickensided, showing abundant thinly drawn-out plates of gold. Coraes, Minas Geraes, Brazil. (30,722.)

30. In opalescent quartz. A brownish impure opal, evidently of same nature as the next. (29,694.) Red Bluff lode, near Virginia City, Mont. (29,698.)

31. In chalcidonic quartz and opal. A small mass of whitish chalcidony, with cavities filled with milky opal. Gold rare and in small flecks. The rock is evidently a hot-spring deposit, but may be a quartzite altered by hot-spring action. Nevada City, Nev. (29,694.)

32. In jasper. A coarse conglomerate composed of pebbles of brown jasper cemented by crystalline quartz. Gold in the jasper pebbles. Lone Star mine, Nevada county, Cal. (14,935.)

33. In magnetite. A bit of lamellar magnetic iron, with thin flecks of gold between the laminae. Mineral Hill mine, Carroll county, Md. (68,028.)

34. On hematite. A small mass of deep blue-black specular hematite, thickly coated on one surface with gold. Brazil. (53,746.)

35. In calcite. A coarsely crystalline gray-brown calcite, with abundant sprinkling of gold, which is distributed without reference to cleavage lines. Particles small. Gympie, Queensland. (83,831.)

36. In calcite. Described briefly by J. S. Diller, *American Journal of Science*, Vol. 39, 1890, p. 160. Minersville, Cal. (48,919.)

37. In fluorite, with calcite. A gray crystalline granular limestone, with segregations of fluorite. Gold in the fluorite; rusty and doubtless set free by decomposition of tellurides. Judith Mts., Mont. (53,081.)

38. With cerargyrite. A silicious, highly altered rock, with scales of horn-silver and minute flecks of gold. Mahogany mine, Owyhee county, Idaho. (14,775.)

39. In mica schist. A deep blue-black fine-grained schist, containing gold leaflets lying along plane of foliation. No visible sulphide. Chile. (11,981.)

40. In chlorite schist. A deep green chlorite schist, with occasional pyrite and flecks of gold drawn out in direction parallel with schistosity. Black Hills, S. D. (75,571.)

41. With pyrite in mica schist. A dense,

*Curator of National Museum.

coal-black schistose rock, with an ill-defined vein of pyrite cutting obliquely across the schistosity, and carrying a little gold intimately associated with the pyrite. Cabarrus county, N. C. (62,911.)

42. In hornblende schist. A black, hornblende schistose rock (diorite), with a little gold. Cross mine, Pennington county, S. D. (67,915.)

43. In selenite. Wire and dendritic gold in selenite. Old Abe mine, White Oaks, Lincoln county, N. M. (84,474.)

44. In barite. A weathered and cavernous mass of barite on surface of silicious rock, and containing abundant flecks of sponge gold. No sulphides. Mexico. (62,230.)

45. With roscoelite, in quartz. A granular quartzite, with scattering segregations of roscoelite, the latter sometimes carrying a little gold. Stockslager mine, Eldorado county, Cal. (84,452.)

46. In halloysite. Cerro Colorado, Batopilas, Mex. (63,719.)

47. In granite. A mica granite of medium texture, with leaf and dendritic gold, sometimes microscopic in the feldspar and quartz. Described by Geo. P. Merrill in *American Journal of Science*, April, 1896. Pozo Prieto mine, Altar district, Sonora, Mex. (64,987.)

48. With albite, in porphyry. A white crystalline granular albite segregation in a dark porphyry, much fine pyrite along line of contact. Gold interstitial in albite, and seemingly independent of pyrite. Show mine, Eldorado county, Cal. (63,371.)

A single-phase electric-railway system is in operation between Pontiac and Odell, in Illinois.

A new development in electric welding is the automatic production of continuous rolls of wire fencing. A number of galvanized-iron wires are fed from reels arranged vertically and parallel to each other, and from another reel placed transversely to these, lengths of wire are cut off and fed horizontally across the vertical wires. Where the horizontal and vertical wires intersect, they are welded together by small transformers. The welded material then moves forward, and the operation is continuously repeated.

During 1904 there were 30 collieries at work in Russian Poland; the pits numbered 48, with 307 boilers, and 346 engines of a total of 31,119 h.p. The number of workmen employed was 18,062, of whom 4,411 worked in the mines, 8,241 were assistants, while 4,563 men and 487 women were employed by the day. The horses at work numbered 952. The total wages paid amounted to \$3,405,425, or an average wage of \$188 per man for the year; 5,592 accidents occurred during the year, and 64 of them were fatal, while three cases rendered further work impossible, and 179 led to partial unfitness for further work; in 5,283 cases the injured men recovered completely.

Theories of Vein Formation.*

BY JAMES PARK.

The theories which now receive the most acceptance are: (1) Eruptive processes: (a) magmatic segregation; (b) eruptive after-actions. (2) Lateral secretion. (3) Ascension of solutions.

Eruptive Processes.—The importance of the rôle played by igneous rocks in the formation of ore deposits has been specially urged in late years by Professor Vogt,¹ of Christiania; Professor Kemp,² of New York; Professor Suess,³ of Vienna; and more recently by Waldemar Lindgren⁴ and W. H. Weed,⁵ of the United States Geological Survey.

Vogt directs renewed attention to the close relationship existing between ore deposits and eruptive processes. Ore deposits which are generally connected with eruptive magmas are grouped by him into two principal classes, namely: (1) those formed by magmatic segregation; (2) those formed by eruptive after-actions. Ore deposits belonging to the first group are infrequent, and therefore economically subordinate in importance to those of the second group. They include, according to Vogt: (a) The occurrences of titaniferous iron ores in basic and semi-basic eruptives; (b) chromite in peridotite; (c) sulphide deposits, such as the nickeliferous pyrrhotite of Sudbury, in Canada; (d) platinum-metals in highly basic eruptive rocks; (e) copper and metallic nickel-iron in serpentinized peridotite.

That sulphides can be segregated from eruptive magmas in the first concentration has yet to be proved; and it is still doubtful how far Vogt's conclusions respecting the occurrence of sulphide ore, as products of primary segregation from molten magmas, are admissible. Moreover, he seems to have been unfortunate in the example of sulphide occurrence which he selected in illustration of his principle of magmatic segregation. A recent investigation of the nickeliferous pyrrhotite and associated sulphides at Sudbury, in Canada, by J. E. Spurr,⁶ furnishes evidence that these ores were deposited by circulating waters (a) along joints; (b) along bedding planes; and (c) at contacts. In all cases metasomatic processes are said to have played an important part in the formation of these valuable deposits.

In the eruptive after-action group,

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

¹ Prof. J. H. L. Vogt, 'Problems in the Origin of Ore Deposits,' *The Genesis of Ore Deposits*, 1901, p. 636.

² J. F. Kemp, 'The Role of the Igneous Rocks in the Formation of Veins,' *loc. cit.*, p. 681. Also *Trans. Amer. Inst. Min. Eng.*, Vol. XXXIX, 1902, p. 681.

³ Prof. Eduard Suess, Lecture, *Royal Geog. Journal*, Vol. XX, 1902, p. 520.

⁴ Waldemar Lindgren, 'Character and Genesis of Certain Contact Deposits,' *Genesis of Ore Deposits*, 1901, p. 716.

