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Iron Trade in Europe.

The iron trade all over Europe is in a prosperous condition. In France there has been only a slight increase in production, but the iron works are all busy. In Belgium the volume of trade has increased, and some of the larger works have difficulty in keeping up with orders, especially for rails and structural steel for export. In Germany there is also reported orders enough to keep the works busy. The exports of iron and steel of all kinds from Germany for the 11 months to November 30th were 1,387,311 metric tons, an increase of 68,150 tons, or 5.2 per cent. over 1894, and of 276,083 tons, or 24.8 per cent., over 1893. In Austria-Hungary there was in November and December a remarkable revival in the iron trade, and all the works are full of orders.

American Shipping Trade.

One great drawback to the development of this now reviving industry, and which there is quite an inclination in influential political and financial circles to foster, is the lack of proper docking facilities; probably the result of the almost extinction of the American shipping industry. To take two notable cases for example, the Indiana, United States battleship, could not be conveniently docked, at least with safety, in the United States, so that it was contemplated sending her to the English Government dock at Halifax. Now, again, the accident to the St. Paul necessitates a thorough overhauling, and although it occurred within comparatively few miles of New York harbor, and the steamship was finally brought up to her dock as usual, she has to go as far as Newport News for examination.

The Roentgen Radiation.

We draw the attention of our readers to the article especially written for the Engineering and Mining Journal by Dr. Charles H. Lees, of Owens College, Manchester, England, on the above subject. This article is accompanied by the reproductions of four photographs taken by Prof. Roentgen himself, which are probably the first from the original source that have appeared in this country. As will be seen by reading the article these photographs are very instructive, and being classified, so to speak, indicate the lines upon which there is a possibility of further successful development and investigation.

According to Mr. Edison there is a field in one direction most interesting to many of our readers, and that is the application of these X rays for the purpose of tempering various metals. Mr. Edison states that he has arrived at some astonishing results with aluminum, hardening and tempering the metal to such an extent that it was scarcely recognizable, and that he is going to prepare some specially large tubes to carry this out on a practical scale, and that he is confident that there will be some valuable results and probably application to copper as well as to aluminum.

Trade with Chile.

There has been an apparent neglect on the part of American merchants of the advantages to be derived by more closely cultivating trade with Chile. One of the most productive portions of the Republic is the Province of Tarapaca, to which is supplementary that section of Bolivia served by the Antofagasta & Bolivia Railroad. Most of the tonnage and value is mineral, not specially required in or exported to the United States, but at the same time the production of which demands a supply of machinery and material, which can be better furnished from the United States than from any other country. The result of this is that vessels freighted to the Chilean ports do not find sufficient return freight for want of a more intimate relation of trade. A small amount of wool and a few hides as a rule constitute the return cargoes, while one of the most valuable products of this region, and which forms such an important article of commerce between Chile, Great Britain and the rest of Europe, viz., nitrate of soda, is almost neglected.

If the Department of Agriculture were to make a systematic effort to instruct farmers and planters as to the value of nitrate of soda as a fertilizer it would undoubtedly lead to such a demand as would tend to increase our general trade with Chile, and provide the return cargoes so greatly needed by the vessels now nearly empty on their homeward voyage which had carried American products to that country.

Analysis of American Refined Copper.

An interesting paper by Harry F. Keller, Ph.D., is published in the Journal of the Franklin Institute on the "Analysis of American Refined Copper." This subject is at present a very important one, the competition between American refined copper and English, French and German refined copper being more keen than ever before.

Naturally, the copper produced in the Lake Superior region is now, as

in the past, expected to supply the grade of metal with the highest conductivity owing to its natural purity. Recently so large a percentage of copper produced in this country has come from sulphide ores, and these frequently containing considerable impurities affecting the quality of the refined metal, that the perfection of the refining and the perfection of the analysis in determining the purity are of greater interest and importance than at any previous time. As is pointed out by Dr. Keller, very slight traces of the impurities retained in the refined copper by the electrolytic process affect the conductivity to a greater extent than is the case in the best Lake copper. Almost the only impurities traceable in Lake copper consist of silver and iron, and these in amounts so small that in many cases they would be disregarded or possibly not detected by analysis. With electrolytic refining there will, in spite of every precaution, occasionally remain small quantities of bismuth, antimony, arsenic, selenium and tellurium.

All electrolytic refiners fail at times to bring up the refined copper to the same standard, and usually test their product so as to grade it first and second. For sake of example, the Baltimore Works have a first-class brand known as B. E. C., and what does not come up to that standard is cast into C. C. W. ingots.

In consequence of the growth of this method of refining in this country it is impossible to make too close a study of this analysis of electrolytic copper, as only by this means can these defects be removed and the standard of electrolytic copper brought up to that of Lake. It is perfectly true that in some cases where those refiners who are doing electrolytic work, and who have a simple proposition in the matter they are handling, make a product equal in conductivity and in every other respect to Lake copper; but, unfortunately, there are many matters that are not so easy to handle. The method adopted by Dr. Keller for making an accurate analysis of electrolytically refined copper appears to us to be both practical and simple, and we give an abstract of his method on another page.

English Mining Finance.

Our London letter last week, which is always worth reading, being full of financial news and right up to date, informed us that the prospect of a boom for the sale of American mining properties might be considered at an end for the present, as the Exploration Company, of London, representing the strongest financial and influential channel, had abandoned several options which they had considered worthy of being taken at some expense to themselves, and the authoritative announcement is made that the Exploration Company has no intention at present of promoting sales of American mines. This is a business-like announcement, and may save vendors and promoters considerable time and money by being made in this public manner.

This will no doubt be a great disappointment to many fortunate owners of prospects or options upon more meritorious properties in this country, as the London market, if properly handled, is undoubtedly the finest field that has ever been exploited by schemers. To give an illustration of the opportunities that occur, and as verifying the old saying, "When thieves fall out, honest men may come to their own," and as it is very rare that the other proverb proves true, viz., that "There is honor among thieves," the mysteries of promoting and underwriting have been laid bare in a lawsuit in London. The facts were undisputed and revealed that a vendor, Carter by name, agreed to sell certain mining concessions in the Gold Coast Colony entirely undeveloped for the sum of \$462,500; \$150,000 of which was to be paid over in cash. The next step was the registration by the purchaser of another company with a capital of \$5,000. This intermediary or buffer company, as it is appropriately described by the *Economist*, subsequently decided to increase its capital from \$5,000 to \$1,175,000, offering the shares to the public at that capitalization. The next step was the formation of a syndicate with \$5,000 which agreed to purchase the concessions for the sum of \$975,000, of which \$50,000 was to be payable in cash and the balance in cash or shares at the option of the directors. The whole transaction was simply to cover up and conceal the fact that what was offered to the company for \$975,000 had been purchased for \$462,500 within a few days or possibly even hours, and in all probability the real price of the concessions without a stroke of work was more nearly represented by the original capital of \$5,000 than any other figure," and yet this went through by the aid of a board of eminent "guinea pigs" and the action was brought to recover money invested.

Economy of Electric Light.—Mr. W. H. Preece, in a recent interview reported in a London daily paper, stated that since the electric light was introduced into the General Post Office, the number of days of absence among the employees and officials had been reduced at the rate of two per annum for each one. By calculating the amount of saving represented by these additional days, he finds it to be sufficient to pay for the electric light.

NEW PUBLICATIONS.

ELEMENTARY LESSONS IN ELECTRIC TELEGRAPHY. By L. Michaut and M. Gillet. Paris; Gauthier-Villars et Fils. 1895. Pages, 210. Illustrated, and Appendix. Second Edition. Price 75c.

Encouraged by the favorable reception accorded their first edition of the same work, the authors have just issued a second edition, containing much new material and a thorough revision of their earlier work. The book is intended to instruct the old operator in the practical details of the apparatus he uses, and also to assist the beginner who rightly considers a familiarity with such details a proper, if not necessary, branch of his study of the art of telegraphy. The authors have endeavored to make this book practically useful, not only in setting forth the subject in a practical way, but also as a guide to which to turn in case of difficulties. In line with the latter object the appendix contains numerous tables of the resistances of wires, etc., together with thirteen practical problems and their solutions. To an American telegrapher who is able to read French the book will prove interesting as illustrating points of difference between his own and French practice, and instructive in its practical points. The fact must be borne in mind, however, that it is intended to be elementary in its scope.

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 on another page of the Journal.

Pennsylvania: Department of Internal Affairs. Reports of the Inspectors of Coal Mines for 1894. Harrisburg, Pa.; State Printers. Pages, 571; illustrated.

Professional Papers Read Before the American Institute of Mining Engineers. By Thomas Arthur Rickard. New York and London: The Scientific Publishing Company. Pages, 351; illustrated. Price, \$2.

Proceedings of the Twenty-First Annual Convention of the American Bankers' Association, held at Atlanta, Ga., October 15th, 16th, and 17th, 1895. New York; Published by the Association. Pages 248.

Republica Mexicana: Estadística Fiscal; Datos Relativos a Septiembre de 1895, y de 1894; y al Primer Trimestre de los Años Fiscales de 1895-96 y de 1894-95. City of Mexico; National Printing Office. Pages, 68.

CORRESPONDENCE.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested. Letters should be addressed to the MANAGING EDITOR. We do not hold ourselves responsible for the opinions expressed by correspondents.

Mining Industry of Bolivia.

Sir: I have read your interesting article on the "Mining Industry of Bolivia" in your valuable paper taken from a report on the trade of Bolivia, by the British Consul at Lima. While I have no doubt that the information about the mines and deposits of ore are in the main correct as emanating from so high an authority as Mr. John B. Minchin, I beg to rectify an error as to the rate of freight from and to Corocoro and the Pacific coast, having been connected with the transport traffic for the last eight years by way of Desaguadero.

The Southern railways of Peru have had for the last three years special contracts with all the mining houses at Corocoro to transport their total output from the mines on board ships at Mollendo, at the rate of B's 1.65 per Spanish quintal of 46 kg. each. This amounts to B's 36.40 per English ton of 2,240 lbs., or, at the present rate of exchange of 19d. per one Bolivian, to £2 17s. 8d. per ton.

This includes agencies at Corocoro, Nazacara, Desaguadero, Puno and Mollendo, with launch hire at the last-mentioned port and all other expenses for embarking. Considering that there are 30 miles of land transport of very difficult road, 42 miles of river transport, 120 miles of lake transport and 325 miles of railroad transport, this rate cannot be considered high, but on the contrary compares, I believe, very favorably with any other road.

As to inward freight the Southern railways of Peru puts all kinds of machinery from Mollendo to the mines at Corocoro for £7 10s. per ton, according to their published tariffs.

The opening of the navigation of the river Desaguadero, eight years ago, has enabled the Southern railways of Peru to give all these facilities for transport, lowering the rates to about one-half of what was paid formerly for llama transportation by way of Arica, though a route much shorter. The facilities for getting machinery by way of the river has contributed greatly to improve the methods of working the mines at Corocoro, and every establishment there has now steam plants for hoisting and grinding ore, thus lessening the cost of production and augmenting their yearly output.

JOHN BERGELUND.
DESAQUADERO, Peru, Nov. 30, 1895.

Milling in the Cooney Mining District, New Mexico.

Sir: In the *Engineering and Mining Journal* of December 14th, 1895, Mr. L. W. Tatum, who from December 1st, 1894, to December 1st, 1895, was general manager for the Silver Creek Mining Company, writes, under the heading "Improved Method of Handling Pulp in Silver Mills," an article for the benefit of others who have a similar problem to solve. But as Mr. Tatum never did perform what he states to have done, I would advise some caution and investigation before adopting his proposed plan of working. The figures below are from Mr. Tatum's own monthly statements, and cover the entire period that he was in charge. I have divided them in two semi-annual statements, thus allowing Mr. Tatum six months to investigate and work out his improvements, and six months to demonstrate the same.

These, Mr. Tatum's own statements, thus show for the first half year, a saving of 63%, at a cost of \$4.57 per ton, and for the second half year a saving of 69%, at a cost of \$5.03 per ton. Of course the expenses under general supplies are greater the last half year, but Mr. Tatum ought not charge the company up with the cost of 4 left-handed mullers that he

ordered, when the mill is a right-handed mill. Furthermore, Mr. Tatum received the mill in good working order and left it a total wreck from the rock-breaker to the engine. As example, the "mullers" in the pan were run so long that not only the shoes were worn out, but the muller too, so that now it would be impossible to fasten any shoes to them. As to Mr. Tatum's comparison between November, 1894, and November, 1895, it would certainly not give a fair idea of the working, as he during the first 20 days of November cleaned up \$5,000, and during the last 10 days of same month, \$11,000. Looking over the company's accounts, I find that during November, 1894, the consumption of fuel was 6½ cords per day, and during November, 1895, 7¼ cords per day, or at the rate of 10½ cords per 40 tons of ore treated, and not 5½ cords as Mr. Tatum states. So much about Mr. Tatum's improvement as to cost of treatment.

As to improvements in treating the ore and saving the slimes, Mr. Tatum writes concerning the *modus operandi* he found on his arrival. "The slimes from sand tanks were allowed to run to waste sluice, and were entirely lost." This is not so. Before Mr. Tatum took charge the slimes from sand tanks were run through three large settling tanks outside of the mill, the overflow from these tanks returned to the mill, were then pumped up in a large settling tank above the charging floor, from which tank the slimes were emptied directly into the pans, the overflow from this last tank was run into the battery. All that Mr. Tatum did do was to add two more settling tanks outside of mill. Mr. Tatum furthermore writes "the coarse sand only contained about 20% of the value of the ore." This is not very surprising, as by pulverizing through 40 mesh screens only 19¼% of the pulp is coarser than 60 mesh. Mr. Tatum then adopted a 22 mesh screen but he forgot to tell that instead of clear water, he used the overflow from the settling tanks which got thicker and thicker so that after 24 hours run, no ore was crushed, the slime-water being so thick that nothing but fine slimes were discharged from the bat-

tery for the commercial production of calcic carbide, which, he says, is an abortion of the old Siemens electrical furnace, and under which Willson method, he says, not a pound of calcic carbide has ever been produced, is likely to make serious trouble for some one. So we have thought for some time. Dr. Birchmore takes strong ground that the gas in question will find no market as an enricher. It certainly will not, from a commercial standpoint, unless carbide can be produced for less than \$20 per ton, in support of which view I may refer to Professor Lewes, of London. Figures have been given in detail in the technical papers, and there is no excuse for ignorance on this subject. From a chemical standpoint, it may be shown that it cannot be used at all for such a purpose. Dr. Birchmore is of the opinion that the gas must be burned pure. He says the idea of mixing it with air is simply ridiculous. He hints that those who prefer acetylene to eyes will use the new gas.

