

THE ENGINEERING AND MINING JOURNAL



Entered at the Post-Office of New York, N. Y., as Second-Class Mail Matter.

VOL. LVI. DECEMBER 9. No. 24.

RICHARD P. ROTHWELL, C. E., M. E., Editor. ROSSITER W. RAYMOND, Ph. D., M. E., Special Contributor. SOPHIA BRAEUNLICH, Business Manager. THE SCIENTIFIC PUBLISHING CO., Publishers.

SUBSCRIPTIONS TO THE ENGINEERING AND MINING JOURNAL are PAYABLE IN ADVANCE. Price: For the United States, Mexico and Canada, \$5 per annum; \$2.50 for six months; all other countries in the Postal Union, \$7.

The address slip on the paper will show date of expiration of subscription. Subscribers wishing their address changed will please give the name of the old post-office as well as the new one.

NOTICE OF DISCONTINUANCE.—The JOURNAL is not discontinued at expiration and is sent to subscribers until an explicit order is received by us, and all payment of arrearages is made, as required by law. The courts invariably hold a subscriber responsible to the publisher for the subscription price of all papers received until the paper is paid for in full up to date and ordered discontinued. PAPERS RETURNED ARE NOT NOTICE OF DISCONTINUANCE.

ADVERTISING RATES furnished on application. REMITTANCES should always be made by Bank Drafts, Post-Office Orders or Express Money Orders on New York, payable to THE SCIENTIFIC PUBLISHING CO.

THE SCIENTIFIC PUBLISHING COMPANY.

OFFICERS: R. P. ROTHWELL, Pres. & Gen'l Mang. SOPHIA BRAEUNLICH, Sec'y & Treas. P. O. BOX 1833. 27 Park Place, New York. Cable Address: "Rothwell, New York." Use A B C Code, Fourth Edition.

LONDON OFFICE:

20 Bucklersbury (Room 366), London, E. C., England. Edward Walker, Manager.

CHICAGO OFFICE: "The Rookery," Room 531.

CONTENTS.

Table listing articles and their page numbers: The German Rolling Mills' Convention... 587, Prof. John Tyndall... 587, The Manchester Ship Canal... 587, The President's Message... 588, The Cripple Creek Gold Fields... 588, The Steel Rail Combination... 588, Science Without Nomenclature... 583, New Publications... 589, Books Received... 589, Scrap Mica... W. G. McNelley 589, Santa Fe Copper Company... 589, The Granulating Matte Process... R. H. Terhune 589, International Terms in Geology... F. Pospelny 589, Pig Iron in Warrant Yards... G. H. Hull 590, The Money of the World... 590, * The Orion Mill in the Transvaal... 591, The World's Production of Gold... W. B. Ingalls 591, * Some New Electrical Power Plants... 593, The F. L. Bartlett Zinc Process... 594, Improvements in Iron Making in Alabama... W. D. Phillips 594, * Elimination of Sulphur from Iron... J. E. Stead 595, * New Clayton Compound Air Compressor... 596, Antimony Mining and Smelting in Japan... 596, Recent Decisions Affecting the Mining Industry... 597, Patents Issued... 597, Personals, Obituary, Societies, Technical Schools, Industrial... 598, Notes: Refuse Burning in England, 590—Centigrade and Fahrenheit Scales, 591—Walrand Bessemer Process, 591—Sault te Marie Canal, 593—Railways in China, 593—Slag Bricks, 593—Coal in Arkansas, 596—British Iron and Steel Exports, 596—Use of Hydrometers, 597—Water Wheels in the United States, 597—Mineral Production of Quebec, 597—Ochse's Blasting Cartridge, 597—Mining Accidents in Great Britain, 597—Iron Ores in Quebec, 597.

* Illustrated.

Table listing market and stock information: MINING NEWS. Texas... 602, Utah... 6-2, Wyoming... 602, FOREIGN. Br. Columbia... 602, Great Britain... 602, Mexico... 602, New Brunswick... 602, New So. Wales... 602, COAL: New York... 602, Boston... 603, Buffalo... 603, Chicago... 603, Pittsburg... 603, IRON: New York... 603, Buffalo... 604, Chicago... 604, Philadelphia... 604, Pittsburg... 604, San Francisco... 610, Coal Stocks... 610, Colo. Springs... 610, Baltimore... 610, London... 610, Paris... 610, Aspen... 610, St. Louis... 610, Duluth... 610, Denver... 610, Helena... 610, Philadelphia... 610, Pittsburg... 610, CURRENT PRICES: Chemicals... 606, Minerals... 606, Rarer Metals... 606, ADVT. INDEX... 15, ADVT. RATES... 14

THE German Rolling Mills Convention has been dissolved finally on account of internal dissensions, due chiefly to the present unfavorable condition of the iron trade and the difficulty of restraining competition. No effort will be made to renew its existence, but several local associations are to be formed, one including the Westphalian mills, another the Silesian ironmasters and so on.

REPORTS have been current of the sale of a large quantity of pig iron—generally put at 100,000 tons—by the Tennessee Coal, Iron and Railway Company for export to Europe. That the transaction had been closed was positively asserted. We are, however, authoritatively informed that no such sale has been made. The company is feeling the improvement in demand, having just put two of its idle furnaces in blast, while two more are being made ready.

AN example of the socialistic tendency in England is to be found in a bill just introduced in Parliament by Mr. KEIR HARDIE, who is one of the labor representatives in that body. This bill provides for the nationalization of all mines, their purchase from the present owners by the nation and their operation under the direction of a government bureau. Of course the bill stands no chance of passage, but that it should be introduced and considered at all is a significant matter.

THE Lehigh Valley Railroad strike has been formally declared at an end, a compromise having been arranged through the intervention of the New York and New Jersey State boards of arbitration. As usual in such cases both sides claimed an advantage in the settlement.

Latest advices, however, are that the closing of the strike is still in some doubt, as the men had expected to return to work in a body, but found that the company would receive their applications only as individuals, and refused to discharge the men whom it had hired to take their places.

AN English authority estimates the loss to that country during the sixteen weeks of the great strike of the coal miners at no less than \$166,000,000, of which \$91,000,000 fell directly upon the miners themselves and upon the iron-workers and other artisans who were directly affected by the stoppage in the production of coal. The loss to mineowners, ironmasters and other manufacturers, and to the railroad companies, according to this statement, was \$66,000,000, while the remaining \$9,000,000 is accounted for in the higher prices paid by ordinary consumers. The sum total is enormous, but the estimate is possibly not a greatly exaggerated one.

THE use of electricity as a motive power for vehicles on streets and roads has seemed to be one of the obvious appliances of this agent, which has been delayed chiefly because of the difficulty in finding a suitable form of storage battery for the purpose. The use of such batteries for street cars and launches has proved successful, and it is now stated that carriages run by electric motors have been put in actual use in Berlin, Germany. These carriages, according to a brief description, have three wheels, the main axle having two, while a third one in front is used for steering. They carry power enough in storage batteries to run a considerable distance, and have so far worked well.

THE death of Prof. JOHN TYNDALL removes one of the greatest and most thorough of the scientific men of our day too soon, since he seemed but lately, though almost an old man, fit for years of useful work. He had, if not genius, at any rate a love of knowledge for its own sake, a keenness in observation and indefatigable perseverance and industry which went in practical results beyond the usual achievements of genius. We but express the feeling of every student of science, every admirer of what is admirable in its great world, when we express our deep sorrow at the untimely death of this eminent and honest worker. His death has removed one of England's glories, a benefactor, and an example for imitation to the scientific world.

THE opening of the Manchester Ship Canal, on December 7th, marks the near completion of one of the greatest engineering works undertaken in England for many years. The object of the canal, as we have explained at different times, is to enable sea-going vessels to reach the great manufacturing city of Manchester and to save the cost of railroad freight and transfer to its mills. The work has been in progress for several years under varying conditions of success and at times of apparent failure, but it is now so far completed that vessels can pass through it and load and unload freight at the great docks which have been prepared at the terminus. The whole scheme is part and evidence of the reaction in favor of water transportation which has recently been apparent in England and, indeed, all over Europe. The canal has, besides the entrance lock, four sets of locks to overcome differences in level, the total rise being 60 ft. The ruling size of the locks is 350 ft. in length and 50 ft. in width.

In another column will be found some extracts from President CLEVELANDS message, from which it will be seen that he maintains the hope of beneficial results from an international conference. After referring to the adjournment of the Congress he requests authority to reopen negotiations and to ask for the reassembling of the conference whenever the time may seem propitious. He recognizes the fact that a definite proposition for discussion is expected to come from this country, which is deeply interested, in common with the rest of the world, in securing a settlement of currency matters. He does not, however, himself suggest, any plans or proposals to be submitted, leaving that for the future.

The one proposition which seems at the present time to promise a permanent and satisfactory adjustment is that for the establishment of an International Monetary Clearing-House, with which our readers are familiar. This plan continues to gain influential indorsement in many countries, and would certainly form a good foundation for the elaboration of a final solution, by an international conference, of this the most important problem before the world to-day.

THE CRIPPLE CREEK GOLD FIELDS.

With characteristic pliability the enterprise and energy of Colorado has been diverted from its silver mines, temporarily under a cloud, to the vigorous development of its gold resources. Cripple Creek began to give signs of becoming an important mining region at the very time when Leadville, Aspen and the San Juan were being depopulated through the paralysis of silver mining. It is an ill wind that blows nobody good. The energetic spirits of the silver camps transferred their activity to the gold districts, and of these the new region at the back of Pike's Peak offered the best field of operations.

At the present time Cripple Creek is the most lively of Western mining towns; its population is nearly 10,000, its mines number nearly 100, while the field is six miles long by three wide. The output is at the rate of \$3,000,000 per annum and slowly increasing. Like all young mining communities it is pervaded by an atmosphere of life, hope and prosperity which is as infectious as it is inspiring.

No gold discovery was ever developed under more favorable auspices. In its proximity to a large smelting center, in the accessibility of all of its mines, in the cheapness with which supplies are bought, in the presence of large numbers of able and experienced mining men, in these and in other respects Cripple Creek is a representative modern mining camp.

What its future destiny may be it would be premature to attempt to say. The merchants of Denver expect Cripple Creek to take the place of Leadville and hope that gold mining will have such life put into it as to more than compensate for the partial cessation of the silver industry, and this is in keeping with that sanguine, elastic temperament which has built up the West in spite of all disappointment and in the face of all difficulty.

THE STEEL RAIL COMBINATION.

There have been many reports circulating in the papers of late concerning the welding together again of the pieces of the broken steel rail ring, and claiming that the Maryland and the Pennsylvania steel companies, both now in the hands of receivers, were to join in the new combination and to stop making rails.

It is evident that the court could not recognize an illegal combination, and that some way would have to be found around the difficulty, for it is also clear that no combination that allowed these two great works to supply the market without control or limitation could possibly be long lived. It was proposed, according to rumor, to lease these works and close them, but this, we were able to state on excellent authority, would not be done. The latest report, stated to be on the authority of the court record, is that the Maryland Steel Company has accepted an offer for 300,000 tons of steel rails, and the Pennsylvania Steel Company one for 100,000 tons, at \$25 a ton, the purchaser putting up as forfeits \$300,000 to be paid to the Maryland Steel Company and \$80,000 to the Pennsylvania Steel Company, should he fail to take the rails.

It is stated further that "the companies bind themselves not to accept any orders for this class of rails until these lots have been taken." In other words, if this be true, the Maryland Steel Company is to receive \$300,000 and the Pennsylvania Steel Company \$80,000 for keeping out of the market this year and not interfering with the rail combination. Of course the purchasers will not take rails at \$25, which can be made at their own works for, say, \$18, and the guarantee or forfeit will simply be the price of peace.

Whether the court can permit its agents, the receivers, to agree or contract not to accept other orders is a legal question, which we do not feel competent to decide; but this disguise of the combination is so "thin" that it is perfectly transparent.

The Maryland Company with free ores should be able, in its magnificent works, to hold its own if it only had a sufficient working capital.

This company can scarcely work as cheaply as the Carnegie or the Illinois steel works, however, but until Alabama has solved the important problem it is now engaged in, of cheaply concentrating and purifying its ores, the Maryland works should have had command of the seaboard market.

SCIENCE WITHOUT NOMENCLATURE.

A letter of Professor POSEPNY, published in another column, replies to a recent criticism from Mr. T. A. RICKARD upon the nomenclature of his paper on "The Genesis of Ore Deposits." Professor POSEPNY leaves something to be said which he is, perhaps, too polite to say. But since, as the translator of the paper referred to, I retained in it the terms with which Mr. RICKARD finds fault, I am justified in taking a hand in the debate; and I shall feel less embarrassment than a stranger might feel, because Mr. RICKARD is a personal friend whom I highly esteem, and whose professional writings command my admiration. In the JOURNAL of November 11th, Mr. W. R. INGALLS continues the subject, taking POSEPNY'S terms as his text, whereas Mr. RICKARD had simply used them as a (really inappropriate) illustration.

The trouble with both of these critics is that they do not think clearly. Mr. RICKARD objects to certain terms taken from the Greek, because they are ugly and unnecessary, and suggests several English words which would do as well. Every one of these English words is in common use already, with other meanings than those which Professor POSEPNY sought to convey. There is no stronger evidence of muddy thinking than the employment of familiar words, with all their misleading associations, to mean something new. Mr. RICKARD'S whole criticism in this particular case stands or falls with his suggested substitutes. No matter how ugly he thinks the new words are, if his own are not adequate to replace them, he must submit to the esthetic sacrifice.

Now "primitive" and "original" do not mean the same thing as "idiogenous"; and Professor POSEPNY, in talking about primitive or original minerals, would have talked vague nonsense. A mineral may be idiogenous, while both it and its inclosing rock are secondary. The same criticism could be applied to the suggestion of "secondary" or "foreign" for "xenogenous." And the deliberate proposal to name a given class of deposits "later" paralyzes criticism. The use of such language in geology would not "conduce to clearness of thought." It would only accommodate those persons who do not think clearly and do not wish to be precise in utterance.

In translating Professor POSEPNY'S paper, I had occasion to try to express his term "idiogenous," for instance, by some English phrase; and I could devise nothing briefer than "contemporaneous in formation with the enclosing rock." Unless Mr. RICKARD can give us a name that tells all that and nothing else, "idiogenous" must stand. With much that Mr. RICKARD has said concerning the bombastic use of scientific terms by people who do not understand them, I heartily agree, of course. Yet some of his illustrations are not pertinent. "Altered" is a poor substitute for "metamorphosed"; "sandy clay composition" is not even English; and "an agricultural implement for triturating the soil" is a very good phrase for describing a class which includes spades, but is not confined to them. Mr. RICKARD is barking in a good cause, but he barks in several cases up the wrong tree.

As for Mr. INGALLS, who is willing to have Greek applied to electricity, but not to geology, and who thinks scientific writing should be picturesque and not pedantic, he too is feeling after a truth, but he is not thinking clearly; and by the time he reaches his crowning illustration his thought is gone entirely. For he actually presents an inscription, the "unquestionably correct" translation of which was, "I have been many times overcome with weariness in this particular employment," and praises as superior the version of Rudyard Kipling, "I am beasty tired!" This vague vulgarity in fact tells nothing at all. It might be uttered by a Yale victor after a football game, or by a dude after no exertion whatever, as well as by a galley slave. It is one of the expressions in which people take refuge who are too lazy or too ignorant to express their thoughts definitely. The language of science would not be enriched by such contributions from cockneydom as that. It must have words which will last

"When the Ruddyards cease from Kipling
And the Haggards ride no more!"

I will confess that I do not relish, in my old age, the necessity of mastering new technical terms. But when they carry new conceptions, I do not see how I can help myself. I cannot quarrel with the names my neighbor gives to his own children, and certainly do not insist that he shall use my children's names, because they are so familiar to me. For what I desire is, to know the youngsters apart. And my friends RICKARD and INGALLS must either accept the POSEPNY titles for the POSEPNY ideas or deny the POSEPNY paternity and produce older names for the same infants. These particular babes may or may not be "ugly"; at all events they have probably come to stay, and "calling them names" will not prevent them from growing. In time they may even be thought good looking.

R. W. RAYMOND.

NEW PUBLICATIONS.

METRICAL AND ENGLISH MEASURES, WEIGHTS, ETC. By Jno. McGee, C. E. New York; the "Engineering News" Publishing Co.

This is a very convenient little book for desk use and for reference. It contains tables giving the equivalents of metric measures and weights in English measures and also the equivalents of boiler and other pressures as generally used in English and metrical measures; tables of areas of right-angled triangles; of horse-powers, units of heat and others which an engineer constantly employs. It is small enough to be carried in the pocket if desired, and has the advantage not always found in books of tables, that the figures are of good size, and therefore easily read.

SEWAGE PURIFICATION IN AMERICA. By M. N. Baker. New York; the "Engineering News" Publishing Co. Pages 192; illustrated.

This little volume is a reprint of a series of articles recently published in the "Engineering News" and contains a description of a number of sewage purification plants in various towns and cities of the United States and Canada. The discussion of this subject is comparatively new here, and many readers will no doubt be surprised to learn that no less than 30 municipalities in this country now have plants of this kind of greater or less extent. The book is a timely one, as the system is growing in acceptance, and there are doubtless many who wish to know something about it.

STANDARD TABLES FOR ELECTRIC WIREMEN, WITH INSTRUCTIONS FOR WIREMEN AND LINEMEN, UNDERWRITERS' RULES, AND USEFUL FORMULAE AND DATA. By Chas. M. Davis. Fourth edition, revised and edited by W. D. Weaver. New York: The W. J. Johnston Company, Ltd. Pages 128. Price, \$1.00.

The fourth edition of this work contains the latest revisions of the insurance rules of the Underwriters' International Electric Association, now almost exclusively used in the United States. In addition to the above rules there has been added an important section on the calculation of alternating current, which, for the first time, brings this subject within the reach of practical men. A number of the tables were prepared expressly for this work. Among these are the tables of alternating current wiring coefficients, those on limiting currents for exterior wiring and on the candle power of arc lamps; the table enabling those for the three standard lamp voltages to be used for any voltage or drop, and several others, including a complete set of wiring tables calculated on a uniform basis of 55-watt lamps. The method of determining the sizes of conductors for incandescent wiring enables feeders, mains and branches to be proportioned as nearly exact as desired. The wiring formulae for motor circuits, etc., are put in a simple and practical form, so as to be easily applied by any one. The formulae for horse power of engines and boilers are published here for the first time. The different values of heating surfaces in boilers being considered, the results they give, it is claimed, are the actual commercial ratings and not the old theoretical horse power.

RESOURCES AND DEVELOPMENT OF MEXICO. By Herbert Howe Bancroft. San Francisco, Cal.: The Bancroft Company. Pages 326; illustrated.

In this volume the author has given us the results of observations made during two years of study and travel in Mexico. In the gathering of facts he had exceptional opportunities, the government and State records being open to him, while official help from different quarters was extended. His intention has been to give the reader a view of Mexico as it is to-day, with some consideration of the possibilities of future development. In this he has succeeded, though many will be inclined to think that he takes somewhat too favorable a view of Mexico as it is. Much progress has been made in late years, and it is a country of great resources, but it has hardly yet reached the standard on which Mr. Bancroft would place it. Naturally it is one of the richest countries in the world, but there is still great room for improvement in many respects.

The book presents a large amount of information and is well arranged. It has chapters treating of the general geography of the country; of intellectual development, communications, mines, agriculture, stock-raising, commerce, manufactures, material development, labor and immigration. The chapter on mines and mining seems to us rather brief for the subject. It has been so condensed that, while it contains a great deal of information, it is too much like a catalogue of the mines and mineral deposits, and gives too little in detail. We must admit, however, that if the course suggested had been followed throughout, it would have swollen the book to an unwieldy size, and we really have no right to demand an exception for one special topic. The mining interest is a very important one in Mexico, and on its development the future of the country depends to a very large extent, as one can realize after reading the volume before us.

Some other interesting chapters are on the intellectual growth of the country, and its present social and economical condition. It is in these especially that Mr. Bancroft is inclined to take a very roseate view, both of the present and the future.

The book is generally well written, and while we may not always agree with the author's opinions there is a general air of directness and sincerity about it which inclines the reader to put confidence in his statements. It is illustrated with a large number of reproductions from photographs, generally of good quality, and is, on the whole, a readable and timely book.

BOOKS RECEIVED.

In sending books for notice, will publishers, for their own sake and for that of book buyers, give the retail price? These notices do not supersede review in another page of the Journal.

Les Moteurs a Gaz et a Petrole en 1892. Par M. Gustave Richard, Ingenieur. Paris, France; Vve. Ch. Dunod. Pages 292; illustrated.

United States Department of Agriculture: Experiment Station Record. Volume V., No. 1. Washington; Government Printing Office. Pages 138.

Annual Report of the Commissioner of Patents for the Year 1892. W. E. Simonds, Commissioner. Washington; Government Printing Office. Pages 776.

California Blue Book, or State Roster, 1893. Compiled by E. G. Waite, Secretary of State. Sacramento, Cal.; State Printer. Pages 332; illustrated.

The Nicaragua Canal; and other Essays on Political and Economic Topics. By Richard H. McDonald, Jr. San Francisco; the "Californian" Publishing Company. Pamphlet, pages 62.

The Manufacturers of the United States: A Classified and Complete Reference Book for Buyers and Sellers. Fourth and Revised Edition. New York; Manufacturers' Publishing Company. Pages 2,008.

Wyoming Experiment Station: Bulletin No. 14. Geology of the Wyoming Experiment Farms and Notes on the Mineral Resources of the State. By W. C. Knight, Geologist. Laramie, Wyo.; published by the University of Wyoming. Pamphlet, pages 168.

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. All letters should be addressed to the MANAGING EDITOR.

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

Scrap Mica.

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: The undersigned would be glad to receive information and correspondence as to the uses of scrap mica; how it is prepared for market, and what it is worth per ton. If there is a considerable demand for it I would be pleased to hear from consumers.