⁵ W. H. Weed, 'Ore Deposits near Igneous Contacts,' *Trans. Amer. Inst. Min. Eng.*, Vol. XXXIII, 1903.

⁶ J. E. Spurr, Twenty-second Annual Report United States Geol. Survey, 1901-1902, part II, p. 777.

Vogt includes cassiterite and apatite veins and "ore deposits of contact-metamorphic zone." Cassiterite deposits are everywhere connected with acid eruptives, principally granite, and occasionally quartz-porphyry and rhyolite. Partly for this reason, and partly because of the characteristic paragenesis of fluoride, borate and phosphate minerals, he supports the common view that tin deposits are genetically connected with granitic eruptions, and that various volatile fluorides took part in their formation. Cassiterite veins were formed, he thinks, by pneumatolytic processes,⁷ that is, by the action of gases and water at high temperature and pressure. He further argues that they were formed immediately after the eruption, and before the complete cooling of the granite, one proof of which, he thinks, is the occurrence of tin minerals in veins of pegmatite in the granite. Cassiterite lodes are admittedly independent of the immediately adjacent country rock, and for this reason seem to be more nearly related to deposits of magmatic segregation than to contact-metamorphic deposits.

It is probable that the magmatic segregation of chromite in peridotite was in some cases effected by pneumatolytic agencies before the complete cooling of the magma. It is not uncommon to find chromite in vein-like masses that have the appearance of having been segregated in cavities of contraction in the pasty magma. As the agency of underground water cannot have been active in this class of ore deposit, the aggregation must have been effected by metal-bearing steam and gases occluded in the igneous magma.

Pegmatite veins, while generally connected with granitic eruptions, seem to be of later formation than the cassiterite veins. They often pass into quartz and frequently possess sharp, well-defined walls, which suggest their formation in shrinkage cracks by pneumatohydrogenetic agencies in the waning phases of the after-actions, developed by the progressive cooling of the eruptive magma. The different phases of after-action must necessarily merge into each other, and hence we may expect to find, as we do, tin-vein minerals, and even cassiterite, in the pegmatite.

Among ore deposits of contact-metamorphic origin, Vogt includes the ore-bodies which occur within the metamorphosed contact-zone of deep eruptives, especially granite. He distinguishes several types of contact deposit. The Christiania type includes iron-ore deposits that appear to have been formed before the solidification of the granitic magma. These ores are never found in the granite, but always in the adjacent rocks. If they had been introduced after the cooling of the magma, they would also have been deposited in the granite. The eruptive

⁷ *Pneumatolysis* is a term first used by Bunsen to describe the combined action of gases and water

magma is believed to be the source of the metal, which is expelled in the heated steam, into the surrounding rocks.

In 1902, Weed⁸ proposed the following provisional genetic classification based on that of Vogt: I. Igneous (magmatic segregation)—(a) Silicious; (b) basic. II. Igneous (emanation deposits)—(a) Contact-metamorphic deposits; (b) veins (related to magmatic veins and division IV). III. Fumarolic. IV. Gas-aqueous (pneumato-hydato-genetic) deposits—(a) Filling deposits; (b) replacement deposits. V. Meteoric waters—(a) Underground; (b) superficial. In this classification the major sub-divisions are based upon magmatic segregation at one end and cold aqueous deposition at the other; with intermediate groups characteristic of the different phases of eruptive after-actions. Weed divides magmatic segregations into two groups, namely, silicious and basic. The latter embraces deposits of iron, copper, etc., found at igneous borders and as dikes; and the former, the ore-bearing pegmatites, with quartz-veins as extreme examples.⁹

This is a distinct departure from Vogt's conception of magmatic segregation. It is almost certain that the segregation of ores from basic magmas and the formation of cassiterite and pegmatite veins are genetically connected with the after-actions of deep-seated eruptions, and as such must, in some degree, be related and merge into each other; but this genetic connection, while it increases the difficulty of formulating a satisfactory classification, hardly justifies the proposed subdivision.

The synthetic experiments of Daubrée seem to justify the views of Vogt, Beck and other observers that cassiterite and pegmatite veins are formed by gaseous and aqueous emanations, and not by direct segregation. Gold is commonly associated with acid rocks, but it does not occur in such a manner as to suggest direct segregation. In Queensland, New South Wales and New Zealand it occurs in quartz veins in granite and quartz-porphry, but in these cases the veins manifestly fill contraction-cracks.

Weed strongly dissents from the view expressed by Van Hise that meteoric waters are an important creative factor in the formation of ore-veins. He thinks, however, that primary hot ore-bearing solutions and hot vapors may rise into the zone of circulating meteoric waters, heating the latter and charging them with metallic salts and such active mineral solvents as fluorine, chlorine and boron. He concludes the paper already referred to with a summary of his views relating to the formation of contact-deposits as follows: "Contact metamorphic ore deposits occur about the margin of intrusive masses of granular igneous rock, either at the actual contact or in the zone of metamor-

phosed sedimentaries. The deposits of economic value occur only where strata or blocks of impure limestone have been crystallized as garnetiferous or actinolite-calcite rocks, with consequent porosity. The ore minerals are intimately associated with these aluminous silicates, and may be either intergrown, or metasomatic replacements, or the result of interstitial filling with partial replacement. The conversion to garnet-epidote-calcite, etc., rock was complete before the consolidation of the igneous rock. The ore-minerals were introduced in gases and vapors—solfataric emanations—from the eruptive masses, of which they constitute pneumatolytic after-actions, or by hot circulating waters given off by the cooling igneous mass. This theory of the genesis being true, the deposits should extend downward in depth to the granular rock."

James F. Kemp, in a valuable paper on "The Rôle of Igneous Rocks in the Formation of Veins,"¹⁰ maintains that the circulation of ground-water is insufficient to account for the majority of the ore deposits in the United States. He supports the petrological view that igneous rocks must have furnished not only the metallic contents, but a large proportion of the waters which brought the metals into their present position. His conception of ore formation is as follows:

(1) Igneous rocks contain the metals and the elements of the gangue minerals more abundantly than do sedimentary rocks.

(2) Igneous rocks are richly provided with vapors, which come up with them from great depths. Igneous rocks are enormous reservoirs of energy.

(3) Igneous districts, or districts of combined igneous and sedimentary rocks, are almost always the geological formation in which the veins occur.

(4) The vapors and solutions from intruded igneous rocks are pre-eminently favorable chemical re-agents.

(5) Observations in deep mines, and the data from very deep wells, indicate the general absence of free water in the rocks below moderate depths, except in regions of expiring vulcanism. This is a grave objection to the conception of universal ground-water.

(6) Capillary attraction is largely an ascensive force, and of problematic existence with increasing pressure. Artesian reservoirs of themselves are unfavorable to extended circulation. There is a strange absence of the original content of water in deep-seated sediments. Standing water in abandoned shafts is strong evidence of the impenetrability of rocks.

(7) Hot springs are necessarily connected with an abnormal rise of the isotherms, and this can only be explained by intruded igneous rocks, or by faults or shattering. The latter do not compare with the former as an efficient cause.

Placer Mining in Antioquia, Colombia.