Mr. John C. McMinn, M. E., recently read a paper before the Northwestern Electrical Association on the subject of acetylene gas, which was most eulogistic of the whole matter. He has been to Spray, says he has seen two tons of calcic carbide produced here in two days, at a cost of \$25 per ton, and then stops his flow of alleged facts. Well, at this figure the "revolution" is over. But we opine that Mr. McMinn is in error in his figures. If he will be good enough to furnish us with the items of his bill of costs we will be indebted. We learned addition early in life. I believe this carbide party not only early in life learned "addition" but also "subtraction," "division," and undoubtedly "silence." In summing up Mr. McMinn says:

"Of the following fact, I am certain: (1) The gas is intensely brilliant." Now, this is news indeed, and we are all much indebted to Mr. McMinn! He is also certain that it has a disagreeable odor! And then he concludes that in all probability it is going to do wonders, even with calcic carbide at \$50 per ton. This gentleman should communicate at once with the

	Ore crushed. Tons.	Average value per ton.	Value in ore.	Bullion produced.	Milling expenses.					Total milling expense.
					Wood, oil, etc.	Chemicals.*	Mercury.	Gen. supplies.	Wages.	
December, 1894.....	434	\$21.14	\$9,174.76	\$8,920.23	\$791.55	\$514.08	\$253.75		\$1,559.38	
January, 1895.....	515	19.71	10,150.65	7,218.88	702.55	506.47	293.61	\$112.23		1,441.11
February, ".....	595	17.56	10,172.96	7,245.49	667.51	635.29	298.92	86.64		1,473.23
March, ".....	864	16.1	14,035.44	7,780.62	825.70	920.81	3.507			1,341.20
† April, ".....	94 slime.	20.00	1,800.00							
	997	15.04	14,994.88	8,899.89	941.74	599.23	162.15	67.68		1,563.70
May, ".....	889	10.05	13,339.15	9,937.19	947.58	431.10	208.86	10.07		1,653.68
	4,379		\$73,758.14	\$47,192.30	\$1,879.62	\$3,607.89	\$1,546.36	\$276.62		\$9,721.95
† In April 94 tons of slime, of \$20 per ton. Cost of milling, per ton, \$1.57. 63% saved.										
June, 1895.....	60 slime.	\$20.00	\$1,200.00							
	656	16.44	10,784.64	\$4,997.57	\$390.20	\$163.95	\$312.30	\$93.78		\$1,455.56
July, ".....	361	15.85	5,721.85	3,595.35	318.53	281.08	52.15	69.64		1,254.71
August, ".....	643	16.41	10,551.63	7,781.55	179.09	210.99	971.94	11.35		1,472.61
September, ".....	727	15.21	11,079.48	8,554.15	669.54	575.61	34.72	793.12		1,301.04
October, ".....	751	17.91	13,456.41	9,117.63	902.24	532.57	524.15	357.73		1,395.10
November, ".....	874	21.41	18,712.34	16,467.42	982.09	751.55	1,295.05	930.13		1,600.68
	4,072		\$71,500.35	\$49,913.77	\$3,759.69	\$2,817.59	\$3,199.31	\$2,257.75		\$8,480.70
‡ In June 60 tons of slime of \$20 per ton. Cost of milling, per ton, \$5.03. 69% saved. *Bluestone and salt.										

tery and the battery had to be shut down until all the slimes had been cleared up. Nor does Mr. Tatum's statements show an output of 40 tons per day.

Thirty mesh screens are now being used at the Confidence mill on the same character of ore as was milled in the "Sheridan" mill (the mill referred to), but I am satisfied that 22 mesh would be altogether too coarse if clear water is used in the battery. The pan capacity of the mill is 32 tons per day of 24 hours (6 hours charge), being 4 pans with 1½ tons capacity and 2 pans of 1 ton capacity.

CARL ANDERSEN.

MOGGOLON, N. MEX., Jan. 19, 1896.

The Acetylene Mystery.

Sir: The carbide schemers have now received their first severe check in that semi-insiders, some of the original purchasers of "rights," are notifying the principals that they will stop payments until the parent company managers show some actual evidence of making their original promises good. In the meantime scientific men are announcing the results of their studies and experiments, all in favor, of course, of the beauty of acetylene gas, but all against its utility on any of the lines laid down by the present carbide party, and all against this party's promises of the cost of calcic carbide at \$5 to \$7 per ton. The carbide party, in the meantime, is harping away on their old promises, and are producing no facts to show their correctness.

The technical, and some of the independent press has taken up the subject, and are boring deep for reasons. This is distasteful to the carbide party. They prefer generalities, not reasons or facts. Fancy is their stronghold and mainstay. They prefer to refer to the beauty of acetylene, which we all admit, rather than to their promises as to the cost of its base—calcic carbide. By this time it is admitted by all that their original claims as to cost, are ridiculous. This being so, naturally all their prognostications as to their "revolution," based upon the original false estimates of cost of the base of their gas, fall to the ground.

Dr. Birchmore says that not a single lawyer consulted by interests known to him has taken any other position than that the Willson-Dickerson-Suckert patents are only waste paper, so far as their claims to the exclusive production of calcic carbide are concerned. I looked into this subject some time since. I am pleased to have such corroboration as is afforded by Dr. Birchmore's statements. This gentleman has made a valuable study of this subject. He states that he has worked with (1) the Willson patent method, (2) the Morehead (Willson) unpatented method, (3) the Cowles patented method, (4) the Clark patented method (5) and by the Moisson unpatented method, and that modifications of the latter method will produce carbide more cheaply than the Morehead (Willson) unpatented method. He calls attention to the fact that in the judgment of some good lawyers the carbide party's antics in exhibiting the Morehead (W.) unpatented method as the basis of the Willson patented method

General Electric Company and get some information which would probably stop him in his mad career.

When the calcic carbide party first began business it was going to send calcic carbide around in casks. This would not do, they soon found. A house, with a cask of it in the cellar, on fire, would simply have been turned into a gas works after the fire engines got to work. The greater the fire the greater the water, and the more water on the calcic carbide, the more gas. The first house has not come down yet! It is in the clouds, with this part of the scheme. The next plan was the service of cylinders—"pocket flasks"—and every man could find his own key-hole. In Europe the students of this subject having dropped the first plan and gone to the second, are now giving this up and are in a quandary. But adhering to the present party's plan of serving this gas in cylinders we have actual figures by Mr. F. H. Lewis, 406 Locust street, Philadelphia, (*Engineering News*, February 6th, 1896), which go to prove at least that this plan has grave defects. This gentleman states that he "had occasion sometime since to ascertain whether a small cylinder of about ½ cubic foot capacity could possibly contain the amount of gas that the company's orator in Philadelphia had declared it to hold. A little calculation showed that if the gas was present, as stated, its density must be nearly equal to that of cast iron." Referring to Dr. Birchmore's probably not fully considered suggestion, likely based upon the carbide party's figures, of storing a month's supply of gas for household use in a bottle of "very moderate dimensions," to contain, say, about 1000 cubic feet, Mr. Lewis shows that according to Dr. Suckert's own figures, would require a cylinder with an inside diameter of five inches, a length of 15 ft., and weight of about 300 lbs. Mr. Lewis then says:

"To make a lighter cylinder would indeed be practicable to sustain 40 atmospheres, but the critical point of the liquified gas is stated to be 98 degs. Fahr. (Suckert, in *Journal of Franklin Institute*), and at this temperature there would be an enormous increase in pressure, the exact amount of which is, however, probably still undetermined. It would clearly be unsafe to furnish or use cylinders which would not be entirely safe at temperatures of at least 100 degs. Fahr. Hence this estimate of 300 lbs. as the weight of cylinder and contents is believed to be a conservative one. . . . The fact which the acetylene gas people must face is this—that it is entirely unsafe to liquify a gas whose critical point is only 98 degs. Fahr., and subject such cylinders to the incidents of transportation and of ordinary use in dwelling-houses. It has been found necessary to adopt this view in the case of nitrous oxide for dentists' use, and it will be necessary with acetylene. If, then, 40 atmospheres at 70 degs. Fahr., is the limit of compressibility, the use of acetylene in cylinders is even more impracticable than its distribution by tanks and street mains."

What is the meaning of Mr. Lewis' mild hint about "danger in transportation"? The distinguished French chemist, Berthelot, says, after experiment, that gases which absorb heat in their formation, as acetylene,

cyanogen, etc., "although they may not be exploded by simple heating, can be made to explode by a sudden and violent shock." This statement refers to experiments carried on with gases under no pressure. Under such conditions, explosions result only in giving off great heat estimated by Berthelot at 2500 degs. C., as a maximum. When, however, such an explosion takes place in a vessel containing compressed acetylene, the free hydrogen has an expansive force enormously greater than the acetylene, which is still further increased by the great amount of heat liberated. Even the strongest vessels obtainable would burst long before the maximum of this pressure was reached. Or, in other words, the explosion of only a part of the liquid acetylene contained in a vessel would burst it before the rest had time to explode, although the remainder would

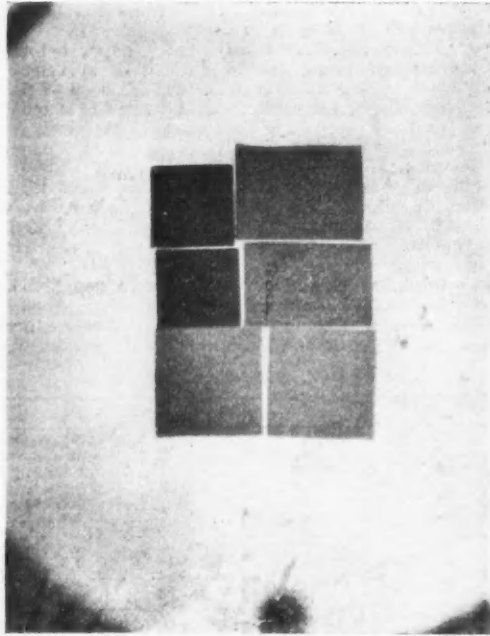


FIG. 1.

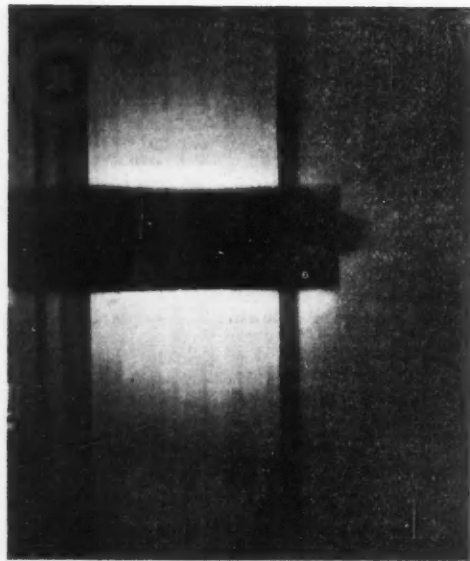


FIG. 2.

explode anyhow and the heated hydrogen would unite with the oxygen of the air causing a second explosion and conflagration.

This is possibly about what took place recently at New Haven. It is also what will occur at many other points before we get through, no doubt. Will the editor of the *Journal* please inform me where I can get a "small bottle" of this beautiful gas? I want one to put into the cellar of mine enemy! "O, that mine enemy might write a book!" will now be changed to the wish that he may "light up"—yea, verily, up he goes!—with acetylene!

I must beg Dr. Birchmore not to hit me when I'm down too hard with his light reference to the "bugaboo" of cost of power. He is a chemist. He must remember that this question of the cost of power does not belong to his profession and is such a deep one as to call out the best efforts of a most expert school of engineers, who are so busy with it that they haven't yet found time to get over into the doctor's professional field and wink slightly at problems which are keeping him busy. I'll venture the assertion that if the doctor will consult the editors of the *Engineering News*, which published his very able paper, he will have his mind opened somewhat upon this subject. He will find that really "cheap" power is a scarce commodity, and in making our best efforts to obtain it that the usual business rules are reversed in that generally as we better our facilities we increase our cost. I beg to call Mr. McMinn's attention also to this fact as it especially relates to Spray.

ACETYLENE.

THE ROENTGEN RADIATION.

Specially Written for the Engineering and Mining Journal by Charles H. Lees, D Sc., Owens College, Manchester, England.

The recent discovery by Professor Roentgen, of Würzburg, of a new kind of radiation, seems likely to bear such important fruit that it is incumbent on every one who is concerned in the practical application of science to make himself acquainted with the most important at least of the details of the discovery. The new rays, which in compliment to the discoverer we may call Roentgen rays, are produced by the discharge of electricity through vacuum tubes. When the exhaustion of a tube is

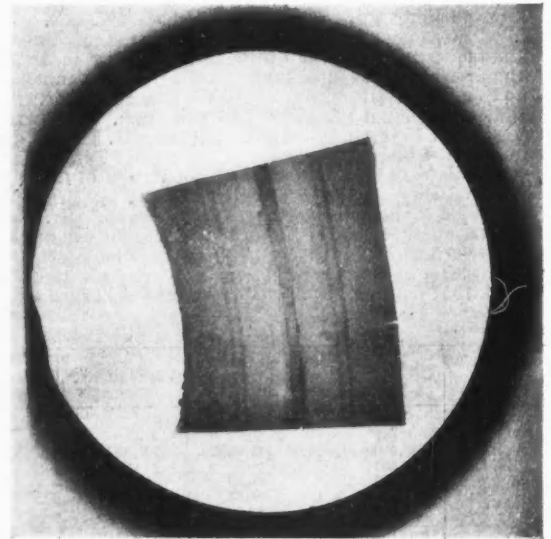


FIG. 3.



FIG. 4.

sufficient, the glow which surrounds the negative electrode extends to the walls of the tube, and causes them to become fluorescent. These fluorescent spots are the sources of the Roentgen rays, and up to the present no more direct method of producing them has been discovered. The rays are found to travel like ordinary light rays in straight lines, but unlike ordinary light they are transmitted by many opaque bodies, e. g., wood, paper, aluminum and flesh. They are capable of producing fluorescence in bodies like quinine, and are found to act on photographic plates and films. This latter fact has furnished a means by which the further properties of the rays have been investigated, but as no body has been found which refracts the rays, nothing of the nature of a lens has been used in taking the photographs which would be more correctly described as shadow pictures. Dense bodies like platinum, lead and iron, absorb the rays in even thin films, while films of zinc, glass and bone require to be thicker to produce the same absorption. Speaking generally, the absorption produced by a film increases with its thickness and with the density of the matter of which it is composed.

The accompanying photographs, taken by Professor Roentgen himself, illustrate some of the possibilities of the discovery. Fig. 1 shows the relative absorption produced by equal thicknesses of glass, aluminum, quartz and Iceland spar, interposed between the source and the plate. It shows also that the two latter substances have no polarizing effect on the rays.

Fig. 2 represents a painted wooden door with a strip of platinum foil attached to it, the source of the rays being on the other side of the door. The fine vertical markings are due to the brush marks in the paint. Fig. 3 represents a sheet of zinc, which appeared homogeneous to the eye, although composed of four pieces soldered together. Under the Roentgen rays the joints come out very distinctly. This may in the future give us a method of detecting flaws in metal, but it should be remembered that it is easier to detect an absorbent body in a non-absorbent one, than vice versa; we can, for example, detect a dark spot in a transparent piece of glass, much better than we can a transparent spot in a piece of dark glass. The distinctness of the joints in the figure is due probably to the presence of the strongly absorbent lead in the solder. The fourth figure shows the bones of a living hand, the outline of the flesh being only just visible. The spot on the third finger is caused by two rings. This figure suggests numerous applications of the new rays to surgery, some of which have already been made. All doubt as to the accuracy of Professor Roentgen's statements has been entirely removed by the repetition of his experiments by at least half a dozen distinguished physicists. The discovery has a scientific as well as a popular aspect, and the present question among scientists is "what is the nature of the Roentgen rays." There appear to be two opinions, each of which has its supporters. According to my view they are transverse vibrations of extremely short wave length—ultra-ultra-violet rays; while, according to the other, they are the longitudinal vibrations which always accompany the transverse vibrations of an elastic medium. Which of these views is the correct one, or whether they are both incorrect, are questions which only further investigation can decide.

ANALYSIS OF REFINED COPPER.*

For several years past I have given considerable attention to this subject. My analyses include the metal from the Lake mines, as well as copper obtained from Western mattes.

To the former, I found Hampe's original method † of analysis well adapted. This consists essentially in precipitating, by electrolysis, the greater part of the copper, and separating the metallic impurities in the usual manner from the remaining solution. The non-metallic elements,



PROF. DR. W. ROENTGEN.

such as oxygen and sulphur, are determined in separate portions of the sample.