DAHLONEGA, Ga., Dec. 4, 1893.

W. G. MCNELLEY.

The Santa Fe Copper Company.

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: Some two years Santa Fe was one of the copper stocks regularly quoted and a little "boom" was created by the giving out of a "tip" on the part of the officials of the company and other insiders that the property was a bonanza, etc. For some months past I have watched in vain for the quotations and it looks as if the property had been quietly swallowed up. Are not the directors obliged by law to give a regularly issued accounting of the standing of the company's affairs? It is of little use to ask for information at the local office, and it is in the hope of getting the facts through your "Journal" that I address myself to you.

STOCKHOLDER.

NEW YORK, Nov. 30, 1893.

(The obligation to make reports varies under the laws of different States. Can any of our readers give information relative to the company?—Ed. E. & M. J.)

The Granulating Matte Process.

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: As the discussion as to the time when the granulation of slag was first begun is continued in your issue of November 25th, I beg to state that this process is older even than Mr. Browne claims it to be. At the February, 1872, meeting of the American Institute of Mining Engineers, Professor Egleston read a paper on the uses of "Blast Furnace Slags," in which he credited M. Minary, director of the Franche Comte Iron Company, not only with granulating slag by tapping directly from the furnace into a trough containing water running at a high velocity, but with the introduction of an elevator to handle the material cheaply. Regarding this latter feature I claim to have been the first to apply it to granulated lead furnace slags in the United States. This was done at the Hanauer Works in June, 1892. I unconsciously followed the plan of M. Minary, and upon applying for patents my agent, Mr. Faber Du Faur, of New York, called my attention to Professor Egleston's article, and while there were a number of minor features adopted by me, perhaps novel and patentable, I deemed the parallelism too great to risk a rejection of my application by the Patent Office. Professor Egleston gave no drawings or details.

R. H. TERHUNE.

SALT LAKE CITY, Nov. 29, 1893.

The Use of International Terms in the Discussion of Geological Questions

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: In the "Engineering and Mining Journal" of October 14th, 1893, Mr. T. A. Rickard makes a plea "for the greater use of simple Anglo-Saxon English in the discussion of mining and geological matters," and protests against "the rapidly increasing introduction of long Greek and Latin words." I should not feel called upon to offer any comments upon his letter, had he not cited my recent paper on "The Genesis of Ore-Deposits" as an example of the practice which he condemns. In view of that criticism, I may be permitted to point out that Mr. Rickard has confounded popular with scientific writings, and has forgotten that these two classes are addressed to two entirely different publics. Moreover, he has overlooked the difference between describing and analyzing single occurrences and synthetically grouping such single facts in comprehensive generalizations, which call for definite and perhaps new conceptions. My paper was not intended to be popular, and is not addressed to miners and foremen; hence Mr. Rickard's criticism is not warranted in that respect.

It may be his mission to purify the English used by miners, though it ought to be questioned whether the object is desirable or even feasible. My standpoint is totally different. Indeed, for the very reason alleged by Mr. Rickard, I should be glad to replace, for scientific uses, the local terminology of all languages with an international one. In different mining districts within the domain of one and the same language, entirely different terms are employed for

the same thing. The North of England, Cornwall, the United States and Australia have innumerable variant uses of English terms; and when these words are employed in scientific writings, addressed to a larger public than that of the immediate locality, the result may be what Mr. Rickard desires in the way of simplicity; but it is to the rest of the world likely to be simply indefinite or unintelligible. Mr. Rickard has recognized this difficulty, and taken much pains to remedy it for American readers, in his papers on Australian mining regions. But scientific discussions addressed to the whole of the scientific public need to be made intelligible to those who speak other languages; and this can be done with relation to geology only as it has long been done for other sciences, by the introduction of universally recognized and precisely defined technical terms.

Naturally, recourse is most frequently had to those languages which have been the principle vehicle of modern culture, and are still taught in most schools, namely, Latin and Greek; but some writers (as for instance, the chemist Mendiljev), in order to escape from the ordinary vocabulary entirely, have taken forms from the Sanscrit, the mother of the Indo-European tongues. It is evidently not always possible to make a new term carry a complete definition of the new idea; on the contrary it may only serve as a mnemotechnic hint, recalling the author's original definition; and, for this purpose, it is comparatively unimportant whether the term has been felicitously chosen or not. I might go so far as to say that a word having no sense in any language could serve as representative of a new definition.

My paper was written in German, a language well known as abundantly provided with technical miners' terms. But I am, upon principle, not a linguistic purist; and for many of these terms which did not seem to me sufficiently definite, I have sought to substitute international ones. Moreover, I have been obliged to give new names to the new conceptions which I sought to establish, and which differed from the accepted meanings noted by terms already in use. Some of these names, such as "idigenous," "xenogenous" and "hystermorphous" do not please Mr. Rickard. He thinks they are "ugly words," and that "original," "secondary or foreign" and "later" could be used instead. Possibly—provided my explanation were carefully remembered, or a definition were inserted after each word. "Secondary" and "foreign" are certainly not the same thing.

But the point which Mr. Rickard entirely forgets is, that I was not attempting to instruct the miners or foremen of this or that district, but submitting my views to scientific circles; and since Science is international, I employed a terminology suited to the public I addressed.

VIENNA, Oct. 29, 1893.

F. POSEPNY.

Pig Iron in Warrant Yards.

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: On page 556 of your issue of November 25th, under the heading "Iron Market Review," you mention a recent sale of warrants for 13,000 tons of pig iron and remark: "Every one knows that the iron placed in warrant stores is not of the best and it never for various reasons commands an average price for the same nominal grades."

The above statement, I claim, is erroneous in both particulars. The iron in warrant yards is graded more closely than the iron usually shipped from the furnaces direct to consumers, and although warrants at times sell for 50c. to 75c. below the price of iron on cars, warrants at other times have commanded as much as \$2 per ton more than the same iron on cars. The time and reason for this large difference in favor of warrants was in the last quarter of the year 1889, when iron advanced from \$9 to \$14.50 per ton for gray forge in the Birmingham, Ala., district, and when the demand for warrants was far in excess of the supply. At the beginning of this activity there was a difference of 40c. per ton in favor of warrants. It gradually increased until it reached the extreme limit of \$2 per ton. Being in Birmingham a few days during this period, I found the representatives of three New York houses there buying warrants, and knew of \$14 per ton being paid for warrants for gray forge by the same parties, who refused gray forge on cars at \$12.50. The warrants were soon exhausted in the Birmingham district and these same houses commenced to buy pig iron in Pennsylvania deliverable at Perth Amboy, where a warrant yard was opened about that time.

Pennsylvania furnaces were selling No. 2 foundry iron at \$17.50 delivered at Perth Amboy while warrants on the Metal Exchange were commanding \$19.50. I knew of parties securing 24-hour options on No. 2 iron at \$17.50 and selling warrants against the same at \$19.50 before the options were closed.

It is not likely that this extreme difference will occur often in the future, as there are many more warrant yards to-day than were in existence in 1889. In fact, the difference was the immediate cause of many furnaces deciding to open yards. I heard the general manager of one large iron company say at that time that he was satisfied his company had lost \$100,000 in consequence of not having warrant yards ready during the season of the advance.

The reason for warrants being lower than iron on cars during seasons of depression and decline, when dealers are the only purchasers of warrants, is that consumers, as a rule, will only make contracts for iron delivered in their yards, payable sometimes by cash and sometimes by long notes. The dealers, when they buy warrants to take the iron out to ship to consumers, must have a profit as well as a margin to cover the loss of interest and the risk of bad debts they take in the transaction. The furnace companies, on the other hand, can afford to sell warrants less than iron on cars, as they escape this risk of bad debts and loss of interest, the warrant being cash by certified check on delivery of the document.

Now, as to the relative grading of iron in and out of warrant yards, our rules require that the furnace company yarding the iron must first break and sort it. After this, our inspector goes over the piles carefully marking every pig he finds that is pronouncedly above or below the grade the lot is offered for, and these marked

pieces must be thrown out and replaced when the iron is moved into the warrant yard. Our inspectors are under oath to obey these rules and no yardmaster is employed by the warrant company who cannot file testimonials with us from his employers for several years back, as to his honesty as a man and capacity as a grader. In addition, he must give our supervisor a practical demonstration for several days of his capacity. The warrant company receives all qualities of iron into warrant yards, but when the grade is not standard it is so stated in the warrant, and if the yarders of iron are not willing to have it so stated the iron is refused. Over 8,000 tons have been so refused by us in the last four years. We do not claim that our agents are infallible, but having delivered out of yards over 100,000 tons of iron we claim the right to speak advisedly, as to the reliability of our grading. Some time ago we employed the best pig iron inspector we could find in Pennsylvania to inspect all the warrant yards in the country and their contents. His report as to grading was that, in most cases, the iron was superior, and in all cases as good as the corresponding grades on furnace yards.

We have occasional complaints as to grade and weights after the iron has left the warrant yard and has gone into the hands of consumers. As a rule it would cost much less to pay the claims made than to send experts to examine and investigate, but we always investigate first and the result is that most of the claims fall to the ground. These claims are not always honest, but are evidently made by some with the hope of securing a reduction, or delaying payment. In several instances we have found the rejected iron to be the best iron of the grade in the complainant's yard. In others, we have found the condemned iron had never been through the warrant yard. In still another case, a large lot of iron was rejected by the consumers, who were receiving iron from the furnace yard and from the warrant yard at the same place, and claimed that the rejected metal was from the warrant yard. We investigated the matter by tracing cars, and found that all of the iron from warrant yard had been received as up to grade, and that all of the rejections were iron shipped from the furnace yard.

I trust you will give this correction publicity.

GEO. H. HULL,

President American Pig Iron Storage Warrant Company.
NEW YORK, Nov. 28, 1893.

THE MONEY OF THE WORLD.

A new table prepared for the report of the Director of the Mint makes some important changes, based on reports recently received, from the table published earlier in the year. The principal changes are an increase of about \$300,000,000 in gold—chiefly in the United States, Germany, Austria-Hungary, Russia and Egypt—and a decrease of \$100,000,000 in silver, the net result of larger amounts allowed to India, China and Japan, combined with a reduction of \$200,000,000 in France, the last-named decrease having been made on the authority of M. de Foville, who recently made a very careful investigation into this question. The new table is as follows:

Countries.	Total in thousands of dollars.			Per capita.			Total.
	Gold.	Silver.	Uncovered paper.	Gold.	Silver.	Paper.	
United States.....	\$651,000	\$624,000	\$469,000	\$9.81	\$9.25	\$6.96	\$26.02
United Kingdom.....	540,000*	112,000	127,000	14.17	2.94	3.33	20.44
France.....	800,000*	500,000	110,000	20.89	13.05	2.87	36.81
Germany.....	618,000†	215,000	84,000	12.51	4.35	1.70	18.56
Belgium.....	54,000	54,900	54,000	8.85	9.00	8.85	26.70
Italy.....	96,000†	16,500	179,000	3.16	.54	5.89	9.59
Switzerland.....	15,000*	15,000	12,000	5.17	5.17	4.14	14.48
Greece.....	500	3,000	23,400	.53	1.36	10.63	12.52
Spain.....	40,000†	15,000	105,000	2.28	8.86	6.00	17.14
Portugal.....	40,000†	10,000	49,000	8.51	2.13	10.42	21.06
Roumania.....	200†	100	25,300	.04	.02	4.54	4.60
Servia.....	3,000†	1,900	4,500	1.56	.86	2.05	4.27
Austria-Hungary.....	124,000	85,000	17,000	3.09	2.06	4.53	9.59
Netherlands.....	19,000†	56,000	37,000	4.13	12.17	8.05	24.34
Norway.....	7,200†	1,700	4,300	3.60	.85	2.15	6.60
Sweden.....	6,600†	4,900	1,500	1.58	1.02	.31	2.71
Denmark.....	14,200	5,400	6,200	6.45	2.45	2.82	11.72
Russia.....	422,000	41,000	550,100	3.49	.33	4.44	8.17
Turkey.....	50,000*	44,000	.....	1.27	1.12	.....	2.39
Australia.....	105,000*	7,000	.....	24.42	1.63	.....	26.05
Egypt.....	127,000*	15,000	.....	17.65	2.20	.....	19.85
Mexico.....	5,000*	50,000	2,000	.44	4.38	.18	5.00
Cent. American states.....	500†	8,000	4,000	.15	2.42	1.21	3.78
So. American states.....	45,000†	30,000	600,000	1.31	.87	17.49	19.67
Japan.....	80,700†	81,300	.....	1.99	2.11	.....	4.00
India.....	.....	950,000	37,000	.....	5.31	.15	3.44
China.....	.....	725,000	.....	.....	1.80	.....	1.80
The Straits.....	.....	110,000	.....	.....	28.94	.....	28.94
Canada.....	14,000*	5,000	29,000	2.92	1.04	6.04	10.00
Cuba.....	19,000	1,500	.....	11.87	.94	.....	12.81
Haiti.....	2,000†	2,900	.....	2.00	2.90	.....	4.90
Total.....	\$3,901,900	\$3,931,100	\$2,700,000	.....	.....	.....	.....

* Estimate, Bureau of the Mint.

† Furnished through the United States representatives abroad.

Among the other authorities consulted in preparing the amended table are the Credit Lyonnais; Haupt, Raffalovich, Sir Charles Fremantle, the reports of the Indian Currency Commission, and the Russian Ministry of Finance.

The stocks of gold in Austria-Hungary have been increased on account of the large purchases made by that country to carry out its monetary reform, to which we have frequently referred, and that of Russia has also been placed higher in view of the continued buying by that country.

Refuse Burning in England.—There are now 55 towns and cities in England which destroy their garbage and solid refuse by burning, and 570 furnaces are employed for this purpose. In many cases the heat from these furnaces is used to produce steam, and the power employed in pumping water and in running electric light and power plants, and for other purposes.

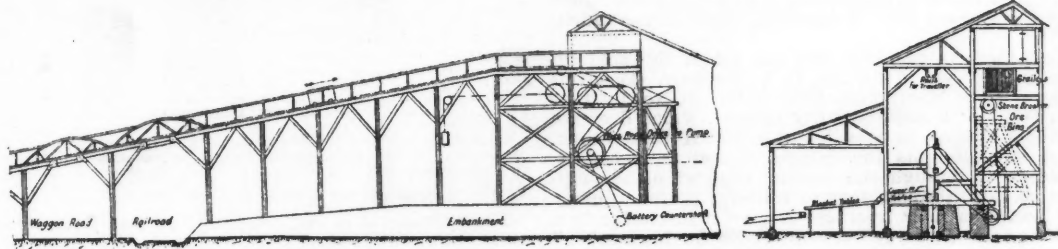
THE ORION MILL IN THE TRANSVAAL.*

The Orion Company's gold mine is the first of the Transvaal mines which the traveler passes on his way up from the coast to Johannesburg. The mine is situated on what is known as the Black Reef, and is about eight miles south of Johannesburg. The formation is very flat, and the workings will nowhere be more than about 100 ft. in depth. The company, having thoroughly proved the property by hiring an adjoining mill, recently decided to put up a first-class mill of its own.

Several difficulties presented themselves, one among them being the flatness of the ground, and another the Cape Railway line, which cuts the property in two. The first was overcome by raising the mill by means of masonry foundations for the piles instead of setting them in the ground as usual, thus securing sufficient fall for the tailings for some time without using any elevating appliances. The second was met by the construction of an inclined bridge over the railway and wagon road, up which the trucks are hauled by an automatic rope haulage. This haulage will be extended along the whole length of the property, and power will also be taken from it at various points for winding and pumping, so that there will only be one engine and boiler station on the property. The general arrangement is shown in the accompanying sketch.

The mill consists of 40 heads of stamps, and an interesting feature is that 20 of them will be of English (Sandycroft) and 20 of American (Fraser & Chalmers) manufacture. One-half of the mill will be fitted with automatic feeds, and the remainder will be, for the present, fed by hand. There are two Blake stonebreakers, 15 in. by 10 in., and the ore bin capacity is about 600 tons. The engine is equal to giving off about 120 actual H. P., and there will be two Babcock & Wilcox boilers. Provision has been made for the addition of a condenser, and also for a fuel economizer, and the whole will be lighted by electric light. The crushing capacity of the mill will be about 160 tons of ore per 24 hours. The total cost of the mill will be about \$79,000. This mill was erected from the designs of Mr. C. T. Roberts, of Johannesburg.

Centigrade and Fahrenheit Scales.—Mr. G. Watmough Webster gives in "Chemical News" the following easy rule for converting thermometrical degrees: To reduce a number of degrees centigrade to Fahrenheit: Double the number and subtract one-tenth of the result. Fahrenheit to centigrade: Increase the number by its ninth part and halve



THE ORION MILL, TRANSVAAL, SOUTH AFRICA.

the result. The necessary subtraction or addition of 32 at the proper stage is performed in the usual manner.

The Walrand Bessemer Process.—Considerable difficulty has been experienced hitherto in the utilization of Bessemer plants of small dimensions for the production of steel castings by reason of the tenacity of the metal to diminish a temperature toward the end of the blow. With a view to overcoming this tendency substances have been introduced into the bath substances whose rapid combustion creates high temperature. For the acid Bessemer ferro-silicon is employed, and for the basic Bessemer ferro-phosphorus is used; still, a pronounced success could not be obtained as long as the practice was to add the ferro-silicon or ferro-phosphorus during the boiling period, because the combustion of the silicon or phosphorus is delayed through the presence of a large quantity of carbonic oxide and because considerable heat is carried off by the large volume of gas. Perceiving this, M. Walrand, Paris, says the London "Iron and Coal Trades Review," decided to make the addition after the carbon had been blown out and thus create a second blow. This important modification has been investigated by Herr R. M. Daelen, Dusseldorf, a well-known German metallurgist, and he reports that its success is complete. The addition of about 5% of fused ferro-silicon increases the temperature of the blow in a few minutes by 200° C., and makes it possible to carry on the elimination of what carbon there is still in the bath to a further point without introducing into the bath excessive quantities of oxygen. Therefore only a slight addition of ferro-manganese is required for expelling the gases, which, besides, is facilitated by the high temperature. The process as invented by Messrs. Walrand was developed in a practical way in the foundry of Messrs. Legenlès & Fils, Paris, and the trial proving successful, the proprietors of the Hagen Steel Works, Hagen, Westphalia, put up two converters, having a capacity each of 1,100 to 1,500 lbs., and producing per turn 4 to 5 tons of steel castings. Herr Daelen states that at these works hard and soft steel castings have been made with perfect regularity. Test pieces cut from the castings have shown a tensile strength of 59,700 to 71,100 lbs. per square inch and an elongation of 25 and 22% respectively. Herr Daelen is of opinion that these Bessemer steel castings can be made more cheaply than crucible steel castings. He also states that the Bessemer converter may be started and stopped as readily as a cupola in a foundry, which cannot be done in the case of open hearth furnaces.

*Abstracted from article in London "Engineering."

THE WORLD'S PRODUCTION OF GOLD.

Written for the Engineering and Mining Journal by Walter Renton Ingalls.

The only recent statistics of the production of gold in the world are those compiled by the Director of the United States Mint, and published in the series of volumes entitled "Production of Gold and Silver in the United States." This publication has received the warmest commendation of statisticians, both at home and abroad, and its statements are generally accepted. Its value is increased also by the promptness with which it is issued, each volume appearing in the early part of the year following the one treated; but for this very reason it is impossible to give the returns of other countries completely, many of them, indeed, being two or three, or more, years late with their own official reports. The Director of the Mint states all his authorities carefully, and when an estimate enters into the computation it is so indicated. This is the proper statistical method, as it enables the results to undergo criticism and verification. The Director of the Mint, himself, corrects his figures for past years as he receives new or better information; there is consequently always a variation in the statistics for recent years from one volume to another, and sometimes the change is very important.

In the Mint Report for 1892, the production of gold in the world in 1890 and 1891 is given as \$113,149,600 and \$120,518,800 respectively, while in the previous volume the figures for these years are reported as \$120,475,300 and \$125,290,700. The great discrepancy between these statements is to be explained thus: Formerly it was the custom to credit the Chinese Empire with a gold-product varying from \$3,500,000 to \$9,500,000 annually. These estimates, which were first introduced into the statistics in 1883, were based on the authority of Ivan C. Michels until 1886, and then on the exports of gold to England and to British India. It was assumed that the gold exported in excess of the amount was of Chinese production, but this was criticised by such high authorities as Professor Suess, and the late Dr. Soetbeer, and in deference to their opinions the Chinese figures were omitted in the last mint report.

Dr. Soetbeer and Professor Suess held that there was no evidence in the writings of travelers in China that gold was produced there in anything like the amount stated in the mint statistics, in which criticism they were unquestionably right. It is undeniable, however, that gold is produced in China, and any statistics of the world's

production which do not take that country into account are incomplete. Dr. John A. Church, who spent several years in China recently as mining engineer for the Viceroy Li Hung Chang, wrote in the "Mineral Industry" for 1892 as follows: "China appears to have an extensive gold field in Manchuria and Corea, and perhaps also in Yunnan and Kwei-Chao. The two former are in the extreme north and the two latter in the extreme south of the Empire. It is reported that the northern mines have been thrown open to foreign methods of work, but the oppressive peculiarities of local government will probably prevent the effectual opening of the mines by foreigners." Dr. Church states that, although mining in Manchuria has been prohibited hitherto, from \$1,500,000 to \$2,000,000 worth of gold finds its way to Peking every year. This estimate was based on the difference between the exports and imports of gold from and into China as reported by the Imperial Maritime Customs.

The constant excess of the Chinese exports of gold over the imports has been a subject of discussion ever since statistics showing it were first compiled. Mr. E. McKean, statistical secretary of the Imperial Maritime Customs, has attributed it to the amount of gold brought clandestinely into the country by Chinese passengers from America and Australia. Without doubt, more or less gold in the form of dust and bars enters China in this manner, and it is further known that some is brought secretly into the country from Siberia. Whatever may be the amount of these clandestine imports it is morally certain that they have also been exported clandestinely from the countries in which the metal was turned out, and probably escaped count in their records of production.