BY F. F. SHARPLESS.

Renewed interest is being shown in Colombian placer ground and in the formation of foreign companies for its exploitation, so that a few remarks from one on the ground may not be out of place. The quantity of gold known to have come from placers, the high returns from material washed in times past, and the good results that are being obtained at many points at the present time, demonstrate that this is a country worthy of careful investigation by those interested in gold mining.

The statistics published by THE ENGINEERING AND MINING JOURNAL give the production of gold for the whole of Colombia as about \$2,600,000 for each of the last five years. No records, official or unofficial, of the production of the precious metals in Colombia are now being kept, and it is extremely difficult to obtain any reliable data as to production or shipments, because of the falsification of shipping bills. The above figure is about as close an approximation as can be obtained. Of this amount, it is probable that three-quarters is produced by the State of Antioquia and by mines, though in other States, very near the boundary of Antioquia. If reliable statistics could be secured they would probably show that even more than this proportion was shipped by the mines and merchants of this State.

In traveling over the country one sees few evidences of mining previous to the Spanish conquest. Shallow workings are occasionally encountered and are said to have been observed on almost all of the principal veins, but aside from these small workings there are other reasons for believing that the inhabitants of the country, previous to the sixteenth century, were miners and sought for gold. Ancient burial places have yielded stores of the precious metal. In the graves it has generally been found in the shape of personal ornaments; a few of these are of Inca or Aztec design, but the greater number show the crude workmanship of a less artistic race. The pottery found is also rough and the absence of anything like permanent stone implements suggests that the ancient diggers were less intelligent than the inhabitants of many parts of Central and South America. Bits of pottery, clay and stone implements mark the sites of former Indian villages, a number of which have been ground-sluced with profit. The gold recovered was in the shape of small ornaments and placer dust. Very little Indian gold has been recovered that bears evidence of having been taken from quartz veins, but scattered workings indicate that at least some of their treasure came from that source. It is highly probable that the greater part of the gold used by the Indians came from the creeks and rivers, that less came from outside through exchange, and that still less came from quartz mining.

Whether the Spaniards found any quartz

⁸ W. H. Weed, 'Ore Deposits near Igneous Contacts,' *Trans. Amer. Inst. Min. Eng.*, Vol. XXXIII, 1903, p. 715.

⁹ Weed, *loc. cit.*, p. 717.

¹⁰ J. F. Kemp, *Trans. Amer. Inst. Min. Eng.*, Vol. XXXIX, 1902, p. 681.

mining in progress when they entered the country is uncertain. The first gold that they took away was nearly all from placers. Old records say that rich quartz veins were pointed out to them and that these were early exploited. Traces of arrastres, unknown until their arrival, are occasionally seen, but it was not until 1828 that the first mill was erected, and that by a Cornishman. This mill, with its square wooden stems, pounding on a stone or wooden die and operated by an overshot water-wheel, is the father of nearly all the Colombian mills of today. The progeny have changed in nothing except to add iron shoes and, in some cases, iron dies.

It has been said that all rivers and streams of the State carry gold in commercial quantity; this is an exaggeration that has been repeated too frequently. From many areas where native methods could be used the gold has been pretty thoroughly removed, but much larger areas requiring diversion of the rivers, the use of giants, of elevators or of dredges are still virgin and well worthy of investigation.

Many of the *playas** have the appearance of virgin ground, but, when cleaned out with the hydraulic elevator, traces of old bed-rock 'tunnels' are found, and too frequently a clean bed-rock that should have been quite thoroughly sprinkled with gold. At one of the mines now working on the Porce, not far from Medellin, there are only a few large boulders and these are all on bed-rock. Almost every boulder so far encountered has the remains of old props under it, and scarcely a color of gold anywhere near. It appears as though a divining-rod with a weakness for boulders had been used by the early operators, for they have certainly missed but few of the pockets in this *playa*. No iron tools or iron rust have been found, and it is probable that the work was pre-Spanish. Many of the *playas* have been worked within historic times, and at several places the rivers have been diverted, this within recent years.

There are few authentic records of what has been produced by any of the recent works; any amount of information, of course, can be picked up from local residents, but unfortunately, of the old men who have seen the mines in operation, no two will tell the same story as to the area worked, the quality of the gravel, the depth to bed-rock, or give any other trustworthy information. Generally speaking, the most profitable placer mining is done by the native owners of the *playas*. During the season (which may be the whole year or only one of the two short dry periods of the year), the owner allows men and women whom he can trust to mine on their own account. It may be necessary to dive, to build small wing-dams, or only to wade the streams for the gravel that they wash. It may be necessary to sink on the *playas* and use pumps;

*The gravels forming the present river banks.

again only ground-slucing is necessary. The owner receives from 15 to 50 per cent of the product, depending upon the yield of the ground.

A great deal of money has been invested by foreign corporations and individuals in Antioquianian placer ground and its equipment. Thirty or forty companies have undertaken serious work along the Cauca, Nechi and Porce rivers within the last few years. Unalloyed prosperity has not been the rule among these companies. Today several strong organizations are working on these rivers. None can be called an absolute failure; on the other hand, very few are yielding what was expected of them, and up to date not more than two or three can be called successes. Failures have seldom been due to lack of gold in the gravel, but rather to the difficulties attending operations in the country, difficulties that were overlooked or ignored before operations began, then appearing in a form sufficient to seriously embarrass the undertaking. There is scarcely a foreign-owned placer that does not show the marks of mismanagement, at home or here. The managers who have been sent out have rarely known anything of the language, the people, their customs, the country, or even of placer mining. The capital of a score of companies, ample for the work undertaken, has been literally thrown away.

The first mistake that is made here—and it is almost always made—is the failure thoroughly to prospect the ground before placing machinery upon it. Many foreigners fail to realize that all of the sands and gravels do not carry sufficient gold, and they also forget that they have been preceded in their search for the precious metal by a race of miners who knew much more about placer gold, and where to look for the rich pockets, than the lawyers, doctors and merchants who are working over the same ground today. The modern gold-hunter, while he may confess to a lack of instinct or knowledge, possessed by his predecessors, forgets that he has the facilities by which, at comparatively little cost, he can prospect his ground and accurately learn its value in advance of his work as no Indian could ever do. A few pits are generally sunk, to be sure; their depth will depend upon the rate at which water comes in and the difficulty of holding up the sides without lagging, but they seldom reach bed-rock. A few pans of dirt are washed and the value of the colors is guessed. If there are colors in the overburden, it is taken for granted that the bed-rock will be gold-plated; and if none are found in the upper sands, it is presumed that all of the gold has been concentrated on the bottom, where it will be found after the plant is installed. Having arrived at these conclusions, the management goes ahead in the erection of a plant as cheerfully and with as much confidence as though 50c.

gravel from grass-roots to bed-rock had been proved. Personally, I am acquainted with less than a half-dozen cases, where systematic exploration has preceded the installation of the plant. So far as I know, no drill-holes have ever been driven. In the case of one of the strongest companies working on the Porce, not a respectable test-pit or drill-hole was put down, but, relying upon the sanguine reports of the natives, there has been spent in equipment and on ground, much of which is known to have been worked, no less than \$75,000; and now comes the usual question from the home-office: "Why are you not sending us some gold?"