For obvious reasons it is not desirable to employ this method in analyzing electrolytically refined copper. Accurate results can be obtained by following the plan proposed by Fresenius, ‡ but the separation of large quantities of copper by means of hydrogen sulphide, and the difficulty of accurate weighing bulky solutions, render this method very objectionable. A far more convenient process is the one recently published by Professor Hampe. § It is also more rapid than either of the two methods mentioned, and, with some modifications, it is especially well adapted for the analysis of most of the American refined coppers.

The process depends upon the removal of most of the copper as cuprous sulphocyanate.

The manner in which I practice it is briefly as follows: Twenty-five grams of material are placed in a tall, lipless beaker and treated with a mixture of 200 cu. cm. of water, 45 to 46 cu. cm. of nitric acid (specific gravity 1.21), and 25 cu. cm. of concentrated sulphuric acid (in case that much antimony or bismuth is present, as much as 100 cu. cm. of H_2SO_4 may be taken). The beaker is covered and heat applied until nitrous fumes are no longer given off and the solution then diluted with 200 cu. cm. of water to prevent the separation of copper sulphate. A rapid current of sulphur dioxide is now conducted into the liquid, the temperature of which is maintained at about 40° C. When the nitric acid is destroyed and the red fumes have disappeared, the liquid becomes turbid, owing to the precipitation of silver, selenium and tellurium. To insure the complete separation of the silver, a drop or two of hydrochloric acid may be added. After standing for 24 hours in a warm place, the solution is poured through a small filter into a graduated flask of two liters capacity. It contains bismuth, antimony, arsenic, iron, also nickel and cobalt, if these are present in the sample.

The sediment retained by the filter is composed of gold, silver, silver

chloride, selenium, tellurium, possibly also lead sulphate, and traces of bismuth and antimony.

To determine the elements in the filtrate, the greater part of the copper must first be removed. To this end a measured amount of standard potassium sulphocyanate solution (1 cc. = .05 Cu) is gradually added, while a current of sulphur dioxide is passed into the liquid. An excess of the sulphocyanate should be carefully avoided; it is preferable to leave some of the copper in the solution which should now emit a perceptible odor of sulphur dioxide. The delivery tube is withdrawn and rinsed off into the flask, the contents of which are then made up to the mark. To effect a thorough mixing it is well to pour the contents into a dry beaker, and to re-transfer them several times from one vessel to the other. The precipitate is allowed to settle and an aliquot portion, say 1,800 cu. cm. of the solution filtered off. The separation and estimation of the different metals is effected according to the usual analytical methods. It is hardly necessary to state that the sulphur dioxide must be expelled before hydrogen sulphide is passed into the liquid.

In calculating the amounts of the metals contained in the entire liquid, we must allow for the volume occupied by the precipitate. According to Hampe the specific gravity of the sulphocyanate is nearly 3, and since 25 grams of copper would give about 48 grams of this salt, the volume of the latter would be 16 cu. cm. The actual volume of the solution, therefore, is 2,000 — 16 = 1,984 cu. cm. Suppose, e. g., we had filtered off 1,800 cu. cm., and found in it .020 gram of arsenic, then

$$\frac{1984 \times .02}{1800}$$

$$1800$$

would be the amount of arsenic in the sample taken.

There yet remains to describe the analysis of the insoluble portion from which the main solution was filtered. It may contain, as I have already said, gold; silver (both in the metallic state and as chloride), selenium, tellurium, lead sulphate, and traces of bismuth and antimony, occasionally also copper.

It is best to detach, as completely as possible, the dry mixture from the filter, and to destroy the latter with fuming nitric acid in a small porcelain casserole. The detached portion is then added, and treated with the nitric acid till completely oxidized. After evaporation on the water-bath of the free nitric acid, the residue is digested with dilute hydrochloric acid, which leaves the silver in the form of chloride. This is filtered off, purified, and determined in the usual way. From the filtrate, selenium and tellurium may be thrown down by means of hydroxylamine hydrochloride. In the cold this reagent seems to have little effect, but, upon warming, a reddish turbidity is observed, which gradually collects in the form of dark flakes. These represent all the selenium and tellurium; they are collected on a tared filter and dried at 105°–110° C. to constant weight.

I have not been able to effect a clean separation of the two elements. Approximate estimations were made by fusing the mixture in a current of hydrogen with potassium cyanide; the aqueous solution of the fused mass was then exposed to the air, which caused most of the tellurium to separate.

Gold, lead, and the traces of antimony and bismuth are obtained by the ordinary methods.

Gold Mining in Victoria.—Forty years ago Victoria was the foremost gold-producer in the world, throwing even California into the shade. Although, however, its output has shrunk from over 3,000,000 oz. in 1856 to 673,000 oz. last year, has now again become a progressive quantity, and the product in 1895 was greater than that in any previous year since 1885. This was due to exceptional causes, the granting to the unemployed of free passes by railway from Melbourne to the various gold-fields having added 15,000 laborers to the number of prospectors and "fossickers." Quartz mining was less actively pursued in 1894 than in 1893, and the whole gain came from alluvial deposits. Of these, as usual, the most important were the "deep leads" or gravels contained in the beds of Pliocene streams now buried beneath lava flows. In Victoria these gravels are almost exclusively reached by shafts, the deepest of which, at Bendigo, is now down 3,122 ft. The government geologist reports that some extensive systems of deep leads have been discovered and traced out by borings, one system in particular, on the northern side of the Great Dividing Range and to the westward of the meridian of Melbourne, having an aggregate length of forty miles of leads. To work this an enormous capital would be required, and it is proposed to make it a national undertaking, subsidized by the government.

Desulphurization of Gold Ores by Ozone.—The desulphurization of gold ores by ozone and manner of making ozone were recently alluded to by the *Electrical Review* (London), and its treatment of the subject brings out the following interesting communication from Col. W. J. Engledue: "In a recent issue there is a note on the 'Desulphurization of Gold Ores by Ozone,' in which the idea is evidently ridiculed. It will, however, interest your readers to know that a patent ozone generator, in which I am interested, has been made by an eminent practical electrician, whose name is a household word in the profession, which enables ozone to be produced in quantities, heretofore impossible, and at a small cost.

"Atmospheric air is forced through the apparatus, and subjected during its passage to the action of a silent discharge of electricity at very high potentials, whereby the ozone is generated from the air acted upon.

"Such an invention opens up enormous possibilities, but its practical use for the treatment of refractory ores to render them more amenable to the action of cyanide or chlorination, can only be determined by tests on a large scale, arrangements for which are being made. There is, however, no doubt as to the value of the invention as enabling cheap ozone to be applied to other industries, such as the bleaching of linen, cotton, silk, and woolen fabrics, and of paper pulp; also for the purification and bleaching of oils, fats, waxes, etc., and for sanitary purposes, general purification and ventilation.

"The new ozone generator appears to be as far ahead of the Siemens's tubes, and other known methods for the production of ozone, as the use of steam is in advance of wind as a motive force; but, as the invention is not yet generally known, the scepticism of the writer of the note in question may be excused."

* Extract from Journal Franklin Institute, by Harry F. Keller, Ph. D.

† Zeitschr. f. Berg. Hütten u. Salinenwesen 21, 218, and 22, 93.

‡ Zeitschr. f. analyt. chem., 21, 229.

§ Chemiker Zig., 1893, 92, 1691.

AUSTRALIAN GOLD MINING AT DEEP LEVELS.

Written for the Engineering and Mining Journal by John Plummer.

The Melbourne *Argus* has published an interesting account of the manner in which payable quartz is being obtained from the deep mines sunk on the New Chum line of reef at Bendigo, the leading Victorian goldfield. The Victorians are firm believers in the existence of gold at deep levels, and when, at a depth of about 2,150 ft., the last payable reef appeared worked out, the miners, instead of abandoning their work, determined upon going further down, with the result that payable quartz was discovered at a depth of 2,800 ft. and in exactly the same formation as that met with in the higher levels. This has naturally acted as an incentive to those engaged in deep mining, and further developments in this direction may be anticipated. The New Chum reef is one of the richest and most extensive known and is worked by a number of companies, the new find being on a portion known as the New Chum Railway, from the ground being traversed by a railway line, and when, in September, 1894, a crushing of 29 loads taken from the cap of a reef met in the center country winze in this mine yielded 56 oz. 9 dwt. of gold, the fact was at once demonstrated that gold in payable quantities still existed in the saddle reef formations on the Bendigo goldfield at the great depth of 2,830 ft.

No time was lost in sinking the main shaft to a depth of 2,878 ft., and driving a crosscut east 232 ft. to the reef, so as to work the payable stone proved above to its best advantage. This deadwork has now been got through, under the mine management of Mr. C. S. Rowe, in a surprisingly short time. Where the reef has been recently struck in the 2,878-ft. crosscut the stone is small—1 ft. thick. The reef underlies to the west at an angle of 69°. A reef drive has been started to go south to pick up the shoot of gold on its southerly dip, as proved in the winze above. Referring to the longitudinal section above, showing the position of the winze where the payable quartz exists at a depth of 300 ft. (or 2,798 ft. from the surface), the first crushing of 19 tons from the extreme cap of the saddle reef only returned 5 oz. of gold. However, the second crushing of 29 loads taken just below the cap yielded 56 oz. 9 dwt., or an average of 1 oz. 19 dwt. per ton. In sinking the winze from 313 ft. to 340 ft., 57 tons were taken out and crushed for 101 oz. 9 dwt., the lode being from 3½ ft. to 6 ft. in width. At a distance of 330 ft. down the winze a north main level has been started and driven 28 ft. on the course of the lode. A crushing of 81 tons was put through from this drive for a return of 137 oz. 16 dwt. Here the stone averages 3 ft., the north face showing 2 ft. of stone in the back and 4 ft. going under foot. At a distance of 345 ft. in the winze a south level has been driven on the reef for a distance of 62 ft. The first crushing of 100 tons taken out from here yielded 171 oz. 17 dwt. A second crushing from here of 94 tons yielded 182 oz. 5 dwt.; the stone taken out averaged 5 ft. in width. Above this level a stope has been taken up 15 ft. in height and 48 ft. in length, and 244 tons broken down yielded 501 oz. 13 dwt. From the winze between 340 ft. and 360 ft. 21 tons were crushed for a return of 6 oz. 14 dwt. The crushing referred to totaled 616 tons, which, with pyrites and plates, has returned altogether 1,161 oz. 12 dwt., equal to an average of 1 oz. 17 dwt. 17 gr. per ton. The shoot of gold is going down horizontally, but the dip of the reef is to the south. The height of the payable shoot of stone is 52 ft., and so far proved to average 4 ft. in width; this is independent of the cap from which the first poor crushing of 19 tons came. The length on the line of reef is about 850 ft. The last payable shoot of stone worked in this mine was between the 2,025-ft. and 2,110-ft. levels. As an illustration of the cost of mining at deep levels, the following facts and figures have been taken from the balance sheets of this company between March, 1890, and up to September, 1892, during which period 25,013 tons of quartz were crushed, producing 21,948 oz. of gold, valued at £87,792, and from which £47,035 was divided among the shareholders. Therefore, the profits obtained in this instance were considerably more than half the value of the gold won, and the expenses of working included an extensive amount of deadwork and also adding more efficient machinery to the plant. This illustration is a fair average of the cost of deep mining in Bendigo, as the stone crushed was by no means a high average, but the fact must not be lost sight of that the quality of the stone so far proved in the winze is immeasurably superior to the last run of stone worked, therefore the profits should in this instance be much larger.

The company owning the adjoining claims, the Shenandoah and North Shenandoah, lost no time in sinking their shaft deeper to pick up the run of gold met in the New Chum Railway mine below 2,800 ft. At a depth of 2,782 ft. the crosscut east struck the lode at a distance of 291 ft. from the shaft. Here a rise has been put up on the reef for a height of 68 ft., and 245 tons has been crushed, which returned 395 oz. 4 dwt. (exclusive of pyrites and plates). The rise averages 13 ft. in length on the course of the lode, and the crushings put through the battery have given excellent results. The character of the lode gives good indications of permanency, and strong enough to live through the country for a long distance north and south, there being no difference of opinion as to this reef being one and the same with that met in the New Chum Railway mine. The last payable reef worked in this mine was between the 1,930-ft. and 1,990-ft. levels. A west leg of a reef was worked out, and £10,400 was paid in dividends, besides paying off a large bank overdraft.

The North Shenandoah is awaiting further developments in the preceding claim, but it has, in the past, been a very good gold producer, 37,155 oz. have been won up to date. The next two mines on the New Chum reef are the Shamrock and North Shamrock. On these preparations are being made for deepening the present shaft, now down 2,346 ft., another 34 ft. The run of gold from the Shenandoah will be picked up. At the 1,840-ft. level in the two mines a run of spurs has been worked with good results during the last nine months, the Shamrock having paid 3s. 3d. per share on the profits obtained, but the stone is now smaller, and not returning much profit. In the North Shamrock these spurs still continue payable. They are from 12 ft. to 14 ft. in width, and work up to a height of 40 ft. Since July, 1893, £9,600 has been paid in dividends.

The Garibaldi, New Chum Consolidated, and other mines which have been working at deep levels and obtaining good returns, are preparing to go further down to pick up the new lode. Among these is the "180

Mine" at the extreme end of the line of reef, and which is owned by Mr. Lansell. This mine has produced up to date 92,389 oz. of gold, and the wealth thus obtained has laid the foundations of the large income enjoyed by Mr. Lansell, which has been largely and unsparingly used by him in carrying out an enormous number of mining enterprises not only on this field, but throughout many of the quartz-mining districts in Victoria. At the "180 Mine" the shaft has now reached the depth of 3,209 ft., and sinking operations are to be carried on until a depth of 3,300 ft. is reached, when crosscuts will be started at the 3,200-ft. and 3,300-ft. levels to the east for the downward continuation of the massive quartz formation at the 3,110-ft. level, where it has the appearance of being the neck of a saddle reef. Although payable gold has not been met with at the great depth obtained, Mr. Lansell states that he has by no means lost heart or faith in the property, and he has every belief that the next levels will bring results which will reward him for his enterprise. As for the depth of working, Mr. Lansell states that if a reef of a size that permits of opening up and working in a large manner is met with the cost of mining it would be no more at 3,300 ft. than at 700 ft. from the surface.

Commenting on the large and valuable body of information collected by him, the *Argus* writer says: "It is by no means contended that the deeper formations are as rich or as profitable as the reefs worked at higher levels. However, no one can help being struck with the splendid reefs now exposed in the New Chum Railway and Shenandoah mines, which battery tests so far have demonstrated to be richer in quality than those worked at the last level. It is an acknowledged fact that mining on the Bendigo field can now be carried on down to 3,000 ft. as economically as was the work at a depth of 600 ft. or 700 ft. from the surface. With the introduction of more efficient machinery, the use of air-compressors and rock drills, and the reduction of cost in mining material, stone which yields 4 dwt. to the ton can be now mined at 3,000 ft. so as to leave a margin of profit, if it exists in bodies sufficiently large to allow of operations on a large scale. A truck of quartz (half a ton) is now hauled from a depth of 2,800 ft. in two minutes. The cost of shaft-sinking at this depth is £10 a foot, and at what depth mining will be profitably carried on depends more on the value of the stone met than the impossibility of mining in deep levels. Everywhere along the line where deep sinking is now being carried out the winding engines are capable of hauling from a depth of 4,000 ft. In the early days of quartz-mining it was considered that payable quartz would not exist much below the grass-roots. Such theories as these were freely enunciated by certain geological authorities, who possibly considered that it was wise to be sceptical; but these ideas have been long since upset by more practical development at the pick's point. However, it has been now practically demonstrated that payable gold does exist so far as the miner has reached, and to what depth he will follow the gold is as yet an unknown quantity."

