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THE HEROULT ALUMINUM PROCESS.

The so-called "Heroult Process" for the production of aluminum alloys, which we described and illustrated in the ENGINEERING AND MINING JOURNAL, December 1st, it appears is not only very similar to the well-known Cowles Electric Process, but it is a simple appropriation of the COWLES' invention, for the first COWLES' patent taken out for the production of alloys by electricity, states distinctly that it can be done in the manner now described by HEROULT. In other words, the Heroult Process is simply an infringement on the Cowles Process, and the Heroult Works were probably established in Switzerland, because there was no protection to patents there at that time. This process is an electric smelting, pure and simple, and depends on carbon and heat alone for the reduction performed.

REPORT ON THE MINERAL RESOURCES OF THE UNITED STATES.

The annual volume of the "Mineral Resources of the United States" for the calendar year 1887 has just been issued by the Geological Survey. The vast amount of useful information which it contains is very welcome, though its value would certainly be much increased if it were issued more promptly. It is true that the statistical tables of production of

minerals were issued at intervals throughout the year, and supplied some of the information which is of practical value in the industry, but they do not give a large part of what would be very important, while on the other hand this preliminary issue has the disadvantage of making the whole volume appear stale, and in a measure "ancient history," when it does come out. It is unfortunate that this should be the result of what is certainly an excellent feature in the publication of this indispensable report, and since the volume is practically all ready for the press early in the year, it seems a great pity that it cannot be issued more promptly than it has been in the past. Possibly the method adopted with the consular reports of issuing them as soon as received might be applied in the case of the Mineral Resources Reports. The separate reports might be issued in pamphlet form as they were ready, without waiting for the complete volume, and these parts would finally be brought together in the annual volume as now. This would have the further advantage of giving an opportunity to correct any errors that might be found in the preliminary issue.

The Division of Mining Statistics and Technology is in some respects the most important department of the Geological Survey of the United States. The immediate practical or commercial value of the information contained in the volume just issued is greater than that of any other publication issued by the Survey, admirable and invaluable as some of these are from a geological or scientific standpoint; and yet this division is allowed, out of the ample appropriation made for the Geological Survey, only the wholly inadequate, and, indeed, miserable allowance of, we believe, \$7000 or \$8000 a year.

The mere idea of collecting the mineral statistics of the United States, which in amount and value exceed those of all the European nations together, for such a sum is discreditable to those who are accountable for it. The fact that in order to collect these statistics the chief of this division has to ask engineers and other gentlemen, as a personal favor, to devote their time gratuitously to aid him in this work is simply disgraceful to the Government and humiliating to the officer who has to do it, and we believe it is quite unnecessary, for Congress is extremely liberal, not to say outrageously extravagant, in the disbursement of the taxpayers' money in far less important directions, and the just claims of this most useful department should, and if properly laid before it, no doubt would be fittingly provided for.

These remarks are occasioned, not by any marked shortcoming in the report just issued, for it is simply a marvel how so much good work was accomplished with the means at the disposal of Dr. DAY, the chief of the division, but they are inspired by a knowledge of the manner in which these results were accomplished, by the gratuitous labor, and in some cases by the actual and considerable expenditure of the expert's own money as well as time, in order that the report should be creditable to those engaged on it. It is earnestly to be hoped that next year will see a more fitting appropriation for the work, and that straw at least will be furnished to those who are expected to make bricks.

The abstracts of the mineral production statistics contained in this report have already been published in the ENGINEERING AND MINING JOURNAL; it is not necessary, therefore, to repeat them now.

The total "spot" value of these products amounted to \$542,284,225; but of this the metals amounted to nearly one half, or a little over \$250,000,000.

Mr. JAMES M. SWANK, General Manager of the American Iron and Steel Association, contributes an elaborate report of 48 pages on the iron and steel industries of the United States, and Mr. CHARLES KIRCHHOFF, Jr., furnishes, as usual, very valuable reports on copper, lead and zinc.

The article on coal contributed by Mr. CHARLES ASHBURNER occupies 216 pages, or about one fourth of the entire volume. It is an extremely valuable contribution, which has involved an enormous amount of work, which we are quite certain never was accomplished with the insignificant sum appropriated for it. The same is true also of the elaborate articles on coke, petroleum and natural gas, contributed by Mr. JOSEPH D. WEEKS, and which together occupy 120 pages.

Mr. WM. C. DAY contributed a valuable statistical report on Structural Materials, which contains much information of practical value. The same author contributed also on Sulphur, and the Potassium and Sodium Salts. A very complete tabulated statement of the Useful Minerals of the United States is contributed by Mr. ALBERT WILLIAMS, JR.

The volume concludes with a full index. In all save promptness of issue the volume is highly creditable to Dr. DAY, the Chief of the Division, and to the several gentlemen who have contributed to its pages.

We shall on many occasions make liberal extracts from the valuable data it furnishes.

THE COLLAPSE OF THE PANAMA CANAL SCHEME.

The complete and confessed failure of the Panama scheme suggests many reflections besides those which we recently made upon it in advance, and need not now repeat at length. As we then said, no body of private capitalists could, in our judgment, afford to take the canal as a gift, free of all debts, as it stands at this moment, and pay

the cost of its completion. The one opportunity of doing the work by private enterprise has been squandered, and is lost forever. Enthusiasts of small means will not again contribute to any great aggregate for this purpose; and bankers of large means can still find more profitable investments than one which would involve six years of expenditure before commencing to yield any returns, and an indefinite period after that before the maritime commerce of the world would have so readjusted itself as to make maximum use of the new route. It is true that this period of readjustment was, in the case of the Suez Canal, contrary to the expectation of the shrewdest commercial authorities, very short. The transfer of the East Indian trade to the canal took place almost immediately, to the ruin of many interests involved in the old system. But the Panama Canal would have to meet a more effective resistance, under circumstances less favorable to its immediate victory. Not Cape Horn, but the transcontinental railroads, and possibly the Nicaragua Canal also, would contest its commercial supremacy.

At all events, it is safe to say that the prospect is sufficiently uncertain to throw a fatal doubt over the investment of private capital in the completion of the Panama Canal. As to the assumption of the enterprise by any government, the situation appears to be, that Colombia is totally unable to engage in such an undertaking; that the United States Congress would never consent to involve this government in it; and that France would probably not be permitted by the United States to prosecute the canal as a state enterprise, even if she were willing to assume this great financial burden in addition to the crushing load of debt under which she is now struggling and by which she is already crippled. Other European states there are none, whose interference in the matter could be tolerated, did any inducement exist for such interference. South American states, even in combination (a quite Utopian hypothesis), would not dream of attempting a work of so little value to South America. We see, therefore, no rational hope of a completion of the canal under governmental auspices.

There is talk of various desperate measures to continue the work for the present—a great lottery, to raise further funds; a guaranty by the French government of new bonds, etc. But it must be remembered that these propositions are based upon the false notion of the state of affairs which still obtains in France. There has been a great disappointment; but the disillusion is not yet complete. The impression still exists that DE LESSEPS and his agents have merely suffered a defeat in the struggle with natural obstacles which had been underrated, or as M. DE LESSEPS puts it, the result of a conspiracy of wreckers. When the whole truth comes to light, it will be seen that the cause of still greater loss has been mismanagement and, perhaps, corruption. The many millions already spent have made a much smaller impression upon the Isthmus than might have been accomplished if they had been spent wisely and honestly.

We find in our exchanges the statement, that at one of the excavations, where Baldwin locomotives were employed to haul the earth, on a down grade, out to the dumps, there were no means of preventing them from running too far, or of recovering them in case of such an accident; and that not less than eight locomotives, thus running over the end of the track, and falling on the dump, had been left there, and covered up with the material subsequently unloaded! This story may not be true; but it presents to those who have had an insight into the management of the canal company, an air of probability. If such reckless waste has fallen primarily upon the contractors, the case is not greatly bettered; for it shows two things: First, that contracts must have been let at exorbitant prices to permit contractors to disregard wholesale destruction of plant; and secondly, that the parties who could be guilty of such mismanagement must be incompetent to execute what they undertake, and, therefore, that their pledges of performance can have no value. No device for continuing the conduct of the business in its present hands can do more than increase the already overwhelming failure.

The moral of the whole affair is not so much a warning to engineers against a too sanguine assault upon great natural obstacles, as an example to capitalists—especially stockholders—of the manner in which vast sums can be uselessly squandered in loose administration. The recklessness of the expenditures of the Canal Company could be matched only by the records of engineering work done in war time, exposed to hostile attacks and under a pressure of military reasons, justifying any outlay of money, as trivial in comparison. We are disposed to believe that the last remnants of French enthusiasm will disappear when the French stockholders discover that they have been not only disappointed through engineering miscalculations, but swindled through gross mismanagement. *

PROGRESS OF THE AUSTRALIAN COLONIES.

The statistician of Australia furnishes, in his recent report, some interesting figures as to the growth of population and advance in material prosperity, during the last decade, of the Australian Colonies, all the more interesting to us at the present moment in consequence of the growing commerce between the United States and those markets,

and the evident and unprejudiced welcome that is given to American manufactures, and the ready advantage that is taken of all improved engineering appliances, acquired under somewhat similar conditions here. As an example of the latter, we need only refer to the adoption of American locomotives on some of the Government railroads, the building of the great bridge over the Murray River, and the frequent purchases of American mining and other machinery of various descriptions.

In spite of an occasional outbreak of mining speculation, which is only natural in a country of such marvelous mineral wealth, and which recently followed the almost unparalleled discovery of silver ore in the Broken Hills District, and the famous Mount Morgan gold mine in Queensland, the financial condition of these communities is undoubtedly sound and solid, and for this reason every effort should be made by our manufacturers and contractors to secure a good footing in such a market.

	Population.			Land under cultivation.		
	1887. No.	1877. No.	Increase per cent.	1887. Acres.	1877. Acres.	Increase per cent.
N. S. Wales.....	1,043,000	644,000	61.9	1,048,000	547,000	91.6
Victoria.....	1,036,000	815,000	27.1	2,576,000	1,420,000	81.4
Queensland.....	367,000	203,000	80.8	206,000	105,000	96.2
South Australia.....	317,000	237,000	33.7	2,793,000	1,823,000	52.8
Western Australia.....	43,000	28,000	53.6	106,000	51,000	107.8
New Zealand.....	603,000	418,000	44.2	1,440,000	960,000	50.0
Tasmania.....	142,000	107,000	32.7	457,000	349,000	30.9
Total.....	3,551,000	2,452,000	44.8	8,626,000	5,260,000	63.9

	Sheep.		Cattle.	
	1887. No.	1877. No.	1887. No.	1877. No.
New South Wales.....	49,965,000	21,521,000	1,575,000	2,746,000
Victoria.....	10,624,000	10,117,000	1,334,000	1,169,000
Queensland.....	12,926,000	6,272,000	4,474,000	2,299,000
South Australia.....	7,254,000	6,098,000	440,000	231,000
West Australia.....	1,910,000	797,000	94,000	52,000
New Zealand.....	16,677,000	13,069,000	895,000	578,000
Tasmania.....	1,547,000	1,818,000	147,000	127,000
Total.....	100,903,000	59,692,000	8,959,000	7,202,000

Notwithstanding its rapid increase, the population is still very small for such a vast extent of country, the area being larger than that of the United States, but when we look at the increase in material wealth and prosperity, and the results already achieved, it gives us a better idea of the importance of these colonies and the immense future that lies before them. These results have come from two causes, first the natural resources, principally mineral, and the suitability of the country for sheep-raising, which has placed it first in the world in the production of wool, and second, the class of immigrants which has increased the population, for if we except the trifling number of Chinese, the newcomers have been of the best description for a new country. Although there has been some outcry against the small influx of Chinamen there as here, they have had their uses in the mining districts.

The total number of sheep last year reached the enormous figure of 100,903,000, showing an increase of 42,211,000 in ten years as stated above.

When we come to the area of land under cultivation, it appears almost insignificant compared with the figures of the pastoral industries, but we must remember the comparative paucity of population and the fact that it is an essentially pastoral country, and yet in this respect the increase is very marked, the total number of acres under cultivation now being 8,626,000 against 5,260,000 in 1877. Of course the wheat raising in Victoria and South Australia counts for most under this head, the acreage in Victoria being 2,576,000 and in South Australia 2,793,000.

It is clear, however, that Australia is not going to be content with wheat raising in the way of cultivation, and the large irrigation projects now being carried out under contract with the governments of Victoria and South Australia point to a still more rapid development of the agricultural resources and those of a more valuable nature.

The value of the imports and exports last year amounted to \$539,035,000, and this in the face of the low value of wool and other produce which constitute the bulk of the exports.