The placer miner has sufficient natural difficulties with which to contend without creating new ones, and there is no ground sufficiently rich to pay without careful management from the start. Of the difficulties to be encountered, probably the most noteworthy is that of climate; there are not many beds of gravel of commercial importance in perfectly healthful localities. Near the headwaters of some of the rivers there are some good beds amid healthful surroundings, and there are some with high alluvions, ancient river-channels, but the latter are generally so high that no water can be placed upon them. The *aventaderos*, or bench deposits, are generally so close to the existing rivers that they have practically the same climate as the *playas*. Nearly all of the workable deposits lie close to the present rivers, where fever not only molests foreigners, but frequently the natives themselves.

The difficulties second in importance relate to the water supply. Many of the best localities in the State must be worked by giants and elevators; this necessitates a long ditch and pipe-line in order to obtain the necessary volume and head of water. Nearly all ditches will have the greater part of their length in a clay formation, derived from the disintegration of the syenites and granites, which are decomposed for many feet from the surface. Every shower has its terrors, and, with the rainy season lasting much of the year, interruptions come frequently. Unless expensive construction work is used, a ditch is an affair of short life; constant repairs and attention are necessary, and even then breaks, wash-outs and landslides come so frequently that the giants may be idle much of the time. If one is so fortunate as to have a long dry spell, with no breaks in the ditch, he will probably be short of water for his plant. There are some places where the undecomposed granite, slate and shales offer firm ground for the ditches, but unfortunately good placer and good ditch ground are not often in conjunction.

Transportation is one of the bugbears of the country. Nearly all of the dredging-ground, and much of that suited to elevators and giants, is on the lower rivers and can be reached by the flat-bottomed river steamers direct from the coast, or

can be reached by short trails from the rivers; but to reach many of the upper and richer placers the mountain trails must be used.

A fourth difficulty with which foreigners must contend, but of less moment to the native operators, is the Colombian laborer; generally of a rather lazy and shiftless disposition, he misses no opportunity to rest and to gather gold on his own account. He needs constant watching, or he will live up to his belief that "God made day for rest and night for sleep." The *peons* as a class are intelligent, but those who are available for the placer work have had their intelligence cultivated along lines inimical to the interests of foreigners.

We must not pass over the advantages of working in this country without giving them some mention, and chief among them is the large extent of good virgin ground with ample water for washing it. There are no Anti-Débris Commissions with which to deal, but unfortunately there are commissions of paludic microbes on nearly every river, and these demand consideration. Long dry seasons are rare, and a shortage of water is uncommon, but there is often much difficulty in keeping the water where it is wanted. There are no miners' unions, with their accompanying disorders and dictations, but there is a united effort on the part of the *peons* to steal your time and gold. There are no questions as to whether the land is agricultural or mineral, whether it is placer or ledge or mill-site; but if you are not around when your neighbor makes his location, some day you may find that he claims a large part of what you supposed was yours, and, what is worse, is able to hold it. It is not a question of working five or eight-cent gravel and making it pay, but a question of working a gravel of much higher grade and of the operator securing a fair share of the gold taken out. Placers of the richness of those found along the Porce, Nechi, Cauca, Magdalena and their tributaries would pay handsomely under conditions prevailing, for example, in many parts of the States. There are many points where the character of the ground is ideal for dredges, but many of these are also the very worst points for fever, and it is a serious question in my mind whether foreigners can be kept in good health for a long time at such points.

To conclude: Antioquia holds some valuable placer ground that may be worked at a profit. Many difficulties beset exploitation, but the difficulties are not insurmountable. By carefully selecting the ground and placing in charge of it men who understand the people and their customs, men who know the resources of the country, its advantages and disadvantages, and understand placer mining, there is every reason to expect substantial profits.

Timiskaming.

BY S. DILLON-MILLS.

My observations are confined to the immediate vicinity of Cobalt station, on the Timiskaming & Northern Railroad in Ontario. The rocks in this area belong to the Lower Huronian and Keewatin formations, with intrusions of diabase and gabbro. Up to the present, the productive mines have been found in the Lower Huronian only, but it is probable that, in the near future, developments will show the presence of workable deposits in the gab-

bro as well. The Huronian rocks show themselves under a variety of aspects; they are of every texture, from fine-grained massive rock (slate?), devoid of cleavage or distinct bedding, to coarse, heavily bedded conglomerates or 'pudding-stones.' In some places they show little evidence of disturbance; in others, all traces of the original lines of deposition have been obliterated by the pressure and strains to which they have been subjected, and which, by developing shear-

sional slickensides. These planes are interesting from the fact that, where other conditions (the nature of which is at present not fully understood) were favorable, they formed the places of deposit in which are now found the various ores which have called attention to the district. At present it appears probable that the intrusion of the gabbro dikes was the main cause of these rock disturbances, and we can easily imagine, in connection also with it, the development in the neighborhood of the dikes of lines of fumaroles by

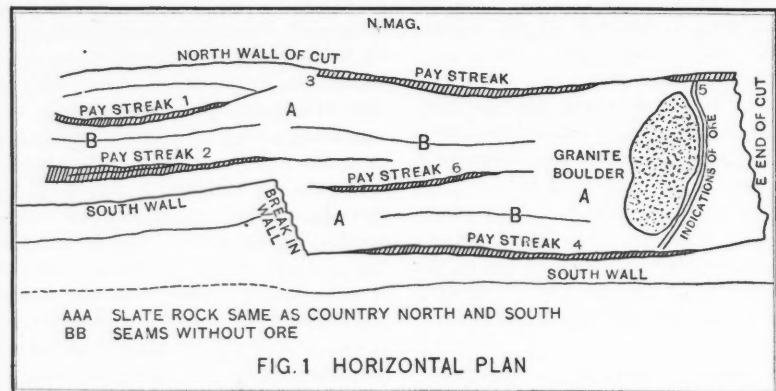


FIG. 1 HORIZONTAL PLAN

bro as well. The Huronian rocks show themselves under a variety of aspects; they are of every texture, from fine-grained massive rock (slate?), devoid of cleavage or distinct bedding, to coarse, heavily bedded conglomerates or 'pudding-stones.' In some places they show little evidence of disturbance; in others, all traces of the original lines of deposition have been obliterated by the pressure and strains to which they have been subjected, and which, by developing shear-

which the rents might be filled with the mingled sulphide ores or arsenides; the native silver being probably the result of recent surface alteration, extending in some cases to a considerable depth in the fissures. This view of the case is strengthened by the recent discovery of these ores in irregular veins in the gabbro itself, under such conditions as to lend color to the belief that the lodes are veins of segregation, not formed by sublimation or deposition as in the Huronian. The idea of