Important evidence on the subject of gold in China was recently contributed by Mr. W. Beauclerk, of the British Legation, at Peking, in a report to the Foreign Office at London, from which the following paragraphs are reproduced:

"A large amount of gold comes to Peking as dust from the washings on the Chinese side of the Amoor River, and partly smuggled across the Russian frontier. It is melted down in Peking in the shape of small bars of 10 taels weight, about the size of a sponge-cake finger biscuit, and has nominally a percentage of 98½ pure gold.

"The recent severe fluctuations in exchange have produced much gambling in gold here, and doubtless elsewhere in China. Foreign bankers buy gold bars to remit home in lieu of bills of exchange. By this system of 'legitimate banking' every transaction is covered at once. Native bankers cannot do this, so that they hold the gold till its value is favorable to them, trusting to luck that the Exchange

may not go against them before they are forced to part with their bullion. The native banker has this advantage over his foreign competitor, that the latter must purchase gold at its present real value, while the former issues paper to the full amount of his credit.

"In Peking there must be a huge amount of hoarded gold, for the officials who, in many cases, make very large fortunes out of their places, buy gold bars and secrete them, fearing to put their money into banks because their superiors would discover its existence and confiscate the whole of it. Consequently, the officials are ready to pay a considerable premium for gold bars, and the Peking market for gold always ranges from 1% to 2% higher than that of Shanghai. When silver is very cheap, and gold correspondingly dear, the possessors of these hoards of gold realize a part of their property and buy in again on the recurrence of a low market."

From this it is evident that not only does China produce gold, but also that she has a stock of the metal which is brought out under certain favorable conditions.

Another opinion on the subject is furnished by Mr. G. Jamieson, Acting Consul-General at Shanghai, in a report to the British Foreign Office on the effect of the fall in value of silver on prices of commodities in China, written under date of August 5th, 1893. He says on page 14 of this report: "The amount of gold sent out of the country during the last 10 or 15 years must be considerable, and it is a question of some interest to ascertain where it comes from. A certain quantity is simply a re-export of gold brought by returned emigrants from San Francisco and Australia, but the bulk of it is a genuine export of the country itself. So far as we know no gold mines are now worked to any extent within the bounds of China proper. A small amount finds its way down from the Russo-Siberian frontier, and from certain gold washings in the Amoor River, but that cannot be much. The gold for export comes mainly from the private hoards of wealthy Chinese, where it may have been for generations in the shape of bracelets, hairpins and other ornaments, being tempted out by the unprecedentedly high price now paid for it. There is also a considerable amount of gold in the shape of bars which pass, especially in the North, as an article of commerce. It is said that one of the principal uses to which such bars are put is to serve as the medium in which presents are made to high officials. It is well known that provincial officials returning to the capital after a few years' service must conform to time-honored custom, and an innocent looking flowerpot with a few gold bars under the roots of the plant is the most acceptable form in which the necessary gratification can be made. In one form or another a very considerable amount of gold exists in China, and I apprehend that there will be, so long as the present rate of exchange lasts, a continuous export to Europe."

On the other hand there is evidence that not all of the gold exported from China is recorded. Thus Mr. C. T. Gardner, Consul at Hankow, says under date of March 21st, 1893, in Report No. 1,231, to the British Foreign Office: "A large quantity of gold, which does not appear in the customs returns, is now being exported from China. The depreciation of silver tempts the natives to sell their hoards, but instead of sending it through the regular channel of the customs and by steamers they, through fear of robbery, prefer to carry it in small parcels hidden in their baggage, or give it in charge to a native employee of the vessel, who gets a commission for his trouble."

It is clear from the foregoing testimony that China should be credited in statistical compilations of the production of gold in the world with the amount of the net exports from the country, for if not actually produced there it has probably come from other countries in which it has not been recorded, and on being exported it is added definitely to the world's supply of the precious metal. The net exports of gold from China since 1888, in which year a statement of the movement of treasure was first prepared by the Imperial Maritime Customs, is given in the following table:

Year.	Net exports, Haikwan Taels.	Average exchange on London.	Average exchange on New York.	Net exports, dollars.	Net exports, kilograms.
1888	1,678,000	4s. 8¼d.	*\$1 14	\$1,932,020	2,908
1889	1,625,000	4s. 8¼d.	1.15	1,863,750	2,812
1890	1,783,000	5s. 2¼d.	*1 26	2,246,580	3,380
1891	3,693,000	4s. 11d.	1.70	4,431,600	6,638
1892	7,332,000	4s. 4d.	*1.06	7,771,920	11,694

* Calculated from English Exchange at £1 = \$4.87.

These are the only official figures relating to China,* and the authority of those used by the Director of the Mint previous to 1892 is questionable. The statistics used by him as representing the production of China are reproduced in the following table:

Year.	Value	Year.	Value.	Year.	Value.	Year.	Value.
1883	\$5,355,000	1886	\$3,650,000	1888	\$9,000,000	1890	\$5,330,000
1884	6,222,000	1887	9,500,000	1889	9,000,000	1891	5,330,000
1885	4,650,000						

In revising the statistics of the production of gold in the world in accordance with the criticisms of Dr. Soetbeer and Professor Sness by eliminating the Chinese figures from his list the Director of the Mint corrected only those for 1890, 1891 and 1892. The statistics given in the last report are not uniform, therefore, because those for years previous to 1883 and subsequent to 1889 do not take into account the production of gold in China at all, while those for

* The "North China Herald" of October 11th, 1889, reported the export of gold from Shanghai in 1886 as 1,746,248 Haikwan taels, and 3,449,853 in 1887. The average rate of exchange in the former year was 5s. (\$1.29) and in the latter 4s. 10d. (\$1.18). The exports for the two years were equivalent, therefore, to \$2,230,423 and \$4,070,827 respectively. This represents practically the total export of gold from China, since Shanghai is the only important port of shipment to for ign countries (Hong Kong being classed as foreign). The gold collected in the various parts of China is shipped from the ports of Foochow, Amoy, Chefoo, Tientsin (through which nearly all the bullion exported from Peking passes), and other ports to Shanghai, thence going to Hong Kong, Yokohama, San Francisco, British India and London.

the years 1883-1889, both inclusive, credit China with an undoubtedly over-stated production. Obviously the Chinese figures for the years 1883 to 1889 should have been dropped out of the list together with those for the years since 1889, pending the substitution of more correct ones. Before making a new statement of the world's production of gold, however, it is necessary to call attention to certain other important errors in the last mint statistics.

Russia is credited with a production of \$24,125,000 in 1891 and \$23,546,000 in 1892, the authority being a dispatch from the American Minister at St. Petersburg, who stated that the figures were official, but there was a mistake somewhere for the official figures subsequently published showed a large increase in the output in 1892. The production of unrefined gold in Russia in 1890 was 39,363 kilos; in 1891 it was 39,010, and in 1892 it increased to 43,138, these figures being taken from a table in the official catalogue of the Russian Section at the Chicago Exposition. The production of refined gold in 1890 was previously reported as 2,155½ pounds, or 35,309 kilos, and in 1891 it was given as 2,014¼ pounds, or 32,993 kilos. The value of the output of fine gold in Russia in 1890 and 1891 would be \$23,466,361 and \$21,927,148, respectively. Assuming that the 43,138 kilos of crude gold produced in 1892 was 860 fine, which has been about the average in recent years, the product of fine gold in that year was 37,099 kilos or \$24,655,995.

The Director of the Mint based his South African figures on the authority of the Kimberley correspondent of the London "Mining World," who stated that the output of gold in the whole of the Transvaal in 1892 had been 1,290,000 oz. valued at £4,535,000, which is equivalent to \$22,069,578 or \$17.10 per oz. The official figures reported by the Witwatersrand Chamber of Mines show that the actual output was 1,325,394 oz., of which 1,210,868 oz.,* coming from Johannesburg was valued at \$20,929,361, while the remainder, calculated at \$17.50 per oz., was worth \$2,004,205 or a total of \$22,933,566.

The world's production of gold from 1883 to 1892, both years inclusive, as reported by the Director of the Mint and corrected in accordance with the criticisms made in this article, is summarized in the following table:

Year.	Mint figures.		Revised figures.	
	Value.	Kilos.	Value.	Kilos.
1883	a. \$95,400,000	143,514	b. \$ 90,045,000	135,487
1884	a. 101,700,000	153,924	b. 95,478,000	143,662
1885	a. 108,400,000	163,166	b. 103,730,000	156,109
1886	a. 106,000,000	159,494	b. 102,350,000	154,002
1887	a. 105,755,000	159,126	b. 96,275,000	144,862
1888	a. 110,197,000	165,810	c. 103,129,900	151,176
1889	a. 123,489,000	185,810	c. 116,357,750	175,079
1890	b. 113,149,600	170,248	c. 115,404,560	173,645
1891	b. 120,518,800	181,359	c. 122,752,590	184,701
1892	b. 130,816,600	196,814	c. 140,562,530	211,499

a includes exaggerated estimate of gold production of China. b includes no estimate of production of gold in China. c includes estimate of production of gold in China based on net exports.

The statements in the column of revised figures for the years 1891 and 1892 are undoubtedly too high being exaggerated by the great increase in the exports from China of metal produced in previous years and hoarded or held in stock. The increase in the world's production of gold in 1892, however, was very large indeed, each of the great gold producing countries making a much larger output than in the previous year, with the exception of the United States, where production was stationary.

The probability, at present, is for a further increase in the production of gold, although the phenomenal ratio of increase in 1892 is scarcely to be expected again in 1893. The reports this year from all parts of the world are favorable, however. The Witwatersrand district of the Transvaal is maintaining its wonderful record of production, while recent developments (no less than the discovery of the Main Reef series at a depth of 2,400 ft. and 4,000 ft. south of the outcrop) have insured the life of these mines beyond a time which any one can yet foresee. In the meanwhile other districts of the Transvaal (De Kaap, Potchefstroom and the rest) are maintaining an output of \$2,000,000 or more per year, and new fields are being discovered as the wave of prospecting spreads out.

From Australasia, which now ranks the United States as the largest gold producing region of the world, the reports are still of increased outputs in the old districts, like Bendigo, and new discoveries in the vast colony of Western Australia, which is as yet imperfectly explored. In British India, also, production is increasing in 1893, according to the monthly returns of the companies operating in the Colar field of Mysore, whence comes nearly all the gold credited now to the Indian Empire. About Russia but little information leaks out in advance of the official statistics, and it is impossible to make any forecast. The production of Russia is more uncertain than that of any other country, since its chief source is still the placers, and such a yield is subject to sharper fluctuations than in countries where the more part of the gold is derived from lode mining.

The production of gold in the United States has ranged between \$32,800,000 and \$33,175,000 for the last six years; the figure for 1892 therefore was almost exactly a mean between these extremes. Since by far the greater part of the gold of this country comes from the lode mines the output is maintained with much regularity, and there is no reason now to anticipate either a startling increase or decrease in the product. The tendency, however, will be more for the former than the latter, after this year at any rate. The closing down of many of the silver mines will reduce the output of gold, of course, because most silver ores are gold-bearing; on the other hand, gold mining has been stimulated by the crisis in silver,

* It is greatly to be regretted that the weight of fine gold is not reported in all statistical compilations of the precious metals.

and an increased production is promised from the gold mines, and the falling off in one way may be compensated by a gain in the other, it is expected, of course, that the resumption of placer mining in California will have an important effect upon production, but it is not likely to be so much as has been predicted. At the time placer mining was restricted, in 1882, the total output of the alluvial diggings was only about \$6,000,000 per annum.* The capacity for production has not increased since that time, and that amount may be taken as the maximum that could be won if work were resumed in all of the idle placer mines. That, however, is improbable. In order to reopen the enjoined diggings, according to the provision of the new law, it is necessary to construct impounding dams, etc., which involve a large expenditure of money. Some concerns like the North Bloomfield Company can stand this, but there are many, producing in 1881, which cannot. It is idle, therefore, to expect an enormous increase in California's gold product, as has been foretold, and in any case it will hardly become apparent this year.

SOME NEW ELECTRICAL POWER PLANTS.

A notable example of the use of water power for the production of electricity is the plant recently erected for the Neuhausen company, at Neuhausen, in Switzerland, by the Oerlikon company. The Neuhausen works, which are near Schaffhausen, and which derive a power from the falls of the Rhine at that place, have, until recently, had in use seven dynamos, four of 150 H. P. each, one of 300 H. P., and two of 600 H. P. each. In order to increase the production of aluminum the company wished to increase in a large proportion the production of electric energy, and for that purpose put in four very large dynamos, making, with the three of the largest of its old machines, a group capable of exerting 3,900 H. P. The four new dynamos are run at a speed of 150 revolutions per minute, and give out 7,500 amperes each, at a tension of 55 volts. The nature of the work

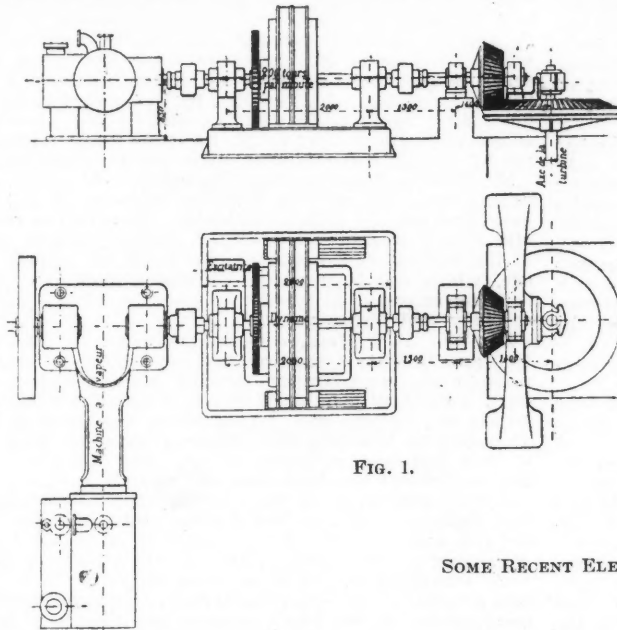


FIG. 1.

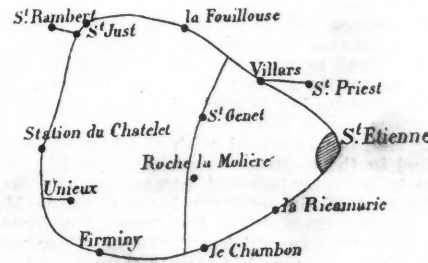


FIG. 2.

SOME RECENT ELECTRIC POWER PLANTS.

at which they are employed, which requires an absolute continuity of current, renders the work in the construction of these dynamos a particularly delicate one, requiring much care. Fig. 1 shows in outline sketch one of these dynamos; it is vertical and coupled directly to the turbine shaft. At the other end of the dynamo shaft is attached a steam engine for use in case of necessity, as shown in the plan. Each unit formed by the turbine of the dynamo is divided into three stages, the turbine forming the lowest, while the dynamo itself is divided into two stages. The machine is built in such a way that variations in charge do not perceptibly move the neutral zone of the magnetic field, and the service is, therefore, very simple. The turbines were built by Escher, Wyss & Company, at Zurich. The weight of the inductor and its attachments are balanced hydraulically in order not to overweight the step bearing.

The dynamos at Neuhausen are of the continuous current variety. Those which are mentioned below, and which are used to transmit power from St. Victor to St. Etienne, are of the triphase type. In 1891 a syndicate was formed at St. Etienne for the purpose of utilizing the falls of the Loire for the production and distribution of power. The fall near the city being insufficient, a concession was obtained of a fall on the Forez Canal capable of developing 900 H. P., with the possibility of a considerable addition.

The power station was established at Chatelet, and is provided also with steam engine in case the water-power becomes insufficient in time of prolonged draught. The engines, however, will only be used in cases of necessity. The power station has three groups of dynamos of 300 H. P. each. Each dynamo can be driven at will by a turbine or by a steam engine, the latter, as stated above, to be used only in cases of necessity. The axis of the turbine is vertical and that of the dynamo horizontal. The dynamo runs 200 revolutions a minute, and the shaft is connected by couplings, either with the

turbine or engine at will. From the power station the wire lines by which power is conveyed, run to St. Etienne in different directions, forming a loop, as shown by the small map Fig. 2, and having several branches to convey current to various points for power and for lighting purposes. While only 900 H. P. will be supplied at first it is expected that this will have to be largely increased, and provision has been made at the power station for the erection of additional units.

Sault Ste. Marie Canal.—The masonry of the new lock was practically completed during the season just closed. The gates for the lock are under contract, and it is now expected that the entire works on the new canal will be finished by the opening of navigation in 1896. On the new canal on the Canadian side of the river the masonry is also completed, and it is expected that the canal will be finished in another year.

Railways in China.—Railway-making is beset with unforeseen obstacles in China, says "Indian Engineering." A line is being made from the interior of Manchouria to the coast, and it was lately proposed to make a junction with Moukden, the chief town. The engineers consulted the Tartar General, and the General, before giving his sanction, consulted the geomancers, who declared that if the line were laid along the proposed track the vertebrae of the dragon that encircles the city would be broken by the nails of the sleepers. Such a contingency was too awful to contemplate, and the general promptly informed the engineers that the thing was impossible. The latter in despair, lodged a protest with Li Hung Chang, who, while commending the caution of his subordinates, expressed it as his opinion that the hidden dragon would suffer no harm, rather otherwise, by the innovation. However, he would refer the matter to the emperor. This struck terror into the heart of the General, and he again consulted the geomancers. Eventually a line was traced some hundreds of miles away from the site at first proposed.

Slag Bricks.—The manufacture of bricks from blast furnace slag has attained considerable dimensions in Germany, the Luhrmann furnaces near Osnabruck alone having turned out 5,100,000 bricks. The manufacture has also been taken up by other iron works. The granulation of the slag, the first essential portion of the process—which is substantially the same everywhere—is effected by running the slag along a channel together with a stream of water into a reservoir, in which it is collected. The lime to be mixed with it, in the proportion of one part to six of granulated slag, is slaked with sufficient water to yield a moist sludge, and the two ingredients are thoroughly incorporated in a mill, in which the process is conducted in the following way: The mixed slag and lime are conveyed by a spout, to which a shaking movement is communicated, to a pair of rolls, which stop the access of unduly large fragments of slag or foreign bodies to the mixer proper, and mingle the slag and lime still more thoroughly while reducing them somewhat in size. The final mixing is effected by a set of three drums with radial projections fitting into each other with only a slight amount of clearance, so that the ingredients are brought into the most intimate contact. A machine absorbing 2 to 3 H. P. will serve to prepare the material for 9,000 to 10,000 bricks per shift of 10 hours. The mixture is molded into bricks by a machine, which is provided with a hopper kept filled by the laborer in charge, and an arrangement whereby the quantity necessary to form one brick is let down into the mold and then the aperture closed, while the movable sides of the mold are brought into position by eccentrics, and by this means pressure is exerted upon the mass to shape and consolidate it. The finished brick is pushed out of the machine and the operations of filling the mold and applying pressure are repeated. A machine absorbing 7 to 8 H. P. will turn out at least 9,000 to 10,000 bricks per shift, its capacity being limited chiefly by the time consumed in removing the finished bricks. The bricks thus prepared are weak at first, and have to be handled carefully, and must be stacked and protected from rain for the first day, a precaution that is not afterward necessary. They become sufficiently strong for use for building purposes after the lapse of six to twelve months.

* The production of gold in California fell from \$18,200,000 in 1881 to \$14,120,000 in 1883, and then sank to about \$12,000,000.

* Translated and abstracted from "Le Genie Civil."

THE F. L. BARTLETT ZINC-LEAD PROCESS.*

This process is used at Canon City, Colo., for the treatment of argentiferous zinc-lead sulphide ores. The process in general consists in separating the zinc and lead by volatilizing them in the form of a zinc-lead fume, from which a marketable pigment is obtained, while the silver is left behind with the other non-volatile metals, and is collected in a copper matte. The process is based on the fact, discovered by Dr. Bartlett, that when silver-bearing zinc sulphide ores are burned and the zinc is volatilized the amount of silver dragged off with it is much less than was previously thought to be the case. Two methods of treating the ores are adopted according to the proportions of zinc and gangue they contain. Those containing about 25% or more are treated by the first method; those containing about 22% of zinc or less by the second.

The following are examples of ores actually treated at Canon City:

	Silver.	Lead.	Zinc.	Iron.	Copper.	Silica
1.....	10 oz.	30%	24	38	0	5
2.....	25 oz.	18%	25	10	0	18
3.....	4 oz.	2%	12	24	10	38
4.....	29 oz.	15%	28	15	6	12

The requisites for the process are: 1. Cheap flaming fuel—e. g., bituminous coal. 2. An iron ore either as oxide or iron pyrites, the latter being especially desirable if it contains silver. 3. A copper ore containing about 3% copper for the formation of the copper matte to collect the silver.

The ores containing 25% of zinc and over are crushed to pass a 4-mesh screen, and are then mixed by an archimedean screw with an equal bulk of fine coal. The mixture is then moistened and charged in lots of 600 lbs. into a furnace, of which the grate consists of perforated plates, the charge being spread on the grate in a layer about 4 in. deep. Air is forced through the charge from below at a pressure of about 2 oz. per sq. in., and a sufficient quantity of air is also forced through openings in the sides of the furnace above the layer of the ore to prevent the formation of sulphuric acid with the hydrocarbon vapor. The burning is completed in about 4½ hours, when the charge, which has not been touched during the operation, is in the form of a sintered mass, ready to go to the blast furnace, containing the silver and other non-volatile metals and some zinc. The sulphur is driven off and all the lead, and most of the zinc is volatilized; being collected in the form of a fume, out of which the pigment is made.

Iron pyrites, when necessary for a flux, is charged into a somewhat similar furnace and treated in a similar manner, except that only enough slack coal is used to start the pyrites burning, their sulphur contents being sufficient to supply the requisite fuel heat, while a higher blast (4 oz. per sq. in.) is used, the burning being completed in from three-quarters to one hour.