A NEW SAFETY CARTRIDGE FOR FIERY MINES.

In order to avoid the dangers of electric sparks and of the flame of the explosive, quicklime cartridges have repeatedly been suggested and applied with a certain amount of success. They cannot, however, replace the powerful, instantaneously acting explosives. Mr. Ludwig Jaroljmek, of Prague, has had the idea of combining quicklime and dynamite cartridges in such a manner that the quicklime by absorbing water heats a preliminary primer sufficiently to fire off the detonator which is imbedded in the dynamite. Two commissions, the Ostrau Firedamp Commission and the Rositz-Oslava Commission, have reported favorably on the new cartridges, which Mr. Jaroljmek has perfected in conjunction with two Prague firms, Messrs. Sellier & Bellot and Mr. A. Schram. Tests were conducted in the collieries of the Emperor Ferdinand North Railway, at Polish Ostrau, in May and June of last year. An abstract of the reports is given by the inventor in the issues of November 16th and 23d of the *Oesterreichische Zeitschrift für Berg und Hüttenwesen*. We quote from those reports: The quicklime is applied in the shape of cylindrical blocks, ending in truncated cones. Into a hollow in the block fits a two-part capsule. The part which is surrounded by the quicklime contains a preparation which takes fire at 212° or 230° Fahr.; the other part, which reaches into the dynamite, is charged with a detonator. When the lime is slacked, the temperature may rise to 750° Fahr. The parts are not put together before everything is ready. The compound cartridge is then inserted in a bag of loose cotton, knitted like a stocking or woven like a wick. A little wire is twisted round the open end of the bag, and the ends of the wire are bent back. These wires prevent the cartridge from slipping out of a hole bored in an upward direction. When the hole is inclined downward, water is simply poured into it over the cartridge just fixed in position. When this is not possible, either special water bags of cartridge shape, made of a stoutish porous paper, are applied and fixed by a tamping, or the lower part of the whole is filled with moss soaked in water. This latter expedient stood all the tests. The blocks are made in different sizes, and are partly encased in tinfoil. The part to which the water is to have access is provided with a removable cap of tinfoil to keep off moisture and the carbonic acid of the atmosphere. The dimensions of a complete cartridge would be, for instance: Total length, 3½ in.; diameter, 1½ in.; length of dynamite cartridge, 2 in.; of lime block, 1½ in.; of primer capsule, 0.75 in.; diameter of capsule, 0.3 in. The tests were made under considerably varying conditions and with different kinds of explosives, not safety explosives. There were no failures, and, on the whole, firing ensued within the periods stated by the manufacturers. No case of premature firing is reported. Small naked cartridges went off in half a minute or a minute; the same blocks, more or less sheathed, in one or two minutes, according to the looseness of the bag. The Ostrau Firedamp Commission worked in an experimental gallery, which contained 6 8% of methane and an ample supply of coaldust, which was kept in agitation. In no case did the cartridge fire the gases or the dust. The commission declare that evidently the explosion cannot spread, and that hence this method is safer than electric blasting, in which sparks must always be feared. The flame is confined to the interior of the cartridge, and is stopped both by the slacked lime and by the water in the borehole.

THE DAVIS CRUSHING ROLLS.

More attention has been paid recently to improvements in crushing rolls than perhaps at any previous period in the manufacture of mining machinery. This is the most rational consequence of the increased demand for this class of pulverizer by reason of development of improved systems of concentration and the numerous cyanide, chlorination and other leaching mills being erected, which call for large and cheaper crushing capacity with the greatest possible avoidance of sliming.

The Davis Crushing Rolls retain in their designs all the good points of the original Cornish rolls, and embody improved details and new features of great merit suggested by our most experienced mill men. The rolls as now perfected are of simple and massive design, entirely self-contained, with perfect provision for adjustment and lubrication, well housed and protected from dust.

In Figs. 1 and 2 the construction of the machine is clearly shown. M is the frame of the rolls, of ample proportion, cast in one piece.

This design of frame insures perfect alignment of the journals, great strength and rigidity, requires no separate foundation, and dispenses entirely with loose joints and their innumerable bolts and nuts.

The ball and socket bearings of the stationary roll are perfectly seated in the frame.

The bearings of the adjustable roll are carried by swinging arms, E, avoiding the excessive wear of the usual sliding bearings. The swinging arm is carried by and turns on a heavy steel eccentric pin, F, held firmly in its seat in the frame. The portion of the pin carrying the arm is eccentric with the part in the frame, and a partial revolution of the pin raises or lowers the swinging arm and bearing, providing a perfect vertical adjustment for the roll shaft—a very important point in fine crushing rolls where it is absolutely necessary that the rolls should be exactly parallel to avoid side thrust in bearings and consequent loss of power.

The bearings, G, for the roll shafts, both in the frame and arms, are of the ball and socket type, very heavy and of ample length to insure moderate working pressure. This form of bearing allows of perfect adjustment under all conditions. The boxes are perfectly fitted to frame and arm, and are provided with phosphor bronze bushings easily renewed. Oiling and the protection of the bearing from dust has been carefully considered.

The arms of the adjustable roll are held in position by the connecting rods, J, which connect the arm to the spring bar, H. The distance between the rolls can be adjusted at any time by means of the turnbuckles, K.

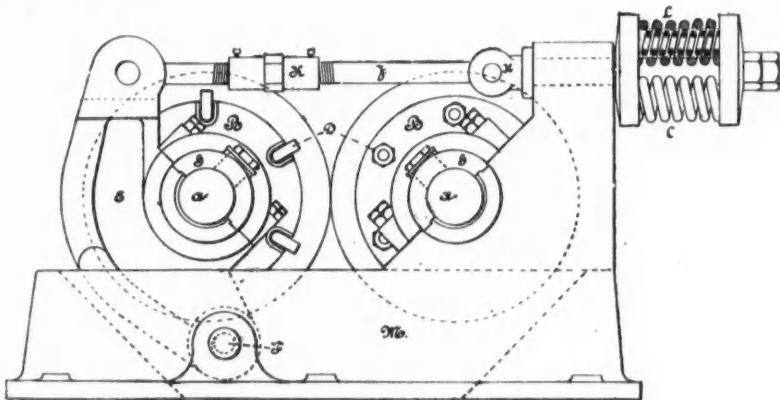


FIG. 1.

THE ORISKANY IRON ORES AT RICH PATCH MINES, VA.

Written for the Engineering and Mining Journal by Edmund C. Pechin.

(Concluded from page 134.)

It is proper in closing this article to call attention to the mining of the Clinton (No. V.) ores on this property. Usually, the Clinton rocks follow the ordinary sweep of the measures, but immediately opposite the camp, and for some distance each way, these rocks have been inverted, the ordinary foot being the hanging and the hanging the foot walls. A large number of test pits, found the ore in place.

At the very bottom of the Rich Patch Mountain, in the ravine of Raleigh Run, and at, say, 3,000 ft. in a direct line from the Oriskany lead, drifts on the opposite sides of the run have been started on this ore. One was in about 50 ft. and another 150 ft. In spots the ore was 4 ft. thick, but the average was fully 3 ft., as I saw it. Mr. E. J. Schmitz, at the Atlanta meeting of the Institute of Mining Engineers, gave an interesting paper on a section of Rich Patch Mountain at Iron Gate, a few miles from Clifton Forge, and only a short distance across the mountain from Rich Patch mines, but on another fold of the measures. He pays particular attention to the fossil ores (No. V.) at that locality, where he finds their seams of brown ore laminated with the fossil. At the workings at Rich Patch the whole seam looks like brown hematite and makes a brown scratch. There are minute seams that look like fossil, but that is all. Picking out the hard lump, it will run from 52% to 54% in iron. At the furnace a cut was made down the middle of a pile that was not regarded as a first-class article, with the following result: Iron, 44.61; silica, 14.34; alumina, 9.95; phosphorus, .74; manganese, 1.15. The combined water was not determined, but it will be noted that room is left for 10% water. The company are mining this ore and shipping it to Buena Vista, because they have found that by using as low even as 10% the furnace works better and can be kept more easily on foundry iron. This recalls to mind a similar result, when I was running a furnace in 1879 at South Pittsburg, Tenn., on fossil ores. The use of a fifth or even a tenth of brown hematite made a wonderful difference both in the working of the furnace and the grade of iron. Of course, a 3-ft. seam is more costly to mine than the brown ones, and it is simply a question of figures whether it will pay to mine and use this ore.

This being decided affirmatively, there seems to be no question of the company's ability to get all they need. There have been surface pits dug in a score of places, and the ore always found under similar conditions. There is scarcely a ravine on the estate, where this seam cannot be at-

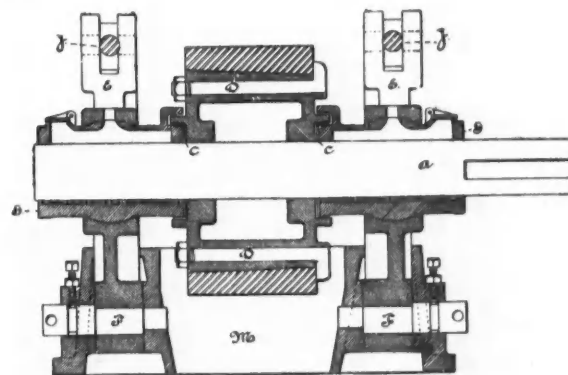


FIG. 2.

The spring bar H passes through the frame, and through a nest of springs on the outside of the frame, and is held by the nuts, which are screwed up against the heavy washers carrying the springs. These springs resist the strains due to crushing, and are stiff enough to do the regular work for which the machine is intended without compression, and only yield under abnormal strains.

The roll proper consists of a very heavy forged steel shaft, A, on which is securely mounted a heart or roll center, B, forming a solid support for the full width of the tire and preventing the shearing off of the edges of the shell, as often occurs when not suitably supported.

This center is turned tapering, and the shell C is bored out to fit, and drawn on and held in place by the draw bolts, D.

The shells are of open hearth steel, hard and tough, forged and rolled to shape, and carefully turned inside and out. For longitudinal adjustment and wear there is placed on the roll shaft, between each bearing and the center, two or more steel rings, C. These can be changed from one side to the other to shift roll as desired. The rolls are completely housed in, but are provided with covers, which can be taken off at any time.

Rolls can be driven by gears, or more usually by large heavy band wheel.

Feeders can be attached to the roll housing, as shown in the engraving, and require no outside supports.

These rolls are built in four sizes, from 12x12 to 16x38. The 12x12-inch rolls are generally used in sampling works, and for this purpose are built with light steel housing, quickly removed by one man, giving free access to all parts of the machine for cleaning. It is also for the same reason provided with but one drive pulley, the adjustable roll being driven by small finger gears.

German Iron Production.—The Association of German Iron and Steel Manufacturers reports the total production of pig iron in Germany (including Luxemburg) for the year 1895 at 5,788,798 metric tons, against 5,559,322 tons in 1894, and 4,986,003 tons in 1893. The output in 1895, over 50%, or 2,898,476 tons, was classed as Thomas pig iron. The Bessemer pig iron made was only 444,495 tons, or 7.7% of the whole. The remaining 2,444,827 tons were foundry and forge irons.

tacked, with level on top of level, starting from the open. Where the two drifts are now being worked the mountain rises so rapidly that within a short distance there is 600 to 800 ft. of vertical height. The vein stands nearly vertical itself, requiring very little timbering and no washing, as the fine is nearly as good as the lump.

The whole estate is thickly covered with forests, so that mine timber will be abundant and cheap for a long time to come. I have gone somewhat into details to give, if possible, the reading public a clear idea of the condition of the ores in this district, as it will have a bearing on what I have to say in another paper, to the effect that the Oriskany brown ores of Alleghany and adjoining counties which have been quietly but profitably worked for many years by local furnaces, must shortly attract large outside attention, and create a new iron center of no mean importance.

Of the many charcoal furnaces built to work the Oriskany brown ores in what is now Alleghany County, Virginia, nothing remains but grass-grown ruins. With the advent of coke and the completion of the Chesapeake & Ohio Railway, came the building of the Longdale and Lowmoor furnaces near Clifton Forge, about 1880, to be followed by the Victoria at Goshen in 1882; the Princess, at Glen Wilton, in 1883; the Alleghany at Iron Gate, and the Covington, at Covington, in 1892. If I am not mistaken Longdale and Low Moor never have stopped save for necessary repairs, but through every business depression, including panics, have kept on the even tenor of their way. All of these furnaces work the Oriskany brown hematites of the section. A gigantic undulation of rocks carrying this ore sweeps over the Potts Creek Mountain, into the valley, up Horse and over Rich Patch mountains, on Crag's Creek, at Longdale and as far east as Goshen, near the Rockbridge alum springs. Necessarily over such an extended area the quality and minor conditions of the ore varies, generally coincident with the flattening and dipping of the seam, at places having much higher silica and manganese.

Longdale has always mined its own furnace supplies, and I believe sells from its Big Hill mines. Low Moor has been a large ore producer, but has also been a purchaser saving its own ground. Princess has had its own mines. Goshen and Iron Gate have been large purchasers. Some years since, the Stack, Dolly Ann and Iron Mountain mines were opened and equipped near Covington, and were the only mines of any consequence supplying the open market, until the Rich Patch property, bought

by some Louisville parties about 1890, came in the field. During the "boom" period a furnace was erected at Covington, but owing to the business revulsion never went into blast, finally becoming the property of the Lyman, of New York. Lately this furnace, together with the three mines of Stack, Dolly Ann and Iron Mountain were consolidated with the Lowmoor furnace property, in which the Lyman were also interested. The Iron Mountain is only a leasehold, the fee being in Mr. McLaren, of Canada, and I am told the lease expires this year. When the depression came, and furnaces were "blown out," there was no market for the Rich Patch ores, so after stocking a considerable quantity of ore, operations, save dead work, were suspended, until recently. The company were confronted with a peculiar condition of affairs. An enormous property, which had cost, with improvements, \$500,000, thoroughly opened and equipped, capable of a large daily output, and no market, save for small and intermittent lots.

It very wisely decided to lease the Buena Vista Furnace, which was on the market. This furnace is reached from the mine, via James River division of the C. & O. Railway, 4 miles (main line) to Clifton Forge, 55 miles to Balcony Falls, 12 miles to Buena Vista, a total of 71 miles. The furnace 16 ft. x 70 ft. is now averaging over 100 tons a day of high-grade iron, so it will be seen that the ore company has a home market for at least 250 tons a working day. This it can give without trouble, and at the same time meet any reasonable demand from Goshen and Iron Gate furnaces. The Rich Patch Company is so well satisfied with the running of the Buena Vista Furnace, since August 1st last, that it has decided to erect one of its own upon its own property.