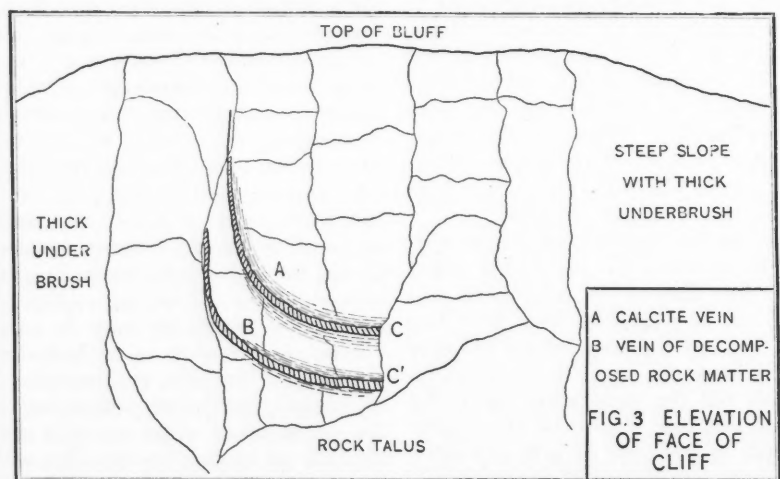


FIG. 3 ELEVATION OF FACE OF CLIFF

ing planes in different directions, and at either high angles or perpendicular elevation, have given to these rocks the appearance of basaltic columns—that is, where this structure has been made visible, as in some of the deeper railroad cuttings. In one cutting I found these shearing planes, where most strongly developed, to be 10° north of west, crossed by others running 12° east of north magnetic; the faces of the planes being polished by mutual attrition, showing occa-

fumarolic action along certain definite lines is suggested both by the steady course of the deposits along certain lines and by the broken nature of the individual seams, nothing like a continuous true vein having yet been found in the district, so far as I know; the pay ore is there, continuous in a general way, and probably persisting in depth, but full of minor breaks. Sketch No. 1 will illustrate my meaning. The ore in the pay-streaks shown on this sketch-plan varied from 1 in. to 10 in.

wide, but the character was similar in all, consisting largely of native silver in cobalt and silver sulphides, with cobalt bloom, etc. From streak No. 2 about \$12,000 of ore was taken out in nine hours by eight men. The cut is from 6 ft. to probably 15 ft. deep, and at the east end, the slate is capped by a conglomerate into which the pay-streaks do not extend. This belt crops out again about ¼ mile from the opening, in a direction slightly south of east, and beyond that again it appears south of the shaft of the Timmons mine, showing a total length, if continuous, of over a mile. The Timmons shaft appears to have been sunk on three veins of calcite and native silver, the intersection of which, with the above-mentioned belt, is clearly indicated at the surface, and when the point of intersection is reached by a level driven from the shaft some

broken character as those first described; they were evidently produced in the same way.

The fourth and last place to which I will now call attention is shown in sketch No. 3, which is a diagrammatic drawing intended to illustrate the appearance of the veins in the gabbro before mentioned. The upper one *A* is calcite apparently devoid of any silver mineral, but the shaded portions of the rock face, along the course of the vein, carry native silver, the ½ in. next the vein being in spots more than one-half pure silver; the assay value decreases from the edge, the portion above the vein from *A* to *C* being apparently richer than that below. The vein *B* is an indescribable mixture of decomposed pyroxene, calcite, etc., carrying but little value, and the selvage along it is not mineralized to the same degree as in the

Filter Pressing of Slime.*

BY H. R. EDMANDS.

A filter-press plant was recently installed to treat a dump of accumulated slime at Menzies, W. A., for the Menzies Mining & Exploration Corporation, Ltd. As the amount was limited to some 12,000 tons, the expenditure had to be kept down, but efficiency was not sacrificed to low first cost. The intention was to make the plant complete and to use the latest improvements, with a view of obtaining satisfactory results and securing reasonable costs.

Taking the process in detail, carting the slime from the dump to the mixer is cheaper (if the dump is low and scattered) than tramming, too much time being lost in laying and shifting rails; but with compact, high dump, or if the distance is considerable, tramming is cheaper. The mixer

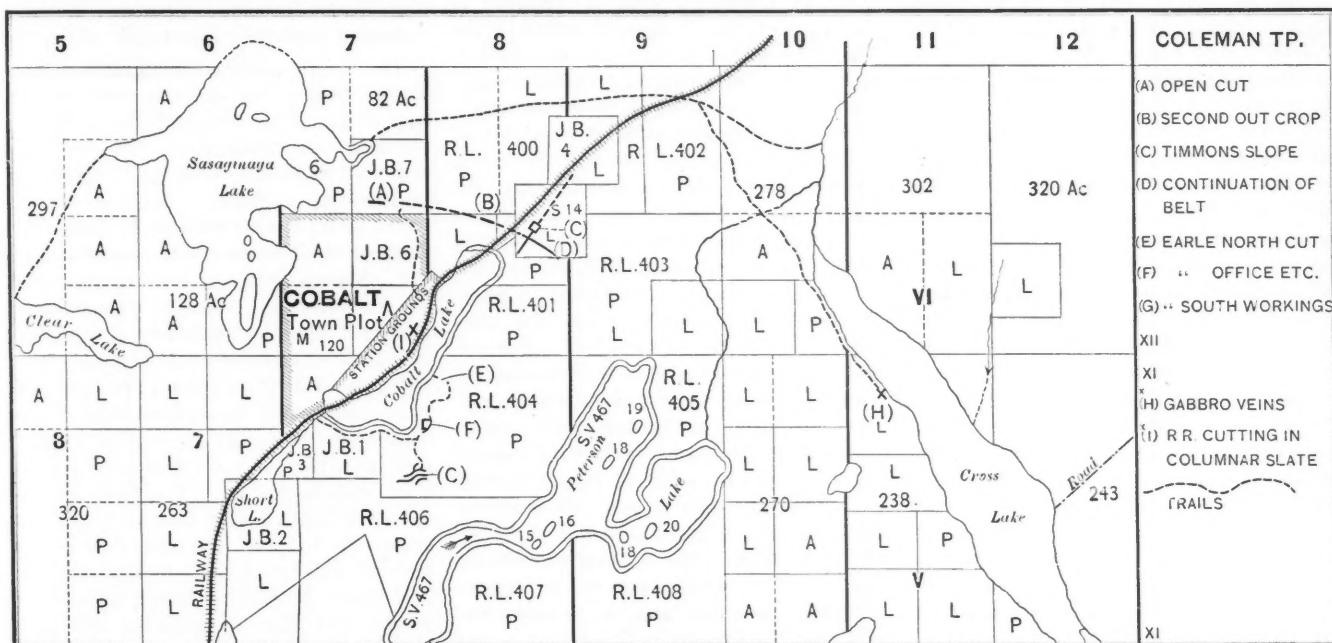


FIG. 2. COLEMAN TOWNSHIP.

interesting developments may be looked for.