Sinter from the zinc ore is mixed with the burned pyrite, copper ore, fluxes and fuel in the requisite proportions, and is smelted at a high temperature in a water-jacketed furnace of a greater proportional length than that of the ordinary blast furnace. Most of the zinc left in the charge passes off in the form of a fume which is saved, while the copper matte which collects the silver runs into an outside crucible with the slag, and is tapped from time to time.

The ores containing about 22% of zinc or less are smelted directly in a special furnace with the proper mixture of copper ore, fluxes and fuel. This furnace is water-jacketed and has two rows of tuyeres on each side, the upper ones being about 10 in. above the lower. The lower blast is supplied under a pressure of about 2 lbs. to the sq. in., and is preferably a hot blast. The upper blast is cold and run under a light pressure. The ore and fuel are fed together continuously in a thin layer from 12 to 18 in. deep. For fuel, a mixture of coke and coal screenings is used amounting to one-quarter of the weight of the ore. The blast from the lower tuyeres plays upon the bath of molten matter, scorifying it, and volatilizing all the lead and most of the zinc, which pass off, through the thin layer of the unmelting portion of the charge, in the form of a fume. The upper tuyeres deliver a blast at the top of the charge, thus serving to keep up the necessary combustion, and preventing the condensation of the volatile compound rising through it. The copper matte which collects the silver, as in the first method, runs into an exterior crucible with the slag, and is tapped from time to time.

The matte contains as much as 65% copper and 250 ozs. silver per ton. The slag contains 6 to 10% zinc and from ¾ to 1½ oz. silver per ton of ore treated, no lead, and only a trace of copper.

The fumes from all the furnaces, consisting of the zinc, lead, and other volatile elements, are drawn from into chambers by means of exhaust fans and then forced through iron cooling conduits into long bags hanging from the roof of a building at some distance from the smelters. The gases pass through the bags, where the solid contents of the fumes are caught and from time to time shaken down into cars and taken to the refinery. This is subjected to a low, red heat in a closed tube containing a screw, which keeps the material in constant motion. By this means all the deleterious volatile elements are removed and the product is a marketable white pigment containing from 35 to 40% of oxysulphate of lead and from 55 to 60% of zinc oxide.

Some ores lose silver heavily and others hardly any, ores containing copper or iron pyrites losing much less than others. As much as 95% has been recovered, but generally the salvage is between 70 and 85%. Theoretically, the loss of silver should be confined to that in the pigment and that in the slags, i. e., in the former about 1 oz. and in the latter 1½ oz., or 2½ ozs. per ton of ore treated; but there is a variable loss somewhere between, which has never been discovered. (Later returns show the silver loss to be under 2 oz. per ton of ores treated, while there was a gain in the lead and gold over the assay of the raw ore.)

* Abstract of a report by E. W. Hawker, F. G. S., for the Broken Hill Company, of Australia. This report was made about one year ago for private use, and is now allowed to be published by courtesy of Mr. F. L. Bartlett.

The cost of treating the ore at Canon City is from \$5 to \$10 (average cost, \$6), including the production of the pigment and matte. The price of slack coal delivered at the works is 50c. per ton, the coal mines being near the works. The price of coke is \$5 per ton at Canon City.

The cost of a plant to treat 250 tons of ore per day, producing about 20 tons of pigment and 40 tons of matte, is \$250,000.

IMPROVEMENTS IN IRON MAKING IN ALABAMA.

Reported for the Engineering and Mining Journal by Dr. Wm. B. Phillips.

At the fall meeting of the Alabama Industrial and Scientific Society held in Birmingham, Nov. 24, several papers of more than usual interest were read. Mr. Murray, superintendent of the Linn Iron Works, described an improvement which he had been able to make in furnace boilers, whereby the use of a double-decked boiler with cylindrical mud-drum suspended beneath and a modification of the Speer-Kennedy gas burner had resulted in notable economy. These boilers were in use at the Alice furnaces before they were blown out, and are now used by the Sloss Iron and Steel Company.

Mr. A. E. Barton, superintendent of the Eusley Furnaces, read a paper on the grading of Southern pig-iron, in which the change from the old method of 15 grades to the present method with 11 grades was treated in detail. The necessity of maintaining a closer watch in the laboratory upon the products of the furnace, in order to grade properly was insisted upon. The fact is that there has always been here a decided tendency toward a multiplication of the number of grades, whereby ensues a confusion in the mind of the purchaser and consequent reclamations. The irregularity of the stock, in chemical composition, has much to do with the number of grades, and until we can secure in the ores a greater uniformity of composition we shall always be troubled by the question of grading. Some sales have been made here of late in which a guarantee of silicon content had been asked for and given. This is a hopeful sign, and may be taken to mean that a nearer approach to the sale of iron by analysis has been reached. The improvement in the speed with which analyses of iron are now made has taken away from the seller the plea that analyses were too much delayed to be of practical use in the selling. For instance, by the Ford method silicon may be determined in 12 to 15 minutes, and by the Drown method three silicon estimations may easily be made in 90 minutes, without the use of oxygen, which is required in the Ford method.

Mr. Erskine Ramsay, mining engineer at Pratt Mines, read an exhaustive paper dealing with the question of utilizing coke oven gases and heat for generating steam. Many of the ovens at the Pratt Mines have been provided with a gas flue running the entire length of the battery, and delivering gas under the boilers. The system in use, which has been most carefully worked out by Mr. Ramsay, is being extended as rapidly as possible, with gratifying results in economy and steam pressure.

Dr. Wm. B. Phillips, consulting chemist for the Tennessee Coal, Iron and Railway Company gave the results of experiments in magnetizing and concentrating the low grade soft red ores of the district. Operating upon 3,000 lbs. at a time the crude ore, which contained 40% of iron and 29% of silica, had been so improved as to yield 57% of iron and 10% of silica. In some cases the percentage of iron had been increased to 60%, and the silica reduced to 9%. The best result had been iron 62% and silica 9%.

It was announced at the meeting that the Tennessee Coal, Iron and Railway Company had decided to build a kiln for magnetizing red ore, and that the capacity would be about 125 tons per 24 hours. According to the quality of this ore the yield, per 24 hours, if magnetic concentrates, would be from 60 to 80 tons. The pattern of kiln adopted is the latest Davis-Colby, with modifications to suit the emergencies of the case, uniform and thorough magnetization. If no unforeseen difficulty occurs the kiln and the accompanying plant will be ready for use by the middle of February.

The experiment to be so soon undertaken will be watched by Southern iron masters with a vast deal of interest, not only on account of the metallurgical questions involved, but also, and perhaps chiefly, because if it is successful, it will bring into market a great deal of ore now practically useless. The 12 ft. seam of soft red ore overlying the seams now worked carries too little iron and too much silica for blast furnace use, while the 22 ft. seam lying between Grace's Gap and Lake View, a distance of five miles along the mountain, will also be rendered available for the furnaceman.

In this connection the work of Mr. H. F. Wilson, Jr., in locating and tracing the great seams of soft ore on Red Mountain, both above and below Grace's Gap, a description of which, with beautiful drawings, he submitted to the Society, becomes most important. The Birmingham district has been through a very trying experience during the past few months, and at one time it seemed to be a question whether it would or could survive without serious impairment of existing conditions. But in the midst of all the depression and the lack of confidence in the future, plans have been made for meeting not only present contingencies, but also those of the coming years. As was remarked in the account of the spring meeting of the Society, the improvement of the ores demands and must have the immediate and careful attention of our furnacemen, if we are to cope successfully with the problems that confront us. It should no longer be the practice to use the best ores on the mountain and leave the future to take care of itself, for this entails the consumption of the cheap ores—those which can be cheaply mined, and used without further preparation. It is one of the most encouraging indications of a more intelligent care in the choice and use of the raw materials in this district that the iron men have been stirred up to the improvement of the ores. It was a result sure to follow upon the improvement of the fuel, for when the maximum beneficiation of the coke was accomplished the very next step was toward the beneficia-

tion of the ores. It is not a matter whose solution can be recorded without the expenditure of thought and money, for at first glance the improvement of the red ores does not present much attractiveness to capital. It is only after unquestionable results have been reached in the laboratory, working with several hundred pounds of ore, and in one case with 3,000 lbs., that the feasibility of the process becomes so apparent as to warrant further and much more extended investigation.

THE ELIMINATION OF SULPHUR FROM IRON.

By J. E. Stead.*

Since the first part of this paper was read special experiments have been made to ascertain the exact nature of the change which occurs when fluid oxides of iron act upon fluid iron containing sulphur. The imperfect trial previously described tended to show that provided the cinder is not charged with any large quantity of peroxide of iron, no gas having a smell of sulphurous acid is given off; but as this was not conclusive, a more careful and elaborate experiment was conducted, which is rather more satisfactory. One clay crucible was luted into the upper part of another, so as to produce an air-tight joint. Into the uppermost crucible was securely fixed a long porcelain tube; the whole arrangement in reality constituting a clay retort, with a porcelain tubulure. Before the crucibles were cemented together a mixture of coarsely-powdered sulphurous white iron and basic ferrous silicate was placed in the lower one. The retort with its contents was then placed into a coke furnace, and was so fixed that the porcelain tube projected through the brickwork quite clear of the fire. To the end of this tube a U tube containing

sulphide of iron, that substance is bodily dissolved out of the iron, and that in the puddling process the sulphur is afterward partially converted into SO₂ by oxidation, and escapes in that state.

Samples taken at various periods during the process of the blow in the converter were carefully analyzed, to investigate the action on sulphur in the basic Bessemer process. The result showed a decrease of sulphur from 0.160% in the raw iron to 0.092% in the steel, with an increase in the cinder. The indications are that the greater part of the sulphur is removed in the latter part of the blow.

In the acid Bessemer process about 10% elimination of sulphur was shown, but the results obtained by experiment and analysis were variable, and further trials are needed before any definite opinion can be given.

With regard to the Saniter process* careful analyses were made of crude metal before and after treatment showing a reduction in sulphur amounting to from 33.4 to 84% of the amount originally in the iron. This confirms the laboratory experiments, and goes far to prove that sulphide of iron is dissolved by the chloride of calcium and lime from the crude iron, and is converted into sulphide of calcium and oxide of iron, and that the oxide so formed then reacts on some of the phosphorus, producing phosphoric acid, which in presence of lime basic slag forms phosphate, the oxide at the same time being reduced to iron, which returns to the bath. It must not, however, be forgotten that any moisture in the chloride of calcium or any carbonic acid associated with the lime will also produce

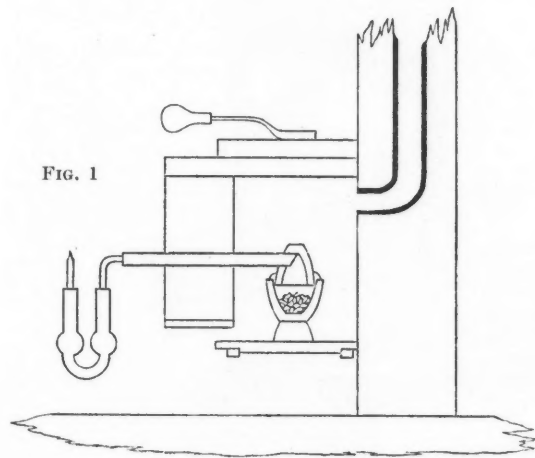


FIG. 1

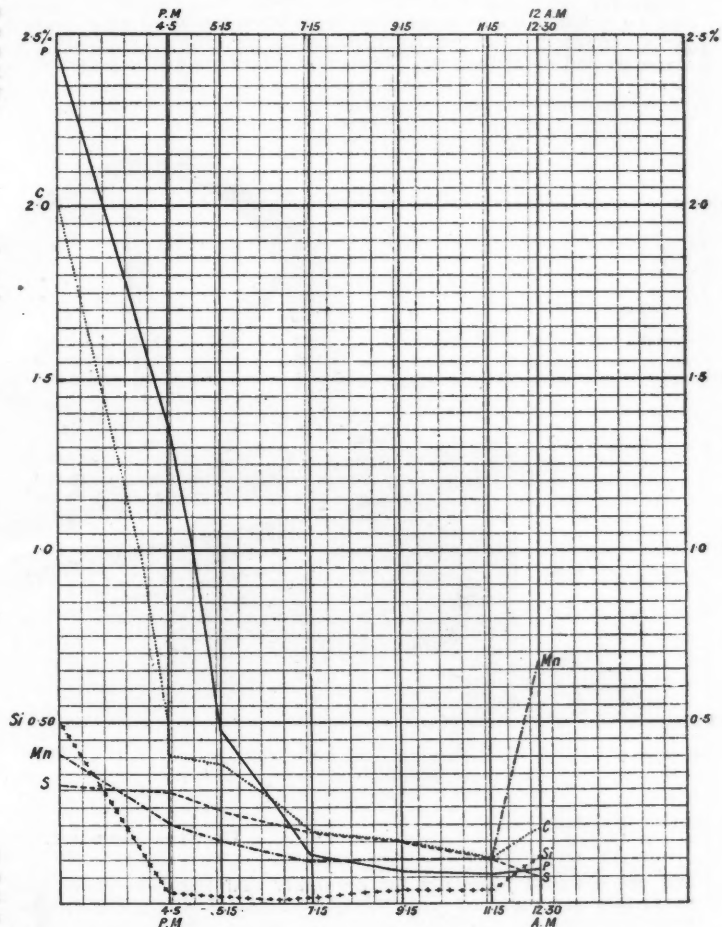
ELIMINATION OF SULPHUR FROM IRON.

a caustic alkali solution was attached, and when all was thus prepared the furnace was lit. The accompanying sketch (Fig. 1) will make the arrangement clearly understood. As soon as the melting-point of the iron was attained a brisk evolution of gas commenced, which burnt on applying a light with a clear blue flame. The whole of the gas was passed through the caustic liquor, so that every trace of sulphurous acid which might be given off would be absorbed by it. When the gas ceased to be evolved the furnace was allowed to cool, and the spongy mass of cinder and iron crushed, and a sufficient quantity of each was separated for analysis, and the caustic liquor, after acidulation and oxidation with bromine water, was examined for sulphuric acid.

Analysis showed that the amount of sulphur in the metal decreased from 1.83 to 0.586%. The amount of sulphur absorbed by the caustic alkali was equal to 0.0024% on the metal treated, or practically only a trace. It would appear from this that no sulphurous acid is formed directly by the oxidizing action of protoxide of iron on the sulphur in fluid iron, but that sulphur existing as sulphide in the iron is found in that state in the cinder. The next question to answer is whether the sulphur is absorbed directly as such, or that sulphide of iron is dissolved out of the metal by the oxides of iron.

An experiment was made in which sulphur vapor was passed through ferrous silicate with the result that the proportion of sulphur increased from 0.21 to 1.96, and finally to 2.87%. It would appear from this that basic silicate of iron is capable of absorbing free sulphur; but whether it has the power to withdraw sulphur from sulphite of iron in fluid metal (taking the sulphur and leaving the iron) is a question which requires further investigation. The most probable reaction is that, as basic silicates freely dissolve

FIG. 2.



oxide of iron, and that these will also act as oxidizing agents. The fact that the iron and manganese are not in nearly sufficient quantity in the slag to combine with the sulphur present is absolute demonstration that sulphide of calcium must be present.

The reactions in this process are exceedingly complex, and there are changes which occur of which we know little or nothing. It is, however, Mr. Stead's opinion that the sulphide of iron is dissolved out of the metal in the first instance by the free or loosely attached dissolved lime; but he does not care at present, without more extended investigation, to hazard any opinion as to what the subsequent reactions may be. With regard to the belief that a powerful reducing agent is required to be present to effect the removal of sulphur from iron as calcium sulphite, Mr. Stead says that, if reducing agents are required, in fluid raw iron itself you have all the reducing agents needed, so that it is not necessary to look for any such agents outside of the iron carbon, silicon, phosphorus and manganese naturally present in all raw iron.

In the Saniter process for desulphurizing in the basic open-hearth steel furnace, analyses were made of the metal used and of samples taken from the bath at different stages. These showed a continuous decrease in sulphur, which gradually diminished from 0.310% in the mixture to 0.052 in the final result. These changes and also those in carbon, phosphorus, silicon and manganese are shown graphically in Fig. 2, the diagram giving the proportions at different stages of the process.

* Abstract of paper read before the Iron and Steel Institute of Great Britain. Part I. was given in the "Engineering and Mining Journal" for October 15th 22d and 29th, November 12th, 19th and 23th, 1892.

* See "Engineering and Mining Journal" for June 10th, 1893, page 596.

A NEW CLAYTON COMPOUND HIGH DUTY AIR COMPRESSOR.

It is now generally the case that builders, who formerly manufactured a general line of machinery, devote all their ingenuity and capacity to some one type which they have excelled in producing. The Clayton Air Compressor Works, of New York, at that time builders of steam pumps and general mining machinery, introduced the first Clayton air compressor in 1871. The rapidly broadening field of usefulness for compressed air created a growing demand for high-class air compressing machinery, and soon caused the Clayton works to discontinue all other lines and concentrate the entire capacity of their plant to the construction of air compressors. Since this time they have made this type of machinery their specialty, laboring constantly to attain a higher plane of general excellence and adopting every improvement that would raise the standard of their machines. Among the numerous special designs which they are continually placing on the market is a compound belt actuated air compressor which we illustrate herewith.

This compressor is intended for experimental and other duties in which air is used under pressures as high as 500 lbs. per square inch, where it is preferred to operate the compressor by belt power.

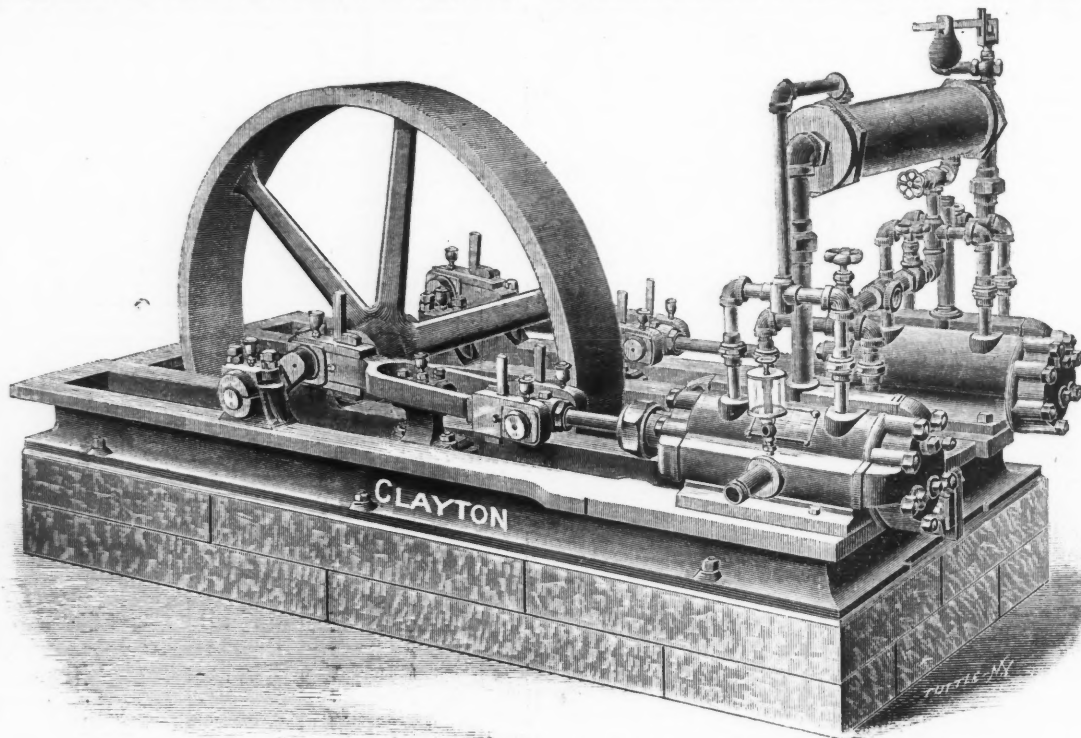
Two parallel cylinders are employed as shown, in a regular pattern of duplex compressor, one cylinder compressing the air to 80 lbs. pressure and transmitting it thence through the cooler shown above the cylinders to the second or high pressure cylinder, which completes the compression. The cooling apparatus combines the most efficient devices known for extracting the heat of compression from the air in transit, and the cylinders are surrounded with the latest improved water jackets for absorbing the heat of compression by an external circulation of water around the cylinders. The suction valves are of the poppet style

ANTIMONY MINING AND SMELTING IN JAPAN.*

The most important antimony mine in Japan is at Ichinokawa, in Ojoimura-Nii-gori, Iyo Province, on the island of Shikoku. It is a little more than two miles from the town of Saijo, and three miles from the sea coast. The mine is said to have been discovered 11 centuries ago, but there are no records of early operations in it. At present it is worked by Kawabata Kumasuke and 50 other persons as a private concern.

The country rock of the district in which this mine is situated is graphitic sericite schist, belonging to the Archaean. The ore deposits occur in the form of veins, of which there are three principal ones. Two of them, the Tsurubi and Kamebi, are parallel to each other, striking east and west, and dipping south at an angle of about 75°. They often unite, in which case they are very wide and rich. The third principal vein, known as the Yokobi, also strikes east and west and dips south, but at a moderate angle, never more than 38°, and sometimes only 10°. It is thought that the Yokobi vein intersects the Tsurubi and Kamebi veins at a greater depth than has yet been explored. These veins vary from 1 in. to 3 ft. in width. There are also many workable veins in the district besides those mentioned. All the veins are worked by shafts and levels, the former being from 50 to 150 ft. deep, and the latter from 300 to 2,000 ft. long. The cost of mining averages 5.877 yen (\$5.88) per 100 kin (60 kilos.) of ore.

