

# The Engineering and Mining Journal

WITH WHICH IS CONSOLIDATED "MINING AND METALLURGY."

VOL. LXXV.

NEW YORK, SATURDAY, MAY 9, 1903.

No. 19.

## THE ENGINEERING AND MINING JOURNAL

PUBLISHED EVERY SATURDAY.

261 BROADWAY, NEW YORK.

TELEPHONE 6866 CORTLANDT. P. O. Box, 1833  
CABLE ADDRESS "ENGINJOUR" NEW YORK.

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## CONTENTS.

Editorial Notes	697
The Library of the Institute	697
Mr. Carnegie's Gift	698
Labor Problems	698
Unreliable Testimony	698
The Latest Suit Against the Anthracite Railroads	699
Copper and Copper Stocks	699
Market Conditions	700
Metallics	700
Some Aspects of Mine Valuation	J. H. Curle 701
The Geologist in Practical Mining	Waldemar Lindgren 702
Secondary Enrichment in Arid Regions	H. B. Starbird 702
The Bessemer Memorial Fund	703
The Latest Montana Mining Decision	Dr. R. W. Raymond 703
*The Montana Supreme Court on the Pennsylvania Case	704
*Copper Deposits at Clifton, Arizona	Waldemar Lindgren 705
Egyptian Clay	F. A. Fitzgerald 707
Cost of Mining and Smelting at Butte, Montana	708
*A Simple Blue-Print Machine	708
*A Modern Method of Coal-Washing	C. W. Meissner 708
*The Copper Sulphate Deposits at Copaque	Edward Walker 710
Some Gold Mining Investments	J. H. Curle 711
The Placers of Siberia	Lewis B. Brown 711
*The Edison Dry Process For the Separation of Gold from Gravel	C. M. Chapman 712
*Heclon Ore and Rock Breaker	713
Geological Survey of Canada	713
Iron and Steel Exports and Imports	713
*An Electric Storage-Battery Locomotive	714
Coal and Asphalt Lands in the Indian Territory	715
The Manufacture of Plaster of Paris	715
Minerals in North Borneo	715
Abstracts of Official Reports	715
Books Received	717
Books Reviewed	717
Recent Decisions	718
Correspondence	718
Questions and Answers	718
*United States Patents	718
British Patents	719
* Illustrated.	

## DEPARTMENTS

Assessments	734
Chemicals, New York and Foreign	731, 736
Coins, Foreign	733
Dividends	734
Financial Notes	732
Industrial Notes	721
Markets: Coal, United States and Foreign	728
Iron and Steel	729
Metals: Gold, Silver, Copper, Tin, Lead, Spelter, Antimony, Platinum, Quicksilver, etc.	732, 733
Mining News: United States and Foreign	723
Mining Stocks	728
Obituaries	720
Personals	720
Schools, Technical	720
Societies	720
Stock Market Review: United States and London	728
Stock Quotations	734, 735
Trade Catalogues	721

Mr. Gates, of Chicago. It is said that companies now operating in the Territory will not be interfered with. The general supposition was that the coal lands in question, which had been laid out by the Geological Survey, would be open to public competition, and the granting of options on large tracks would seem to be altogether opposed to the general policy of the Land Department.



A PERIOD OF transition is facing the American phosphate industry; production and consumption are the largest on record; speculation, which has been rampant among sellers in years past, is being superseded by a more satisfactory business policy, tending towards the centralization of the export trade; and lastly, the introduction of modern machinery is reducing the cost of operating the mines and is improving the quality of the product sent to market. This era has long been the hope of the miners, who have in the past met with indifferent success in their attempts to better the condition of the industry. Factors that have had an important bearing on the present situation are the general belief that the known deposits of high-grade phosphate rock are limited in number, and owing to the heavy production, are becoming exhausted; the invasion of the big fertilizer combinations that are purchasing or optioning mines in order to control an independent supply of raw material; and the prospect for an increased production in Africa and the Pacific Islands. To show the magnitude of the American phosphate industry it is only necessary to say that the exports last year amounted to 802,086 long tons, the greatest quantity on record, and representing fully 40 per cent of the purchases made by European super-phosphate manufacturers. Much of this was high-grade rock, which brought a better price than the foreign phosphates.



### THE LIBRARY OF THE INSTITUTE.

A circular has reached us from the office of the secretary of the American Institute of Mining Engineers, asking for subscriptions to a fund to be devoted to the completion of the library which is already in existence at the rooms of the Institute.

This circular is signed by ten past presidents. We are also informed that the absence of the name of one of the ex-presidents is due to his having been out of the country, and that he, Prof. William B. Potter, has cordially indorsed the movement, both by letter and in a more practical manner. There is a touch of pathos in the statement that Mr. Abram S. Hewitt, shortly before his death, expressed his approval of the undertaking and authorized the use of his name to the circular now sent out.

The present library is based on a generous gift from Mr. John Hays Hammond, who purchased the libraries of the late Clarence King and R. P. Rothwell, and gave them to the Institute. To these has been added a further deposit of books by Dr. R. W. Raymond, so that with the large list of technical papers and government reports, previously owned by the Institute, the library now comprises about 10,000 volumes, covering geology, mining, metallurgy and the allied arts.

IN THIS ISSUE Dr. R. W. Raymond appears again as a special contributor to this JOURNAL, after an interval of six months, due to absence in Europe. Our readers will join with us in welcoming him back to his useful labors after the rest and holiday which he had so fully earned.



A REPORT is current that representatives acting for the United States Steel Corporation have secured options on somewhat extensive tracks of iron ore and coal-lands in Alabama. Heretofore, the corporation has done nothing in this direction, and apparently has not sought to secure any hold in the Southern field, so that this report, if true, would indicate somewhat of a new departure. It is, however, in line with the policy of the United States Steel Corporation, to which we have heretofore referred, to secure control of supplies of raw material in every direction, and it is quite possible that the facts may be correct, although we cannot expect any official confirmation of the rumors.



THE OPENING of a considerable portion of the Choctaw Lands, in the Indian Territory, brings into the market some extensive tracts of valuable coal lands, a portion of which have heretofore been worked under lease from the Choctaw Nation. It is now reported that options on these lands have been given to parties already largely interested in the coal business, among them being Mr. H. C. Frick, of Pittsburg, and

It is proposed to raise a fund of \$25,000 for the acquisition of more books, and for the preparation of a complete catalogue. This reference library will then be available to the profession, and it is intended to broaden its usefulness by engaging a librarian who will hunt up data and abstract information for members who live at a distance. The last mentioned feature will, it is hoped, render the library serviceable to engineers who are remote from a complete collection of books of reference.

Finally, the library is to be named the Raymond Memorial Library, as a tribute not so much to the living man who will need no memorial beyond his own work, but in remembrance of the son, Alfred Raymond, who passed away before his lifework was done.

The undertaking is eminently appropriate and practical. It is based throughout on generous sentiments, which are not unworthy of a profession built on a scale of twelve inches to the foot, and we trust that the expectations of the past presidents, who have consented to become trustees, will be amply fulfilled.



#### MR. CARNEGIE'S GIFT.

It is well known that in past years several abortive attempts have been made to centralize the engineering societies having offices in New York City, and that the differences in the character and financial resources of these societies has caused such schemes to fail. The recent decision of the Engineers' Club, which is not a technical society, but a purely social organization of technical men, to build a new clubhouse on Fortieth Street, overlooking Bryant Park, led a group of active men to revive the old project of having a central building where the various institutes, representing the principal branches of the engineering profession, might have headquarters, libraries, a lunchroom and a club. It has been proposed that the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Institute of Mining Engineers shall unite with the Engineers' Club in the erection of a large and suitable building on a plot of ground stretching from Thirty-ninth Street to Fortieth Street, between Fifth and Sixth Avenues.

This proposition only needed cash for a stimulant; now, at the psychological moment, Mr. Andrew Carnegie has come forward and has offered a sum of over \$1,000,000 to ensure the fulfilment of the idea. We understand that the offer of Mr. Carnegie is a gift, outright, without conditions or reservation of any kind. In our next issue we hope to publish complete details, when these have been worked out at a forthcoming conference between representatives of the societies in interest.

In the meantime, it may be stated that the Building of the Engineering Societies is planned to contain a large assembly hall, available for lectures and conventions; a number of smaller halls will be at the disposal of lesser gatherings and council meetings; the libraries of the several institutes will be in adjacent alcoves or rooms, so as to constitute one comprehensive engineering library; other rooms will be available for reading and writing, so that visiting members will have a place where they can do quiet work. The accommodations for the administrative offices of the several engineering societies will be provided according to their various needs. It is

likely that even facilities for printing will be included, so that the volumes of Transactions may be prepared on the spot. Finally, a restaurant will promote social amenities, and formal dinners may be served, by arrangement with the cuisine of the Engineers' Club.

The best feature of such a central building lies in the fact that it will afford a convenient rendezvous for all engineers in good standing and those birds of passage more particularly, the mining engineers, will have a place to set their feet. If the idea is carried out to its complete fulfilment, it means that the band of men "who give expression to that combination of contemporary science, art, knowledge and practice which we recognize as modern engineering" will be enabled to meet amid a favorable environment and consummate the purpose of all such gatherings, namely, to discover one another, to give the right hand of good fellowship, to make common cause against the Fool.



#### LABOR PROBLEMS.

At the moment when the officials of the Transvaal are still seeking a solution to the difficulty created by a dearth of laborers at the South African mines, we in this country are perplexed by the question of the destiny of the negro who was brought hither from Africa. Furthermore, while Mr. H. Ross Skinner, representing the Chamber of Mines, Johannesburg, is on his way to China to see what can be done toward bringing coolies under indenture to the Rand, the Chinese are actually being introduced in great numbers into Mexico to do agricultural work, mainly, and the California fruit-growers are complaining of the lack of pickers caused by the Chinese Exclusion Act. Thus does the labor problem present itself in varying guise.

Before the war the mines of the Rand gave employment to 96,700 Kaffirs; the mills and mines which were about to enlarge their operations at that time were ready to employ about 40,000 more; therefore on the full resumption of work, after the war, from 135,000 to 140,000 Kaffirs were needed; as yet only about 60,000 have responded to the recruiting, which has been carried on vigorously since the war ended. But even these figures do not measure the full disparity, for when the proposed new mining undertakings are started and the intended enlargement of the old ones is carried out, there will be need for approximately 200,000 to 250,000 Kaffirs, or their equivalent. No wonder then that the managers at Johannesburg are impatient, and that the share market is depressed on account of the outlook.

In their disappointment the Rand managers have suggested the introduction of the Chinese coolie, the idea being that he is to come under indenture and go back at the end of his term, to live in a compound, to have his own womenfolk with him, and to be kept entirely apart from the rest of the population. If the legislature of the Transvaal endorses this plan, it can be done, for the Imperial Government is likely to allow the colonies to do what they consider proper in this regard. In a similar way, at this time, Mexico also is in want of laborers, the industries of the country having grown too fast for the existing population; moreover, the frequent *fiesta* diminishes the usefulness of the indigenous *peon*; consequently the Chinese are being helped to immigrate into the land where "it is always afternoon," when it is not tomorrow. Large numbers of them have arrived re-

cently, under contract; more are said to be on their way thither.

Meanwhile, in the United States, we have a population of 9,185,000 negroes, and of these about 1,600,000 are adult males. It is fair to say that we could spare a good many of them, enough at any rate for our friends at Johannesburg; as a matter of fact, the negroes are out of their proper environment, they belong to Africa and Africa ought to have her own, or at least such of them as she needs. They are good laborers; in the mines of North and South Carolina, West Virginia and Tennessee, the negro does excellent work. The Transvaal wants just that element in our population which we find difficult to manage, because the negro is an anomaly threatening to become more serious every year. Why should not the new world redress the balance of the old and America give to Africa the laborer who was forcibly taken from the latter and trained to usefulness by the former? This suggestion is made in all seriousness, and is worthy of the investigation of the mining magnates on the other side of the water. It is largely a matter of wages. The Kaffirs get \$12 per month, the skilled white miner get \$6 per shift; it seems to us that the better class of negro at \$2 per day would fit in between these extremes, and prove more economical than the cheap white labor imported from Southern Europe, or the Mongol brought wholesale from Asia. "Africa for the Africans," therefore seems to be a fitting motto for the Rand labor problem. With the Kaffir as the hod-carrier of South African civilization, with the re-imported negro as the brick-layer and the white man as the foreman and engineer, there will be an adjustment of work in ratio to capacity such as would ensure efficiency and progress in the industrial development of the new English colonies.



#### UNRELIABLE TESTIMONY.

The disaster at Frank, in the coal-mining region of British Columbia, was evidently due to a large landslide, which occurred on the side of a mountain overlooking the village. Such landslides are commonly due to the penetration of water along bedding planes and other lines of rock-parting so situated as to favor the action of gravity. While in the present case the results were fatal to many human lives and destructive to property, the incident itself was hugely exaggerated and misrepresented by the daily press, in a manner not unusual when descriptions of natural catastrophes are based upon the data of excited eye-witnesses. The first account imputed the disaster to a volcanic explosion, then to the shock of an earthquake, and finally to a subterranean explosion of gas. These versions were based upon the dust caused by the landslide, the electric condition of the air, due possibly to the friction of a large moving mass of rock, and the noise accompanying such movement, which probably culminated in a sounding roar when the slide was finally stopped by some projecting bar of rock. Thus were "smoke," "balls of fire" and "terrific explosions" evolved by startled onlookers.

There is a trait in human nature which renders it impossible to obtain true accounts of any occurrence which is outside of ordinary experience. The descriptions of Mount Pelee are a case in point; the accounts which were sent out over the world stimulated artists to paint pictures and illustrated papers to publish representations such as Nature,

even in her bitterest moment, never has duplicated. While the average man is apparently an utterly unreliable witness to natural phenomena which are out of his ken, it is fair to say that even men of scientific training exhibit a similar weakness, due in their case, however, more often to the possession of preconceived theories explanatory of that which they expect to see. Thus most of the papers and books on the Martinique disaster bear the trace of explanations made with one eye to fact and a side-glance at some theory of volcanic action previously accepted by the author. A truthful witness is a rare individual, as any experienced lawyer knows well enough. "Good witnesses" are common, that is, men who can testify consistently with a chosen line of explanation, but these are just the men who are most dangerous in technical and scientific matters. Of the witnesses of the Mount Pelee eruptions who apparently observed without prejudice and reported with accuracy, we venture to mention Mr. George Kennan, whose descriptions were stamped with a naive and photographic truthfulness, such as will always make him and the like of him, an invaluable contributor to the records of science. Unvarnished statements of fact are like the unsculptured stones that form the base of a big building and are often required to support a large mass of highly ornate material. In the case of the happening at the little township of Frank, it appears that the love of the marvelous which is inherent in all mankind, but more particularly in children and in the daily press, has developed a mountain out of a mole hill, a cataclysm out of a landslide.



**THE LATEST SUIT AGAINST THE ANTHRACITE RAILROADS.**

The son of a man who left a great fortune made from mining enterprises is now proprietor of several newspapers and a congressman-elect from New York. His newspapers are the embodiment of what is known as yellow journalism. They shriek in scare-type, fake pictures and double-leaded long primer editorials. The congressman-elect is credited with political ambitions, aspiring to become a candidate for the presidency of this nation, and his newspapers constantly call attention to his supposed activity as a friend of the people and a champion of the oppressed.

We have no desire to discuss this gentleman's character, either as praised by his newspapers or criticised by his acquaintances. It would be a waste of time to point out what his wealth might do, and what it has done, but occasionally the utterances of his newspapers and his misdirected activity call for notice. His newspapers have indulged in wild abuse of the Coal Trust, a term applied either to anthracite or bituminous coal mining and transportation companies. At present the Coal Trust is the anthracite railroads and their subsidiary mining companies, chartered under the laws of Pennsylvania. After failing—presumably from lack of sufficient evidence—to interest either the Attorney-General of the State of New York or Attorney-General Knox, the congressman-elect succeeded in getting a hearing before the Interstate Commerce Commission. His attorney charged that the various railroads, particularly those which guaranteed the bonds of the Temple Iron Company, when that company took over the Simpson & Watkins collieries in 1900, make unreasonable rates on anthracite, discriminate against possible shippers,

and also pool rates in violation of the Interstate Commerce Act. The plaintiff's attorney has also alleged that the railroads have combined to restrict output, and prevent competition, that they have unreasonably advanced prices, and have thus violated the Sherman Anti-Trust Act.

The evidence thus far presented at the hearings in New York has not been startling. Little has been shown on anthracite rates that has not been brought out in the case of Coxe Brothers against the Lehigh Valley Company or in the hearings before the Industrial Commission in 1900. About the only interesting testimony was that of Mr. Baer, who stated what were some, at least, of the reasons which led the railroads to guarantee the bonds of the Temple Iron Company. Much of the evidence offered by the plaintiff seemed to be presented from ulterior motives, and it may be that the whole hearing is simply to give the plaintiff an opportunity to fish for evidence to be made the basis of another suit to be brought under the Sherman law. Hence, attorneys for the defendant companies objected vigorously to much of the evidence, claiming that while the Interstate Commerce Commission had power to investigate questions of transportation, it had no authority to take up matter relating solely to the mining and selling of coal.

As is generally known, the coal of the so-called independent operators is bought at the breaker by a coal-mining company controlled by a railroad, or in the case of the Lackawanna, bought by the road itself, and is sold at the prevailing price. In the case of coal shipped to New York Harbor, 65 per cent of the f.o.b. selling price is returned to the operator; the remaining 35 per cent is turned over by the subsidiary coal company to the railroad company, to cover freight and other charges. Hence, the plaintiff's attorney contended that the commission, in seeking to determine the reasonableness of the rates on anthracite, might investigate contracts to buy and sell coal, hoping thus to take up the reasonableness of prices, the control of prices, restrictions on production, etc. This question of the powers of the Interstate Commerce Commission is to come before the United States Circuit Court at an early date, and may be taken ultimately to the United States Supreme Court.

As the case before the Commission, though adjourned for a few weeks, is still pending, we shall not undertake to discuss its merits. At the same time, we firmly believe that though the officers of the railroad companies may be harassed by counsel and may see their testimony twisted and exaggerated, yet in the end it is better for them to meet the issue frankly and have the courts decide whether the anthracite railroads are or are not violating the laws than to pursue a policy that might lead to hasty and harsh legislation.

President Baer, at a recent hearing before the Interstate Commerce Commission, in reply to an attorney's taunt that he was seeking to evade the law, declared:

"The majesty of the law I respect as much as any man. I'll welcome you to proceed against us by the Sherman anti-trust law or any other law and abide by the decision of the United States Supreme Court. No one is more interested in maintaining the law than we are. We have, indeed, seen too much of the lax enforcement of the law. If you can prove in any court that we have disobeyed the law we shall then obey it."

President Baer said some things during the strike last summer which undoubtedly helped to alienate

public sympathy from the operators, but the above words ring true. The great corporations are a tempting mark for the frothy agitator or unscrupulous demagogue, and President Baer's attitude should meet the approval of every man who has the management of large interests and sees the dangers ahead. It is better to test a law than evade it, better to fight than to pay blackmail.



**COPPER AND COPPER STOCKS.**

In recent issues we have referred to the strong position of copper and to the fact that—in this country at least—there are no stocks in existence beyond the normal quantity which is always necessarily held in transit, in the process of refining and the like. In our issue of January 3 last we gave an approximate statement of the stocks then on hand, and we have since seen no reason to change those figures. The suspension of the reports to the Copper Producers' Association has left us, unfortunately, without those accurate figures of production, which were of great service to the trade. We are able, however, to supply the deficiency, at least approximately, and to give an estimate of production, which, we believe, is close to the actual figures. Taking these figures, with the imports and exports as reported by the Bureau of Statistics of the Treasury Department, we obtain the statement given below. The net imports given in the table represent the balance remaining, after deducting the re-exports of foreign material. The figures are in long tons, of 2,240 lb., and the statement covers the quarter ending March 31 last:

Stocks reported Jan. 1, 1903 .....	Tons.	65,008
Approximate production .....		69,653
Net imports .....		14,840
Total supplies .....		149,501
Exports for the quarter .....	35,239	
Approximate consumption .....	57,825	
		93,064
Stocks, March 31 .....		56,437

In this statement we have assumed that consumption remains at the same rate which was shown last year, though some good authorities believe that there has been a slight increase; at any rate, it is certain that there has been no diminution.

The figures show that stocks of copper on hand have fallen 9,571 tons below those estimated at the beginning of the year, and that they were, at the end of March, below the normal quantity, rather than above it. This accords with the fact that at the present time producers find some difficulty in making their deliveries, and that they have, as a rule, no surplus to offer upon the market.

Of course, the reduction in stocks is due, to some extent, to some rather heavy buying when prices began to rise, and to a transfer of metal from the hands of sellers to the yards and storehouses of manufacturers. This is true, however, only to a limited degree. Very few consumers are supplied beyond the end of June; many of them not beyond the current month. Beyond that there is practically no reserve, and any considerable increase in demand, either from home consumers or from abroad, could not be met. The exports from the United States this year were 14,340 tons less than in the first quarter of 1902. Had it not been for this decrease in shipment, we believe that an actual shortage in copper supplies would have been manifested at the present time.

Production has increased this year, but only to a moderate extent—hardly beyond the normal growth, or the average of several years past. The Lake and Arizona mines which are now entering the list of producers, are the result of two or three years' work, and the increase due to their production has been partly offset by a diminished output from some older mines, notably in Montana.



#### MARKET CONDITIONS.

The metal markets are generally quiet for the moment, although the underlying conditions have not changed; but there seems to be a lull in purchasing for the time being.

Copper remains unchanged nominally, a light business only being transacted. The copper situation is considered at some length in another column; but we may add here that most producers are sold up to the end of June, and that when manufacturers return to the market, as they must do shortly, the question of supplies will be rather a pressing one.

Tin continues unchanged, and the spot stocks to which we referred last week, are being gradually worked off, and passing into consumption.

In lead there has been no further change. Consumption continues on a large scale, and manufacturers are steadily taking about their usual quantities of supplies.

Spelter is firm and prices continue high. Ore prices are also high, the sales in Joplin being made this week at about \$38 per ton on a 60 per cent basis. The reserve of ores in the district is small, and was further reduced this week, as smelters have been buying rather freely.

Silver is again higher this week, and still considerably above the average of the last few months. In this metal alone the position is not a strong one, and the purchases here for the Philippine coinage and abroad for the French Mint, which are chiefly responsible for the recent rise, are now over. The Eastern demand continues light, and there is a prospect of a somewhat lower range of values.

The iron markets are steady but comparatively quiet. While business continues on an enormous scale, buyers are holding back a little, hoping to secure concessions on pig iron and steel billets. There seems to be very little prospect that they can do this, however, and we shall doubtless hear, before long, of increased buying for the fourth quarter of the year.

In the Western coal markets there is very little new. The Lake trade has fairly begun, and shipments to the Northwest are heavy. In local trade, at various points, conditions are generally good.

There is no especial change in the Atlantic seaboard bituminous trade, the amount of coal arriving at tidewater being sufficient for all needs, and even in excess of current demand, so that railroads still have embargoes on against the distribution of cars to those companies which allow coal to stand at tidewater. Prices range below \$2.75 for Clearfield grades f.o.b. New York Harbor shipping ports.

In the anthracite trade demand continues active and widespread. A large amount of coal is going to Western points, although ordering is heaviest from the seaboard trade. The outlook is that a lot of coal wanted at May discounts will not be delivered before June.

#### METALLICS.

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

The development of every branch of physical knowledge presents three stages, which, in their logical relation, are successive; observation, experiment and speculation.

The interests of science and of industry are identical; science cannot make a step forward without, sooner or later, opening up new channels for industry, and, on the other hand, every advance of industry facilitates those experimental investigations, upon which the growth of science depends.

An interesting contrast between the geology of the present day and that of half a century ago, is presented by the complete emancipation of the modern geologist from the controlling and perverting influence of theology, all-powerful at the earlier date.

Geology is, as it were, the biology of our planet as a whole. In so far as it comprises the surface configuration and the inner structure of the earth, it answers to morphology; in so far as it studies changes of condition and their causes, it corresponds with physiology; in so far as it deals with the causes which have affected the progress of the earth from its earliest to its present state, it forms part of the general doctrine of evolution.

The study of the earth indicates the continuation of processes of natural causation for a period of time as great, in relation to human history, as the distance of the heavenly bodies from us are, in relation to terrestrial standards of measurement. The abyss of time looms large as the abyss of space.

The progress of physical science is largely due to the fact that men have gradually learned to lay aside the consideration of unverifiable hypotheses; to guide observation and experiment by verifiable hypotheses; and to consider the latter, not as ideal truths, but as a symbolical language, by the aid of which Nature can be interpreted in terms apprehensible by our intellects.

Nothing great in science has ever been done by men, whatever their powers, in whom the divine afflatus of the truth-seeker was wanting. Men of moderate capacity have done great things because it animated them; and men of great natural gifts have failed, absolutely or relatively, because they lacked this one thing needful.

Gold-bearing beds of conglomerate—which are termed banket formation—have been found at Nullagine in northwestern Australia.

There is a proverb current in Utah that "only the miners of Tintic can find the ore in the limestone of Tintic."

Ten years ago the iron mines of New Jersey were "played out," according to the general consensus of opinion; yet last year they shipped nearly 500,000 tons—most of it 55 to 60 per cent iron. One cannot always tell.

The bonanzas of Kalgoorlie, West Australia, are evidently not all worked out, as a late statement from the Iron Duke Mine testifies. The declaration for the month of January, 1903, shows shipments of smelting ore to Dapto, N. S. W., as follows:

	No.	Tons.	Gold, oz.
Per steamer <i>Wollowra</i> .....	35	225	1,750
Per steamer <i>Wollowra</i> .....	36	267	1,686
Per steamer <i>Wollowra</i> .....	37	200	1,246
Per steamer <i>Pilbarra</i> .....	38	229	1,461
Per steamer <i>Burrumbet</i> .....	39	202	2,220

These five shipments in one month show a total of 1,123 tons for 8,363 oz. gold; an average of 7.44 oz. gold per ton.

The loss of velocity, in a falling stamp, due to friction is about 25 per cent. This friction is mainly due to the contract between the stamp and the guides.

In the Cape York District of Northern Queensland tin production is increasing. The works at Stannary Hill have a capacity of 400 tons of 10 per cent ore; that of the Ivanhoe Mine is stated to average 20 per cent tin.

Tin occurs at Greenbushes, in West Australia, and a new discovery is reported. But this district has had several abortive excitements, and has as yet done nothing serious by way of production. Alluvial mining on a small scale is being carried on, but lode mining has not proved profitable. The tin occurs in an iron-stained conglomerate about 20 ft. thick. In the granitic bedrock underneath there are stringers, forming a network of small veins, made up chiefly of tourmaline and quartz. The tin-stone is associated with tantalite—a rare mineral containing tantalum and niobium as oxides combined with antimony oxide.

The celebrated Mount Bischoff Tin Mine, at Warratah, Tasmania, earned a profit of \$168,915 during the last half of 1902, and declared its 309th dividend. Dividends for 1902 amounted to \$270,000. Total costs for the last half year were \$1.35 per ton. Thirty-eight thousand nine hundred and forty-two tons were treated in a 60-stamp mill, and 11,102 tons in another of 15 heads, the total production amounting to 636 tons of black tin, for the six months. This is an average of 1.4 per cent. There were 604 tons of black tin smelted on the spot, the yield being 423 tons of metallic tin. This mine has yielded 60,946 tons of tin oxide since its discovery.

The Briseis Mine (described in this JOURNAL, under date of January 17, 1903) is another important Tasmanian tin mine. It is a gravel deposit and is worked by hydraulicking. The production is at the rate of about 30 tons of tin stone per month.

The "covering power" of a paint means, theoretically, the proportion of area a given amount will cover without its losing opacity. The term is used chiefly in connection with white lead, which owes its wide application to the fact that extremely thin films of its mixture with oil are perfectly opaque and brilliantly white. In the color trade the term is also made to mean the characteristic possessed by white lead of making an opaque mixture with other white pigments that are not themselves opaque when thinly applied. White lead may be mixed with considerable quantities of barytes, whiting and zinc white without seriously losing opacity, and as these materials are much cheaper than white lead, their use as adulterants is extensive. A great many substitutes for white lead have been manufactured at various times, but as they have lacked this particular characteristic, they have not been received with favor by the color trade. For instance, artificial sulphide and sulphate of lead are excellent pigments in themselves, but are acceptable among colormen only as cheap adulterants of the real white lead.

The Roumanian exports of petroleum in 1902 amounted to 71,714 tons. The total production of crude petroleum refined in Roumania was 215,574 tons.

Tungsten ores are being searched for in Westmoreland, England, but so far the ores are only found in limited quantity, and contain phosphorus and arsenic. The same conditions apply to ores found on the east Cumberland fields, that have been known for many years. Recently these ores have had more attention, and, according to report, Ireland may furnish supplies. Some Irish samples recently seen are free from phosphorus, and nearly a pure tungstic acid, and associated are high-grade oxides of tungsten.

## DISCUSSION.

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

## SOME ASPECTS OF MINE VALUATION.

The Editor:

Sir.—As there are no gold mines in Scotland, I, a would-be valuer of mines, had to seek my ideals elsewhere. I found them in American methods. The American engineer goes at once to the vital point. He says: "I want to know the net profit in sight in this mine." On that one fact we will base everything. Don't bother me with details; just let us set to work to get the sampling through." At least, if he doesn't say that he ought to, because it is the one thing in mining that matters. Frankly, I have got "profit in sight" on the brain.

There is no marked cleavage between the American and the English schools as regards mine valuation; but an Englishman, as a rule, has got a less clearly defined idea of the net value of any given mine than an American. As a mine manager he is perhaps the better man of the two, but on the question of valuation he is not so clear. There is a certain haziness and slovenliness about English gold mining. Some of the mines use a ton of 2,000 lb.; others, one of 2,240 lbs. We calculate our yields and our assays in the wearisome Troy weight, instead of in that Sterling with which nature has supplied us. We put our best properties under the control of titled incompetents, and we write reports on mines so lacking in a grasp of the vital points, that the compilers ought to be led out at sunrise and shot.

This slovenliness in the English system shows itself, naturally, in the all-important branch of mine valuation. We do not, it seems to me, rush in and grasp the one great fact—the profit in sight—as do Americans. We play round the edges of it, and our reports, which should be merely a statement of this fact in its several bearings, are made bulky with useless details and side issues. I believe that often, too, having got the fact, we don't quite know how to use it. We cannot crystallize it sufficiently into thought. If our fact, as is so often the case, shows the mine to be on the borderland of good and bad, in the region of doubt, we are afraid to say to our principal, definitely, either "yes" or "no." We try to shift the responsibility of the decision to some one else, and write a report which has no backbone or individuality about it. I think it takes a strong man to be a good mine valuer, a man to whom the taking on of responsibility comes naturally. You must know how to handle your fact to be successful. An able engineer told me that he judged his subordinates by the way they could condense a report into the limits of a cable; and the shortest cable meant the best man. I think he was not far wrong. He was an American.

English engineers often fall short of doing good work because they are unable to view the problem from their employer's point of view. They get their fact all right, that is to say, the net value of the mine, but they don't know how that fact ought to be set before the capitalist. To be a good mine valuer, a man must have the instincts of a financier. He must put himself in that particular financier's place. He would then realize how needful it is that his report should be a clear-cut statement, saying yes or no to each question, and taking full responsibility. As it is, four out of five reports I read are written by men who hedge, who are weak on the financial aspect, and who leave an impression of vagueness that is exasperating. These same reports will be voluminous, and deal at length with side-issues, but they don't satisfy one on the vital points. The system is wrong.

The environment of the English engineer is against him. In America, the capitalist who sends a man to value a mine probably intends to buy that mine himself, and work it; and as likely as not he knows nearly as much about mining as the engineer does. His first question to the mine valuer on his return is, "Well, what's the net profit in sight?" He takes

the report and turns it inside out, and if in his several capacities—as mining man, financier and student of men—it fails to satisfy him, its compiler may understand that he has been "turned down." But the London capitalist is a man who does not buy mines to work himself. He is essentially a middleman. His life's work consists in educating a large public to come forward and buy the wares—good or bad—which he may from time to time offer them. He would hardly appreciate the significance of being told that he had got hold of a valuable mine. To him the great question would be, "Can I get the shares well introduced on the market?" On your returning from the mine his first question would be, not "What is the net value of the ore?" but, "Can you lurch here to-morrow? I want you to explain your report to Lord So-and-So, who is to be our chairman."

The English school of mining is seen at its worst in Australia; that is to say, in Australian mines controlled and managed locally. Some of these mines, for instance, those at Gympie, Queensland, are pocketty, and would be difficult to sample correctly, but four out of any five mines in Australia might be sampled with some exactness. The Australian, however, flatly refuses to sample any of his mines; he just goes along from one ore shoot to another, picking the eyes out of each, and so far as this great mining continent is concerned—with the exception of West Australia, whose mines are owned in England—mine sampling or valuation is almost an unknown art. In the Melbourne *Argus*, on a Monday morning, there will be the weekly reports of perhaps 300 local gold mines. In these the managers will describe development work as exposing "gold," "good gold," "pyrites," "colors," "pay-dirt," etc., etc., but from beginning to end there will be no word of either systematic sampling, assay results, or estimates of ore reserves.

Now mark the force of evil example. The gold-mining industry in the Malay Peninsula was started by Australian prospectors, and they were succeeded by Australian mine managers trained to these methods. The principal mine there was the Raub. Some years ago I was asked to report on it, because of its failing to keep up to previous yields. The mine had been working for 11 years, and at that time had a 60-stamp mill. The manager had just written a report stating that there were 300,000 tons of rich ore in sight (value about \$20) and that the lowest workings showed no falling off in results.

Then I made the following discoveries: First, that the mine had never been sampled; second, that there were only 41,000 tons of pay-ore reserves (value \$9); lastly, that the lowest workings in the mine showed no pay ore. This property at the time was valued at \$6,000,000.

That was an extreme case—even under the Australian system—but it is a warning that careless mine managers might take to heart.

I started to write this article under the idea that I was about to make some profound remarks on the minutiae of mine valuation—about sampling methods, irregular values, ore reserves, and so forth. But after reading Mr. Rickard on "Mine Sampling," Mr. Argall on "Ore Reserves," and other authorities who have lately spoken in this paper, my assurance is not what it was. They have left little loophole for any one coming after.

I have never allowed a sample to be broken down, except in my presence. However much I trusted an assistant, I could only accept the assurance of my eyes that the section in question was fairly represented by the 10, 20 or 50 lb. of ore going into the bag. Soft streaks in the ore generally means richness; hard streaks poverty. The adjustment of the two is a problem which only one's own conscience can satisfy.

I have my assays done in duplicate, especially so when there is a plant on the mine, and I can take my own assayer. If the beads vary only slightly in weight you cannot but feel the more satisfied with the eventual result. At the Chuquitambo Mine in Peru, a conglomerate ore assaying \$5, in four samples out

of five, my duplicate beads used almost to balance; for instance, a series would read: 4.01, 4.02—6.83, 6.85—2.31, 2.31—4.98, 5.00. When there is a big difference it is as well to re-assay the sample—not to take the mean of the two beads. I expect to be sampling a mine in Hungary shortly, where the ore carries tellurides; there I shall have the assays done in triplicate.

The question of high assays is a difficult one. Even Mr. Rickard handled this question gingerly. As he implied, it is one which varies with nearly every mine; it cannot be reduced to definite system. In some mines, but I think very few, the occasional high assay truly represents the nature of the ore. Mr. Rickard's example of the Tomboy Mine, as falling under this heading, is also the one I would suggest. If the fantastic assays at Tomboy were eliminated, the ore would work out at an average recovery of \$4 or \$5—but it is actually double that. At the adjacent Camp Bird Mine, the assays which run into hundreds of dollars, and they occur rather often, are judged in their relation to the assays on each side, and, should those be much lower, are reduced considerably. For example, three following assays going \$52—\$165—\$79, would be entered on to the plan, but in a series reading \$5—\$104—\$11, the middle assay would be drastically cut down. In the Camp Bird there are so many very high assays that this method leaves the management with a something "up its sleeve," but, for accuracy, it is nearer the mark than putting every high sample on to the plan at its theoretical value. On the Rand, at least in my day, exceptional assays were rigidly reduced to something like the general average of the mine. I feel sure this was correct. The collapse of many of the outside Transvaal mines, banket and quartz, may be traced to the fact that their sampling was inefficient, and that their incapable managers had included all high assays at their full value. Mr. Denny has written very well on the subject of sampling on the Rand. This year I sampled a certain mine. I took 75 samples, of which four gave fantastic results, showing coarse gold. The general average without these was unpayable, so I was spared the trouble of even re-sampling at these spots. I included these four samples on the assay plan, giving to each a value four times greater than the general average without them, and thereby raising the general average \$1 a ton. The result, curiously enough, brought the theoretical recovery value of the ore out at the precise figure which some thousands of tons had already yielded in actual treatment.

As Mr. Rickard pointed out, you may either re-sample a rich spot, or you may sample on each side of it, close up, and take the mean of the two. My own idea is that in a low-grade ore, especially one carrying regular values, a high assay is out of place. Even if I resampled such a spot a dozen times, and kept getting higher and higher results, I should still cut it down to the average. In a high-grade ore it would be more natural to find a few big assays, but I would not recommend the purchase of a mine on them; the margin would have to be represented without their assistance.

In figuring out ore reserves a mine valuer has got to take certain risks, for not one mine in fifty changes hands on the basis of net profit in sight. If the ore shoot under valuation is of bigish dimensions, and the lode well defined, I think the engineer is entitled to allow something for "good-will." In such a case I should allow 25 or 30 ft. beyond the face of a drive in good ore; below a single winze I would allow 10 ft., and below two winzes not a great distance apart, 25 ft. A similar margin of risk would hold good at other development points. If the ore shoot was a short one, or a series of short shoots, and the lode of "scraggy" appearance, I do not think I should make any allowance at all. In either case one would be guided by the condition of neighboring mines.

Of course, it were better to be in the position of never taking a risk beyond, let us say, a block of ore exposed on two sides—but, as I have said, mines can rarely be bought on such conditions. The mine

valuer knows that he is liable to error, and that the ore "assumed to exist" may turn out valueless; but if he is an honorable man, whose experience tells him he is justified in taking such risks, I see nothing wrong with the system. If a man is true to himself he is not dealing falsely by his employers.

With the assistance of a good surveyor and draughtsman, and of a reliable assayer, there is no reason why a mine valuer who is very careful, who is practical, who is experienced, and who down in the depth of his heart has confidence in himself, should not arrive at a fairly correct estimate of the intrinsic value of most ore-bodies. But he must be practical. In mine valuation, practice and theory are apt to clash rudely. I once sampled a gold mine which had previously been reported on by one who wrote after his name "Lecturer on Mining." He had fine credentials. This man as a theorist was in the upper ranks of mining, but in practice, as a valuer of mines, I found him, to say the least, eccentric. He satisfied himself with only 13 samples altogether, although the workings were quite extensive, and from the results of these assumed the average value of 60,000 tons of ore. One block of 18,000 tons he valued on a single sample. Across this same spot my own sample gave \$30 less than his, and the rest of the block, from samples taken every few feet, was still poorer. My valuation for the whole mine, from a big number of assays, worked out at one-third of his, and the tonnage at one-third. I do not infer that my own figures were necessarily correct; but those who style themselves "Lecturers on Mining" should realize that mines cannot be summarized in 13 samples, nor 18,000-ton blocks of ore by single assays. This person, I believe, meant well by his report, but nature did not fit him with that practical and active nature necessary to a valuer of mines. As a plumber he might have been a success.