Within sight of Covington, on the south bank of the Jackson River, they have a broad stretch of level land, at the base of Horse Mountain, and with a long river front. An unfailing supply of pure water can be had at Mill Branch, with a pressure that will throw the water over the stack. A short tramway will connect the furnace site with the great ore deposits heretofore noted as running all along the slope of the mountain. This location is the natural outlet for at least 4,000 acres, to be readily reached through the ravines of Mill Branch and Laurel Run. Beyond question, this company could in a comparatively short time, and with a moderate outlay of money mine, at the rate of 1,200 to 1,500 tons of ore a day. The ground now worked is as rich as any I have ever seen (for brown ores) and 1 ton of ore to 10 cubic ft. of ground is certainly a safe estimate. Now 1,000 ft. in length with an average width of 20 ft. and a depth of 300 ft. will give 6,000,000 cubic ft. of ground, or 600,000 tons of ore. The ground now actually proved and opened is over 5,000 ft. in length, with an average of considerably over 20 ft. in width, and this, irrespective of the parallel seam noted in my first article, which if it continues will double the quantity, and this 5,000 ft. is only one little corner of the estate, with miles and miles of the exposed and tested lead as yet untouched. It seems to me beyond question that this single company is now in a position, not only to supply its own furnace or furnaces, but to guarantee very large supplies of ore to other furnaces that may be erected by outside parties. But the Rich Patch property, large as it is, is small as compared with other land apparently carrying these Oriskany ores. The Iron Mountain mine above mentioned, as adjoining the Dolly Ann, is on one edge of a vast tract of 175,000 acres, making a considerable portion of three counties, the property of Mr. McLaren. When I last saw this mine there was a great face of ore, worked as an open cut. As above stated, it is only leased by the parties who are working it, and as lessees for a moderate time, they naturally would not go to the expense of underground work, so long as they could work it in the open. On this side of the river, as on the south side, the fold runs many miles to the eastward, and unless all signs fail there are untold tons of ore, only awaiting the advent of enterprise and capital to penetrate these wilds and make them productive. The outlook on Craig's Creek, as it appeared to me some years since, is fully described in the issue of the *Engineering and Mining Journal* of August 13th, 1892. I simply repeat that while the outcrop could be traced for miles, the test pits were so superficial and perfunctory, that no fair opinion as to the extent of the deposit could be found, but I saw enough to conclude that a thorough and systematic exploration was warranted, and might lead to most important results.

Still further to the southwest is the Mountain Lake property, on which large showings of Oriskany ores have been talked of for years. Mr. D. W. Langdon, Jr., of Cincinnati, told me that when he visited the openings, some years since, they were of such a character as made it impossible to form any estimate as to quantity. Mr. Reuben Patterson, manager of the Roanoke Furnace, an intelligent and competent observer, told me a few months since that he had lately inspected the property, and that further work had shown satisfactory indications of a large amount of ore. A branch road is now being constructed, 13 miles long, from the Norfolk & Western Railroad, on New River. Should these anticipations be realized, while the output of ores would go to supply the Graham, Radford, Pulaski and Max Meadows furnaces, it would be strong presumptive evidence that the seam was in a workable condition along Craig's Creek, and indeed in the whole section between Jackson and New Rivers.

For many years past Potts Creek, which is parallel to Craig's and flows into Jackson River at Covington, has been heralded as carrying on both sides of its valley enormous quantities of this ore. I have never visited this locality, but my friend, the late J. Herbert Bramwell had and expressed to me a very high opinion of this ground. Knowing his caution and large experience, I have just heard to my surprise that another friend, Mr. P. N. Moore, who ought to know what he is talking about, has quite recently made an examination of Potts Creek, and has expressed an unfavorable opinion of it. As he is undoubtedly a reader of your journal, perhaps he will not find it inconvenient to give his reasons for this conclusion, if correctly reported. Popular expressions of approval are one thing—the opinion of an expert is what is of real value when we are seeking for real facts. I must be permitted to say, however, that in view of the remarkable and unexpected results reached on Rich Patch and a Low Moor, I do not think that any section in this vicinity carrying the Oriskany sandstones, with accompanying outcrop of ore, should be turned down without a thorough and conclusive testing. Much depends upon the dip of the ore, as wherever I have seen the measures seriously flattened much of the ore was gone, and what remained was very silicious.

Leaving these outlying districts out of consideration, enough high-grade

ground has been proved to warrant the expectation that in the near future, with the rapidly increasing demand for cheap iron, that this great district of Virginia, taking Clifton Forge as a center, must and will be looked to as an attractive field for the necessary and profitable expenditure of the capital necessary to build furnaces and cognate industrial plants. The quality of the foundry irons of Low Moor, and of the forge irons of Longdale, has been "known and read of all men" engaged in the iron business for many years past. A new feature is now at hand, which must not be ignored, the application of these ores without any admixture to the manufacture of open-hearth basic steel. My views on the advantages of using the Virginia brown ores for this purpose have been public property for years, and while at the time recognized as being theoretically correct from a practical standpoint, were relegated to the middle of the next century.

Longdale has been making open-hearth basic pig for months past and Mr. Johnson advises me that they have no difficulty in guaranteeing a maximum of 1% of silicon. Within the last two months I have seen analyses of forge irons made at Buena Vista, when the furnace ran off of foundry, that gave one-half of 1% of silicon. The sulphur in these irons, made with New River and Pocohontas coke, is always extremely low, the phosphorus is within satisfactory limits, and the manganese always present in varying quantities, is a help rather than objectionable. If the North and West want high-grade basic irons they can get them right here.

All recognize that it is an unsatisfactory business condition for any section to be putting ores into irons to be sold at a small margin of profit, to be manufactured elsewhere into finished products. The true business position is to have the furnaces and mills close to the raw materials and ship the finished goods. While there are many favorable sites along the railroad, and the C. & O. Railway has shown a liberal policy to industries on the line of its road, a severe business experience has taught me, if you can possibly avoid it, never put yourself in the power of one road. Absolutely uninterested, either directly or indirectly, in either place, my own judgment is, that the natural locations for large iron industries in Virginia are Buchanan, Botetourt County, and Glasgow, Rockbridge County, 18 miles below. Both the Norfolk & Western and the Chesapeake & Ohio (James River division) run through these places, affording access to all markets. Both places are on the James River, with its ample supply of pure water. Two competing coke regions, the Pocohontas and New River are about equidistant. Buchanan has a trifling advantage over Glasgow, in the enormous deposits of almost pure dolomitic and carbonate limestones, from which the furnaces at Roanoke, Iron Gate, Clifton Forge, Buena Vista and Shenandoah are now supplied. Taking Clifton Forge as a center, the ores would have a haul of only 35 miles to Buchanan and 53 to Glasgow.

Broad level reaches of land on the river bank are available at both places. A superb climate, neither too hot nor cold, wonderfully cheap living, owing to the fertility of the surrounding limestone soils, and a good deal of excellent local labor. The seaboard is reached both at Newport News and Norfolk. In addition to the two railroads above mentioned, the Valley Branch of the Baltimore & Ohio Railway is at Lexington, 24 miles from Buchanan, with a roadbed partly graded. Any large industrial development in the region would undoubtedly result in the building of this extension to Roanoke, via Buchanan. This would give connection with a third trunk line.

Considering its geographical position, its existing rail facilities, and the excellence and availability of its ores, this great Oriskany field must become before long another important factor in the iron business of the country.

ANCIENT COAL MINING.

Coal mining in the United States has been in operation about 150 years and the earliest mention of coal itself seems to date back about 200 years. When we come to coal mining in Scotland we have to take a back seat, as, although there is little documentary evidence of the extent of the operations, there is a legal document in existence conveying a coal mine in the year 1210, 686 years ago. Mr. Walter H. Mungall, of the British Society of Mining Students, has written an interesting paper on the historical records of Scotch Coal Mining. Although the document above referred to is the only known authentic evidence fixing the early part of the thirteenth century as the historical birth of coal mining in Scotland, the conveyance itself is significant of the fact that prior to that date coal mining had been carried on for some considerable time.

The method and extent of these early operations, however, are not described, and beyond the fact that coal was worked there anterior to the year 1210, we have no definite information on the subject. About the same time also a colliery was in operation on the Duke of Hamilton's estate of Carriden, near Blackness, a small village on the southern shore of the Forth, and about five miles to the west of the modern Forth Bridge; for we find that in 1214 William de Vereponte paid a tithe of this colliery to the monks of Holyrood Abbey in Edinburgh. Nor was the Fifeshire coal-field unknown in these early times. Toward the close of the thirteenth century (in 1291) the right to dig coal in the lands of Pittencreeff, adjoining the Convent, was granted by William de Oberwill to the Benedictine monks of Dunfermline.

From this time onward the Scottish coal trade continued to increase till, toward the middle of the sixteenth century, the export trade from Scotland, as from England, had assumed such proportions that fear of the early exhaustion of the coal-fields was entertained. So great had the export trade become, especially to France, that in 1563 the Scottish Parliament of Queen Mary, having "consideration of the great multitude of coales continually carried furth of this Realme, not only be strangers, but also be the lieges and inhabitantes of the samin," passed an Act prohibiting the exportation of coal which was then "becummin the common ballast of emptie schippes." The penalty for an offense against this Act was the "confiscation of the schip, coales and all the guds that the awner of the coales hes within the said schip." Notwithstanding the provisions of this act do not seem to have been generally observed, for sixteen years later, another Act was passed, ratifying the former Act, and "ordaining it to be put to execution in all pointes." Even this was not rigorously enforced, and in 1597 another act prohibiting the exportation of coal stated that "Coales are commonly transported fourth of this

Realme be diverse and sindry persones quha at all times laidens their Schippes and uthers veschells therewith, and transports the same at their pleasure usand the samin as a commoun trade togidder, without his Majesties licence or permission: To the great hurt of the Commoun weill, and expressly against his Hienesse Lawes, Acts of Parliamente and sindry Proclamations made in the contrair."

About the beginning of the seventeenth century fresh difficulties arose, and the fears that had been entertained half a century earlier seemed now to be almost realized. The supply of coal from parts that were easily accessible was now well nigh exhausted, and to maintain a supply equal to the demand that had arisen, it became necessary to work the coal that lay at greater depths. The new difficulties now to be encountered soon became apparent, and of these, not the least considerable was the difficulty of dealing with the water that was found in greater abundance than formerly. Where the situation of the mine and other local circumstances were favorable, this was overcome by driving level tunnels or adits from the lowest part of the workings across the strata till the surface was reached. Through these tunnels, or "day levels" as they were commonly called, the water flowed from the workings and discharged into some river or stream. In the case of mines less favored by local circumstances some mechanical appliance had to be resorted to for unwatering the mines. Probably the earliest form of mechanical contrivance for this purpose was the rag-and-chain pump, which consisted of a column of pipes through which an endless chain, with bunches of rags or other material attached at short distances apart, passed. These somewhat primitive pistons, ascending in the pipes, carried the water before them and it was discharged at the top. Motion was given to these water-raising machines by horses, wind-mills, or water-wheels where they could be applied. An improvement on this form of pump was the Egyptian wheel—a sort of dredger or bucket elevator. One of these wheels was erected by Sir George Bruce when re-opening his sometime abandoned colliery at Culross, near Dunfermline. Sir George, being a man of no mean ability, and having a knowledge of machinery "such like as no man has in these days," his colliery soon became renowned, not merely in the immediate neighborhood but throughout the district. There were two shafts at the colliery, one on the shore and the other near low water mark, protected from incursions of the sea by an artificial embankment. His water-raising machine, consisting of thirty-six buckets, was placed at the pit on shore, and was actuated by three horses. According to tradition, King James VI, then also I. of England, in making an excursion to Fife-shire about 1617, visited this colliery at Culross, and by his own desire was conducted through the workings. Without giving him previous intimation the party as-

common laborers, and, under certain restrictions, liberated the collier from bondage after a given time, but his emancipation was not completed till the restrictions were removed by a further act in 1799. Females and children, however, still continued to find employment in the mines, and it was not till Lord Ashley's famous bill became law, that the bearing system in Scotland was doomed to extinction, and the labor of young persons became regulated by statute. In carrying coals along the roadways and up the ladders in the shaft, the common load of a woman was from 200 to 240 pounds, while girls and small boys carried single blocks of coal, proportionate to their strength. The coals were carried in wicker creels or baskets fitted to the back and steadied with a strap across the forehead. In reporting on a colliery in Midlothian in 1830 where this system was then in operation the late Matthias Dunn says: "The bearers find their own lights and creels, and are hired at from 10d. to 14d. per day, by such of the hewers as are not fortunate enough to possess wife, sister, or daughter, the necessity of which tends to constant and early intermarriages amongst each other, and is attended with utter want of domestic comfort."

THE TAYLOR HAND ROCK CRUSHER.

The design of this small machine is to enable a person quickly and easily to crush by hand power to a fine powder the hardest ores.

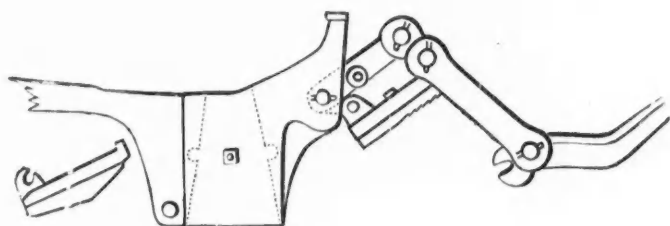
Both jaws are faced with hard white or chilled iron, the lower parts of which are plain surfaces, between which the ore is crushed fine. The stationary jaw, B, has its lower plain surface at an angle to the upper or corrugated surface. The lower part of this jaw is adjusted by a screw shown under the hand, to crush fine or coarse. The movable jaw, C, is operated by the hand lever, and has its corrugations horizontal to facilitate the forcing the ore down at each stroke of the lever. This jaw has a vertical and horizontal motion.

The lever has a rubber covering where grasped by the hand, and a rubber cushion where it strikes the bed piece, to prevent jar and noise.

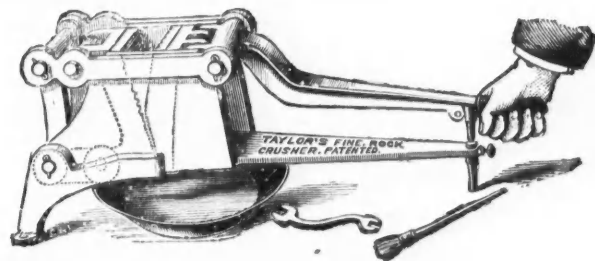
These jaws are 3 in. wide and open at the top $1\frac{1}{2}$ in., consequently a piece of rock $3 \times 1\frac{1}{2}$ in. can be crushed. With the lower part of the jaws set at one-tenth inch apart, 40 lb. of the hardest rock can easily be crushed in one hour, and 20% of this will then go through a No. 60 sieve. Screw up machine and soon run through balance to No. 60 or finer.

This machine crushes much faster than the hand mortar and pestle, because of the great leverage and power, and because the fine crushed rock always drops away; whereas with mortar and pestle the fine is always in the way, and deadens each blow of the pestle.

The mine superintendent uses them as an easy method of getting an



THE TAYLOR HAND ROCK CRUSHER.



ended by the second shaft, and it being then high water, the king, finding himself surrounded by the sea, was apprehensive of some plot against his liberty or life, but was soon assured that such apprehension was groundless and the party went ashore, His Majesty expressing gratification at what he had seen.

The first pumps, apart from Egyptian wheels and earlier contrivances, that were introduced into the pits of Scotland were erected by the then Earl of Mar at his Alloa collieries.

Even in these early times the lot of the coalmaster or colliery manager was not a happy one. Although the colliers had not yet learned the art of striking, they had found other means of shewing their displeasure, and of emphasizing their grievances, real or imaginary. At this time it was no uncommon thing for the mines to be set on fire, and so general had this practice become, that in 1592 the Scottish Parliament passed an Act "For the better punishment of the wicked crime of setting of fire in coal-heuches" by some ungodly persones upon privat revenge and despite." By that act it was declared "that the committing of the said crime in any time hereafter shall be treason, And that the committers thereof, being ordourly convict, shall suffer sik punishment in bodies, landes and guddes, as is dew by the Law, in causes of treason." Within a year after the passing of this act, a collier who had been found guilty of this "wicked crime" was hanged at the Market Cross of Edinburgh, and his head was subsequently placed upon a pole near the mine as a warning to others.