The ore, which is stibnite of high grade, is smelted at works on the seacoast at Sanchoba, three miles from the Ichinokawa mine and only one-half mile from Saijo. The method of smelting employed is very simple. A crucible with a small hole bored through its bottom is set upon another crucible. The upper is filled with powdered ore, covered and heated from below, coal being used as fuel. The sulphide of anti-



CLAYTON BELT-DRIVEN DUPLEX AIR COMPRESSOR.

and are designed especially for durability and tightness under high duty; they are equipped with the Clayton patent safety stems, absolutely avoiding the possibility of a valve falling into the cylinder, and reducing clearance space to a minimum by permitting the pistons to run close up to the cylinder heads. As an extra precaution the main valve stems are fitted with both flange nuts and jam nuts. The pistons consist of a series of metallic rings of a composition made especially for the requirements of the duty. The connecting rods, bearings, etc., are all in accordance with the latest steam engine practice, and the entire machine represents the continued progress of the house. A similar design of steam actuated compressor is constructed for operation by direct steam connection.

Another design of compressor recently brought out by the same makers, is a triple compression cylinder compressor for liquifying carbonic acid gas, which has many excellent points.

Coal in Arkansas.—During the year ending June 30th, 1893, there were 666,300 tons of coal mined in Arkansas. There were 22 mines in operation, employing 1,752 men. This does not include some small open workings, where coal is taken out for local use.

British Iron and Steel Exports.—The total exports of iron and steel from Great Britain in October, were 243,717 tons, valued at £1,608,708. These exports were made up as follows: 89,928 tons pig iron; 8,518 tons bar angles and plates; 41,467 tons railroad material; 3,128 tons wire; 9,480 tons plate and boiler iron; 13,586 tons galvanized sheet; 27,088 tons tin plate; 8,073 tons old material; 14,087 tons unwrought; 23,195 tons manufactures of iron and steel. For the 10 months ending October 31st the total export was 2,478,310 tons, an increase of 194,879 tons over the corresponding period in 1892.

mony in the ore is melted and drains away from the gangue into the lower crucible, whence it is ladled into molds. The monthly production of ore averages 200,000 lbs. and that of antimony sulphide from 150,000 to 160,000 lbs. The sulphide of antimony is reduced to metal and shipped in boxes to Osaka and Kobe, which are the principal markets for the product, both being within 200 miles of the mines. The cost of smelting is 0.385 yen (38½ cents) per 100 kin (60 kilos.) of antimony sulphide and 2.5 yen (\$2.50) per 100 kin of refined antimony.

RECENT DECISIONS AFFECTING THE MINING INDUSTRY.

Supreme Court of Iowa.

Reservation in Deed of Right to Sink Mining Shafts.

Here two parties entered into an agreement releasing to each other certain claims made by each in the grounds claimed by the other, in which agreement the first party reserved, held and enjoyed the privilege of mining and drifting any crevice or range struck by him on his own lands through the second party's ground, with the privilege of sinking shafts on said ground by paying to him an equal one-sixth portion of all mineral discovered or raised on said ground. They shortly afterward transferred their interests, but this reservation continued to be treated as valid by their successors in interest for 30 years. The reservation gave not a personal license merely to the first party, nor an interest for life only, but a continuous right in himself and successors, to work through the land conceded to the second party. Such reservation gave to the first party or his successors in title no right to erect, on the second party's land, houses or shanties, except for use in connection with the working of the mines; and in an action

* Abstracted from "The Mining Industry of Japan," by Wajo Tsunashiro.

to quiet title, in the absence of evidence of the purpose for which they were erected, successors in title were entitled to a decree vesting in them the title to houses so erected.—*Bonson vs. Jones*. 56 N. W. Rep., 515.

Supreme Court of Pennsylvania.

Risks of Employment and Negligence of Fellow Servant.

The mining boss, required by the act of 1885, to be employed by mineowners, with prescribed duties relative to the inspection and care of the mines, is a fellow-servant with the miners at work in the mine, and if the owners have exercised reasonable care in the selection of a mining boss, they are not liable to injuries to workmen resulting from his negligence. Rule 24, Article 12, of the above act, which requires employes of a mine to give notice of apprehended danger to the mining boss, does not make the mining boss the representative of the owner, so as to charge them with constructive notice of information given to him by the workmen; since his duty is the same with or without the provision, to give immediate actual notice of apprehended danger to the owners, and take all proper measures to prevent its occurrence. The length of time during which the mining boss, a fellow-servant with the workmen in the mine, had notice of the apprehended danger of a cave-in in the mine, does not affect the master's liability; since, if the defects warned against are serious, and the mining boss does not correct them, it is the duty of workmen having knowledge to notify the master, and if they do not do so they continue work at their own risk.—*Lineoski vs. Susquehanna*. 27 At. Rep., 577.

The Use of Hydrometers.—Fr. Maly shows that accuracy in the use of these instruments depends on the state of the spindles. He cleanses first from coarse impurities, and then rubs with a damp (but not wet) cloth. Friction with a dry cloth is useless. The cleansed instrument is then allowed to lie for a time, so as to permit of the evaporation of any adhering moisture.

Water-Wheels of the United States.—In a paper read at the last meeting of the Boston Society of Civil Engineers, Mr. H. W. Hunkling estimated that there are 70,000 water-wheels in use in the United States; not over 2,000 of these are at the great water powers, such as those of Lowell, Holyoke, and others, the remainder being scattered around the country at small mills. Competition and the methods of testing adopted have caused great improvements in wheels. The principal points of difference from the old wheels as shown by those to-day are the increase in speed, the use of larger openings, and the use of fewer buckets.

The paper referred only to turbines and said nothing of the use of impact wheels, which has come into use to a considerable extent and to great advantage where there is a comparatively small amount of water and a great fall.

Mineral Production of Quebec.—In the report of the Department of Crown Lands of the Province of Quebec for the year ending June 30th is included that of Mr. J. Obalski, Inspector of Mines. He states that during the year 132 prospecting permits were applied for and 102 granted, comprising an area of 19,743 acres in surveyed and 130 square miles of unsurveyed territory. The revenue from this source amounted to \$1,675. The sale of mining lands was much greater than the previous year, and the receipts exceeded those of 1892 by \$3,594. The report gives the mineral production of the Province for the year as follows:

Gold, ounces.....	350	Magnetic iron, tons.....	1,550	Mica, tons.....	1,164
Lead, tons.....	100	Graphite, tons.....	325	Feldspar, tons.....	1,000
Copper, tons.....	50	Ochre, tons.....	950	Phosphates, tons.....	8,177
Copper pyrites, tons.....	58,001	Asbestos, tons.....	7,219	Slate, tons.....	4,785
Bog iron ore, tons.....	26,510	Serpentine, tons.....	300	Granite, cu. ft.....	100,000

Taking 4,153 as the total number employed in the industry it appears that the proportion of fatal accidents during the year was 1 in 1,034, and one person was injured for every 378 employed.

Ochse's Blasting Cartridge.—A new explosive cartridge in which the principal of electrolysis is involved, has been invented by Dr. Ochse, who was formerly employed at the works of Messrs. Krupp, Essen. The apparatus consists, says the "Iron and Coal Trades Review," of a closed glass tube or ball containing a small quantity of slightly acidulated water, into which two small platinum wires are led. In order to use the explosive a current of electricity is sent through the platinum wires. The electric current causes the water to be reduced into its component elements, hydrogen and oxygen, and also ignites the gaseous mixture. By the ignition of the gases in the bottle or tube a pressure 14½ times greater than that of the pressure inside the cartridge is said to be produced. Messrs. Soenderop & Co., who have acquired this new invention, have during the past five months been manufacturing these glass cartridges, and they now make them having an internal pressure of 400 atmospheres. Upon the ignition of such a cartridge an effective explosive force of 5,800 atmospheres on the square inch is produced. These cartridges are made with different internal pressures, so that any necessary or required explosive force can be obtained.

Mining Accidents in Great Britain.—The total quantity of all kinds of mineral raised in the Midland District in 1892 was 21,726,122 tons. This was an increase of 12,431 tons as compared with the year 1891. The average number of days worked in the four counties included within the district in 1892 was as follows. Derbyshire, 248¼; Nottinghamshire, 238½; Warwickshire, 259, and Leicestershire, 226¼. The number of persons employed in the district was 74,657, as against 71,540 in the previous year, and 66,468 in 1890. The quantity of mineral raised last year was about 13,000 tons in excess of that raised in 1891. The number of lives lost in 1892 was 73, the tons of mineral raised per death being 297,618. These figures contrasted

unfavorably with the previous year, when there were only 60 deaths, and the tonnage of mineral raised per death was 361,894. But the proportion of deaths to tonnage throughout the United Kingdom is much worse still, for the tonnage of mineral raised per death in 1892 was only 195,473, and in 1891 201,934. The colliery accidents in the Midland District in 1892 were 69 in number—including 40 falls of roof, six shafts, and 23 miscellaneous. In 1891 there were only 60 accidents. The non-fatal accidents reported under the Coal Mines Regulation Act during 1892 were as follows: Derbyshire, 385; Nottinghamshire, 180; Warwickshire, 49, and Leicestershire, 49; total, 663.

Iron Ores in Quebec.—The only deposits of iron ore in Quebec thus far worked have been the bog or lake ores of the Three Rivers district; although large deposits of Titanic iron ores are known to exist in the Laurentian range of mountains and elsewhere, they have not so far been worked. The bog ores have been worked in small charcoal furnaces and forges at Batiscan, St. Maurice, and elsewhere, since about 1730. Recently the Canada Iron Furnace Company has built a charcoal furnace at Radnor near the village of Fremont, on the Piles branch of the Canadian Pacific railroad. The company also purchased a large tract along the St. Maurice River. It was at first proposed to build a charcoal blast furnace of 25 tons capacity, to make a special pig iron for car wheels, but the possible supply of ore proved to be so large that it was decided to make the furnace of 50 tons capacity. The ore is found in many parts of a district nearly 400 miles long, and from 40 to 60 miles wide, extending from a point northeast of the city of Quebec to west of Ottawa. It is found in the lakes and swamps, generally covered by from 1 to 4 ft. of mud and vegetable matter. These beds vary in depth from 10 to 15 ft. and over. In the vicinity of Radnor, at a depth of 15 ft. the indications are as strong at the bottom as at the top. The ore at Radnor shows by analysis, from 40.4 to 49.3% of metallic iron; 0.205 to 0.331 phosphorus, and 0.036 to 0.093 sulphur. It also contains from 8 to 14% silica, from 2 to 4% aluminum, and a small quantity of manganese in the form of oxide.

PATENTS PUBLISHED IN GREAT BRITAIN.

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

WEEK ENDING NOVEMBER 25TH, 1893.

- 20,231 of 1892. Firing Mining Cartridges. R. W. Sedgwick, Newcastle, and C. Lamm Manchester.
- 23,101 of 1892. Recovering Zinc from the Waste Products of Galvanic Batteries. C. & H. Schroeder, London.
- 24,109 of 1892. Puddling and Melting Furnaces. J. J. & T. F. Meldrum, Manchester.
- 92 of 1893. Sulphate of Ammonia from Gas Liquor. F. M. & D. D. Spence and G. Tison, Manchester.
- 164 of 1893. Washing and Sizing Coal. J. Morison, Dalkeith; A. Kesson, D. Campbell and S. Potts, Hamilton, Scotland.
- 2,330 of 1893. Improvements in Separating Copper from Solutions by Iron. R. Conedea, Grosseto, Italy.
- 3,785 of 1893. Miners' Safety Lamps. J. Prestwich, Manchester.
- 5,525 of 1893. Electrolysis of Salt. Col. T. J. Holland, Tunbridge Wells.
- 17,602 of 1893. Manufacture of Sulphuric Acid. F. J. Falding, Cleveland, O., U. S. A.

PATENTS GRANTED BY THE UNITED STATES PATENT OFFICE.

The following is a list of the patents relating to mining, metallurgy and kindred subjects issued by the United States Patent Office:

TUESDAY, NOVEMBER 28TH, 1893.

- 509,360. Pug Mill. Thomas B. Campbell, Ithaca, N. Y.
- 509,361. Separator for Brick Machines. Thomas B. Campbell, Ithaca, N. Y.
- 509,368. Process of Treating Ores. Ernest C. Engelhardt, Deadwood, S. Dak.
- 509,369. Gas Mixer. Claudius G. Freeman, Louisville, Ky., Assignor to William H. Maulack, same place.
- 509,373. Electrically-Operated Jumper Drill. Carl Hoffman, Berlin, Germany, Assignor to Siemens & Halske, same place.
- 509,394. Packer for Artesian Wells. George Palm, Butler, Pa.
- 509,397. Electric Elevator. Charles R. Pratt, New York, N. Y.
- 509,418. Miner's Safety Lamp. Carl H. Wolf, Zwickau, Germany.
- 509,428. Composition Brick and Method of Making Same. Thomas A. Edison, Llewellyn Park, N. J.
- 509,439. Limekiln. Garwin A. Mace, Menomonee Falls, Wis.
- 509,450. Cupola of Blast Furnace. Alexander P. Rushforth, Canning Town, England.
- 309,474. Pile. William Kennish, Wilmington, N. C.
- 509,478. Antimony Compound and Process of Making Same. Theodor Mayer Fenerbach, Germany.
- 509,495. Heater or Boiler. Henry Stanton, Flushing, O.
- 509,547. Hot-Blast Stove. George W. McClure and Carl Amsler, Pittsburg, Pa.
- 509,550. Kiln for Burning Lime or Cement-Rock. Truman K. Nickerson, Maquoketa, Ia.
- 509,619. Process of Hardening Copper. Philip Helbig, Baltimore, Md.
- 509,633. Process of Treating Precious Metal-Bearing Slimes. David K. Tuttle, Philadelphia, Pa., and Cabell Whitehead, Washington, D. C.
- 509,634. Process of Refining Slimes from the Electrolytic Refining of Copper. David K. Tuttle, Philadelphia, Pa., and Cabell Whitehead, Washington, D. C.
- 509,659. Duplex Steam Pump. Charles A. Goynes, Ashland, Pa., Assignor to himself, Francis H. Goynes, Thomas R. Goynes and Arthur H. Goynes, same place.
- 509,664. Method of and Apparatus for Concentrating Sulphuric Acid. Henry Howard, Brookline, Mass.
- 509,701. Rotom Plate for Steel Ingot Molds. Benj. Talbot, Peneoyd, Pa.
- 509,728. Apparatus for Grading Powdered Materials. William W. Gillespie, Stamford, Conn.
- 509,745. Apparatus for Cleaning and Polishing Coated Metal Plates. Richard Lewis, Norristown, Pa., and Gwilym Morgan, West New Brighton, N. Y.
- 509,745. Apparatus for Coating Iron and Steel Plates with Metal or Alloy. Richard Lewis, Norristown, Pa., and Gwilym Morgan, West New Brighton, N. Y.
- 509,757. Overhead Travelling Crane. William H. Morgan, Alliance, O., Assignor, of three-fourths to Thomas R. Morgan, Sr., Thomas R. Morgan, Jr., and John R. Morgan, same place.
- 505,758. Trolley for Overhead Travelling Cranes. Thomas R. Morgan, Sr., and William H. Morgan, Alliance, O., Assignors of one-half to Thomas R. Morgan, Jr., and John R. Morgan, same place.
- 509,789. Machine for Grinding Gangue Containing Corundum. Michael Balmes, Detroit, Mich.
- 509,798. Apparatus for Removing Impurities from Smoke. Edward E. DuRier, London, England.
- 509,814. Machine for Cutting and Polishing Gems. William C. Knuth, Chicago, Ill.
- 509,818. Art of Washing and Separating Minerals. William S. Lockhart, London, England, Assignor to the Automatic Gem and Gold Separator Syndicate, Ltd., same place.
- 509,822. Building-Block and Process of Making Same. Theodore S. Pierce, St. Joseph, Mich., Assignor to the Michigan Sand Brick Company, Chicago, Ill., and Grand Rapids, Mich.

PERSONALS.

Capt. H. Prideaux, general manager of the Jay Hawk & Lone Pine Company, is in Butte.

Mr. Hermann Thofehn, mining engineer, who recently spent some time in this country, has returned to his home in Paris.

Mr. A. L. Mohler has resigned his position as manager of the Great Northern Railroad on account of ill health, and will spend the winter in North Carolina.

Mr. Daniel Kirby has resigned as superintendent of the Enterprise Mining Company, Rico, Colo., having accepted a similar position at the Ute & Ulay mines, at Lake City, Colo.

Carl H. Hand, mining engineer and member of the firm of Cary & Moore, of Butte, Mont., is at present in Pony, Mont., superintending the development work on the Clipper gold mine.

Mr. Wm. C. Hudson, who has been secretary of the New York Railroad Commission since its first organization, has resigned his position. It is understood that this action was undertaken for political reasons.

The firm of Cary & Moore, analytical and consulting chemists, has been formed in Chicago. Mr. Cary was officially connected with the Exposition, and Mr. Moore was formerly with the firm of Rattle, Nye & Hollis, in Chicago.

Mr. Joseph Wharton, founder of the Wharton School of Finance and Economy, of the University of Pennsylvania, has just supplemented his previous endowments of \$125,000 by a further gift of \$75,000 to the school which bears his name.

OBITUARY.

Cornelius McLaughlin, a well known mining man, of Park City, Utah, died at that place on November 28th, aged 66 years.

Paul Jousselin, president of the Societe des Ingenieurs Civils de France, died in Paris, November 18th, of pneumonia. He was 63 years old, and had been engaged on many important public works.

Rodman G. Moulton, who died in Sparkill, N. Y., November 22d, aged 76 years, was for 15 years general sales agent of the Delaware & Hudson Canal Company. He had been out of active business for some years.

George Payson, who died December 1st, aged 69 years, was for 20 years general counsel of the Western Railroad Association, in Chicago, and probably had a more profound knowledge of patent law than any other man in this country. He represented the Western Association in many important patent cases.

James Colquhoun, for 20 years manager of the Tredegar Iron Works, in Wales, died November 20th at his residence at Weston, England. He retired from business about a year ago. He was an active member of the Iron and Steel Institute and was for some time president of the South Wales Institute of Engineers.

Thomas M. Cleeman, of Philadelphia, died in Guayaquil, Ecuador, November 16th. He went to that place last summer to take charge of the building of the water-works there. He had been at different times in South America for a number of years, having been engineer in charge of construction on the Southern Railroad of Chile, on the Lima & Oroya, in Peru, and on other lines. He was also for some time engaged in the Philadelphia water department, and was principal assistant engineer of construction to the Centennial Exposition.

Edward Martin died at Red Hook, N. Y., on December 3d, aged 83 years. He was born in 1811. He was by education a civil engineer, and for many years he was associated with Robert L. Stevens, of Hoboken, N. J. He went West in 1835, and in his capacity as engineer laid out many railroads. He laid out the Hudson River Railroad from Albany as far south as Hyde Park. At one time he was superintendent of the old Galena & Chicago Railroad. He was the first president of the Rhinebeck & Connecticut Railroad. The first engine that ever drew a train of cars in America was put in running order by him.

Gen. Wm. Lilly, who died in Mauch Chunk, Pa., December 3d, aged 73 years, was for many years engaged in the coal business in connection with Messrs. Pardee, Markle and J. Gillingham Fell, and accumulated a large fortune. Some years ago he retired from business. At the last election he was chosen Congressman-at-Large from Pennsylvania. He was an engineer of ability and was also a great student of technical and public questions. He was a member of the American Institute of Mining Engineers and of several other technical societies, and took an active interest in their proceedings and discussions.

Joseph D. Potts, of Philadelphia, Pa., died at Milton, Pa., December 3d, aged 64 years. He came of the well known family of ironmasters, but he became a civil engineer, as such being connected

with various railroads, beginning in May, 1852, upon the Sunbury & Erie. Subsequently he was made vice-president of the Steubenville & Indiana Railroad; superintendent of the western division of the Pennsylvania Railroad, and president of the Western Transportation Company. During 1862, 1863, 1864 and 1865 he served as general manager of the Philadelphia & Erie Railroad for its lessee, the Pennsylvania Railroad Company, and from 1865 to 1877 he was president of the Empire Transportation Company, and for some time also of the Erie & Western Transportation Company. In 1877 the Empire Transportation Company sold its entire equipment, plant and good will and closed its existence, Mr. Potts continuing as its president until the final dissolution. In 1874 he became a managing director in the National Storage Company, and in 1879 president of the National Docks Railway Company, resigning both in 1884. He was elected president of the Enterprise Transit Company in 1871. For some years prior to 1885 he was president of the Girard Point Storage Company, of Philadelphia, and continued as a director of the company. He has been from its establishment a large owner and a director in the International Navigation Company, which operates the Red Star Line, the Inman and International Line and American Line of ocean steamers. Mr. Potts became owner of an interest in Potts Brothers' Iron Company, Limited, of Pottstown, Pa., which owns and operates a rolling mill in that place, and in 1890 he purchased the Chester Pipe and Tube Works, of Chester, Pa. In 1880 he purchased the Isabella Furnace property in Chester County, formerly owned by his father. In 1886 he was elected a trustee of the University of Pennsylvania, which position he held at the time of his death.