J. H. CURLE.

London, April 25, 1903.

#### THE GEOLOGIST IN PRACTICAL MINING.

The Editor:

Sir.—The letters of Mr. J. E. Spurr and Mr. Philip Argall, in recent numbers of the *JOURNAL*, on the subject of the relation of geology to mining, contain much of interest and value, but neither of these gentlemen appears to consider the question from an entirely just standpoint. Mr. Spurr, defending the mining geologist, contrasts him with the "miner" using, in general, this term to mean the exclusively "practical" man, without theoretical foundation for his education. The relation of the mining engineer to the mining geologist is not brought out. Mr. Argall, in brief, thinks that the mining geologist is of no practical value to mining, though he admits that his theoretical views may advance the science of ore deposits. Throughout his letter a sharp and entirely unwarranted line is drawn between mining engineers and "professional mining geologists."

Some twenty years ago the mining engineer with a thoroughly theoretical and practical education was a somewhat rare specimen as a superintendent of mines. No mine was considered to be on a solid basis unless run by one of the "practical"—preferably Cornish—captains, most excellent and energetic men, and many of them thoroughly competent superintendents, but as a class no doubt lacking that foundation of science which is so absolutely indispensable to the mining engineer. To a great extent these conditions have changed and will change still more. The necessity for a scientific foundation in the education is becoming universally recognized. It is unessential whether this has been obtained in mining school or by self-education. Mining engineers, in the best sense of the word, are now far more commonly than before put in charge of important mines. And most of these men are good mining geologists.

I draw no line between the mining engineer and the mining geologist, though in their highest development each represents a technical or scientific specialization of the ordinary type of the profession. The former must, to some degree, be a geologist, the lat-

ter must have an extensive knowledge of mining, and also, to some extent, of metallurgy. I cannot conceive of a successful mining geologist who is not also a mining engineer. But though the ordinary mining engineer is well schooled in geology, it has been my experience (and here I must differ from Mr. Argall), that he may often be confronted by complicated questions in which his knowledge proves insufficient, and here it is where the specialist, the professional mining geologist, comes to his rescue. Of course, even he may be unable to unravel the tangled skein of phenomena. And these questions more often than not, are related to that most practical subject, the ore-reserves. Nor is it always safe to differentiate the "practical" from the "theoretical" results of the mining geologist. A mere reference to the recently discovered secondary nature of chalcocite suffices to illustrate this.

While it is true that each mining district may have its own minor characteristics, I would not like to say that "no two districts are strictly comparable." It is certainly possible to distinguish frequently recurring types, and the mining geologist, by his more extensive knowledge in this direction, is at a great advantage in operating on deposits of a type perhaps new to the less experienced.

Turning for a moment from the present application of the science to its future, I feel sure that, whatever mining geology may have been in the past, at the present time its main structure cannot be successfully raised higher, except by those who have made it a very important part of their life study.

There is only one field which Mr. Argall concedes to the mining geologist, who, I fear, he pictures to himself as a highly dogmatic, theoretical and academic person. This field is "to describe and to theorize in general." The mining geologist certainly does these things, among others, though I agree with Mr. Spurr, that as a theorizer, he is easily outclassed by the "practical" miner. It is true that to describe—perhaps also to construct theories—is the duty of those who happen to be employed by the government for the purpose of examining mining districts. They are expected, not to act as advisory experts to the various companies in the camps described, but to give a correct account of the districts for the instruction of the engineers, and for the advancement of practical and theoretical mining geology. They stoutly maintain that the reports are of direct practical utility, and feel confident that the mining community, as a whole, puts this valuation on them. I may be permitted to add that the criticism involved in the application by Mr. Argall of the name "obituary notices of great mining camps" to the reports of the Geological Survey is so easily refuted by the examination of a list of publications that its further consideration may be omitted.

But the mining geologists employed by the United States are only few in number. There is a much larger body of men whom Mr. Argall passes over—the great and yearly increasing body of competent mining geologists who direct the workings of many prominent mines. To this class of men—mining engineers with a thorough, up-to-date training in geology, in fact, as Mr. Argall says, "professional mining geologists"—much of the improvement in the art of mining and much of the progress in the science of ore-deposits is due, and I believe that these men will be very much in evidence in the future.

WALDEMAR LINDGREN.

Washington, D. C., April 27, 1903.

#### SECONDARY ENRICHMENT IN ARID REGIONS.

The Editor:

Sir.—The mine which I operate is situated at 7,000 ft. elevation in T. 2 N., R. 3 E., of San Bernardino meridian in Southern California. It comes well within what is known as the arid territory. I thoroughly believe that these ore-deposits have many peculiarities differing from those of humid regions.

The Rose Mine, from the surface to the water-level (600 ft.), and along the strike for 2,000 ft., is a striking example of oxidation with maximum enrichment between the depths of 75 and 500 ft. The zone

of "vadose circulation" (Posepny) here extends a full 650 ft. from the surface; this does not mean that sulphides are entirely absent, for solid nuclei of quartz containing pyrite, chalcopyrite, tetrahedrite, etc., occur within the ore shoot, but otherwise oxidation is very complete, the hematite smelting ore when shipped in car-load lots averaging 60 per cent iron, 6 to 10 per cent insoluble, and 10 oz. gold per ton. About one ton per car (of 10 tons) is pure chalcocite.

The cropping consists of a rose-red iron-stained clay and lime, about 15 ft. wide, which has little or no value, except a portion about 50 ft. in length, where the shoot comes to surface, and here the values are in a high-grade hematite, forming a scale around boulders of limestone. These boulders appear well rounded, as though water-worn, but as they occur throughout the entire depth, I cannot think that such is the case. Although the hematite scale carries 10 oz. gold per ton, an average of 10 ft. of outcrop along the shoot will not assay better than ½ oz. gold per ton. The ores sufficiently rich to be profitably mined are found at 75 ft. in depth. They occur in a shoot having a pitch westward, along an east and west vein. The maximum enrichment, both as to value and width, occurs between 300 and 500 ft. from the surface. Below the zone the values decrease rapidly to water-level. The gradation from hematite to sulphides is clearly evident, and it coincides with the falling off in the richness of the ore. There is one exception, however; at about 540 ft., a body of massive pyrite and chalcopyrite, amounting to several car-loads, assayed 25 oz. gold per ton. At 600 ft. the lode is 80 ft. wide, stained with hematite and filled with disseminated pyrite. The gold values are very low, and no high-value samples are obtainable.

So much for oxidation. The vein itself consists of an altered dike of granite traversing limestone; at no place in the vadose zone is the dike more than 25 ft. wide. Sometimes it is pinched to one foot, it averages about 10 ft., and stands almost vertically.

The ore has been formed by replacement of the soluble portions of the granite and the limestone. The unaltered granite dike is very plain in places, where nicely polished marble walls show movement, but no ore. These conditions are encountered in stopping, but such ground is avoided. The ore may make on either wall, even far into the lime, wholly or partially replacing the country rock. Sometimes the whole dike is altered, leaving many by-products. Ore does not always result from the alteration of the dike, the feldspar may be thoroughly kaolinized and even have the characteristic red hematite stain, and yet lack gold values; however, it is safe enough to mine by the candlestick test, according to which "everything which marks red is ore." When solid high-grade hematite is present, then all the surrounding red-stained material is good mill-ore. Needless to say, the largest percentage of the mill-ore is composed of red china-clay and lime; the quartz, mica, and the alkaline portion of the feldspar having been dissolved. Copper plays an important part, for it invariably accompanies the gold values. When chalcocite decreases, solid hematite decreases, when malachite ceases to be scattered through the mill-ore, the gold values are low. As the property is equipped with a 100-ton cyanide mill, the cyanider can see that with the difficulties of copper carbonate, clay slimes and acid ore, the crushing is likely to be ahead of the leaching capacity.

To account for the granite dike one is forced to the magmatic theory, the initial intrusion of the granite by volcanic agency, then the ascending mineralizing solution finding its way along the contacts and depositing values depending upon the mechanical and chemical condition of the dike and limestone. It is a notable feature that where the walls are good, no ore deposition has taken place, and this occurs generally when the dike is comparatively small, but where the dike is large and the limestone walls are much broken the red clay is filled with pebbles of lime and nicely rounded boulders, the whole enclosing masses of hematite and stringers of

chalcocite. The entire vein-filling or mineralized dike is damp and soft, augers being largely used for drilling, but as this dampness dries out the ground caves badly. It is probably this moisture, with plenty of air, which is responsible for the complete and deep oxidation.

H. B. STARBIRD.

Victor, California, April 25, 1903.

#### THE BESSEMER MEMORIAL FUND.

We are requested to announce that a representative committee has been formed for the purpose of raising a memorial to the late Sir Henry Bessemer. The phenomenal industrial development of the world in recent years is largely due to the metallurgical process which bears the name of Bessemer, and it has long been felt that his life's work should be suitably commemorated in the center of the British Empire. The objects of the memorial are as follows:

1. The erection, and if necessary the endowment, of metallurgical teaching and research works in connection with the University of London, equipped for the testing of ores and metallurgical products by modern methods, and for the investigation of new methods and processes.

2. The foundation of international scholarships for post-graduate courses in practical work in connection with proposals of the Institution of Mining and Metallurgy, now under the consideration of the Board of Education.

The committee includes leading representatives of the metallurgical, engineering and mining industries and professions, and of education authorities. Prof. Henry M. Howe, of Columbia University, New York, has been requested to act as representative of the committee in the United States.

A meeting to inaugurate the fund will be held at the Mansion House, London, on Monday, June 29 next, under the presidency of the Lord Mayor. All communications should be addressed to the "Secretary Bessemer Memorial Fund, Salisbury House, London, E. C."

The list of the committee appointed at a meeting held April 23, 1903, is as follows: Chairman, Sir William H. Preece (Chairman of the Society of Arts). Trustees, Sir Francis Mowatt (Permanent Secretary to the Treasury), Julius Wernher (Messrs. Wernher, Beit & Co.). Secretary, Charles McDermid (Secretary of the Institution of Mining and Metallurgy). Other members are Sir W. de W. Abney, Col. Charles Allen, Sir William H. Bailey, Sir John Wolfe Barry, Sir Stuart C. Bailey, Maj. Gen. Sir Owen Tudor Burne, Sir Edwin Durning-Lawrence, Sir Christopher Furness, Dr. C. Le Neve Foster, Right Hon. R. B. Haldane, Prof. A. K. Huntington, Alfred James, Hennen Jennings, Walter McDermott, Edward P. Martin, C. Algernon Moreng, Richard Price-Williams, Sir Arthur Rucker (Principal of the University of London), The Vice-Chancellor of the University of London, Sir Marcus Samuel (Lord Mayor of London), Lord Strathcona, Sir H. Truman Wood and Sir Thomas Wrightson.

**UTILIZING BLAST-FURNACE GASES.**—Messrs. Breitfeld, Danek & Co., of Prague, Bohemia, have recently completed a 300-h.p. blast-furnace gas engine, on the Delamare-Deboutteville system, for the works of the Bohemian Mining Company at Königshof.

**UTILIZING PEAT IN IRELAND.**—The London *Colliery Guardian* says: "It is stated that documents have been signed at Banagher, Ireland, for the purchase of several thousand acres of bog and lands for the erection of peat factories, situated on the Grand Canal, and possessing many advantages as to water power from the Shannon and another river. The new industry will be worked by a syndicate now being formed in London. It is expected, apart from the manufacture of fuel and peat moss litter, a trade will be done in the by-products obtained from the peat, in the manufacture of which valuable rights have been acquired."

#### THE LATEST MONTANA MINING DECISION.

By DR. R. W. RAYMOND.

The ENGINEERING AND MINING JOURNAL of January 17, 1903, published a decision rendered by the Montana Supreme Court in December, 1902, in the "Pennsylvania" case. On April 17 the Court, after a re-hearing, adhered to one branch of that decision, and modified another. The portion covering this modification is published in another column, together with an illustrative diagram.

Referring to this diagram, and, for convenience, calling the plaintiff (Montana Ore-Purchasing Company) A, and the defendant (Boston & Montana Company) B, I may briefly state as follows this change in the Supreme Court's decision:

In December the court held that the limits of A's extralateral rights towards the west should be vertical planes, parallel to the line LM, and drawn through the points at which the different veins concerned passed through the line EF.

In April, it holds that A's extralateral rights should be bounded by "vertical planes in the direction of the line FE to the point E, and thence in the direction of the line EQ extended." Only one plane can satisfy these conditions; and hence one boundary is thus fixed for every one of the different veins, irrespective of the point where its apex crosses FE or Eu, or ceases to exist before reaching either of these lines.

The December decision was based in this particular on the effect of certain deeds in conveying to A's predecessors in title that part of the Rarus claim included in the Johnstown, east of the line AFE—i. e., the surface ABCDEF. As to the question, what extralateral rights went with this grant of surface, the court held that, being a conveyance of mining ground, it carried whatever extralateral rights the grantors possessed under the title conveyed; and that these rights being controlled east and west by the direction of the Johnstown end-lines (B C, and the parallel western end line), the portion thereof conveyed by the deeds must be bounded by a plane through B C on the east, and on the west by a parallel plane drawn through the points where the several apexes departed from the surface granted. This is exactly what the Johnstown owners would themselves have possessed, if, in applying for patent they had disclaimed all that part of the surface covered by their location lines except ABCDEF. In that case ("imaginary boundaries," located simply to make a proper location with parallel end lines, having been legalized by the United States Supreme Court), the end line B C would have fixed the direction of the extralateral end boundaries.

It should be borne in mind (a) that any rights of A otherwise derived—as through the lines of the Rarus or any other location—are not here in question, the only question being what A received through the deeds aforesaid; and (b) that the fact that the grantors in these deeds had all the extralateral rights of the Johnstown to dispose of, if they saw fit to do so, and could have deeded away, without wrong to anybody else, everything of that nature between the boundary planes drawn through their own end lines, is equally irrelevant. The December decision deals with their grant as the sole source of the title it confirms; it interprets that grant (in the absence of explicit definitions or reservations as to extralateral rights) as any such instrument should be construed under the common law, according to the necessarily implied intent of the grantor and the mutual understanding of the parties.

From this standpoint, it seems to me, the December decision was clearly reasonable and just. Moreover, it embodied a rule as to the effect of a deed conveying in general terms a segregated portion of a mining claim, which can easily be applied in all such cases; while, on the other hand, if the grantor in such a deed desires to limit or extend the extralateral rights thereby conveyed, he can easily do so, by special descriptions or reservations, stated in the instrument itself.

The principle that when a grantor of mining

ground held under the United States mining law does not explicitly reserve extralateral rights, he should be deemed to convey them, is sound; and the further principle that the rights thus implicitly, not explicitly, conveyed should not include any rights not derived through the possession by the grantor of the precise surface granted, is obviously just.

Now the rights of a mining claim do not depend upon the knowledge of the locator as to the dip of the located vein, or of any other veins legally covered by the location. The *course* of the apex of the located vein may control his rights on that and on all other included veins; but any mistake on his part as to its *dip* has no effect upon his extralateral rights except to determine in which direction they lie. Certainly, so long as a vein is pursuing its downward course into the earth, the direction of that downward course does not at any stage of title, before or after the issue of patent, or at, before or after conveyance of title to others, affect the nature or the longitudinal extent of the extralateral right, as regards other mineral lands or mining claims. It seems to me that, if the patent of the United States is not affected by this feature, the deed of a grantee of the United States should be similarly independent of it.

But the April decision in this case abandons this safe, plain principle, and fixes one extralateral boundary plane for all veins claimed by A under the deed, namely, a plane through E, the extreme western point of the grant.

It is only fair to note that, on this re-hearing, A contended that the boundary plane of the extralateral rights conveyed should be drawn through F E. There is something to be said in favor of that contention; for F E is parallel with the end line, T U, of the Rarus claim; and it might be plausibly argued that a deed from the Johnstown owners for a portion of the Rarus surface in interference between the two locations, should be construed as yielding to the latter whatever it could legally claim by reason of the surface grant. And, if the Rarus location had validly covered, without any interference whatever, the area A T U E F, its extralateral rights would have been undoubtedly controlled by the direction of the parallel lines T U and F E; and a plane through F E would have been their proper western limit.

But, so far as the title conveyed by the Johnstown owners is concerned, they could not be held to have given by *implication* more than they had to give by reason of the surface they conveyed. The claim of their grantees for anything more than that must rest on some other foundation. In a deed conveying to the grantee a certain defined piece of real estate with all its appurtenances, the further declaration, "together with all further rights which may hereafter be proved to belong to the said grantee through title not derived from this grantor," would really convey nothing additional. Hence, whatever claim A had in this case to a boundary plane through F E, could not fairly accrue through the implied meaning of the Johnstown deed. The court, in fact, denied in December, and still denies, this contention of A (which the court below had upheld), but chiefly on the ground that it would involve the grant, by the Johnstown owners, of too much—namely, of the greater part of the extralateral right of their whole location—a poor reason, I think, for a sound conclusion.

But the April decision proceeds to decree the new, single and common western boundary plane through E Q for A's extralateral rights, on the ground that its December rule was made under the impression that, at the time of the execution of the decisive deeds, the dip of the Johnstown discovery vein was not known; and that, under this impression, the court overlooked certain evidence in the record, indicating that this dip was at that time known to both parties to be southward. In view of that evidence (accepted as conclusive, because relating to the facts decided by the trial below, and not to be reopened on appeal), the court reaches the new conclusion that the Johnstown grantors intended by

their deed "to convey all of the vein extralaterally east of a vertical plane in the direction of the line E Q."

This reasoning, I confess, I do not perfectly understand. If the intention of the Johnstown grantors was to convey all their extralateral rights up to a plane through E Q, parallel with B G', why did they not draw the line E F through E in *that direction*? If the deed of a given area within a mining claim carries implied extralateral rights, are not those implications *somehow* related to the surface boundaries of the said area? If so, what does the line E F mean? Does it cut off surface rights only, and not the extralateral rights appurtenant thereto? In other words, can a deed granting surface rights only be held to convey by implication extralateral rights not appurtenant thereto?

What has "a knowledge of the dip" to do with the legal construction of a mining deed, which does not mention the dip, and only constructively conveys certain rights upon it, whichever way it may go?

But the court's recognition of this new element does not go beyond the Johnstown discovery vein. Of other included veins, the knowledge of the dip was not then, or may not be now, "known." The extralateral right on such other veins has been plainly restricted, I think, by repeated decisions of the United States Supreme Court, to such longitudinal extent as their apexes may have within the location. In a perfectly normal and valid location, the two parallel end lines of which are crossed by the apex of the discovery lode, the direction of these end lines fixes the direction of the extralateral dip right for every other lode, the apex of which is under the surface located; but the extralateral rights upon such lodes are limited in longitudinal extent by vertical planes, parallel with the said end lines, passing through the points where each of the said apexes departs from the ground covered by the location. The extent of such rights upon one lode does not imply, under the same location title, similar rights to an equal extent, horizontally and longitudinally, upon any other lode. The extralateral right accruing to every lode apex within a location is bounded by the length of the said apex within the location—whether it be the discovery lode or another. This I understand to be the law as to the mining grants and patents of the United States. Is there another rule for its grantees when they become in turn grantors?

The April decision seems to recognize this difficulty, and presents a curious argument to meet it. The diagram shows three apexes as crossing the west boundary line E F A, namely, the "north connecting vein," crossing at F, the "Discovery" vein crossing at L, and the "South" vein, crossing E F between the other two. For all these, and any others not shown, the April decision fixes as the western boundary of the extralateral rights a vertical plane through E Q. Its argument as to the discovery lode is that the grantors meant to convey all rights on that lode as far west as E. As to the other lodes, it says:

"The portion of the veins cut off by the vertical plane along the line F E thereby became a conventional apex for the portion of the veins between the point E and the points at which they respectively cross the line F E."

This somewhat obscure statement I take, after considerable study, to mean that a plane through F E, intersecting underground the veins referred to, created at its intersection a "conventional apex," destroying the rights of the real apex on the surface. Can a "conventional apex" (whatever that may mean) be created by implication and then clothed with extralateral rights? Can any secondary grant of United States mining title convey by implication apex rights which the primary grant could not convey, and which have no corresponding apex, except a "conventional" one?

This proposition may be tested in another way, to explain which I have introduced into the diagram the dotted line B B'. If the Johnstown deed here in question had conveyed B B' C, instead of

A B C D E F, the principle laid down in the April decision would have made the deed convey *all* the extralateral rights of *all* the lodes concerned between B C and the parallel line B' B', though it would have conveyed, on the surface, only a small part of the Johnstown claim. In that case, however, the court would have said, as it says in its April decision of A's claim to F K as a boundary, that such a construction would not, in its judgment, be fair, because it would give too much. Such reasoning is kindly and merciful, and may save B from greater loss than it imposes upon him. But, however benevolent or beneficent in settling the controversy between A and B, it is not very useful to the rest of the alphabet, i. e., to other applicants for justice at the hands of courts, who regard these tribunals as established to remedy legal wrongs, not hardships, and to lay down rules of construction which do not involve considerations of judicial sympathy.

The court justifies its present conclusion by the statement that "in view of the surrounding circumstances this seems to be the most equitable solution of the very difficult problem presented." No doubt the general problem involved in this litigation was difficult. I confess that I have at present no opinion concerning either the law or the equity of the original controversy. But many elements of complication were cleared away by Judge Clancy in the Montana district court, and the Montana Supreme Court, both in December and in April, accepted his findings of fact as equivalent to a jury verdict, and declined to review them. The particular problem thus left for solution was not so very difficult. It was simply the proper construction of the terms of a deed conveying, without definite grants or reservations as to particular apex or vein rights, a segregated portion of a mining claim. The April solution of this problem, I am sorry to say, throws no light upon it. The court seems to have considered itself to be rather an industrial "arbitration commission" than a tribunal for the interpretation and application of the law. It appears to have thought that, as between the contentions of two opposing parties, wisdom consisted in the display of impartiality by disappointing both, and devising a *tertium quid*, not called for by either, and founded rather in the court's judgment of what, "under the surrounding circumstances," would be "equitable," than upon any principle applicable to other circumstances. Whether its latest decision be, in this sense, "equitable" or not, I am obliged to say that, as an answer to the important legal questions involved, it exhibits neither force nor clearness nor applicability to other cases.

While I frankly admit that, in the construction of a written contract, a court may seek for the mutual intent and understanding of the parties as a guide to the interpretation of the instrument, I think that this principle of the common law cannot properly be extended to cover anything directly contrary to the explicit terms or the strictly legal implications of the instrument itself. If a party has deeded away more or less than he intended, the correction of that mistake is legally possible through a separate proceeding, but I hardly think it can be permitted in the way of a collateral attack upon the deed in another proceeding, in which it is offered as evidence of a link in the chain of title. This is such a case; and the court has practically decided that the grantors in such a deed conveyed by the text of his grant less than they meant to give, their intention being inferred by the court (not declared by them) from the possession by them of certain knowledge, namely, as to the probable dip of one vein. This fact, whether absolutely known or erroneously supposed, was not mentioned in the deed, and does not affect the legal construction of its terms. If the said dip had been north instead of south, there would be no reason for changing the lines of the surface grant conveyed, or their legal effect extralaterally.

In short, A and B, both of whom are grantees of the original parties, and base their claims of right upon written conveyances many years old, ought to have respectively whatever those conveyances cover

by legal construction. The opinion of a kindly tribunal as to what would be fair under the circumstances adds nothing to that clear knowledge of the United States mining law, and of its application to individual controversies, for which the whole mining community continues to yearn.

#### THE LATEST DECISION OF THE MONTANA SUPREME COURT IN THE PENNSYLVANIA CASE.

A report of the December decision of this court in this case was published by us January 17, 1903. A re-hearing having been granted, and held in March, the court rendered, April 2, 1903, a modified decision. On the first point involved, namely, the right of the defendant to a jury trial in the lower court, the decision of December was reaffirmed. As that question is simply one of equity practice under Montana statutes, we omit here that portion of the new opinion which re-states and defends the former decision.

Its practical effect is, that the facts, as found in the State District Court by Judge Clancy, sitting without a jury, are accepted by the State Supreme Court to the same extent as if found by the verdict of a jury. However this may affect the rights of the parties to the litigation, it greatly simplifies the case before the Supreme Court, and warrants the interpretation of its decision as based upon facts already settled beyond dispute.

The remainder of the new decision, delivered April 2 by Chief Justice Brantley (associate Justices Geo. R. Milburn and W. L. Holloway concurring) is as follows:

In their brief accompanying the motion for a re-hearing counsel for the plaintiffs criticise the following portion of the former opinion: "In our opinion, the decree should be modified so as to fix the west end planes in the direction of the lines L. M. and F. N., at the points where the different veins pass through the line E. F.; the plaintiff conceding that this is proper, if upon a construction of the deeds this court concludes that the trial court erred in fixing the west end plane in the direction of the line E. F." They say that the court therein erroneously made them concede something which they in fact did not. Upon a re-examination of the briefs we find no specific statement to justify the use of the language employed by this court. The court was perhaps misled by some suggestion made during the oral argument. We are, therefore, pleased to make the correction suggested by the criticism. The absence of the concession, however, does not relieve the difficulty of solving the question as to the correct position of the west boundary line limiting the extralateral rights of the plaintiff beneath the surface of the Pennsylvania claim. The plaintiff insists that this court is bound by the judgment of the district court in this connection, because if the court did not expressly find the facts warranting the construction given the deed to the conveyed portion, yet under the doctrine of implied findings which prevails in this State (*Yellowstone National Bank v. Gagnon*, 25 Mont. 268), it must be presumed that the district court found the facts; and in the absence of an effective attack upon the findings, either express or implied, we cannot review the conclusion of the court thereon. In this we do not agree with counsel. We shall not discuss the question of practice presented in this connection, but pass them with the remark that there are in the record of the evidence no facts warranting a finding upon which the court could construe the deed as it did. The effect to be given to this deed presents a question of law. The court could look to the facts surrounding its execution to aid it in arriving at a just and correct conclusion, but the conclusion so reached is not necessarily binding upon this court, especially so, since the facts surrounding the execution of the deed are not controverted.

The facts apparent from the record to which counsel say we failed to give due weight in our consideration of the case are the following: That the Rarus claim was located October 2, 1878, entered for patent September 2, 1883, and patented June 25, 1884; that the Johnstown claim was located January 24, 1879, entered for patent September 1, 1883, and patented November 15, 1884; that on March 7, 1883, the owners of the Johnstown gave the deed to the conveyed portion; that at the same time the same persons who are also the owners of the Pennsylvania claim, gave a deed to the small triangle in conflict between the Rarus and Pennsylvania claims; that the discovery shaft of the Johnstown was within the limits of the Rarus claim and that at the time the deed was executed the owners of both these



claims knew that the discovery vein of the Johnstown dipped to the south. It follows, they say, that the location of the Johnstown was void, and therefore that, as the patent to the Rarus excluded all the area in conflict between that claim and the Johnstown as located, the inference is conclusive that there was a compromise between the parties by which the owners of the Rarus were to have extralateral rights upon the Johnstown vein bounded by the vertical plane of the line F. E. (see diagram) extended in its own direction. This theory is plausible, but cannot, we think, be sustained. The Johnstown claim was patented as the Johnstown claim. Such rights as appertain to it extralaterally came through that patent. The extralateral rights conveyed by its owners were such as were obtained through their patent. While it was competent for them to convey all rights so obtained, they cannot be held to have conveyed any more of them than were expressly granted under the terms of their deed, or such as, looking to the nature of the property they were dealing with, and the surrounding circumstances, must, by necessary implication have also been included. All of these facts, save those showing knowledge in the parties as to the direction of the dip of the vein, were fully considered in arriving at the construction given the deeds to the conveyed

rights of the grantees should extend along the strike of the veins conveyed, and that they should have all the rights thereon extralaterally which the grantors had. The portion of the veins cut off by the vertical plane along the line F. E. thereby became a conventional apex for the portion of the veins between the point E. and the points at which they respectively cross the line F. E. In view of the surrounding circumstances this seems to be the most equitable solution of the very difficult question presented. The theory of the plaintiff, besides requiring speculative reasons to support it, would also lead to the result that their grantors, in order to avoid complications in the proceedings instituted to secure the patent to the Johnstown claim, actually granted away substantially all their extralateral rights, because it is apparent that if the vertical plane off the line F. E. extended should be taken as the boundary between the parties as to their extralateral rights, the defendant would have nothing left except the portions of the veins intercepted by that plane and one passing downward through the west end line of the Johnstown claim. While we think the conclusion reached in the original opinion is correct upon the facts that were then presented, the judgment should be modified to meet the inferences deducible from the facts as they actually exist.

THE COPPER DEPOSITS OF CLIFTON, ARIZONA.\*

BY WALDEMAR LINDGREN.

*Introductory.*—The Clifton mines were discovered in 1872, but owing to adverse conditions, such as the want of railroad communications, the district did not attain early prominence. During late years the production has been increasing rapidly, by reason of the discovery of large bodies of low-grade ore adapted to concentration. During the last ten years the Clifton District has, in point of production, ranked third among the copper districts of Arizona, being exceeded only by the United Verde and by Bisbee. The production attained 38,000,000 lb. of copper in 1901. During that year the sequence became reversed, Bisbee leading with 39,800,000, followed by Clifton with 38,000,000, and United Verde with 34,500,000 lb. It is believed that a still further increase took place in 1902, although complete statistics are not as yet available. The production of Arizona is at present a little more than one-fifth of the total production of the United States.

Three large companies at Clifton are smelting copper on an extensive scale. These are (1) the Arizona Copper Company, having mines at Metcalf and Morenci, a few miles northwest of Clifton, and a smelter located at Clifton. The production of this company in 1901 was 20,500,000 lb.; (2) the Detroit Copper Company having its mines and smelting works at Morenci. In 1901 the production of the company was 17,500,000 lb.; (3) the Shannon Copper Company having mines at Metcalf and smelting works a short distance below the town of Clifton. This company began operations on a large scale in 1902, and started its furnaces in May of that year.

Besides these companies there are a number of smaller mines and prospects, the production of which is relatively unimportant.

*Topography.*—Clifton is situated on the San Francisco River near the point where the older rocks emerge from Pleistocene terraces, and has an elevation of 3,465 ft. At Clifton the San Francisco River is joined from the west by Chase Creek, a ten-mile long water-course flowing in a S.-S.-E. direction, most of the way through a deeply cut canyon. An irregular and high complex of mountains rises between the San Francisco River and Chase Creek, the most prominent of which is Copper King Mountain, attaining 6,825 ft. On the west side of Chase Creek the high ridges reach elevations of up to 7,400 ft., the highest point being the flat topped mass of Coronado Mountain. The town of Metcalf is situated on Chase Creek, 6 miles N.-N.-W. of Clifton, while Morenci is 4 miles distant in a northwesterly direction from the same place, but located high up in the hills, 1,000 ft. above Chase Creek.

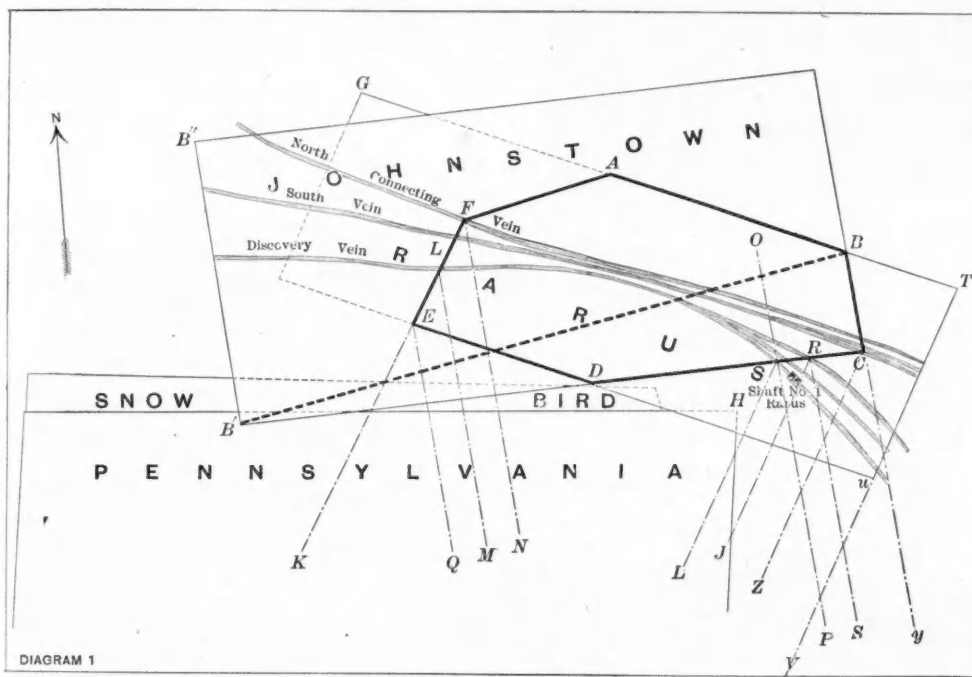
*General Geology.*—An old Pleistocene gravel plateau extends northward from the Gila River to near Clifton and Morenci. The older rocks, rising above this plateau, are largely of volcanic origin and Tertiary age. The whole region north of the Gila River, for a distance of at least 100 miles northward, is covered with very heavy flows of basalt and rhyolite. It is, in fact, the southern edge of the great volcanic plateau of eastern Arizona.

Near Clifton original high elevation and extensive subsequent erosion have combined in forming an exposure of pre-Tertiary rocks, consisting of granite, porphyry, quartzite and limestone. Thus the Clifton area may be considered as a small island, about 12 by 8 miles in extent, surrounded by vast lava flows.

The oldest rock, and that which occupies the largest area, is granite of evidently pre-Cambrian age. It forms the great mass of Coronado Mountain, and the larger part of the precipitous complex of mountains between Chase Creek and San Francisco River.

On the irregular surface of this granite rests a sedimentary series of Paleozoic age, the lower part consisting of 200 ft. of quartzite. Immediately overlying the granite is a thickness of up to 50 ft. of coarse quartzite conglomerate. This quartzite, in

\* Abstract from advance sheets of "Copper Deposits at Clifton, Arizona," by W. Lindgren. By permission of the Director of the United States Geological Survey.



portion; and though we have taken them in connection with the fact of the knowledge of the dip, which latter was not called to our attention at the first hearing, we do not think there is any foundation in the record to support the claim of plaintiff that under the deed of March 7, 1883, the grantors intended to convey the vein extralaterally in the direction of the line E. F. extended, as the district court held. This solution of the question presented would rest upon a speculative conclusion as to what the purpose of the parties was in the transaction connected with the patent proceedings. The knowledge of the parties of the direction of the dip of the vein, however, taken in connection with the transactions surrounding the application for patent, supports the theory that the grantors by that deed intended to convey to plaintiff all of the vein extralaterally east of a vertical plane in the direction of the line E. Q. The deed clearly included all of the parts of the veins embraced within the boundaries of the conveyed portion. When the original opinion was prepared we proceeded upon the presumption that the record contained no facts tending to show that the parties knew the direction of the dip of the veins, and hence, there being manifested by the terms of the deed and attendant circumstances an intention to convey extralateral rights, that the extent of these should not be left to depend upon the mere accident of the direction of the dip. We, therefore, adopted the theory that the most equitable solution of the matter was to fix the boundaries extralaterally by vertical planes passing in the direction of the lines F. N. and L. M. It appears, however, that at the time surveys were made for patent for the Johnstown and Rarus claims, some development work had been done upon the discovery vein, and that it was shown to have a dip to the south. This fact, taken in connection with the other circumstances stated, we think justifies the conclusion that the line F. E. was fixed by the parties as the utmost limit to which the

The order denying a new trial is therefore affirmed. The cause is remanded with directions that the district court modify the decree by disallowing the items of costs complained of, and by limiting the extralateral rights of the plaintiff by vertical planes in the direction of the line F. E. to the point E., and thence in the direction of the line E. Q. extended. When so modified the decree will be affirmed.

**CONTOUR MAP OF ALASKA.**—A new map of Alaska on a scale of 40 miles to the inch has just been completed by the United States Geological Survey. It is the first contour map of Alaska yet made, the relief being shown by contour lines representing vertical intervals of 1,000 ft. In the construction of this map, which was prepared by E. C. Barnard, topographer, all available information was used. The maps of the United States Coast and Geodetic Survey, covering southeastern Alaska and the coast, were extensively utilized. Within the coast line the map is based principally on surveys and reconnaissance maps made by the Geological Survey. Other sources of information were the maps of the Army, the Navy, the Revenue Marine Service, and the British Government. After all the authoritative data had been used there still remained large areas where the topographic features had to be based upon such general information as could be obtained. The map will be printed in colors, the streams, lakes and glaciers being shown in blue, the cultural features in black, and the contour lines in brown.

which no fossils have been found, is probably of Cambrian age.

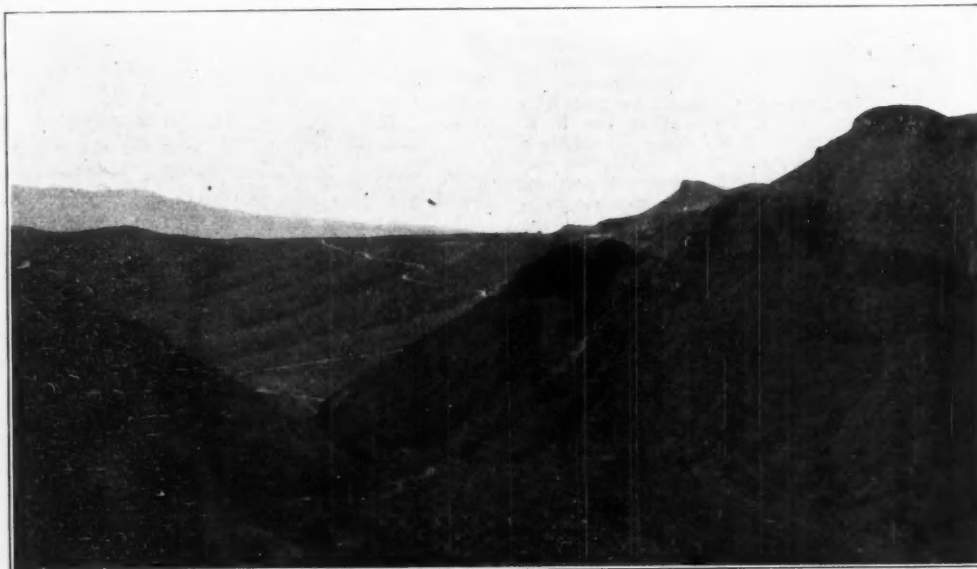
The quartzite is covered by 800 ft. of limestone, the lower part of which belongs to the Silurian period, the middle part to the Devonian, and the upper 100 ft. to the Lower Carboniferous period. Beginning from the base, the limestones gradually be-

elevated in dome-like shape and then fractured in a most extensive manner.

The main faults extend in an E.-W. or NE.-SW. direction. Faults having a throw of over 1,000 ft. are common, and in the Paleozoic series, where conditions are favorable for deciphering the structure, as, for instance, near Morenci, the complication is

by the erosion which has actively removed large masses of these early Pleistocene gravels and deepened the canyons to the level which they had attained before the volcanic eruptions.