Virtually the mine-workers were serfs and the coalmasters were invested with power and were commissioned "to apprehend all vagabounds and sturdie beggars to be put to labour" in the mines. Fifty-five years later, in 1661, considering that "Watermen who laves and draws Water in the Coal-heugh-head, and Gates-men, who work the wayes and passiges in the saids heughs, are as necessary to the Owners and Masters of the saids Coal-heughs, as the Coal-hewers and Bearers" they were employed under the same conditions, and their removal from one place to another was restricted in the same way as in the case of the hewers and bearers. By the same act, not only was the maximum wage of the collier limited, but his minimum period of labor was fixed at "six dayes of the week, except the time of Christmas." Failure on the part of the colliers to comply with this provision mulcted them in the sum of twenty shillings Scots to be paid to their masters for each day they were idle.

This system of serfdom continued till, in 1775, Parliament decreed that no person shall be bound to work in the mines, in any way different from

* Coal-hewings or coal-workings.

accurate sample of ore. He takes a few hundred pounds from this or that drift, and quickly crushes it to the size of corn, and then samples it down by rolling it over and dividing upon a rubber sheet, then crushes the sample fine and assays it; thus he is able to have a check as to what the mill should do, as the assayed sample is an average of a large lot—instead of being from a small selected piece.

The prospector with this crusher, and a few other tools, can make an extended search for mines. He can break off from the croppings one hundred or more pounds, crush it down and sample, and pack the samples in small paper bags; number them and keep a record of the date and locality, and when he reaches home make assays, and learn the result of the summer's work more satisfactorily than he would if compelled to pack hundreds of pounds of ore home. He can prospect more territory.

The assayer is enabled to save fine ore, and to rapidly clean the machine, making it so easy to sample and assay much larger lots of ore than when confined to the common mortar and pestle, and to prepare a greater number of assays in a short time.

Many miners have been deceived and have experienced great disappointment and loss by sampling a small quantity of rock in a mortar, which all experienced miners know is very uncertain and risky to base large calculations upon, as a small piece might contain a few specks of gold, making a valuation per ton that would be much more than by large samples.

This rock crusher was invented by H. R. Taylor, of John Taylor & Company, who have been in business in San Francisco ever since the first California gold discoveries. The crusher has had a large sale, not only on the Pacific coast but in Australia and other mining countries.

A Pointer for the New York "L" Road.—The experience of the Metropolitan, of Chicago, shows that on an elevated railroad the expense of electrical operation averages 45% of the gross income. Figuring on this basis and the present business of 35,000 passengers per day, President Louderback, of the Lake Street Elevated Railroad Company, Chicago, estimates that the change from steam locomotives to electric power on that road will cause a saving sufficient to show an annual net earning of \$362,312. This will meet the fixed charges of \$280,237, and leave \$82,075 for the stockholders—changing the road from a losing venture to a profitable one. According to the annual report, contracts have been let for equipping the road with electricity, at an estimated cost of \$249,410, which will include car barns and repair shops to house 38 cars.

RECENT DECISIONS AFFECTING THE MINING INDUSTRY.

Specially Reported for the Engineering and Mining Journal.

NEGLIGENCE OF MINE FOREMAN IN PENNSYLVANIA.—A coal mine foreman, licensed under the laws of Pennsylvania, is liable, independently, as well as under the statute, for injury to an employee due to his want of attention to his proper duties, in failing to render secure what he must have known to be an unsafe place to work.—*Durkin vs. Kingston Coal Company* (33 Atlantic Reporter, 237), Supreme Court of Pennsylvania.

OWNERS OF MINES CANNOT BE MADE LIABLE FOR NEGLIGENCE OF FELLOW SERVANTS.—The Court holds that a law which makes the owner of mines, etc., liable, for injuries to other employees, from the failure of a foreman, a fellow servant of the other workmen to do properly what the laws of Pennsylvania require of him, is unconstitutional, as being in violation of the Bill of Rights.—*Durkin vs. Kingston Coal Company* (33 Atlantic Reporter, 237), Supreme Court of Pennsylvania.

CONSTRUCTION OF ASSIGNMENT OF A MINING LEASE.—The Court holds that, where one to whom an interest in the lease of a mine is assigned agrees to pay all costs and assessments on his own interest and that of his assignor, he is not liable for a deficiency of receipts for a certain month, and incurs no liability, if during the whole period of the lease there are funds available for expenses.—*Shaw vs. Horner* (42 Pacific Reporter, 689), Court of Appeals, Colorado.

INDICTMENT FOR OPERATING COAL MINE ON SUNDAY.—Where, on an indictment for operating the pumps and fan of a coal mine on Sunday, there was evidence that the work was necessary to keep the mine from flooding, and from becoming dangerous by filling with gas, but it did not appear that the owners could not have employed some other device, without unreasonable expenditure of time and money, or that the mine could not, by the exercise of ordinary care, have been so constructed as to avoid Sunday labor, a conviction will not be disturbed on appeal to the higher court.—*Shipley vs. State* (32 Southwestern Reporter, 489), Supreme Court of Arkansas.

QUESTIONS OF NEGLIGENCE MUST BE DETERMINED BY THE JURY IN MINING AND ENGINEERING CASES.—Where, in an action for personal injuries to a miner, there was evidence that the superintendent of the company knew of a loose stone over the place where the miner was put to work by him, and that the superintendent had made an unsuccessful attempt to dislodge it, and that he told the workman of that fact, and that the place was safe, but the stone afterward fell upon the workman, the question of the company's negligence and the employee's want of care is for the jury. As is also the question of whether the employee assumed the risk. In such an action it is not competent to show that no accident had ever happened there before that.—*Burgess vs. Davis Sulphur Ore Company* (41 Northeastern Reporter, 501), Supreme Judicial Court of Massachusetts.

CONTRACT OF CONVEYANCE OF MINERAL RIGHTS.—An instrument conveying the mineral interest in certain land, after reciting a nominal consideration, declared that the grantee should have full power to convey, and the grantee stipulated that he would examine the land and if he found valuable minerals, would pay the grantor one-half the net proceeds of same, or should such grantee convey to third persons he would pay the grantor \$200 and one-half the net proceeds of the sale. The Court held that the rights of the grantee under such an instrument were forfeited by his failure for eight years to open the mine and prepare it for sale. Also, that where a conveyance of mineral rights in land is defeated by the grantee's failure to perform the particular acts stipulated to be done by him in the instrument itself, and which form the real consideration for its execution, a re-entry by the grantor is unnecessary.—*Hawkins vs. Pepper* (23 Southeastern Reporter, 434), Supreme Court of North Carolina.

SPUR VEINS AND MEASURE OF DAMAGES IN MINING CLAIMS.—Where a party is adjudged the owner of a vein, having its apex within his location, dipping to the north, and extending under the location of another company, which lay north of this vein; and it appeared that there were certain ore bodies lying south of the vein and under it, with reference to vertical location, and that the ore had been taken by such company from such bodies, such ore bodies, since they could upon no theory have a separate existence, extending through said vein, and giving them an outcrop on the location of the company, should be regarded as having some connection with and belonging to the vein of the first party, and thus entitle him to whatever was in them. The proper measure of damages in an action against the company for unlawfully taking such ore, when the company was not a willful trespasser, is the value of the ore taken, less the cost and expense of breaking it and bringing it to the mouth of the mine; and where the ore has been taken out by a lessee of such company, it having received a royalty upon the ore, such royalty may be taken as its net profit.—*Colorado Central Consolidated Mining Company vs. Turck* (70 Federal Reporter, 294), Circuit Court of the United States, District of Colorado.

LOCATION OF MINING CLAIMS.—A party discovered a mineral lode and posted on the spot a notice claiming the right to locate 1,500 ft. on the lode and 300 ft. on each side of it, naming it the "R. J. Lode," and also claiming the right to have 20 days in which to complete his boundary monuments. He afterward went to the premises to mark the boundaries but was prevented by sickness; but within 20 days he agreed with three other persons to give them half the claim if they would complete the location, which they did, by setting up monuments at the corners and on the lines and posting a location notice, describing it, in which the claim was called the "R. J. Gold, Silver and Nickel Quartz Mining Claim." The court held that the location made by the associates was a completion of the claim made by the first party, notwithstanding the addition of descriptive terms to the name of the claim, in the notice posted by them;

also, that the first party had a right to transfer by parol an interest in his right to locate his claim to his associates, and his doing so and permitting them to complete the location was not an abandonment of such right. Also that the discoverer of a mineral vein should have a reasonable time after his discovery to complete his location, the length of time depending on the nature of the ground, the means of marking it and the ability to ascertain the course or strike of the vein, and that, in the case stated, 20 days was not an unreasonable time, the vein being situated on a rough mountain side, the dip not exposed and 1,000 ft. of vein covered.—*Doe vs. Waterloo Mining Company* (70 Federal Reporter, 455), United States Court of Appeals, District of California.

Glucinum.—The price of this metal is now nearly \$18 per pound, says the *Electrical Review* (London); it is a white metal of a specific gravity of 2.1, that of aluminum being 2.6; it is malleable, may be forged, rolled into sheets, and will take a high polish, does not tarnish in the air, and resists the action of most oxidizing agents; its electrical conductivity is as high as that of silver, and therefore higher than copper; its price is only one-tenth that of platinum, weight for weight, and 166th volume for volume; it is thought that if the supply is sufficient and the methods of production are improved, it will find useful application in the electrical industries; it was formerly known by the name of beryllium.

Gravity Electrical Power Generation.—The old story of an electric railway in the iron district of Michigan, to operate without a power house is revived. An exchange states that the subject is being considered by the Marquette Iron Range Railroad Company, Michigan, for transporting ores; the length is 15 miles, in which there is a fall of about 800 ft. from the mines to Lake Superior; on account of the topography an endless chain cable is impracticable; it is therefore proposed to construct an ordinary trolley line without a power house; the loaded trains come down from the mines generating current, which is to be transmitted to the trolley line and from it to the cars going up grade; the loaded cars weigh 25 tons; each train of 10 or 15 cars will have a motor car; the difference in weight between the light and loaded trains is thought to suffice to overcome the loss of power in the transmission and machinery.

PATENTS RELATING TO MINING AND METALLURGY.

United States.

The following is a list of the patents relating to mining, metallurgy and kindred subjects issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by the Scientific Publishing Company upon receipt of 25 cents.

WEEK ENDING FEBRUARY 4TH, 1896.

- 553,875. **MANUFACTURE OF IRON.** Charles P. Sherck and James L. Rutter, Lebanon, and Samuel Groh, Lickdale, Pa.; said Groh assignor to said Sherck and Samuel Weiss, Lebanon, Pa. In the conversion of crude or pig iron into malleable iron or steel, the method consists in simultaneously applying a portion of the blast across the bath above the surface of the metal, and a portion across the bath below, the portions of the blast being in opposing directions thereby circulating the bath horizontally and effecting the conversion simultaneously.
- 553,989. **APPARATUS FOR CONDENSING METALLIFEROUS FUMES.** Malvern W. Iles, Denver, Colo. Combination with a metallurgical furnace or furnaces, of a cooling chamber for conducting the smoke and metalliferous fume from the furnace or furnaces, a condensing-chamber into which the cooling chamber opens having two or more sets of tubes or pipes therein, passages so arranged that the smoke and fume will be conducted through one set of the tubes after the other, and nozzles for throwing a spray of water through the tubes always in the direction of the smoke-current so as not to impede but rather to aid the flow of the current, and means for collecting the water and separating it from the condensed fume carried thereby.
- 554,082. **MINING PUMP.** William Nance, Grass Valley, Cal. A combination of a reciprocating pump-rod formed of connected and reinforced wooden sections, means for connecting the piston rods or plungers therewith, an actuating mechanism consisting of bell-crank oscillating levers or bobs, the horizontal arm of one connected with the pump-rod, and the other carrying a counter-balance-weight, and the vertical arms connected by pitmen with an engine-crank intermediate between the two, a horizontal rod extending beyond the weight-carrying bob or lever, a fixed cushion upon the rod and adapted to make contact with the cushion at the end of the downstroke of the pump-rod.
- 554,143. **ORE CONCENTRATOR.** Wentworth Rice and Percy S. Farrar, Deadwood, S. Dak. Combination of a sluice box having a bottom opening, a supporting-stand having a hollow bearing-post provided with a lower interiorly-threaded end, an exteriorly-threaded bearing-step fitted in the lower end of the post, a vertical table-shaft journaled inside of the post and stepped on the bearing-step, a conical concentrating table mounted on the upper end of the table shaft directly under the sluice box opening, and means for rotating the table.
- 554,185. **APPARATUS FOR REFINING ZINC.** George M. Holstein, Pulaski City, Va. Assignor to the Bertha Mineral Company, same place. Combination of a series of retorts set in the furnace chamber with their front ends lower than their back ends, and formed with an externally-exposed dam at the lower part of their front ends for retaining and chilling the stratum of metal flowing to the front and a recessed seat for the condenser above the dam and a condenser communicating with the retort above the chilling-dam and fitted in the recessed seat all combined.

Great Britain.

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

DURING WEEK ENDING JANUARY 4TH, 1896.

- 24,782 of 1894. **W. H. Hyatt, London.** Dry amalgamator, in which the crushed rock is carried by a powerful current of air over mercury in such a way that the gold balls to the surface of the mercury while the tailings are carried away by the blast.
- 24,288 of 1894. **P. Grandjean, Paris.** Improving the Coombes' miners safety lamp by increasing the air inlet and so increasing the luminosity of the flame.
- 297 of 1895. **C. F. Claus, Swansea and H. S. Sutton, Neath.** Recovering tin from scrap by an alkaline electrolytic bath in presence of sulphides.
- 1,155 of 1895. **M. M. Tolten, Berlin.** In making alloys of iron with nickel, chromium, etc., adding a carbonizing material.
- 21,415 of 1895. **R. H. Elliott and J. B. Carrington, Birmingham, Ala.** Dust arresters for use with mining drills.
- 21,416 of 1895. **R. H. Elliott and J. B. Carrington, Birmingham, Ala.** Detailed improvements in coal cutters.
- 21,463 of 1895. **I. B. Hammond, Portland, Ore.** Improvements in framing of stamp mills.

DURING WEEK ENDING JANUARY 11TH, 1896.

- 3,755 of 1895. **B. C. Hinman, New York.** Economizing bromine in bromination process by recovering the excess used.

DURING WEEK ENDING JANUARY 18TH, 1896.

- 19,912 of 1895. **S. Mason, Leicester.** Detailed alteration in Blake rock crusher.

PERSONAL.

Mr. A. R. MEYER, President of the Consolidated Kansas City Smelting and Refining Company is in New York for a few days on business for the company.

Mr. FRED. M. RUSSELL, of Wallace, Idaho, assayer to Messrs. Finch & Campbell, the well-known mine owners of Cœur d'Alene, Idaho, is now in New York City.

Mr. T. BENTON LEITER has resigned his position as general manager of the Leiter Mining Company, Madison County, Montana, and will hereafter devote himself to his other interests in Montana.

Mr. G. W. BENJAMIN has been appointed coal and coke agent of the Chesapeake & Ohio Railroad, and will have charge of the westbound coal traffic of the company, with headquarters at Cincinnati, O.

Mr. W. P. WALKER, JR., who has been appointed freight traffic manager of the Chesapeake & Ohio Railroad, will hereafter have direct charge of the seaboard coal traffic of that road. His office will be at 362 Broadway, New York.

OBITUARY.

CHARLES WACHSMUTH, a geologist, died on February 7th, at Burlington, Ia., aged 67 years. He was a member of the leading scientific societies of London and Berlin.

JOSEPH C. F. CHEEVER died in Brooklyn, N. Y., on February 8th, aged 59 years. He was born in Salem, Mass., and went to Brooklyn in 1866. He was a graduate of the Lawrence Scientific School of Harvard University, and was a chemist of some note. Since his arrival in Brooklyn he had been connected with the New York Chemical Coal Tar Company as superintendent.

SOCIETIES AND TECHNICAL SCHOOLS.