John Tyndall died in Haslemere, Surrey, England, on December 4th. He was born in 1820 in Leighlin Bridge, Ireland. Tyndall left school in his 19th year and became an assistant to a division of the Ordnance Survey stationed at Leighlin. He acquired a practical knowledge of every detail of this service, and became skillful as a draftsman, a computer and a surveyor. In 1848, in company with Edward Frankland, afterward professor of chemistry in the Royal Institution, he went to the University of Marburg, in Hesse-Cassel, where he studied chemistry under Bunsen. The latter formed a high opinion of the young man's talents, and took great interest in directing his studies, placing the laboratory and all its appliances at his disposal. Tyndall's advancement in scientific attainment at Marburg was uncommonly rapid, and it soon became evident that he had found his true sphere in life in conducting scientific investigations. Besides his work with Bunsen, Tyndall studied physics with Gerling and Knoblauch, and mathematics with Stegmann. Tyndall's hard work in the laboratory with Knoblauch resulted in a series of discoveries in magnetism and diamagnetism; he incorporated in the paper which first made him a name in the scientific world, "On the Magneto-Optic Properties of Crystals and the Relation of Magnetism and Diamagnetism to Molecular Arrangement," written in conjunction with Knoblauch, and published in "The Philosophical Magazine" in 1850. The next year Tyndall took his degree, submitting a thesis on "Screw Surfaces" (in German), which won him high commendation. The same year he went to Berlin, where, for a short time, he continued his researches under Professor Magnus. In 1851 Tyndall returned to London, and soon afterward formed the acquaintance of Professor Faraday, to whom he communicated the results of series of experiments of such ingenuity as to lead at once to his election as a Fellow of the Royal Society. In 1852 he became a member of the British Association for the Advancement of Science and applied, but in vain, for a vacant professorship in the University of Toronto, Can. The next year he was elected professor of natural philosophy in the Royal Institution and in the Government School of Mines. Professor Tyndall made his first visit to Switzerland in 1849—the forerunner of a series that was destined to bear important fruit. The publication of an essay on the cleavage of slate rocks was the proximate cause of his joining Professor Huxley on a visit to the Swiss glaciers in 1856. They afterward published a joint paper on the structure and motion of glaciers. Tyndall returned to Switzerland in 1857, 1858 and 1859. For many years Professor Tyndall made the Alps serve him for recreation and scientific investigation, generally in summer, but occasionally in winter, sometimes alone, sometimes in the company of Professors Huxley and Hirst. He scaled for the first time the Weishorn in 1861 and the Matterhorn in 1868. The results of these excursions are seen in the four well known volumes of Alpine studies. Professor Tyndall's studies on radiant heat were begun in 1859 and culminated in the publication of his lectures at the Royal Institution in 1863, in the volume entitled, "Heat Considered as a Mode of Motion," a book thoroughly characteristic of Professor Tyndall's skill in presenting the results of scientific investigations in lucid and engaging form. The book has had many editions. Professor Tyndall's studies on the theory at one time held of "spontaneous generation," made in 1875 and 1876, were extremely important. They showed that theory to be untenable, and proved that the organisms developed in putrefaction and fermentation were due to bacteria re-

ceived from the air and not spontaneously generated. In 1872, in response to a request signed by many prominent scientific and literary men of America, Professor Tyndall visited this country and delivered 35 lectures, the net income from these lectures amounting to more than \$13,000. Professor Tyndall formed a scholarship fund, the income of which is given to scientific students in Harvard, Columbia and the University of Pennsylvania to further their studies under certain broad conditions in the universities of Europe. Professor Tyndall's writings include many volumes and detached articles in addition to those already mentioned upon the most important branches of physical science. They are marked in general by a style as delightful as it is lucid and energetic, and by a faculty of presenting the results of laborious investigations in a manner to attract the widest attention. His work, in virtue of these qualities, has been of the greatest service in bringing scientific study to the high estate it enjoys in the modern world. Professor Tyndall received the degree of LL. D. from Cambridge in 1855 and from Edinburgh in 1866, and that of D. C. L. from Oxford in 1873.

SOCIETIES AND TECHNICAL SCHOOLS.

General Mining Association of Quebec.—The annual meeting will be held on the second Wednesday in January (10th), and several important papers are promised for the meeting.

Canadian Society of Civil Engineers.—At the regular meeting in Montreal, December 7th, the discussion of Mr. Macdougall's paper on "Domestic Sanitation" was concluded. A paper by Mr. H. F. Perley on a "Cubic Yard of Concrete" was read and discussed.

Engineers' Club of Cincinnati.—At the October meeting Mr. Charles A. Ewing read a paper on "Contractors Versus Specifications," in which he discussed the question from the contractors' standpoint, claiming that they do not receive proper recognition from engineers, but that they are a mistreated and misjudged class of men. He suggested a simplification of the forms of contract and specification as one way of improving this condition of affairs. A very animated discussion followed the reading of this paper.

Columbia College, New York.—The faculty of Columbia College announces that the first free public course in co-operation with the American Museum of Natural History is in mining, by Henry S. Munroe, professor of mining. The first lecture was on December 2d, subject, "Prospecting." The other lectures will be on succeeding Saturday evenings on "Development of Mineral Properties," "Coal Mining," "Metal Mining." The second course will be on "Light," by William Hallowell, adjunct professor of physics. The fourth course will be given by Charles F. Chandler, professor of chemistry, on "Aluminum and Electric Lighting." The fifth course will be given by Frederick R. Hutton, professor of mechanical engineering, on "The Mechanical Engineering of An Ocean Greyhound" and "The Growth of the Locomotive Engine." Tickets of admission can be procured, without charge, by application to the secretary of the president, Columbia College.

American Society of Mechanical Engineers.—The 15th annual convention began in New York December 4th, with a public session, at which a number of addresses were made. On the following day a business session was held at which officers for the ensuing year were elected as follows: President, Eckley B. Cox, Drifton, Pa.; vice-presidents: C. E. Billings, Hartford, Conn.; Percival Roberts, Jr., Pencoed, Pa., and H. J. Small, Sacramento, Cal.; managers: John B. Herreshoff, Bristol, R. I.; L. B. Miller, Elizabeth, N. J., and W. S. Russell, Detroit, Mich.; treasurer, William H. Wiley, New York; secretary, F. R. Hutton; assistant secretary, Francis Hoadley. At the evening session papers by Prof. R. H. Thurston, A. K. Mansfield and George S. Morison, were read and discussed. On December 6th and 7th, sessions for reading of papers and discussions of topical questions were also held and the meeting concluded on December 8th. In the afternoons the members visited a number of workshops and other places of interest in New York and the neighborhood. Many papers of interest were presented at this meeting.

INDUSTRIAL NOTES.

The Wheeling Coal and Iron Company started its Benwood mill December 4th, employing 500 men.

The Edgar Thomson Steel Works, at Braddock, Pa., resumed work on December 4th, employing 800 men.

The Tudor Iron Works, in East St. Louis, Ill., shut down December 5th for 10 days on account of a lack of orders.

About one-third of the plant of the National Rolling Mill Company, at McKeesport, Pa., shut down on December 2d, owing to lack of orders.

The Berlin Iron Bridge Company, East Berlin,

Conn., is putting an iron roof on the purifier house of the Northern Liberties Gas Works, in Philadelphia.

The entire sheet mill department of the Aetna Standard Iron and Steel Company, of Wheeling, W. Va., resumed work on full time December 4th, employing 1,500 men.

Richards & Co., Limited, Chicago, have issued a new and completely illustrated catalogue of chemical and physical apparatus, including materials and apparatus for assaying.

Mr. B. Lewinson has been appointed receiver of the Coal Economizer and Manufacturing Company, of New York, on suit of some of the creditors. The principal assets of the company are its patents.

The Cleveland Rolling Mill Company's sheet and puddle mills, which have been idle since July 1st, received orders to start up this week, under a reduction of 12% to employees.

William Sellers & Co., Philadelphia, have just completed a hydraulic press for the United States mint in that city. The press has a ram 25 in. in diameter, and can exert a maximum pressure of 4,000 lbs. to the square inch.

The Pittsburg Bridge Company has recently completed a steel tippie for the Alex. Black Coal Company, and has under construction a tippie and head frame for the Berwind-White Coal Company and a similar order for the Ocean Coal Company.

The Curtis Bay Brass and Metal Works have been incorporated, with D. R. Steele, president, and J. H. Farlow, secretary and treasurer, and will build works at Curtis Bay, near Baltimore, Md., to manufacture brass and composition of metal casting of all kinds.

John H. McGowan & Co., Cincinnati, O., have just completed and shipped an order for two large duplex steam pumps of their twin-lever pattern, to Cuba. The order was received on account of the favorable impression made on the purchaser by the working of these pumps at the Exposition.

The C. W. Hunt Company, New York, have in hand at present contracts for a coaling plant at the works of the East River Gas Company, in Brooklyn; coaling stations for the Brooklyn City Elevated Railroad at two points; a coaling station for locomotives for the Boston & Maine Railroad, in Boston, and the equipment of a coal dock for J. Roughan, in Boston.

The contract for the three light-draught gunboats, authorized by the last Congress, has been awarded by the Navy Department to the Newport News Shipbuilding Company, Newport News, Va., at its bid of \$280,000 for each vessel. This is the first contract given to the Newport News company for naval vessels, as the company has not heretofore bid on any work of this kind. These vessels, as described in the "Journal," October 28th last, will be about 1,260 tons displacement and from 8 to 11 ft. draught, and are intended for special work on the Asiatic and South American stations.

Bids for furnishing the War Department with 10,000 lbs. of smokeless powder were received from the Pneumatic Torpedo and Construction Company, of New York, at 70 cents per pound for a powder containing 60% of nitro-glycerine, and 80 cents per pound for powder without nitro-glycerine; Herman Waltebeck, of Newark, N. J., \$2.20 per pound; Bernard Peyton, of Santa Cruz, Cal., \$1.25 per pound; Leonard Smokeless Powder Company, New York, 50 cents per pound for an initial velocity of 1,960 ft., the price to be increased 1 cent per pound for each 10 ft. additional of initial velocity.

An application for a receiver for the Solar Iron Works, of Pittsburg, Pa., operated by William Clark's Sons & Co., was filed on December 6th, by Knox & Reed on behalf of Elizabeth Clark, administratrix for the late Edward L. Clark, against Jane Clark. The firm was composed of Edward L. and Jane Clark. It began business in 1888 with a capital of \$380,000, of which Jane had \$224,000. She was guaranteed a profit of 10%, or \$22,400 per year, for five years. The defendant received her share of the profits regularly. At the time of Mr. Clark's death he had accumulated net profits exceeding \$268,000, of which he had on deposit in the bank \$100,000, in the firm name. The balance was on bills receivable, book accounts, etc. At and since Edward Clark's death the defendant, it is claimed, has assumed the right to manage the business, and has appropriated to herself the entire assets, including the profits belonging to the deceased. The plaintiff asks for a computation of the partnership.

At the Columbian Exposition, in Chicago, the Williams Manufacturing Company, the well known tank builders, Kalamazoo, Mich., in connection with the paper mill exhibit, showed two large stuff chests, made from Louisiana red cypress. At their factory are stocks of dry tank lumber, both of Michigan white pine and Louisiana red cypress, up to 30 ft. in length, and special machinery is used, insuring quick and economical, as well as good, work. They already have offices in New York City, Boston and Philadelphia, and to more successfully take care of a fast increasing trade in Chicago, have opened an office in that city. A

great many buildings and factories all over the country are being equipped with tanks for automatic fire extinguishing purposes, and particularly for this trade, the Williams Manufacturing Company have obtained from the builders of the Ferris wheel a number of designs for steel structures to hold elevated tanks at different heights.

Some excellent work in hard rock tunneling is now being done on the Palisades tunnel of the New York, Susquehanna & Western Railroad, opposite New York. Work has been in progress here for about a year, and the tunnel is to be completed early in 1894. During November, on the east end, under charge of P. F. McLaughlin, there was completed 161 ft. of heading and 186 ft. of bench; the tunnel is for double track, and 27 x 21 ft. in section. The record in the heading is especially remarkable, as it was done by the night shift only. This plan of working with a single shift was introduced by Mr. McLaughlin, and has proved very successful; the main advantage is that after drilling through the night and firing early in the morning the muckers are put at work in the heading to get out the broken stone and the foreman in charge sees that the columns are put up and drills in place ready for the runners to begin work when they come on. The rock is the very hard trap, of which the Palisades are composed. This work was done with 10 Ingersoll-Sargeant drills, size F2, four of them being in use in the heading and six on the bench.

MACHINERY AND SUPPLIES WANTED.

If any one wanting machinery or supplies of any kind will notify the "Engineering and Mining Journal" of what he needs he will be put in communication with the best manufacturers of the same.

We also offer our services to foreign correspondents who desire to purchase American goods, and shall be pleased to furnish them information concerning goods of any kind, and forward them catalogues and discounts of manufacturers in each line.

All these services are rendered gratuitously in the interest of our subscribers and advertisers; the proprietors of the "Engineering and Mining Journal" are not brokers or exporters, nor have they any pecuniary interest in buying or selling goods of any kind.

GENERAL MINING NEWS

ALASKA.

Alaska-Treadwell Gold Mining Company.—Some time ago a suit was brought in San Francisco by F. O. Downing against W. W. Murray, James Treadwell and others. Downing brought suit to recover a portion of money received from the sale of mines to this company, and claimed that the other defendants had appropriated the money received and refused to account for it. The case was ended last week, the court granting a nonsuit on the ground that the plaintiff did not show that he was entitled to any share in the money.

Chichagoff Island.—A new gold ledge has been discovered on this island, according to the Juneau "Mining Record." It is said to be valuable, but definite accounts are lacking yet.

(From our Special Correspondent.)

Alaska-Treadwell Mining Company.—During the month of November the mill ran for 29½ days, crushing 19,170 tons of ore. The gold product was \$75,588. There were 440 tons concentrations which yielded \$23,433 included in the above total of the month's bullion product.

ARIZONA.

Advices from Tucson state that a 6-ft. vein of coal has been discovered in southeastern Arizona by Dr. Theo. B. Comstock, director of the Arizona School of Mines. The coal is semi-anthracite. Work was begun on December 1st on sinking a new shaft at the site of the late diamond drill borings. The purpose is to confirm the showings of the drill. Later the shaft will be used as an air shaft. The first vein is at 79 ft.

Maricopa County.

Phoenix Consolidated Gold Mining Company.—President W. S. Alley and Superintendent Alexander Trippel stated to the Phoenix "Herald" that in the last six weeks 753 ft. of drifts have been run, 429½ ft. of raises have been made, and 162 ft. of shafts have been sunk, a total of 1,344½ lin. ft. which, it is said, is more than has been done on the property in the past 15 years. While this work is more or less of the nature of dead work, it has been arranged by Dr. Trippel as to answer for development work and is in a part of the mine that has never been prospected before; several new bodies of ore have been opened up that show up well. The work of connecting the Meshacerty property (see "Engineering and Mining Journal," December 2d) is progressing. It requires over 1,500 ft. of track to connect this property with the mill. Twenty of the 100 stamps were started up on November 30th, the balance to follow very quickly.

Yavapai County.

Seven Stars Gold Mining Company.—In New York, December 5th, judgment for \$2,218 on a note given to Richard K. Fox was entered against the Industrial and Mining Guarantee Company. This is the company which, in connection with H. H. Warner, guaranteed a dividend on Seven Stars

stock. It is not the first judgment which has been entered against the company. It may be added that H. H. Warner, who is now in England, is being questioned in a very searching way by some of the stockholders in his patent medicines companies. It is possible that the Seven Stars stockholders there may also have something to say to him.

Yuma County.

Harqua Hala Gold Mining Company.—The following notice has been issued from the London office by Mr. C. Pakeman, secretary: I am directed to inform you that the board has received a cablegram from the chairman, Mr. Francis Muir, who is at present at the mine, to the effect that, as the result of bad management under the former owners, the present main shaft is insecure and dangerous to life and property. He considers it absolutely necessary that the mill should be closed down on December 1st until the new shaft, already commenced, is sunk, a period which will not exceed three months, and the board have adopted his recommendation. He reports that the mine is looking well, that the developments fully justified the erection of the increased milling power already ordered, and that he is much pleased with the general management. Compressed air drills have been ordered to facilitate the rapid sinking of the new shaft.

CALIFORNIA.

Butte County.

Bullion.—A company has been formed at Forbestown, to work this mine, the property of S. K. Reasoner. The officers of the company are: Frank Willet, president; Jesse T. Clemens, treasurer; Chas. Bouvier, secretary; John Pellar, foreman; John Crossman, W. Kendall, Wm. Smitheram and Thos. Stocker, directors.

El Dorado County.

Reports from this country indicate that there is considerable activity among mining men there. The Oro Fino, the Starlight and the Shaw mines are said to be producing handsomely. Many other quartz lodes hitherto considered non-paying are being worked and considerable prospecting is going on.

Mono County.

Bulwer Consolidated Mining Company.—The official letter for the week ending November 26th says that ore is being extracted from the various openings on the 200-ft. level. Crushing began at the Bodie mill on November 21st and 108 tons of ore were crushed up to date, the battery samples averaging \$25.60 per ton and the tailings \$7.57.

Syndicate Mining Company.—This company, at Bodie, made a recent bullion shipment valued at \$2,400.

Placer County.

Big Dipper.—This mine, at Iowa Hill, is employing about 45 men. The new machinery is working well.

Bonanza.—This mine, at Alta, says the Placer "Herald," has its tunnel in about 600 ft. At this distance an upraise of 120 ft. was made, and gravel was struck which is believed to be in the rim of the channel.

Golden Eagle Drift Mine.—This property, at Shady Run, has been sold for \$10,000.

Sierra County.

Empire.—Work is progressing at this property, in Gold Valley. The shaft is down 220 ft. below the croppings. The ledge is 6 ft. wide to a depth of 200 ft., but within the last 20 ft. it has gradually widened until it is 10 ft. wide at the bottom of the shaft. The ore is said to show high assays. Next spring, says the Downieville "Mountain Messenger," hoisting works will be erected, the mill remodeled and the plant put into active operation.

Siskiyou County.

According to the Yreka "Journal" three new quartz mills will be erected shortly in the Salmon River section and new machinery is constantly received at the mines at that region since the completion of the new wagon road. More prospectors and mining engineers, it is said, have recently visited that section than ever before.

Sonoma County.

Great Eastern Quicksilver Mining Company.—This company leased the Mount Jackson mine, near Guerneville, some time ago, and is now working it. The output was 147 flasks last month. The company is working from 35 to 40 men.

COLORADO.

The Colorado Midland Railway Company has been reincorporated under the laws of the State of Colorado, as the Colorado Midland Railroad Company. It is capitalized at \$8,600,000. The papers state that the stockholders of the Colorado Midland Railway Company and the Aspen Short Line Railway Company agreed to consolidate their stock, franchises and property on July 28th last at Colorado Springs, and the reincorporation is the result. The incorporators are George C. Magoun, John J. McCook and Thomas Baring, of New York City, stockholders of the Colorado Midland, and James J. Hagerman, of Colorado Springs, and Henry T. Rogers, of Denver, stockholders of the Aspen Short line. The directors named are Thomas Baring, Cecil Baring, Joseph R. Busk, William Libbey, George C. Magoun, John J. McCook and

Jerome B. Wheeler, of New York City; Joseph W. Reinhart and B. P. Cheney, of Boston; James J. Hagerman, Colorado Springs, and Charles E. Gast, Pueblo. The principal office of the company will be at Colorado Springs.

Boulder County.

Gold Nugget.—Good progress is being made at this property, in Left Hand.

Chaffee County.

Several prospectors are at work on Seven-Mile Creek. They have just brought down some fine gold ore; the rock is full of free gold.

Crooked Creek Camp.—Advices from Buena Vista state that Crooked Creek, the new camp, six miles east of Buena Vista, is attracting considerable attention. A vein of free milling gold ore 40 ft. wide, between quartzite and granite, has been discovered which is said to run very high. It crops at surface at different places for 4,500 ft. along the vein; this will make a good milling property, as it is very handy to water. Streaks of ore in the vein varying in size from 2 in. to 8 in. assay from \$30 to \$100 per ton.

Gold Cup.—Two carloads of ore recently shipped from this mine, on Tront Creek Range, gave returns of \$20 per ton. This amount was caught on the plates. It is a free milling proposition. The gold is worth \$18 per ounce.

Metsen & Frame have just given a bond on two of their gold properties, situated three miles east of Buena Vista.

El Paso County.

A press dispatch from Colorado Springs states that four mines changed ownership on December 2d, at Cripple Creek, the considerations aggregating \$112,000, as follows: A controlling interest in the Climax, \$12,000; Little May, \$40,000; Australia, \$20,000; Hulllity Placer, \$40,000. The prospect of the early completion of the Colorado Midland Terminal, which will deliver ore to samplers and mills at \$1 to \$1.50 a ton, against \$9 at present, has created a lively demand for mining property. In the past month the sales of mines at the camp have reached a high figure.

Hillside.—The pay streak in this property has widened out to 3 ft. The owners have been following a spur vein from 2 to 6 in. in width through solid granite for the past two months and took out about 1,000 lbs. of ore in sinking 40 ft. on an incline. This ore ran about 10 oz. per ton. The contact between the granite and porphyry has now been reached and the vein widened out to 4 ft.

Gilpin County.

Fisk Gold Mine, Limited.—This company has been formed with a capital of \$1,000,000, in \$5 shares, of which 134,000 are offered for subscription in London, England. The prospectus states that the object of the company is to purchase the share capital of the Fisk Gold Mining and Milling Company, of Blackhawk, and an adjoining property, known as the Teller Fisk mine. The vendor states that mining operations were commenced about two years ago, and the gross output for the first 17 months amounts to about \$150,000. The Fisk Mining and Milling Company is said to have paid dividends at the rate of 24% per annum for the last two quarters of 1892, although, according to the report of Mr. P. Coulson Bunn, the machinery in use was inadequate for its requirements. During 1893, Mr. Bunn adds, quarterly dividends have been paid at the rate of 45% per annum in addition to a large bonus, and the net profit for the first seven months' working was \$88,000. For August and September the net profit is given as \$16,500 and \$20,500. Fifty thousand dollars will be set aside as working capital. The purchase price is \$950,000—\$400,000 in cash and \$330,000 in fully paid shares, and the balance in cash or shares at the directors' option.

Lake County.

(From our Special Correspondent.)

The Johnnie, Rawlings, Eliza and Little Vinnie are located on Brece Hill, on the south end of the gold belt and adjoining Iowa Gulch, where the Lillian property is situated. A shipment made from the latter mine within the past two weeks of 46 tons had a value in excess of 4 oz. of gold to the ton.

Between these two points is the Antioch mine milling 100 tons daily of low-grade ore, which proves that there is a gold-producing belt extending from Iowa to Evans Gulch, lying parallel to and immediately above the silver-lead-producing belts of the district of Leadville.