*Ore Deposits.*—There is no evidence of ore having been formed in this region before the intrusion of porphyry. This event appears to have had an intimate connection with the origin of all of the copper deposits. Wherever the porphyry came into contact with the granite or the quartzite, but little alteration is observed. But wherever we find the porphyry bordering against the limestones or the shales of the Paleozoic series, very extensive contact metamorphism occurred, accompanied by the formation of masses of garnet and epidote. This alteration is emphasized at Morenci. The whole Paleozoic series is affected, but more particularly the pure limestone of the lower Carboniferous, which, for a distance of several hundred feet from the contact has been converted into an almost solid mass of garnet. The shales have suffered less from this metamorphism, but wherever they are near the porphyry they contain epidote and other minerals. This metamorphism does not only appear at the contact of the main mass of porphyry forming the southern slope of Copper Mountain, but also in the hills between Morenci and the Longfellow Mine, in which dikes have produced contact metamorphic minerals along their sides. Wherever alteration does not mask the phenomena, magnetite, pyrite, chalcopyrite and zincblende accompany the contact metamorphic minerals, and are intergrown with them in such a way that the contact metamorphic origin of these ores appears beyond doubt. In many places the ores have accumulated along certain horizons in the sedimentary series, evidently more suitable than others to those processes of alteration which produced the deposits. The origin of these contact metamorphic deposits is conceived to be in the water and metallic substances which were originally contained in the magma of the porphyry, and which were released by decreasing



FOOT-HILLS BETWEEN CLIFTON AND MORENCI.

(Pleistocene gravel hills to the left. Cambrian quartzite and Silurian limestone to the right.)

come poorer, and the top stratum, well exposed at Morenci, is almost entirely pure carbonate of lime. Within the Devonian part of the series about 100 ft. of clay is intercalated in the limestones.

A large mass of porphyry running out at various points into complicated dike systems, has been intruded into these rocks, granites as well as quartzites and limestones, and this porphyry seems most intimately connected with the origin of the ore. It varies in character. The prevailing rock near Morenci is intermediate between a granite-porphyry and a diorite-porphyry, but at some points diorite-porphyrines of typical character also occur. The porphyry at Metcalf is more acidic and contains large quartz crystals, but probably the same body as the Morenci porphyry.

At the Coronado Mine and other places in that vicinity, small dikes of diabase occur.

*Geological Structure.*—The structure of the pre-Tertiary rocks is complicated by extensive faulting. In few places only does this faulting affect the covering basalt and rhyolite, from which it is to be concluded that the main epoch of disturbance antedates the volcanic eruptions of the Tertiary period. The history of the Paleozoic period in this region is evidently one of quiescence and deposition, and it is believed that undisturbed deposition continued through the larger part of the Cretaceous period. The intrusion of porphyry took place during the late Cretaceous or the earliest Tertiary, for we find bodies of that rock intruded into Cretaceous sediments as well as in older rocks. In many places this intrusion was accompanied by a great disturbance, fracturing and shattering of the sedimentary series into which it was intruded. The important ore depositions were formed during, and a short time after, this intrusion of porphyry. Alteration gradually changing and often enriching these ore-deposits has, however, continued from their deposition to the present time.

The deposition of the ores was followed by extensive fracturing and faulting, affecting, as already mentioned, all of the rocks in the district excepting the younger lavas.

From the form of the remaining patches of quartzite, it would seem as if the surface of the granite and the whole overlying series had been buckled, perhaps

particularly apparent. Among more important faults may be mentioned that at the Coronado mine, where the south side is dropped 1,000 ft., and that cutting across Chase Creek east of Morenci, where again the Paleozoic series has been dropped 1,500 ft. or more.



SHANNON MOUNTAIN, AS SEEN FROM METCALF.

(Metcalf inclines and open-cuts. Shannon Tunnel in center background. Foreground is Porphyry. Darker background consists of contact-metamorphosed sediments.)

An extensive erosion, resulting in an accentuated surface, followed these disturbances. Then, probably in the latter part of the Tertiary period, the whole region was flooded by rhyolites and basalts. Following this, in the early part of the Pleistocene, the level of the Gila River became greatly raised by accumulations of detrital material, and the foothills of the mountain complex were buried up to an elevation of 4,500 ft.

The last phase in the geological history is marked

pressure at the time of the intrusion of the rock into higher levels of the earth's crust. We may thus speak of these deposits as contemporaneous with the cooling and solidification of the porphyry.

As to form, the ore deposits in limestone are often irregular, but more frequently perhaps they assume a tabular shape due to the accumulation of the minerals along certain planes of stratification.

Oxidizing waters have greatly altered the deposits in limestone. The sulphides have been converted

into carbonates, so that malachite and azurite are the most common ores. Cuprite also occurs extensively and seems to form, by preference, in the shale constituting part of the Devonian series. Chalcocite and other sulphides are almost absent. The zinc-blende has been carried away as sulphate of zinc, which is frequently found in efflorescence upon the walls of the tunnels. The magnetite and the garnet which originally formed a part of these deposits have also undergone decomposition, the resulting minerals being silica and limonite.

The celebrated Longfellow Mine is worked on one of these deposits occurring as, roughly speaking, a funnel-shaped mass in the lower Silurian limestone between two large porphyry dikes. Going further west along the main porphyry contact, the Montezuma is then encountered, and further on, the Detroit and the Manganese Blue mines. Both of the latter mines followed several tabular ore-bodies, occurring in horizons varying from Silurian to the Lower Carboniferous. All of these deposits are now

of the porphyry. In lower levels the veins consist of pyrite, chalcopyrite and zinc-blende, magnetite being conspicuously absent. At the surface many of the veins have been completely leached, and now show nothing but limonite and silicified porphyry. This rule is, however, not a general one, as, especially in porphyry, oxidized ores are sometimes found in the outcrops of the deposits.

The most important vein system is that which, under the general name of the Humboldt vein, extends from northeast to southwest through Copper Mountain at Morenci. The outcrops of this vein are practically barren, but at the depth of about 200 ft. the deposit becomes productive and contains chalcocite associated with pyrite. There are usually one or more central seams of massive chalcocite, some of which are fairly persistent. These seams are ordinarily adjoined by decomposed porphyry, now consisting chiefly of sericite and quartz, together with pyrite and chalcocite. These extensive impregnations of the country rock are not always confined by

Along many of these movement and fissuring have taken place, and a varying amount of copper ores has been encountered. The veins contain comparatively little gangue, the copper minerals being chiefly distributed through the porphyry or through the granite adjoining the dike. At the surface a small amount of carbonates may be found, but they change at slight depth, sometimes only a few feet from the surface, into an ore composed of chalcocite and pyrite, which still further down appears to change into pyrite and chalcopyrite. The most prominent deposit on this system of veins is the Copper King Mine, which is situated only a few hundred feet below the summit of the mountain of the same name. The main mass of porphyry between Morenci and Metcalf shows evidence of very strong mineralization throughout. A great number of fissure veins have been encountered in it, although many of them are neither persistent nor strong. Close to the surface the ores are apt to spread through a considerable mass of rock, and in some cases important bodies of chalcocite, due to secondary deposition on pyrite from solutions containing copper, have resulted.

The granite adjoining this porphyry is sometimes also thoroughly altered and impregnated with pyrite and chalcopyrite. This may be seen in the narrow canyons of Chase Creek for one mile above Longfellow Incline. While a number of more or less well defined veins have been opened here, the results have not been encouraging.

#### EGYPTIANIZED CLAY.

By F. A. J. FITZGERALD.

In attempting to manufacture graphite crucibles with certain American fireclays, instead of the German clays usually employed for this purpose, Mr. Acheson found that the former were greatly lacking in the necessary plasticity and strength. He made several experiments to determine, if possible, the cause of plasticity in clays and finally found that, by treating clays with dilute solutions of tannic acid, the plasticity was greatly increased. Carrying the experiments still further he found that clays treated in this way had a much greater tensile strength when made up into forms and baked, that less water was required to get the clay into working condition, and hence the cracking during baking was much decreased and a less porous article produced. Although several experiments have been made with this process, they are not sufficiently advanced as yet to permit the publication of their details.

It occurred to Mr. Acheson, in making the experiments with tannic acid, that possibly the reason why the Egyptians added straw to their bricks was to obtain the great strength that would be given to the clay by treatment with an extract of straw. He made an extract of straw and repeated his experiments with the result that the straw extract produced effects quite as satisfactory as the tannic acid; these effects being sufficient in value to have justified the Egyptians in the use of straw. It is no longer necessary to assume that the benefits derived by them was due to the presence of the straw fiber, but rather to this, as yet, mysterious effect of the extract. The experiments were further extended and demonstrated that similar effects could be derived from quite a large class of vegetable extracts. Searching for a term to designate clay treated in this manner, it occurred to Mr. Acheson that it might be appropriate to recognize this early Egyptian work by terming the product "Egyptianized Clay."

**OPENING RHODESIAN COAL MINES.**—The Rhodesian Railroad—which forms a section of the Cape-to-Cairo line—is now completed to a point 167 miles north of Buluwayo. This opens up transportation for the coal of the Wankie District. Coal from the Wankie mines is now used on the railroad, and is said to show better results than any other South African coal.



CLIFTON AND THE ARIZONA COPPER COMPANY'S SMELTING WORKS.

(Hills of Basalt, Rhyolite and Andesite. Granite in the background.)

largely exhausted. They contained a large quantity of very rich carbonate and oxide ore. The extent of these ore-bodies was, however, much smaller than the large masses of chalcocite ore which now forms the main support of the camp.

At Metcalf the Shannon Mine contains several ore-bodies of similar origin. A fragment of the Paleozoic series outcrops on Shannon Hill, and is cut by an extensive system of dikes, which in the lower part of the mountain join a large intrusive body of porphyry. In several horizons the limestones are greatly altered, the final product generally being copper carbonates and limonite, with some quartz. In some places the ore-bodies are less affected by oxidation, and their original character of garnet, epidote, magnetite and sulphides may be plainly seen.

Oxidation by surface waters, as at the Shannon Mine, also concentrated much copper as chalcocite in some of the dikes, and the Metcalf Mine, on a lower spur of the same hill, consists chiefly of a body of extremely decomposed porphyry containing chalcocite and carbonates. This copper probably has migrated into the decomposing porphyry from bodies of contact metamorphic rock at higher elevation, part of which are now eroded.

**Fissure Veins.**—At many places in the district, the copper carbonates consist of fissure veins, cutting alike porphyry, granite and sedimentary rocks. From the available evidence it would seem as if these veins had been formed a short time after the consolidation

distinct walls, but often fade into the surrounding porphyry. Their character as fissure veins, can, however, not be doubted. In lower levels the ore is apt to change to pyrite and chalcopyrite. Both the Arizona Copper Company and the Detroit Copper Company are now working the low-grade bodies of chalcocite ore accompanying the veins. The resources already proved assure a large production for many years.

Parallel veins, somewhat narrower, but similar in character, are those opened up in the Arizona Central Mine, also at Morenci. These veins are partly in porphyry, partly in contact metamorphosed limestone. While malachite and azurite sometimes occur, they are by no means as prominent as in the limestone deposits, and frequently the leached surface zone is immediately adjoined by the chalcocite ore.

The Coronado Mine represents a different type of deposit. It is formed on a fault-fissure between granite and quartzite, indicating a throw of at least 1,000 ft. The fissure is followed in places by a diabase dike, showing the effects of crushing and movement along the vein. The croppings contain copper carbonate and silicate, but these minerals change at slight depth to chalcocite, and still further down it is believed that the ore bodies consist chiefly of pyrite and chalcopyrite.

Somewhat different again are the fissure veins on Markeen and Copper King mountains. The granite of this complex of hills is cut by a great number of dikes which generally have a northeasterly direction.

### COST OF MINING AND SMELTING AT BUTTE, MONTANA.

BY AN OCCASIONAL CORRESPONDENT.

The testimony given in a recent trial to determine the justness of certain smelter charges made by one of the Butte mining companies has been printed and affords an opportunity not only to compare such costs with similar plants elsewhere but to compare the relative efficiency of the various methods used at Butte. The testimony was given by the company superintendents under oath and applies to the latter half of 1901, and the first four months of 1902. The figures given in the testimony have been gathered in the form of a table, affording a ready means of comparison.

Cost of Treatment of Butte Ores.

	Montana Ore Purchasing Company.	Butte & Boston Company.	Colorado Smelting Co.	Boston & Mont. Co.
Transportation .....	0.18	0.15	0.20	0.15
Crushing & sampling .....	0.50	0.53	0.36	0.20
Calcining concentrates, per ton concentrates wasted .....	0.66	0.78	0.98	1.25
Total cost (blast) .....	5.96	4.84	...	4.78
Total cost (reverberatory) ..	4.59	3.63	3.55,	...

Itemized Costs of Treatment of Concentrating Ore per Ton.

	Montana Ore Purchasing Company.	Butte & Boston Company.	Colorado Smelting Co.	Boston & Mont. Co.
Transportation .....	0.18	0.15	0.20	0.15
Sampling & crushing .....	0.50	0.53	0.36	0.20
Concentration .....	0.70	0.70	0.70	0.75
Calcining .....	0.22	0.26	0.33	0.33
Matting .....	1.533	0.97	1.767	1.24
Total cost .....	3.133	2.61	2.35	2.67

It should be stated that the cost of coke at the time was \$8.50 per ton for Horr (Montana) coke, and \$10.50 for Pennsylvania coke. The amount of ore handled varied at the different plants, but the only figures given are 30,000 tons of concentrating ore and 4,753 tons of first-class ore per month at the Montana Ore Purchasing Company's works, and 18,000 tons of concentrating ore and 2,100 of first-class ore per month at the Butte & Boston works.

The ores averaged 15 per cent copper, 50 per cent silica, and 16 per cent iron for first-class ore at the Montana Ore Purchasing Company's works, and about the same at the others, though it is probable that the first-class ores of most of the works will not exceed 12 per cent copper at the present time.

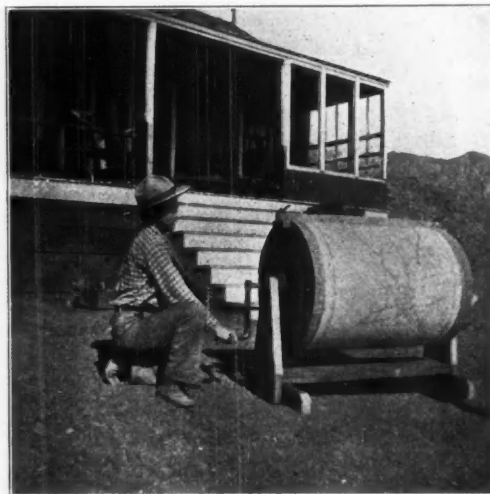
An examination of this table brings out several very interesting facts not generally known except to the copper smelting fraternity.

In the first place, the mining costs are given by two companies at \$3.18 and \$3.50, respectively, figures which are probably a little low for the entire camp.

Transportation varies from 15 to 20c. per ton, in which the higher figures are for the short hauls by team of a mile or less, and the lower figures are for railroad hauls; and although the cost of railroad hauls is the same, the distance in one case is not over a couple of miles and in the other is 150 miles to Great Falls. Crushing and sampling varies from 20 to 53c., being least at the largest plant. Concentration costs are very nearly the same at all the plants. In this connection it should be noted that the testimony shows that the ores treated averaged 3.2 per cent in copper and are concentrated three into one, but as there is a loss of 30 per cent in concentrating, the actual reduction is 3.65 into one. More recent practice is, I am told, to use a greatly increased number of jigs with an increased output of coarse jig product that goes directly to the furnace, while the slimes from the tables are settled and either mixed with quartz for converter linings or briquetted and sent to the furnaces.

Calcining costs are very different at the various works. The Colorado Company, using the Pearce mechanical turret roaster, reported a cost of 98c. per ton of concentrates handled. The Butte & Boston Company, using an O'Harra roaster, gave the cost at 78c. per ton. The Montana Ore Purchasing Company, using Herreshoff

multiple-hearth roasters, gave a cost of 47 to 66c., and an average of 50c. The Boston & Montana Company reported the cost at \$1.25 per ton of concentrates, or a cost of 42c.; or allowing that 80 per cent is smelted, the cost is 33c. per ton. Smelting costs present an even greater variation at the different works, with differences that are apparently somewhat unusual even when it is remembered that one company was endeavoring to show as high cost of treatment as possible while the others were trying to refute the figures given by their opponent. Thus the cost of reverberatory smelting at the Colorado Works, where no blast furnaces are used, is given at \$3.40, and at the Butte & Boston as \$3.63 as against \$4.59 at the Montana Ore Company's works. It is only fair to add that this may be due in part to the disorganized condition of the latter plant as the result of a fire that necessitated extensive repairs. At the Colorado Company's works the cost of smelting first-class ore is given at \$3.55, and the cost of smelting a ton of concentrates is given as \$3.40 to \$3.45. The figure given in the table is



A SIMPLE BLUE-PRINT MACHINE.

without the cost of transport, so that adding 20c. it makes the total cost the same as that given. The cost of limestone is not given for all the companies. At the Montana Ore Purchasing works it is \$1.25 to \$1.40 per ton, and is added to the extent of 50 per cent of the ore. For the first four months of the year 1902 the total cost of reducing concentrating ore to copper at the Butte & Boston works was \$2.35, \$2.45, \$2.51, \$2.57, or an average of \$2.47. It will be noted that this is less than the total cost as given in the table.

Comparing the relative cost of blast and reverberatory treatment at the Butte & Boston works, the matting in blast furnaces is \$4.16, and in reverberatory furnaces \$3.63, the latter figure including the cost of calcining which is \$0.78. The slag from the blast carries 0.02 per cent copper and 0.06 per cent copper from the reverberatory.

#### A SIMPLE BLUE PRINT MACHINE.

BY GEO. S. BINKLEY.

A very simple and practical device for making blue prints of practically any size is shown in the accompanying illustration, and the writer believes that it will be found valuable to many engineers, who, like himself, find it impracticable to have a large frame of the ordinary kind at hand.

The device is simply a cylinder of wood, mounted, as shown, in a crude frame, and provided with a crank for turning it. A clamp is provided for pinching down the tracing and paper at one end, and the sides and other end of both are secured by means of thumb-tacks, as the paper and tracing are unrolled together, around the circumference of the cylinder, being tightly stretched to the surface as unrolled. When it has been secured thus the cylinder is slowly turned in its bearings, requiring about three

times as long an exposure as in a frame, as only part of the surface is exposed to the sun at any one time.

It is well to roll the tracing and blue print together before going into the sun to put them on the cylinder, as then the end of the roll can be inserted under the clamp, the clamp tightened, and the paper unrolled under the tracing, without danger of being light-struck. A colored tracing, of course, will not print as well as an uncolored one, since it is more or less shrunken along the colored parts, and will not lie flat; but with the ordinary tracing almost, if not quite, as good results may be obtained as from the ordinary frame, if care is exercised in placing paper and tracing in position.

This idea is not original with the writer, but was suggested to him a year or so ago by one of his numerous mining friends, who is beyond memory, or due credit would be given for what is really a valuable little scheme.

The photograph, showing the frame with our surveyor turning the crank, gives a very good idea of both construction and operation. The machine as shown will make a print 40 ins. wide by 84 ins. long, and from this down, of course.

#### A MODERN METHOD OF COAL WASHING.\*

BY C. A. MEISSNER.

A few notes on the Campbell coal washing table may prove of interest, especially as this table can be made available not only as a washer of coal but also of metallic ores; in fact, for any material where the valuable matter and the refuse are of distinctly different specific gravity.

In dealing with coal we have the following differences of specific gravity to consider: That of pure coal is from 1 to 1.3, while slate has a specific gravity of from 2 to 2.7, and pyrite, or sulphide of iron, from 3.1 to 5.1. The whole value of a washing machine lies in its ability to eliminate sulphur and ash as largely as possible, particularly the sulphur. The ash is largely formed from slate. Bone coal, sulphates of lime and magnesia, and clay are also ash producers. The sulphur occurs mostly in the form of pyrite, and also more or less as organic sulphur, which in Nova Scotia coals amounts to 1 per cent. The latter cannot be eliminated by washing, and whatever amount of this there is in the coal will have to remain.

The great difficulty has been heretofore to eliminate the very light flaky particles of sulphur, which in many coals fill all the cracks with a film of yellow pyrite, and are so thin and light that they have a tendency to float off with the coal. When, therefore, the coal contains this form of pyrite, the thorough washing becomes all the more difficult. The solid pyrite, occurring in little crystals or aggregates of crystals, is the easiest to wash out.

There is usually very little trouble in washing out the slate, though even here in some styles of washers there is always danger of the fine particles of slate being washed off with the coarser particles of coal, unless very great care is exercised in sizing, or rather, in crushing all coal to less than 1/4 in. in size.

The greatest difficulty experienced heretofore in many coal washing plants has been the lack of recognition by the operators that successful action is dependent entirely on uniformity of size; for it stands to reason that a piece of coal 1/2 in. large requires as much pressure or current of water to carry it away as would carry away a piece of slate one-third its size, or a piece of pyrites one-fifth its size. This fact, therefore, has always made it necessary with most other washers to grade the coal into its different sizes in order to attain the most satisfactory results.

In this machine the fine powdery coal, while of the same consistency as slate and pyrite, is given a chance to assert its lighter specific gravity, and to float away with the current of water mixed with

\* Paper read before the February meeting of the Nova Scotia Mining Society.

coal, and thus be saved in a form that makes it directly available.

If this machine were to be applied to ores, the conditions would be, in most cases, very similar, excepting that a much stronger current of water would be required, as the specific gravity of both the ore and rock are greater than that of the coal and slate—the ore representing in this case the pyrite and slate, and the rock representing the coal—it would naturally require a heavier current to carry away the heavier rock than the lighter coal, which it would represent, whereas the finer ore would act like fine pyrite and slate and pass through the riffles into the receptacle built underneath. With this machine, therefore, it is not necessary to size the coal

neath, into which all the coal that passes through the grizzly is discharged. These hoppers form the boots of the elevators, which carry the coal to the long bin above the washers. The washers are suspended from this bin by swinging suspension rods, and each washer or bed, as it is called, is provided with an adjustable chute, having a 1-in. water pipe arranged at the point of junction of the chute to the bin. The object of this water jet is to stir up and sluice the coal down to the beds in uniform quantity, and at this point of the entrance of the water a small slide valve is inserted, by means of which larger and smaller quantities of coal can be let down over the chute into the bed.

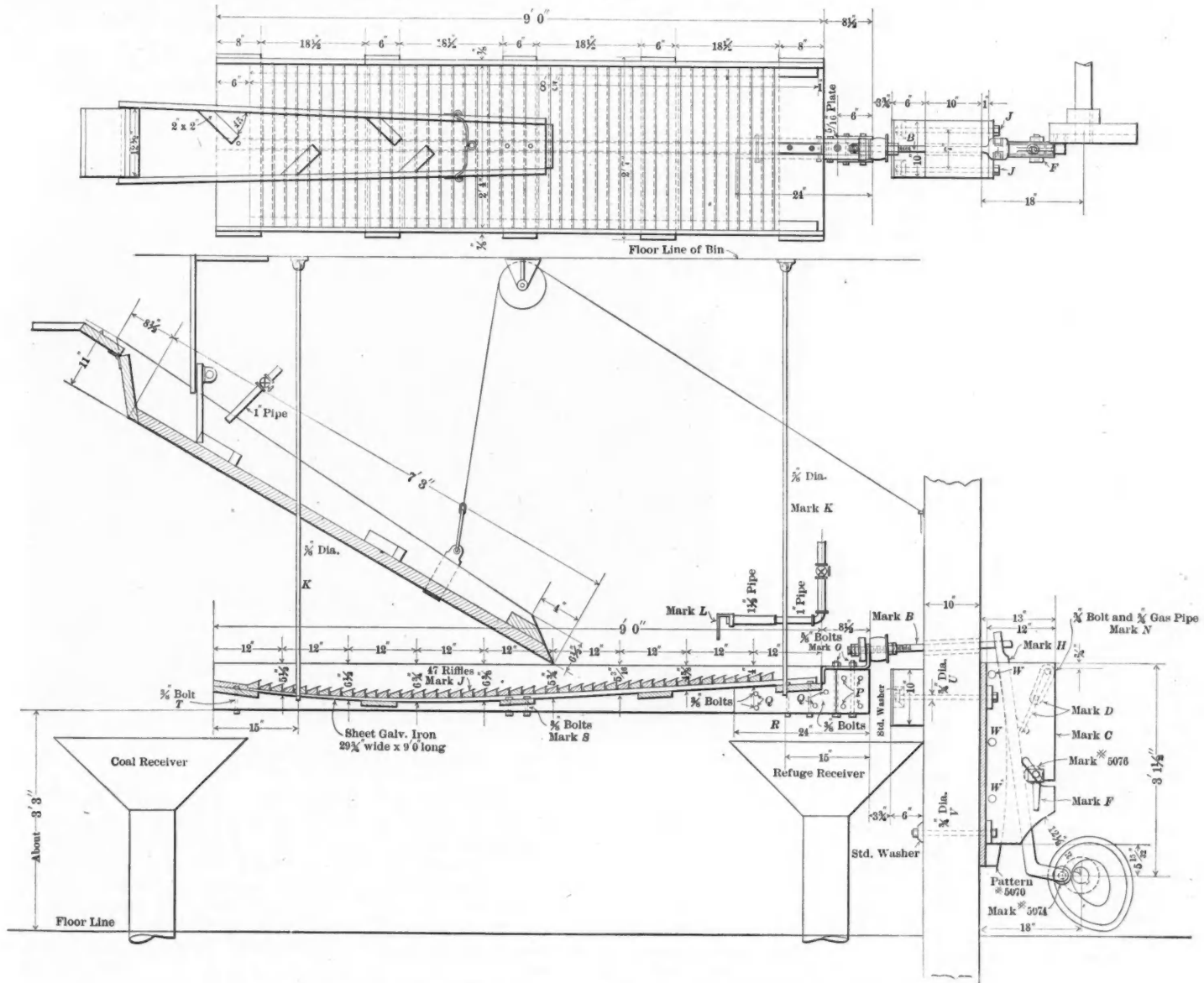
The beds are 9 ft. long and 30 ins. wide, being

These riffles constitute a false bottom, and consist of triangular strips of oak, having an overlapping strip of galvanized sheet iron fastened to them.

The riffles are set  $\frac{1}{8}$  in. apart, and this space is the means of communication to the hollow space between the bottom of the riffle and the sheet iron bottom of the bed. The sides of the bed are 6 ins. high, and the construction of the top side of the keel is such as to give the riffles and the bottom a slight curvature, and the whole resembles a trough with a serrated bottom.

In operation the cam is rotated and imparts a backward and forward motion to the bed through the rocker arm and reach rod connecting them.

The coal being sluiced to the bed with water, the



CAMPBELL COAL WASHING TABLE IN USE AT DOMINION COAL COMPANY'S MINES.

as closely as is the case for the successful operation of most other washers.

I would like to say that I am indebted to Mr. O. F. Greim, superintendent of the Dominion Iron and Steel Company's coke ovens, for the data and details.

The raw coal from the mines is received in the form of slack, varying in size from dust to one inch. This slack is dumped into a pit under the coal track, and elevated to overhead bins, known as the raw coal bins, and from these the coal is drawn and passed over a grizzly, which removes all coal from  $\frac{1}{4}$  in. to zero, the balance going to the rolls. The rolls are of the corrugated type and are four in number, arranged in a single row, end to end, in pairs of two, and these reduce the coal to the same size that passes through the grizzly; not larger than  $\frac{1}{4}$  in.

Each pair of rolls is provided with a hopper be-

suspended at their four corners on rods, so that they are free to move backwards and forwards in a lateral direction. This head, or bumping end, is connected with a rod to a loosely hung rocker arm, the free end of which engages a peculiarly designed cam, which is mounted upon a shaft driven by a motor or engine. This rocker arm is adjustable, so that you can give a longer or shorter swing to the bed.

The bed proper consists of a central timber, or keel, as it is termed, upon which are fastened crosswise, in the manner of a fishbone, five or six strips, 8 ins. wide and 30 ins. long. Upon these cross-pieces or strips is fastened a sheet of galvanized iron, which constitutes the bottom of the bed. Upon the top of this sheet iron three narrow strips are secured, running lengthwise with the bed, one in the center and one at each end of the cross-pieces, and upon these strips in turn are mounted the riffles.

bed soon fills, and the cam motion is such that the bed is brought at regular intervals of time, about 60 strokes per minute, against a block or bumping post of heavy timber. This serves to agitate the mass upon the table, allowing the heavier impurities in the coal to settle upon the riffles. At each successive blow the slate and pyrite are caused to move up towards the bumping end, the riffles all being set in that direction, until they are finally discharged over the end of the bed into the refuse sluice, while the lighter coal flows with the water to the lower end of the bed into the coal sluice, which conveys the coal to the settling tanks.

Near the slate or bumping end of the table, a stream of water is introduced on the bed in the form of a fan-shaped sheet, covering the whole width of the bed. This serves to wash back any larger pieces of coal which have a tendency to move up

with the slate. The fine pyritic flakes and other pulverized heavy impurities pass down between the riffle spaces to the sheet iron bottom, whence this material is discharged.

The beds have a capacity each of five tons of washed coal per hour, making each bed in 10 hours' work equivalent to 50 tons. The amount of refuse, including what coal is carried with it, is about 4 per cent, so that each table washes about 52 tons per day.

The raw coal, as it originally enters the tables, contains about 6.50 per cent of ash and 2 per cent of sulphur. As it leaves the table, it contains 3 to 4 per cent of ash, and 1.2 to 1.4 per cent of sulphur.

The refuse contains about 40 to 50 per cent ash and about 10 to 15 per cent of sulphur, the balance, about 35 to 40 per cent being coal. This, on about 4 per cent of loss, means a total loss of about 0.7 to 0.8 ton of coal to each washing table per day.

In order to be able to utilize the lost coal in the refuse, the amount of such coal can be raised in the washing so as to increase the loss, say, 6 per cent, which will give a purer coal, but leaves more coal in the refuse. This refuse can then be re-washed roughly on the re-washing beds, so as to get the refuse practically free from coal, and a coal containing anywhere from 3 to 4 per cent of sulphur and a proportionate percentage of slate, or with, say, 60 to 70 per cent of coal, which latter can then be used for fuel under the boilers where this additional percentage of impurities does no material harm, in view of the saving of fuel thus effected, particularly when the Parsons system of firing under boilers is used.

The construction of these beds, as shown in the drawing, is very simple, and the average cost of a bed is estimated at \$50. The arrangement is called the Campbell washer and is controlled and patented by Heyl & Patterson, of Pittsburg.

#### THE COPPER SULPHATE DEPOSITS AT COPAQUIRE, CHILE.

By EDWARD WALKER.

For some years it has been known that natural deposits of copper sulphate exist in the rainless districts of the Cordilleras, in Chili, but owing to remoteness and the physical difficulties involved, they have hitherto not received much attention. The owners at Iquique succeeded two years ago in interesting German and English financiers in the development of the deposits, and recently money has been subscribed for the purpose of starting practical work. The extent and nature of the deposit has not as yet been very fully studied, but the readers of this JOURNAL will be interested in such details as have been received up to the present time.

The deposit is situated at Copaquire, in the Province of Tarapaca, lat. 20° 50' S., long. 68° 45' W., and about 130 miles E.S.E. of Iquique. It is in a barren rainless region, 11,000 ft. above sea level, and difficult of access. The nearest habitation is 15 miles west, at Huatacondo, where a few natives pick up a bare living by farming. Twenty-five miles further west is the silver mine of Chalcolollo, which is connected by a narrow-gauge railway with the Nitrate Railway at Cerro Gordo, where there are smelting works belonging to the Chalcolollo mine. The 40 miles from Chalcolollo to Copaquire is over a rough and steep mule path, and it presents many serious obstacles to the economical exploitation of the deposits.

The sulphate occurs in the hydrated form in thin irregular veins, disseminated through the rocks over quite a large area, mostly along the sides of steep ravines. The formation can hardly be called a lode or ore-body, and its geology and the theory of its genesis require further study. The rock in which it occurs is chiefly decomposed porphyry, but there are also granites and metamorphic rocks. All the rocks show signs of the disintegration characteristic of districts where there has been no water for a long period, and where there have been great variations in temperature by night and day. The region has also been subjected to volcanic action, and earthquakes are of frequent occurrence. It is

difficult to say whether the cracks in the rock in which the sulphate occurs were caused by volcanic action, and afterwards filled in with sulphate by infiltration, or whether the sulphate was formed by the oxidation of pyrite in place.

The samples so far analyzed vary considerably, but the following is a fairly characteristic one:

Hydrated copper sulphate.....	12.77%
Copper carbonate.....	1.53%
Copper sulphide.....	0.39%
Iron sulphide.....	1.07%
Ferric oxide.....	4.45%
Alumina (chiefly as sulphate).....	2.11%
Sulphate of lime (anhydrous).....	6.51%
Sulphate of magnesia (anhydrous).....	4.47%
Manganous oxide.....	0.26%

The remainder is rock insoluble in water or acid. The percentages of metallic copper work out at 3.25, 0.88 and 0.31 in the sulphate, carbonate and sulphide, respectively.

It will be seen from the above analysis that carbonate and sulphide occur, as well as sulphate. The carbonate was probably formed by the action of carbonate of lime on the sulphate. The sulphide occurs as chalcopyrite, and is interspersed throughout the rock, side by side with the sulphate, and is often nearer the surface than some of the sulphate.



PARTILLO VALLEY, CHILE.

This fact would lead to the opinion that the sulphate was deposited by infiltration, and not by oxidation *in situ*. There are deposits of chalcopyrite at higher altitudes, and the water in streams and lakes higher up contains sulphate in solution. It may be that at some past time these waters from above ran over and through the rocks now under discussion, and that afterwards some volcanic action changed their direction and left the region waterless. This, however, is pure speculation, and further details of the geological and mineralogical features of the neighborhood are required before any definite opinion can be put forward.

Along with the sulphate there are also found other soluble salts, such as sulphate of alumina and magnesia. These may have been formed in place by the action of oxidizing pyrite in the presence of rocks containing alumina and magnesia, or they may have been deposited by infiltration from solutions derived from similar reactions in the mountains above. But this question also must be deferred until further study is made of the region.

At the present time the commercial exploitation of the deposits occupies the chief attention of those interested in them. The rock is very friable, and as it occurs on the surface of steep inclines, there will be little cost incurred in mining and crushing. The usual course of treatment would be to wash out the sulphate with water and extract the carbonate with acid, but the natural difficulties present serious

obstacles. In the first place, there is no water near. There is a water-course 15 miles away, and water can also be obtained by sinking in certain places, but in both cases the cost of the supply would be a serious item. Secondly, it would be impossible, owing to the rough and steep nature of the track, to bring up acid for the treatment of the carbonates. During the last year or so processes for extracting copper from carbonates by means of solutions containing an excess of sulphurous acid have been proposed, but so far the value of these processes has not been demonstrated. Besides, the pyrite in the district does not occur in masses, and a supply of sulphurous acid could not be economically obtained from them if they had to be first concentrated. It seems therefore that attention will have to be confined to the leaching of the sulphate. A third difficulty presents itself in the evaporation of these sulphate solutions. There is practically no wood or other fuel in the district, and it seems hardly feasible to bring coal from other districts on account of the great difficulties of transport. Probably the best plan would be to utilize the heat of the sun for evaporative purposes, and to produce an anhydrous sulphate. The fourth question to be con-

sidered is how to reduce the copper from the sulphate. As is the case with acid, it would be prohibitive to bring pig iron up to the mine for the purpose of precipitating the copper. Any electrical method of depositing the copper would require fuel for generating the electric current, and, as mentioned before, fuel is scarce locally. The presence of other soluble salts in the rocks might cause difficulties with other processes that could be suggested. The only practicable method of dealing with the solutions seems to be therefore to evaporate and form anhydrous sulphate, and to ship this down to the coast. The further treatment would depend on circumstances. It might be best to dispose of it as sulphate, or it might pay to reduce the copper by means of pig iron at cementation works on the coast. The consideration of this question would naturally be deferred, however, until it has been ascertained that the deposit can be worked at all.

For the facts (as distinct from the theories and opinions) given in this article the writer is indebted to Mr. Wilhelm Venator, of Magdeburg, who examined the properties for the Deutsche Bank, and to Mr. S. R. Adcock, manager of the St. Helens Smelting Company, St. Helens, England, formerly chemist to the Rio Tinto Company. Mr. Adcock is at present engaged on an exhaustive investigation into the nature of the deposit, and the best method of treatment, and it is hoped that he will contribute further information on the subject later on.

## SOME GOLD MINING INVESTMENTS.\*

By J. H. CURLE.

This is by way of an epilogue to the series of articles on gold mining investments which I finished some weeks ago.

Only a few gold mines, we found, stood on an investment basis. The severe test through which they had to pass to justify the use of the word "investment" rejected even many of the best-known mines in the world.

For a gold mine to be an "investment," I require the following conditions:

First.—The shares must yield at least a clear 10 per cent to the purchaser.

Second.—The profit in sight must represent distinctly more than half the mine's market valuation.

Third.—The lowest workings and principal development points must be in ore of average size and value.

I have explained all this at length before; but unconscious cerebration keeps pointing out to me that this is such a really sound basis of valuation that I shall again use it as my text.

As set forth above, these requirements for a mine represent the normal condition; but by the variation of the factors permutations may be allowed. For instance, the share I want to buy may yield me at market price only 7 or 8 per cent, instead of "a clear 10 per cent."

By thus reducing the factor of rate of yield, the factor of profit in sight must be raised. Therefore, in a case like this it would be necessary that the security—the ore in sight—should show a profit not of more than half the mine's market valuation, but fully 75 or 80 per cent of its market valuation.

If, on the other hand, I find that the mine I wish to invest in has only 30 per cent of its market valuation in sight, I must raise accordingly the factor of rate of yield. Instead of 10 per cent in such a case I would be a fool to take less than 15 or 20 per cent for my money; indeed, with only 30 per cent of market value in sight, it is doubtful whether the mine could be considered an investment.

The remaining factor—the value of the ore in the lowest workings—is a dangerous one to alter at all. A mine may become temporarily poor in depth, afterwards passing again into good ore, but at such times people do not buy for investment. As a rule, with poor ore in the lowest workings, I should require to see the whole market valuation represented by ore in sight.

Leaving out the Rand, as being *sui generis*, the four mines which satisfied me best in the world's survey we made were El Oro, Camp Bird, Great Fingall and Oroya-Brownhill. Those mines passed the test of being investments better than did any others. It says something for this method of valuation, with its severe test of facts, that I am now able to confirm all my figures about these mines. Not only is this so. Although only three or four months have elapsed, I am able to state that three out of four of these properties are going to have bigger futures than I allowed for.

In the last yearly report of El Oro Mr. Foster gave the ore reserve as 530,000 tons. In a circular issued a few weeks ago the board announced that the ore reserves were now 1,000,000 tons. At one stroke the reserves are, therefore, nearly doubled. As this would mean nine years' work for the present 100 stamps, the management has decided to double the mill, and a second 100 stamps are now being put up. Now let us apply our tests. The million tons represent a profit of considerably more than half the mine's market valuation. In addition, all the development points in the mine look well; they lead one to suppose El Oro to be a bigger mine than any one suspected. The present dividend is 15 per cent. At \$7.50 per \$5 share the shares would yield 10 per cent. At their present price they do not yield so much. But the mine is earning 20 per cent on par, and in a year from now, with 200 stamps, will be earning a good deal more. It is permissible in this case to discount the future. If El Oro continues to

develop as it has done lately, the shares will be worth \$10, and my recent estimate of \$7.50 will probably need to be revised.