Another mine, known as the Earle, shows two developments of a very different character; the northerly one is a rock cut in Huronian slate regularly bedded and traversed by shearing planes. The ore here is chiefly cobalt arsenide. The south working is in Huronian conglomerate on top, which passes downward into fine-grained slate rock, the beds dipping southeast at an angle of 10°; the shearing planes run in a tortuous manner in all directions, and the fact that the rock between certain pairs of planes seems to differ from the country makes one doubtful as to whether they are not in reality intrusive dikes of fine-grained diorite. This can be determined only by making micro-sections. The ore in the crevices consists of a dark, earthy matter showing cobalt bloom, and rich in native silver and sulphides. The pay-streaks here and at the north working are both of the same

case of *A*. Both veins disappear at *C* behind a curtain of rock, which has perhaps slid down the almost perpendicular face of the bluff. The width of the vein *A* is about 6 in., the selvage being the same. This looks like a case of arrested segregation, with (possibly) subsequent filling of the cavity with calcite; and, as I before stated, indicates the gabbro as being the probable source of the Huronian silver. I may add, in regard to the pay-streaks in sketch No. 1, that they are probably continuous in depth, as a shaft has been sunk to about 75 ft. just west of the cut, and the streaks persist to that depth, though changing in character below the zone of surface alteration. The occurrence of the granite boulder in the solid slate, forming to some degree a connection between streaks 4 and 5, is remarkable; the boulder along one side showed a little silver, as did also the slate in contact with it. The other streaks showed no connection with each other.

takes a dray load at a time, and is most efficient in pulping the slime. It was found that the speed had to be kept high. A well-designed elevator is superior either to a plunger or to a centrifugal pump. An elevator gives practically no trouble—the wear is mainly on the belt, and is inconsiderable.

For fine screening, the elevator delivers, through the top grizzly, into a wide launder, with a screen of heavy wire. It is most important to keep out chips; they are liable to choke the ports in the press frames. The thickness of the pulp may vary, but it is kept at about 1,400 sq. gr., or about 45% dry slime.

Agitators are provided with means for raising and lowering agitator arms; but the height of the frame-work does not admit of this. There has never yet been any trouble in re-starting them, even after a week's stoppage, so it is concluded that

*Abstracted from the *Proceedings* of the Australian Institute of Mining Engineers.

in many cases the raising gear is unnecessary. No stuff is filter-pressed until it has been in contact with cyanide solution for at least 12 hours. As the power consumed by agitators is trifling, there is no reason for not having them large enough. The larger they are the longer will be the average time of contact of the slime with cyanide solution. Steel is probably the best material for agitators. Concrete was the material the writer employed most recently, and it gives great satisfaction.

The advantage of filling the filter-press by pumps, in preference to compressed air, is now generally admitted. In filling press, higher speed is used until the pressure rises to about 70 or 80 lb.; then a lower speed is used and a pressure is maintained of about 80 lb. until the press is full, the pressure being regulated by a relief cock, operated by the pressman.

The filter-press used was an old one of Dehne's make. It was originally intended for 50 1¼-in. cakes; but by screwing on wood to the frames these were increased in thickness to 2 in., and the number of cakes reduced to 40; but, of course, with an increased capacity. This was found to be a trifle over three tons dry slime per press, the frames and plates being 40 in. square outside measure, and the cakes 36 in. square and nearly 2½ in. thick. Filter cloth is hung over the high- and low-pressure plates and tied here and there with twine, the joints in flaps being made by rubber rings fitted in recesses around channels. Each frame is placed in the press with a high-pressure plate on one side and a low-pressure plate on the other. The press is closed by turning a ratchet wheel. Hinged washers are then thrown over in place, and the press further tightened by nuts, using a bar for leverage. The final closing of the press is effected by an angle-lever arrangement. By turning the capstan wheel, which is keyed on to a right- and left-handed screw passing through the ends of the two levers, these ends are brought closer together. The effect, therefore, of turning the capstan is to exert an enormous pressure in closing the press. No bars should be allowed on capstan. The joints between plates and frames must be tight. One thickness of hessian next the plates, covered by one thickness of filter cloth, is often used. Slime is now pumped into the press through the valve opening to the channel and thence to the frames. All the cocks on the plates are left open, but they are closed as soon as solution comes out. All the other cocks are closed. After a time (here generally in about 25 min.), the flow of solution slackens very much and the press is full, when the pump is stopped and the 4-in. inlet valve closed.

The next step is to wash out the soluble gold remaining in the cakes of slime. The usual method is to pump weak cyanide solution from the sump tank through the lower inlet valve, the solution enter-

ing the cakes at the high-pressure side, and coming out at the low-pressure side, escaping either by the cocks attached to the low-pressure plates or by a valve. After sufficient washing, compressed air is admitted into the same channel to expel as much water as possible. If air is to be used at all (and it is an expensive luxury) it would be better to use it *after filling* and *before* washing, whereby extraction might be increased.

The next step was the adoption of what the writer calls the central wash, on the recommendation of Messrs. Black, Blatchford and Powell, of Kalgoorlie, who first introduced it, and to whom a considerable debt is due for many useful suggestions in erecting and running the plant. The central wash is as follows: The 4-in. inlet valve is removed from the press, and in its place a 4-in. T-piece is connected with a channel; to one arm of the T-piece is attached the 4-in. inlet valve, connected with delivery pipe from slime pump, and to the remaining arm of T-piece is fixed a 2-in. valve. This valve is connected to the delivery of the wash pump and admits the wash *through the filling channel*. All the cocks on the high- and low-pressure plates are either left open, or, as in the present case, removed, and drip pipes bolted on instead. On starting to wash, the 4-in. valve is closed and the 2-in. valve opened; also the valve is either left open or removed and a pipe leading to solution launder put into its place.

At first sight, one would hardly expect good results by this method of central wash; but, as a matter of fact, a distinct line of cleavage was found in the center of cake, dividing it into half-cakes 36 in. sq. by 1¼ in. thick. The cleavage has always been found central; even if two frames are placed together and the solution enters from two ports, or if the port is not in the center of frame (and in this case the ports are not central, as the frames have been packed with wood on one side to increase their thickness), yet the cleavage line is central and the wash is perfect. The cakes retain rather more moisture with central than with high-pressure wash. In the case of a gritty slime, which fills quickly, the difference is not material. Cakes washed by high pressure were found to retain 23.3% moisture, while centrally washed cakes retained about 24%. At first, 25 minutes' central wash, followed by 10 minutes' high-pressure wash, was given; but later the high-pressure wash was discarded, and 30 minutes' central wash used alone. The advantages were great, as there was no longer need to close any of the cocks on the plates, which were always a nuisance. They were discarded altogether, and in their place drip-pipes were bolted on to the plates.

A further advantage in the system of central wash is that more solution goes through the cake in a given time, thus reducing the time of washing, the solu-

tion having to penetrate only half the thickness of slime, and it has double the area of filter cloth through which to escape. No difficulty has been experienced in discharging residue, owing to the somewhat greater amount of moisture it contains, even with the most slimy portion of the dump. The writer would not like to affirm that central wash can be used in all cases; but, where it can be used, the filter-press might be somewhat simplified by abolishing the use of all cocks to plates.

Books Reviewed.

A Treatise on Concrete, Plain and Reinforced. By Frederick W. Taylor and Sanford E. Thompson. With Chapters by R. Feret, W. B. Fuller and Spencer B. Newberry. New York; John Wiley & Sons. London; Chapman & Hall, Ltd. Pages, 620; illustrated. Price, \$5.