The debts of the colonies appear at first sight large in proportion to the population, amounting to \$801,140,000, but we must bear in mind that nearly the whole of this sum has been spent in railroads, roads and harbors belonging to the respective governments, and that apart from the fact that the net revenue of these public works, very nearly covers the whole interest charge upon the debt, the colonists have benefited by the construction of 9545 miles of railroad open for traffic, and a further extension now under construction, and the indirect return in opening up new districts and promoting development is more than equivalent to the actual revenue. Financially the position of the colonies is sound, and the public revenue is in excess of the expenditure, and has increased in the period under revision from \$88,980,000 to \$124,000,000.

The Australians under an environment somewhat similar to our own have evolved qualities resembling those of Americans. They are the Americans of the East, and have already furnished us with several valuable lessons and examples. Thus the admirable and simple Australian system of land-title transfer is infinitely in advance of our cumbersome plan. The Australian secret ballot system of voting, which effectually

prevents corruption at the polls, that disgracefully common occurrence in this country, is now recognized as a decided improvement over other methods of voting, and will no doubt be generally adopted here.

The Australians have found the same difficulty in agreeing upon a fiscal policy that we do here, but since each colony makes its own laws we have presented in striking contrast, the high protection and the free trade systems under very similar conditions in adjoining colonies.

Victoria has adopted the policy of high protective tariffs, and New South Wales has adopted free trade. The study of the results attained under each system is extremely instructive, and should be carefully digested by those who desire more than a partisan voting acquaintance with the subject. We have no intention of discussing it here at present, but it is certain that New South Wales has made far greater progress than Victoria, and that especially in its industrial development.

It is of the greatest interest to us that our people should understand these subjects, and as each policy has been worked out in the Australian Colonies under conditions not only common to each, but under conditions much resembling those existing in this country, the lesson is a valuable one for us.

CORRESPONDENCE.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested. All letters should be addressed to the MANAGING EDITOR.

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

Phosphor Tin.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: Having occasion to use some phosphor tin, I am at a loss to find out where it can be purchased, and I address myself to you in the hope that you, or some of the readers of the JOURNAL, will be able to give me the information.

J. F.

Mining in Arizona.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: Revisiting this part of Arizona after an absence of a year or more, it is gratifying to note that real progress has been made in legitimate mining industry. There is a pronounced and evident revival, with increased courage and hopefulness for the future, amongst those who, through the long night of depression, were inclined to despair. A glance at the nature of the ores of the Bradshaw gold district will suffice to show the causes of such a depression, and of the reaction. Most of the gold-bearing veins contain a high percentage of sulphurets, often as much as 25 per cent of the mass, as against 1 or 2 per cent common in California veins, and do not yield up their gold to the ordinary milling (mechanical) process. As soon, therefore, as the pioneer miners had stripped off the oxidized croppings, where the gold was free and could be taken out by the arrastra, most of the veins were neglected or abandoned.

The advent of the railway and the exhibition of the sulphureted ores at New Orleans and at Prescott resulted in the establishment of sampling works at the latter place, at which any miner found a cash market for his ore, even if only a few hundred pounds. The effect was magical. Old mines are reopened, and the despised rebellious sulphurets are now sought in all directions. One of the best examples is the old Congress mine at Martinez, which a few years ago could have been purchased for a few thousand dollars, and is now rated at over a million in value. It was secured by Mr. Jo. Reynolds, of Chicago, who last year had sent a fine mill into this section to put upon another property, he had scarcely seen. Disappointed and disgusted with the representations made to him he countermanded the order for forwarding the machinery, and it could be found in pieces by the roadside for miles from Prescott to the Bradshaws. He was then with difficulty induced to take hold of the Congress, and putting Mr. Frank Murphy in charge has developed this property by shafts and levels to such an extent that there are 100-foot blocks standing of high-grade sulphuret ore averaging \$150 per ton as shipped to the sampling works. The shipments are made from the ore broken out in driving the levels. A specimen mass of nearly pure sulphuret of iron weighing over a ton has been sent to Prescott.

The Senator mine, now developing under the management of J. W. McGowan, is another example. He is sinking a large vertical shaft intending to undererrun the long chute of high-grade sulphide gold ore known to exist, and will erect a crushing and concentrating plant in the spring.

Oro Bella, including the Oro Bonito in Tiger District, is opened by several tunnels, all upon the vein, and all showing good faces of high-grade ore, which will be concentrated before shipping. This company has built a good wagon road, seven miles long, connecting the property with the old wagon road from Walnut Grove to Minnehaha Basin, passing over the south extension of the Tiger lode and into Humbug Gulch. A ten-stamp mill is expected to be completed by spring, when the shipments of concentrates will commence. These concentrates contain silver as well as gold, and a small amount of copper, and at present can be more economically treated by smelting than otherwise.

Boaz Company, composed of Texan capitalists, has acquired one or more of the claims on the large quartz ledge at Minnehaha, and has erected a twenty-stamp mill there. Water is conveyed to it two miles in a pipe from Minnehaha Flat.

Del Pasco, owned by Messrs. Place and Shekels, is now successfully running ten stamps upon one of the long-neglected sulphuret lodes.

United Verde Copper is in successful operation, producing high-grade matte from the large bodies of granular sulphuret ore. It is now proposed to combine with these ores some of the auriferous sulphide ores from some claims on the Agua Fria, owned by Colonel Boggs.

Mr. Williams and Captain Prout, at Copper Basin, are now busily engaged in the preparations for smelting some at least of the ores from this

peculiar mineral deposit, which is another example of deposition of copper ore in a sandstone and conglomerate, the detailed description of which I reserve for a special communication. The large croppings of conglomerate colored green and blue by both forms of the carbonate of copper—malachite and chersylite—are conspicuously brilliant around the base of the granitic hill. The platforms are built and the breaker and furnace of the new hot blast form, designed by the Brothers Williams, are now in place. The company has completed, under the survey and superintendence of Mr. Beckwith, a new road avoiding the very steep grades of the old government road and giving easy access to Prescott.

Under an arrangement with London purchasers of the Vulture mine, the British superintendent has taken charge, and will work the mine under a six months option, which commenced 1st September last. Mr. Wm. Farish, representing Governor Tabor, has recently returned to Denver.

In one of your editorial articles upon the sale of this property in London, your criticism that I avoided the responsibility of stating the amount of reserves standing would have been entirely just if I had had any direct knowledge on the subject, but I had not seen the mine for three years, and it had been actively worked during that period; consequently, I could not assume the responsibility.

The Silver King property in Pinal County has become one of the most notable and inexplicable mining disappointments of the period. Apparently in the full tide of success, with continuous costly preparations making for increased capacity for working the ores; with additional stamps and a forty-thousand-dollar compound condensing engine just laid down there, an assessment is levied—the first in the history of the mine—the cry of exhaustion is raised, the flag is hauled down and the work of producing ore and bullion is stopped!

Always a peculiar mineral vein, it has not always been understood. The great bonanza of the 7th level, from which so many dividends have been paid, is reported as entirely worked out. It had a rough wedge shape, something like the form of a man's foot, with the thickest, or heel part, nearest to the old shaft. Under it there is a floor of the soft "porphyry," the ore-bearing rock, but the quartz vein continues on down, and seems to say, "Sink and drive ye laggards! You forget that the mine has seen dark days before, when men of feeble faith and weakly mining sense threw down their picks and turned their backs upon the virgin treasures lying hidden below."

The great 110-foot dam for water storage at Walnut Grove was finished last winter and the vast natural reservoir above it was filled, according to prediction, up to the 80-foot line, above which, to avoid flooding certain buildings, the water was not allowed to rise. At present, the water stands at about the 60-foot line and affords a steady flow, which keeps a constant supply in the Hassayampa, and gives water where formerly it dried away in summer. This illustrates one very important function of such dams for storing up the great floods and equalizing the flow throughout all the months of the year.

The company is now engaged in putting in a second dam, some fifteen miles lower down the valley, to take up the flow of water and divert it upon the lower portions of the placer ground, where sluicing will be resorted to instead of hydraulic washing, as at first proposed. This is done chiefly to save the great cost of a flume or pipe line upon the higher level. Recent re-examinations of the gold gravel deposits by several expert placer miners from California are reported as satisfactory.

The lake already abounds in fish, a carp pond above having broken away and let a few of the fish out. They have increased with great rapidity, and can be seen in shoals.

W. P. BLAKE.

PRESCOTT, ARIZONA.

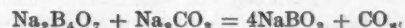
ON THE MANUFACTURE OF BORAX FROM BORONATROCALCITE.

By F. Witting.

All the borax now manufactured in Germany is prepared from boronatrocalcite, commercially known as borate of lime or "tiza" ($\text{Na}_2\text{B}_4\text{O}_7 + 2\text{CaB}_2\text{O}_7 + 18\text{H}_2\text{O}$). It is found in large quantities in the north of Chili, at Maricunga and Pedernal, and at Ascotan, which is situated about 90 miles from Antofagasta. It is also shipped from Rosario (Argentina), and in this case, too, is obtained from beds situated not far from Ascotan. The borate of lime from Ascotan is superior to that from Maricunga, as it contains on the average 84 per cent of boron trioxide, as against 12 to 24 per cent; it also contains much less calcium sulphate than the latter, and consequently requires much less soda for its decomposition. The borate of lime from Antofagasta goes direct to a syndicate in Hamburg, which consists of three refineries—Hell & Sthamer, Morgenstern, Bigot & Co., and Julius Grossman. This syndicate also sells to other refineries at a price which is regulated according to the price of borax. Since the formation of the syndicate the price of borax has remained firm at 60 to 62 marks per 100 kilos during the last two years. The manufacture of borax from borate of lime is divided into four parts.

1. Boiling of the borate of lime with soda. 2. Working up the residual mud. 3. Fine crystallization. 4. Working up the lyes.

1. The borate of lime is coarsely ground in a disintegrator, and 2500 kilos at a time of this are mixed with 4 to 5 times as much water. The mixture is heated directly by steam in a large vat provided with a powerful mixing apparatus. As soon as the mixture begins to boil, calcined soda is added. The quantity of the latter which is necessary depends on the amount of boron trioxide and calcium sulphate present in the borate of lime. The presence of too much sulphate spoils the quality of the lye. In this case much work and much steam are wasted in its removal. As a rule the soda should be added in slight excess. It is better still to use a mixture of equal parts of calcined soda and sodium bicarbonate, as in this case the boiling goes on quicker and the mixture is more fluid. The mixture should not be too alkaline, as in this case sodium metaborate ($\text{NaBO}_2 + 4\text{HO}_2$) is also obtained on crystallization, and as this only contains four molecules of water the loss is considerable. The reaction is:



On the other hand, if a slight excess of carbonate be not present, crystallization is very slow. When the soda is being added the mixture froths up violently, but this frothing can be easily overcome by shutting off the steam and adding cold water, which should be near at hand.

When the boiling is over the mixture is allowed to settle, the supernatant lye siphoned off, and the sediment passed through a filter press. The lye should have an average concentration of 30 degrees to 35 degrees Baumé or more. The degree of concentration is regulated by the amount of sodium sulphate present. The lye is run into rectangular iron tanks of 1000 to 1500 liters capacity, and allowed to crystallize in a well-ventilated, cool place. The crude borax, which contains about 40 to 50 per cent of common salt, crystallizes out on the sides and bottom of the vessels in three or four days. The lyes can be employed several times for the boiling, but when they get too concentrated, it is best to evaporate them down. The crude borax then obtained contains sufficient borax to be worked up by the usual method, but the subsequent crystallizations, containing only 10 per cent of borax, have to be specially worked up.

2. To obtain the borax still present in the filter-pressed sediment the latter is either lixiviated in the press or the cakes are removed and lixiviated with hot water. This lixiviation is necessary to obtain a good yield. The lyes thus obtained are boiled down and crystallized.

3. The crystallization vats used in the refining process are large iron rectangular vessels capable of holding 8 to 10 cubic meters. They are cased in wood, and the interspace is packed with some non-conducting material, as it is very important that irregularities in cooling be avoided in order to obtain crystals of the necessary hardness and size. The crude borax is dissolved in pure water in quantity sufficient to obtain a boiling hot lye of 30° B. The fine lyes obtained can be several times employed for dissolving fresh quantities of crude borax; but as the amount of salt and sodium sulphate increases, the gravity of the solution is increased. Lyes which are too concentrated should not, however, be employed, for in this case octahedral borax containing five mols. of water crystallizes out at a high temperature, and loss is thereby entailed, as commercial prismatic borax contains 10 mols. of water. To remove iron and organic matter, which color the borax-sodium, hypochlorite is added. This is obtained by digesting bleaching powder with sodium carbonate solution, and the clear liquid is added to the borax solution until the latter is limpid and gives no reaction with potassium ferrocyanide.