At Camp Bird a few days ago took place what will probably turn out after development to be one of the biggest discoveries ever made in an established gold mine. The most valuable section of this mine is an ore shoot about 1,100 ft. long. From the point where the drive ran through this ore shoot the surface is over 1,000 ft., and in virgin, unexplored ground. On my first visit to the mine, in 1901, this ore shoot had just been found. On my second visit, last November, the mine having in the meantime changed ownership, a raise had been put up in the ore 240 ft., an intermediate drive was going in from this raise, and stoping was in progress all along the top of the level. All these workings showed rich, almost phenomenal, ore. The extraordinarily interesting question then presented itself, "Why should not this immensely valuable ore shoot go right up to the surface?" On the surface itself no prospecting was possible, owing to a deep covering of volcanic debris, and also because the mountain at this point is precipitous; but Mr. Hays Hammond adopted the next best course, and laid out the Chicago tunnel, which would cut the lode at 400 or 500 ft. below the surface, and at 600 ft. above the drive where it was first exposed. This tunnel, we now hear by telegraph, has cut the lode. It is 6 ft. wide, worth \$30 a ton, and has now been exposed for 25 ft. in length. Of course, it would not be fair to say that this proves this big new area of ground, because it will take a lot of development before that can be said. But, as a mining engineer, I may say it is probable that the ore shoot continues from the intermediate level up to the Chicago tunnel, and possibly to a point much nearer the surface. The area in question—between the intermediate level and the surface—if it turns out anything like this, will yield a net profit of \$5,000,000.

Would-be purchasers of Camp Bird shares must remember that after a sum of about \$2.88 a share has been paid in dividends (to be precise, \$2,400,000), the late vendor is then entitled to one-quarter of the dividends, until, under this heading, he has received a sum of \$2,000,000. It is intended, I believe, when this time comes, to add 20 stamps to the present mill of 60, and so not interfere with the current dividends. The mine is opening so well at all points, that I see no reason why, for many years to come, it should not pay 20 or 25 per cent to shareholders—exclusive of the vendor's proportion. The investment value of the shares will soon, I expect, have to be raised to \$10.

The Great Fingall I still look on as the best mine in West Australia. Although the lately issued report places the profit in sight at between \$25 and \$30 a share, I figure it in my own mind as more than this. The gradual reduction in cost, too, tends to bring more ore into the zone of payability. With 100 stamps at work, against 60 at present, and crushing a lower average grade of ore, I shall expect the mine to earn 100 per cent for a long time. This share easily fulfils our requirements. It yields 12 per cent or more; the profit in sight is much more than half the market value, while the lowest workings and those on the new ore shoot show excellent results.

The position of Oroya-Brownhill gets stronger every month. Six months ago I understood the old Brownhill Mine was practically worked out. Three months ago the general manager stated that the ore reserves there had been increased to 30,000 tons, and to-day there are unquestionably 60,000 tons of 2-oz. ore still in that section. The reserves in the No. 1 and 2 Oroya blocks are also now represented by substantial and increasing figures. I may point out to the management that it is now in a position to increase the stamps from 30 to 50—not 40, as is being done.

The life of Oroya-Brownhill, so far as we can see, will not be a lengthy one; but I am sure that the mine will pay back its present market value, with a handsome interest added. It is, therefore, an investment.

## THE PLACERS OF SIBERIA.\*

By LEWIS B. BROWN.

As is well known, the alluvial deposits of Siberia in general are characterized by a covering of matted earth and vegetation, commonly referred to as "turf." For the most part this turf is the material known in America as peat, and which may be dried and used as fuel. Among the gold miners, however, the distinction between true turf and other material is not sharply drawn. All material in the placers which overlies the *plast*, or pay gravel, is included under the name *touarf*. This may be poor gravel, rounded or angular in character, and occasionally sand; even landslide material is included.

The turf, properly speaking, varies in thickness from 6 ins. to 60 ft. Figures from the Lena District of East Siberia give an occasional depth of 150 ft., but I am not sure that this is true turf. It is probably, in part, barren gravel. Analogies between the Siberian deposits and those of Alaska, especially those of the region behind Cape Nome, exist to a remarkable extent.<sup>1</sup>

It appears probable that these turf or peat deposits are primarily the result of the extreme length of time the ground has remained frozen. It is rarely absent even on the barren and treeless steppe area about Troitsk, in the Orenburg Government, where it exists, in the depressions of the plain, as a thin covering. The turf occurs not only in the valleys of the country, but also on the very summits of some of the Altai peaks, which reach to over 7,000 ft. It exists also on the sides of the mountains, holding the water like a great sponge. To this fact, may be attributed the remarkable scarcity of visible streams and small brooks. A journey of a whole day along the mountain ridges and through the valleys of the Altai will hardly furnish opportunity for seeing more than a dozen brooks, tributary to the large creeks.

In the gold-bearing valleys of the Marinsk and Achinsk districts the true turf does not exceed a couple of feet in thickness. Underneath this comes a layer of rounded gravel, consisting of debris brought from a distance. This is occasionally mixed with sand, and layers of tough clay. Beneath this is a layer of varying thickness of gravel. The last is generally barren. Underneath this comes the pay-gravel, from 2 to 8 ft. in thickness. This is usually of an angular or sub-angular character. It resembles the ordinary auriferous gravels of Siberia, but in comparison with those of California, it appears to have suffered much less wear, and to have traveled a relatively much shorter distance.

One feature which characterizes the Siberian deposits is their remarkable similarity over wide stretches of country. Thus, from Levat's descriptions,<sup>2</sup> it appears that the gravels of the Amoor District are in a few places almost exactly similar to those which I have seen in the Ural and West Siberia, the only difference being in the tenor of the gold, and in the fact that the East Siberian gravels are generally frozen throughout the year. See also in this regard, De Batz<sup>3</sup> in his descriptions of the Amgoon River deposits.

PRODUCER GAS.—The London *Colliery Guardian* says that in a recent lecture before the Society of Experimental Engineers, Mr. George C. Douglas pointed out that the steam engine in its present form was doomed, and that power in the future was to be obtained by means of water or steam turbines and gas engines operated in conjunction with dynamos and electric motors. These prime movers would be situated at centers where energy could be conveniently obtained, such as great waterfalls, coal mines or oil wells. Confining his attention to coal, he showed that the most economical way of utilizing that source of energy was to convert it into producer gas, using it to operate gas engines directly or by means of

\* Abstract of a paper presented to the American Institute of Mining Engineers, March, 1903.

<sup>1</sup> Frank C. Shrader and A. H. Brooks, "Preliminary Report on the Cape Nome Gold Region," Alaska, United States Geological Survey, 1900, page 14.

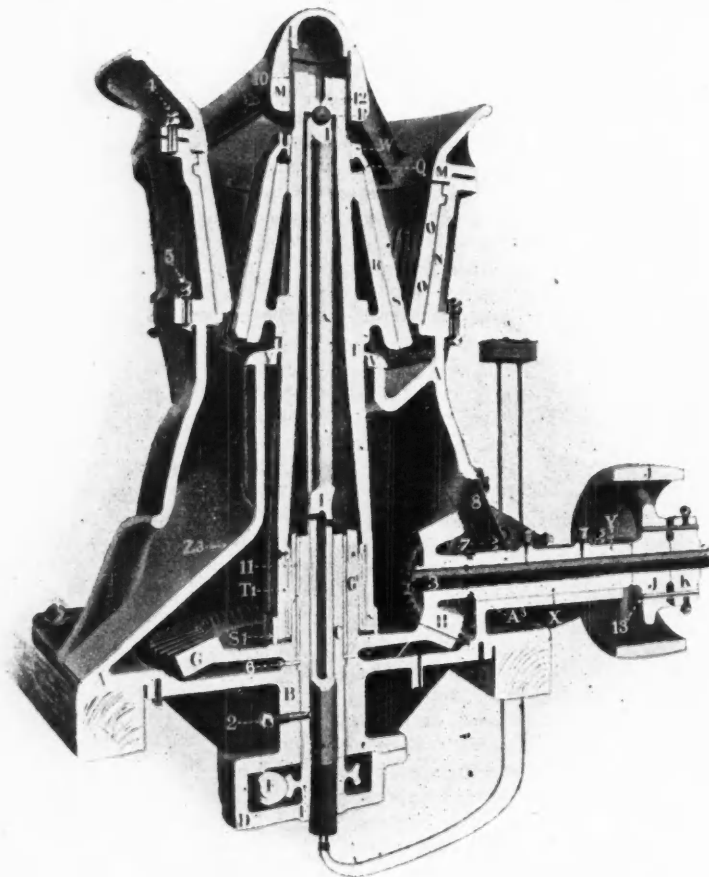
<sup>2</sup> "L'Or en Sibirie Orientale," E. D. Levat, Paris, 1897.  
<sup>3</sup> Baron René De Batz, "Les Gisements Aurifères de Sibirie," Paris, 1898.

\* From the London *Economist*, April 25, 1903.

mains leading it to manufacturing centers, where it would be used to fire steam boilers. He thought that although the best way would be to generate electricity at the pit head and convey electrical energy to consumers, it might be better for gas manufacturers in the meantime to convey the gas to the consumer, as by so doing existing plant could be used, and only displaced when the owners of works found it most convenient.

#### THE HECLON ROCK AND ORE BREAKER.

The accompanying illustration shows a rock-breaker having some new features, which has been designed by Messrs. R. A. Hadfield and A. G. M. Jack. It is made at the Hecla Works, in Sheffield, England, and has been called by the makers the "Heclon" breaker. The peculiarity of this breaker



THE HECLON ORE-BREAKER.

is that it revolves eccentrically, or gyrates; and in this it differs from other revolving crushers.

The illustration shows a section of the machine, and its construction will be readily understood. The main shaft T is so supported by the central spindle 1 that it is free to move in much the same manner as a plumb-bob when suspended in the usual way. The pinion H is, of course, driven by means of the counter-shaft 3 and the pulley J, the motion being transmitted to the bevel wheel G, which is fitted with an eccentric, G<sup>1</sup>, revolving inside of the hollow shaft T. The crushing cone S is immovably attached to the hollow shaft, and therefore the two partake of the same motion, the effect being that in relation to the outside shell O the crushing cone is constantly approaching and receding, so that stone coming between is at once cracked and then released to settle down ready for another crunch at the next gyration, or to be discharged if already fine enough.

The gyrating motion imparted to the hollow shaft by the eccentric is naturally greatest at the bottom, and becomes less and less as the top is approached. It will therefore be apparent that the motion of the crushing cone is very slight, less than in the case of

any breaker of the jaw type, and this fact, combined with the concave form of the surface against which the stone is broken and the instant release after cracking, ends to prevent the shattering of the stone, minimizes the dust, and gives, it is claimed, a very even product.

The arrangement for regulating the grade or size of the product is simple, all that is required being to slack the screw 2 and turn a hand-wheel (not shown in the illustration). The hand-wheel mentioned operates a worm F engaging with the worm-wheel E and causing it to revolve. The lower end of the central spindle 1 is threaded to fit the threads in the bore of the worm-wheel, so that as this wheel revolves the central spindle is raised or lowered according to whether the hand-wheel is turned to the left or the right. The hollow shaft and crushing cone being supported by the ball and socket bearing at the top of the central spindle, are thus raised or

lowered as desired and the necessary adjustment obtained.

Owing to the continuous action of the breaker, no flywheel is needed. A special arrangement is used to prevent breakage of the machine in case a hammer drill, or crowbar should accidentally fall into the feed opening with the stone. The pulley J is not fast to the countershaft 3, but is free to revolve except for its connection to the break pin hub K, by means of two cast iron break pins 13. The break pin hub is, of course, keyed fast on the countershaft, and the break pins are of a cross section, which is calculated to give sufficient strength to insure driving the crusher when working on the hardest stone, but not strong enough to stand an undue strain likely to damage the machine. The result is that in the event of a hammer falling into the breaker, the damage is confined to breaking a couple of cast iron pins that can be replaced in a few minutes and at a small expense.

With the exception of the bottom shell A and the bottom plate B, both of which are of cast iron, the breaker is constructed of steel. The crushing faces are usually made of manganese steel.

#### GEOLOGICAL SURVEY OF CANADA.

An Ottawa dispatch says that the field operations of the Geological Survey of Canada have been planned for the coming season. The number of parties sent out will be fewer than last year, but better organized and equipped. In Nova Scotia the work will be prosecuted by Messrs. A. Fletcher, E. R. Faribault and Dr. Ami. In Ontario a party under the direction of Dr. Barlow will investigate the nickel and iron deposits. Messrs. R. G. McConnell and J. Keele will continue to map out the mineral areas of the Klondike, with special reference to the gold-bearing gravels and reefs. Mr. R. W. Brock, accompanied by Mr. Boyd, will investigate the silver-lead, copper and other ore deposits in the Kootenay District. The work of surveying the gold-bearing strata of the foothill district east of the Rockies and in the Bow River Pass, in Alberta, will be carried on, while Mr. W. Leach will continue his work on the coal deposits of British Columbia. Messrs. W. McInnes and W. J. Wilson will each have charge of parties on the still unexplored region southwest of Hudson Bay.

#### IRON AND STEEL EXPORTS AND IMPORTS.

Exports of iron and steel—including machinery—from the United States, for the three months ending March 31, are valued by the Bureau of Statistics of the Treasury Department at \$22,344,050, against \$23,816,660 for the corresponding period in 1902: showing a decrease of \$1,472,610, or 6.2 per cent. this year.

The principal items of these exports are shown in the table below, in long tons:

	1902.	1903.	Changes.
Pig iron .....	11,412	3,839	D. 7,573
Billets and ingots .....	457	511	I. 54
Bars .....	7,024	10,649	I. 3,625
Sheets and plates .....	2,653	3,075	I. 422
Rails .....	28,624	1,037	D. 27,587
Structural steel .....	26,748	7,752	I. 18,996
Wire .....	21,431	24,174	I. 2,743
Nails .....	7,016	8,014	I. 998

The only increases shown were in lines where there is a long established trade. It must be remembered that in 1902 exports had fallen off very largely from those of the preceding year.

Exports of iron ore for the three months were 2,168 tons, against 996 tons last year; an increase of 1,172 tons.

The total value of iron and steel imports for the three months is given at \$12,393,810, against \$5,892,088 for the first quarter of 1902; an increase of \$6,501,722. The chief items of these imports were as follows, in long tons:

	1902.	1903.	Changes.
Pig iron .....	33,374	215,494	I. 182,120
Scrap iron and steel .....	5,889	24,380	I. 18,491
Ingots, billets and blooms .....	14,136	90,309	I. 76,173
Tin-plates .....	18,893	12,804	D. 6,089

The reason for the large increase in imports this year is found in the heavy consumption of iron and steel here. British and German pig iron and steel billets have found quite an extensive market along the Atlantic Coast. While the quantities taken are comparatively large, they are, however, insignificant when compared with our total production.

Imports of iron ore for the three months were 192,927 tons, against 214,826 tons in the corresponding period in 1902; a decrease of 21,899 tons. The larger part of this ore came from Cuba.

#### BLAST FURNACES IN GREAT BRITAIN.—

On March 31 there were in Great Britain 350 furnaces in blast, or two less than the average of the quarter ending December 31. The total number of furnaces on the list of the British Iron Trade Association is 554, so that there were 204 out of blast. In Great Britain, as in this country, however, it is quite probable that there are a number of old furnaces carried on the list, which, owing to their position or old-fashioned equipment, will never be operated again. On March 31 there were 63 furnaces reported as under construction or under general repair.



**THE EDISON DRY PROCESS FOR THE SEPARATION OF GOLD FROM GRAVEL.**

By CLOYD M. CHAPMAN.

(NOTE.—This article is published with my consent and approval; and the facts set forth are correct.—T. A. EDISON.)

In spite of the fact that there are several hundred patented processes for the separation of gold from gravel without the use of water, there is not one as yet in any general use on a large scale. Dry washers of various forms have been employed, and are still at work in various parts of the world upon placers having little or no water at hand, but they are usually hand machines, and are only practicable where the gravel carries values sufficient to pay the operator out of the few tons at most which he can handle in a day, and the greater part of the gold is left in the gravel.

About six years ago Mr. Edison took up the problem of producing a process which would save the

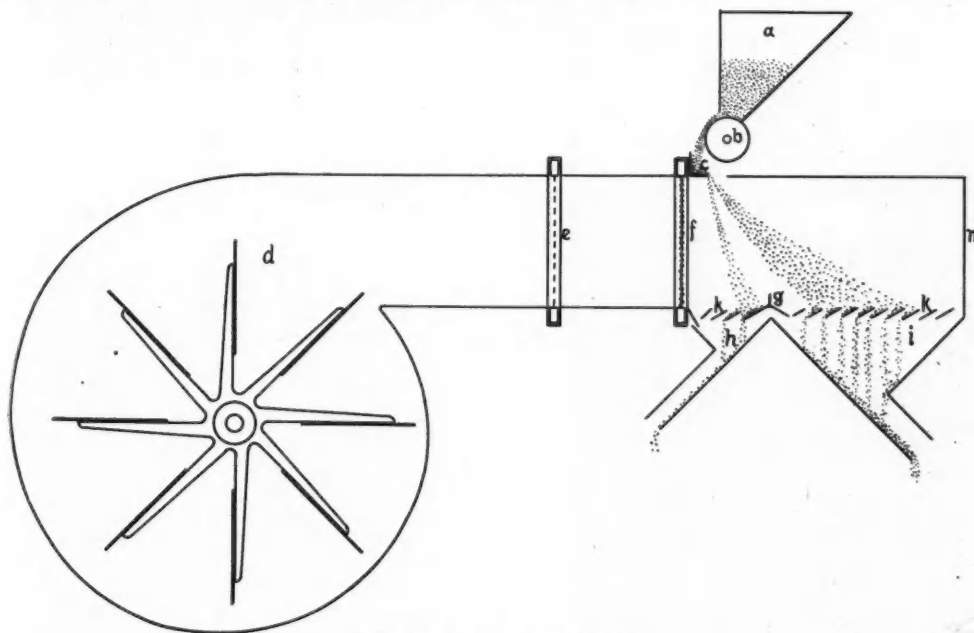
through which the blast passed must be overcome so that the blast shall not be stronger in the middle than on the sides.

Third.—All particles of gravel and gold must enter the blast at a uniformly low velocity.

Fourth.—The material being treated at any one time must not vary in size beyond certain limits.

In time all the requirements were met and a machine was taken to New Mexico, where an experimental plant was erected upon the placer for the working of which the process was developed. This machine was a wooden affair, and its essential features are shown in Fig. 1.

The revolving roller *b* discharges the gravel from the hopper *a* upon the shelf *c*, from which it falls into the air-blast created by the centrifugal fan *d* discharging its air through the screens *e* and *f*. The parting board *g* divides the heavier portion of the gravel—the gold and iron or black sand, which falls into the chute *h* from the lighter portion falling into the tailings chute *i*. The lattice *k*, *k* is simply to prevent eddy currents of air going down the chutes *h* and *i*. The end *m* is open.



EDISON DRY PLACER MACHINE.

gold in a very large, and, judging from numerous reports that had been made on it, a very rich placer located at the foot of the famous Golden Mountains in the arid region of New Mexico, on the Ortiz Mine grant, 35 miles southwest of Santa Fe. To what extent he has succeeded, it is a part of the purpose of this article to show.

The difficulties to be faced were many and great. First, the process must be exceedingly inexpensive to operate. The gravel must be excavated, concentrated, and the tailings disposed of for not more than 15c. per cubic yard.

Second.—It must have a large capacity in order that great quantities of gravel can be treated daily in a plant of practical size.

Third.—It must save a high percentage of the gold. Very little gold can be spared in the tailings when the original gravel carries so small an amount.

Fourth.—It must save all sizes of gold from a few thousandths of an inch to the size of peas or larger.

After three years of work, covering the known processes for dry concentration and many original methods, it was found that if certain conditions could be brought about the simple method of letting the gravel fall freely through a horizontal current of air, and saving that portion of the material which was least deflected from its vertical course by the blast, gave the best results.

The necessary conditions were: First.—A blast free from all puffs.

Second.—A blast of perfectly uniform velocity throughout its entire cross section; that is, the retarding action of the walls of the chamber or duct

By a suitable adjustment of the speed of the fan, the position of the parting board *g* and the rate of feed of the gravel a concentrate was obtained, the details of which are given below.

The gravel treated by this machine was taken from shafts sunk at widely distributed points on the placer. The material, therefore, was of a variety of qualities. From some shafts the gold was fairly coarse; from others exceedingly fine. From some the gravel was very coarse and stony, from others it resembled clay in its fineness of grain. Some of the gravel treated carried more than 30c. per cubic yard, some less than 3c.

It was known that the coarsest gold was less than 1/8-in. mesh, hence everything over that size was screened out at the shaft and not taken to the mill for treatment. The gravel under 1/8-in. mesh was taken to the mill, divided into five sizes, which will be called A, B, C, D, and E; A being the finest and E the coarsest. The size A would, if wet, make slimes, as very little of it was coarser than 100-mesh, and the greater portion of it finer than 200-mesh. This division of the gravel into sizes was done by means of Mr. Edison's screening process, the details of which space will not permit me to give here.

Each of these sizes was next passed through the air separator. A sample of the tailings, amounting to about 4 per cent of the total material passing, was automatically taken. The entire concentrate was panned with water by hand and assayed by fire. The tailings sample was similarly treated. From the assay of this sample was computed the loss of gold in the tailings.

It will be noted from the table that, as usual, it is the finest gold that is difficult to recover. Since these tests were made, a method has been devised and operated which greatly improves the percentage of saving of this fine gold.

The apparent drop in the efficiency of the size E was due to the finding of one piece of gold weighing about 10 milligrams in the tailings sample. Disregarding that piece the saving would have been 98.3 per cent, making a gradual advance in the efficiency, as the size of the material increased.

These figures show the results on one of the many shafts tested, but do not represent the best work done by the process. The general average of all the runs with all sizes of gravel from the finest dust to 1/8-in. mesh and carrying from 3c. to 35c. in gold per yard, showed 92.5 per cent of the gold saved.

Upon a large scale the process operates as follows: A steam shovel excavates the gravel and deposits it on grizzlies having a spacing that will allow the passage of the coarsest gold which the deposit is known to produce. The stones thus removed are left on the spot. The fines fall into cars, are hauled in trains to the mill, and dumped into a storage bin from the bottom of which it is fed to an inclined conveyor leading to the top of the sizing house. In passing by gravity through the screens the gravel is divided into the number of sizes required by the character of the material, from four to eight. Each size of gravel coming from the screens is conveyed to a group of separators, properly adjusted to treat their particular size of material. Passing under all the separators are two conveyors, one carrying the concentrate to the stock house for final refining and the other carrying the tailings to the dump or to the empty cars which dump the tailings on their way back to the steam shovel.

The data for shaft No. 9 are as follows: Total gravel excavated, 33.8 cu. yds.; weight, 137,464 lb.; total gravel treated in mill, 38,896 lb. This was divided among the five sizes as follows: A, 8,911 lb.; B, 7,022 lb.; C, 8,040 lb.; D, 8,075 lb.; E, 6,848 lb. The results are shown in the following table:

Size.	Amount treated, pounds.	Weight gold in concentrate milligrams.	Weight gold in tailings milligrams.	Per cent of gold saved.
A	8,911	513.2	147.40	77.7
B	7,022	1,737.5	66.65	96.3
C	8,040	3,478.0	75.70	97.8
D	8,075	3,667.0	340.46	91.5
E	6,848	2,542.5	26.41	99.0
Total	38,896	11,938.2	656.62	95.0

The concentrates are further treated, in order to reduce their bulk and increase their value, by passing them over an Edison magnetic separator which removes the magnetic black sand or iron ore. This magnetite is found almost without exception in all placer deposits and being the heaviest constituent of the gravel, with the exception of the gold, it usually forms the bulk of the concentrate. This iron is also in demand as a flux in copper smelting and for other purposes. It may, therefore, be a valuable by-product of the plant, and by the use of these magnetic separators it is concentrated cheaply and efficiently, and may be disposed of profitably.

**IRON MAKING IN THE MIDDLESBROUGH DISTRICT.**—The London *Colliery Guardian* says that at the annual meeting of Messrs. Bell Brothers, Limited, at Middlesbrough, recently, Sir Isaac Lowthian Bell stated that during 1902 each furnace in blast had made 39,360 tons of iron, against 34,080 in 1901. The coke made at the Clarence ovens was 664,570 tons, against 765,000 tons in 1901; the coal worked was 871,400 tons, against 765,117 tons; the ironstone raised was 1,131,848 tons, against 1,095,970 tons. Speaking of the Cleveland iron ores, he said that, making allowance for difference in content of iron and so forth, it was one of the most economical sources of iron that he knew of. He must except Germany, because in Luxembourg they had a very large field of iron ore, which was very cheaply worked.

### A TWENTY-TON SWITCHING ELECTRIC STORAGE-BATTERY LOCOMOTIVE.

The electric storage battery locomotive described below has been designed with special reference to the economical handling of material in mills or other manufacturing establishments. It frequently happens that a single car-load of raw material has to be distributed at various parts of the works, and, in such cases, much costly re-handling can be saved by shifting the entire car from point to point, and discharging each portion of the load exactly where it is required. A similar economy can be effected by collecting the finished product at the different buildings, and loading each consignment directly into its proper car. The locomotive in question is used for shifting cars while loading or unloading in this manner, and also for transferring material in course of construction, from one shop to another.

The simple and rugged construction of this locomotive reduces the expense for maintenance to a minimum, probably less than the cost of shoeing the horses, which it replaces. The operating ex-

Before installing the locomotive, the cars were shifted, one at a time, by three horses harnessed up tandem. The storeroom at the canal is so constructed that the horses would have no means of exit if driven in ahead of the car, and this necessitated sending it in "on the fly." The bridge across the canal is just wide enough for the car tracks, and the horses had to turn out before reaching it. To get up speed, it was necessary to start some distance up the track, the "tag holder" (the man at the coupling), the driver and the horses all traveling at their best gait. At the proper moment, the tag holder unhooked the "tag" or rope fastened to the traces and ran out from in front of the car. The consequence of a slip or false step are self evident. In the case of a heavily loaded car, the horses were unable to give it sufficient momentum, and the operation had to be completed by the loading gang.

This locomotive is built for the standard 4 ft., 8½ ins. gauge, and fitted with M. C. B. standard couplings, making it suitable for use with any ordinary railroad car, and on any standard railroad track.

complete shut-down is necessary to enable more or less costly repairs to be made by an expert electrician or mechanic.

The battery was furnished by the Electric Storage Battery Company, the elements being mounted in tanks of extra depth to prevent the electrolyte from splashing over the top. In mounting the battery, special attention has been paid to protecting it against injury due to the shocks to which the locomotive is exposed in switching.

There are two motors, specially wound, for the service. By connecting the two motors in series or parallel, and by varying the arrangement of the fields, an efficient speed control is obtained without wasting any of the energy of the battery by passing it through a resistance. The controller is of the standard vehicle type, and has two levers which control every desired motion of the locomotive. The reversing lever is set to point in the direction in which the locomotive is to move, and the second lever controls the speed. These levers are mechanically interlocked, as in the case of a trolley car controller, so that the motors can only be reversed when the speed lever is in the off position. The locomotive may be run with the controller in any notch, there being no transition point on which a careless operator might leave his lever and burn out the apparatus.

As already mentioned, the speed-reducing gearing is located in the cab, instead of beneath the car-body. All the gears are machine cut, and run in a bath of oil, in fully enclosed gear cases of the C. W. Hunt Company's standard type. The same company's regular flexible and insulated coupling is used for connecting the motor to the gear case. There is a separate gear-case for each of the two motors. It will be seen that the driving gear consists of two parts which are exact duplicates of each other. In an emergency, one motor could be cut out entirely, and the locomotive operated by the remaining motor, but with a reduction of hauling capacity.

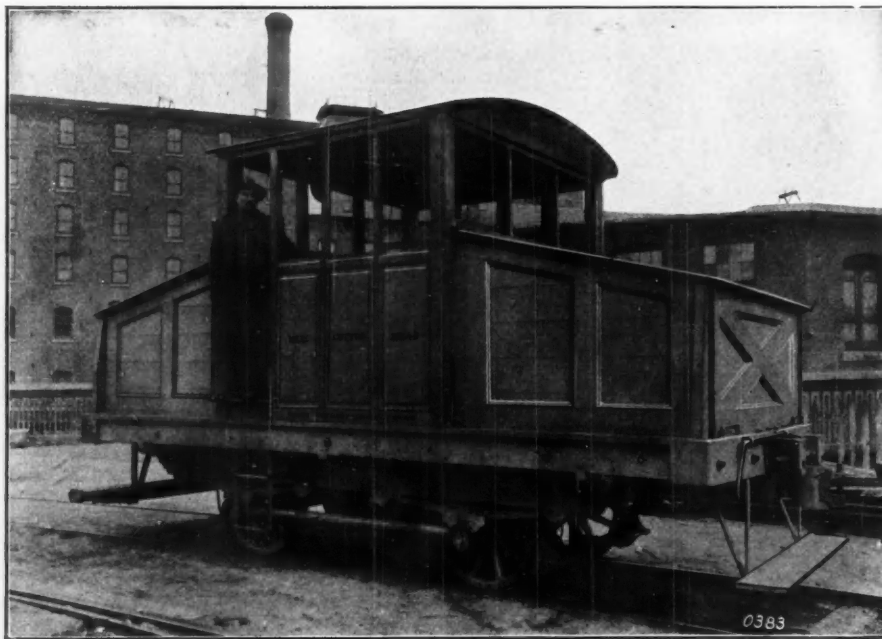
The speed reduction of the gear case is so proportioned to the safe discharge rate of the batteries, the safe capacity of the motor, and to the weight of the locomotive, that neither the batteries nor the motors can be dangerously overloaded.

The driving axles are made to the M. C. B. standard dimensions, and run in Hunt patent roller bearings, which reduce the friction at these points to a very small amount. The wheels are shrunk in place, and have chilled treads and flanges of M. C. B. standard size and shape. A powerful brake is conveniently located in the cab. An alarm gong is also provided.

Experience has shown that in light switching service the batteries can be recharged at various times during the day while the locomotive is waiting between hauls. For heavier service, it may be necessary to charge during the noon hour or after working hours in the evening. The battery is automatically protected during charging by well-known safety appliances which open the circuit if the current is excessive, and also when it drops so low as to indicate that the battery is fully charged. The precise arrangement of the charging station depends largely on the details of the electric plant available, and the builders of the locomotive are glad to advise their customers as to the methods to be employed in each particular case.

This locomotive is designed and built by the C. W. Hunt Company, of West New Brighton, Staten Island, N. Y. Smaller locomotives intended for use on the narrow-gauge tracks have been built by the same company for a number of years, and have been described in former issues of this paper. The locomotive illustrated could be used in many places for haulage about mines and mills where heavy work is done and there are railroad connections.

**COAL AND PETROLEUM IN TRINIDAD.**—The recent British Colonial report for 1902 says that during the year ten licenses were issued to prospectors to search for petroleum and coal in



TWENTY-TON ELECTRIC STORAGE BATTERY LOCOMOTIVE.

penses consist of the cost of power required to charge the batteries, and the pay of one man. Even if charging current is supplied from an independent steam driven generator, it is cheaper than any other method of handling cars, as there is no waste of energy when the machine is not in operation. A steam locomotive requires a licensed engineer and an assistant to operate it, and it greatly increases the fire risk. The disastrous consequences which can result from the sparks of a steam locomotive when used near highly inflammable material are frequently illustrated.

A further advantage of the storage battery locomotive is that it can be run on any track or switch without the expense of the erection and maintenance of a trolley wire.

A locomotive of this type has recently been installed at the works of the Massachusetts Cotton Mills in Lowell, Mass. The original buildings have been improved and extended to meet the requirements of the growing business, and new structures have been added, from time to time, until the entire plant covers a considerable area. The freight siding is separated from one of the two principal storehouses by the main business street of the city, and from the second of these storehouses by the canal which supplies the turbines of the mill. It is necessary to deliver car-loads of baled cotton at either or both of these buildings. Neither a steam nor a trolley electric locomotive is permissible in the storehouses on account of the fire risk.

The length over the bumpers is 21 ft. 4 ins., and the height from the rail-head to the top of the cab is 12 ft. 1 in. The wheel base is 7 ft. 6 ins., and permits the operating of the locomotive over a comparatively smaller turntable. It weighs about 20 tons, and runs at a speed of from two to four miles per hour on level track.

As will be seen from the illustration, the locomotive is double-ended, the cab being located directly in the center. This makes a very desirable arrangement for switching work, which calls for operation in both directions with equal facility. The batteries are contained in the sloping compartments at either end. This symmetrical disposition distributes the weight evenly on the four wheels, and, as each of these is a driver, the entire weight of the locomotive is usefully employed in traction. The wheels and axles are driven from the gear cases in the cab by means of Renold silent chains suitably enclosed. These chains are the only portions of the driving gear situated below the car-body, the motors and gear-cases being mounted in the cab where they are readily accessible, and always under the immediate notice of the operator. Under these conditions, any reasonably reliable man can be depended upon to maintain the electrical equipment in proper working condition. This is considered a most important feature of the design, as it is a matter of common experience that any inaccessible piece of mechanism will be run with no attention until it finally refuses to operate. When such a condition is reached, a

Trinidad. Coal has been found in several parts of the island, in most cases outcropping at the surface, but it is chiefly lignite of a quality which would be unable to compete with the important coal. The borings for coal undertaken by the Government have been so far successful as to warrant further trials being made under expert advice.

**COAL AND ASPHALT LANDS IN INDIAN TERRITORY.**

The selection of the coal and asphalt lands in the Choctaw and Chickasaw Nations, Indian Territory, for segregation and sale was completed and the report was submitted March 19. This segregation was made under the direction of the Commission to the Five Civilized Tribes by order of the Secretary of the Interior, and Mr. Joseph A. Taff, of the United States Geological Survey, was assigned to make the selection. With three assistants, Mr. Taff began work December 1, 1902, and during the progress of the survey traced the outcrop of the coal beds as accurately as possible through several thousand square miles of coal-bearing rocks, which had been surveyed during the preceding five years. Nearly 100 square miles of new territory were surveyed in order to complete the geological work of the Choctaw and Chickasaw coal-fields.

Ten coal beds were found to be of economic value and were located for segregation. The coal in the lands selected ranged in quality from that of high-grade bituminous coking coals to medium grade bituminous steaming coals that do not coke successfully. The coal in each bed varies slightly from point to point both in thickness and in quality, and also differs in quality from that of other beds. The coal beds vary in inclination beneath the surface, and extend from the outcrops to depths beyond the limit of practicable mining.

The asphalt lands selected contain asphalt of two general classes. To the larger of these classes belong the bituminous semi-liquid deposits which are found permeating porous sandstones and limestones. These occur both in horizontal beds and in beds dipping at various angles to the surface. Deposits of this nature are found filling rocks that range in thickness from thin beds to beds several hundred feet thick. The second class of asphalt is solid, has the general appearance of a highly bituminous coal, and is usually clear of earthy or stony impurities. It is found filling fissures as solid veins pitching steeply into the earth, and may be mined and shipped in the same manner as coal.

**THE MANUFACTURE OF PLASTER OF PARIS.**

First the gypsum rock should be crushed down with some first-class crusher, jaw crusher preferred, down to about 1-in. cubes. If Blake or jaw crusher is used, the opening should be 20 by 12 ins.

Second.—The crushed rock should then be dried on a rotary dryer, direct heat. The products of combustion should not pass through the material unless oil, gas or coke is used for fuel, but should pass on the outside of the dryer only. The size of the dryer depends upon the capacity required, and should have in connection with it a good dust chamber for settling the dust which is valuable.

Third.—After drying the material should again be crushed on an ordinary Bowl crusher.

Fourth.—It is then ground to about 80-mesh, usually on French buhr stones or some pulverizer, as may be desired.

Fifth.—The ground material is then passed into a calcining kettle, usually about 8 ft. diameter, 8 ft. high, with cross flues with fire front and grates and doors, also with upright shaft and stirrers near the bottom, driven with heavy gears above.

The material is slowly passed into this calcining kettle, when it soon begins to boil, more material is gradually added until the kettle is full. From rock that has been crushed and dried thoroughly, a batch can be calcined in about an hour and a half, depending very much on the dryness of the gypsum rock, also of the finished product. The material contains enough moisture to thoroughly boil for a short time,

when it comes to a dead state and then will boil the second time, and in some cases even the third time. The more it boils the better the quality of the material. For ordinary plaster work but one boiling is required; for fine work and plaster of paris, two boilings are necessary.

This is where the chemical change takes place. After it is sufficiently calcined or boiled, it should be immediately emptied and placed into hoppers or bins made of brick or iron, after which it is ready to be conveyed and elevated to the storage bins to be packed in barrels or sacks ready for the market. As soon as the kettle is emptied another charge should be immediately put in.

To manufacture, say, 10 tons of plaster of paris an hour would require the following machinery:

1. Crusher for crushing the material down to 1-in. cubes; estimated price, \$1,000.
2. Rotary dryer, direct heat, 48 ins. in diameter, 27 ft. long, together with dust room; estimated price, \$2,500.
3. "Bowl" crusher for crushing the material after drying fine enough to grind on buhr stones; estimated price, \$300.
4. Four French buhr stones for grinding; estimated price, \$1,200 each.
5. Two calcining kettles; estimated price, \$1,200 each.
6. Necessary hoppers, bins and conveyors, also power.

It will require about 150-h.p. engine with the necessary boilers for same.

If it is desired to make this material into wall plaster, which is now largely done, in addition to the above, it will be necessary to have a dryer for drying sand and a hair picker for picking the hair and the necessary dry mixers for mixing the different materials.

**MINERALS IN NORTH BORNEO.**

In a paper read recently before the Society of Arts in London, Mr. Henry Walker, Commissioner of Lands for British North Borneo, said that gold and coal have long been known to exist in North Borneo. At one time the alluvial gold-field round Darvel Bay and on the Segama River seemed likely to be an attractive one, and in 1888 nearly 100 Chinese were washing for gold on what is now the Darvel Bay Company's Tobacco Estate; but in those days we had no regular steamer to Darvel Bay, the miners had to pay heavy prices for provisions, and what may yet be a profitable gold-field ceased to be worked. In Sarawak and in Dutch Borneo the alluvial gold is worked by Chinese settlers. These people make a living by agriculture, and they have all the comforts afforded by the presence of their wives and families. If our Chinese gold workers had facilities similar to those in South Borneo, we should to-day have a large gold-working population in Darvel Bay.

Coal is being prospected for by a syndicate, and their engineer, Mr. Phillips, has lately located, and traced for a mile, a 3-ft. seam in the vicinity of Cowie Harbor, on the east coast, and it is confidently anticipated that this seam will shortly be worked. Coal also exists at Naloyan, near the railway. In 1902, a very important mineral concession was granted to an influential syndicate on the understanding that a large sum of money is to be spent annually on prospecting. This syndicate has lately sent out a number of experienced prospectors to explore our territory, and has offered a reward for finding minerals. A lode of manganese ore was lately found by Mr. John Carnarvon on the Borneo Coffee Company's estate in Marudu Bay. Copper and antimony are both believed to exist in North Borneo. Platinum is found in small quantities in conjunction with the alluvial gold in the Segama River. Mineral oil oozes out in various places, notably in the Sequati River, at the extreme north of the territory, and on the Klias Peninsula. Iron ores are also known to exist in large quantities.