El Capitan.—This property, located on Taylor, has been thoroughly developed this season and will be worked this winter. The ore will be treated by the Huntington process, by which it is thought that 80% of the value will be saved. The vein has been opened up for 90 ft. and ore running from 1 to 90 oz. in gold is being mined. The work of the mill, which has just been erected will be watched with interest, for if it can make as large a saving as claimed, it means a great deal for the mines of Taylor Hill.

Fanny Rawlings.—This mine is now shipping about 30 tons daily, and the Eliza, adjoining it, 15 tons daily of ore similar to that of the Little Johnnie.

Ibex Mining Company.—This company is operating the Little Johnnie mine with success and is

shipping about 150 tons daily of ore, carrying over \$25 worth of gold to the ton.

Little Vinnie.—This mine, operated by Ronald Morrison, has disclosed the Little Johnnie gold ore chute.

Union Mining and Leasing Company.—The work begun a year ago by this company of unwatering that section of Fryer Hill, where its properties are located, has been successfully completed, and the El Paso, Bangkok-Cora-Belle, Tip Top, Jamie Lee, Forepaugh and Olive Branch, which were flooded for several years, have been drained. The work of drainage was carried on through the El Paso shaft, which can easily handle 2,000 gallons of water per minute. In this property they are now drifting for the known Alpha ore chute, and a 160-ft. drift is being run. In the Jamie Lee and Olive Branch the same ore chute exists and the Lee is already shipping some 40 to 50 tons of ore daily.

White Cap.—The lessees working this property are doing nicely and some good lead ore is being mined and shipped. There are also streaks of ore just opened up that run well in gold.

Pitkin County.

Bonnybell Mining Company vs. Durant Mining Company.—The suits of John C. Bates, representing the Bonnybell against the Durant company have been withdrawn, each side paying its costs. It is understood that by the terms of the settlement the property in dispute and now in the hands of Bates, is to be retained by him. He is to resume operations when the price of silver justifies, paying Hyman a portion of the proceeds.

Difficult District.—Late advices from Aspen would indicate that Difficult gold camp, 18 miles southeast of Aspen, is rapidly coming to the front as a producer of the yellow metal. Assays from the Ripperton, owned by W. E. Ladd, Edward Hardy and L. J. Reilly, are said to go over 9 oz., and the owners claim they have a large body of this, averaging no less than 24 in. Unless the heavy snows interfere, a earload will soon be shipped as a test to the Denver smelters. Supplies have been sent in to prosecute work all winter.

St. Joe and Mineral Farm.—November 17th the sheriff took possession of the St. Joe and Mineral Farm and the Champion Empire properties on attachments got out by Byron E. Shear and David H. Moffat, of Denver. The claim of the former is on the Champion Empire and is somewhere in the neighborhood of \$55,000. The claim of Mr. Moffat is against the Mineral Farm, and will foot up close to that of Shear. Both properties have been under the management of B. Clark Wheeler for nearly a year past. Other attachments are expected to follow. On November 29th the case of J. J. Hagerman, to have a receiver appointed for the St. Joe and Mineral Farm and to enjoin, S. S. Hansbrough and the company from working the property and to restrain the company from paying certain of its debts, came up before Judge Rucker, of the District Court, and was thrown out of court. This is a victory for B. Clark Wheeler.

IDAHO.

Boise County.

(Reported for the "Engineering and Mining Journal.")

Grimes Creek Bed Rock Flume Company.—Capt. J. T. Hey, representative of English capitalists, and S. Clarke Bowen, from London, accompanied by J. B. Hastings, mining engineer, arrived in Centreville November 19th. Mr. Bowen is half owner in this company, which holds placer claims from 300 to 600 ft. wide, extending nine miles along Grimes Creek and three miles along Granite Creek. In 1863-67 this portion of Boise Basin was thronged with miners working the creek, hill and bar claims; the first were 200 ft. along the creek bed; the second 100 ft. front and back to summit of hill; the third 200 ft. front and back to foot of hill. It is claimed with wages \$5 and \$6 per diem and 50 cents to \$1 per 24 hour-inch for water, the ground was so hurriedly worked that but half the gold was saved, while portions of the creek bed dumped upon by both hill and creek claims were not worked at all. Since this first washing the ground has remained untouched, protected by tailings from claims higher up the creeks. The gravel is 300 to 600 ft. wide, 20 ft. deep, of fluvial and drift origin, consisting of 60% sand and 40% cobble, the largest of the latter reaching 10 in. in longest diameter, but usually much smaller. With proper facilities for storage of water, a high head can be obtained, the working season extending from March 1st to November 1st. Forests of pine trees border the streams. The London syndicate, after receiving Mr. Hastings' report, will decide on the practicability of laying wooden sluices in the granite bedrock suitable for working with the high water of spring and low water of summer and fall.

Coeur d'Alenes.

Bunker Hill & Sullivan Mining Company.—At this mine, according to the Wallace "Miner," about 165 men are employed, and there are also about 35 contractors and 30 men employed around the concentrator, making a total of 230 men in all. Only the day shift is working in the mine, but a part of the mill is running full time with a double shift.

Last Chance.—The mill and concentrator started up last week and are now running with one shift. There are about 20 men employed in the mine, but only in the upper workings, as no more can be put in the lower levels until the pending lawsuit is decided.

INDIAN TERRITORY.

Choctaw Coal and Railway Company.—A dispatch from Philadelphia says that there is a prospect that the connecting link between the two sections of this company's lines will shortly be built. At a meeting of the board of directors, held in Philadelphia, Pa., on December 4th, a representative of the Standard Oil interest stated that he would like to have an explicit statement of the company's condition, and that if it was satisfactory the money to build 125 miles link to a connection with the Missouri, Kansas & Texas would be forthcoming. Francis I. Gowen, one of the receivers, is preparing the statement.

IOWA.

At a meeting of coal miners in Des Moines on December 6th, over 1,000 miners, employed in 11 mines, were present. It was decided to order a general strike unless the operators rescind their decision to keep back two weeks' pay instead of one, and demanding pay every two weeks instead of monthly.

KENTUCKY.

Bell County.

Southern Land Improvement Company.—Thomas Haskins has leased a portion of the Moss track from this company and is now sinking a shaft for coal.

MICHIGAN.

Iron—Marquette Range.

Lake Superior Iron Company.—Shafts 6 and 7 of this company resumed work December 4th with a full force, and it is said that the company will increase its force to 1,000 men before the close of the year.

Swanzy Mine.—A small force were set at work in this mine last week, after a stoppage of about two months. The men are employed at present in a shaft which is to be sunk about 200 ft. farther than at present.

Winthrop Iron Mine.—A number of the men in this mine struck last week, demanding a guarantee of \$1.50 per day on contract. Later, most of them returned to work, an arrangement having been made, but a few remained out.

Iron—Menominee Range.

Appleton.—The new cross-cut at this mine, according to the Norway "Current," is 276 ft. long, and last week had passed through 6 ft. of first-class ore with no signs of a termination of the lens.

Keel Ridge.—At this mine the drift east from the shaft has been driven 508 ft., and a cross-cut is being driven north from the end of the drift. No large body of ore has yet been reached, however.

Pewabic.—The fire in this mine reported last week was less extensive than was at first feared and has now been extinguished. The damage is not very great.

MINNESOTA.

Duluth.

(From our Special Correspondent.)

Exact shipments of iron ore from this county for the year, lake and rail, have been as follows: Minnesota Iron Company, 805,258 tons; Zenith, 14,417 tons; total Vermilion Range, 819,675 tons. Mesaba Range over Duluth & Iron Range road, 102,410 tons; Duluth, Missabe & Northern road, 520,565 tons; total, 622,975 tons. It is expected that official announcement of the double tracking of the latter road, as well as of the contract for a new Mesaba line for the former, will be given in a few weeks. The Duluth & Iron Range expects to decrease its 136-ft. grade up from Lake Superior by a new line a few miles long, on which surveyors are now at work. There have so far been very few sales of ore for next season, practically none except to the Rockefeller syndicate.

Iron—Mesaba Range.

(From our Special Correspondent.)

Bnekeye.—A contract for the extension of the Duluth & Winnipeg road to this mine, has been declared off and delayed until spring.

Franklin.—At this mine, a mile east of the town of Virginia, a towsite has been platted to be called Franklin. Hoisting ore is going on rapidly.

Hale.—The exact terms of the sub-lease of this property by the Thomas Iron Company call for a minimum annual output of 50,000 tons a year for buyers. The Standard Ore Company, lessee, is to do the mining for the Thomas people.

Mesaba Chief.—An option for sale of this property, expiring December 1st, has been renewed, it is stated, for a short term.

MISSOURI.

Jasper County.

(From our Special Correspondent.)

Joplin, Dec. 2.

The past two weeks of mining operations in this lead and zinc belt have been fairly active and the production large. The prices paid for zinc ore

waiting to see what will be the next movement. The present demand for iron and steel is so limited to the actual requirements of consumers that nothing at all likely to happen can effect it to any great extent.

Business in finished material is limited to small orders, although some good-sized lots will soon be wanted. The extreme competition continues, and many mills have practically been forced out of business.

Steel.—The market continues to show a fair amount of activity, but at exceedingly low figures, some being the lowest ever recorded, while many are of the opinion that the bottom has not been reached.

Coke Smelted Lake and Native Ore.

Table with columns for Tons, Bessemer, Dec., Cash, and various grades of steel and iron products like Billets, Slabs, and Sheet Bars.

METAL MARKET.

NEW YORK, Friday Evening, Dec. 8, 1893.

Prices of Silver per Ounce Troy.

Table showing prices of silver per ounce troy from Dec 2 to Dec 5, with columns for Dec., St. Ex., London Pence, N.Y. Cls., and Value of sil. in \$.

The market has been firm and advancing on good buying orders for the Indian banks, but closes weaker on large sales from this side at the advance.

The United States Assay Office at New York reports the total receipts of silver for the week to be 71,000 ounces.

Gold and Silver Exports and Imports at New York, Week Ending December 2d, 1893, and for Years from January 1st, 1893, 1892.

Table with columns for Gold (Exports, Imports), Silver (Exports, Imports), and Excess of Ex. or Imp. for the week and years 1893 and 1892.

The gold exported for the week went to the West Indies; the silver to Europe, some of it in transit for China. The gold imports came mainly from the West Indies, with some small lots from France; the silver from Jamaica.

During the five days ending December 7th the exports and imports of gold and silver have been as follows: Exports, gold, \$40,123; silver, \$652,410. Imports, gold, \$72,821; silver, \$9,537.

NOTES OF THE WEEK.

The business situation shows little change. A gradual improvement is apparent, but it grows slowly, and no very marked revival has come yet, or indeed can be expected.

It is announced to-day that \$500,000 gold will be shipped on the "Trave" to-morrow (9th) on its way to Berlin. The shippers are Heidelberg, Ickelheimer & Co., who will follow it up with \$500,000 more on December 13th.

Tariff discussion continues, of course, and there are the usual predictions of disaster from some of those whose interests will be affected. The general expression, however, from men of all shades of opinion, is that action should be taken with as little delay as possible.

The President's message sent to Congress on its reassembling in regular session on December 4th is a plain and business-like document. As generally expected, the President fully indorses the work of the Ways and Means Committee on the tariff bill, and intimates that, to meet the needs of the Treasury, there may be some increase in internal revenue taxes.

The President's recommendations on currency questions are as follows: The recent repeal of the provision of law requiring the purchase of silver bullion by the Government as a feature of our monetary scheme has made an entire change in the complexion of our currency affairs.

In the pursuit of this object we should resolutely turn away from alluring and temporary expedients, determined to be content with nothing less than a lasting and comprehensive financial plan. In these circumstances, I am convinced that a reasonable delay in dealing with this subject, instead of being injurious, will increase the probability of wise action.

The Monetary Conference which assembled at Brussels upon our invitation was adjourned to November 30th in the present year. The considerations just stated and the fact that a definite proposition from us seemed to be expected upon the reassembling of the conference led me to express a willingness to have the meeting still further postponed.

I desire also to earnestly suggest the wisdom of amending the existing statutes in regard to the issuance of government bonds. The authority now vested in the Secretary of the Treasury to issue bonds is not as clear as it should be, and the bonds authorized are disadvantageous to the government both as to the time of their maturity and rate of interest.

Mr. Cleveland clearly recognizes the need of economy, for his general recommendations are all in the direction of lower expenditures, and he does not advocate any present increase in the navy.

The paragraph in relation to the Monetary Conference is to be noted. Let us hope that before long the United States will be ready to ask for the adjourned session, and that a definite proposition—as for the constitution of the International Monetary Clearing House—may be ready for discussion.

The statement of the New York banks for the week ending December 2d shows increases of \$5,261,725 in reserves; \$4,288,400 in loans; \$3,375,200 in specie; \$4,894,900 in legal tenders; \$12,033,500 in deposits, and decreases of \$173,700 in circulation. The gain in specie was due chiefly to settlement of Sub-Treasury balances in coin; that in legal tenders to receipts from interior banks.

corresponding period of 1892; the specie \$25,289,000 and the legal tenders \$52,455,000 more.

The United States Treasury report on Thursday, December 7th, showed total balances in excess of outstanding certificates amounting to \$94,863,437, made up of \$83,660,906 gold; \$6,300,761 silver; \$3,562,650 legal tenders; \$1,254,120 treasury notes, etc.

Silver dollars and hullion on hand December 7th, under the act of July, 1890, were \$153,331,550, against which there were outstanding \$153,364,280 in treasury notes.

The Mint statement for December 1st gives the total amount of money of all kinds in the country, including that in the Treasury, at \$2,226,420,843; amount in circulation, \$1,720,994,290. As compared with December 1st, 1892, this is an increase of \$112,204,024.

Silver exports continue heavy. The "Umbria" on Wednesday took 450,000 oz. for Europe, and the "Majestic" on Thursday carried 535,000 oz. more.

London reports for the week ending December 7th show net imports of £69,000 in gold, the receipts being £127,000 from Egypt and £22,000 from Portugal, while the exports were £30,000 to Roumania.

The specie holdings of the Bank of France on December 7th amounted in sterling to £68,435,911 gold and £50,830,845 silver, an increase of £743,161 gold and a decrease of £198,902 silver as compared with the corresponding date last year.

Domestic and Foreign Coins.

The following are the latest market quotations for the leading foreign coins:

Table with columns for Bid and Asked prices for Mexican dollars, Peruvian soles, Victoria sovereigns, Twenty francs, and Spanish 25 pesetas.

Metal Exports and Imports.

The exports of metals from the port of New York for week ending December 7th, as reported by the New York Metal Exchange were:

Table listing metal exports from the port of New York: Swansea-Massasoit (Zinc skimmings, 40 tons), Bristol-Massasoit (Zinc dross, 20 tons), Liverpool-Bolivia (Old brass, 12 tons), Hamburg-Moravia (Old copper, 1 ton), Amsterdam-Zaandam (Copper bullion, 1 ton), and Amsterdam-Zaandam (Zinc oxide, 10 tons).

The imports of metals at the port of New York for week ending December 6th, as reported by the New York Metal Exchange, were: From London, anti-mony, 80 casks.

Other Metals.

Copper.—While the market has not lost its firmness, it certainly has its buoyancy, for, as soon as the price for Lake reached 10 1/2% the demand gradually lessened and now buyers are holding off. A few orders have been placed at below 10% and the market closes quiet, but steady.

In England prices hardened somewhat during the early part of the week reaching the top notch on Tuesday morning when the quotations were £43 17s. 6d. for spot and £44 7s. 6d. for three months prompt.

It now seems that in reporting the decrease in visible supplies during the last half of November as having been 400 tons, a mistake was made, as the decrease actually was 1,000 tons, which is truly remarkable in view of the enormous quantities being shipped from America.

The exports of copper from the port of New York during the past week, as reported by the New York Metal Exchange, were as follows:

Table listing copper exports from the port of New York: Swansea-Massasoit (Bars, 202 Tons; Pigs, 52 tons; Cakes, 11 tons), Liverpool-Nomadic (Ingots, 140 tons; Bars, 25 tons), Hamburg-Moravia (Ingots, 50 tons), Havre-Mohican (Ingots, 100 tons), and Trieste-State of California (Ingots, 30 tons).

Kearsarge also came in for large dealings and advanced from \$8 1/2 to \$9 1/2, but lost nearly all of it in the later dealings.

Tamarack, Jr., was strong with buying orders from good sources. The stock did not respond to the upward movement as fully as the others, but there is no amount of stock offered, and it is liable to advance rapidly when it starts, and \$25 is named as the figure. Sales from \$20 to \$20 1/2 with reaction to \$19 1/2 and later sales at \$20 1/2. Wolverine sold quite freely at \$2 3/4 @ \$3 1/8, latest sales at \$3.

Central made its bow for the first time the current year, if memory serves, and recorded a sale of 100 shares at \$12 1/2, and later advanced to \$15 for 250 shares. This stock is largely held in New York, and but little of it finds its way into this market.

The low-priced copper, non-productive mines and which are purely speculative, are begging to be inquired for and should the market continue active we look for a good deal of activity in this class. Sales of the following were quoted this week: National, at 75c @ \$1; Aloncz, 45 @ 50c; and Bonanza, at 20c. For Mesnard, 45c is bid; Pontiac, 25c; and Tecumseh, 50c. Arnold sold a short time since at 60c, and is said to be pushing development work rapidly and expects to be producing copper early next year.

3:00 P. M.—The market was inclined to be heavy after the noon hour, and Boston & Montana declined to \$27 1/2. Butte & Boston was steady at \$10. Quincy declined from \$125 to \$116 on small sales, and Tamarack fell off from \$165 to \$162.

Tamarack, Jr., dropped to 19 1/2 and Wolverine to \$25 1/2. Centennial steady at \$4 1/2 @ \$4 3/8.

San Francisco. Dec. 1.

(From our Special Correspondent.)

Mining stocks have remained active during the week and the prices have fluctuated sufficiently to make trading interesting. The tendency of the market as a whole, however, has been downward and at the close to-day a further shading off in prices took place. It is scarcely likely that the price of leading stocks will go much lower just at present. The mere fact of work being started in the West Consolidated Virginia mine, in addition to the Rule drift being run in Consolidated California & Virginia, is sufficient to send prices up a point or two.

To-day at the opening of the Pacific Board Consolidated California & Virginia opened at \$3.70, but declined under the sale of 500 shares to \$3.55.

In the big Board the stock recovered and sold steady to noon. In the afternoon a sharp decline took place to \$3.35, the leader selling at the close \$3.25 bid. Ophir sold to-day for \$1.70; Mexico for \$1.15; Sierra Nevada for \$1.35, and Union for 95c.

In the middle group of Comstocks there was considerable activity to-day. Best & Belcher sold for \$2.35; Chollar for 75c; Gould & Curry sold freely for \$1.20, but later in the day, under moderately heavy sales, sold down to \$1.05. Hale & Norcross sold for 75c; Potosi and Savage 90c. each.

The recent strike in the Yellow Jacket raise has had the effect of depressing the stock rather than sending it to a higher point. To-day in early session it sold for \$1.35, but shaded off during the afternoon to \$1.05.

The balance of the Gold Hill and south-enders have been very quiet this week. The ruling rates to-day were as follows: Belcher, 80c; Bullion, 40c; Crown Point, 80c; Justice, 20c; Kentuck, 20c; Overman, 40c; and Segregated Belcher, 20c. In outside stocks nothing has been done.

San Francisco, Dec. 8 (By telegraph).—Opening quotations to-day are as follows: Best & Belcher, \$2.70; Bodie, 35c; Belle Isle, 5c; Bulwer, 5c; Chollar, 70c; Consolidated California & Virginia, \$4; Gould & Curry, \$1.25; Hale & Norcross, 95c; Mexican, \$1.25; Mono, 15c; Navajo, 10c; Ophir, \$1.95; Savage, 85c; Sierra Nevada, \$1.65; Union Consolidated, \$1.20; Yellow Jacket, \$1.35.

London. Nov. 28.

The amount of business still continues very restricted and hardly anything of a speculative character is to be seen. South African shares have been generally dull and lifeless. American mining stocks have received, perhaps, rather more attention than usual and some investment buying has taken place. The stock to feel this return to legitimate business the most is Jay Hawk, which has improved by a shilling during the past week or 10 days, and now stands at 9s. 6d. The result of the announcement from the Harqua Hala company, given in our mining news column, is that sellers of the shares have made their appearance and the price has fallen considerably, viz., from 15s. to 11s. The long neglected Golden Leaf stock has found buyers among those in the inner circle, and the price has risen from the nominal "rubbish" price to a figure, which, though low, shows that buyers have some expectation of a new and more hopeful departure. Though no official information

of the cause of this revival, there is reason to believe that the company are negotiating to acquire an interest in a new property by placing their plant at the disposal of the owners thereof. The Golden Gate Alliance Syndicate, Limited, has been reconstructed under the name of the Golden Gate of California, Limited. The capital of the new company is £80,000, in shares of £1 each, the same as that of the old one, and the shares are issued as 17s. 6d. paid, leaving 2s. 6d. per share to be called up. The reason for this reconstruction is that money will be thus provided to enable the directors to purchase an adjoining property, through which a ledge runs, that they are working on the Lucky Bob claim. Mr. Alfred Boswick, a large shareholder, has been appointed to the board of directors. At the meeting of shareholders sanctioning the change, there was a good deal of adverse opinion expressed on Colonel McLaughlin's management of the mine, but the reconstruction scheme was carried through in spite of their opposition.

The new Montana company does not appear to be in a very prosperous condition, to judge from the report just issued, for the period from December 15th, 1892 (the date of reconstruction), to June 30th, 1893. The company has made a total loss of £19,243 during this period. More than half this loss is accounted for by extraordinary expenses. The lawsuit against them by the St. Louis Mining and Milling Company has cost £7,249, and the reconstruction expenses amounted to £2,033, while £861 has been spent on permanent improvements. Of the remaining loss, £7,653 is accounted for by expenditure out of revenue on prospecting development and shaft work. The realized value of the yield was \$228,385. On the publication of this report the shares of the company fell 6d. and now stand at 2s.