This is the most complete and authoritative treatise on concrete that has yet appeared. It is designed for practicing engineers and contractors, and also for a text and reference book on concrete for engineering students. The authors are aided by R. Feret, William B. Fuller and Spencer B. Newberry, who contribute special chapters, respectively, on the effect of sea-water on concrete; proportioning concrete; and the chemistry of hydraulic cements. In addition to these names, there is given a list of 37 other authorities who have contributed in various ways to the making of the book. In such a complete treatise it may be unkind to note any uneven distribution of labor, but perhaps some readers will find fault with the relatively short space (48 pages) given to such a subject as reinforced concrete. The spirit of practical utility, however, is joined with that of scientific thoroughness, even to the lists of bibliographic references. We predict for the volume a successful reception in an age which is just beginning to appreciate the possibilities of cement, plain and reinforced.

United States Geological Survey. Bulletin No. 259. Report on Progress of Investigations of Mineral Resources of Alaska in 1904. By Alfred H. Brooks and Others. Washington; Government Printing Office. Pages, 200; with maps and illustrations.

This report of progress is one of those welcome contributions to our information available for the Pacific territory of the Northwest. The bulletin is composite in make-up, including, as it does, placer mining in Alaska, by A. H. Brooks; placer mining, method and cost, by C. W. Purington; southeastern Alaska, by F. E. and C. W. Wright; geology of the Treadwell, by A. C. Spencer; Cape Yaktag placers, by George C. Martin; and other detailed reports on gold, tin, copper, petroleum and coal. The report is a sample of what

more of the reports of our Survey should be—timely, technical and authoritative. Such reports make the basis of our reference libraries in mining, milling and metallurgy.

United States Geological Survey. Water Supply and Irrigation Paper No. 114. Underground Waters of the Eastern United States. By Myron L. Fuller. Washington; Government Printing Office. Pages, 288; illustrated.

The principles of the identification and recovery of underground water, for the use of drillers, seekers for city supply, and others, are well described. Mr. Fuller has been assisted by a dozen or more prominent geologists in the detailed description of the several States, which includes those east of the Mississippi. The bulletin is a valuable contribution to hydrography.

Western Australia Geological Survey. Bulletin No. 15. Preliminary Report of the Pilbara Goldfield. By A. Gibb Maitland. Perth, W. A.; Government Printer. Pages, 118; with maps.

This pamphlet is a contribution to a district of which but little reliable information is available. The region described lies on the northwest coast of West Australia, between 118° and 122° east longitude, and 20° and 23° south latitude. Mr. Maitland frankly acknowledges that the present is a time of depression, but believes that with earnest prospecting and mining the district can again be made a producer, both of gold and tin.

Gold Dredging. By Capt. C. C. Longridge. London. The *Mining Journal*. Pages, 198; illustrated. Royal octavo. Price, \$4.

This book is largely a compilation of matter which has appeared at various times in the Reports of the New Zealand Department of Mines and in the columns of the *London Mining Journal*. A large number of excellent illustrations are included; these, however, are mainly taken from the catalogues of manufacturers, and are rarely such as to be of service to an engineer engaged in designing a plant. There is no pretence of a literary or consecutive treatment of the subject; the different chapters cover the main features of dredging in a direct manner, rendering the book less attractive, but no less immediately useful. All compilations are open to criticism; but we regard such technical scrap-books from the point of view of utility. This publication will be of service to those interested in dredging, and that is all that need be said.

Descriptive Geometry for Students of Engineering. Second Edition. By James Ambrose Moyer. New York; John Wiley & Sons. London; Chapman & Hall, Ltd. Pages, 198; illustrated.

The science of making projections, and especially of the intersections of lines, planes or solids with other solids, planes

or lines, is a fundamental part of drafting which is itself fundamental to all engineering practice. This treatise, by an instructor in Harvard University, is based on his experience in teaching the subject. The notation is that of mechanical drawing; and the data are stated in terms of the coordinate system of analytic geometry. The new edition is improved by suggestions drawn from practice. The book is not intended for a self-help independent of instruction; but it is recommended that the student work out the exercises, which, after all, is the only way to make a student.

United States Geological Survey. Bulletin No. 250. The Petroleum Fields of the Pacific Coast of Alaska, with an Account of the Bering River Coal Deposits. By George C. Martin. Washington; Government Printing Office. Pages, 70; with maps and illustrations.

This is a fairly detailed account of one coal and four petroleum fields. The oil districts are the Controller Bay near Cape Suckling; the Cape Yaktag, 75 miles to the east; and the Cook Inlet and Cold Bay, 300 miles west and south of the former. The latter two are northwest of Kodiak island. The first field mentioned, that of Controller Bay, has enjoyed more prospecting than any of the others, ten out of 15 wells having shown some production. The oil is of the better class, namely, with a paraffin base, and the volatile distillates are considerable. The other fields are not sufficiently exploited to pronounce definitely on the quantity of the yield, but the quality is of the same high grade as that of the Controller Bay. Considerable detail of geology and stratigraphy is given in the pamphlet, which will be of great assistance to prospectors. The coal at Bering river near Controller Bay, is also described with some detail. It is on the whole a high-grade bituminous, or semi-anthracite (though not an anthracite proper). It occurs in abundance. There are 20 seams which are 5 ft. or more thick; several of which are over 20, one being 27 and another 31 ft. thick. This is only about 20 miles from the coast.

American Telephone Practice. Fourth Edition. By Kempster B. Miller. New York; the McGraw Publishing Company. Pages, 904; illustrated. Price, \$4.

The appearance of a new edition of this authoritative work is evidence both of its appreciation by the public, and also of the close following of a phase of communication which is a necessity in modern life. This phase is growing in breadth and in detail in a way that is reflected to the surface only by the improvement in public convenience. In this edition "obsolete methods and equipment are not dealt with, except where of distinct educational or historic value." Chapters 16 to 35 (about 500 pages) are almost entirely new.

Among the fields in which great advance has been made is that of automatic-switch-board practice. Mr. Miller has a readable style, and is easily master of his subject, both in theory and in practice. The book-work is fair, though some of the half-tones (and line cuts also) are poorly printed, perhaps from poor or worn plates. But in spite of these incidental defects, the book as a whole is one of the few exhaustive authorities, and is up to date on a topic which is more closely interwoven with our daily lives than any other use of electricity, amounting in fact almost to another sense.

Hypochlorite und Elektrische Bleiche. By Emil Abel. Halle-a-S, Germany; Wilhelm Knapp. Pages, 110. Price (in New York), \$1.50.

The practical technique of the manufacture of electrolytic bleach has already been given in Volume VIII (of the series of monographs on applied electro-chemistry) by Viktor Engelhardt, chief engineer and chemist-in-chief of the Siemens & Halske works at Vienna, Austria. The quarto pamphlet in question is Volume XVII, of the same series, by Dr. Abel, who is an associate chemist of the same firm, and is intended as the theoretical counterpart of Volume VIII referred to. The author attempts the analysis of the energy consumed and the chemical conditions desirable in the reaction mechanism implied in the production of commercial hypochlorite. Starting with a detailed discussion of the electro-motive forces concerned respectively with the ions, hydrogen, hydroxyl, oxygen, chlorine, hypochlorous chlorine, and chloric chlorine, the author proceeds with a rigorous mathematico-chemical analysis of conditions which, eventually, lead to some definite results capable of being translated into language comprehensible by laymen. Thus, the hypochlorous ion is liable to be set free at some distance from the anode (by interference with hydroxyl), and to obviate this it is necessary to avoid chloride solutions which are too highly alkaline. Several similarly valuable deductions are drawn relative to the anode, cathode, and electrolyte efficiency. The brochure will serve a valuable part in tracing the use of energy in building up available oxidizers from common salt, and incidentally to the theory of chemical energy itself. It is a worthy illustration of the far-sighted wisdom of employing theoretical chemists by progressive practice, though it must be confessed that the discussion is technical, even for the technical reader.