**ABSTRACTS OF OFFICIAL REPORTS.**

*Winona Copper Company, Michigan.*

This company is developing a copper mine in the Lake Superior country. Its report for the year ending December 31, 1902, shows that 1,660 ft. of development work was done during the year, and that a quantity of new machinery was erected. In December a test of rock taken from the mine was begun, and lasted until the end of February of the current year. During this time 12,895 tons of rock were stamped, from which 436,144 lb. of mineral, or 33.8 lb. per ton, was obtained. The total yield of fine copper, including 19,752 lb. of mass copper, was 301,339 lb., showing an average of 23.4 lb. per ton, or 1.17 per cent.

The financial statement shows that receipts from sales of 101,188 lb. of copper at an average of 12 7/8c., were \$13,028. Receipts on account of assessment No. 1 were \$90,744, making a total of \$103,772. Expenses at the mine were \$48,059; other expenses, \$7,003, making a total of \$55,062, and leaving a balance of \$48,710. At the commencing of the year there was a deficiency of \$9,617, showing a balance on hand at the close of the year of \$39,093.

President John Stanton's report says: "The underground work during the year was confined to drifting on the lode in the direction in which the previous work had indicated the probability of discovering paying ground, and in making preparation for a mill test, which would determine the yield of the rock that could be taken from the copper-bearing portions of the lode through which the levels had passed.

"The only stamp that could be made available was the head in the Atlantic Mining Company's mill then engaged in stamping rock from the Champion Mine. This head was not ready for use until early in December, when it began to stamp rock from our mine with quite satisfactory results. These results warranted the directors in adopting a policy of active exploration of the territory towards our southern boundary, both by extending the lower levels and by sinking another shaft from the surface at a suitable distance from the shaft now in use.

"An assessment of \$1 per share (\$100,000) on the capital stock of the company, payable March 12, 1903, has been called for, in order to provide funds for the purposes named."

*Mason & Barry, Limited.*

The report of this company, which works an extensive deposit of copper-bearing pyrites in the San Domingos Mine, in Portugal, covers the year ending December 31, 1902. The directors' report says: "The total quantity of ore broken and raised at the mine during 1902 was 177,563 tons, as against 129,314 tons in 1901, and the shipments during the same period (inclusive of ore from the cementation works) amounted to 405,111 tons, as against 449,760 tons in the previous year. The quantity of ore sold and invoiced for its sulphur value during 1902 amounted to 413,309 tons, as against 453,027 tons in 1901.

After writing off for depreciation of works, plant, etc., the sum of £20,681, which is approximately the value of new works and plant added to capital account during the year, and allowing for the variation in the estimated value of the stocks on hand on December 31, 1902, and after deducting management expenses and income tax, the net profits on working account have amounted to the sum of £90,495, to which has to be added the sum of £9,316 received as dividend on La Sabina shares, and the sum of £1,301 from sundries, making together a total profit for the year of £101,112. Assets reported are:

	1900.	1901.	1902.
St'ks in Eng. and on the con't	£18,167	£11,384	£17,271
Stocks in Portugal, bal. of cost of ore at cementation works	42,880	33,156	21,554
Ore ready for shipment	26,893	16,142	27,647
Copper precipitate	11,170	9,816	8,832
Total	£99,110	£70,498	£75,298

"The mine assets in Portugal (after writing off

for depreciation) stood at £115,496. These assets embrace works, buildings, land, plant, etc.; railways, shipping piers, tugboats, etc.; mine stores and cash assets; stocks of ore and copper precipitate.

"The profit realized on the year's working amounts to £101,112, to which has to be added the balance—£8,564—brought forward from 1901, making £109,676; the directors having written the sum of £2,000 off La Sabina shares, there remains a balance for appropriation of £107,676. From this balance the directors recommend the payment of a dividend of 55 per cent, or 11s. per share, the appropriation of £1,000 to the staff pension fund, and to carry forward the sum of £4,832 to the next account."

#### Alaska Mexican Gold Mining Company.

This company works a large deposit of low-grade ore on Douglas Island, Alaska, adjoining the property of the Alaska Treadwell Company. Its report covers the year 1902. The capital stock is \$1,000,000 in shares of \$5 each. Of this stock a total of \$900,000 has been issued, \$100,000 being held by the company.

The earnings and expenses for the year were as

making a total of 5,286 ft. The greater part of this was done on the 330 and 440-ft. levels. Development, however, is being pushed on the 550-ft. level, and a little work has been done on the 660-ft. level. This work has shown some considerable bodies of ore, similar to that now being obtained from the mine. The estimate of ore in sight at the close of the year was 161,450 tons, chiefly on the 440 and 550-ft. levels. In addition to this, there is an estimated tonnage of 122,000 above the 550-ft. level, which is not yet developed.

The average assay value of 1,512 samples taken in the mine from each level was \$2.01 per ton. Excluding the cost of shaft sinking, the cost of mining and developing was \$1.059 per ton of output. The total amount of ore mined and sent to the mill during the year was 207,455 tons, which includes 9,157 tons obtained from development work. The larger proportion of the ore mined, or 64.1 per cent, came from the 330-ft. level.

The 120-stamp mill crushed during the year 207,455 tons of ore, the yield being shown above. The mill ran 216 days 15 hours during the year, the average duty being 5.83 tons per stamp per day. The

take all the product, and the steamship companies would not take concentrates, so long as they could secure any other freight.

There were 13 accidents during the year, in which 5 were killed, 2 seriously and 6 slightly injured. One man was killed by falling down a raise, one by a mine car, two while loading concentrates, and one while erecting a gallows frame. Of the injuries, two were caused by falling of rock, two by falling down shafts, two by mine cars, one by explosives and one in the mill.

Labor was plentiful during the year. The report gives the rate of wages paid as follows, these rates being in all cases in addition to board and lodging, which is furnished by the company to all its employees, with the exception of Indian laborers: Machine drillers, \$2.50 per day; helpers, \$2.25; amalgamators, \$90 per month; feeders, \$70 per month; vanner men, \$65 to \$100 per month; blacksmiths, \$4 per day; tool sharpeners, \$3.50; blacksmith helpers, \$2; white mine labor, \$2 per day, with board and lodging; Indian labor, \$2 per day, without board and lodging.

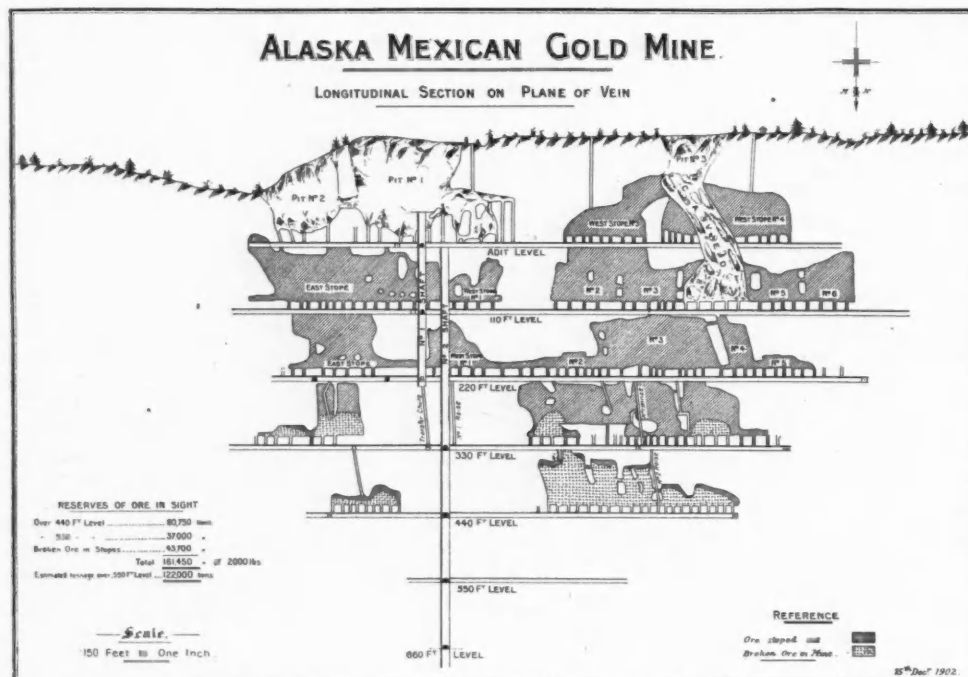
#### Union Copper, Land & Mining Company, Michigan.

The directors' report for the year 1902 says: "During the past year we have continued and finally brought to a conclusion the engineering and other work to which reference has previously been made. Each tract of land has been carefully surveyed, and its area, contour and boundaries noted; corner posts and other landmarks, which were found in place and in good condition, have been identified, while many others which had become obliterated have now been properly located. We have also finished the work of estimating the quantity and nature of the standing timber with which a very large part of the property is covered. Practically all the pine had been removed years ago, only about 150,000 ft. remaining. There are, however, still standing over 3,000,000 ft. of hemlock, and about 300,000 cords of hard wood, with a quantity of cedar, spruce, basswood, etc., all of which for mining, manufacturing or fuel purposes already commands a good price and which is steadily increasing. We have, moreover, explored so far as possible by surface examination the outcrops of different geological formations, having previously examined, by the aid of the diamond drill, some of the underlying mineral lodes. These and similar reliable data have now been for the first time collected, recorded and filed in the company's archives, thus being made readily available whenever information relative to the physical or geological characteristics of the property is needed. This has required a considerable outlay.

"Although for well-known causes there has been little or no demand for mining lands during the past year or more, the recent revival of interest in copper matters has induced renewed inquiry as to a number of different tracts during the last few months. While existing mines have so far been able to supply the consumptive demand, we believe that the steadily increasing call for this metal will require in the future, as in the past, new sources of supply—especially for Lake copper—and that a market will thus be made for all available mineral lands in that section.

"It should be borne in mind that the 200 different parcels comprising our 7,000 acres are all located on the so-called mineral belt, and extend over a distance of 100 miles from north to south. Developments during the last five years have shown that preconceived notions as to the richest mineral deposits, based upon information acquired through the relatively small number of working mines, are entirely misleading, and that no one can safely prophesy on what yet undiscovered lodes the great Michigan mines of the future will be located.

"The total expense during the past year, less interest, etc., amounted to \$8,851, which will be reduced during the current year as the surveying and other work above referred to is now finished. The cash balance in the treasury on January 1, 1903, was \$83,856."



follows, the averages being based on 207,455 tons ore milled and 3,528 tons sulphurets treated:

	Amount.	Per ton.
Free gold from mill .....	\$211,576	\$1.0199
Base bars .....	5,196	0.0250
Sulphurets treated .....	209,960	1.0121
<b>Total receipts .....</b>	<b>\$426,732</b>	<b>\$2.0570</b>
Mining .....	\$219,706	\$1.0590
Milling .....	48,180	0.2322
Sulphuret treatment .....	25,896	0.1248
General expense, Douglas Island ..	4,011	0.0193
San Francisco office .....	2,313	0.0112
London office .....	616	0.0030
Paris office .....	101	0.0005
Consulting engineer .....	1,014	0.0049
Bullion charges .....	2,071	0.0100
<b>Total working costs .....</b>	<b>\$303,908</b>	<b>\$1.4649</b>
Construction .....	36,799	0.1774
<b>Total costs .....</b>	<b>\$340,707</b>	<b>\$1.6423</b>
<b>Net profit .....</b>	<b>\$86,025</b>	<b>\$0.4147</b>

The balance carried over from 1901 was \$36,506; making a total credit to profit and loss of \$122,531, brought forward to current year. Current assets include \$3,845 stores and \$92,104 cash on hand. The company owns 100 shares Tacoma Smelting Company stock, valued at \$10,262.

The work done, and the ore developed in the mine at the close of the year, are shown in a map attached to the report, which is reproduced herewith.

The report of General Superintendent Joseph MacDonald says that the exploration and development work for the year included 2,022 ft. drifting; 397 ft. cross-cutting; 670 ft. intermediate drifting; 218 ft. shaft sinking; 153 ft. station and skip shoots,

quantity of sulphurets saved on the concentrating tables was 3,792 tons. The mill ran 150 days, 3 hours by water, and 146 days, 13 hours by steam. The quicksilver used in the batteries was 42,844 lb., and on the plates 5,372 lb. Repairs to the mill included 345 new shoes, 260 dies, 182 stamp stems broken and replaced, 2 new cam shafts, 20 new tappets, 27 boss-heads and 5 new mortars. There were also 9 new vanner-belts placed during the year. The quantity of sulphurets sent to the Tacoma Smelter and treated there was 3,528 tons. As will be seen from the expense statement, the sulphurets furnished very nearly one-half of the bullion saved. At the close of the year there were 272 tons of sulphurets on hand awaiting treatment.

The time lost in the mill was chiefly due to the reconstruction of the plant after the fire in February. This fire completely destroyed the gallows frame, shaft house and compressor, and besides did considerable damage to the mill building. The compressor was not materially damaged, but the dynamo of the electric light plant was a total loss. The cost of reconstruction was \$23,891.

The ore-bin in the mill was strengthened by additional posts, caps and sills, and two additional ore cars were placed in the equipment. At the beginning of the year, horses were substituted for men in tramping ore to the shoots. Some trouble has arisen in consequence of the difficulty of obtaining transportation for the concentrates to Tacoma. The two barges used for this purpose were not able to

## BOOKS RECEIVED.

In sending books for notices, will publishers, for their own sake and for that of book buyers, give the retail prices. These notices do not supersede review in a subsequent issue of the ENGINEERING AND MINING JOURNAL.

- Mond Gas.* Philadelphia; prepared and issued by R. D. Wood & Co. Pages, 104; illustrated.
- The Story of "South Africa" Newspaper and Its Founder.* Told by Others. London, England; published by South Africa. Pages, 188; illustrated.
- Modern Electrolytic Copper Refining.* By Titus Ulke. New York; John Wiley & Sons. London; Chapman & Hall, Limited. Pages, 176; illustrated. Price, \$3, net.
- L'Aluminium. Ses Propriétés—Ses Applications.* By Dr. P. Moissonnier. Paris, France; Gauthier-Villars. Pages, 222; illustrated. Price (in New York), \$2.50.
- Aide-Memoire de Photographie pour 1903. Twentieth Year.* By Dr. C. Fabre. Paris, France; Gauthier-Villars. Pages, 300. Price (in New York), paper, 60 cents; cloth, 80 cents.
- Mining Operations in the Province of Quebec, 1902.* J. Obalski, Engineer and Inspector of Mines. Quebec, P. Q.; published by the Department of Lands, Mines and Fisheries. Pages, 50.
- California Miners' Association. Proceedings of the Eleventh Annual Convention.* 1902. Edward H. Benjamin, Secretary. San Francisco; published by the Association. Pages, 172; illustrated.
- Report to the President on the Anthracite Coal Strike of May-October, 1902, by the Anthracite Coal Strike Commission.* Washington; Government Printing Office. Pages, 172; with map.
- Shipping Mines and Coal Railroads of Illinois and Indiana, with Map.* Compiled by A. Bement. Chicago; issued by the Peabody Coal Company.. Text, 56 pages; Map, mounted, 42 by 60 ins.
- Statistical Resume of the Empire of Japan. Thirty-sixth Year of Meiji (1901).* Prepared by the General Statistical Bureau; N. Hannabura, Director. Tokio, Japan; published by the Bureau. Pages, 164.
- The Restoration of the Ancient Irrigation Works on the Tigris; or the Re-creation of Chaldea.* By Sir William Willcocks. Cairo, Egypt; National Printing Department. Pages, 72; with maps and plates.
- The Copper Handbook. A Manual of the Copper Industry of the World. Volume III. For the Year 1902.* Compiled by Horace J. Stevens, Houghton, Mich.; Horace J. Stevens. Pages, 600. Price, buckram, \$5; full library morocco, \$7.50.
- Das Kalibrieren der Walzen. Eine Vollständige Sammlung von Kalibrierungs Beispielen Systematisch Geordnet und Erläutert.* By Prof. Alb. Brovot. In two Parts; each 32 pages text and 40 large tables. Leipzig, Germany; Arthur Felix. Price, for both parts (in New York), \$9.75.
- The Improvement of Rivers. A Treatise on the Methods Employed for Improving Streams for Open Navigation and for Navigation by Means of Locks and Dams.* By B. F. Thomas and D. A. Watt, United States Engineers. New York; John Wiley & Sons. London; Chapman & Hall, Limited. Pages, 370; illustrated. Price, \$6, net.

## BOOKS REVIEWED.

- State of Michigan. Twentieth Annual Report of the Bureau of Labor and Industrial Statistics.* Scott Griswold, Commissioner. Lansing, Mich.; State Printer. Pages, 532; illustrated.
- This report gives much information on the labor conditions of Michigan and the various incidents of the year which it covers. So far as mining is concerned, the chief information given in the report is in relation to the coal mines of Michigan which represent a growing industry. In 1902, however, this

was somewhat interrupted by a strike of the miners, which lasted several months. The copper and iron industries of the Upper Peninsula are not treated in this volume, as their work is described by the separate departments under the charge of the Mineral Commissioner of the State.

*Eleventh Annual Report of the Bureau of Statistics of Maryland.* 1902. Thomas A. Smith, Chief of Bureau. Baltimore, Md.; Published by the Bureau. Pages, 372; with tables and illustrations.

This report contains a great deal of information on labor conditions in the various industries of Maryland, and on the strike and other labor troubles which have occurred during the year. These industries are of a varied nature, the most interesting to us being the chapter devoted to the Cumberland coal district, which is the only coal-field of the State. This industry was generally prosperous during the year on account of the unusual demand for soft coal during the anthracite strike. The Cumberland field, although of comparatively limited extent, furnishes a large tonnage, and the quality of the coal is very good, the mines of the district supplying a special demand which no other field seems to be able to reach. The statistics of labor, wages, etc., given in the report are very complete and in very conveniently arranged form.

*Geological Survey of Newfoundland. Reports Upon a Geological Exploration in the White Bay District and Upon the Mineral Statistics of Newfoundland.* James P. Howley, Geologist. St. Johns, Newfoundland; published for the Survey. Pages, 56.

This pamphlet contains a statement of the mineral production of Newfoundland for the year 1902, which has already been summarized in our columns. In addition to this, it contains a report of an examination made of the White Bay District, which has recently attracted considerable attention, owing to the discovery of gold at Sop's Arm. The results obtained from this examination indicate the existence of gold-bearing quartz veins in several localities, although the determination of their actual value must be left to further exploration. The district has never been carefully studied, although a preliminary visit was made nearly 40 years ago by the late Alexander Murray. The geological structure is complicated, and it is quite possible that other mineral deposits may be developed. The facts so far ascertained, tend to prove that although the lower Silurian formation are probably the chief gold-bearing rocks of the region, the conditions which seem to favor the existence of gold do not extend to the entire series, but are limited to such portions as have undergone an intermediate degree of metamorphism, brought about by the action of the eruptive rocks upon the pyritiferous slates. The decision of the Survey seems to be that further careful exploration is justifiable by the indications so far brought to notice.

*Mining Bureau, Philippine Islands. Bulletin No. 2. Complete List of Spanish Mining Claims Recorded in the Bureau.* Compiled by Charles H. Burritt, Chief of Bureau. Manila, P. I.; Bureau of Public Printing. Pages, 28.

The Mining Bureau of the Philippines has had some difficult work before it, owing to the fragmentary nature of the records attainable, and to the variety of mining regulations and concessions existing in the Islands. The data contained in the present *Bulletin* presents in tabular form a complete and accurate list of all the mining claims given in the Spanish records and in the archives of the mining bureau of the colonial government. There are certain other outside claims, the number of which is not known, as the proceedings for the obtaining of titles had never been completed. There are three classes of mining claims existing in the Philippine Islands. Those for which concessions were formally issued under royal decree of the Spanish government; second, those in process of demarkation as

provided by the regulations; third, those for which petitions have been accepted with deposit of fees, in accordance with the decree of the Governor-General, issued in 1898. The total number of claims recorded in all classes is no less than 2,212, scattered over the different islands. These include gold, copper, iron, coal, petroleum, phosphates, clays of different description, marble and limestone. The collection and classification of these claims has involved a great deal of labor, but it was necessary in order to place the Bureau in a position where it could determine vested rights under the Spanish law, and could ascertain what deposits might be open to new locations, whenever provisions is made for them in the Islands. It may be added that actual workings of these claims have been limited to some alluvial gold, principally in the provinces of Amobos Camarines, Benguet and Nueva Ecija; coal in Cebu and Mindoro; copper in Ambos Camarines; marble and building stone in Bataan and other provinces. Some concessions for mining sulphur are also recorded in Leyte. The actual amount of mining done, however, in the Philippines is not large, and the possibilities of building up a mineral industry there are yet to be determined.

*Hardening, Tempering, Annealing and Forging of Steel. A Treatise on the Practical Treatment and Working of High and Low-Grade Steel.* By Joseph V. Woodworth. New York; Norman W. Henley & Co. Pages, 288; with 201 engravings. Price, \$2.50.

We recently noted a work by the same author on "Dies and Their Use in Iron and Steel Manufacture." This book is prepared on very much the same lines as the former; that is, to give the information on the treatment and working of steel which will be of practical value to the mechanic and manufacturer. There is very little of a theoretical kind—only sufficient to make clear some of the points in the book. The most part is devoted to the different processes in use in the treatment of steel, such as heating, annealing, forging, hardening, tempering and the like. Naturally, much of the information has been compiled, although the author, as a practical man, shows his thorough acquaintance with, and his experience in, the uses of steel in the shop. The book includes chapters on the Selection of Steel for Various Purposes; Annealing Processes; on the Heating and Cooling of Steel; on the Hardening of Steel by Different Methods; on the Tempering of Steel by Different Methods; on the Tempering of Tool Steel; on the Manufacture of Dies; on Forging and Welding; and on Grinding. There is also a chapter on miscellaneous methods and processes and a number of tables which are useful in metal working, such as sizes of threads, weights of round, square and hexagon steel, weight of sheets, weights of bars and the like. We are pleased to see that the author realizes that the metric system will in time be generally adopted, and that he gives tables of metric measures as well as of the old measures.

The author is evidently familiar with his work, and the results of his experience are shown in the selection of his material, and the methods in which it is presented. It is a useful and practical book.

**IRON TRUST IN AUSTRIA-HUNGARY.**—The Austrian and Hungarian iron manufacturers last week succeeded in forming a new trust. The former organization was dissolved in 1900, and since then several unsuccessful attempts have been made to reconstruct the combination.

**GERMAN COAL PRICES.**—The prices fixed by the Westphalian Coal Syndicate for the current year, beginning April 1, show a decrease, varying from 12 to 24c., from those of last year. Some of the prices are as follows, f.o.b. colliery: Run-of-mine, \$2.40 per metric ton; run-of-mine, not less than 50 per cent lump, \$2.52; forge coal, small, \$2.52, large, \$2.64; screened coal, \$2.76; best hard bituminous, \$3; gas coal, from \$2.16 for slack to \$2.88 for lump; run-of-mine, free-burning coal, \$2.88.

### RECENT DECISIONS AFFECTING THE MINING INDUSTRY.

SPECIALLY REPORTED.

WHEN STATUTE OF LIMITATIONS COMMENCES TO RUN ON VIOLATION OF TRUST.—Where A. & B. purchased a mining claim and the deed to the interest of both was taken in the name of the latter, the four-year statute of limitation prescribed by the laws of Montana (*Code of Civil Procedure, section 343*) began to run against an action by A. to enforce the trust created by such conveyance on the day that A. acquired knowledge that B. had repudiated that trust. Such suit would not suspend the operation of the statute of limitation against an action for an accounting on the ores taken from the claim and to restrain the operation of the mine.—*Mantel v. Speculator Mining Company* (71 *Pacific Reporter*, 665); Supreme Court of Montana.

COMPARATIVE RIGHTS OF LIENHOLDERS ON MICHIGAN MINING PROPERTY.—The law of Michigan (*Compiled Laws, 1897, section 5472*) giving a lien on the property of a foreign mining corporation doing business in the State to laborers and persons furnishing materials for the same, and section 10,755, giving such to laborers and persons furnishing materials for any mining corporation are concurrent and simultaneous and neither has priority over the other. Where the holder of a material man's lien on mining property, which was also incumbered by another similar lien, purchased the property, equity will not treat his lien as merged in his title so as to give the other lien priority and the property should be sold and the proceeds applied to the payment of the respective liens, pro rata; and where the holder of a judgment against such mining corporation caused a portion of such property to be sold under execution and applied the proceeds on his judgment, as between him and the other lienholders on an accounting such proceeds should be deducted from the pro rata share coming to him under his lien.—*Bullock Manufacturing Company v. Sunday Lake Iron Mining Company* (93 *Northwestern Reporter*, 611); Supreme Court of Michigan.

### 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 MANAGING EDITOR. We do not hold ourselves responsible for the opinions expressed by correspondents.

#### A Correction.

Sir.—In the *ENGINEERING AND MINING JOURNAL*, December 19, 1902, page 781, you published an abstract of an article from the *Journal of the American Chemical Society* (Volume 24, No. 9), entitled "Rapid Volumetric Method for Determining Phosphoric Acid in Fertilizers," and assigned A. G. Woodman as the author. This was evidently a mistake on your part, as it was written by the undersigned.

This method has been quite extensively abstracted from your paper, both in the French and German journals. I have run across it at least half a dozen times.

It is a matter of slight importance; but I feel confident that you will be glad to correct the mistake, now that your attention is called to it.

ARTHUR L. EMERY.

San Francisco, April 24, 1903.

#### Stealing Platinum from Laboratories.

Sir.—Within the last four months an individual, evidently well acquainted with conditions of the chemical laboratories of manufacturing plants, especially iron and steel works, has been plundering laboratories in Virginia, West Virginia, and recently in Ohio, of their platinum ware. We have had over a dozen such robberies within the last four

months. From the way the thief goes about it, it is evident that he must have been formerly an iron chemist, thoroughly acquainted with the conditions of the chemical laboratories in the districts mentioned. From what we can learn, he is now traveling up the Ohio River, probably with the intention of getting into Pennsylvania. A great service can be done by your valuable *JOURNAL* if you will make these facts known, in order to put the chemists of iron, steel, cement and other works throughout the Central States, on their guard against him.

EIMER & AMEND.

New York City, May 4, 1903.

SELENIUM IN COKE.—A paper recently read before the Yorkshire (England) section of the Society of Chemical Industry described a process for determining the quantity of selenium in coke. By means of tests after the method of L. v. Bašo and Fresenius for separating selenium from arsenic, the author had found the amount of selenium in coke made from Yorkshire coal varied from a slight trace to 0.015 per cent.

IRON ORE IN NORWAY.—The Trafikbolaget Grängesberg-Oxelösund has acquired a predominant interest (amounting to 90 per cent of the shares) in the two leading iron-mining and exporting companies in Norrland—the Luossavaara-Kiirunavaara Aktiebolag and the Aktiebolaget Gellivare Malmfält. The present capital of the concern is 21,160,000 kr., which is now increased by 10,000,000 kr., the State also granting a loan of 20,000,000 kr. For a period of thirty years 650,000 kr. are to be paid to the State every half-year, equal to 0.375 per cent of the cost of constructing the line between Gellivare and the frontier. The Luossavaara Company has the right to gradually increase the transport of ore between Kiiruna and the Norwegian frontier up to at least 1,500,000, eventually to 2,000,000 tons, the quantity at present dispatched being 1,200,000 tons.

### 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 besides 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.

*De Laval Zinc Ore Treatment Patents.*—I have seen references to a new process for treating zinc ores devised by Dr. De Laval, a Swedish scientist. Can I obtain his address, or other particulars?—J. S. C.

*Answer.*—Mr. De Laval is a very fertile inventor, having taken out many patents covering various devices. We have seen no particulars with regard to his process for treating zinc ores. His present address is "care Trollhattans Elektriska Aktiebolag, Trollhattan, Sweden."

*Calcium Nitrate.*—Can you give me the following information regarding nitrate of calcium? 1. Is it produced extensively, either mined or as a by-product? 2. Can you supply the names of companies that deal in it? 3. Can you give me the approximate value of a 20-ton lot of it? I do not want the refined chemical product, but a commercial article.—E. E. J.

*Answer.*—1. We do not know that calcium nitrate is produced in this country. It is made as a by-product at some chemical works in Germany. The little used here is imported from that country.

2. The principal dealers and importers here are Fuerst Brothers & Co., whose address is No. 2 Stone Street, New York.

3. The price varies according to quality. The importers quote, for the chemical product, 10¼c. per lb. for No. 1, and 7¼c. for No. 2 grade, f.o.b. New

York. No price can be quoted for a natural product. The demand is not large, and importations are made only on orders.

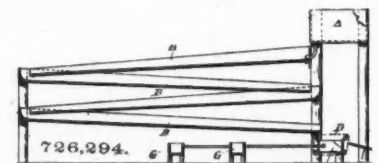
### PATENTS RELATING TO MINING AND METALLURGY.

#### 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 April 28, 1903.

- 726,239. PROCESS OF MAKING PIGMENTS.—William J. Armbruster, St. Louis, Mo. In the manufacture of pigments, the process of adding barium hydrate to a soluble salt of zinc other than the sulphate, then adding sulphate of zinc, and recovering the resulting precipitates.
- 726,259. PUMP.—Willard B. Culver, Carbondale, Pa., assignor to Eli E. Hendrick, Carbondale, Pa. In a pump, the combination with a casing, of a shaft having propellers mounted thereon, a hub through which said shaft passes, a part connected to said hub which exerts yielding pressure against the interior of said casing at one side, and a part also connected to said hub, on the other side, which has a rigid bearing against the interior of said casing and opposes the application of said yielding pressure.
- 726,263. APPARATUS FOR DELIVERING AIR UNDER PRESSURE.—Herbert Davis, Walthamstow, England, assignor to Hugh Swanton, London, England. In apparatus for delivering air under pressure the combination of a rotary shaft, weighted feeders disposed around said shaft and opening toward same, an intake-chamber formed between the shaft and feeders, compressed-air discharge chambers disposed circumferentially, an air-chamber disposed around the shaft and in communication with the discharge-chambers, discharge-orifices disposed in said air-chamber around the shaft, a fixed air-discharge trunk adjacent to said orifices, a flexible annular diaphragm subject to the pressure of the discharge, turned-metal jointing-rings, one on the flexible diaphragm and the other on the rotating air-chamber.
- 726,278. ARTIFICIAL STONE.—Thomas K. Gaines, Burnet, Tex. An artificial stone comprising a mixture of sand and cement impregnated and combined with alum, an acid, gum and zinc oxide.
- 726,286. CONVEYER.—John Harmon, Chicago, Ill. A conveyer comprising a stationary frame having belt-wheels at the top and bottom thereof, and a movable frame, having belt-wheels at the top thereof, extensible vertically from the top of the stationary frame, and endless conveyer-chains passing around said wheels.
- 726,294. METHOD OF EXTRACTING GOLD FROM ORES.—Frederick J. Hoyt, Chicago, Ill. A method of milling gold ore consisting of the following steps: First pulverizing the ore; second, distributing the ore thinly over a wide, long and open sluiceway; third, flowing the ore

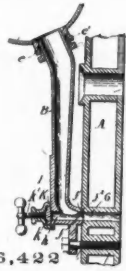


and propelling it forward over its bed by the action of a stream of chemical solution adapted to dissolve the ore; fourth, automatically screening and separating the solution from the tailings by the same force; and fifth, subjecting the solution to a reagent to precipitate the gold therein.

726,338. PERFORATED-BOTTOM FURNACE.—Peter Patterson, McKeesport, Pa., assignor to National Tube Company, Pittsburg, Pa. A heating-furnace for tube-plates and other blanks provided with a bed, gas and air ports at the sides thereof, supports on said bed, and a perforated hearth on said supports, said hearth being constructed to leave open spaces over the air and gas ports, thereby permitting the flame and gas to pass up at the sides thereof and over the same.

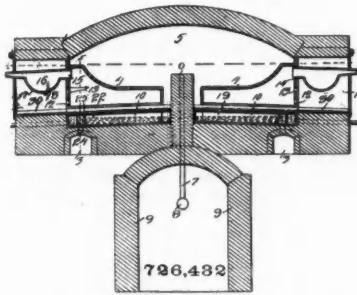
726,364. ELECTRIC FURNACE.—Ernst A. Sjøstedt, Sault Ste. Marie, Canada, assignor to the Lake Superior Power Company, Sault Ste. Marie, Canada. In an electric smelting-furnace, the combination of a water-jacketed body-case with refractory lining provided with slag-notch, vent-holes and stoke holes, a water-jacketed bottom frame held removably on said body and carrying a refractory lining on a plate secured to said frame and having a tapping-hole or metal-notch provided in one of the ends, a cover of refractory material having feed and vent holes and opening for the electrode, an upper electrode held adjustably suspended within said opening of the cover and a bottom electrode embedded in the bottom lining and its ends in contact with the metallic frame of the bottom and wires connecting the upper electrode and the bottom frame to a suitable electric generator.

726,422. TUYERE FOR BLAST-FURNACES.—Oliver S. Garrettson, Buffalo, N. Y. The combination with a furnace and its tuyere, of a blast-pipe arranged above said



tuyere and provided at its outlet with a stuffing-box, and a tuyere-pipe having its upper end arranged in said stuffing-box and capable of being raised and lowered in the same and having its lower end turned inwardly and detachably connected with said tuyere.

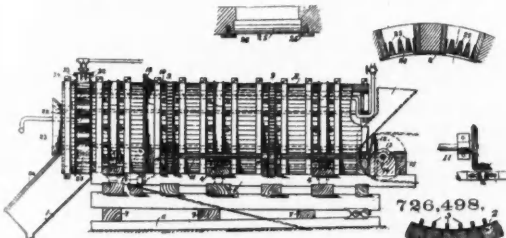
726,432. APPARATUS FOR REFINING ZINC SPELTER.—Thos. Jones, Iola, Kan., assignor of one-half to Nelson



F. Acers, Iola, Kan. The combination with a muffle, of a water-bosh disposed beneath the same and provided with an air-duct extending throughout its length.

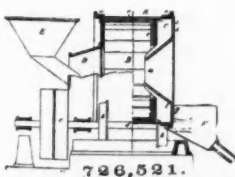
726,475. MACHINE FOR MOLDING PLASTIC MATERIAL.—Ervin W. Stevens, Philadelphia, Pa. In combination, a mold-carrier having teeth, plungers projecting between the teeth and a toothed wheel meshing with the teeth of the carrier and operating the plungers.

726,498. CEMENT AND GRAVEL SEPARATOR.—Joseph Behm, San Francisco, Cal. An apparatus for the separation of cement from gravel and pulverizing the cement consisting of a cylinder and an adjustable supporting-framework therefor; annular racks fixed around the exterior of the cylinder, and bearing-rollers on the frame enter-



gaging said racks; annular gears formed of sections bolted to the cylinder; a shaft extending along the outside of the cylinder and provided with pinions to engage said gears; a power-transmitting shaft extending transversely across the head end of the cylinder and intermeshing gears between the two shafts; and means for maintaining the transmitting-gear in mesh with the gear of the first-named shaft consisting of boxes in which the power-shaft is journaled, said boxes having slots transverse to the axis, and bolts passing through said slots whereby the boxes and power-shaft may be moved to maintain the gears in mesh when the inclination of the cylinder is changed.

726,521. APPARATUS FOR CRUSHING OR CRUSHING AND SORTING ORES, ETC.—Erminio Ferraris, Montepioni, Italy, assignor of one-fourth to Walter Renton Ingalls, Lynn, Mass. An ore-crushing apparatus consisting of a grinding-cylinder divided into two compartments by



a partition parallel with the heads of said cylinder, said partition being provided with an opening for the return of oversize ore and with openings intermediate between the said opening and the outer edge of the partition, means for crushing the ore in one of said compartments, means for sifting the ore which has passed into the other compartment and discharging the sifted ore therefrom, and a re-

turn-cone situated in the last-mentioned compartment and adapted to return the oversize ore through the opening provided therefor in the partition into the crushing-compartment for further crushing.

726,533. PROCESS OF MANUFACTURING MURIATIC ACID.—George E. Hipp, Buffalo, N. Y. A process of manufacturing muriatic acid, which consists in first dissolving niter cake, then adding a quantity of a sulphide of an alkali metal, then boiling, clarifying and concentrating the solution, and finally heating and adding a chloride of an alkali metal, the whole being thoroughly blended and calcined.

726,541. DOOR-OPERATING GEAR FOR COAL OR COKE CARS.—William F. Kiesel, Jr., Altoona, Pa. In a car, the combination, with the chutes and hinged doors, of a shaft passing along beneath the chutes at each side of the car, toggle-arms on said shafts at each side of the doors, links coupling said arms to the sides of the doors, and means for rotating the shafts simultaneously in either direction to open and close the doors.

726,556. COIL-HEATING FURNACE.—Camille Mercader, Pittsburg, Pa. A horizontally-turning hearth-furnace, a plurality of revoluble bundle-supports therein and flues arranged to register with the open ends of the furnace.

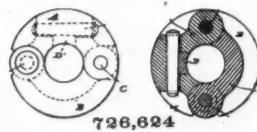
726,564. RUBBISH-DIVERTER FOR FLUME-GATES.—Jonathan F. Pierce, Milwaukee, Wis. The combination with a flume, of a port leading therefrom, and a rubbish-diverter for said port constructed of meshed fabric, having two diverging flume-wall-contacting edges and from one of said edges to the other being bent into a curved form.

726,588. ALLOY.—William G. Stevens, Memphis, Tenn., assignor of one-half to Sidney Milton Neely and J. Walter May, Memphis, Tenn. An alloy formed by fusing and thoroughly mingling the following ingredients: Copper 75 per cent; tin 20 per cent; borax 2.5 per cent, and lamp-black 2.5 per cent.

726,602. CRUSHER AND PULVERIZER.—Milton F. Williams, St. Louis, Mo., assignor to the Williams Patent Crusher & Pulverizer Co., St. Louis, Mo. In a crusher a casing having a disintegrating-chamber and a hopper leading thereinto, said casing having a portion cut away adjacent to the lower end of the hopper, a rotary breaker-plate arranged in said cut-away portion of the casing, a grinding-surface adjacent said breaker-plate, and pivoted beaters adapted to co-operate with said breaker-plate and the grinding-surface.

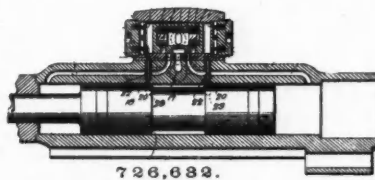
726,623. PIGMENT AND PROCESS OF MAKING SAME.—William N. Blakeman, Jr., New York, N. Y. A pigment composed of oxide of zinc having hydroxide of zinc incorporated therewith.

726,624. TAPPET FOR USE IN STAMP-BATTERIES OR THE LIKE.—Mark Bodley, Johannesburg, Transvaal,



South Africa. A tappet comprising two members hinged together at one side and having means for connecting the edges at the opposite side, and means for keying said tappet to a shaft.