IRON FOUNDERS' ASSOCIATION OF MONTREAL.—At the annual meeting of the association held in Montreal, Canada, on January 31st, the following officers were elected for the ensuing year: H. R. Ives, president; Walter Laurie, first vice-president; Jos. Amosse, second vice-president; Moses Parker, treasurer; Wm. Greig, honorary secretary; G. H. Weaver, secretary.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—An ordinary meeting was held on February 13th, at which a paper on "The Penn Yan (N. Y.) Water-works," by Angus Smith, was read. The discussion on Mr. W. B. Dawson's paper was concluded, and the discussion on Mr. Smith's paper continued. The following special topic was discussed: That engineering works should be constructed by day's work, under the immediate direction of a civil engineer instead of being done through a contractor.

ILLINOIS SOCIETY OF ENGINEERS.—At the annual meeting at Galesburg, Ill., January 30th, the following officers were elected: President, C. C. Stowell, of Rockford; vice-president, J. H. Burnham, of Bloomington; recording secretary, J. W. Alford, of Chicago; executive secretary, J. A. Harmon, of Peoria. The society will meet next year in Springfield. A committee was appointed to act in conjunction with the State Board of Health in securing legislation that will broaden the work of the board in sanitary matters.

AMERICAN CHEMICAL SOCIETY.—The New York Section of the American Chemical Society held its regular meeting at the College of the City of New York on February 7th. The programme announced a paper by Dr. R. G. Eccles on "New Facts About Calceanthus" and "Items of Interest from the Cleveland Meeting," by Prof. A. A. Breneman. Dr. Durand Woodman exhibited a simple lecture table apparatus for experimentally demonstrating the luminosity of the acetylene flame. The meeting adjourned until March 6th.

CIVIL ENGINEERS' SOCIETY OF SAINT PAUL, MINN.—A regular meeting of the Society was held on February 3d. Mr. Archibald Johnson exhibited the drawings and explained the details of the bear-trap lock gates at Sandy Lake. Lieut.-Col. W. A. Jones, U. S. Eng. Corps followed with suggestions as to the probable application of the bear-trap weir foreshadowed by its use at Sandy Lake. The Sandy Lake lock has been in almost constant operation this winter, a temperature of perhaps 30° below zero not having interfered with its work.

NEW YORK ACADEMY OF SCIENCES.—At the meeting of the Section of Geology, on Monday evening, February 17th, at 8 p. m., or soon after, Prof. J. F. Kemp, of the Columbia School of Mines, will give a paper on the Cripple Creek Mining District, Colorado, based on a visit to the camp the past summer. The paper will be illustrated by lantern views and specimens. The meeting will be held in Hamilton Hall, Columbia College, Madison avenue and Forty-ninth street, entrance on the east side, and mining engineers or others interested are invited to attend, whether members of the Academy or not.

GENERAL MINING ASSOCIATION OF THE PROVINCE OF QUEBEC.—This association held its sixth annual session in Montreal recently. The annual report made special reference to the still unsatisfactory

interpretation of the tariff in regard to mining machinery. The election of officers resulted as follows: Capt. R. C. Adams, of the Anglo-Canadian Phosphate Company, president; G. H. Drummond, of the Canadian Iron Furnace Company, first vice-president; B. T. A. Bell, Ottawa, secretary. Mr. Drummond read a paper on "Iron Mining and Trade," John Blue one on "Pyrites and Copper." In this he showed that the quantity of copper ore mined in Quebec in 1895 was 37,560 tons, 22,700 tons of this going to the United States. A paper on "Chrome Iron" was read by J. Obalski, Inspector of Mines, Quebec. There were several other interesting papers.

THE FOUNDRYMEN'S ASSOCIATION.—The regular monthly meeting was held in Philadelphia February 5th, the president, Francis Schumann, occupying the chair. The general order of business was departed from on this occasion, routine business being deferred to allow of ample time for the reading of papers and discussions. The Anniston Pipe and Foundry Company, Anniston, Ala., represented by J. K. Dimmick, vice-president of the company, was a candidate for election, and was admitted to membership in the association. Mr. A. E. Outerbridge, of William Sellers & Co., incorporated, Philadelphia, then read a paper on "Molding Sand and its Preparation." At the conclusion of the reading some discussion arose on points brought out by the paper. In answer to a question: "What did you notice when you used powdered resin in the core mixture? Was there a tendency to a separation of the resin from the sand?" Mr. Outerbridge replied that there was no separation whatever. Before the sand could get out, he said, it was thrown backward and forward an inestimable number of times, and it was this action that caused the thorough mixing. The breaking up of the lumps showed how completely the sand was agitated before it left the machine. A paper by R. A. Hadfield, Sheffield, England, on "The Labor Question" was next read. It had been expected that Mr. Hadfield would be present and take part in the discussion which might arise afterward, but business engagements prevented his attendance. (An abstract of this paper was published in the *Engineering and Mining Journal* for February 15th.) A discussion followed, in which Messrs. Outerbridge, Schumann, Glover, Messick, Justice Cox, Jr., Hanley G. Flagg, Jr., and J. K. Dimmick took part. After passing a vote of thanks to Mr. Outerbridge and Mr. Hadfield for the papers read, adjournment was taken until March 4th, when it is expected that details in regard to the convention of foundrymen to be held in May next will be presented and a programme for that meeting adopted.

INDUSTRIAL NOTES.

The Chattanooga (Tenn.) Iron Company's furnace has gone into blast.

The Reed Island (Va.) Iron Company expects to blow in its charcoal stack early in the spring.

The iron mill at Kittanning, Pa., started up on February 10th, after a shut-down since last September.

The charcoal stack of the Jenifer Furnace Company at Anniston, Ala., will probably be put in operation April 1st.

The Ludlow-Saylor Wire Company, St. Louis, Mo., has just closed a contract for a new building which will be ready for occupancy on October 1st.

C. H. Colby and P. R. Foley have purchased the Dauphin (Pa.) Car Works, and will spend \$50,000 in preparing the plant for making bridges and architectural iron work.

T. A. Wilson and associates will erect a telephone line from West Point to Mokelumne Hill, Calaveras County, Cal., a distance of 15 miles, as soon as the weather will permit.

The Titusville (Pa.) Iron Company has been incorporated with a capital of \$250,000. The directors are John Fertig, John S. and J. C. McKinney, J. J. Carter and B. F. Kraftert.

The Etna Foundry and Machine Company, of Warren, O., which was organized recently, expects to enlarge its works. New machinery will be put in and the capacity of the plant increased one-half.

The Ohio Falls Iron Works, of New Albany, Ind., has filed a mortgage for \$60,500. Immediately after the company asked for a receiver and N. T. De Pauw was appointed with power to operate the plant.

The first electric locomotive built on the Westinghouse system at the Baldwin Locomotive Works, of Philadelphia, arrived at Pittsburg last week. It will be used for heavy hauling in the yards at East Pittsburg.

The Pioneer Rail Renewing Company, which leased the North Chicago rolling mill of the Illinois Steel Company, will probably build a plant of its own at Joliet, Ill., as the lease on the present plant has expired.

The Crown Drill Manufacturing Company, of Phelps, N. Y., has elected the following officers for the ensuing year: President, B. F. Prichard; vice-president and treasurer, G. C. Prichard; secretary, E. H. Liggett.

The contract has been closed for building the new Talcot Forge Works, which are to be removed to New Haven, Conn., from Springfield, Mass. The main building is 70 x 90 ft. and will be ready in about a month.

What is claimed to be the largest lap-welded wrought iron pipe ever produced was turned out at the Pennsylvania Tube Works, Pittsburg, a few days ago. It is 28 in. in diameter, 20 ft. long and weighs 1½ tons.

The Wellston (O.) Furnace Company's stack, producing American-Scotch iron, made an output of 17,500 tons in 310 days in 1895. Of this amount, 95% was No. 1 and No. 2 foundry iron. The present output is 80 tons a day.

The Pultney Foundry and Engineering Works, of Youngstown, O., has been incorporated. The capital stock is \$50,000. The firm manufactures hydraulic machinery, blowing engines and the celebrated Pultney valve.

One of the furnaces of the Shoenberger Steel Company, of Pittsburg, Pa., has had its stoves heightened about 15 ft., and will be blown in this week. The other furnace will probably have its capacity increased in the same manner.

The Round Mountain (Ala.) Furnace Company, with headquarters at Chattanooga, will blow in its charcoal stack about May 1st. The product is cold-blast pig iron for chilled rolls and car wheels, and amounts to about 6,500 tons annually.

The regular organization of the Greensboro (N.C.) Furnace Company was effected on February 4th by D. G. Worth, of Wilmington, N. C.; J. M. Worth, Asheville, N. C.; Edwin Shaver, Salisbury, N. C.; D. F. Caldwell and E. P. Wharton, Greensboro, N. C.

A charter has been applied for by the McKeesport Brass and Iron Company, of McKeesport, Pa. George Russell, George S. Ramsey, George W. Kepner, John Russell and Peter Cameron, Jr., are the interested parties. The company has leased a portion of the May foundry property.

The nail works of the E. & G. Brooke Iron Company, of Birdsboro, Pa., which have been idle for some time, resumed operations on February 5th. The puddling mill will start in a few days. The company has dismantled its Hampton furnace which was built in 1846, and abandoned several years ago.

The Riverside Iron Company, Kansas City, Mo., has been casting some large kettles for the Consolidated Kansas City Smelting and Refining Company, which are used for melting lead. One recently cast was 11 ft. 5 in. in diameter and weighed 18,000 lbs. It would hold 140,000 lbs. of melted lead.

Arrangements have been concluded to place in operation the Fort Payne Steel Mills, at Fort Payne, Ala., owned by E. N. Cullom, of Birmingham and Boston associates. The mills were built eight years ago at a cost of \$300,000, but were never operated because of the collapse of the Fort Payne boom.

The American Projectile Company of Lynn, Mass., which for the past five years has been engaged in the manufacture of different kinds of armor piercing projectiles, is contemplating removal. It is understood that the proposition under consideration is consolidation with the Hotchkiss Repeating Arms Company of Bridgeport, Conn.

Officers of the Pacific Rolling Mills were elected last week at San Francisco, Cal., as follows: President, Edward Coleman; vice-president, Charles F. Neal; general manager, Charles M. Keeney; superintendent, Patrick Noble; secretary, W. T. Sullivan. The directors are: Edward Coleman, Charles F. Neal, George Whittell, L. C. Bresse, A. H. Payson.

Olive Furnace at Ironton, O., has been blown out. Hecla Furnace at the same place will be running by February 20th. It has been banked up some months, waiting for ore. Sarah Furnace, also at Ironton, which blew out January 8th, is having a new hearth and in-wall and some minor repairs made, to put the furnace in first-class shape. It will be ready in a few weeks, but it is not certain when it will be started up.

The Nevada Metallurgical Works, of San Francisco, Cal., established in 1869, have removed to more commodious quarters at No. 71 and 73 Stevenson street. The new premises have been fitted up with a plant which includes a three-stamp Union mill and concentrator, also a large double-hearth reverberatory furnace, one ton capacity. The concrete sampling floor will be a feature. W. B. Taylor and H. C. Ward succeed the late Mr. Luckhardt in this company.

The Punxsutawney (Pa.) Iron Company is now having plans made for the erection of a coke blast furnace. At present the company is figuring on an 80 by 18-ft. furnace, to be equipped with three 80 by 18 ft. Cowper-Kennedy stoves. The plans may, however, be modified a little. The furnace will probably have an annual capacity of from 75,000 to 85,000 gross tons. The company expects to begin active work on the foundations of the plant shortly, and hopes to have the stack completed and ready for blast next fall.

A force of men is at work razing the Alice stack

Passagem mine yielded 1,602 oz. gold from 3,940 tons ore. The total yield was 1,652 oz. gold, an average of 0.39 oz. per ton worked.

CHILE.

NAVARINO ISLAND.—Not more than 50 miners remain on Lennox and Navarino islands, says the Chilian Times.

PUCHOCO COAL MINES.—A cablegram from Valparaiso states that the vast Puchoco coal mines situated near the port of Coronel, the property of the heirs of Jorge Rojas, have been sold to a French syndicate for \$10,000,000.

SIERRA OVERA.—Mr. Ramon Guerrero, is erecting a plant at Sierra Overa, Taltal, for the extraction of gold. The new concern, which is looked upon with much favor by the miners of the district, will be under his own personal management.

INDIA.

COLAR GOLD FIELD OF MYSORE.

CHAMPION REEF GOLD MINING COMPANY.—The report made up for the year September 30th states that the gold produced during the year realized \$264,459, and the profit, after charging to capital account £2,290 for buildings and machinery, amounted to £139,333.

GOLD FIELDS OF MYSORE, LIMITED.—The report for the year ending September 30th states that during the year the company sold a block of 213 1/2 acres of land to the Oriental Gold Mining Company of India for the consideration of 62,500 fully-paid shares in that company.

OOREGUM GOLD MINING COMPANY.—The statement for December shows 4,785 tons of ore worked in the mill and 4,784 tons of tailings treated. The result was 4,068 oz. from mill and 1,239 oz. from tailings, a total of 6,207 oz. gold.

MEXICO.

(From Our Special Correspondent.)

JACALITOS PLACERS.—A company composed of San Diego and Los Angeles parties, which owns 800 acres of placer claims in the Jacalitos District, about 90 miles south of San Diego, is making arrangements to commence work on a large scale next month.

SONORA.

LA SOLEDAD.—This mine, owned by Duran & Morales, of Ilano, and situa ed about 15 miles from that place, is one of the regular producers of Sonora and yields steadily and well.

FERGUSON CAMP.—Despite the extremely cold weather good progress has been made in the open cuts and shafts at the Ferguson Camp on La Seine. Work on this property commenced in December.

FOLEY'S CAMP.—The North Shaft is down 123 ft. The vein is nearly 5 ft. at bottom. Drifting commenced at 100 ft. both ways, with good results throughout.

RAY.—The Ray additional, including K 198 and its sub-divisions, lately inspected by Hamilton-Merritt, are again under investigation preparatory to active development.

NEWFOUNDLAND.

(From Our Special Correspondent.)

BELL ISLAND IRON MINES.—Work is going on steadily on the deposit of red hematite recently opened at Bell Island, near St. Johns.

NICARAGUA.

XINOTEGA PLACERS.—It is said that arrangements are in progress to work these placers, which are reported to be rich. They are on the Bondequi River, near the northern boundary of the Republic.

SOUTH AFRICA.

TRANSVAAL.

CASSEL COAL COMPANY.—During the year 1895 this company mined and shipped 247,308 tons of coal, an average of 20,609 tons a month.

TRANSVAAL COAL TRUST.—The total quantity of coal mined by this company in 1895 was 343,800 tons, an average of 28,650 tons per month.

LATE NEWS.

Mr. W. R. Boggs, Jr., mining engineer, of Winston, N. C., leaves this week for Mexico on professional business. He will be absent several months.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, Feb. 14.

Statement of shipments of anthracite coal (approximated) in tons of 2,240 lbs., for the week ending February 8th, 1896, compared with the corresponding period last year.

Table with 3 columns: Week, 1896, Year, 1895. Rows: Pennsylvania Railroad, Totals.

PRODUCTION OF BITUMINOUS COAL, in tons of 2,000 lbs., for week ending February 8th, and for years from January 1st, 1896 and 1895:

Table with 3 columns: Week, 1896, Year, 1895. Rows: Shipped East and North: Allegheny, Pa., Barclay, Pa., Beech Creek, Pa., Broad Top, Pa., Clearfield, Pa., Cumberland, Md., Kanawha, W. Va., Phila. & Erie, Pocahontas Flat, Totals.

Shipped West: Mononahela, Pa., Pittsburg, Pa., Westmoreland, Pa., Totals.