The crystallization vats are all but filled with the borax solution and

THE DRAINAGE OF THE VALLEY OF MEXICO.

Written for the Engineering and Mining Journal by Richard E. Ohlsm, M.E.

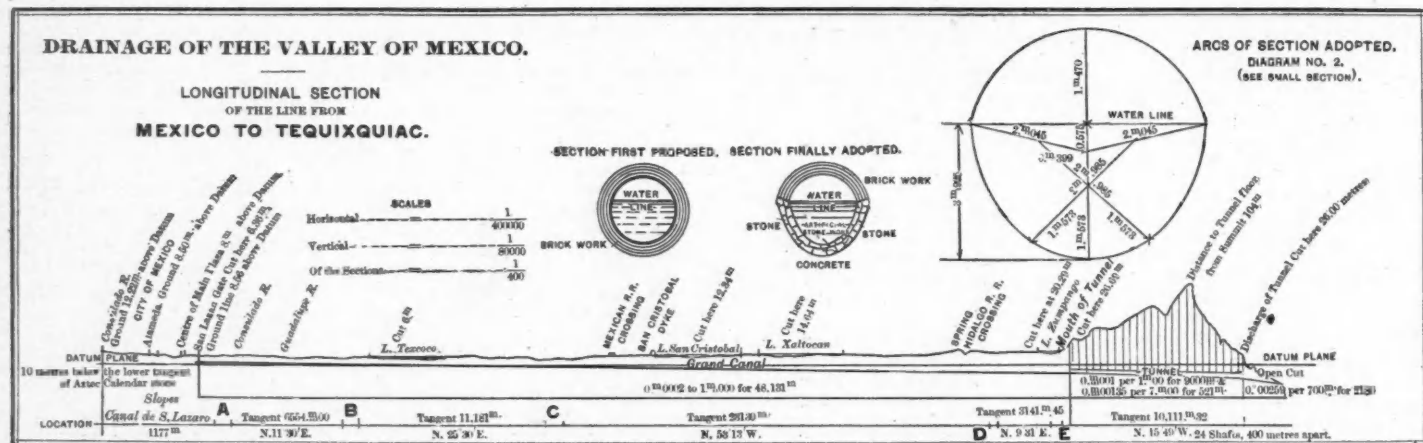
Concluded from page 501.)

The author of the project that is now being carried out for the drainage of the valley took into consideration, as I have stated, the opinions of several physicians and learned persons of this city that it would be unwise to dry up the lakes completely; hence he confined himself simply to the control of Lake Texcoco by securing therein a certain level so low that there will be no danger of an inundation in the city.

He accomplishes this end by leading away from the lake all the water that runs into it during the five rainy months of the year above a certain quantity.

The amount of the drainage through the sewers of the city into the lake is comprehended in the above proposition, and about this quantity of water will run during the whole year in the canal leading to the tunnel. But as this is less than the capacity of the canal a part of the water of lakes Xaltocan, San Cristobal, Chalco and Xochimilco can also be disposed of during the dry season when the waters of Lake Texcoco have been sufficiently lowered. For the purpose of this project the maximum variation in the level of Lake Texcoco from the beginning of the rainy season until its end has been calculated as 0.70 meter, leaving out of the account the abnormal years in which it would exceed this amount. The mean area of the lake has been taken as 272,170,803 square meters, so that there is a volume of 190,519,562 cubic meters to be disposed of in five months, which gives an approximate discharge for the canal and tunnel of 15 cubic meters per second. In order to allow a margin for the effects of the evaporation which might dry up the lake too much and thereby cause danger to the public health, the above quantity, which is less than the lake receives, has been taken as the base of the calculation. In some years of little rainfall Lake Texcoco has been known to dry up almost entirely in the dry season. Should this occur again it is proposed to turn into the bed of Texcoco the waters of Lake Chalco, or so much of them as may be necessary, so as to preserve the public health.

And although 15 c. m. per second is the discharge obtained by the above calculation it is proposed to make the outlets capable of discharg-



carefully covered up. After 10 to 14 days the temperature has sunk to 33 degrees, and the borax crystallization is finished. At this temperature, too, the sodium sulphate begins to crystallize, so that at 33 degrees the liquor must be run off. The borax crust (about 20 cm. thick) is then freed from the mother liquor by sparging it with water or washing it with a sponge. It is then knocked off with a hammer, freed from adhering dirt, and dried in baskets at 30 degrees in a drying chamber for 24 hours. Small, imperfect crystals are then removed and the borax is finally packed into barrels lined with blue paper and capable of holding from 3 to 400 kilos.

4. A very important point is the working up of the large quantities of lye obtained in the crude and fine crystallization. The lyes should not contain too much sodium sulphate and salt. In winter the lyes which have previously been strongly concentrated are run into crystallization vats, which are placed in the open air. The Glauber's salt then crystallizes out in large quantities. In summer crystallization is very difficult, and the sodium sulphate and salt have then to be boiled out. This, however, entails loss, as the hard crusts formed on the sides of the vessel contain 3 per cent. of borax, which is lost. The sodium sulphate thus obtained, as well as that (containing 10 per cent of borax) obtained in the crude borax distillation are mixed and gently heated, being stirred up and worked all the time until the sulphate just dissolves in its water of crystallization. The liquid is at once run off and the hard pieces of borax left are worked up in the fine crystallization. To obtain a satisfactory yield all loss by spilling should be avoided, and great care has to be exercised in the manufacture. Iron crystallization tanks are preferable to leaden ones, as they are much stronger, and after some use the sides become perfectly polished. With the present cheap soda the above method is better than the acid method, as the plant is not so seriously attacked, and considerable loss results in the latter method from boric acid being volatile with steam. —*Jour. Soc. Chem. Ind.*

Vulcanized Fiber for Gear-Wheels.—Vulcanized fiber for mechanical purposes has for some time attracted attention. As a material for cogs, in cases where the moist are, would be an inconvenience and injury to ordinary gearing, it has, according to all accounts, given very satisfactory results. In one case gutta percha cogs are known to have been used for twenty years. When the wheels became worn, the material was utilized for cast-iron gears.

ing 17.50 c. m. per second to allow for any filtrations of water into the canal along its course.

As the water of Lake Texcoco does not enter the canal until kilometer 20 the canal has been divided into two parts. The first part commences in the San Lazaro canal a short distance outside of the city gate and is just large enough to carry off the discharge of that canal, which is calculated, normally, at 5 c. m. per second. This section is 20,040 kils. long. The second part of the canal will receive the discharge of Lake Texcoco in addition to that of the first section of the canal, has the full calculated section to allow of a discharge of 17.50 per second, and is to be 28,091 kils. in length. The whole canal will then be 48,130 kils. long, or 29.84 miles from the city to the tunnel.

The whole canal will have a grade of 0.0002 meter per meter, or 2-100 of one per cent; but the first part, as it is to have a discharge of only 5 c. m. will have a bottom width of only 5 meters. The water will have a depth of 1.40 meter and a velocity that will be approximately 0.56 meter per second. In this part, as in the rest of the canal, the banks will slope upwards from the bottom at an angle of 45 degrees.

The second part of the canal will have a width at the bottom of 6.50 meter, with the same grade and side slopes as the first part, and should, according to the calculation, deliver 17.50 c. m. per second with the water at the depth of not over 2.50 and at a velocity of 0.80 meter per second approximately.

It is calculated that the backing up of the water caused by the difference in the level of the water in the two canals at their point of junction [2.50 meters—1.40 meters] will cease to be observable at 13 kilometers back towards the city from the point where the narrower canal joins the wider one, and that this back-flow will not be an obstacle to the exit of the water from the city drains.

The datum plane which has been adopted for the forming of the profile of the axis of the canal and tunnel is called "Plane of the Valley Drainage Commission." It is 10 meters below the lower tangent to the Aztec Calendar stone as it formerly stood against the west wall of the Cathedral, and 8.075 meters below the pavement at the northwest corner of the National Palace in the Great Plaza of Mexico. At the point of beginning of the drainage canal the natural surface of the soil has an elevation of 8.56 meters above the datum plane, and the bottom of the canal will be 2.20 meters above the same plane, so that the canal will be 6.36 meters deep at its initial point.

The level of the city proper is about the same every where as that of the ground at the beginning of the canal, except in the extreme western

part, where the ground rises a little. The canal then should drain the city to a depth of a little over six meters (19.7 feet) below the surface. As the water now stands commonly at say 2 feet below the surface of the soil, it will, when the drainage is finished, be lowered 17.7 feet below its present level.

In the whole 48.131 kils. of the extension of the canal, the fall will be 9.6262 meters, according to the grade, as already mentioned. This will bring the bottom of the canal at the beginning of the tunnel to 7.426 meters below the datum plane, or 15.501 meters below the corner of the National Palace. The surface of the ground at the latter point is 20.10 meters above the datum plane, so that the depth of the canal at its termination, which is also its maximum depth, will be 27.526 meters (90.78 feet).

The depths at the intermediate points of the canal can be taken from the profile which accompanies this article.

The volume of the excavation is as follows:

	Cub. metrs.
From the initial point at the city gate of San Lazaro up to a distance of 20.040 kils., with a bottom width of 5 meters.....	1,770,582
From the latter point to the mouth of the tunnel, 28.091 kils., width at bottom 6.50 meters.....	10,169,906
Total.....	11,940,488
From the above must be deducted the quantity contracted for by the Bucyrus Construction Co.....	1,000,000
And the amount excavated by the Drainage Commission up to June 30th, 1888.....	575,354.73

concern, which has been for some time at work on kilometer 23 of the canal where it crosses Lake San Cristobal. The work has been done by means of floating dredgers of a peculiar patent, owned by the company. I am not aware how the enterprise has succeeded.

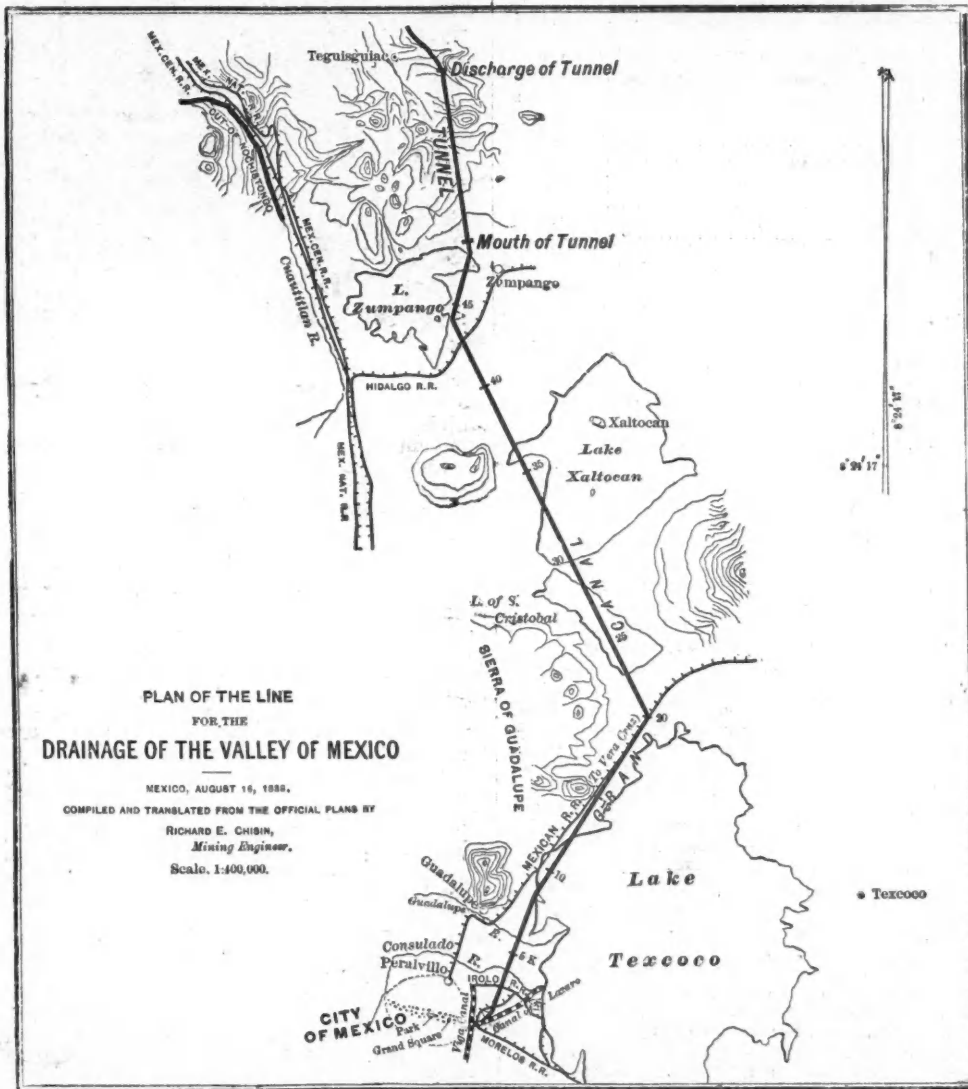
Taking the accounts as rendered by the Drainage Commission up to the end of June I find that, as nearly as can be ascertained, the cost of the excavation done along the canal, including that done by the Bucyrus Company, has been \$0.395 per cubic meter during the first six months of the present year. The estimate includes the cost of materials and the general expenses of administration.