The Bonanza Gold Mining Company, working a property in California, and which has only recently been formed here, report that the mill commenced running on November 20th. The mill capacity is 70 tons per 24 hours. The ore is estimated to yield \$8 per ton and the expenses are not expected to be more than \$1.50 per ton. The ore now in reserve is calculated to be worth \$900,000 net.

DIVIDENDS.

Osceola Consolidated Mining Company's dividend of \$1 per share (\$50,000), payable December 30th, to stockholders of record December 9th.

CURRENT PRICES.

Table listing various commodities and their prices, including items like Muriate, Aqua Ammonia, Antimony, Arsenic, Asbestos, Ashes, Asphaltum, Barium, Bauxite, Bichromate of Potash, Bromine, Cadmium, etc.

Table listing various commodities and their prices, including items like Cadmium Iodide, China Clay, Chlorine Water, Chrome Iron Ore, Chromalum, Cobalt, Copper, Corundum, Cryolite, Emery, Epsom Salt, Feldspar, Fluorspar, French Chalk, Fuller's Earth, Glass, Gold, Kaolin, Kieserite, Lead, Litharge, Magnesite, Manganese, Mercuric Chloride, Marble Dust, Metallic Paint, Mica, etc.

Table listing various commodities and their prices, including items like Mineral Wool, Naphtha, Nitrate, Ochre, Potassium Cyanide, Potash, Pumice Stone, Pyrites, Quartz, Kotten Stone, Sal Ammoniac, Soapstone, Soda, Sulfur, Sylvite, Talc, Terra Alba, etc.

Table listing various commodities and their prices, including items like Tin Crystals, Muriate, Vermilion, Zinc White, etc.

THE RARER METALS.

Table listing prices for rarer metals, including items like Arsenic, Barium, Bismuth, Cadmium, Calcium, Cerium, Chromium, Cobalt, Didymium, Erbium, Gallium, Germanium, Glucinum, Iodine, Iridium, Lanthanum, Lithium, Magnesium, Manganese, Molybdenum, Niobium, Osmium, Palladium, Potassium, Radium, Rubidium, Selenium, Sodium, Strontium, Tantalum, Tellurium, Thallium, Titanium, Tungsten, Uranium, Vanadium.

NEW YORK MINING STOCK QUOTATIONS.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Table with columns: NAME AND LOCATION OF COMPANY, Dec. 2, Dec. 4, Dec. 5, Dec. 6, Dec. 7, Dec. 8, SALES. Lists various mining companies like Adams, Alice, Amador, etc.

Table with columns: NAME AND LOCATION OF COMPANY, Dec. 2, Dec. 4, Dec. 5, Dec. 6, Dec. 7, Dec. 8, SALES. Lists various mining companies like Alpha, Alta, American Flag, etc.

*Ex-dividend. †Dealt in at New York Stock Ex. ‡Assessment paid. §Assessment unpaid. Dividend shares sold, 1,900. Non-dividend shares sold, 5,400. Total shares sold, 7,300.

BOSTON MINING STOCK QUOTATIONS.

Table with columns: NAME OF COMPANY, Dec. 1, Dec. 2, Dec. 4, Dec. 5, Dec. 6, Dec. 7, SALES. Lists various mining companies like Atlantic, Bate, Bannan Development, etc.

Table with columns: NAME OF COMPANY, Dec. 1, Dec. 2, Dec. 4, Dec. 5, Dec. 6, Dec. 7, SALES. Lists various mining companies like Allouez, Arnold, Artec, etc.

Dividend shares sold, 18,321.

Non-dividend shares sold, 20,829.

Total shares sold, 39,141.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Table with columns: Name and Location of Company, Capital Stock, Shares, Assessments, Dividends, Date and amount of last. Lists various mining companies with financial details.

Table with columns: Name and Location of Company, Capital Stock, Shares, Assessments, Dividends, Date and amount of last. Lists various mining companies with financial details.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Main table with columns: Name and Location of Company, Capital Stock, Shares, Par, Assessments (Total Levied, Date and amount of last), Dividends (Total paid, Date and amount of last), Name and Location of Company, Capital Stock, Shares, Par, Assessments (Total levied, Date and amount of last).

G., Gold. S., Silver. L., Lead. C., Copper. B., Borax. * Non-assessable. † This company, as the Western, up to December 10th, 1881, paid \$1,400,000. ‡ Non-assessable for three years. § The Deadwood previously paid \$275,000 in eleven dividends and the Terra \$75,000. ¶ Previous to the consolidation in August, 1884, the California has paid \$1,350,000 in dividends, and the Cons. Virginia \$2,800,000. ** Previous to the consolidation of the Copper Queen with the Atlanta, August, 1885, the Copper Queen has paid \$1,350,000 in dividends. †† This company paid \$190,000 before the reorganization in 1880. ‡‡ This company acquired the property of the Raymond & Ely Company which had paid \$3,075,000 in dividends. **** Previous to this company's acquiring Northern Belle, that mine paid \$2,400,000 in dividends against \$425,000 in assessments.

COAL AND COAL RAILROAD STOCKS.

Table with columns for Names of Stocks, Dec. 2, Dec. 4, Dec. 5, Dec. 6, Dec. 7, Dec. 8, and Sales. Lists various coal and railroad stocks with their respective prices and sales figures.

Total shares sold, 66,327.

INDUSTRIAL AND TRUST STOCKS.

Table with columns for Name of Stocks, Dec. 2, Dec. 4, Dec. 5, Dec. 6, Dec. 7, Dec. 8, and Sales. Lists industrial and trust stocks with their respective prices and sales figures.

Total sales, 371,907.

CALIFORNIA.

Table titled 'San Francisco' showing closing quotations for various stocks in California from Dec. 1 to Dec. 7.

COLORADO.

Table titled 'Colorado Springs, Dec. 7' showing closing quotations for various stocks in Colorado, including a special report by W. H. McIntyre.

COLORADO.

Table titled 'Aspen' showing prices and sales for various stocks in Colorado for December 4th.

Denver.

Table showing prices and sales for various stocks in Denver for December 4th.

Table with columns for High, Low, and Sales. Lists stocks like Mollie Gibson, Ophir, Puzzler, etc., with their high and low prices and sales figures.

MARYLAND.

Table with columns for Company, Bid, and Asked. Lists Maryland stocks like Baltimore, Conard Hill, etc., with their bid and asked prices.

MINNESOTA.

Table with columns for Par, Bid, and Asked. Lists Minnesota stocks like Duluth, Biwabik M. Iron Co., etc., with their par, bid, and asked prices.

UNLISTED STOCKS.

Table listing unlisted stocks with their respective prices and sales figures.

MISSOURI.

Table with columns for Closing quotations, Bid, and Asked. Lists Missouri stocks like Adams, American & Nettie, etc., with their closing quotations, bid, and asked prices.

London Quotations.

Table with columns for Nov. 28, 1893, Buyer, and Seller. Lists London quotations for various international stocks like Alaska Treadwell, Harquahala, etc.

Paris.

Table with columns for Nov. 24, France. Lists Paris quotations for various international stocks like Belmez, Spain, Golden River, etc.

New York Mining Stocks.

Table with columns for Bid, Asked, and Dec. 8. Lists New York mining stocks like Alice, Alta, Best & Belcher, etc., with their bid and asked prices.

ASSESSMENTS.

Table with columns for Company, No., Dlnqt. in office, Day of sale, and Amt. per sh. Lists assessments for various companies like Alta, Nev., Benton Group, etc.

MONTANA.

Table with columns for Helena. Lists Montana stocks like Bald Butte, Benton Group, etc., with their respective prices.

PENNSYLVANIA.

Table with columns for Philadelphia, Dec. 7. Lists Pennsylvania stocks like Bloomington C. & C., Buck Mountain, etc., with their respective prices.

Book Buyers.

Consult This Column for New Books.

ASSAYING.

Assaying.
-BY-
C. H. AARON
PART I.—Gold and Silver Ores.
2d Edition. Price, \$1.00.
PARTS II. and III. —Gold and Silver Bullion, Lead
Copper, Tin, Mercury, Etc.
2d Edition. Price, \$1.75.

CHEMISTRY.

Electro-Chemical Analysis.
-BY-
EDGAR F. SMITH.
Cloth. Price, \$1.00.
The World of Matter.
A Guide to the Study of Chemistry and Mineralogy.
-BY-
HARLAN HAGUE BALLARD, A. M.
Cloth. Illustrated. Price, \$1.00.

CIVIL ENGINEERING.

Notes on the Testing and Use of Hydraulic Cement.
-BY-
FRED P. SPAULDING.
Bound in Cloth. Price, \$1.00.

GEOLOGY.

A Text-Book Petrology.
-BY-
FREDERICK H. HATCH, Ph. D., F. G. S.
Cloth. Illustrated. 90 Cents.

MECHANICAL.

Science of Mechanics.
A Critical and Historical Exposition of its Principles.
-BY-
Dr. ERNST MACH.
Translated from the German by Thomas J. McCormack.
Bound in Cloth. Price, \$2.50.

Theoretical Mechanics.
PART I. Kinematics.
Cloth. Price, \$2.25.
PART II. Introduction to Dynamics; Statics.
Cloth. Price, \$2.25.
-BY-
Prof. ALEXANDER ZIWET.

The Mechanics of Hoisting Machinery.
-BY-
Dr. JULIUS WEISBACH
AND
Prof. GUSTAV HERRMAN.
Translated from the German by Karl P. Dahlstrom, M.E.
Cloth. Illustrated. Price, \$3.75.

The Corliss Engine.
-BY-
JOHN T. HENTHORN,
And Its Management by **CHAS. D. THURBER.**
Edited by Eghert P. Watson.
Cloth. Illustrated. Price, \$1.00.

MINERALOGY.

Tables for the Determination of the Rock Forming Minerals.
COMPILED BY
J. LOEWINSON-LESSING.
Translated from the Russian by
J. W. GREGORY.
Cloth. Price, \$1.50.

TERMS: CASH WITH ORDER.
Scientific Publishing Co.,
Publishers and Booksellers,
27 PARK PLACE, - NEW YORK.

LANDS AND MINES FOR SALE.

FOR SALE.

CANNEL COAL MINE

well located, excellent quality; good, well established business throughout the U. S. and Canada.
Very similar in appearance, but of better quality than English Cannel.
Address

OTIS E. YOUNG, Lorain, Ohio.

FOR SALE - THE CULPEPER GOLD MINE, containing 623 acres more or less; situated in Culpeper, Culpeper County, Va., near Richardsville; formerly owned by the late Charles Knapp. For terms, etc., apply to
THOMAS S. RHETT,
THOMAS A. WHELAN,
Sustitute Trustees, 13 East Lexington st., Baltimore, Md.

GOLD PLACER GROUND

THREE THOUSAND ACRES PATENTED SUITED FOR HYDRAULICKING.

Plenty of water, with good head; gold from grass roots to bedrock. Ten thousand dollars already expended. Dirt runs from 15 cents to \$3.00 per yard. All conditions for success are present.

For sale at low price, or will take partner with capital. Maps and reports on request to intending purchasers.

W. H. ROOT, Laramie, Wyoming.
Reference given in London, New York or Chicago.

GOLD MINE INTEREST FOR SALE IN celebrated Placerville district, Idaho. Ore yields over \$15 ton; fine free gold worth \$18 per ounce; 7-foot vein; will stand investigation; mine will pay for itself within a year. Call or write to **C. C. MARCH, Room 18, 184 Dearborn street, Chicago, Ill.**

I CONTROL: VALUABLE PAYING GOLD MINES

In Colorado, California and Oregon,
Capable of very large dividends. Correspondence Solicited.
E. WALLACE,
Room 54, 155 Washington St., Chicago.

FOR SALE.

A three-quarter interest in a GROUP of GOLD QUARTZ MINES, partly developed. Price low. Cash payment required, \$1,000; balance on 100 days' option. Address

CALIFORNIA, Engineering & Mining Journal.

GOLD MINE FOR SALE.

A fully developed **GOLD MINE** in Virginia is for sale, in part or whole, at **one-fourth** the sum for which a property of the same value could be purchased in a Western State, present controllers not having sufficient capital to put down a chlorination plant and operate it. There are eight to ten true fissure veins assaying \$10 to \$275 per ton. Mill of 10 stamps, engine, boiler, etc.; miners' wages, \$1 per diem; 274 acres of land, over half, under cultivation; plenty of wood and water; good residence and all necessary outhouses. A rich **magnetic iron ore vein, free from sulphur,** crosses the property for three-quarters of a mile; five miles from railroad station. Mining can be done 12 months in the year. No snow blockades; no blizzards. Address

FRANK SMYTH, 904 12th St. N. W., Washington, D. C.

MINE AND SMELTING WORKS FOR SALE. IN GERMANY.

The works are in first-class order and have been in operation for centuries. The supply of ores is inexhaustible. Present production, about 1,500 tons of lead and 7,000 kilos of silver yearly; can easily be increased. High profits guaranteed.

The amount necessary for buying the property and providing working capital is one and a third million marks (\$320,000). Address

SMELTING WORKS, "Engineering and Mining Journal."

MACHINERY AND SUPPLIES FOR SALE.

FOR SALE CHEAP

A Good Instrument for a German Engineer.

- 1 German Mining Theodolite, with extra level for short level work.
 - 1 Eccentric Telescope.
 - 1 Metric Sliding Leveling Rod.
 - 1 Lantern for same (in case).
 - 1 box with metre reel and 6 screws for spreizen-aufleitung of theodolite, and set plate for theodolite on tripod.
- Manufactured by LINGKE, of Freiberg, Germany.

Address Theodolite,
ENGINEERING AND MINING JOURNAL.

SECOND-HAND RAILS

We own, and offer for sale cheap, about 100 tons of second-hand 52-lb. Steel Rails, all carefully selected for re-laying, and practically as good as new. Write or wire at our expense.

ROBINSON & ORR,
No. 419 Wood Street, Pittsburg, Pa.

FOR SALE, CHEAP.

Fifteen miles, more or less, of Spiral Weld eight-inch pipe newly coated with maltha; weight, 7-88 pounds per lineal foot; in lengths 16 to 20 feet; warranted by manufacturer to stand a pressure of 500 pounds per square inch, and especially adapted for irrigation and water-works. Inquire of

THE WAUKESHA HYGIEIA MINERAL SPRINGS CO.,
1908 Wabash Avenue, Chicago, Ill.

FOR SALE CHEAP.

- 3 Lidgerwood Hoists.
 - 2 Raymond Crushers } Nearly new.
 - 2 Raymond Pulverizers }
 - Buckeye Tangeye 140 H. P. engine.
 - Boilers, Conveyors, Cars, Cages, etc.
- At Republic, Mich.

Send for itemized list.

CHARLES E. GREGORY CO.,
47-49 S. Jefferson St., Chicago, Ill.

FOR SALE OR RENT.

The Toston Smelter. Specially adapted for pyritic smelting, capacity 100 tons per diem. On the Northern Pacific R. R., within a few miles of the extensive gold deposits of Radersburg, St. Louis, Winston, &c. Apply
MANAGER,
Toston Smelting Co., Toston, Montana.

MISCELLANEOUS WANTS.

AN AGENT AND PROMOTOR WITH unique-able references and 25 years' business experience in Chicago is especially qualified to act as agent and to promote the interests of manufacturers, desiring such services. Address **G. D. GREGORY,** Room 513, 218 La Salle street, Chicago, Ill.

THE HASENZAHN
DIAMOND BIT ROCK DRILL
FOR HAND AND OTHER POWER.
Brings out a Core. Write for Particulars.
WM. HASENZAHN, Mfr.,
135 West Second Street, Cincinnati, Ohio.

HUNT & ROBERTSON,
77 PINE ST., NEW YORK,
ANALYSTS & ASSAYERS,
MINING ENGINEERS.
Specialty Made of Copper Metallurgy.

THE CANADIAN COPPER CO.
HEAD OFFICE:
Room 201 Perry-Payne Bldg., Cleveland, O.
Miners and Smelters of Copper-Nickel
Ores at Sudbury, Ontario, Can.
COPPER-NICKEL.

BALTIMORE
Copper Smelting and Rolling Company
(THE BALTIMORE COPPER WORKS).
Office: KEYSER BUILDING,
BALTIMORE, MD.
INGOT COPPER. SHEET COPPER.

J. STOCKLY CARY, Chemist and Assayer Dept of Mines and Mining; Chemist of National Jury of Awards. World's Columbian Exposition.
JOHN E. MOORE, formerly with Rattle, Nye & Hollis, Rookery Building.

CARY & MOORE,
Analytical and Consulting Chemists, Samplers and Assayers,
1539 UNITY BUILDING, - CHICAGO.
Specialty: Coal and Coke Analyses.

THE AMERICAN METAL CO.,
LIMITED,

80 Wall Street (P. O. Box 957), NEW YORK.
114 Laeade Building, ST. LOUIS, MO.

Copper, Copper Ores and Mattes, Tin,
Lead, Spelter, Antimony,
Nickel, Aluminum.

ADVANCES MADE ON CONSIGNMENTS.
AGENTS FOR

HENRY R. MERTON & Co., London.
METALLGESELLSCHAFT, Frankfurt-on-Main.
WILLIAMS, FOSTER & Co., } Limited, Swansea, Eng.
PASCOE GRENFELL & SONS, }
BALBACH SMELTING & REFINING Co., Newark, N. J.

ORFORD COPPER CO.,
COPPER SMELTERS

Works at Constable's Hook, N. J., opposite New Brighton, Staten Island. Copper Ore, Mattes, or Bullion purchased. Advances made on consignments for refining and sale. Specialty made of Silver-Bearing Ores and Mattes.

SELL
INGOT AND CAKE COPPER.
President, ROBERT M. THOMPSON,
Office, 37 to 39 Wall Street, New York.

JAMES & SHAKSPEARE,
ENGLAND.

1 Metal Exchange Buildings, London, E. C.,
AND
17 Irwell Chambers West, Liverpool.

METALS, MATTES AND MINERALS.

Cable Address, METALLURGY, LONDON.
Use A B C Code, 4th Edition.

LEDOUX & CO.

9 Cliff Street, N. Y. City,
Assayers, Metallurgists
and Engineers.

Sample and Assay Ores, Metals and Furnace Products of all kinds. Test by working processes all classes of ores and determine the best method of treatment. Analyses of chemicals, waters and all industrial products.

FORMERLY OF NO. 10 CEDAR STREET.

RIGGETTS & BANKS,

104 John St., New York.

ORES TESTED!

Complete Ore Milling and Testing Works or making practical working tests of ores to determine the Best Method of Treatment. Milling, Metallurgical and Chemical Processes investigated.

Assays and Analyses!

CIRCULARS AND TERMS ON APPLICATION.

THE VANDENBERGH
LABORATORY OF CHEMICAL INDUSTRY

F. P. VANDENBERGH, B. S., M. D.;
R. A. WITTHAUS, A. M., M. D.

Chemical Engineers, Analytical and Consulting
Chemists.

New Processes Investigated: mineral properties prospected and reported upon; assays and analyses of ores, metals and metallurgical products.

LABORATORY:
31-34 LEWIS BLOCK, BUFFALO, N. Y.

Established 1845.
W. & L. E. GURLEY, TROY, N. Y.
Largest Manufacturers of Civil Engineers' and Surveyors' Instruments. Send for Illustrated Circular Price List showing latest improvements.

DR. HENRY FROEHLING,

Chemical and Metallurgical Laboratory.

7 South 12th Street, Richmond, Va.

Assays and analyses of ores, furnace products, clays, limestones, phosphates, waters, coals, oils, gases, etc. Price lists of analyses on application.

Mines and mineral properties in the South examined.

HASTINGS, JOHN B.,

Consulting Mining Engineer.

Office: Broad St. House, Old Broad St., London, E. C., England.
Present Address: Boise City, Idaho, U. S. A.

THE COWLES ELECTRIC SMELTING & ALUMINUM COMPANY,

LOCKPORT, N. Y.

Offer Commercially Pure Aluminum in Ingots, Slabs Sheet, Wire, and Castings at lowest market rates.

Aluminum Bronze, Aluminum
Brass, Silver Bronze,
Silicon Bronze, and
Manganese Bronze.

To Our Foreign Subscribers

who desire to purchase American goods, we shall be pleased to furnish information concerning supplies of any kind, and forward them catalogues and discounts of manufacturers in each line.

THE ENGINEERING AND MINING JOURNAL

LEWISOHN BROTHERS,

P. O. BOX 1247.

81 AND 83 FULTON STREET, NEW YORK.

LAKE COPPER, ARIZONA CASTING COPPER.

SOLE AGENTS A. C. C. AND M. A. BRANDS.

ADVANCES MADE ON COPPER, MATTE, AND ORES

AGENTS FOR THE FOLLOWING MINING COMPANIES:

Boston and Montana Consolidated Copper and Silver Mining Company, Montana.
Butte & Boston Mining Company, Montana.
Arizona Copper Company, Arizona.
Huron Copper Mining Company, Lake Superior, Mich.

Tamarack Mining Company, Lake Superior, Mich.
Osceola Mining Company, Lake Superior, Mich.
Kearsarge Mining Company, Lake Superior, Mich.
Santa Fe Copper Company, New Mexico.
Peninsula Copper Mining Co., Lake Superior, Mich.

HIGH GRADE HOISTING ENGINES AND DRUMS.

We have some of the heaviest plants in the world in Iron, Copper and Silver Districts of United States.

OUR **CORLISS ENGINES ARE DESIGNED EXPRESSLY FOR HOISTS**

SEND FOR CATALOGUE.

OTHER SPECIALTIES.

Diamond Core Drills.
Rock Drills and Air Compressors.

Cable Address:
"BULLOCK."

M. C. BULLOCK MFG. CO.
37 Canal Street, Chicago, Ill.