726,632. VALVE FOR ROCK-DRILLS.—Harry S. Burrell, Belleville, Canada. In a device of the class described, a cylinder, a reciprocating piston therein having an inter-



mediate recess, a valve-chest, ports leading therefrom to the cylinder and to a main exhaust, a loose valve arranged within said valve-chest, a steam-supply leading to the interior of the valve, ports extending from the opposite ends of the valve-chest to the main cylinder, and escape-ports aligning therewith and extending from the main cylinder to the main exhaust-port.

726,640. DREDGING BUCKET.—Robert W. Christian, Banack, Mont. In a bucket conveyer the combination with the conveyer elements having pivotally-associated eyes, the outer face of one of the outer eyes being provided with a depressed seat, of a pin passing through the eyes, and a locking device for the pin secured in the seat and detachably engaging the pin to hold it against longitudinal displacement.

726,659. APPARATUS FOR THE GENERATION AND DIRECT ELECTROLYTIC APPLICATION OF ELECTRIC CURRENTS.—Francis E. Elmore, London, Eng. In an organized structure, an electrolytic cell and a unipolar dynamo-electric machine, the armature of the latter being in direct electrical connection with the anodes or cathodes of the former.

726,665. MOLD FOR THE MANUFACTURE OF BLOCKS OF ARTIFICIAL STONE.—Lewis P. Ford, Gresford,

England. In a mold for the manufacture of blocks of artificial stone, where use is made of the expanding property of lime or cement to obtain compression to solidify the blocks; the combination of a perforated body of flexible metal adapted to be strained in cylindrical form, means attached to said body near its meeting edges, for tightly closing the joint, detachable perforated ends and means for tightly securing said ends to the body.

726,728. METAL-TREATING FURNACE.—Michael J. Murdoch, Youngstown, Ohio. In a metal-treating furnace the combination with the hearth-chamber and the fire-chamber separated by the bridge-wall, of the roof having a horizontal section over the hearth-chamber, and a depressed portion or drop constituting the crown of the fire-chamber, said depressed portion or drop including an inclined up-draft section lying above the bridge-wall and meeting said horizontal roof-section, and also including a separate inclined section reaching to the front wall of the casing to form therewith a closed gas-pocket in the front upper corner of the fire-chamber.

726,757. GAS-PRODUCER.—Josef Reuleaux, Wilkinsburg, Pa., assignor to Alexander Laughlin, Sewickley, Pa. A water-sealed gas-producer having a cleaning-pan beneath the hopper, a movable bottom for the hopper located within the pan and movable between the latter and the lower end of the hopper for forcing ashes from beneath the producer and out of the pan, and a conveyer movable adjacent to the discharge end of the pan for receiving the ashes therefrom.

726,774. REPEATER FOR ROLLING-MILLS.—Edwin E. Slick, Pittsburg, Pa. In repeater mechanism, a set of rolls, a straight trough leading from the rolls, a repeater at the end of said trough, another straight trough leading from the opposite end of the repeater, and feed-rolls arranged to receive the metal between them and fed forwardly through said system at the time when the metal is entirely out of the rolls.

726,802. ORE-TREATING PROCESS.—Bella T. Nichols, Montevista, Colo. A process for treating ore preparatory to leaching, consisting first in mixing the suitably-pulverized ore with lime; second, applying water to the mixture and introducing steam whereby the pulp is agitated and kept at a suitable temperature until certain impurities which retard leaching are freed; third, washing the pulp by the introduction of water and continued agitation; fourth, draining off the water as far as practicable, and finally drying the ore.

726,814. FURNACE FOR HEATING BILLETS.—Elbert H. Carroll, Worcester, Mass. In a furnace for heating billets, the combination with the heating-chamber, of a longitudinal track leading from the charging to the delivery end of the furnace, of delivery-openings in the opposite side walls of the furnace, said delivery-openings being in alignment with each other and with the end of said longitudinal track, an endless-chain conveyer passing through said delivery-openings and through said heating-chamber and adapted to support a billet thereon, a supporting-trough for said chain, and means for moving said chain through said heating-chamber.

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 11, 1903.

- 6,145 of 1902. PURIFYING NATURAL SODA.—E. Naumann, Cologne, Germany. Method of purifying and separating the various constituents of natural soda.
- 8,494 of 1902. MOULD FOR CASTING.—J. T. Martin, London. Preparing moulds for pig iron, by having rails on each side and a roller with longitudinal ribs to run over it and compress the sand to shape.
- 9,340 of 1902. ALUMINUM SOLDER.—W. Shone, Chester. A solder for aluminum consisting of tin 16½ parts, zinc 3 parts, and bismuth 1 part.
- 9,696 of 1902. ALLOY.—T. W. Just and W. F. L. Frith, London. A white metal of great tensile strength and un-tarnishable consisting of copper, zinc and nickel with small proportions of tin, iron, vanadium and palladium.
- 10,528 of 1902. ELECTRIC SHOT-FIRING.—C. Cook, Nottingham. Improved portable electric battery for shot firing in mines.
- 11,147 of 1902. SIZING ROLLS.—T. D. Stonehouse, Guernsey. Inclined parallel rollers adjustable to a certain distance apart and rotating in opposite directions, for sizing crushed materials.
- 22,852 of 1902. HOOD FOR CRUCIBLES.—W. Lynes, Birmingham. Improved hood for covering crucibles and metallurgical furnaces and for extracting the fumes.
- 28,240 of 1902. STEEL WORKING.—J. A. Hunter, Philadelphia, U. S. A. Making steel by placing iron in muffle furnace at less than melting temperature and decarbonizing by nitric or sulphuric acid gases.
- 1,852 of 1903. AMALGAMATOR.—C. L. Anderson, S. Alford and J. J. R. Smyth, Johannesburg, Transvaal. An amalgamating machine in the form of a rotating drum, the pulp being brought only into surface contact with mercury, thus enabling great quantities of low-grade ore to be treated rapidly.

## ANNOUNCEMENT.

We find it desirable to state that the company owning THE ENGINEERING AND MINING JOURNAL has not purchased and will not purchase *The Pacific Coast Miner*, with which publication intimate relations have been maintained for the past four months. The ENGINEERING AND MINING JOURNAL is in a particular sense the organ of the mining and metallurgical professions of America, and while we wish well to all those who are doing good work in their respective fields of activity, it is found inexpedient to form an alliance with any local paper anywhere.

## TO ENGINEERS VISITING NEW YORK.

A room for the exclusive use of visiting mining engineers is maintained at the New York office of THE ENGINEERING AND MINING JOURNAL. Visitors to the metropolis are cordially invited to take advantage of the facilities it offers, by having their mail addressed in care of the JOURNAL and making its office their headquarters. The managers of the branch offices will also be glad to welcome visiting engineers and to be of any service to them that they can.

We are informed that the Institution of Mining and Metallurgy offers to all members of the American Institute of Mining Engineers non-resident in Great Britain, the privilege of free use of the Institution offices and library in Salisbury House, London Wall, E. C. Visiting engineers may have their letters addressed to the offices of the Institution and thus enjoy the advantages of temporary office accommodation in the city of London.

## PERSONAL.

Mr. Arthur Pearce, of Denver, is at Oruro, Bolivia.

Mr. R. A. Hadfield, of Sheffield, Eng., is in New York City.

Mr. C. L. Wright reached New York from London on the *Oceanic* on April 29.

Mr. Ben. B. Lawrence, of New York City, has returned from South Dakota.

Mr. J. Parke Channing has gone to the Feather River District, near Oroville, Cal.

Prof. Courtney De Kalb, of Boston, has been in California on professional business.

Mr. William A. Farish, who was recently in New York City, is now at Milford, Utah.

Mr. E. Mathers, editor of *South Africa*, arrived at New York on the *Teutonic*, May 6.

Mr. J. H. Robeson, of Georgetown, Colo., is examining mining property in Arizona.

Mr. Fred P. Paul, en route from Sydney, Australia, sailed on the *Cymric* this week.

Mr. Lindsay Clarke has been appointed manager of the Briseis tin mines at Derby, Tasmania.

Mr. George B. Earnshaw, of Nogales, Ariz., is now consulting engineer to the Nogales Copper Company.

Mr. Richard Pearce, of Denver, sailed on the *Cymric* on May 8 to spend the summer in England.

Mr. Charles F. Hoffman, of San Francisco, Cal., is in northern Alaska and will go to Siberia shortly.

Mr. George Mitchell, of Los Angeles, Cal., has been visiting his native town, Swansea, in South Wales.

Mr. Louis A. Wright, consulting mining engineer, of Monterey, Mex., has removed his headquarters to El Paso, Texas.

Mr. L. H. Beason has become correspondent of the ENGINEERING AND MINING JOURNAL at Salt Lake, Utah.

Mr. E. J. Adams, of the Bullion Mining Company, operating at Apex, Colo., is making a business visit to Omaha, Neb.

Mr. F. H. Minard, of Denver, Colo., has returned from a professional engagement in the Black Hills District, S. D.

Mr. E. H. Pulham, of Central City, Colo., has returned home after a visit to Arizona to report on some mining properties.

Mr. Frederick S. Harris has returned to New York City from an examination of the zinc fields of Southwestern Wisconsin.

Mr. Henry H. Knox, of New York City, accompanied by Mr. A. H. Fay, has gone on professional work to Deadwood, S. D.

Mr. Kyle, of Chicago, Ill., a stockholder in the Lyons-Kyle Mining Company, has been making a visit to Gilpin County, Colo.

Capt. James Wilcox, superintendent of the Mass Consolidated Mining Company, has returned to Mass, Mich., from a visit to Chicago.

Mr. Thomas Weir, of Salt Lake City, has recently returned from Europe. He is now professionally engaged in the Tintic District, Utah.

Mr. Charles A. Molson, of Salt Lake, Utah, has returned from a professional engagement in California and leaves in a few days for Mexico.

Mr. Gardner F. Williams, general manager of the De Beers Consolidated Mines, Limited, of Kimberley, Cape Colony, has been in San Francisco, Cal.

Mr. W. B. Millikin, formerly general manager of the Union Mill, at Florence, Colo., recently returned to Denver from Deadwood, S. D., and will open an office.

Mr. Lewis Rowand, general superintendent of the Wetherill Separating Company, of New Jersey, recently visited Leadville and Kokomo, Colo., in the interest of his company.

Prof. Simon Newcomb, of Washington, has been appointed a delegate from the National Academy of Sciences to the International Association of Academies, which meets in London this June.

Mr. W. L. Puffer has resigned the presidency of the Great Western Coal and Coke Company to accept the general Western agency of the largest independent producing mines in the Youghiogheny field, Pa.

Mr. H. Ramsey Speer, of Pittsburg, Pa., has been visiting Central City, Colo., where Mr. Speer is interested as secretary of the Old Town Consolidated Mining Company, operating in the Russell District.

Mr. M. Gordon, manager of the turbine department of the British Westinghouse Electric and Manufacturing Company's Manchester works, who has been on this side for several weeks, has sailed for Europe.

Mr. S. F. Emmons and Mr. George F. Becker, of Washington, and Prof. C. R. Van Hise, of Madison, Wis., have been appointed delegates to the International Geological Congress, which meets in Vienna next August.

Mr. M. P. Fox, of Marshall, Colo., was in the northern sections of Gilpin County during last week, where he is interested with Senator T. M. Patterson, of Denver, in the Baltimore property. The mine is situated near the proposed line of the Moffat road.

Messrs. J. Franklin Stevens and Henry F. Saviile have opened an office and laboratory in the Girard Trust Building, Philadelphia, Pa., as consulting engineers. They will act as engineers to engineers, and will test and report on instruments and apparatus.

Mr. Godfrey D. Doveton and Mr. Chester W. Purington have opened an office in the Majestic Building in Denver, Colo., as consulting mining engineers and metallurgists. Both gentlemen were connected with the management of the Camp Bird Mine at Ouray, Colo.

Mr. Joseph Bryan, of Richmond, Va., first vice-president, Col. H. O. Seixas and Mr. Geo. Parsons, New York, directors of the Sloss-Sheffield Steel and Iron Company, are making a semi-annual inspection of the properties of the company. The company now has seven blast furnaces in full operation.

Mr. Francis H. Clergue has resigned as vice-president of the Consolidated Lake Superior Company, of which he was the chief promoter, but will continue as a member of the board of directors. Mr. Henry K. McHarg, who is a large stockholder in the concern, has been elected a director of the company.

Mr. George W. Maynard, of New York, accompanied by Mr. Forbes Rickard, of Denver, last week passed through Salt Lake, Utah, on his way East from an extended trip in Idaho and to the Tonopah District, Nev. Mr. Rickard will only remain in Denver a few days and will then leave on a professional trip to Wyoming.

Mr. J. M. Davis, late division superintendent of the Erie road, has become superintendent of the Eastern division of the Great Northern, succeeding Mr. D. M. Philbin, who has now been advanced to general superintendent of the whole Eastern division, the change merely giving him Mr. Davis as an assistant. The Great Northern this year will haul nearly or quite 6,000,000 tons of Mesabi iron ore to Lake Superior.

## SOCIETIES AND TECHNICAL SCHOOLS.

MC GILL UNIVERSITY.—The Summer School in Mining will be held this year in the iron and copper districts of Michigan. The work of the school will be carried out chiefly on the Marquette Range, with Ishpeming as headquarters.

VEREIN DEUTSCHER CHEMIKER—NEW YORK SECTION.—The section, on May 12, the centennial of Justus Liebig's birthday, will have a celebration in the evening at the assembly hall of the Chemists' Club. Members of the American Chemical Society, Society of Chemical Industry, American Electrochemical Society and the Chemists' Club are invited. Addresses

are expected from Profs. Ira Remsen, William H. Brewer and Charles F. Chandler and from Dr. C. Duisberg, of Eberfeld, Germany.

PROVINCIAL MINING ASSOCIATION.—The first annual meeting of the Rossland branch was held recently at Rossland. Two hundred members were in attendance. The following officers were elected: J. A. MacDonald, president; A. C. Galt, vice-president; Lorne A. Campbell, vice-president; Archibald B. Barker, treasurer; Archibald B. MacKenzie, secretary. The executive committee consists of Henry G. Seaman, Peter R. McDonald and Michael P. Villeneuve, representing the miners and prospectors; Edmund B. Kirby, William Thompson and S. F. Parrish, representing the operators; Robert Hunter, G. W. McBride and Arthur S. Goodeye, representing the business men; John Dean, J. S. C. Fraser and Alfred McMillan, representing the professional men.

## INDUSTRIAL NOTES.

The Philadelphia Pneumatic Tool Company has lately obtained some good orders from Great Britain, Germany and Italy.

The Colorado Iron Works Company, of Denver, is putting up a big mill for the Leland Mining Company at Leland, Ariz.

The Marquette blast-furnace of the Pioneer Iron Company, at Marquette, Mich., is now in commission. The plant has been over two years in building.

The Sprague Elevator Company, of No. 52 Broadway, New York City, has lately taken some substantial orders for elevators to be installed in Sydney, N. S. W.

The Nova Scotia Steel and Coal Company is building a new blast-furnace plant at Sydney Mines, Cape Breton. Frank C. Roberts & Co., of Philadelphia, are the engineers.

The Mohawk Valley Steel Company, which is to build a big steel plant at Brunswick, Ga., is reported to have purchased large tracts of coal and ore lands in the Birmingham District.

The Baldwin Locomotive Works, of Philadelphia, Pa., has secured a contract for 10 locomotives to be shipped to Guatemala for service on the Trans-Continental Railroad. The road is to be built by the Central American Improvement Company.

The Godbe Agitation Cyanide Company has been incorporated in Utah by E. L. Godbe, A. H. Godbe, S. E. Wertheimer and G. N. Lawrence. It is said that the process owned by the company has been used successfully at De La Mar, Nev., and elsewhere.

The National Pneumatic Ore Concentrator Company, of Dayton, O., has been incorporated to manufacture and sell pneumatic ore concentrators. Capital, \$100,000. The incorporators are Edwin M. Jahrans, J. J. Snider, F. E. Mellinger, William G. Frizell, Dayton, O.; Henry Latrow, Miamasburg, O.

The Allis-Chalmers Company has secured an important contract for various equipment to be installed in the Cerro de Pasco Mines, Peru, which are being developed on a large scale by Americans headed by J. B. Haggin. The company now has its general offices in the New York Life Building, corner La Salle and Monroe streets, Chicago.

The blast furnace now being erected for the Nova Scotia Steel and Coal Company at Sydney Mines by the Rarig Engineering Company will be ready for bricking in 60 days. Its capacity is to be 400 tons of pig iron a day, considerably more than those of the Dominion Iron and Steel Company. The furnace will be turning out pig iron by October.

The F. M. Goss Construction Company has been awarded a contract for building a bag house 60 ft. high and a double-deck roaster 140 by 20 ft. at the Tacoma Smelter, both to cost \$25,000. Under the present arrangement at the smelter smoke from the blast furnace travels through lines of flues from 700 and 800 to 1,000 and 1,500 ft. long before it starts up the 150-ft. chimney.

Wonham & Magor, of New York City, have secured a contract for 50 steel dump cars from the Humber Consolidated Mining and Manufacturing Company, Newfoundland. Twenty hopper style steel cars have also been ordered by the American Smelting and Refining Company, for shipment to Mexico. The cars will be built at the new Wonham-Magor Steel Car Works, near Passaic, N. J.

The American Machinery and Export Company, with offices in the Beard Building, Liberty Street, New York City, has placed an order for two large compound engines, to be shipped to Yokohama for driving a fan ventilating plant. The boilers will be built at the Atlas Engine Works, Indianapolis, Ind. The fans, etc., will be furnished by the B. F. Sturtevant Company, of Boston, Mass.

The Combination Rubber and Belting Company, of Bloomfield, N. J., with salesrooms at 157 Cedar



Street, New York, and 158 Randolph Street, Chicago, Ill. states that it is making a strong bid for the mining trade, as its belts are strong enough for the heaviest work, and are especially suited for use where the atmosphere is moist. The company wishes to secure active agents and sub-agents in all manufacturing centers outside of New York and Chicago.

The Bishop & Babcock Company, of Cleveland, O., is equipping its machine shop for electric driving, and short lengths of line shafting throughout the shops are driven by Westinghouse induction motors, 7 or 8 of which, ranging in size from 10 h.p. to 40 h.p., are in operation, current being temporarily supplied from the plant of the Cleveland Twist Drill Company. The Bishop & Babcock Company is installing a power plant of its own, and has recently purchased a 175-kw., 2-phase Westinghouse, engine-type alternator, with switchboard complete. George S. Rider & Co. are the engineers for the plant.

Fairbanks, Morse & Co., of Salt Lake, Utah, who sold a 25-h.p. gasoline hoist to the Erie Copper Mining Company, have contracted to furnish the entire equipment for the plant. Among other recent sales of the Fairbanks Company were: Eight-h.p. gasoline engine for the State School of Mines of the University of Utah; 8-h.p. gasoline engine to be used at Cache Junction to operate well-driving machine; a 25-h.p. steam engine and boiler for Bliss, Idaho, and 3 22½-ft. pattern windmills, complete with pumps, for the Oregon Short Line railroad. Also 4 Jack-of-all-Trades gasoline engines.

The F. P. Smith Wire and Iron Works, at 100-102 Lake Street, Chicago, manufacturing ornamental and structural iron, art brass and wire work, has been appointed sole agent in Chicago, and in several States for the Columbus Steel Rolling Shutter Company, manufacturers of steel rolling doors for freight houses, car barns, warehouses, etc. Owing to the large number of inquiries from all over the United States and from foreign countries, from engineers, architects and builders, such agencies are being established in all of the large centers as fast as representative firms in architectural or engineering construction work can be found.

Van Voorhis & Sanford, of Monterey, Mex., have received an order from the Compania Minera de Dolores Trompeta, of Catorce, San Luis Potosi, for a 100-h.p., double-drum, standard Vulcan geared hoist, with steam operated band friction clutches and hand-operated post brakes; two 125-h.p. Ames flush front boilers, one Worthington pump, a Springfield heater, cages, ore cars, etc. The machinery will be installed by Van Voorhis & Sanford's engineers. The Dolores Trompeta Company is in bonanza. The mine is under the management of Luis Ramirez, the president of the company being Filiberto Castillo.

The Kennicott Water Softener Company, of Chicago, states that the Union Pacific Railway, one of the first of the large railway systems in the country to take up this method of dealing with the water supply of its locomotives, has within the last month given orders for 25 Kennicott softeners varying in size from 10,000 to 15,000 gals. capacity per hour, and has ordered enough plants for nearly three-quarters of its line. The Kennicott Company has under construction machines with an aggregate daily capacity of 20,000,000 gals., including an order for 10 from the Pittsburg & Lake Erie road, the smallest of which is 15,000 gals. per hour and the largest, exceeding in size anything heretofore attempted, has a capacity of 60,000 gals. per hour.

An agreement has just been consummated, whereby the Allis-Chalmers Company becomes sole licensee for building and selling the blast-furnace gas engines of Nurnberg & Augsberg, of Nurnberg, Germany, in the United States, Canada, British Columbia and Mexico. A 3,000-h.p. unit will be built at the West Allis plant immediately for exhibition at the St. Louis Exposition. At present the German company builds the engines in units of from 1,200 to 2,000 h.p. The Allis-Chalmers Company will not only build these engines, but will go as high in horse-power per unit as practice in this country demands. The Nurnberg Company now has in its shops upwards of 50,000 h.p. in process of construction.

Owing to the necessity of obtaining more room, Robert W. Hunt & Co. have removed their New York office to No. 66 Broadway. Messrs. John J. Cone and James C. Hallsted, of the firm, sailed for Europe on the *Campania* on May 2, the former returning after a few weeks' visit home. Mr. Hallsted has gone over to personally inspect the structural material for two large London hotels, which has been awarded to his firm. These contracts together with several others for buildings to be erected in England and South Africa, as well as bridge material for this continent, have compelled the firm to organize a foreign structural and bridge department in addition to the one handling rails, splice bars, billets, etc.

The annual meeting of the Jones & Laughlin Steel Company, of Pittsburg, Pa., was held on April 28. The old officers were re-elected: B. F. Jones, Jr., president; Willis L. King, vice-president; William

Larimer Jones, general manager; W. C. Moreland, secretary; Irwin B. Laughlin, treasurer; T. K. Laughlin, assistant treasurer. Directors: B. F. Jones, Henry A. Laughlin, George M. Laughlin, James Laughlin, Jr., B. F. Jones, Jr., Willis L. King, Irwin B. Laughlin, Thomas O'Connor Jones, Roland Gerry, W. C. Moreland, Robert Geddis, W. W. Hillock and H. S. Hiehl. The company has decided to make some very extensive enlargements to its works, and will probably take up some new lines of manufacture.

Probably the largest contract for electrical generators ever placed for use west of the Rocky Mountains has been awarded by Stone & Webster, of Boston, managers of electric power, traction and lighting plants along Puget Sound, to the General Electric Company. The order is for six machines, two to be furnished to the Tacoma Industrial Company for use in their development of the White River, and four to the Pierce County Improvement Company for the work of developing the Puyallup River, including the flow from the Mount Rainier glaciers. The generators will be 3-phase, 60-cycle, of 3,500 kw. capacity each, at 2,300 volts, and 225 revolutions. Deliveries will begin next September. Both of these developments are being carried forward, and it is announced that every effort will be made to complete them at the earliest possible date.

Contracts for Pelton waterwheels netting 2,000 h.p., besides other contracts, that have either been installed or ordered during the last three months, may be summarized as follows: Iowa & Mexico Mining and Milling Company, Tepic, Mex.; Gwin Mine Development Company, 2 6-ft. wheels for running a rock-crusher plant, 300 h.p. 290-ft. head, 217 revolutions per minute; Brigham City Electric Light and Power Company, Brigham City, Utah, 800 h.p. 280-ft. head, 300 revolutions per minute; Corrigan, McKinney & Co., Concho, Mex., 150 h.p., 190-ft. head, 85 revolutions per minute; Kerkhoven & Mazel, Pasir, Naugka, Java, 800 h.p., 36-ft. head, 76 revolutions per minute; Oregon Developing Company, Cascades Calumet Manufacturing Company, Castle Rock, Ore. Contracts for an interesting plant have been let by the Pike's Peak Hydro-Electric Company, Colorado Springs, Colo., which, when finished, will be the highest in the Western Hemisphere, both in altitude and operating head for the wheels, the effective head being 2,100 ft. The plant will consist of 3 Pelton wheels, each direct connected to a 750-kw. generator, which will run at a speed of 450 revolutions per minute.

The first of the three blast-furnaces at the Clairton, Pa., plant of the Clairton Steel Company has blown in. The remaining two stacks will be ready for operation early in the summer. Each stack is 21 ft. in diameter at the bosh and 85 ft. high, and is equipped with skip hoists operated by electric hoisting engines. The stove equipment consists of four 3-pass Massick & Crooks stoves, 21 ft. diameter and 95 ft. high for each furnace. Blast is supplied by seven cross-compound condensing steeple type blowing engines, erected by the Southwark Foundry and Machine Company. Steam is supplied by a battery of 12,000-h.p. Babcock & Wilcox water tube boilers, the fuel being waste gases. The ore handling equipment was installed by the Brown Hoisting Machinery Company, and consists of a car trolley with a capacity for turning over cars weighing, with contents, 160,000 lbs. Two traveling bridges, each 357 ft. long, are fitted with both shovel and grab buckets. Ore and coke bins are continuous and 711 ft. long. Provision is made for handling slag by granulating it in a pit, or running it direct into cinder cars. Iron is to be handled in ladles and run to the open-hearth plant direct or to the casting machine. The pumping station is equipped with three pumps of 10,000,000 gals. capacity each. The furnace output will be 500 tons each daily.

#### TRADE CATALOGUES.

Adam Cook's Sons, of New York City, are sending out circulars calling attention to the merits of Albany grease as a lubricant for both light and heavy machinery.

The Sturtevant roll-jaw crusher, which crushes rock to ¼ in. and finer at one operation, is described in a circular sent out by the Sturtevant Mill Company, of Boston, Mass.

The Rand Drill Company, in its circular No. 2, treating of its Imperial pneumatic tools, briefly describes long-stroke hammers, piston air-drills, air-motor hoists, etc.

"People You Meet in the Dining Car" is the title of a cleverly conceived and artistically printed little pamphlet issued by the Chicago & Alton Railway. It describes the dining car service on that road.

Dixon's lumber pencils, manufactured in black and in colors for every variety of use about sawmills, lumber-yards, etc., are described in a little 8-page pamphlet, which the Joseph Dixon Crucible Company, of Jersey City, N. J., will send to any address.

Catalogue 032, sent out by the C. W. Hunt Company, of West New Brighton, N. Y., describes foundry ladle cars made in sizes of 1,500, 2,000 and 3,000 lbs. capacity. They are of the same gauge as the company's industrial railway, 21½ ins. They have patent steel wheels and flexible bearings, and will run around a curve of 12-ft. radius. It is stated that a car fully loaded can be handled by one man.

The Wilson shoes and dies for stamp mills are briefly described in a little pamphlet published by the Western Forge Company, of St. Louis, Mo. These shoes and dies are forged from special high-grade steel billets. The pamphlet contains diagrams showing dimensions to be given when ordering, a general statement of the power required for operating stamps and copies of numerous testimonial letters from mining companies.

A pamphlet of 64 pages, published by the Ajax Metal Company, of Philadelphia, Pa., describes that company's copper and white metal alloys, including various bearing metals, babbit, phosphor-bronze, white brass, etc., and the company's finished specialties for electric railroads, including trolley wheels, controller fingers, rail bonds, armature bearings, etc. The pamphlet gives considerable interesting information about the composition and micro-structure of bearing metals.

The Sullivan Machinery Company, of Chicago, Ill., issues Catalogue 52, a 58-page pamphlet, containing some remarkably fine half-tone cuts. The pamphlet deals with the excavation of rock by machinery, and describes the Sullivan rock drills and air-compressors. The simplicity and economy of Sullivan drills are mentioned, and attention is called to the construction of the valves, the adjustable tripod, the mining column and stoping-bar, etc. The pamphlet also describes and prices such drill accessories as blacksmiths' tools, sand pumps, electric blasting apparatus and steam and air hose, and also the Sullivan sectional boiler for mule-back transportation. The Sullivan straightline compressors are built in steam-driven and belt-driven types, either single-stage or double-stage. The company also builds Corliss cross-compound condensing compressors, and a full line of compressors to be driven by electricity or water power. A number of useful tables add to the value of the pamphlet.

#### SPECIAL CORRESPONDENCE

Butte, Mont.

May 1.

(From Our Special Correspondent.)

As far as work in the mines is concerned, there probably are as many miners employed at present as ever in the history of this camp. Most of the larger copper properties are in operation, except those closed by injunction. The Amalgamated Copper Company is working the following individual mines; Anaconda, Nevewesweat, High Ore, Belle, Diamond, Wake Up Jim, and Mountain Consolidated, belonging to the Anaconda Copper Mining Company; the Boston & Montana section of the Amalgamated Company has in operation the Pennsylvania, Leonard, West Colusa, East Colusa and Mountain View; the Butte & Boston Company is working Silver Bow No. 1, Silver Bow No. 3, Berkley and East Gray Rock. The Colorado Smelting and Mining Company division has in operation the Gagnon. The ore from this mine is treated at the company smelter here in Butte. The ore extracted by the Butte & Boston is treated at that company's works also at Butte. All other ore from the Amalgamated properties is sent either to the Washoe Smelter at Anaconda, which is receiving a daily tonnage better than 5,000 tons, or to the Boston & Montana Smelter at Great Falls, which is treating 3,000 tons daily. For the week ending April 25 the Great Northern Railway carried from Butte to Great Falls 811 cars of ore, most of these cars being of 50 tons capacity.

The Heinze Smelter is receiving a large tonnage from the Rarus and Cora mines. The concentrator at Basin, where the Heinze people are dressing the low-grade stuff which is returned to Butte for treatment, is handling 850 tons of that kind of material a day.

The Speculator Mining Company has its property again in full swing, and is sending the ore partly to the Colorado works and partly to Anaconda for treatment.

It is safe to say that the daily output from the Butte mines at present is fully 12,000 tons. The contractors of the Pittsburg & Montana Copper Company's new smelter, to be built on the flat east of Meaderville, have a large force breaking ground for the works, and are erecting temporary quarters for the workmen. There is a movement on foot to consolidate a number of partly developed and undeveloped copper properties, into a new copper company. J. A. Coram, of Boston, and C. H. Palmer, both of whom have in the past been identified with the copper interests of the camp, are supposed to be leading spirits in this new deal.

The outlook for mining throughout the State is good. In western Montana, near Saltse, recent de-

velopments look favorable for another copper producing district. The Bitter Root Copper Company has under exploration a property, developed to the 200-ft. level, that has a flattering showing all the way to the bottom. A Scotch syndicate is having the property examined, with a view of purchasing. The Vermilion Placer Mining Company, operating on the Vermilion River, near Thompson Falls, has tapped bed-rock through a 50-ft. tunnel, in which a 6-ft. flume is in position. Two giants were started piping gravel last week. This is the largest hydraulic mining enterprise in the State at present.

Denver. May 2.

(From Our Special Correspondent.)

As an illustration of the methods of some Eastern promoters, a man, with an office in Philadelphia, has written to several Denver men saying that he is in the market for some cheap gold or silver mining prospect, or preferably an old abandoned mine, the price to be less than \$100.

Considerable indignation has been expressed in Denver and Colorado over a recent flotation by a New York promoting firm of a company, based on two Gilpin County properties which have been virtually abandoned for some time. The statements in the prospectus and in the sensational advertisements in New York dailies, as to past productions of various mines, etc., are gross exaggerations. The company apparently "controls" (whatever that may mean) two ordinary old Gilpin County lode claims, which have been intermittently worked in the past. Quite a number of similar properties are obtainable in the same general vicinity, by lease on easy terms, with option to purchase. None of the local parties, letters from whom are quoted in the prospectus, would for a moment indorse any one purchasing the stock of the company (capitalized at 1,500,000 \$1 shares, amount of treasury stock not stated) at 30c., the price asked. A Gilpin County operator, to whom the prospectus and advertisements were submitted, says that the prospectus and advertisements bear the ear-marks of a purely stock-selling scheme.

The Ohio & Colorado Smelting and Refining Company's plant at Salida, Colo., with six furnaces and a gross capacity of 1,000 tons of ore per day, is said to be treating between 600 and 700 tons per day, and ships a 30-ton car of lead bullion daily to Eastern refineries. About 250 men are employed. While Leadville is the chief source of ore supply, the plant receives considerable ore from Utah, Idaho and other distant districts, and Lake City, Hinsdale County also furnishes much. The old mining camp of Monarch, Chaffee County, years ago a heavy producer of lead ores, has felt increased activity from the establishment of the Salida, as also the promising copper district around Salida. The company proposes to expend \$500,000 this season in erecting a roasting plant for sulphide ores. Practically the same men who compose the Ohio & Colorado Smelting and Refining Company are in the Republic Smelting and Reduction Company, which owns the Boston Gold-Copper Smelter at Leadville, with three furnaces, and a capacity of 500 tons. The matte from this plant will be shipped to the Salida plant, and reduced to bullion.

San Francisco. April 29.

(From Our Special Correspondent.)

The strike among the miners in Amador and Calaveras counties has ended in about the manner predicted last week, a sort of compromise, though the mine owners had to recede from their original position and the miners had a jollification at Jackson as for a victory. The miners had demanded that the union be recognized; union men reinstated who had been discharged; and eight-hour instead of ten-hour shifts. The agreement finally reached was about as follows: Time to begin at 7 A. M., when the first man steps on the skip to go down the shaft, a nine-hour day, miners to go down and to their stations on the company's time, take dinner on their own time, that is, they must not quit half an hour or so before the hour to go up; no discrimination against union miners, and no direct recognition of the union. While the hours from 7 A. M. to 4 P. M. make the nine-hour day, the miners consider that they really will work but eight and a half hours.

As practically all the men in Amador County, and many in Calaveras County (notably at the Gwin Mine), had joined the union, there is not much chance for the mine owners to discriminate against union men and keep the mines running. It is well, however, that the strike ended before the mines were allowed to fill with water or any overt acts were committed. If at some properties conditions under the change of hours are found unfavorable, these mines will close. Up at Keswick, Shasta County, the strike continues, but the company continues to get men. The machinists called out by orders from the union did not go out. Still the controversy is hampering the work of the Mountain Copper Company.

Some surprise has been shown by the public that the oil from the Bakersfield, destined for the Standard Oil Company's refineries on the shores of San Francisco Bay, has not yet arrived through the 300-mile pipe line, though it started over a month since. The facts

are, however, that the pipe line was originally divided into 28-mile sections, and defects in each section have to be repaired as they appear. The Standard Company does not expect the first oil at Point Richmond before June 1. California oil flows slowly, as its specific gravity is high, and it has to be reheated at each station.

In connection with the railroad companies patenting lands in Shasta County, it is found that over 500 unpatented mining locations are involved. These claims have been located on odd sections, and some have been worked for years.

There is considerable interest in the placer gold-fields discovered in San Bernardino County along the Colorado River. Some of the gravel is at a depth of about 14 ft. A large extent of country has been located, but water is scarce, and apparently only under exceptional circumstances where capital may bring water in, will the fields prove profitable. Still hundreds of men have gone to the new fields.

Although the people of Yuba County, especially around Marysville, were long opponents of hydraulic mining, and led the fight against that industry, now that mining ground of value has been found in their immediate vicinity, they show satisfaction in its development. Along both sides of the Yuba good dredging ground has been found, and a number of companies are either prospecting or working and a number of dredgers are assigned.

The Golden Cross (or Free Gold) Mine at Hedges, San Diego County, so long in litigation, has been purchased by an English corporation, which pays £10,000 down and £470,000 in paid-up shares. The new company agrees to increase the cyanide plant and otherwise to put the property in better shape.

Considerable capital is going into the northwestern counties of the State, particularly Shasta, Siskiyou and Trinity. Siskiyou and Trinity lack railroad facilities, but have many good mines yet to be properly exploited.

The starting of the old Peabody Mine, given up some 10 or 11 years ago, is an event for the Grass Valley region. A new company has acquired the plant, and put in many improvements. The mine paid well many years ago, and some splendid specimens were taken out just before it closed.

The last Legislature appropriated \$56,000 for the maintenance of the California State Mining Bureau for two years. Of this \$6,000 is for salary of the State Mineralogist, \$10,000 for geological or other field work, and \$40,000 to maintain the office and museum in San Francisco. In addition there is an appropriation of \$7,000 for printing. Just at present one field assistant is completing researches in the quicksilver mining industry of the State, and the report, maps, etc., will shortly be published. The State Mineralogist is preparing to get out maps and registers of the oil producing regions of the State. The first will be that of the Los Angeles City field. New maps and registers of the counties in the Mother Lode region will shortly receive attention. The first will probably be that of Tuolumne County to be followed by Mariposa County. These maps show not only roads, trails, towns, rivers, etc., but locate each separate mine. The accompanying registers give the principal features of each mine with its developments and names of owners and superintendents and their addresses. Twelve or thirteen counties have been completed, and the maps and registers published. They are sold by the Mining Bureau for a nominal sum, only enough to pay for printing.

San Luis Potosi, Mex. April 28.

(From Our Special Correspondent.)

Ex-Gov. Orman, Judge Goddard, B. Clark Wheeler and others of Colorado, are at present in the City of Mexico, but will go on their way north to Sonora, in which State they have large holdings, and where they plan to build in connection with the mines a large smelting plant. The building of the first custom smelter in the State, of 125 tons capacity, has been begun by the Yaqui Smelting and Refining Company, at Toledo, about 90 miles east of Torres station, on the Sonora Railway. Another smelter is planned for the Veta Grande mines in Copete, where J. J. Hardwick is starting up the Copete mines, and to which point a railroad is building from Democrata Bridge. Near Copete are the San Miguel placer fields, where dry washing is carried on. At Suaqui Grande a concentrating plant and smelter are in contemplation by the Sonora Gold and Silver Mining Company, which, under the management of F. E. Dickinson and superintendence of T. F. Collins, is operating the Mina Blanca, and installing new machinery. In the Altar District, at El Tino, the Reina de Oro Mining Company is sinking a deep shaft, where 380 mining concessions were granted in February. There is renewed activity also at San Javier, 100 miles southeast from Minas Prietas, where modern machinery is going in. The 100 bars of silver just brought into Hermosillo, from the Lampazos mines, are evidence of at least one rich strike in that Moctezuma District, wherein several have recently been reported. B. J. Home, of Bavispe, is said to have located a wide vein that can be traced 5 miles, and assays \$1.25 in gold and 5 oz. silver on the surface. F. W. Foster has

found rich ground in the Arizpe District. A rich strike of silver ore has been made at Casa Grande, Atil District, and in La Fortuna mines, where work has recently been resumed. A large corporation, known as La Dura Mining and Milling Company, is developing the Prietas Mine at La Dura. Work that was just being started on the Sierra de Cobres, which adjoins the Greene Consolidated, and was recently sold to Phelps, Dodge & Co. for \$2,000,000, has been stopped, the Indiana & Sonora Mining Company, through Thomas Taggart, of Indianapolis, its president, contesting the titles given by Messrs. Lindsey and Curtis.