The costs are divided about as follows:

Excavation.....	\$0.150
Materials, tools, etc.....	0.107
General expenses administration.....	0.129
Total.....	\$0.385

The most important part of the drainage works is of course the tunnel. It commences at the end of the canal and extends through the hills to a length which, as the present plans go, is 9520 meters, although it is possible that this may be prolonged southward some 400 or 500 meters, as the canal at that point would be rather over 27 meters deep, and it may be determined to lengthen the tunnel instead of making such a deep open cut.

The tunnel is to have a slope of 0.001 meter per meter, $\frac{1}{10}$ of 1 per cent, in the first 9000 meters, and of 0.00135 per meter in the last 520 meters. The



So that there is now open for contract 10,365,133.72 cu. metrs. The excavated materials are to be placed on each side of the canal, allowing them to take their natural slope, and arranging them so that the lower edge of the embankment which they form shall be from six to ten meters distant from the edge of the excavation, so as to leave a towpath at least six meters wide between the edge of the embankment and that of the canal. At the foot of the embankments, on the side toward the canal, ditches are to be dug, so as to prevent the rainwater from running down the slope of the canal. The ditches are to drain into the nearest natural water-courses, or their waters are to be led into the canal itself by means of ditches, lined with mason-work, down the slope of the canal.

At the beginning of the canal a water-gate with two openings is to be constructed so that the drainage from the city can be controlled and either directed through the canal or turned into Lake Texcoco. A water gate is also to be placed at kilometer 20, where the canal receives the drainage of Lake Texcoco, so as to control the waters from that lake to and prevent their entrance to the canal whenever necessary. At the entrance to the tunnel another water-gate of three openings will be placed, by which the quantity of water in the tunnel can be regulated so as not to allow it to rise above the proper height. Bridges and viaducts are also to be constructed at various points, such as railroad, common road and river crossings: these are seven in number.

The Bucyrus Construction Company, alluded to above, is an American

total fall in the whole distance is then 9.70 meters, or rather more than in the whole length of the canal. As the mouth of the tunnel is, as we have seen, 7.426 meters below the datum plane, the discharge end will be 17.126 meters below the same plane, or 25.201 meters below the level of the main plaza of Mexico.

The grade which has been artificially given to the bottom of the ravine in which the tunnel is to discharge is 0.00269 meter per meter for a length of 2180 meters. The cross section of the tunnel is semi-ovoid, see diagram No. 2, and is so calculated in area with reference to the above slope, as to give the required calculated discharge of 17.50 cubic meters per second, when the tunnel is filled to the maximum height of flow at 3.925 meters above the lowest point of the bottom. The useful section of the tunnel has an area of 7.7879 square meters. There is, however, a space in the form of the arc of a circle with 1.47 meters of height and 3.925 meters of chord, left above the surface of the water to allow for the passage of floating bodies. Including this free space the tunnel has a total area of 12.0365 square meters. Just why the government should go to the expense of building a tunnel and then leave 35 per cent of its area unutilized for the passage of floating bodies that could just as well, or better, be kept out altogether by a simple grating at the entrance, is one of the many problems in engineering science that no fellow can find out. The mean velocity of the water in the tunnel is calculated to be 2.30 meters per second, approximately.

The arched part of the tunnel is to be lined with brick, as it is supposed

that the water will never get up that high, but as a brick lining is thought to be insufficient to resist the abrasion of the water at the above velocity, the lower part of the tunnel is to be lined first with basalt building stone which will carry an inside lining of artificial stone made of Portland cement and sand.

The upper lining of brick is to be 0.45 meter thick and the lower part is to have 0.30 meter of stone and 0.15 meter of artificial stone.

The work on the tunnel was to be carried forward through twenty-four shafts, about 400 meters apart, the first one being 65 meters north of the south end or entrance to the tunnel. At the present time four of these are completed, the rest being in various stages of advancement except Number 19, which caved in, and has been abandoned. The shafts are lined with masonry as far as completed, and there are numerous steam hoists and pumps to carry the work on in good shape. The observations made by visitors go to show, however, that the work on these shafts is not under proper supervision, as the machinery is represented as out of order, and the construction of the shafts is described as being very slovenly in some places and positively dangerous in others.

The work on the tunnel was commenced about the year 1878, but from a report of the Drainage Commission I learn that in January of 1886 there were only about 415 meters of advance gallery and 370 meters of the upper arch constructed. Not one meter of completed tunnel is reported. The present Drainage Commission took charge of the work at that time and in 1886 and 1887 there were made 442 meters of advance gallery, 775 meters of the upper arch and 847 meters of completed tunnel. During the first six months of the present year there were made 241 meters of gallery, 161 meters of the upper arch and 314 meters of completed tunnel.

As nearly as I can estimate from the accounts published by the commission, the expense of each meter of completed tunnel has been as follows, counting four meters of gallery or two meters of upper arch as equal to one meter of completed tunnel:

For opening and lining and labor.....	\$72.80
Cement and materials, wood, etc.....	68.10
One-third cost of repairs, etc., to railroad.....	1.77
Part expense of the shafts.....	3.30
General expenses, administration, etc.....	44.10

Total cost of one meter of tunnel.....\$188.07

In round numbers it will be safe to say that each meter of completed tunnel costs \$200, and at this rate the whole 9520 meters will cost \$1,904,000.

The tunnel, as well as the canal, is to be opened through soft, decomposed rocks of a clayey or marly nature, which can easily be removed by pick and shovel. To facilitate the operations the commission has laid down a line of railroad from the station of Zumpango, on the Hidalgo railroad, and which connects with each shaft along the line of the tunnel and extends to the northern end of the workings. A railroad is also to be built to unite the mouth of the tunnel with a point on the Mexican National Railroad so as to shorten transportation.

The commission has also in operation a brickyard, a full set of lime-kilns of improved construction and a factory of the artificial stone used in lining the tunnel.

There is also a workshop mounted with power lathes and drills, and with some wood-working machinery.

The Drainage Commission, of which I have spoken so frequently, is composed of prominent and wealthy citizens and is appointed by the City Council of Mexico, with full powers to act in all things relating to the financial and administrative direction of the drainage, but the supervision of the work and the appointment of the engineering staff is reserved to the General Government.

The present commission has been in power some three years, and as will be seen by some of the foregoing data, has done much more than any of its predecessors. It has lately further earned the gratitude of the people of this valley by contracting for the finishing of the tunnel by an English company who have agreed to complete the tunnel within three years from the first of October.

The contracting company is called the "London-Mexican Prospecting and Finance Company, Limited," and as the agreement has been signed by both parties and received the sanction of the president, it is likely that the work will at last be finished within a reasonable time. What the terms of the contract are I have not been informed, but it is understood that the work is to be paid for in city bonds, which are sold to the contractors at a price considerably below par.

The completion of this work of drainage will remove the greatest obstacle to the path of progress of Mexico. This city is remarkably well situated to become the capital of a great nation, and only the present disagreeable features of residing here and the positive danger to life and property, which is the result of bad drainage, have prevented it from having three times as many inhabitants as it now has. With all the tributary railroads the city should have progressed in the past few years more than it has done. Nothing but the want of drainage has kept it back, and it is not too much to affirm that should this improvement be once effected and the peace of the country in general continue the City of Mexico will within twenty years thereafter be nearly as populous as New York is now.

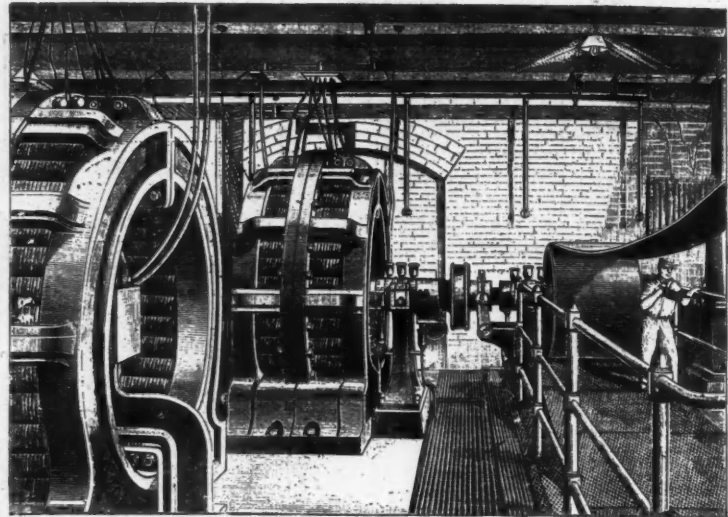
MEXICO, Oct. 30, 1888.

Mining Industry in Bavaria.—The mining industry of Bavaria has not, so far, assumed much importance, and is only represented at present by 179 mines, which afford employment to 4877 hands, and steam power is only used in 27 of the mines. Coal is found at Micobach, Hausham and Penzberg in sufficient quantities to cover the requirements of the manufactories in those districts, and the production could no doubt be considerably increased. Coal is also found in Franconia, but the collieries in that province suffer from the competition of Bohemian and Saxon products of the same description. Porcelain clay is obtained in the Palatinate and in Franconia, but can only find a market within a comparatively limited distance of the deposits, as the British and the Bohemian kaolin prevent it from being exported. The production of the graphite mines in the south of Bavaria is, however, increasing, and has of late realized more remunerative prices than formerly, and steatite is extracted in rather considerable quantities in Franconia.

THE 10,000-LIGHT FERRANTI DYNAMO.

In our issue of November 10th we gave a description of the Central Station of the London Electric Supply Corporation, and referred to the gigantic Ferranti dynamos, which it is proposed to put in. We now reproduce from the *Electrician* an illustration of one of these dynamos, in use at the Grosvenor Gallery Station of the same corporation, which is nominally a 10,000-light machine, being designed for that number of 10-candle power lamps, but in practice it has proved itself capable of taking a load of 19,500 lamps without injury. The *Electrician* describes the dynamo as follows:

These machines stand 9 feet 6 inches in height, with a floor space 9 feet by 11 feet. The armature is not built up in the way usually associated with the name of Ferranti, but is composed of separated bobbins, after the Siemens type. The coils are wound on laminated cores of gunmetal and German silver, and are composed of copper tape $\frac{1}{4}$ inch in



10,000 Light Ferranti Dynamo.

width by $\frac{1}{16}$ inch in thickness. The tape is slightly corrugated in order to prevent its slipping on the crown of the core, which is also corrugated to receive it. The insulation is wound on with the tape, and consists of hard vulcanized fiber of $\frac{1}{4}$ millimeter thickness. One end of the bobbin is soldered to the core, which is insulated from the frame by blocks of ebonite held in cast-iron clamps. In the Deptford machines we understand that an improved method will be adopted. There are forty coils, each consisting of 25 turns, connected 20 in series and two in parallel, so as to keep the points of maximum difference of potential at the opposite extremities of a diameter. The diameter of the armature is 8 feet 6 inches, and its resistance when hot is 1.1 ohm, which at 2400 volts gives a loss of only 7000 watts, or 1.36 per cent. on the maximum output. The speed is 260 revolutions per minute, which is equal to a peripheral velocity of 6942 feet per minute. The field magnets are eighty in number, and are set very close together, forty on either side. The coils are connected in eight parallels, and have a resulting resistance of 1 ohm nearly. The field magnets weigh 17 tons, the base plate 13 tons, the pulley (diameter 5 feet) weighs 2 tons, and the armature $\frac{1}{2}$ ton.

The exciters are shunt-wound Siemens machines, giving 100 volts and 108 amperes; they are coupled direct to the shafts of the Ferrantis. The latest addition to the plant is a twelve-unit Kapp machine, also shunt wound, which is at present used chiefly for lighting the engine-room, but is also intended as a stand-by for the exciting current in case of need. Switches are arranged for this purpose. There is a constant oil service for each of these machines; the tank holds 300 gallons, and the circulation is effected by two Worthington pumps. Castor oil is used, and the used oil is returned through two strainers.