Grand totals 461,363 2,619,947 2,320,420

Production of coke on line of Pennsylvania Railroad for the week ending February 8th, 1896, and year from January 1st, in tons of 2,000 lbs.: Week, 96,628 tons; year, 563,198; to corresponding date in 1895, 640,855 tons.

Anthracite.

No change has taken place in the anthracite coal trade since our review last week. The market is very quiet, so far as concerns new business, and mostly all the coal moving now consists of deliveries on orders booked before the advance.

Despite the present dullness, which after all is only natural, there is now an element of firmness in the market which has been absent from it for many a month.

In the first place the radical restriction recommended by the sales agents is being strictly adhered to by all the companies. This being the case, it is not very difficult to maintain the circular.

This, however, has always been the case in past years.

The East is reported to have comparatively little stocks on hand, as New England dealers were rather skeptical of the ability of the presidents to agree on percentages and consequently bought little coal previous to the advance.

The market for the rest of the winter must be a waiting market, with spurts of activity governed by weather conditions. That the year opens better than did 1895 is undoubtedly true.

Bituminous.

There is no change to report in the bituminous coal trade. There are still a few more orders coming from points around Cape Cod, chiefly additional cargoes taken by regular contract customers, and also from dealers and consumers who can now take advantage of the prevailing low ocean freights.

There is a desire on the part of the producers' sales agents to learn what prices will be this year. This is always the case at this time. In all probability, and with or without a "combination," prices will be slightly higher than in 1895, on account of the advances in railroad freight rates, which at present amount to from 5c. to 15c.

There are a few contracts in the market, principally on all-rail business. Consumers find last year's figures acceptable, but sellers are not eager to name the same.

Some of the shoal water ports along the Sound and elsewhere are getting clear of ice, thus permitting once more the direct shipment of extra cargoes, that otherwise would have to go by rail from the nearest ice-free port.

The New York harbor trade continues fairly good. The lack of large storage capacity on account of high ground values, prevents the keeping of very heavy stocks on hand, and the demand is always fairly well maintained.

Transportation from mines to tide is good and the car supply is all that could be desired. Vessels are in poorer supply than last week, doubtless due to the recent storms, and rates are stronger.

Nominal prices are unchanged. We quote f. o. b. at the various ports, as follows: Norfolk and Newport News, \$1.9 @ \$2.15; Baltimore, \$2 @ \$2.20; Philadelphia, \$1.75 @ \$2.20; New York harbor shipping ports, \$2.20 @ \$2.65; alongside New York harbor, \$2.40 @ \$2.75; alongside Boston, \$2.75 @ \$3.

The latest reports anent the proposed association of soft coal interests, generally referred to as "the combination," are that a new difficulty has been met with in the stand taken by the interest representing a certain region which is by no means a very prominent factor in the tidewater market.

It is a very difficult matter to bring together 125 or 150 bituminous operators and get them to agree on a plan, and it is next to impossible to select a plan which will be acceptable to all. Many of the soft coal men interested profess skepticism as to the ability of the committee to achieve success in this matter.

NOTES OF THE WEEK.

Receipts of coal by water at San Francisco in January were 120,211 tons, a decrease of 13,802 tons from January, 1895. The receipts this year were made up as follows: Oregon and Washington, 30,853 tons; Eastern (anthracite and Cumberland), 3,200 tons; British Columbia, 32,155 tons; Australia,

STOCK QUOTATIONS.

BOSTON, MASS.*

Table of stock quotations for Boston, Mass. listing companies like Allouez, Arnold, Atlantic, and others with columns for location, par value, and sales.

* Official quotations Boston Stock Exchange. † Holiday. Total sales, \$1,594.

INDUSTRIAL COAL AND COAL RAILROAD.*

Table of industrial coal and coal railroad stock quotations for Boston, Mass. listing companies like Bait & Onio, Ches. & Ohio, and others.

* Official quotations N. Y. Stock Exchange. † Holiday. Total shares sold, 159,912.

NEW YORK.*

Table of stock quotations for New York listing companies like Adams, Anchor, Bogan, and others with columns for location, par value, and sales.

* Official quotations N. Y. Stock and Con. Stock & Petroleum Exchanges. Total sales, 41,305. † Holiday.

PITTSBURG, PA.*

Week ending Feb. 13.

Table of Pittsburgh, Pa. stock quotations listing companies like Mansfield, N.Y. & C. Gas Co., and others.

* Official quotations Pittsburgh Stock Exchange.

COLORADO SPRINGS, COLO.*

Table of Colorado Springs, Colo. stock quotations listing companies like Ajax, Alamo, American A, and others.

Total shares sold: Listed 2,445,154; Unlisted 2,049,949.

* Official quotations and sales Board of Trade Exchange. † Mining Stock Association.

ST. LOUIS, MO., STOCKS.

Week ending Feb. 9.

Table of St. Louis, Mo. stock quotations listing companies like Central Lead, Con. Coal, and others.

SAN FRANCISCO, CAL.*

Table of San Francisco, Cal. stock quotations listing companies like Alta, Belcher, Best & Belcher, and others.

* Official telegraphic quotations, San Francisco Stock Exchange.

BALTIMORE, MD.*

Week ending Feb. 13.

Table of Baltimore, Md. stock quotations listing companies like Balt. M. & S. N. C., Conrad Hill, and others.

* Official quotations Baltimore Stock Exchange.

MISCELLANEOUS SECURITIES.

Table of miscellaneous securities listing companies like American Coal, Chattanooga Ore & Iron R. R., and others.

LONDON. Jan. 31.

Table with columns: NAME OF COMPANY, Country, Product, Capital stock, Par value, Last dividend, Quotations (Buyers, Sellers), and various price points.

PARIS. Week ending Jan. 30.

Table with columns: NAME OF COMPANY, Country, Product, Capital Stock, Par value, Div. last year, Prices (Op'n'g, Closing), and various price points.

MEXICO. Week ending Feb. 6.

Table with columns: NAME OF COMPANY, State, No. of shares, Last dividend, Last assessment, Prices (Opening, Closing), and various price points.

NOTE.—In most Mexican mining companies the shares have no fixed par value. The capital is formed of a certain number of shares, the total value not being named. Prices are in Mexican dollars.

VALPARAISO, CHILE.* Week ending Dec. 21.

Table with columns: NAME OF COMPANY, Capital, Share value (Nominal/Paid up), Last Dividend, Prices (Bid, Asked, Last sale), and various price points.

* Special Report of Jackson Bros. Values are in Chilean pesos or dollars.

SHANGHAI, CHINA.* Jan. 3.

Table with columns: NAME OF COMPANY, Country, No. of shares, Value (Par, Paid up), Last dividend, Price, and various price points.

* Special Report of J. P. Blissett & Co. The prices quoted are in Shanghai taels.

DENVER, COLO.

Table with columns: NAME OF COMPANY, Par val, Feb. 3, Feb. 4, Feb. 5, Feb. 6, Feb. 7, Feb. 8, Sales, and various price points.

* All the companies are located in Colorado. Total shares sold: listed, 3,346,450; unlisted, 3,167,000.

PHILADELPHIA, PA.*

Table with columns: NAME OF COMPANY, Location, Par Val, Feb. 6, Feb. 7, Feb. 8, Feb. 10, Feb. 11, Feb. 12, Sales, and various price points.

* Official quotations Philadelphia Stock Exchange. Total sales, 6,348.

SALT LAKE CITY, UTAH.* Week ending Feb. 8.

Table with columns: Name of Company, Par value, Bid, Asked, Actual selling price, Name of Company, Par value, Bid, Asked, Actual selling price, and various price points.

* Special Report of James A. Pollock. † All the companies are located in Utah.

ASPEN, COLO.* Week ending Feb. 5.

Table with columns: NAME OF COMPANY, Location, Par value, Bid, Asked, Sales, Price, and various price points.

* Special Report of J. F. MacMillan. Total sales, 9,400.

HELENA, MONT.* Week ending Jan. 28.

Table with columns: NAME OF COMPANY, Location, Company's office, Par value, Bid, Asked, Shares sold, Price, Date, and various price points.

* Special Report of Samuel K. Davis. Total shares sold, 7,900.

DULUTH, MINN.* Week ending Feb. 8.

Table with columns: NAME OF COMPANY, Location, Company's Office, Par value, Bid, Ask, Price, and various price points.

* Special Report of Dwight E. Woodbridge.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES

Main table with columns: Name and Location of Company, Capital Stock, Shares, Par, Dividends, Date and amount of last, Total paid, Name and Location of Company, Capital Stock, Shares, Par, Assessments, Date and amount of last. Lists various mining companies and their financial details.

G. Gold, S. Silver, L. Lead, C. Copper, B. Borax. * Non-assessable. † The Deadwood previously paid \$275,000 in eleven dividends and the Terra \$75,000. Previous to the consolidation in August, 1884, the California had paid \$31,320,000 in dividends, and the Cons. Virginia \$42,330,000. ‡ Previous to the consolidation of the Copper Queen with the Atlanta, August, 1885, the Copper Queen had paid \$1,350,000 in dividends. § Previous to this company's acquiring Northern Belle, that mine paid 100,000 in dividends against \$425,000 in assessments.

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McNeill's Code.
Mining Journal.
Poor's Manual of R.R.'s
Scientific Pub. Co.
So. African Mfg. Jour.
Spon & Chamberlain.
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Zeitschrift fur Practische Geologie
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DIVIDENDS.

GOLD COIN MINES COMPANY (CENTRAL CITY, GILPIN COUNTY, COLORADO).
Office 53 Broadway, Room 34, New York, February 17th, 1896.
A dividend of ONE AND ONE-HALF PER CENT. has this day been declared upon the capital stock of this Company, payable at their office, No. 53 Broadway, New York, on March 16th, 1896, to stockholders of record of February 29th, 1896. Transfer books will be closed on the 29th inst. and reopened March 17th. J. A. EDWARDS, Sec etary.

HOMESTAKE MINING COMPANY.

MILLS BUILDING, 15 Broad St.,

New York, Feb. 15, 1896.

DIVIDEND NO. 211.

The regular monthly dividend, TWENTY-FIVE (25) CENTS PER SHARE has been declared for January, payable at the office of the company, San Francisco, or at the transfer agency in New York, on the 25th inst. Transfer books close on the 20th inst.

LOUNSBERY & CO., Transfer Agents.

ONTARIO SILVER MINING COMPANY.

MILLS BUILDING, 15 Broad Street,

NEW YORK, February 17th, 1896.

DIVIDEND NO. 199.

A dividend of TEN (10) CENTS PER SHARE has been declared, payable at the office of the company, San Francisco, or at the transfer agency in New York, on the 29th inst.

Transfer books close on the 25th inst. LOUNSBERY & CO., Transfer Agents.

NOTICE OF ASSESSMENT.

(Civil Code of California.)

BULWER CONSOLIDATED MINING COMPANY.

Location of Principal Place of Business, San Francisco, California.

Location of Works, Bodie, Mono County, California.

Notice is hereby given that at a meeting of the Board of Directors, held on the third day of February, 1896, an assessment No. 12 of five (5) cents per share was levied upon the Capital Stock of the Corporation, payable immediately in United States Gold Coin, to the Secretary, at the office of the Company, Room 35, Nevada Block, No. 309 Montgomery street, San Francisco, California, or to the Farmers' Loan & Trust Company, Nos. 20 and 22 William street, New York.

Any stock upon which this assessment shall remain unpaid on the 11th day of March, 1896, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on Friday, the 31 day of April, 1896, to pay the delinquent assessment together with the cost of advertising and expenses of sale.

By order of the Board of Directors,

J. E. JACOBUS, Secretary.

Office: Room 33, Nevada Block, No. 309 Montgomery street, San Francisco, California, and Nos. 20 and 22 William street, New York.

NOTICE.

Mr. LEO VON ROSENBERG returned from Colorado on the 21st, and may be seen at his office, No. 35 Broadway, New York City.

MINING.

Reports, Maps and Prospectuses prepared of mining properties.

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POSITIONS VACANT.

Continued from Page 18.

U. S. CIVIL SERVICE COMMISSION WILL hold an examination at New York City and Philadelphia on the 28th inst., for the positions of map printer and engraver in the Geological Survey. The subjects of each of the examinations will be confined to spelling, penmanship, copying and arithmetic, including simple fractions. No person will be examined for either of these positions who has not thoroughly mastered the business of map printing or engraving. Applicants must show that they have had at least six years' experience, and at least three years as journey-men. Applicants for the map printer must be specially qualified as lithographic steam pressman in color work. The salary will not exceed \$3.40 per diem. Applicants for engraver must be thoroughly competent copper-plate engravers, especially qualified in the map work of the Survey. The salaries of engravers range from \$3 to \$5 per diem, according to ability.

Requests for application blanks and other information should be made to the U. S. Civil Service Commission, Washington, D. C., which will also furnish specimen work, etc., required of engravers.

UNITED STATES CIVIL SERVICE COMMISSION will hold an examination, commencing at 9 a. m., on March 10th, to fill a vacancy in the position of topographic draftsman in the United States Coast and Geodetic Survey at a salary of \$900 per annum. The subjects of the examination will be letter writing, geography, scale drawing, geographic projections and mathematics (algebra, arithmetic and geometry). Persons desiring to compete should write to the Civil Service Commission for an application blank and file their applications at once. Arrangements may be made to give the examination at some of the large cities outside of Washington if there are applicants.

CONTRACTS OPEN.

Continued from Page 18.

DAM, ETC.—SEALED PROPOSALS, MARKED "Proposals for Building Dam," will be received by the Town Clerk until the 25th day of February, A. D., 1896, for the building of a dam and public road in Butler Township, Schuylkill Co., Pa. Plans and specifications can be examined in the office of the Town Clerk, Frank Rentz, Centre street, Ashland, Pa. Specifications will be mailed on application. By order of the Town Clerk, ABEL M. WATTS, H. F. BRIGHT, FRED. KRAPP, Water Committee.

WATER-WORKS AND ELECTRIC LIGHT plant.—Sealed bids will be received by the undersigned up to April 2d, 1896, for the erection or construction of a combined system of water-works and electric lights for the city of Dublin, U. S., in accordance with the survey and plans now in the hands of the City Clerk of Dublin. Specifications and drawings will be furnished bidders at a cost of \$11 one dollar each. Work to commence on said plants by May 1, and must be completed by September 1, 1896. For further particulars apply to the Chairman or to Jno. D. Prince.—N. B. BAUM, Chairman.

CIVIL SERVICE EXAMINATIONS.—On Tuesday, February 25th, the United States Civil Service Commission will hold the examinations in New York City and Philadelphia of candidates for positions as map printers and engravers in the United States Geological Survey Department. The subjects of examinations will be spelling, penmanship, arithmetic and copying. Examinations will shortly be held for the positions of computers, transitmen and topographical draftsmen. Application blanks may be secured and filed now. These candidates will receive due notice of examination. S. WILLIAM BRISCOE, Secretary, New York City Civil Service Boards, New Criminal Court Building, New York.

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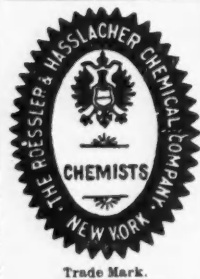
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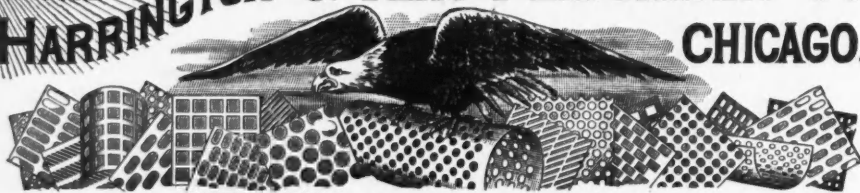
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