At San Marcial, with a population of 4,000, is the largest coal mining camp in the Republic, though not yet producing. At La Barranca, the Sunset Development Company, under the superintendence of H. S. Martin, is shipping coal and natural coke, and the Southern Pacific Railroad has sent E. F. Dumble to examine these coal fields with the idea of purchase. Coal lands are in great demand and engineers have gone from Mapimi to San Pedro del Gallo. An American company, the Compania Minera de Penoles, and Moreno Hermanos are opening up those fields on a large scale. Of other work in the State of Durango, the Reina de Oro, near Mapimi, has begun shipments. A dynamite factory is building at La Tinaja, near Mapimi. A concentrating mill is to be built at Tovar, near Tapehuanas. The Abismo Mine is working extensively. J. V. Davis and J. H. Parker are operating in San Dimas District. At San Juan de Heredia the Carmen Copper Company is just beginning to open up its vein, but is handicapped by a scarcity of labor. This trouble exists, in fact, in almost all parts of the Republic, and there seems to be no remedy, unless it be the importation of foreign labor. There are men enough, but many will not work regularly, and increasing the pay only makes matters worse, as they need to work less to gain the same number of dollars per month. Already employment agencies are trying to have large corporations import the Japanese and Chinese laborers.

The peace of old Popocatepetl is being disturbed by a party of Americans, represented by A. H. Smith, who are negotiating with General Sanchez y Ochos, the present owner for the purchase of the mountain. It is the intention of the Americans to work the sulphur deposits from various points on the mountain, and to construct a cable or cog railroad from the base to the lip of the crater, not only for handling sulphur, but also to take some money from tourists.

Exchange on New York has declined from 252 $\frac{3}{4}$  on Monday to 219 on Saturday, while some deals were said to have been made at two for one. Somewhat of a reaction is feared this week, as exchange is below what the price of silver warrants. Mining stock trading is a little more active, and the prices prevailing among the favorites are: Monterey Iron and Steel, \$111; Dos Estrellas, \$2,130; Cinco Senores, \$200; La Paz, \$760; Candalaria de Pinos, \$320; Noche Buena, \$100; Santa Rosa, at El Oro, \$120; La Esperanza, \$1,170; San Rafael y Anexas, \$1,150; Santa Gertrudis, \$82; and Luz de Borda, \$58.

London. April 25.

(From Our Special Correspondent.)

Quite a number of interesting reports of West Australian mining companies have been published during the past week. The first to claim notice was the Great Fingall Consolidated, which obtained unenviable repute through the frauds of the late secretary. The report makes it clear that Mr. Moreing has made good all the losses of the company due to this cause. The period covered by the report extends over 16 months, ended December 31 last, and shows a divisible profit of £277,000 after very liberal allowances have been made for depreciation and development. Out of the profit £175,000 has been distributed, and the remainder is held over until the question of rearrangement of finances has been settled. Hitherto dividends have been paid out of moneys borrowed on gold in transit, and by many it is considered better to keep this balance in hand, and with it extinguish these loans against gold. On the other hand, others favor the issue of new shares to wipe out the loans, and at the same time to provide further working capital for equipments. The latter scheme is favored by the directors who propose that 25,000 new shares shall be issued at £6 each, thus providing £150,000 new working capital. It is probable that some shareholders will propose to use the £100,000 balance at present in hand, and £50,000 out of profits in 1903 for the same purpose. There is, however, not much to choose between the two schemes. Another question, which is agitating shareholders, is the method of management, and the election of the directorate. It will be remembered that the firm of Bewick, Moreing & Co. have been managers since the beginning, and that the directorate and secretaryship have been practically in their hands. The defalcations of the secretary, A. S. Rowe, who was a partner in Bewick, Moreing & Co., caused some shareholders to be dissatisfied with the direction, and some of the directors resigned, giving place to independent shareholders. The new board, on due consideration of all the facts, deemed it desir-

able that Bewick, Moreing & Co. should continue to act as general managers of the company's properties. Mr. Moreing not only made good the secretary's defalcations, for which he was not actually legally liable, but proposed that in the future the firm should become legally liable for all irregularities on the part of their servants. Under the circumstances, it is only in accordance with common sense that Mr. Moreing should join the board and become chairman, an arrangement which has already been made. At the coming meeting of shareholders certain parties intend to challenge the propriety of this policy, but I sincerely hope they will not receive support, for the firm have not only managed the properties ably but in connection with the unfortunate incident acted chivalrously.

The other two West Australian companies that have just issued their reports for 1902 are the Golden Horseshoe and the Ivanhoe. Both of these Kalgoorlie companies are now in excellent hands, and the management give full details of the work done. As you will be referring to the reports in another part of the JOURNAL, it is not necessary to go into details here. It is sufficient to say that as the companies are now established as regular producers there is no room for the wild speculations and the buffeting to which their shares were subjected in former days. They have arrived at a position when they can be compared to the Mysore mines or the Mount Morgan and Broken Hill properties. During 1902 the Golden Horseshoe distributed £270,000 as dividends besides making large allowances for depreciation and development, while the Ivanhoe has distributed £150,000.

A new company of some interest has been introduced to the public. This is the San Francisco Del Oro Mines, Limited, which has been formed to acquire the mine of that name in the Parral District of Mexico. Some time ago, when writing of the work done by Mr. Frederick Hawden, of London, in connection with several Mexican properties, notably those belonging to the Parral and Mesquital companies, I mentioned that he had obtained an option on another mine in the neighborhood of these. The San Francisco del Oro has been worked for many years locally, and it is stated that with additional working capital it can be developed into a large producer. The former owners sold the ore to the American Smelting and Refining Company, and the company proposes to continue this policy for the present. The properties have been examined and reported on by Mr. Rowland Feilding and Mr. Stanley Clay. The prospectus does not make it sufficiently clear that the ore is essentially silver-lead, and that its value is diminished by the presence of zinc. The gold content is small, and there is also some copper. In Mr. Feilding's report a large number of assays are given with the gold, silver, copper, zinc and lead contents specified. The value of each constituent is also given, and the total is represented as the value of the ore. As a matter of fact, however, the smelters only pay for the silver, lead and part of the gold, the receipts from the last named being practically negligible, while there is a penalty on zinc when over 10 per cent. It is misleading, therefore, to give the zinc values of 23 per cent as £4 7s. 4d. and to include it in the value of the ore. The directors and engineers, of course, hope some day to discover a process for saving the zinc and copper values, but until such a process is found these metals are only a hindrance. Up to the present time shipments have been from the oxidized zones, and these ores are nearing exhaustion. The sulphide ores will not command the same price, and the company may be disappointed in the receipts. The assays at depth in the sulphides given by Mr. Feilding show the presence of increasing quantities of zinc. The ore-bodies are so extensive, however, that possibly the managers will be able to pick out the best ore and leave the zinky ones alone, but the company has a difficult problem before it.

In your issue of April 11 I gave some account of the position of English companies conducting prospecting operations in Egypt, and I mentioned particularly the case of the Nile Valley Company. The operations of this company had turned out so well that Mr. J. B. Robinson, of Rand fame, had decided to take a large interest, in fact, to provide something like £50,000 of working capital. In order to make an equitable arrangement with other shareholders, it was proposed to form a new company, with a greatly increased nominal capital. At this juncture, as I mentioned in your issue of April 11, the Egyptian Government refused to sanction the reconstruction scheme. Since then the chairman and managing director have been to Egypt to consult Lord Cromer and Sir J. Eldon Gorst with a view of overcoming the objections and of arriving at some satisfactory solution of the difficulty. From these interviews it appears that the Egyptian authorities have laid down two definite rules with regard to mining operations. In the first place, the authorities have to be satisfied that a concessionaire either a private individual or a company has sufficient working capital. Second, no individual or company will be allowed to sell a prospect to the British public; that is, before a property can be floated off for cash or other consideration the authorities must be convinced of its value as a paying mine. In

other words, all money subscribed by shareholders when the properties are merely prospects or undeveloped mines, is to be used as working capital only, and is not to go to promoters and vendors or be used for market operations. The original scheme of the Nile Valley Company was to issue five new shares for each one in the old company, pro rata among shareholders; to issue 32,250 new shares at 30s. each to Mr. J. B. Robinson, and to hold the remainder of the nominal capital (which would then be £250,000) for issue at some future time. It will be seen that this scheme gave old shareholders a very considerable advance in the value of their holdings, while not calling on them to subscribe any further cash, all the new working capital coming from Mr. Robinson. The Egyptian authorities objected to this and stipulated that present shareholders should subscribe some of the new working capital. The scheme now put before the company is that old shareholders should have four new shares given in exchange for each one in the old company, and should be expected to buy one new share as well. This practically comes to an assessment of £1 per old share, with three new shares given as a bonus. Though there is no legal obligation to subscribe for one new share, yet it is obvious that if the majority of shareholders do not come forward in this way the Egyptian authorities will not sanction the scheme. With Mr. Robinson's money and the money thus subscribed by old shareholders the company should have at least £80,000 as working capital, and would thus be in a very strong position. I have entered into details to this extent, because the particular case is characteristic of the way mining will be conducted in Egypt. The conscienceless promoter is nipped in the bud by the facts that he will have to prove that he has sufficient capital, that he will be required to spend all that capital on the properties, and that he will not be able to sell the properties until their value has been demonstrated. People who buy shares in Egyptian companies will, therefore, know whether they are sharing prospects or acquiring a paying property, and will know exactly where their money is going. The restrictions may appear galling to inhabitants of the "land of the free," but on serious consideration nobody can claim that they hinder or hamper legitimate mining operations.

Sydney, N. S. W. March 25.

(From Our Special Correspondent.)

**New South Wales.**—The mines which shut down on account of the fall in lead included Block 14, British, Junction, Junction North and North Broken Hill. The North and Junction closed down in April, 1901, the British and one shift of Block 10 in July, 1901, and Block 14 in December, 1901. The British is the first to resume work, and expects to treat over 2,000 tons of ore weekly. The mine is as secure as when it was shut down, when it was known that there were over 150,000 tons of payable sulphides above the 400-ft. level. The North Broken Hill Mine is to resume work at once, and will produce 250 tons concentrates per week. There is a rumor that the North and Junction North are likely to be amalgamated, which would be to the advantage of both mines. Miners are now looking forward to the Junction and Block 14 recommencing work. When all these mines are in active operation it means that about 2,000 additional hands will be employed. A slight settlement has been taking place at Block 10 ever since the creep in Block 11 of the Proprietary Mine, and the movement has affected the security of the old mill, while work on the new mill is being pushed so as to avoid complications that might follow any accident to the old plant. Working tests of the Delprat zinc process are being made in quantities of one ton per hour, with the object of ascertaining the working expense and cost of chemicals. The plant consists of a copper pan 6 ft. long and 3 ft. wide, with a sloping bottom, below which a number of gas jets are placed. At the end are settling pits for the concentrates, and below the pan is a small bin, into which the waste products fall. There are 2 tanks, one for dissolving the salt cake, and another, lead lined, at a higher level to hold the stock solution. The liquor and concentrates flow along laundries to settling tanks from which the liquor is pumped to the storage tanks. It is unofficially reported that this process costs \$1.20 per ton, and that when the company is in a position to supply its own saltcake and acid that the cost may be reduced to 96c. The estimated extraction is about 90 per cent of the zinc, 90 per cent of the lead, and a still higher percentage of the silver content. It is estimated that the quantity of zinc tailings on the Barrier which could be profitably treated by this process amounts to 4,000,000 tons, and the heaps are increased by 17,000 tons per week. The Block 10 Company has over 400,000 tons of zinc tailings, assaying 9.70 oz. silver, 6.68 per cent lead and 22.69 per cent zinc.

The New South Wales gold returns were 29,222 oz. fine gold, as compared with 9,324 oz. for February, 1902. Deducting the quantity imported from other States by custom works, the gold won in the State for the month is estimated at 10,512 oz. fine. At Wyalong a splendid yield has been obtained from the

crude ore, which is being stoped at the 700-ft. level in the Lady Grace Mine, two tons yielding 51 oz. 16 dwt. gold, and 12 tons, 87 oz. 12 dwt. The January returns of the English owned Mount Boppy Mine, near Cobarr, were 2,100 oz. gold from 2,200 tons ore treated. The Brown's Creek Gold Mine, near Blaney, worked for only six weeks about seven years ago, spent £60,000 on one of the finest batteries in the State, which has been acquired by Mr. Frank Gardiner, of West Australia, who will operate it himself. At the Mookerawa diggings, near Stuart Town, one party has a face of wash 60 ft. wide returning 3 oz. of gold to the load.

**Victoria.**—The Cassilis Gold Mines, Gippsland, has paid a 6d. dividend. In February 1,054 tons yielded 1,280½ oz., giving a net profit of £3,000.

**South Australia.**—Good rain has fallen on the Arltunga gold-field. There is less excitement over this field, as people appear to be awaiting results from some of the prospecting parties. Capt. Pleitner reporting to the Undoolya Mining Association writes: "I have been over a great deal of the country, but I find that the rich lodes are not as plentiful as reported to be in Adelaide. There is only one good surface showing that I have seen at Winnecke's Depot, Paddy's Goose, and I doubt if it will go down. There are a few large out-crops, but I think they are too poor to pay. The rest of the claims where any work has been done can show only leaders from 3 ins. to 15 ins. wide. I also notice that the best stone is at the surface." He also says that he considers White Range a good field. The lodes are from 8 ft. to 20 ft. wide, and appear to be permanent, though he does not think the best will average more than 1 oz. to the ton. It is reported that a rich deposit of phosphate of lime has been discovered a few miles from Robertstown on the Murry flats.

**Tasmania.**—According to report, arrangements practically concluded between the representatives of the Mount Lyell and the North Mount Lyell companies will enable the two properties to be worked in a mutually helpful fashion. W. Knox, director of the Mount Lyell Company, has accompanied J. Angus, a visiting director of the North Mount Lyell Company to England, and an extraordinary general meeting of the Mount Lyell Company has been called to authorize the directors to amalgamate with the North Mount Lyell.

The recent increase in charges by the local smelting companies, leaves no margin of profit for a low grade proposition like the Hercules Mine, so if fresh arrangements are not made, it is probable that operations will be confined to prospecting the lower levels. It is stated that overtures have been made by C. W. McMurrin on behalf of American capitalists to purchase the Hercules.

The Briseis and Brother's Home No. 1 companies contemplate a scheme under which the former will work the overburden and tin drift of the Brother's Home No. 1, with a full force of water from the Ringarooma, the net returns to be paid to the Brother's Home, less a proportionate charge for working expenses. The advantage to the Briseis will consist of increased facilities for mining and better dump room.

The Gympie mines during February produced 13,768 oz. of gold from 14,172 tons crushed, and the dividends for the month amounted to £18,000. The Eastern Gympie Gold Mines, a Scottish venture, has sunk its first 1,000 ft., at a cost of \$18.54 per ft., in 10 months. The West of Scotland Gold Mines Gympie has cut 1 ft. of gold-bearing quartz at 3,069 ft., the greatest depth at which gold has been found in Queensland. The country rock is of a sort that those with long experience of Gympie thought would not carry gold. Colors are seen through the stone, which also carries a fair amount of galena.

## GENERAL MINING NEWS.

### ALASKA.

#### PRINCE OF WALES ISLAND.

**Brown-Alaska Company.**—This company, it is said, is considering the erection of a 400-ton smelter at its property, which consists of 20 copper claims. Sam Silverman, of Butte, Mont., is the chief promoter. The company owns the Mamie group.

### ARIZONA.

#### PINAL COUNTY.

**San Carlos Copper Company.**—Phelps, Dodge & Co., of New York, and George B. Chittenden, of Arizona, are conducting operations near Dudleyville on a strip of land cut off from the San Carlos Indian reservation. The properties, it is said, show great copper deposits. The San Carlos Copper Company, controlled by Phelps, Dodge & Co., has 30 men at work, and contemplates the erection of large reduction works as soon as the Phoenix and Eastern Railroad is completed.

#### YAVAPAI COUNTY.

**United Verde Copper Company.**—A new blast-furnace, with a capacity of several hundred tons a day



**Yankee Consolidated.**—Work on the new concentrator at Alice is under way, and the mill is expected to be running by July 1. The company is sinking the Lombard shaft, also driving the Manhattan tunnel to reach the lodes and connect with the shaft now sinking. The Lombard shows a wide body of milling and smelting ore in the adit levels. The old Ashbaugh Mill is being torn down. Henry I. Seemann, of the Equitable Building, Denver, is manager.

## FREMONT COUNTY.

**Gypsie Queen.**—A strike of galena is reported at this mine, situated at Jennings Gulch, 16 miles west of Florence.

**Keystone Oil Company.**—A strike of oil, at 2,400 ft. depth, is reported to have recently been made on this company's property, near Florence.

**Portland Cement Company.**—This company is said to have purchased 2,000 acres of land near Coaldale. On the land, it is said, is a vast deposit of pure white gypsum, which the company proposes to manufacture into cement and plaster of paris. A road, 2 miles in length, will be built connecting the main line of the Rio Grande Railroad with the gypsum bed.

## GILPIN COUNTY.

(From Our Special Correspondent.)

**Gilpin Ore Shipments.**—The shipments of smelting and crude ores, tailings and concentrates from the Black Hawk depot of the Colorado & Southern Railroad during April to valley smelters and to Idaho Springs mills were 231 cars, or 4,620 tons, a very small record, due to the continued shut down of the Golden Smelter, and to prevailing bad weather.

**Charter Oak.**—St. Louis, Mo., men, interested in this group on Quartz Hill, have put up a 40-h.p. boiler, and resumed developments in the 540 and 440 levels. E. W. Davis, Central City, is manager.

**Drake Tunnel.**—St. Louis, Mo., men who recently became interested in this proposition below Black Hawk, may start developments this month by extending the tunnel westward to Bobtail Hill, and sinking deep a shaft in the Lake District on which they will have to install machinery. Eugene Drake, Central City, represents the St. Louis men.

**Eldorado.**—Denver men have this and an adjoining group in Russell District, and are organizing a company. A new shaft is to be sunk on the Eldorado about 200 ft. west of the present shaft. The company is also timbering the Portage claim, and will carry on developments there. S. T. Harris, Russell Gulch, is in charge.

**Fairfield Mining Company.**—During April this company shipped from its Fairfield Mine, in Russell District, 30 cords of milling ore, averaging 3 oz. gold per cord, with a fair grade of tailings, as well as 75 tons of smelting ores, which averaged around \$125 per ton. Dr. W. M. Nickerson, Central City, is manager.

**Golden Cloud Mining Company.**—Idaho Springs men who took a bond in sinking at less than 300 ft., have opened a good sized ore-body, the main portion running between \$13 and \$20 per ton, with nearly 2 ft. running between \$30 and \$40 per ton. T. Tobias of Idaho Springs, is looking after the property.

**Grand Central Mining Company.**—This company has stopped developments on the East Whiting, and may consider the question of letting the property on a lease, and may sink the shaft 200 ft. deeper. The property shows considerable low-grade ore, and the problem is whether to erect a mill or carry prospect for higher-grade ores. Colorado Springs men are behind the enterprise.

**Kemp-Calhoun.**—Manhire Brothers, of Russell Gulch, are working this property in Leavenworth Gulch under a lease and bond, and have opened some high-grade ore in sinking. The crevice is 3 ft. wide, with the smelting streak averaging from 10 to 12 ins. wide, the best of the smelting ores going over \$200 per ton. The royalties apply on the purchase price of the bond. The ores are chalcopryite and tetrahedrite galena and blende.

**Stewart.**—After being tied up because of bad roads for two months, shipments have resumed, a lot of 100 tons being hauled to Black Hawk, the product of leasers. New Englanders are interested, and may decide to build their own mill in Stewart Gulch during the summer. J. A. Gilmour, Central City, is manager.

**Town Topics Gold Mining Company.**—A contract has been given M. W. Ballard, of Central City, for erecting a large shaft building. The machinery formerly on the Mammoth has been purchased, and will be installed by Stroehle & Sons, of Black Hawk. The main shaft on the East Notaway Mine is down 666 ft., and will be sunk to 1,000 ft., when the new plant is installed. The property has been successfully operated by sub-leasing since its purchase over two years ago, and has paid regular quarterly dividends of \$5,000, amounting to \$40,000. M. D. Draper, Central City, is superintendent.

## LAKE COUNTY—LEADVILLE.

(From Our Special Correspondent.)

**Leadville Manganese Production.**—The Sixth Street, Catalpa Crescent and Caribou are now steady shippers to the steel works at Pueblo. The ore nets the miner about \$3 a ton, and 150 to 175 tons are shipped daily.

**Best Friend.**—The 500-ft. tunnel started last year to get under the old workings, is completed, and has cut a 16-in. vein of iron sulphides that runs \$150 in silver and gold values. This was one of the early gold producers, but has been long dormant.

**Blue Ribbon.**—This is virgin territory south of the Valley Mine. A new shaft has been sunk 150 ft., where lessees are drifting to the ore horizon.

**Caribou.**—One hundred tons of oxidized iron ore are shipped daily besides 25 tons of rich lead ore. A contract has just been made for manganese ore from the large manganese bodies exposed.

**Coronado.**—At 660 ft. a station has been cut and a 1,000-gal. pump is being installed.

**Fairview.**—A large oxidized and manganese body is being developed. Fifty tons a day are shipped.

**Fryer Hill Mines Company.**—Since May 1, 1902, this company has unwatered a large territory, handling over 200,000,000 gals. of surplus water and over 20,000 tons of debris, and equipped its property on Fryer Hill with a fine plant of machinery. Shipments have just been increased to 150 tons a day, half of which is high-grade material. A drift started at 425 ft., in the El Paso workings, has followed a new sulphide body 10 ft. high and 8 ft. wide for 70 ft. The company has 1,500,000 tons of low-grade sulphides in sight. The new shaft on the Pride of the West will be in the first ore horizon at another 100 ft.

**Last Chance.**—On this Lake Park property local men are following a vein of rich gold ore.

**London.**—During the winter a vein in porphyry from 2 to 4 ft. wide was opened. The values are gold, copper, lead and silver, mostly gold. The new tunnel has made available over 1,200 ft. of virgin ground.

**New Leadville Home Mining Company.**—More ore is exposed than at any time in the previous history of the mine. Two hundred and fifty tons daily of good iron material are shipped. Work is going ahead in virgin ground.

**Orion.**—After a long idleness local leasers have begun prospecting in the old workings.

**Peerless Maud Combination.**—A new strike has just been made in the shaft at 160-ft. depth of fine lead ore. Fifty tons of good lead concentrates running 60 per cent lead are shipped weekly.

**Utah Placer.**—This tract of virgin ground will be systematically developed this summer, it is believed. Tests are being made which will decide whether a dredging plant will be installed.

## MINERAL COUNTY.

**American Sulphur and Mining Company.**—The litigation between Dennis Brennan and others and this company, over the rights to valuable sulphur beds about 20 miles above Creede, has been decided by Judge Holbrook in the district court in favor of the plaintiff and his associates. An appeal was taken by the defendants.

## OURAY COUNTY.

**Bright Diamond.**—This mill and mine, 1 mile north of Ouray, which have been idle for several years, have been opened by Barney Du Praw and A. A. Moule. The mine was a paying one years ago. The new owners have repaired the machinery.

## SAGUACHE COUNTY.

**Independent.**—A strike of the miners at this property at Crestone is reported. The miners ask for an 8-hour day and the old scale of wages. Percy McGeorge, manager, refuses either to grant the men's demands of an 8-hour day, with \$4 for machine men, \$3.50 for helper, \$3 for trammers, \$2.50 for top car men, \$3.50 for engineers, and \$3 for firemen.

## SAN MIGUEL COUNTY.

**Caribou-Montezuma.**—This mine, near Ophir, has been purchased by New England men, who have made a first payment of \$50,000. Mr. Axtell, of Boston, the principal owner, succeeds Charles F. Newton as resident manager. The erection of a new mill is contemplated.

## SUMMIT COUNTY.

**Gold Cord Mining and Smelting Company.**—The contractors driving the tunnel on this company's property at Kokomo, have cut another vein of lead and copper ore.

**Snowbank.**—This mine on Sheep Mountain, near Kokomo, is reported showing up well. A recent shipment of one car-load gave smelter returns of \$2,500.

**Uthoff.**—This mine, near Kokomo, Axel Borg manager, is reported producing about 50 tons per day.

**Wilfly.**—This property on Elk Mountain, E. E. Byron manager, is producing steadily. The concentrating mill is kept busy treating the product.

## TELLER COUNTY—CRIPPLE CREEK.

(From Our Special Correspondent.)

**Cripple Creek Geological Survey.**—The sum of \$3,500 for a geological survey of the Cripple Creek District by the Government, has nearly been raised. The amount raised is to co-operate with the Government in order that the survey may be made this year.

**C. K. & N.**—The lowest level of this Beacon Hill property has been unwatered and the ore shipped from it is of very good value.

**Cripple Creek Enterprise Mining Company.**—This company has recently added a compressor, and is using an air drill in the drift, being run at a depth of 200 ft. It is reported that some very good assays have been obtained. The company has a franchise to mine under the streets and alleys of a considerable portion of the city of Cripple Creek. A good strike has recently been made on the Abe Lincoln Mine, not very far from this property. Dan Hanley, of Cripple Creek, is in charge.

**Golden Cycle Mining Company.**—This property is steadily producing a large quantity of fair-grade ore. The litigation does not interfere with the production, as the litigation is between the majority and minority stockholders. Messrs. Milliken and Hill are the principal majority stockholders, and Messrs. F. J. Campbell and Tucker Ballard & Co. are the principal minority stockholders. A. T. Holman is in charge.

**Isabella Gold Mining Company.**—The property is still idle. According to the yearly report the mine has not very much money in the treasury at present. A large amount of the territory has never been prospected.

**Stratton Cripple Creek Mining and Development Company.**—Contrary to expectation the leasers have not been granted, owing to the absence of one of the directors. The leases appear to be in great demand, especially those on Bull Hill.

**Stratton's Independence, Limited.**—It is reported that ore in large quantities has been discovered on the 1,460-ft. level, but at present the report cannot be verified. Considerable development has been done of late on the lower levels, but no ore of any quantity has been shipped, though the mine has been shipping a large quantity of low-grade ore. Developments on the 1,460-ft. level are watched with interest. Thos. Cornish is in charge.

## GEORGIA.

## LUMPKIN COUNTY.

**Ingersoll & Crisson Dredge.**—This dredge boat, which is to work on the Chestatee River, near Dalton, was launched April 30, and the machinery is now being put in.

## IDAHO.

## IDAHO COUNTY.

**American Eagle.**—The 10-stamp mill on this property, at Elk City, continues crushing ore. The total monthly clearing since January has, it is said, averaged about \$9,000. A tramway is being built from the mill to the mine.

## SHOSHONE COUNTY.

**Buckeye Boy.**—Greene & Anderson report a strike of 4 ft. of milling gold ore near Pierce.

**Bunker Hill.**—J. L. Safford has begun sluicing out the waste dumps for concentrates.

**Rich Hill Placer Company.**—This company is putting men to work on its claims at Pierce.

## ILLINOIS.

(From Our Special Correspondent.)

All of the miners of the Pana sub-district went on a strike May 1, because the operators refused to meet them in sub-district convention. The mines affected are at Pana, Taylorville, Decatur, Witt, Assumption, Lovington, Tower Hill, Hillsboro and Moweaqua. Conditions at these mines are so different that there has been no sub-district agreement between miners and operators, but each mine has had a local agreement. This year the miners want a sub-district agreement. Secretary W. D. Ryan, of the United Mine Workers of Illinois, stated that the State organization would not take a hand in the strike, which was ordered by the sub-district officers. It is thought that the strike will not last long.

## SANGAMON COUNTY.

(From Our Special Correspondent.)

**Chicago & Springfield Coal Company.**—This company has been incorporated in Springfield to sink a mine northeast of the city, on the Chicago & Alton Railway. The stockholders include Harry Devereaux, J. A. Hall, D. A. Watson, George A. Wood and Michael Burke, of Springfield. They have about 1,160 acres of coal land adjoining the Jones & Adams mine on the east. Work will start at once.

**Continental Coal Company.**—This company has been organized in Springfield to sink a mine at

Pawnee Junction on the Illinois Central Railway, and a branch of the Chicago & Alton Railway, running east from Auburn. Among the stockholders are S. H. Cummins, Dr. Vincent and Thomas R. Gray. The company has commenced sinking and expects to be shipping coal in the fall.

## INDIANA.

## DAVISS COUNTY.

(From Our Special Correspondent.)

*W. L. Davis & Co.*—This firm, of Canton, O., owning 8,000 acres of coal land near Winslow, has let a contract for opening mines on the property.

## SULLIVAN COUNTY.

(From Our Special Correspondent.)

This bids fair to be the greatest oil development year in the history of the Indiana field. One French syndicate alone expects to invest a very large sum in the oil districts of Indiana and Ohio. The advances in the price of crude have encouraged the development of new territory. The Emory Oil Company, of Marion, has transferred to E. Y. Ramage, leases and holdings in Grant and Wells counties, for a consideration of \$193,000. During the last week in April there were 97 wells drilled in Indiana, with a new production of 4,055 bbls. Only 3 dry holes were reported.

## KANSAS.

## LEAVENWORTH COUNTY.

*Home-Riverside Coal Mining Company.*—Recently the Pioneer Trust Company, of Painesville, O., filed suit in the United States Federal Court at Leavenworth asking for the appointment of receivers to take charge of this company's properties at Leavenworth. Judge Hook appointed as receivers E. W. Snyder and A. P. King. The company owned several hundred acres of land in Platte County, Wis., to take charge of which Judge Phillips appointed the same men as auxiliary receivers. The company's coal property is reported valued at about \$1,000,000, and bonded for some \$500,000.

## KENTUCKY.

## KNOTT COUNTY.

It is reported that Eastern men have secured 15,000 acres of mineral lands along Quicksand Creek at \$20 per acre.

## LOUISIANA.

## CALCASIEU PARISH.

(From Our Special Correspondent.)

*Jennings Oil Field.*—There are 12 producing wells here, all pumps, each averaging about 200 bbls. per day. The producing area is small, with prospects of an extensive field. The 1902 shipments are given as 418,000 bbls., but the estimate is probably much too high.

*Southern Oil Company.*—This company's well, No. 6, at Jennings, has been brought in. It is a pumper.

*Superior Oil Company.*—This company has started drilling a well at Jennings.

*Welch Oil Field.*—Two of the four producing wells are being pumped, yielding about 250 bbls. daily. Experts claim that wells drilled to 2,000 ft. instead of 1,400 ft., as at present, would greatly increase production.

## MICHIGAN.

## COPPER—HOUGHTON COUNTY.

(From Our Special Correspondent.)

*Baltic.*—No. 5 shaft is sinking to the 8th level, No. 4 to the 9th, and No. 3 to the 10th. South of No. 3 shaft good copper ground is opening. Four heads at the stamp mill are in commission treating 1,700 tons of rock daily. Fifty drills are in commission, a large number being on development work.

*Champion.*—This mine is shipping 1,300 tons of rock daily, supplying three heads at the mill. No increase in production is expected until the 100-drill compressor, ordered from the Nordberg Manufacturing Company, of Milwaukee, Wis., is working.

*Franklin.*—Development work at the Junior branch is progressing rapidly. The Allouez conglomerate lode is reported opening well, particularly to the south. The two branches of the mine are operating 50 power drills and shipping 1,100 tons of rock daily.

*Quincy.*—No. 8 shaft, on the Mesnard property, is down to the 8th level. Sinking will be continued until the depth will permit connection with the old mine workings below the line of the Franklin Mine.

*Tamarack.*—Development work in the territory tributary to No. 5 shaft is progressing steadily, 500 ft. of new drifts are opened each month, and rock shipments average 475 tons daily. Parts of the new hoist and compressor have arrived. The work of installing the machinery should commence within two months.

*Trimountain.*—The third head at this company's stamp mill is in commission. Two heads at the Arcadian Mill are used, and rock shipments to the two mills aggregate 2,300 tons daily.

*Winona.*—No. 2 shaft is supplying rock for one head at the Atlantic Mill. The fourth level south

exposes the Winona lode to a width of 40 ft. in some places.

*Wolverine.*—The trammers' strike has ended, and work has been resumed. The trammers accepted the terms offered, \$56 per month, a raise of \$2.

## COPPER—KEWEENAW COUNTY.

(From Our Special Correspondent.)

*Central.*—This old property is being explored systematically with a diamond drill. A 16-ft. amygdaloid lode was opened two miles south of the old mine workings last fall, but nothing else of importance has been found.

## COPPER—ONTONAGON COUNTY.

(From Our Special Correspondent.)

*Adventure Consolidated.*—The Allis-Chalmers Company, of Chicago, Ill., has completed the repairs to the mill at Edgemere. Three stamps are operated during the day shift only, owing to the limited openings at the mine, treating 750 tons of rock daily.

*Hamilton.*—The Copper Crown Mining Company, of St. Louis, Mo., is developing this property. The 2-compartment shaft is sinking to the first level. A tunnel is being run under the high bluff.

*Mass Consolidated.*—C shaft is down 450 ft. on the Butler lode. A and B shafts are both sinking to the 13th level.

## MINNESOTA.

(From Our Special Correspondent.)

April shipments of iron ore amounted to 723,199 gross tons, against 1,016,513 tons to the same date last year. When lake shipments began, early in April, this year, many boats were not out yet. Shipments from the Duluth, Missabe & Northern dock for May 2, this year, were 70,000 gross tons, in spite of work stopping at steam shovel mines belonging to the Minnesota and Oliver companies, where there was a small labor difficulty.

For the past few days a large number of new 100,000-lb. cars for the Duluth, Missabe & Northern and Duluth & Iron Range have been arriving. The cars differ from former models, as both sides can be dumped from either side the car, a feature of importance that will save time at the ore docks, and make work there less dangerous. New trackage, both main lines and mine spurs, is going in very fast on all the Minnesota roads. The Duluth, Missabe & Northern will soon connect its cut-off to its main Hibbing line, also a spur to the Shenango and Chisholm. The road is also shifting its tracks near the Burt, Morris and other mines about Hibbing. The Great Northern has its new line from Kelly Lake to Buhl about half graded, and will use it this year. This line passes south of all the mines of Hibbing District. The double tracking of the main Virginia-Duluth line is progressing, and the Nushwauk extension is soon to start. The Duluth & Iron Range is enlarging side-track facilities all along the road, especially near the Fayal.

## IRON—MESABI RANGE.

(From Our Special Correspondent.)

Steam shovel mines have begun shipment. The Mountain Iron, Fayal and others of the Steel Corporation are sending out ore.

About 125 drills, chiefly churn, are working on the Western Mesabi, near Hibbing. The United States Steel Corporation is exploring its land between the village and its Hull Mine, where vast quantities of ore are known to exist. The Mahoning Ore and Steel Company is exploring between the Hull and the rock on which its buildings are. All round Hibbing drills are going down, many of them in ore.

In the Biwabik District Hopkins & Holland, who have been exploring lands in section 4 belonging to the John Williams estate, have a mine of small size, and will open it this year. They will strip 35 ft. of surface, and mine by milling. On this tract the Chicago Iron Company once spent \$25,000 unsuccessfully, and when Mr. Holland took it up the Williams estate had expended, without result, more than \$10,000.

*Biwabik.*—This mine is shipping, and is expected to make an output of 1,000,000 tons, its largest to date. It has always shipped via the Duluth, Missabe & Northern road to Duluth, but as it is nearer Two Harbors docks, via the Duluth & Iron Range, it now sends its ore there. The Duluth, Missabe & Northern will gradually withdraw from the east end of the range, and its mines between Evelett and Virginia and Hibbing will furnish all the traffic it can handle. Shipping at the Biwabik has gone on all winter, and a new through-cut has been made. The shipping now goes to the north line of the ore and of the property.

*Donora Mining Company.*—This company, now a United States Steel concern, has lost in its defense of a boundary dispute at the Donora Mine at Little Mesabi Lake, in section 28, T. 59, R. 15.

Section 15, T. 58, R. 19.—In the northwest corner of this section D. E. Woodbridge has shown up about 1,000,000 tons of ore. This property had been explored several times unsuccessfully by local and East-

ern interests. Two drills are working on the 40-acre tract.

## MONTANA.

## CASCADE COUNTY.

*Great Falls Mining Company.*—This concern has bonded the Tyler group two miles from Montana City to Jones & Martin, of Great Falls. Development is being pushed.

*Nelson Coal Company.*—This company has closed its mines, it is said, to make repairs. The employees were paid off and discharged. The property may be transferred to the Boston & Montana Copper Company.

## FERGUS COUNTY.

*Burke & Sweeney.*—Sapphires from this mine at Yogo, will hereafter be cut at the mine, a force of lapidaries having been brought out for that purpose.

## GRANITE COUNTY.

*Sunday.*—This mine, at Princeton, is reported having made a bullion shipment worth \$3,600 from its Huntington mill.

(From Our Special Correspondent.)

*Coal Discovery.*—A 4½-ft. vein of coal at the depth of 200 ft. is reported found near Ft. Branch. The prospectors at 400 ft. expects to find the 6-ft. vein now worked near Princeton. A shaft will be sunk and the first vein worked.

## LEWIS &amp; CLARKE COUNTY.

*East Side Mining Company.*—This company recently decided to build a concentrator at its mine, with a capacity of 50 to 75 tons a day. The concentrator, together with an electric hoist and compressor, will be operated by electrical power to be generated at a plant erected at Winston. R. A. Bell is president of the company. The company is capitalized at \$1,500,000. W. W. McDowell, of Butte, is vice-president.

*Lee Mountain.*—This mine is shipping 7 cars a week to the East Helena Smelter. This mine was closed for several years, but the recent lessees have struck a new vein and 20 men are employed.

*Montana Gold Mining Company.*—This company is shipping gold bullion from the Huntington mill at the Sunday Mine, near Princeton. It is understood that the owners are making preparations to sink another 100 ft.

## MADISON COUNTY.

*Alder Gulch Mining Company.*—This company has started work in Alder Gulch for the season under Manager W. F. Kammerer.

*Bullion.*—Trial shipments of ore from this mine, one of the Cataract group in the Basin District, are said to show very encouraging results, and contracts for development work will be let.

*Clipper.*—These mines, at Pony, are shipping a car a day.

*Eastern.*—This stamp mill, near Virginia City, has started up. The tailings are being treated in the cyanide plant adjoining the mill.

*Granite Mountain Company.*—This company, owning 14 claims in the Summit District, is reported having begun work on its property.

*Gray Eagle.*—It is said a concentrator will be built to work the second-class ores of this mine, which has been an extensive shipper during the past year.

*Strawberry.*—Extensive development work is being done on these properties near Pony.

## NEW MEXICO.

## TAOS COUNTY.

*Red Fissure Mining Company.*—This company, composed of Milwaukee and New Mexico people, was recently organized to carry on mining in the Bromide District. The capital stock is \$300,000, one-half subscribed. The officers are: President, A. J. Heyer; vice-president, E. J. Wagner; secretary, Martin W. Sherman; treasurer, C. W. Milbrath; attorney, E. J. Henning. Directors: The officers and H. J. Chesick, of Milwaukee; R. W. Tandy, Richard Cole, William H. Raymer, all of Tres Piedras. The company owns 80 acres in the Bromide District.

## NEVADA.

## STOREY COUNTY.

The State has appropriated \$20,000 for a mining exhibit at the St. Louis Exhibition.

*Woodbury.*—This plant, located at Virginia City, is handling 50 tons of tailings a day, flumed from the Kinkead Mill.

## OREGON.

## JACKSON COUNTY.

*Bouden Mining and Milling Company.*—This company, it is said has completed its assay office and stamp mill, near Gold Hill, and put on a force of men. It is said the shaft will go down 500 ft. before drifting starts.



mine at Hedley City, Similkameen District. The property is now owned by the Yale Mining Company.