The total number of lamps at present wired in connection with this station is equivalent to about 35,000 of 10 candle-power and to supply current for these lights two Ferranti machines are provided and have been found amply sufficient for the service.

State Aid to Industry in Germany.—Not only has the Prussian Government fitted up mechanical and technical testing establishments at Charlottenburg and in the Royal chemico-technical laboratory in Berlin, at which establishment technical novelties are tested as to their practicality and usefulness, but they also afford direct pecuniary support to such technical experiments. We hear, for instance, that the Prussian Minister of Public Works has ordered the experiments with ferro-silicon at the Gleiwitz smelting works to take place at the expense of the government. This will be highly appreciated by the iron founders, who are following these experiments with lively interest.—*Kuhlou*.

The Sault Ste. Marie vs. The Sault Ste. Marie Canal.—The last month of any considerable traffic through the Sault Ste. Marie Canal showed a gain of 105,000 tons over November, 1887, and brought the total freight tonnage for the season to December 1st up to 6,409,278 tons. This, a Cleveland paper remarks, is doubtless the greatest volume of business which has ever passed through any ship canal in an equal period. It is about the usual tonnage of the Suez canal for an entire year, showing a monthly traffic twice as great as that of the famous highway opened through the Egyptian sands by Count de Lesseps. The growth of the commerce of the great lakes is wonderful, even in this land of industrial marvels,

The Mendeleef Theory of the Formation of Petroleum.—The theory is held by Professor Mendeleef, of Russia, that petroleum is produced by water, which penetrates the earth's crust and comes in contact with glowing carbides of metals, especially of iron. The water is decomposed into its constituent gases, the oxygen uniting with the iron while the hydrogen takes up the carbon and ascends to a higher region, where part of it is condensed into mineral oil, and part remains as natural gas, to escape wherever and whenever it can find an outlet. If this assumption is correct, and a sufficient store of metallic carbides is contained in the earth's interior, petroleum may continue to be formed almost indefinitely, and yield a supply of fuel long after coal has become exhausted. Professor Mendeleef supports his views by producing artificial petroleum in a manner similar to that by which he believes the natural product is made.

Coals in Japan.—The following is a copy of a letter from the acting secretary of the Yokohama General Chamber of Commerce, under date October 6th, 1888: In former years a large and regular trade in coal was not carried on, since the ocean-going steamers either had their own depots or took their supply at Nagasaki from the Takashima mines; but latterly both production and export of coals have greatly increased. The most important and most productive mines of Japan are the Takashima, Katatsu and Miki mines, in the south, not far from Nagasaki, and the Poronai mines, on the Island of Yesso. These latter mines had formerly the disadvantage that they were situated too far from the coast; but since a railway has been opened to Otaru, these coals come more into the market. The principal mines on the island of Kiushiu are the Amakuru, Karatsu, Chikuzen and Bizen mines. Among the smaller mines between Kiushiu and Yesso, the Aburato mine, in the Province of Echigo, is the most important. Its coals are used in the gold mines of Sado Island and in the silver mines of Inai; laterally, a small quantity has been exported to Nugata. At a rough estimate, the total production of all mines may be placed at fully one million tons, viz.: The Takashima mines, about 370,000 tons per annum; the Miki mines, about 240,000 tons per annum; the Poronai mines, about 80,000 tons per annum. The remaining 310,000 tons are divided among the other mines. The best coals come from the Takashima mines; all the others, with the exception, perhaps, of the Miki coals, are inferior in quality. The exports were: 1882, 327,240 tons, value \$1,197,053; 1883, 391,944 tons, value \$1,373,570; 1884, 522,211 tons, value \$1,828,263; 1885, 580,689 tons, value \$1,975,965; 1886, 670,863 tons, value \$2,208,548; 1887, 704,935 tons, value \$2,337,804.

Report of the Director of the Mint at Lima, Peru.—The report of the director of the Lima mint for the year ending June 30, 1888, shows that the receipts of the mint for the purpose of coinage were 1428 bars of silver, weighing 69,057 kilograms, producing 3,073,789.61 sols; of this 2,454,000 sols were placed in circulation by the owners, for the silver coined was private property. Three per cent was collected for the expenses of the operation, of which 2½ per cent went to the contractor, under whose direction the mint is conducted, and one half of 1 per cent was appropriated for the salaries of the Government employés, guards, etc., who are concerned in the official assays, the security and protection of the buildings and their valuable contents. The silver coin exported from Peru during the year was 1,108,415 sols, and the duty imposed amounted to \$6,617 sols. Of gold 74 bars were exported weighing 137 kilograms. The present coining capacity of the mint is 400,000 sols per month, and with an inconsiderable expenditure for improvements on the machinery, the director states that 1,000,000 of sols monthly could easily be turned out. The mint at Lima was erected thirty years ago, and is a faithful reproduction on a limited scale of that in operation at Philadelphia. During the year the mint also received from Bolivia and Chili 231 bars of silver, which were coined into 622,654 sols. In view of the important results to be derived from an extension of the coinage facilities, the government has ordered that the machinery requiring repair be looked after, and at the request of the Chamber of Commerce at Lima, that the bar silver delivered by native miners and owners be coined in preference to that arriving from abroad. The mint is self-supporting and is directed by experienced and scientific men.

Alkali Works in England.—The amount of capital at present invested in the Leblanc process is about \$15,000,000. During the past year there were 601,580 tons of salt decomposed in England and Ireland, or, including Scotland, 649,867 tons, in the North of England 117,225 tons, in Cheshire, North Wales, and part of Lancashire 143,600 tons, and in Widnes 236,430 tons. From the above total 10 per cent should probably be deducted to allow for stoppages for repairs and holidays.

In the ammonia-soda process 158,636 tons of salt were decomposed during the year. In the subjoined table is given a comparison of the amount of salt decomposed in the two processes for the past three years:

	1885.	1886.	1887.
	Tons.	Tons.	Tons.
Leblanc process.....	598,096	584,323	577,381
Ammonia-soda.....	115,082	137,220	158,636
Total.....	713,178	721,543	736,017

The alkali waste receives the constant attention of the inspectors in order to secure the adoption of the best method in laying it, and to see that the surfaces are well rammed and that every precaution is taken to prevent the ingress of air. The importance of constant care is seen in the fact that the waste is produced at the rate of 1,500,000 tons per annum. In Widnes alone the heaps contain 8,000,000 tons of material and cover 450 acres of ground, and receive daily an addition of 1000 tons of the waste.

From Messrs. Brunner, Mond & Co.'s new coke-ovens and gas-producers there is obtained, per ton of slack burned, about 66 pounds of sulphate of ammonia, being three or four times the amount obtained in gas-works, though even this is only about half the possible ammonia.

Irrigation in Egypt.—*Indian Engineering*: The Raiyan Reservoir is a project for impounding a part of the surplus water of the inundation of the Nile, to be used during the Sefi or low Nile period. In a memorandum on the latest survey, Colonel Western, C.M.G., R.E., Director-General of Works, describes how this valley or depression lies immediately to the southwest of the Fayoum Province, to the west of the Nile,

and about 70 miles south-southwest from Cairo. Sir Evelyn Baring informs Lord Salisbury of the discovery and its importance, stating how scholastic researches had led to the belief that such a depression did exist. Complete surveys have been made and notes prepared by Sir C. Scott-Moncrieff and Nubar Pasha based upon those of Colonel Western and the inspectors of irrigation. The facts, therefore, are beyond all dispute. In a summary of the proposals, it is said that a reservoir capable of supplying Low Nile with 50,000,000 cubic meters of water per diem for 100 days can be made for £500,000. The canal of escape for the excess of the Nile flood, to be used as the canal of supply and discharge, can be opened in 300 days, by the excavation and handling of 3,000,000 cubic meters of sand, clay, and soft rock. The area and productive wealth of Egypt would be increased by more than one third. No burden would be imposed upon the present taxpayers. The works would be mainly the utilization and restoration of dykes, canals, and physical characteristics in actual use for this same purpose during 2000 years, and, in part, in continuous operation from B. C. 1800 to the present time.

[The credit for this work must be given in great part to our countryman, Mr. Cope Whitehouse, who was among the first to call attention to the great depression known as Lake Moeris (the Raiyan reservoir) and who has been indefatigable in his efforts to have recognized the enormous benefits which would accrue to Egypt from the filling of this lake by the re-opening of "Joseph's Canal." We congratulate him on the progress he has made, as shown in the above report.—Ed. E. AND M. J.]

Electrolytic Extraction of Chlorine and Sodium from Sea Salt.—We learn from the *Moniteur Industriel* that Mr. N. N. Beketov, a Russian chemist, has made an interesting communication to the Technical Society of St. Petersburg on the subject of a new system of decomposition of chloride of sodium, which may have important results in the manufacture of soda ash and caustic soda. Mr. Beketov made his first experiments in 1885, according to the Hefler process, but the results were not satisfactory, the loss of chlorine was so large. He has now treated electrolytically the salt in a state of fusion, and at this temperature, which with sea salt is 500 degrees C., its conductivity is sufficient to produce electrolytic decomposition. With a force of five volts (sufficient to decompose the salt) and one ampère, 1805.60 pounds of salt can be decomposed in 24 hours, resulting in a production of 722.24 pounds of sodium and 1083.36 pounds of chlorine. In other words, it requires in twenty-four hours 16,000 ampères at five volts, or the work of 80,000 volt-ampères. Here our contemporary gives the figures of cost under Russian conditions, which, however, are not so interesting as those that can be applied generally in this country. It is pointed out that in order to obtain the best results possible, the sodium and the chlorine should be utilized on the spot, and the formation of by-products avoided. The sodium could be used in the preparation of caustic soda, or the production of aluminum, and the chlorine in the manufacture of chloride of lime (bleaching powder). The fusion and electrolysis of the salt can be made in cast iron or fire-clay cylinders with three openings—one for charging the salt previously heated, the others to introduce the electrodes, which pass through porcelain tubes and do not reach the bottom. The positive electrode is of carbon and the negative iron. This latter should have a passage for the metallic sodium as fast as it forms. It is of importance to have the electrodes shorter than the tubes in order to avoid the recombination of the sodium and chlorine. To give practical realization to this system, it is necessary to construct a dynamo of great volume with low tension, but no doubt a higher force than 5 volts could be utilized.

BOOKS RECEIVED.

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

The Principles of Thermodynamics, with Special Applications to Hot Air, Gas and Steam Engines. By Robert Röntgen. Published by John Wiley & Sons, New York. Pages, 707. Price, \$5.

Chemical Lecture Notes. By Prof. Peter T. Austen, Ph. D., F. C. S. Published by John Wiley & Sons. New York. Pages, 98. Price, \$1.

Mineral Resources of the United States for 1887. By David T. Day, Chief of Division of Mining Statistics and Technology. United States Geological Survey. Published by the Government. Pages 832 and Index.

MAP RECEIVED.

Map of the Territory of Wyoming. Compiled and drawn by A. F. Dinsmore, under supervision of George U. Mayo, Civil Engineer in Chief, General Land Office, Department of the Interior. Forwarded from office of the Secretary of the Territory.

PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

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

PATENTS GRANTED DECEMBER 18TH, 1888.

- 394,574. Steam-Generator. Henry H. Hyland, Pittsburg, Pa.
- 394,593. Mining Skip. Leander S. Woodbury, Calumet, Mich.
- 394,635. Rolling-Mill. William H. Appleton, New York, N. Y.
- 394,636. Gold-Saving Apparatus. Olin H. Bagley, Knappa, Ore.
- 394,654. Concentrator. John A. Jones, Tuscarora, Nev.
- 394,657. Blow-Pipe. George W. Melotte, Ithaca, N. Y.
- 394,685. Ingot-Forming Apparatus. John Illingworth, Newark, N. J.
- 394,719. Well-Sinking Machine. Chester A. Overton and Oscar E. Ingersoll, Bliss, Neb.
- 394,724. Rope Tramway. Jesse W. Reno, Leadville, Colo.
- 394,740. Water-Motor. Henry E. Trumble, Kalamazoo, Mich.
- 394,742. Flux to be used for the Refining of Metals. James Webster, Birmingham County of Warwick, England.
- 394,787. Stone or Marble Drill. Reuben A. McHenry, Winfield, Kan.
- 394,837. Conveying Electric Energy. Sebastian Ziani de Ferranti, Hampstead, County of Middlesex, England.
- 394,838. Conveying Electric Energy. Sebastian Ziani de Ferranti, Hampstead, County of Middlesex, England.
- 394,840. Machine for Soldering in Vacuo. William R. Drucek, Chicago.
- 394,865. Welding Furnace. Henry C. P. Le Pan, Chicago, Ill.
- 394,892. Portable Electric Welding Apparatus. Elihu Thomson, Lynn, Mass.
- 394,944. Mining Chair and Indicating Mechanism. Joseph Treweek, Lead City, Dak.