On May 14 a special on the Reading Railroad, carrying European officials attending the International Railroad Congress, covered the distance from Camden to Atlantic City, 54 miles, in 43 minutes. This is at the rate of a mile in 47.8 seconds, or over 75 miles an hour. The horsepower-mile-ton is not stated.

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.

Congrès International de Pétrole. Notes, Memoirs et Documents. Paris, France; *Journal du Pétrole.* Pages, 216.

Manual of Terreohmetry. By Ethan Scheidler. South Pasadena, Cal.; published by the author. Pages, 44; with diagrams. Price, \$2.

Tasmania. Progress of the Mineral Industry. 1904. By W. H. Twelvetrees, Government Geologist. Hobart, Tasmania; Government Printer. Pamphlet, 18 pages.

Annales des Mines de Belgique. Volume 10. 1905. Prepared by the Bureau of Mines in the Ministry of Industry. Bruxelles, Belgium; L. Narcisse. Pages, 336; illustrated.

New South Wales. Annual Report of the Department of Mines in 1904. E. F. Pittman, Under-Secretary for Mines. Sydney, N. S. W.; Government Printer. Pages, 168; illustrated.

A Monograph on the Geology and Mining Features of Silver Valley, North Queensland. By James Stirling. Frankfurt, Germany; F. E. Clotten. Pages, 32; with maps and illustrations.

Fifth Annual Report of the Mining Bureau of the Philippine Islands. H. D. McCaskey, Chief of the Bureau. Manila, P. I.; Bureau of Public Printing. Pages, 44; with maps and illustrations.

United States Geological Survey. Bulletin No. 264. Record for Deep-Well Drilling for 1904. By M. L. Fuller, E. F. Lines and A. C. Veatch. Washington; Government Printing Office. Pages, 108.

New South Wales Geological Survey. No. 13. Monograph on the Silurian and Devonian Corals of New South Wales. Part 1. The Genus Halysites. By R. Etheridge, Jr. Sydney, N. S. W.; Government Printer. Pages, 40; with 10 plates.

United States Geological Survey. Professional Paper No. 32. Preliminary Report on the Geology and Underground Water Resources of the Central Great Plains. By N. H. Darton. Washington; Government Printing Office. Pages, 436; with maps and illustrations.

United States Commission of Fish and Fisheries. Bulletin No. 569. Distribution of Sewerage in the Waters of Narragansett Bay, with Reference to the Contamination of the Oyster Beds. By C. A. Fuller. Pages, 488. No. 570. *Statistics of the Fisheries of the South Atlantic States.* By A. B. Alexander. Pages, 68. *Report of the Commissioner for the Year Ending June 30, 1903.* George M. Bowers, Commissioner. Pages, 552; illustrated. Washington; Government Printing Office.

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.

The Yaqui River Country.

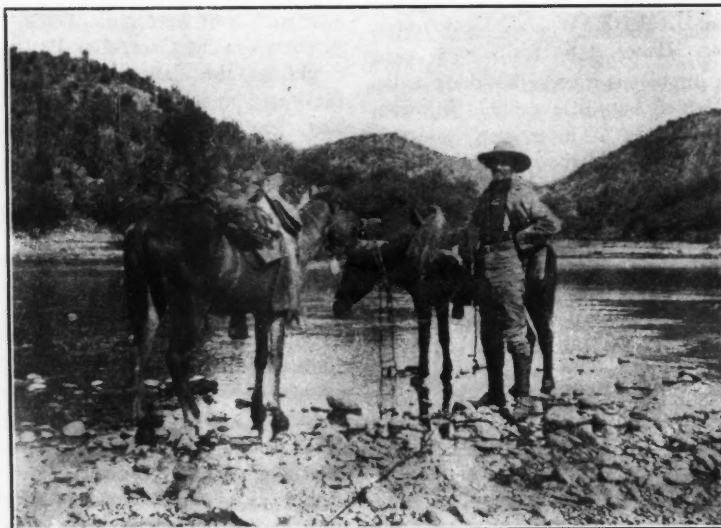
Sir—I have just returned from an extensive trip into the Yaqui country, Sonora, Mexico. The Yaqui river is one of the most important streams of the Republic; it flows in a winding course southwesterly into the Gulf of California, south of Guaymas. Its source is in the Sierra Madre mountains and it drains a great watershed. Three railroad surveys are being made at the present time in this valley. I found much of great interest to me in this country and was astonished at its mineral richness. The mining laws enacted by the general government are

trouble to the government. I called on Gen. Luis E. Torres, commander of the northern military zone of the Republic, just before starting on my trip and was furnished an escort of two officers and 15 men from La Colorado to Matape, a distance of 60 miles through the most dangerous section. The same escort met me promptly at Matape on the day arranged for my return. I was much pleased with the efficiency of the officers and troop, and appreciate the courteous treatment shown me by Gen. Torres. He is anxious to protect all who visit this country by furnishing military escort where there is danger from the Yaquis.

L. H. JANSEN.

Hermosillo, Mex., April 27, 1905.

Metallic lead may be reduced electrolytically from waste peroxide of old storage batteries. One ton of pure lead may be recovered with 435 k.w.h., costing \$0.87,



IN THE YAQUI RIVER COUNTRY.

quite simple and very liberal. The stability of the present government, with a general regard for law and order, the cheapness of labor and the absence of labor troubles have caused an enormous inflow of American capital, awakening the idle and slumbering regions of Sonora.

I have, during the past few months, received many clippings from Eastern papers in regard to the conditions in Sonora on account of the Yaqui Indian trouble. Some of these statements were undoubtedly written by persons who have never been in the interior, while others are absolutely false. There are at the present time many American companies operating extensive properties in Sonora. I have visited several districts during the past few months and find new machinery being installed and development work being carried on in a modern way. I believe in a few years this country will develop into a great mineral-producing region. A number of serious depredations have been committed by the Yaqui Indians in the State of Sonora, and they are still a source of

with current at \$15 per k.w.-year. This is from work of A. Lodyguine.

The earthquake of April 4 last, according to *Indian Engineering*, advanced into India from the Himalayas at about 6 A. M., and worked apparently southeast through Lahore, Delhi, Agra and Allahabad. Bombay escaped altogether, while the Panjab suffered severely. The only recording instruments in the path of the shock were at Calcutta, where the loss in life was even worse than in 1897. The movable spot of light passed beyond the limit of the photographic paper, except at the beginning and the end of the shock. This does not necessarily mean that Calcutta was at the origin, but only along the line of disturbance. If the center of activity were in the Indian Ocean, as might naturally have been anticipated, the advance of the seismic wave would have been from south to north. It is a matter of regret that more stations were not provided with suitable automatic-recording seismic apparatus.