#### NOVA SCOTIA—CAPE BRETON.

**Dominion Coal Company.**—The output of this company's mines for April was 263,878 tons—a decrease of 25,791 tons from March, and an increase of 21,626 tons over April last year. The decrease shown for March is partly due to the fire in the Dominion Mine.

**Nova Scotia Steel and Coal Company.**—This company's coal mines, near Sydney, shipped 31,000 tons in April.

#### ONTARIO—LAKE OF THE WOODS DISTRICT.

(From Our Special Correspondent.)

The Lake of the Woods is about open for navigation.

**Consolidated Mines Company, of Lake Superior.**—G. R. Vary, manager of the mill at Silver Mountain, near Port Arthur, reports the mine looking well, and the 20-stamp mill steadily putting through about 70 tons of ore a day, and shipping the concentrates.

#### YUKON TERRITORY.

A telegram announces a destructive flood in the Klondike region. Costly plants of machinery are reported destroyed, and valuable dumps of ore washed away.

#### SOUTH AMERICA.

##### CHILE.

**Salar del Carmen Nitrate Syndicate, Limited.**—The gross profit in the year 1902 was £54,754 (\$273,770), from which £10,464 has to be deducted for London charges, debenture interest, income tax, depreciation of plant and machinery, also of investments, leaving £44,290 to be carried to the balance sheet, plus £1,245 brought forward from 1901, making altogether £45,535. Out of this there has been appropriated: Debenture redemption, £30,450; balance of debenture account written off, £3,000; interim dividend of 4s. per share, £4,380. The directors now propose to pay a final dividend of 6s. per share (making 10 per cent for the year), absorbing a further £6,570, leaving £1,135 to be carried forward to 1903. The board has also decided to devote all the available balance to the debenture redemption fund. Besides the £29,000 provided for in the appropriation account, there are debentures of £15,000 more. Three months' notice has accordingly been given that the whole of the outstanding issue of debentures (£44,000 in all) will be redeemed on July 1 next.

#### MINING STOCKS.

(Full quotation are given on pages 733 and 734.)

**New York** May 6.

Very little has been done in the copper shares this week, while gold and silver securities have shown the customary professional trading to keep them before the public. Prices generally are among the lowest this year, and at present there is no sign of an early recovery, as the public still holds off from buying.

Amalgamated Copper made small sales above \$64, while Anaconda was invisible on Monday, and on Tuesday and Wednesday. Greene Consolidated, of Mexico, has received little nourishment from the declaration of a 2 per cent dividend—the first since February—and holders appear willing to accept a fraction over \$22. Tennessee was quiet at \$28¼@29. White Knob, of Idaho, brought \$13.

Colorado gold stocks were not much in evidence, though Portland of Cripple Creek brought \$1.40@ iron market, and while some iron founders are ville, sold at 52c.

Comstock stocks, in view of further assessments, the latest being 25c. on Consolidated California & Virginia, lack outside demand. Caledonia has changed hands at \$2.15; Union Consolidated, 94c., and Mexican, \$1.05. The only public dividend payer in Storey County, Nev., the Silver Hill Mining Company, was dealt in at 90c., but trading was limited.

**Boston** May 5.

(From Our Special Correspondent.)

Business in mining shares is at a low ebb in this market, and fluctuations are so narrow as to hardly call for comment. Net variations for the week are very slight. The market drags its weary length along from day to day, and brokers are not beginning to pay expenses. The traders are very blue, and are waiting for something to turn up. Spurts in Copper Range and Winona are about the only things that have excited comment. A fair market in the latter has been on at times, but this is about all. Copper Range was marked up in anticipation of the annual report, which came out Monday. There are many ways of interpreting the report, but it covers a period of construction, and did not have the benefit of the present price of copper. It is well received, and shows great possibilities in earning capacity. The most significant statement is that made by President Paine, who says that the company will be in a position to pay dividends before the end of the year. It is reported that the Champion has declared a \$1 dividend on its 100,000 shares, one-half of which is owned by Copper Range and the other half by the St. Mary's

Mineral Land Company. Copper Range Consolidated varied from \$62.67½@65, closing the same as a week ago at \$64. Winona spurted \$1.87½ to \$12.87½, closing at \$12. The latter has broken ground for a new shaft.

Dominion Iron and Steel has varied from \$27.50@ \$31 during the week, closing at \$30.50, a net gain of \$2.75. This, however, represents but small trading. Dominion Coal has advanced \$5 to \$110 on limited business. Old Dominion is firm at \$17@17.75, with very small dealings. Earnings last month are reported as \$75,000 net. The company is reported to be loaning \$125,000 on the street. United States Mining holds just under \$25, with but little selling pressure. Last month's product was \$51,000 lbs. bullion from three furnaces. At the present time four are being operated. The Bingham has taken over the Sampson Mining Company in Utah.

There has been listed on this exchange 37,623 common and 10,300 preferred shares of Nova Scotia Steel and Coal stock, par being \$100 in each case. No transactions have been reported, however. There is some talk of listing Greene Consolidated on this exchange, but nothing definite has been done as yet.

**Colorado Springs** May 2.

(From Our Special Correspondent.)

The general tone of the market at the close of this week's business is not as encouraging as it was a week ago. Trading has been fairly active, but the quotation on a majority of the leaders is fractionally lower to-day than at the close of business last week, with no apparent good reason. During April the Cripple Creek output was something over \$1,700,000 in gold, a gain of almost \$150,000 over March. The necessary funds to insure the re-survey of the district by the United States Geological Survey have been pledged and mining men generally anticipate stimulated activity in the gold camp when this survey is completed. The natural result of this should be advancing prices on mining securities.

The quotation on C. K. & N. has not varied materially during the week, the bid remaining at 19c. Elkton sold at 37c. a week ago, advanced slightly, and again sold at 37c. to-day, that figure being the bid at the close. El Paso sold at 58½c. the 24th, and at 59c. the 28th, that being about the market price to-day. Isabella scored the only marked advance of the week, selling at 15¼c. on the 24th and 17c. to-day, closing at 16¼c. bid. Portland had an off week, selling from \$1.40 a week ago down to \$1.35, and back to \$1.38 to-day. Selling orders are no doubt responsible for the downward tendency of this stock. Vindicator was a lively trader during the week at low figures, selling from \$1 down to 90c., and back to 95c. Dead Shot was also an active trader, but the advance in price scored last week could not be sustained, the stock dropping from 3¼@3c. Old Gold was in good demand at 5c. all the week.

**Salt Lake City** May 2.

(From Our Special Correspondent.)

The week has recorded an advance in prices all through the regular list. The advance in the price of silver is given as the reason for the upward movement.

Daly West opened at \$44.70, and advanced to \$48.75, with 2,098 shares exchanged. Lower Mammoth opened at 54, and closed at 68c., with 23,600 shares sold. Uncle Sam traded to the extent of 10,900 shares, opening at 21 and closing at 25¼c. The heaviest traders during the week were California, 25,560 shares, at 19½@16¾c.; Consolidated Mercur, 7,100 shares, at \$1.43¼@1.34½; May Day, 41,400 shares, at 21½@15c.; Wabash, 19,500 shares, at 31½@28½c.; Yankee Consolidated, 12,600 shares, at 36½@28c.

The total amount of business for the week was 275,968 shares, which brought \$192,769.

**San Francisco** May 2.

(From Our Special Correspondent.)

The market continued to drop off early in the week, but towards the close there was a sharp rise in the Gold Hill stocks. For Caledonia there was a brisk demand.

Some quotations noted are: Caledonia, \$2.15; Consolidated California & Virginia, \$1.35; Best & Belcher, \$1.50; Hale & Norcross, 75c.

An assessment of 25c. a share has been levied on Consolidated California & Virginia stock, delinquent June 2.

Business in oil stocks was good, and prices generally firm. Home sold freely at \$2.50. Monte Cristo was quoted at \$1.30; Caribou, 80@85c.; Four Oil, 68c.; Monarch, 49@50c.; Pittsburg, 50c.; Occidental, 21c.; Independence, 13c. Quite a brisk demand developed for some of the low-priced stocks.

#### COAL TRADE REVIEW.

**New York**, May 7.

##### ANTHRACITE.

The demand for anthracite is strong, and comes from all consuming territories. The output at the mines, now that those miners who were dissatisfied

with conditions at certain collieries have decided to return to work pending the settlement of local disputes by the Conciliation Committee of miners and operators, should be heavy. The Conciliation Committee consists of the presidents of the three anthracite districts of the United Mine Workers, and Messrs. W. L. Connell, an independent operator, of Scranton; S. D. Warrimer, general superintendent of the Lehigh Valley Coal Company, and R. C. Luther, general superintendent of the Philadelphia & Reading Coal and Iron Company. Any points on which this committee is divided—and such points may be many—are to be referred to a seventh person, appointed by the United States Circuit Court. The committee will undoubtedly have plenty of work for a while. What the miners will do if many decisions are against them remains to be seen.

The coastwise movement of coal has been somewhat hampered during the week by the strike of the tug boat engineers. Some towing companies have adjusted matters temporarily, pending arbitration of the points at issue. The strike is felt most by men having a few tugs and handling vessels and barges at New York Harbor. They claim that the engineers' demand for a 10-hour day—owing to the irregular character of the business offered such tugs—is utterly unreasonable and cannot be granted without a material increase in towing charges.

Trade at the head of the lakes is very active, in fact, it is said that the movement of anthracite from docks to country yards during the last two weeks of April broke all records. The price of prepared sizes at the docks advanced to \$6.10 on May 1. In Chicago territory a lot of business has developed of late, and, as pointed out in this column some time ago, the increase of 50c. a ton this year on prepared sizes is not likely to affect consumption materially, in spite of all the talk about the great damage done to the anthracite trade in the West by last winter's prices. The size most wanted just now seems to be egg. Receipts of all prepared sizes do not meet the demand. At lower lake points and in Canadian territory demand is brisk. Prices, f.o.b. cars Buffalo or Suspension Bridge, advanced on May 1 to \$4.85 for broken and \$5.10 for egg, stove and chestnut sizes. At seaboard points demand is strong, though shipments have been restricted by the tugboat engineers' strike. Retail trade at New York has been bothered by a strike of cart drivers. The May 1 retail prices at Boston are: Broken, \$6.25; egg, stove and nut, \$6.75. At New York Harbor the May 1 prices, f.o.b. shipping port, are: Broken, \$4.35; egg, stove and nut, \$4.60.

##### BITUMINOUS.

More than enough bituminous coal to supply current needs has arrived at tidewater, and shipments eastward have been bothered by the tugboat engineers' strike. As a result, coal has accumulated at shipping ports, and is selling where shippers are being prodded by the railroads on account of cars not being unloaded promptly, for as low as \$2.45 f.o.b. for Clearfield grades. This is still the dull season of the year—dealers are giving attention to anthracite, and coastwise freight rates do not attract buyers at Eastern points, who expect rates to fall before long.

At points beyond Cape Cod the situation is little changed from last week. What coal is arriving is almost wholly on new contracts. Along Long Island Sound trade continues quiet, and no revival of activity is expected for several weeks. Shipments to New York Harbor points, owing to the generally limited yard room of dealers and consumers, are relatively greater than to other consuming territories, but the market is quiet, and consumers apparently have little trouble in getting what coal they want, though trouble in getting tugs may have bothered some concerns. In the all-rail trade demand is rather slack; considerable coal has gone into storage and consumers' needs are well supplied.

Car supply for these producers not under embargo on account of cars standing at tidewater is fully 80 per cent. Transportation from the mines continues prompt—coal running through in less than a week. The coastwise vessel market suffered a little from barges being tied up by the tugboat troubles, but the movement of coal by barges is now approaching normal conditions. Schooners have had bother in toying to and from loading docks, but the Pennsylvania Company has had little trouble with its tug engineers. We quote current freight rates from Philadelphia: Long Island Sound, \$1; Boston, Salem and Portland, \$1.20.

**Birmingham** May 4.

(From Our Special Correspondent.)

The coal production in Alabama continues strong, notwithstanding the closing of the season for domestic coal. Mining operations throughout the State are very active, and all efforts appear to be turned towards getting out as much coal as possible before July 1. It is this date that the new contracts with the United Mine Workers of America will go into effect. There is more or less uncertainty as to a new contract, but there is no anticipation of trouble in making the same.

There have been no changes in coal prices recently





and \$21 for Northern. A range of 50c. to \$1 above these quotations will represent premiums paid for speedy delivery. The customary 50c. more for No. 1 and the same amount less for No. 3 applies to these quotations on lots similar as to quantity and time of delivery.

Coke is ultra-plentiful. The supply continues more than adequate to the demand, and sellers are working hard to dispose of it as fast as it comes in, activity being necessary under the new rules governing transportation of coke. First-class foundry brings \$7.50, but this price is reported to have been cut to \$7 during the week on good-sized orders.

Cleveland. May 5.

(From Our Special Correspondent.)

**Iron Ore.**—The lake market is somewhat dull, with no wild chartering being done, and with but little activity in the making of season contracts. Shipments are slow, and boats are congesting at both loading and unloading ports, because of the scarcity of railroad equipment and the slowness of the dock machinery. Rates are unchanged at 85c. from Duluth; 75c. from Marquette, and 65c. from Escanaba, all to Lake Erie ports. The prices of ore have not changed, although nothing is being done in the way of sales. The quotations are based on \$4.50 for bessemer old range and \$4 for bessemer Mesabi.

**Pig Iron.**—The market is dull in all lines. Foundry is selling for May and June delivery in very small quantities, and the supply is becoming limited. Second half buying has been slow, and there is talk of a reduction in prices to a basis more nearly normal. Buyers seem to be holding back to get advantage of the proposed reductions if they come. Producers are firm and have sold nothing of importance lately. The prices are: No. 2 foundry, \$22; Southern Ohio furnace for first half, and \$21@21.50 for second half, Valley furnace. The Bessemer Association has made no sales lately, despite the rumors that have been abroad. Nothing whatever has been done in this territory for either early delivery or second half, and the quotations, while unchanged, are purely nominal. They are \$21.50@22 for first half and \$20.50@21 for second half, Valley furnace. Basic is off the market, quotations holding nominally at \$21.50@22, Valley furnace, for first half, and \$20 for second half delivery.

**Finished Material.**—The plate trade has been the strongest feature of the market. The specifications on old contracts have been heavy and the market is firm. The larger mills have about all the material on their books that they can deliver and the smaller mills are getting a good run of orders. While prices have eased up there is no particular weakness, and the mills are getting a good premium. The prices hold firm at 1.60c., Pittsburg, from the large mills and 2c., Cleveland, from the smaller concerns. Sheets have also held firm at the old listed prices; the orders have been steady and the market healthy. The business from this territory has been out of stock lately. The prices are still based on a quotation of 3.10@3.25c. for No. 27 black sheets out of stock, and it seems hardly possible that there is to be any material change. Bars have been fairly active, but big business is still holding off. Some of the smaller concerns have come in and bought their material for the year following July, but the big agricultural implement works are still holding off, and have made no purchases. They are waiting on crop developments. The prices have held firm on steel, while on iron bars some of the mills are making a little concession on choice orders. The prices are 1.60c., Pittsburg, for bessemer; 1.70c., Pittsburg, for open-hearth; and 1.80@1.85c., Youngstown, on bar iron. The structural market is still weak, and the outlook is that there is to be a good business ahead, but it is not yet ready to be placed. Many of the ventures in this city that have been planned for some time are still pending. The smaller mills are getting no premiums, because the larger mills can make prompt shipment. The prices hold at 1.60c., Pittsburg, from the mill, and 2.15@2.25c. out of stock. There is a big call for semi-finished material, but the supply is limited.

**Old Material.**—Steel scrap is scarce, with a big demand, and cast scrap is active. Other grades show a little easing up in prices.

Philadelphia. May 6.

(From Our Special Correspondent.)

**Pig Iron.**—Consumers of foundry iron have finally settled down into the attitude of doubt as to the permanence of present quotations. Foundry interests are having all the work they can do, and have as much work in sight as they want to look at, but they say that there are two things which warrant them in delaying their requirements for the last half of the year, namely, increasing production at hand and the chances for buying pig iron abroad on more favorable terms. A third possibility has entered into their conclusion, namely, that there is a constructive accumulation of pig iron at Southern furnaces. The main point in the matter is the uncertainty as to the ex-

tent of the decline in foreign iron. Consumers of bessemer iron feel a little differently. The heavy buying which has been done within a few days at \$19.50 at furnace for delivery during the third quarter, and a little less for delivery during the fourth quarter, shows that the bessemer pig interests have made their turning point. Quotations for iron in this market may be given at about the same figures as prevailed last week, although it is claimed that concessions are being privately named on foundry and forge.

**Billets.**—German steel is now being quietly contracted for, but the details are very carefully guarded. Large quantities are being negotiated for, and it is said to-day that it is quite probable that these negotiations will go through.

**Merchant Bar.**—Merchant bar gathered strength this week from unexpected sources. It was due to the placing of large orders for common iron for car-building purposes. The prices were shaded slightly, and it is believed that \$2 per ton represents the cut. There is also a fair retail demand at mills, and the retail business in stores is larger.

**Sheets.**—All of our sheet people report a good week's business, the demand covering every product. There is particular inquiry just now for galvanized sheets, the quotations for which are exceptionally firm.

**Merchant Steel.**—Some business in a wholesale way, which has been hanging fire for a month, failed to go through at last, because of the refusal of manufacturers to make certain concessions which were persistently demanded. The merchant steel situation is strong, owing to quite a heavy demand from Western sources, which has had a toning up effect upon the market. In a retail way there is no change in quotations, and deliveries are being hurried forward at the instance of consumers.

**Skelp Iron.**—Skelp iron is very strong, and an order for quick delivery could not be placed, excepting at a sharp premium. There is a great deal of work in sight, and manufacturers have the pick of orders.

**Pipes and Tubes.**—Both pipes and tubes developed strength this week, some of the orders being of considerable magnitude. Several of the large Eastern buyers are about closing contracts for a great deal of tube work, and notwithstanding the firmness of the market in a small way, it is claimed that concessions have been granted in large lots, and that a lower range of prices will develop early in the summer. This is a mere rumor from the buying side of the market, and is given for what it is worth.

**Plates.**—Conditions do not appear to have changed; premiums are being paid for early deliveries, and our plate people say that this premium paying will be a feature of the market throughout the entire season, because of the policy which so many of the smaller consumers are following of not ordering until they are in need of material.

**Structural Material.**—This week's business has been made up very largely of orders ranging from 50 to 200 or 300 tons, all of it for office building work in this territory. The structural iron makers are very well satisfied with the condition of things, and are looking for a great deal of work from the bridge builders. No change in quotations.

**Steel Rails.**—Two or three railroad companies are about closing with foreign makers for rails, and railroad people here say that if all the work is undertaken during the latter half of the year for which financial arrangements have been completed that foreign rails will be in greater demand. Girder rails are very active, and the volume of business placed is larger than for standard rails.

**Old Rails.**—There is more inquiry for old iron rails than we have had for several weeks.

Pittsburg. May 5.

(From Our Special Correspondent.)

The pig iron market is more active than it has been for several months, and while there was a slight decline in the fixed prices for late shipment, it does not now seem likely that a serious reduction will follow. As told in the last letter the week opened with a sale of 3,000 tons of bessemer iron at \$20.15, Valley furnaces. This was followed during the week by some heavy transactions, and when the week closed fully 50,000 tons of new business was on the books of the merchant furnaces. The bulk of the orders was for delivery up to October 1, at prices ranging from \$19.90@20.15, Valley furnaces. Some sales of bessemer for delivery in the fourth quarter were made at the lowest point in the year, \$19.40, Valley. The market is strong at that price, but better rates are expected to rule, as this week opened with sales aggregating 15,000 tons at prices ranging from \$19.40@20, Valley. The situation is different in foundry iron, and there may be a decline in prices. Foundries covered early at a high figure, and are now waiting for a lower price before placing any new business. It is probable that the prices fixed by the Southern Furnace Association for foundry iron will be shaded considerably for deliveries after July 1. Northern furnaces are still holding to the prices quoted

during the past few months, but a drop is expected when deliveries have been made on the old orders. Gray forge prices are being firmly held, and a number of sales of Southern forge have been made during the week. Reports show that contrary to expectations, imports of pig iron during March were 60,000 tons, or 15,000 tons greater than in the previous month. This indicates that the domestic production was not equal to the requirements. The blast furnaces in the Pittsburg District and throughout the Mahoning and Shenango valleys are being operated to their full capacity, there being no difficulty now as to coke delivery, and the railroads are taking care of all the freight offered.

The decided scarcity of crude still continues, although some relief was afforded to the Steel Corporation mills when the Youngstown plant was put on sheet and tin-bars. This, however, will not continue long, as the demand for steel rails is too great to permit the plant to remain out. It was thought at the time the change was made that the Edgar Thomson works could take care of urgent orders, but this is found to be impossible. The slight decline in pig iron prices has had no effect on finished steel lines. The demand continues heavy, and prices are firm. The structural mills have business that will keep them in steady operation all summer, and are still booking new orders. The demand for steel bars and plates is as great as ever, and premiums are still being paid for deliveries within three months. An advance in black and galvanized sheets is again rumored, but an official announcement by the American Sheet Steel Company has not been made.

The officers of the Amalgamated Association of Iron, Steel and Tin Workers returned yesterday from Columbus, where they attended the annual convention which closed on Saturday, having been in session for three weeks, or one week longer than previous years. Contrary to expectations, no advance was decided upon for sheet workers, and surprise was caused by a decision to ask for what is practically an advance in the iron scale. The tin-plate scale was not disturbed only to make some changes in the foot-notes. In the puddling and finishing scales, which are based on the average selling price of bar iron, it was decided to make the increase in the puddling rate at a straight 25c. per ton for every one-tenth cent advance in bar iron prices, the base of the scale remaining at \$5 a ton with bar iron selling at 1, 1.1 and 1.2c. From that point under the present scale the wages of the puddlers advances 25c. a ton with every one-tenth cent increase in the bar iron rate, until bar iron sells at 1.6c., when the advances are 12½c. for each one-tenth. The last examination showed that the average selling price of bar iron was 1.7c., which made the puddling rate 6.12½ a ton. Under the proposed scale this price would fix the puddling rate at \$6.25 a ton, but if bar iron drops to 1.6c. and continues at or below that price the proposed scale will be inoperative. Bar iron has been selling at 1.80@1.85c. for several months, but some large contracts taken at a lower price have kept the average down. It is believed manufacturers will strongly oppose the new scale, as they are deriving no particular benefit from the prevailing high prices, owing to the increased cost of raw material. In addition to the advance in the puddling scale, which carries with it an increase of 2 per cent in the wages of finishers with every one-tenth cent advance in bar iron prices, there are a number of important foot notes which still further increase the cost of making bar iron. The dates for conferences with the manufacturers on the proposed scales have not yet been arranged. The present scales do not expire until June 30.

**Pig Iron.**—The pig iron market has been active with prices strong at a slight decline for bessemer. So far prices for delivery up to October 1 range from \$19.65@20.15, Valley furnaces. Fully 60,000 tons have been sold within the past 10 days at those rates. There is but little doing in foundry iron. Southern No. 2 is held at \$21.35, delivered in the Pittsburg market, but it is believed this price could be shaded. The Northern product is quoted at \$21.50, Pittsburg. Northern gray forge is held at \$20.25, and Southern at \$19.85, Pittsburg.

**Steel.**—Crude steel is still scarce, and the inquiry continues heavy. Bessemer billets are quoted at \$31@31.50, and open-hearth at about 50c. a ton higher. Sheet bars cannot be had, and the foreign product is quoted at \$33, delivered at Pittsburg. Bars and plates are still quoted at 1.60c., but for early shipment premiums ranging from \$3 to \$5 a ton are charged for plates.

**Sheets.**—The demand is improving, and prices are firm. The expected advance has not yet been made, and the leading interest is quoting No. 28 gauge black sheets at 2.75c., and galvanized at 3.85c.

**Ferro-manganese.**—Domestic 80 per cent is still out of the market, and the price of English ferro remains at \$50@52.50.

New York. May 7.

**Pig Iron.**—Buying is expected to show a little improvement now that May 1 is past and labor troubles

are not as widespread as seemed possible. We quote for early delivery, Northern iron at tidewater: No. 1X foundry, \$22.25; No. 2X, \$20.50; No. 2 plain, \$20. For Southern iron on dock, New York: No. 1 foundry, \$21.50; No. 2, \$20.75; No. 3, \$20.

Bar Iron and Steel.—We continue to quote for large lots on dock: Refined bars, 1.95@2c.; soft steel bars, 1.80@1.90c.

Plates.—Tank is quoted, 1/4-in. and heavier, at 1.90 @2c.; flange, 2@2.05c.

Steel Rails.—The quotation remains \$28 for standard sections, f.o.b. mills for 1903 delivery; light rails, \$33@36, according to weight. Relaying rails are \$28@30 for heavy sections and \$33@35 for light sections.

Structural Material.—The demands of certain labor unions make the outlook uncertain. We quote for large lots at tidewater: Beams, angles, channels and tees, 1.75@2c.

Cartagena, Spain. April 18.

(Special Report of Barrington & Holt.)

Iron and Manganiferous Ores.—Since last report there have been no shipments of ores from this port. There are several steamers in the harbor, but no shipments have been made this week, as the dock laborers have again come out on strike, intimidating non-union men, and not only preventing the loading and discharging of all steamers in the harbor, either at the Cartagena wharves or the mineral wharves of Sta. Lucia in this port, but even stopping the unloading of wagons brought by the railway companies. As the merchants and shippers absolutely decline to give in to the unjust demands of the strikers, it is difficult to say when the strike may terminate; but as the funds of the dock laborers are practically nil it is not likely that they can hold out very long.

Prices are firm at 6s. 9d.@7s. per ton, f.o.b. shipping port, for ordinary 50 per cent ore; 7s. 3d.@7s. 9d. for special low phosphorus; 9s. 3d. for 58 per cent specular ore. Magnetic ore, 60 per cent iron, is 11s. for lump and 9s. 6d. for smalls. Manganiferous ores range from 14s. 6d. for 20 per cent manganese and 20 iron, to 9s. 9d. for 12 manganese and 35 iron.

Pyrites.—Iron pyrites, 43 per cent sulphur and 40 per cent iron, are quoted at 10s. 6d. per ton. No shipments are reported for the week.

CHEMICALS AND MINERALS.

(See also Prices-Current on page 736.)

New York, May 6.

The bulk of current business constitutes deliveries on season contracts taken some time ago. Occasionally, however, a few new orders are taken, but the competition for these always tends to lower prices. It is also evident that speculation, particularly in raw materials, is again tempting dealers and others who are conversant with the tactics of the respective combinations. As yet such speculation has little effect on the primary markets, as producers are as one in quoting for export.

The Western trade has been surprised by the destruction by fire recently of the South Chicago works of the International Salt Company. This will likely influence the sal soda market there, as the company was one of the largest producers in the United States.

On May 1 the Borax Consolidated, Limited, the international borax combination, having among its properties plants in California and New Jersey, paid an interim dividend of 5s. (\$1.20) less income tax on its ordinary shares for the quarter ending December 31, 1902, while the preferred stockholders received the customary half-yearly dividend of 2 3/4 per cent.

An attempt is being made to interest the trade in the recently discovered fluorspar deposit near Rome, in Smith County, Tenn. About 100 tons were shipped to the middle West in April. Most of the domestic production comes from Illinois and Kentucky, sells at a good price, and is consumed chiefly as a fluxing material in blast-furnaces, though smaller quantities are employed in the preparation of opalescent glass and for the manufacture of hydrofluoric acid. Imports are also made from Great Britain.

Imports into the United States of chemicals and minerals not mentioned in our market reports for March and the three months this year, were as follows, in pounds, unless otherwise specified:

Table with 3 columns: Item, March, Three mos. Items include Chlorate of potash, Muriate of potash, Saltpeter, All other potash, Caustic soda, Sal soda, Soda ash, All other than nitrate of soda, Asphalt (tons), Cement, Graphite (tons), Salt.

Increases this year are shown in muriate of potash, saltpeter and cement, the other substances record a decrease, principally in the heavy chemicals which are being manufactured on a larger scale in this country.

Cyanide of Potassium.—There is little animation in this market, primarily because consumption is being satisfied by regular contract deliveries, and, secondly, imports are small. Of late exports of cyanide from Great Britain to the United States have been made at a small fraction over 17c. per lb. Importers quote 20c., f.o.b. New York, for wholesale quantities, but it is possible a lower rate could be obtained. Export trade is quiet, and small lots have been sold to Colon, Panama, and Tampico, Mexico, around 19c.

Bleaching Powder and Chlorine.—Conditions in the bleaching powder trade are unsatisfactory, particularly to importers who are suffering from keen competition. The situation is clearly shown by the statistics given below. Sales of foreign bleach are reported at \$1@1.20 per 100 lbs., f.o.b. New York, according to test and quantity, while the domestic article is quoted at \$1@1.12 1/2, f.o.b. works. These prices can likely be shaded on new business, as it is generally understood the domestic makers will not concede the market to foreigners, nor will importers give way to each other. In short, consumers can get bleach at their own price for some time to come.

Imports of bleaching powder into the United States in March aggregated 11,977,243 lbs., against 12,170,515 lbs. last year; showing a decrease of 193,272 lbs. Since January 1 the receipts were:

Table with 3 columns: From, 1902, 1903. Items include Great Britain, Ger., Bel., France, Total imports, Re-exports, Balance, Est. Chlorine Content.

The decrease in imports this year is equal to 2,973,165 lbs., or about 9 per cent, all in Continental European bleach. The average value of the bleaching powder imported, and the relative price of the chlorine content, compare as follows, per 100 lbs.:

Table with 3 columns: 1902, 1903, Changes. Items include Bleaching powder, Chlorine.

These prices show a recession equal to 32 per cent this year, which is explained by the demoralization following the dissolution of the agreement among European producers.

Chlorine is unchanged at 30c. per lb. for imported liquid, and 10c. per lb. for water, f.o.b. New York. Little is being done in either article.

Copper Sulphate.—Business is small, either for export or domestic consumption, and prices are a shade weaker at \$5.25@5.37 1/2 per 100 lbs., f.o.b. New York.

Exports of copper sulphate from the United States in March aggregated 2,688 long tons, making a total of 5,643 tons for the quarter, as against 7,013 tons in the corresponding period last year; showing a decrease of 1,370 tons, or 19 1/2 per cent, owing chiefly to the smaller demand in Italy. The average invoice value of this year's exports was \$87.64 per long ton, as compared with \$90.70 in 1902; showing a depreciation of \$3.06, which is attributed to British competition. During the same period domestic trade was satisfied at \$110.66 per ton, f.o.b. New York, which is an advance of \$12.20 over last year, as a result of a smaller supply and greater demand. This shows that exporters are realizing much less than the sellers for domestic consumption.

Acids.—Briefly, there has been no change to influence the market either way, and consumption is met by contract deliveries. We quote, as below, per 100 lbs., unless otherwise specified, for large lots in carboys or bulk (in tank cars), delivered in New York and vicinity:

Table with 3 columns: Item, Price. Items include Muriatic, Oxalic, Sulphuric, Nitric.

Brimstone.—An era of speculation has been begun here, and from appearances may continue indefinitely. Apparently the disastrous experience of a large dealer in the speculative arena not many months ago, does not phase others from attempting the same performance. Sales of best unmixed seconds for shipment are reported at \$22 1/2 per ton, and perhaps some confidential orders have been taken at a fraction less. Spot is nominal at \$22.50. Best thirds rule from \$1 @ \$1.25 lower than seconds.

Imports of brimstone into the United States in March were 24,687 long tons, as against 18,920 tons; showing an increase of 5,767 tons. The consumption in the three months compares with last year as follows:

Table with 3 columns: 1902, 1903, Changes. Items include Imports, Re-exports, Consumption.

Apparently consumption has increased 31.5 per cent, due entirely to the larger demand from the paper pulp mills. The average invoice value of this year's imports was \$19.77 per long ton, against \$19.04 in 1902; showing an advance of 73c. per ton, which is equal to \$43,541 on the total quantity imported this year. On the other hand, this year's prices for brimstone are about \$2.90 higher than an equivalent quantity of sulphur recovered from pyrites.

Sicilian brimstone exports in March are reported at 61,683 tons, making a total of 148,082 tons for the three months this year; showing an increase of 11,902 tons, or about 9 per cent. The shipments to the United States in the quarter this year amounted to 43,241 tons, which is equivalent to 29 per cent of the total; as against 46,312 tons, or 24 per cent in 1902.

Stocks of brimstone at seaports in Sicily on March 31 are calculated at 301,123 tons, which is the smallest quantity reported since November last; but it is in excess of the corresponding dates for four years past.

Pyrites.—Sellers are gratified at the condition of business, and are unanimous in their belief that this year will prove more profitable than 1902.

Imports of pyrites into the United States in March amounted to 33,076 long tons, which compares with 33,714 tons last year. Since January 1 the imports were:

Table with 3 columns: 1902, 1903, Changes. Items include Pyrites, Sulphur content.

This statement shows an increase this year of nearly 10 per cent, principally in iron pyrites.

The average value of the pyrites imported was as follows, per ton:

Table with 3 columns: 1902, 1903, Changes. Items include Pyrites, Sulphur content.

Prices this year are about 6 per cent higher than 1902:

We quote: Domestic pyrites, \$5 per ton for lump ore, f.o.b. Atlantic coast mines, and 10c. per unit for fines; sulphur content varies from 42@44 per cent. Spanish pyrites, carrying from 46@52 per cent sulphur, are quoted at 11@12c. per unit for lump, and 9@10 1/2c. for fines, delivered at Atlantic ports.

Nitrate of Soda.—The market is firmer in all positions, owing to the advance of 7s. 6d. (\$1.80) in ocean freight rates, and 3@4d. per qtl. (66@88c. per long ton) for nitrate of soda in Chile, as a result of the greater demand in Europe. At the present rate of consumption it is believed that stocks in Europe will be exhausted within the next two months. The visible supply in Europe on May 1 was 120,000 tons less than last year, the sailings in April, 54,545 tons, and the loadings in Chile on May 1, 50,000 tons. In the United States importers conversant with the consequences that will reflect the improvement in the European statistical position, are holding for higher prices. Momentarily they are asking \$2 per 100 lbs. for spot and May to July delivery, while for August forward they quote \$1.92 1/2. The sailings from Chile for the United States in April amounted to 18,182 tons, and the loadings on May 1 to 11,364 tons.

The imports of nitrate of soda into the United States in March were 28,067 long tons, being the largest quantity reported since September last. In the three months ending March 31 the imports totaled 63,305 tons, which, compared to the corresponding period last year, shows an increase of 27,247 tons, or about 75 per cent. This remarkable growth has been due principally to the enormous consumption by blasting powder and fertilizer manufacturers in the East.

Messrs. Mortimer & Wisner, in their monthly statement of nitrate of soda, dated New York, May 1, give the following interesting statistics, in long tons:

Table with 3 columns: 1903, 1902, 1901. Items include Imported into Atlantic ports from West coast S. A., Stock in store and afloat May 1, Visible supply to Aug. 15, Stock on hand Jan. 1, Deliveries past month, Deliveries since Jan. 1, Total yearly deliveries, Prices current, May 1, per 100 lbs.

Sulphate of Ammonia.—An improved demand abroad has stimulated prices here, and sellers now ask \$3.20 per 100 lbs. for foreign gas liquor for shipment. Domestic may be had at \$3.12 1/2 @ \$3.15.





Average Prices of Silver, per ounce Troy.

Table with columns for 1901, 1902, and 1903, and sub-columns for London and New York prices in Pence and Cents.

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

DIVIDENDS.

Table listing companies, dates, share counts, and total dividends.

\* Monthly. † Quarterly.

ASSESSMENTS.

Table listing company names, locations, delinquency dates, and assessment amounts.

STOCK QUOTATIONS.

NEW YORK.

Large table of stock quotations for New York, including company names, par values, and prices for various dates.

† Ex-Dividend. Total sales 116,954 shares.

COAL IRON AND INDUSTRIAL STOCKS.\*

Table of stock quotations for coal, iron, and industrial stocks, including company names and prices.

\* New York Stock Exchange. † Pittsburg Stock Exchange. ‡ Ex-Dividend. Total sales, 75,341 shares.

COLORADO SPRINGS, COLO.\*

Table of stock quotations for Colorado Springs, including company names and prices.

\* Colo. Springs Mining Stock Exchange. All mines are in Colorado. Total sales 28,300 shares.

COLORADO SPRINGS. (By Telegraph.)

Table of stock quotations for Colorado Springs received by telegraph, including company names and prices.

BOSTON, MASS.\*

Large table of stock quotations for Boston, including company names, shares listed, and prices.

\* Boston Stock Exchange. † Ex-Dividend. Total sales, 67,969 shares.

STOCK QUOTATIONS.

MEXICO\*.

April 24.

Table of stock quotations for Mexico, listing companies like Durango, Guanajuato, and San Rafael, with columns for Shares Issued, Last Div'd, and Prices (Bid, Ask).

\*Values are in Mexican currency.

SAN FRANCISCO (By Telegraph).

Table of stock quotations for San Francisco, listing companies like Belcher, Justice, and Mexican, with columns for Name of Company, May 4, and May 5.

SALT LAKE CITY.\*

May 1.

Table of stock quotations for Salt Lake City, listing companies like Ajax, Mammoth, and Ben Butler, with columns for Name of Company, Shares, Par Val, High, Low, and Sales.

All mines are in Utah. \*By our Special Correspondent. Total sales, 261,718 shares.

ST. LOUIS, MO.\*

May 2.

Table of stock quotations for St. Louis, MO, listing companies like Am.-Nettie, Columbia Lead, and Catherine Lead, with columns for Name, Capital Stock, Par Val, and Prices.

\*From our Special Correspondent.

PHILADELPHIA, PA.\*

Table of stock quotations for Philadelphia, PA, listing companies like Am. Alkali, Am. Cement, and Cambria Iron, with columns for Name and Location of Company, par val, and Prices.

\*Reported by Townsend, Whelen & Co., 308 Walnut St., Philadelphia, Pa. Total sales 4,351 shares.

LONDON.

April 24.

Large table of stock quotations for London, listing companies from various countries like Alaska-Treadwell, Anaconda, and Anglo, with columns for Name and Country of Company, Shares Issued, Par value, Latest dividend, and Quotations.

c.—Copper. d.—Diamonds. g.—Gold. l.—Lead. s.—Silver.

LONDON. (By Cable).\*

Table of stock quotations for London (By Cable), listing companies like Anaconda, British South Africa, and Camp Bird, with columns for Name of Company, Apr. 28, May 5, and Prices.

\*Furnished by Wm. P. Bonbright & Co., 15 Wall St., New York.

PARIS.

April 22.

Table of stock quotations for Paris, listing companies like Boleo, Champ d'Or, and Fraser River, with columns for Name of Company, Country, Product, Capital Stock, Par value, Latest divs., and Prices.

TORONTO, ONT.\*

May 2.

Table of stock quotations for Toronto, ONT, listing companies like Black Tail, Cariboo, and Center Star, with columns for Name of Company, par val, and Prices.

\*Standard Stock and Mining Exchange. Total sales 19,100 shares

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES. (See also Market Reviews.)

Table with multiple columns listing various chemical and mineral products such as ABRASIVES, BARIUM, BARYTES, GRAPHITE, GYPSUM, etc., along with their respective units and prices.

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.