THE METALLURGY OF STEEL.*

By Henry M. Howe.

(Continued from page 505.)

In view of what follows, it is perhaps superfluous to point out that these results agree poorly with his theory. Steel quenched from the crest of a_{r2} , should be already partly softened, having passed all of a_{r3} and half of a_{r2} : yet he reports it as hardened unqualifiedly. Steel quenched from B, on the cooler slope of a_{r1} , should have part if not most of its carbon in the cement state, yet he reports "hardening carbon" without qualification.

Lacking time for an elaborate investigation, I have made the following tests, which indicate either that the steel on which Osmond experimented differed strangely from all those which I have tested, or, as seems more probable, that he is simply mistaken. The right-hand end of a copper box, Figure 72, $12'' \times 0.44'' \times 0.88''$ inside, with walls $0.44''$ thick, was placed within a muffle furnace heated to a light yellow, the left-hand end projecting into the outer air. Thanks to the high thermal conductivity of copper, the temperature descended very slowly and regularly in passing from right to left. Within this after it was thoroughly heated I placed two bars of steel cut from the same piece, containing about 0.50% of carbon, 0.375 inch square, previously nicked hot on one side at points 0.5 inch apart, and polished on the opposite face. After 18 minutes I began drawing bar I back, a little at a time, till after 25 minutes more I had drawn it back 3.5 inch, in 18 small movements of about 0.2 inch. each I then drew and quenched each bar. Bar I was re-polished, its carbon condition determined by nitric acid spotting, its hardness by drawing the same edge of the same file, at as nearly constant speed and pressure as I could, across its edge twenty times at each of many points, care being taken to choose the order of these points so that the gradual dulling of the file's edge might not mislead me: the depth of the file mark gave a rough measure of hardness. The carbon condition and the hardness of bar I and the hardness of bar II were noted independently.

We have in bar I a series of points each of which before quenching had cooled from above W to a little lower point than its neighbor. While we have no absolute measure of these temperatures, we here have evidence of the relative positions of the carbon-change and the hardness change during cooling. Instead of finding, as Osmond's statements imply, a sudden change in hardness at one point, and then a sudden change of carbon-condition at a point which had been cooler, I found, as Brinnell's results confirmed by Coffin would lead us to expect, that these changes cover a long region and are apparently simultaneous. The carbon-change could indeed be traced over a longer space than the hardness-change, probably because slight carbon-changes are recognized by the eye more easily than equally slight hardness-changes are by the file. I have repeated this experiment many times with Bessemer rail-steel of about 0.40% of carbon, Bessemer steel of about 0.50% of carbon, and crucible tool steel of several grades, always with the same result.^a

* Copyright by the Scientific Publishing Company, 1887.

^a It will be noticed that the change from hard to soft in bar I which was gradually cooling when quenched appears to occur at a somewhat lower temperature and to extend over a longer space than in the reverse change from soft to hard, in both respects agreeing fairly with Brinnell's results showing that the change from hardening to cement carbon occurs gradually in the range W-V while the reverse change occurs rapidly at W. In this particular case the difference between the length and position of change from hard to soft was much less marked than in most of my other experiments, and I am inclined to think that in

Thus there seems to be no reason to doubt, but every reason to believe, that the hardness-change is simultaneous during both heating and cooling with the carbon-change, and is a direct result of it. This admitted, it becomes relatively unimportant whether any phenomena of the W group be independent of the carbon-change and liable to occur separately from it. We may note, however, that Pionchon found indications of a change at W in perfectly carbonless iron, whose specific heat seemed to change at this point. This change may be wholly independent of the carbon-change, occurring whether carbon be present or not; it may precipitate the carbon-change, which in turn introduces practically wholly new phenomena, the hardness-change, of which not more than the germ (if even that) occurs in carbonless iron.

A possible simple explanation of the discrepancy between Osmond's results and mine is that he judged the hardness in the usual way, simply by the feeling of the file, and not by the depth of the indentation produced by a fixed number of like strokes. The feeling readily detects the slight difference between that degree of hardness which just forbids and that which permits the file to bite, but not slight differences between this and slightly lower degrees of hardness. It exaggerates greatly the first slight decline in hardness. Judging from my results, in the steel which he pronounced soft though with hardening carbon both carbon and hardness had begun to change. When compared with that of a fully annealed piece the carbon-tint indeed seems wholly hardening: while judged simply by the feeling the steel seems soft: blacksmiths to whom I have submitted steel in this condition have always pronounced it soft. Yet careful comparison of carbon-tint and depth of indentation with those of like steel quenched from slightly higher and slightly lower temperatures seems to show clearly that both hardness and carbon-tint have changed, and apparently in not unlike degree.

Let us now consider Osmond's allotropic theory as applied to the phenomena of tempering, turning to curve 15. He holds that d_1 and d_2 represent the change from hardening to cement, and hence that d_1 can only represent that from β to α iron, because he found by Weyl's method that the carbon was cement in steel which had been held for thirty minutes in molten lead at about 400° C.

But Weyl's method could hardly give trustworthy information as to the completeness of the change from hard-

drawing back bar I the temperature of bar II must have been temporarily raised and then again lowered: for in another experiment (Figure 73) in which both bars were drawn and quenched immediately after heating for 16 minutes in this box, the change of hardness covered a length of only 0.25 inch. In this case one bar was from the same piece as those shown in Figure 72, the other of hard crucible tool steel: yet the range covered by the change from soft to hard had almost exactly the same position in both bars. The slight difference was probably due wholly to experimental error, since the change occurred if anything at lower temperature in the low than in the high-carbon steel. The agreement is as close as could be expected with such rough tests: it tends to confirm Coffin's belief that the position of W is independent of the proportion of carbon (§ 245 p. 175).

In all these experiments I found that the change from soft to hard steel and back occurred simultaneously with the change of carbon as shown by nitric acid spotting, though naturally their limits did not coincide exactly, as is inevitable with two such rough tests. Further, the change from soft to hard coincided with the change from coarse fracture (Brinnell's B) to fine (Brinnell's F). While the change from soft to hard was always more sudden than the reverse change, the difference between the suddenness of these two changes seemed to me less marked than one would infer from Brinnell's results. I hope to present in an appendix more trustworthy results as to the change in hardness, obtained by scratching with the diamond or by indentation. These methods may not, indeed, give like results, one telling the hardness of the very skin, the other that of skin and relatively deep subcutaneous layers, whose hardness may vary at a different rate from that of the skin.

ening to cement, as Osmond admits^a: but, accepting it, it does not justify his inference, for in curve 15 only two minutes and a few seconds were occupied in passing from 98° to 520° C., or far past d_1 and d_2 . That these two depressions do not represent the whole change from hardening to cement, and hence that d_4 may be regarded as due to the continuation of that change, is shown by Abel's discovery that less than half the carbon of hardened steel became cement during six hours exposure to say a blue heat, say 300° C.,^b and that this change occurred gradually at both a blue and a straw heat; and is further indicated by the results of Barus and Strouhal,^c who found that the thermo-electric power of hardened steel increased continuously with rising tempering-temperature, and was far from reaching a maximum at 330° C.

Again, Coffin finds that the proportion of the carbon which is in the hardening state (as indicated by nitric acid spotting) diminishes continuously, as the temperature at which hardened steel is subsequently tempered is raised from the cold up to redness, say 900° C.^d As the hardness diminishes continuously and gradually, we more naturally attribute its change to the change of carbon known to be simultaneous, gradual and continuous, rather than to two distinct causes operating jerkily, change of carbon falsely supposed to be confined to lower temperatures, imagined allotropic change of iron unwarrantably supposed to occur at d_4 .

Finally, undaunted by the fact that hardened steel is actually softened by heating past d_1 , and still more if heated to d_2 , though his theory holds that β changes to α only when the temperature reaches d_4 , Osmond explains that this softening is not due to the simultaneous change from hardening to cement carbon, but to the fact that this change causes some of the iron to leave the β state in order to form a carbide (cementite) with the now-forming cement carbon. Unfortunately, Müller has proved that this cementite is extremely hard and brittle, scratching glass: Sorby was convinced that it was extremely hard. Now the change from brittle β iron to a mixture of part β iron and part glass-hard carbide, does not explain the softening and toughening which occurs when hardened steel is tempered: while the carbon-theory, holding that in tempering a harder compound of all the iron with hardening carbon (hardening) is gradually and progressively changed to a mixture of uncombined soft iron and hard carbide, ferrite and cementite, explains the softening clearly and in accordance with the known facts.

To sum up, Osmond's theory accords neither with our old nor his new facts: while the latter like the former harmonize well with the carbon-theory. The carbon-change being a fact, the $\alpha\beta$ allotropic change of iron as

yet a mere figment, the balance of present probability is readily seen.

§ 258. RECRYSTALLIZATION AT HIGH TEMPERATURES AFTER FORGING.—The microscope shows, as we should expect, that cold-working distorts the crystals which compose iron; and further, as we might not expect, that this distortion is effaced when the metal is reheated; and that the distortion of the grains which doubtless occurs during hot working is effaced before the metal grows cold, the ultimate grains in both cases becoming nearly or quite equiaxed. If this occurred through each crystal's drawing together and resuming its initial shape while retaining all its original particles, the bar as a whole would regain its initial shape, like a stretched bar of India-rubber. A cold rolled bar, however, changes shape so little on reheating as to show that a rearrangement of particles occurs, and that practically new crystals arise.

A. *Distortion in Cold Working.*—Sorby^e drew out a bar of weld iron, 1.8 inches square, to about 2.25 times its original length by cold-forging: the microscope showed that the grains were broken down, and twice or thrice as long in the line of the length of the bar as transversely. On exposure to redness during 80 hours, the crystals again became equiaxed.

Martens^f hammered cubes of rail-steel on one face, till they began to crack, then nicked and split them. Their fractures, Figures 73-4, indicate that the grains were flattened into sheets parallel with the hammered face.

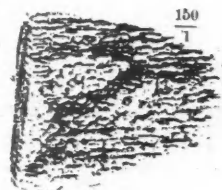


Figure 73, section perpendicular to hammered face.

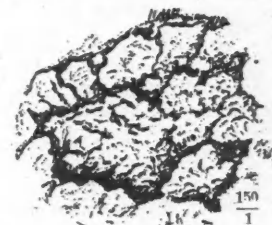


Figure 74, section parallel to hammered face.

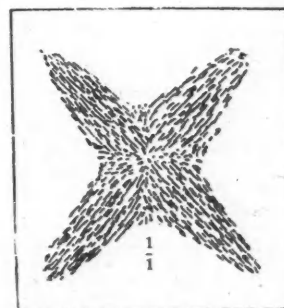


Figure 75.—Steel bar cold-hammered on all four faces. Etched section.

Osmond and Werth,^g etching (with nitric acid, 36°B.) steel which had been hammered cold on all four sides, find a St. Andrew's cross, Figure 75, coinciding with Tresca's zones of transmission of force. In the most fatigued parts the simple cells (pearlyte?) are lengthened along the planes of movement, in which their relatively brittle shells (cementite?) are shattered, in such a way as to recall the schistosity of rocks.

(TO BE CONTINUED.)

NOTE.—The publishers of the ENGINEERING AND MINING JOURNAL will thank the readers of this article if they will promptly call attention to any inaccuracies they may observe in it.

^e Journ. Iron and Steel Inst., 1887, I., p. 263.

^f Stahl und Eisen, VII., p. 239, 1887.

^g Comptes Rendus, C., p. 452, 1885; Ann. Mines, 5th Ser., VIII., p. 15, 1885.

^a Ann. Mines, 8th ser., VIII., p. 20, 1885.

^b Table 2, p. 12.

^c Bulletin 14, U. S. Geological Survey, pp. 54-5, 1885.

^d Trans. Am. Soc. Civ. Engineers, XV., p. 322, 1887. Twelve pieces from the same bar of tool steel were similarly hardened, numbered, tempered at temperatures rising gradually from the cold to full redness, repolished, touched with nitric acid on the unnumbered side for 45 seconds, washed, and arranged in the order of their color, numbered side down. Turning the numbered sides up, their order was found to agree exactly with their numbering, and hence with their tempering temperature. The differences between the two coolest (untempered and very faint straw-tempered) and between the three hottest (ash-grey to full red) was recognized with difficulty. We have, indeed, no conclusive evidence that these changes of color are due to increasing proportion of cement carbon though this is extremely probable: but their progressive change indicates that they are due to some change which goes on continuously in tempering, from the cold to redness. Tempering a hardened steel bar in the copper box already described, the tempering-temperature rising so gradually that the change from a grey tint to purple occupied twelve inches, I found that the hardness measured by abrasion decreased gradually and continuously, and not by jerks.

PERSONAL.

Mr. Guy P. Norton has been appointed Surveyor General of Utah, to succeed Wm. Bowman, deceased.

The Chemical Section of the Franklin Institute, Philadelphia, Pa., has elected Mr. H. G. Pemberton, Jr., President.

Mr. Walter D. Gregory has resigned the position of Chemist of the New York, Lake Erie & Western Railroad Company.

Mr. Per Larsson, late mining engineer at the Chapin mine, has accepted the position of superintendent for the Aragon Mining Company, of Michigan.

Mr. Charles F. Mayer, President of the Consolidation Coal Company of Maryland, has been elected President of the Baltimore & Ohio Railroad.

Mr. Francis H. Blake, who for the past year has been General Manager of the Boicza gold mines and mills in Transylvania, has resigned, and will return shortly to the United States.

Mr. H. S. Fleming, of the Northwestern Iron Company, Mayville, Wis., has been appointed Superintendent of the Cameron Iron and Coal Company, at Emporium, Pa., to take effect January 1st.

Mr. W. E. Terhune, formerly in charge of the Iron Hill smelter, and latterly superintendent of the Silver Queen smelter, Galena, Dakota, has been engaged by the Deadwood Reduction Company to take a position under Superintendent Clark.

Capt. D. N. Jones, General Superintendent and Chief Engineer of the steel-works of the Colorado Coal and Iron Company at Pueblo, Colo., died last week, after an illness of five weeks, of inflammation of the brain, at his residence in Pueblo.

Mr. John Heebner, formerly of Pottsville, Pa., has been appointed purchasing agent and assistant treasurer of the Calumet & Hecla Mining Company, and will reside in Calumet. Mr. H. K. Cole, clerk, has resigned his position of that office.

Prof. Wm. P. Blake, since his return from England in September last, has made a tour of the western mining districts in the interest of the mineral display at the Paris Exposition next year, and has returned to his home at Mill Rock, New Haven, Conn.

Mr. Frank M. Sisson died in Telluride, Colorado last week. He came to this country in 1883 in the employ of the Big San Juan Mining Company, and since that time paid considerable attention to the mineral developments of the San Juan district.

Prof. Henry A. Ward, of Rochester, N. Y., is about to leave for South America on an investigating tour in the interest of natural science. His trip will occupy at least a year, and during that time he will visit Patagonia and part of the continent of which little is known.

Mr. Charles F. Mayer, Jr., a prominent civil engineer of Baltimore, Md., died suddenly on the 18th inst. from apoplexy, aged fifty-eight years. Most of his life was spent in surveying and engineering railroads in South America. Before the late war and during it he was in the engineer corps of the United States service.

Mr. Daniel McGarry, one of the best known coal men in Ohio, died on the 3d inst., in Milford, aged sixty-four. He was President of the Ohio & Pennsylvania Coal Company and of the Mingo Junction Iron Works. He was one of the original mine operators in the Gogebic region, and owned an interest in many iron mines in the lake region.

Col. George T. M. Davis died at his home in New York on the 20th inst. He had not been engaged in active business for about ten years. After serving as Chief Clerk of the War Department at Washington, Col. Davis came to this city, where he was long connected with the iron trade and with Western railroads. He was the receiver for the Iowa Central Railroad, and at the time of his death was Vice-President of the Adirondack Railroad, and Secretary of the Oregon & Pacific.

INDUSTRIAL NOTES.

According to reports, a combination of all the Edison electric light interests is being formed with a capital of about \$12,000,000.

The Decatur Land, Improvement, and Furnace Company, Decatur, Ala., will lease its charcoal iron furnace, now nearly completed.

The Iron Moulders' Union of North America has adopted a resolution that from the 1st of April next nine hours shall constitute a day's work in that trade.

The works of the Straight Fibre Iron Company, in the southern suburbs of Chicago, Ill., were burned on the 18th inst. The building had just been completed.

The stockholders of the Union Iron Works, of Chattanooga, Tenn., have filed an application in the Chancery Court for the appointment of a receiver to wind up the affairs of the company. The schedule of liabilities shows \$40,000, and assets \$55,000.

The Bradley Fertilizer and Chemical Company of Baltimore has been incorporated by Robert S. Bradley and Peter B. Bradley, of Boston, Mass., and Louis F. Detrick, Wm. H. Detrick and John U. Detrick, of Baltimore. The capital is \$100,000, shares of \$100 each.

The U. S. Supreme Court has declared unconstitutional the Iowa law requiring foreign corporations doing business in Iowa to incorporate under the laws of the State. The case was brought by Goodell, agent of Chicago, Burlington & Quincy Railroad, and decision of State Court was reversed.

Reports from the City of Mexico state that Congress has granted a concession to the Union Light, Fuel and Gas Company of Illinois, in which New York, Chicago, Detroit and St. Louis parties are interested, to introduce gas and water in all cities of the republic, and all government buildings. The free importation of all material needed for fifteen years is granted.

The Portland Indurated Fibre Company is reported to have absorbed its strongest rival, the Lockport Indurated Fibre Company. The combination will reorganize as the United Fibre Company, with a capital of \$500,000. Additional buildings will be erected at Lockport, N. Y., and the new company expects to have a monopoly of the indurated fibre goods trade.

The suit of the Bessemer Steel Company, Limited, against Jacob Reese has again come up. In accordance with the decision of the Supreme Court, Mr. Reese was to turn over all his inventions relating to the manufacture of steel, iron, and pig-iron, to the Bessemer Steel Company, Limited, upon the payment to him of \$32,110.83. The assignment of the patents was made in accordance with the decree, but the steel company refused to accept it or pay the \$32,110.83. Mr. Reese asked the court for a process for the collection of the money, which was granted him on the 15th inst.

Under a decree of the United States Court at Richmond, Va., the Chancery Commissioners, in the case of the Fidelity Trust, Insurance, and State Deposit Company of Philadelphia, vs. the Shenandoah Iron Company, in Page County, Va., have advertised to sell, on January 8th, the company's works and personal property, 33,000 acres of mineral lands, three mansions, and 77 tenant houses. The capacity of the furnace is 100 tons of pig-iron daily. The debt against the company is over \$800,000. As mentioned in our last issue, the property was offered for sale on the 8th inst., but only \$85,000 being offered, it was bid in.

The use of oil as fuel, with regard to which we gave in our issue of November 17th the interesting and instructive experience of the North Chicago Rolling Mill furnished to us by Mr. E. C. Potter, of that company, has now received an additional practical illustration on a large scale confirmatory of the results reported by Mr. Potter. The South Chicago Steel Works has completed its arrangement for adapting its boiler furnaces to the use of oil, and the battery of 40 boilers, which formerly required 65 men with coal, is now worked by 10 men. This is an important saving in the direct labor item, without taking into account the cost of handling the ashes and the cleanliness gained.

Messrs. Lean & Blair, of Pittsburgh, Pa., have closed a contract with the Union Rolling Mill Company, of Cleveland, Ohio, for the remodeling of their blast-furnace plant, including the erection of two of their Ford & Moncur hot-blast stoves. These two stoves are to blow a furnace of 200 tons daily capacity and it is claimed that the blast for two of the largest modern blast furnaces can easily be heated with three of these stoves and kept at an absolutely even temperature throughout the blow, and the stoves kept perfectly clean for all time. If these claims, which are backed up by letters from many of the most prominent British iron masters who have these stoves in use, can be substantiated, a most valuable step in the right direction has undoubtedly been made.

According to reports, the stern post of the cruiser "Maine," cast by the Pittsburgh Steel Casting Company, of Pittsburgh, Pa., has proved valueless in the failure of the casting. Superintendent Hainsworth states: "The casting, according to the specifications, must have an exact length of 26 feet from one extreme point of the 'L' to the other. The casting, however, in cooling, was warped, and it exceeds this length by about five inches. By reheating the end of the casting we might be able to bend it back into the correct length; but this would require much time and the expenditure of several hundred dollars. Since the failure of the gun the company has ordered me not to make this further attempt. We are now preparing for the manufacture of cast steel car wheels, and have thrown up the contract for the 'Maine.' Satisfactory arrangements have been made with the government, and the Standard Steel Company, of Philadelphia, will undertake the casting of the sternpost. This is the firm that has cast a steel gun, the Thurlow gun, which will soon be tested." The casting was the largest of its kind ever made in Pittsburgh. Eleven tons of steel (22,000 pounds) were poured into the mold. The casting was to weigh 18,000 pounds finished. It is an L-shaped affair. The longest arm measures 26 feet, and the shortest 13 feet. It is 42 inches thick at the thickest portion.

CONTRACTING NOTES.

Our list of machinery and supplies wanted will be found on page xii. Manufacturers of machinery, engineers and contractors should also consult our directory of "Contracts Open" on page xi. This week, proposals are invited for the following new contracts: No. 1223, Pumping Machinery; No. 1224, Materials for

U. S. Monitor "Terror;" No. 1225, Construction of Water-Works; No. 1226, Building Dam; No. 1227, River Improvement; No. 1228, Dredging; No. 1229, Furnishing Rubble Stone; 1230, Erection of Light-houses and Metal Work for the same.

The Builders' Iron Foundry, of Providence, R. I., were the lowest bidders for the cast-iron mortar bodies for which bids were received at the War Department this week. The bid was \$1475 for each mortar. The next lowest bidders were the South Boston Iron Works, of Boston, and the West Point Foundry Company, who bid the same, \$2750 for mortar bodies and \$4250 for finishing. The Midvale Steel Company were the lowest bidders for the steel forgings required.

The Chief of Ordnance of the Army in Washington has received the following bids for supplying complete sets of rough-finished, oil-tempered and annealed steel forgings, of American manufacture, for 8 inch, 10 inch and 12 guns: The Midvale Steel Company, Philadelphia, for the 8 inch, 29 cents a pound; 10 inch, 30 cents, and 12 inch, 31 cents, and the Bethlehem Iron Company, 8 inch, 24 cents; 10 inch, 26½ cents, and 12 inch, 27½ cents. There is an appropriation of \$1,455,000 for this purpose.

GENERAL MINING NEWS.

WISCONSIN LEAD AND ZINC COMPANY.—This company, which has a paid up capital of \$500,000, has purchased six valuable tracts of mining land in Lafayette County, Wisconsin, and Jo Daviess County, Illinois, aggregating 1000 acres, which are to be developed at once.

ALASKA.

ALASKA GOLD COMPANY.—This company, which owns the Bear's Nest group of mines on Douglas Island, to the sale of which we referred in our issues of June 16th and August 4th, is pushing work in the tunnel, and Burleigh drills are kept running night and day. The mouth of the tunnel is located just above high tide, and will be nearly 1000 feet in length before the vein is reached, and will tap the vein about 800 feet below the surface croppings. This property, says the Alaska Free Press, adjoins the Paris (or Treadwell) mine to the west. A large amount of quartz croppings are visible on the surface, and the quartz body has been quite thoroughly tested by diamond drills. Assays of the core gave returns as high as over \$100 per ton, with a general average of about \$13 per ton. We are informed that as soon as the tunnel reaches the vein, the erection of a large stamp mill will be commenced. The property is admirably located for mining and milling, as a steamship can glide directly up to the mill, and 1000 feet of tunneling will connect the mill and mine.

ARIZONA.

PINAL COUNTY.

BLACKBIRD.—This mine, a short distance northeast of the J. D. Reymert mine at De Noon, has been bonded to Eastern parties.

YAVAPAI COUNTY.

Mr. William Beard, who owns considerable mining property in Arizona, has just returned from a visit to Prescott. Every piece of machinery and every team is at work, he says, and shipments of bullion from Prescott District average 20,000 ounces per month of gold and silver bullion.

ARKANSAS.

PULASKI COUNTY.

KELLOGG MINING AND MILLING COMPANY.—We are advised that work has been resumed at the Kellogg mines, near Little Rock, by the above named company, recently organized with J. G. Sandidge as President, G. F. Martin as Vice-President, C. T. Walker as Treasurer, Anthony Koenen, Secretary, and Charles E. Crockett as Superintendent. Boiler, engine, hoist, rolls, jigs, vanners, etc., have been ordered and are partly on the ground. Ninety-five pounds of zinc blends, taken as a sample of a ten ton lot sacked, which is now ready to ship, yielded (Matteson & Hegeler Zinc Company, La Salle, Ill.) 62½ per cent zinc. They offer \$32.50 per ton f.o.b. La Salle. Frank W. Gibb made an assay of a selected sample of gray copper, showing a value of 1112 ounces of silver per ton. A car load of zinc will be shipped in a few days. The property has always had a reputation of being rich in zinc, galena and gray copper, and those interested are sanguine of the success of the enterprise.

CALIFORNIA.

AMADOR COUNTY.

[From our Special Correspondent.]

BUNKER HILL GOLD MINING COMPANY.—This gold mine at Amador City is looking a little better at the present writing. I understand they have struck a good vein of ore at the north end of the 500 level. It prospects and assays well. At the north end of the property a tunnel has been run in on a level with their 40-stamp mill, and at a distance of 1100 feet they struck the ledge. This ledge is 12 feet thick and shows some very good ore. This property is 2600 feet by 500 feet. Its 40-stamp mill is kept constantly running. They also have chlorination works in which they treat their own sulphurets. I understand the present owners would sell this property if they could get a fair price. A company looking for a large property would do well to examine Bunker Hill before buying elsewhere.

KEYSTONE.—This mine, at Amador City, is running full, but the ore is not paying as well as it did a few years ago. However, with its large supply of low-grade ore, they will have no trouble in keeping their 40-stamp mill running for some time.

NORTH STAR.—This mine, located south of the Talisman, is being worked by a local company in

small way by levying an assessment of 100,000 shares every month. They have sunk a shaft 600 feet and drifted about 100 feet southerly. Just at present they are very much excited over a few stringers of very rich quartz found in their drift. To my mind it is a far better indication of permanency to have a fair sized ledge of pay ore than to have very rich stratas of quartz in dry slate.

PLYMOUTH CONSOLIDATED GOLD MINING COMPANY.—At these mines the work of taking out the water goes slowly on. As they have no pumps, it all has to be hoisted in buckets. I understand they expect to get most of the water out by January 1st, but I hardly think they will, as the levels and stopes are long and large near the bottom. What the damage was, if any, by the reported fire still remains a mystery.

SOUTH SPRING HILL.—This mine, also of Amador City, is running along about as usual, keeping its 30-stamp mill busy night and day. We do not hear much about how the ore is paying, but presume it is satisfactory. Just at present there is an injunction hanging over them preventing them sinking deeper. This injunction was obtained by the Medina Company, which joins them on the east. It is to be hoped that the matter will be settled satisfactorily so as not to injure either party.

TALISMAN.—Adjoining the South Spring Hill, on the south, is the old Talisman mine. An Eastern company has got possession of this property, and is busy prospecting underground. In former days (ten years ago), the ore from this mine is said to have paid well. I have no doubt the present company will soon be able to put the mine on a paying basis.

WABASH.—This mine, east of and parallel with the North Star, has been prospected sufficiently to show a 3-foot ledge extending most of the way through the property. At present no work is being done upon it for want of capital. The property is for sale.

NEVADA COUNTY.

Negotiations are now pending for the erection of a plant at Grass Valley, to work the Newberry-Vautin chlorination process.

HARTERY.—This mine has been leased to A. W. Stoddart, of Grass Valley, for three years, the lessee agreeing to erect machinery on the property and to vigorously prosecute the work of re-opening and development. Ten per cent royalty on all the ore extracted is to be paid the owners, and Mr. Stoddart has the privilege of purchasing the mine at any time within the three years for \$40,000. The mine is situated south of and on the same line as the Omaha & Lone Jack Consolidated (recently re opened), the Homeward Bound—900 foot claim—intervening. West of the Hartery are the Wisconsin and North Star mines, and south is the Allison Ranch, all gold producers.

COLORADO.

GYPSEY MAID CONSOLIDATED MINING COMPANY.—The annual meeting of the stockholders, as advertised, was to be held in New York on the 17th inst., but at the designated place of meeting no one knew anything about the company, its officers or its property except the bare fact that it existed.

BOULDER COUNTY.

TALLEY ELECTRIC REDUCTION COMPANY.—This company, recently organized, is putting in a plant for the reduction of low-grade ores by the use of electricity, and will furnish the Longmont Electric Light Company with the means of lighting Ironmont.

CUSTER COUNTY.

GEYSER MINING AND MILLING COMPANY.—To a representative of the ENGINEERING AND MINING JOURNAL, one of the present directors of the company said: "An important meeting of the board of directors will be held in Boston on Saturday, the 22d inst., to consider the question of purchasing new machinery. We already have some old machinery on the property, which was guaranteed for five years, and has not been used four. Although this should suffice, some of the directors are in favor of purchasing a new outfit which, it is estimated, will cost about \$17,000. We have now on hand about \$30,000 in cash, being the proceeds of the sale of 30,000 shares of the stock at \$1 per share. There is also about 100,000 shares of stock in the treasury. We are now doing assessment work on some thirty claims, and as soon as the necessary equipment is obtained we intend to push the work as rapidly and economically as possible.

GILPIN COUNTY.

GERMAN CONSOLIDATED MINING COMPANY.—A movement is on foot to organize a mining pool to lease the property of this company on the Bates-Hunter lode. The new pool when formed will have a capital of \$15,000.

LAKE COUNTY.

DUNKIN MINING COMPANY.—The company has declared a dividend of 5 cents per share, payable January 15th, 1889. After payment of the above dividend the company will have some \$28,000 on hand.

LOS ANIMAS COUNTY.

[From our Special Correspondent.]

The Pennsylvania Salt Manufacturing Company purposes to erect a matting plant in the West, and has about decided to locate the works at Pueblo; is, in fact, simply waiting for the deed of land donated for that purpose to be signed. The works are designed to treat the refractory copper ores and the mattes and speisses of local smelters. It will be mainly (if not entirely) a purchasing proposition, depending upon marketed ores, etc., for supply. It is doubtful if a refining plant will be built, the intention being to produce high-grade copper mattes for shipment to the company's refining works in Pennsylvania. Ores of copper hitherto

considered scarcely worth mining on account of their arsenical and other base properties, are now becoming much sought after. Hitherto, about the only market for argentiferous and auriferous base copper ores in Colorado was at the Boston & Colorado smelter, Denver, but lately the Salt Company has become an enterprising and powerful rival of the Argo Company. The Salt Company is, however, not the only rival now, although that company's wealth and connection renders it the most formidable.

The chief claim of the Boston & Colorado has been its ability to separate the silver and gold from copper by special secret process. The salt company also makes a similar claim, although not claiming a similar process. Sentiment, etc., have been cast aside, and it is now only a question of business, the highest bidder getting the ore. The market for all classes of ore improves steadily, and fields hitherto unknown are sending to the market very desirable ores.

Pueblo shows enterprise certainly in securing this smelter in the face of the advantages offered by Denver as a market for purchasers, and Trinidad, with its cheap fuel. It is a great smelting point. One would almost have fancied that its facilities had been fully improved years ago by the great plants then erected. With all the "boom" of those days, the work of building was insignificant in comparison with that of the present and its promise.

OURAY COUNTY.

NEW GUSTON COMPANY, LIMITED.—We are officially informed that this company paid its first dividend of 50c. per share, or about \$50,000, from earnings of two months previous. The fact is more noteworthy as the property was abandoned practically, and full of water previous to July last.

SAN JUAN COUNTY.

VICTORIA.—The mine has closed down. A stamp mill and concentrator will be erected in the spring.

SUMMIT COUNTY.

There is at present a scheme on foot, by a number of Eastern capitalists, to consolidate the whole of the Gold Run basin in one company, says the Breckenridge Leader. A branch road will be built from Brad-dock to Preston, and it is proposed to erect a 150-stamp mill with concentrators. The matter has been under consideration by a St. Louis syndicate for some time. The capital stock will be \$1,000,000.

LITTLE MOUNTAIN MINING AND MILLING COMPANY.—It is reported that the claims against this company will all be settled this month. It is claimed that the sale was postponed at the suggestion of the owners of the mine in order to give them additional time to raise the money.

GEORGIA.

CARROLL IRON, LAND AND TIMBER COMPANY.—This company has been incorporated with a capital stock of \$300,000 by S. M. Carter, E. G. Cramer, L. P. Mandeville, W. W. Fitts, J. W. Cavender, J. D. Williamson and others, to develop timber and mineral lands, quarry stone, erect mills, factories, etc.

NORTHWEST GEORGIA COAL AND IRON COMPANY.—This company has been chartered with a capital stock of \$600,000, to develop timber and all kind of mineral land, and build furnaces, etc., by J. D. Williamson, Samuel Carter, A. L. Ochs, J. C. Clements, R. T. Fouche and others.

IDAHO.

Mr. Harry J. Foljaent, Superintendent of the Mountain Goat and Comfort mining companies, of Rocky Bar, Idaho, is in New York. He states that the mines have already paid for themselves and they have a surplus in the treasury. The mines will be worked during the winter and the ore milled at the Reeser Mill at Rocky Bar. What ore has been milled, he says, has paid from \$200 to \$600 per ton gold and silver.

BOIS COUNTY.

IDAHO GOLD AND SILVER MINING COMPANY LIMITED.—It is reported that this company, to the difficulties of which we referred in our last issue, has cabled from London to Bois City Bank to place \$30,000 to its credit to pay off its indebtedness.

CUSTER COUNTY.

NIAGARA MINING AND SMELTING COMPANY.—This company has been organized for the purpose of conducting a general mining and smelting business in Idaho, and is to exist for fifty years. The company owns the Czar, Neptune and Copenhagen mining claims, all situated in Alder Creek mining district, Custer County. The capital stock is placed at \$2,000,000; shares, \$10 each. The officers are: P. A. H. Franklin, President; G. E. Palen, Vice-President; O. H. Peterson, Treasurer; and John Wall, Secretary.

INDIANA.

Press dispatches state that there is no truth in the report that the wells from which Indianapolis draws its supply of gas are giving out and will soon be exhausted. The companies have temporarily cut off subscribers who were overtaxing the capacity of the wells. New wells are being sunk to meet the demands.

CLAY COUNTY.

The miners of the Indiana Block coal district, the largest mining district in the State, met at Brazil on the 17th inst. and indorsed the action of the Columbus Convention in recommending one national order for the miners of the United States. The miners also indorsed a long bill of amendments to the mining laws of the State, to be submitted to the next Legislature. The bill calls for three instead of one state mine inspector, and for reform in ventilation, a two weeks' pay-day and cash system at the "pluck me" stores.

MICHIGAN.

COPPER MINES.

The tributers at the Adventure copper mine expect to have the stamps running by the end of December,

the machinery being on the way to the property. Tribute work also is going on at the Mass, Evergreen Bluff, and Hilton mines.

CALUMET & HECLA MINING COMPANY.—Officials of this company on the 20th inst. pronounced the fire in Shaft No. 3 extinguished. It started exactly a month ago. The amount of damage under ground is not yet ascertained.

The miners who were sent down to examine the mine could descend only a few hundred feet on account of the gas with which the underground workings are filled. It will be some time before work can be resumed.

LAKE SUPERIOR COPPER COMPANY.—At a meeting of the stockholders of this company held in London, England, on the 17th inst., it was decided to voluntarily wind up the affairs of the concern.

MONTANA.

LEWIS & CLARKE COUNTY.

MONTANA COMPANY, LIMITED.—Official advices to us show that during November the total weight of the ore crushed was 7070 tons; the total gross yield from all three mills was \$70,200; the working expenses for the month were \$48,000.

NEVADA.

ESMERALDA COUNTY.

A copper smelting plant is to be erected at Luning.

EUREKA COUNTY.

Messrs. Charles Read, Richard Mackintosh and other Salt Lake mining men have secured a bond on the Diamond Group at Eureka, and will push work there vigorously. The price named is \$60,000.

EUREKA CONSOLIDATED MINING COMPANY.—The November statement just received shows a larger balance than was expected. On November 30th the amount of assets over liabilities was \$16,581.86, against \$14,490.88 on October 31st. This is a profit of over \$2000 for the month, to which should be added \$5500 taxes on Eureka property, about \$1000 legal expenses, and \$1000 to patentee of smelting process, making a total of nearly \$10,000, which must have been the profits for the month. A bullion shipment valued at \$21,000 was received in San Francisco on the 15th inst. It is thought that there is enough coke on hand at Eureka to keep the smelter running till the 22d, by which time there should be a surplus of nearly \$20,000 in the treasury. All the mine laborers and miners have been discharged, and no work is being done in the mine.

STOREY COUNTY—COMSTOCK LODGE.

ALTA MINING COMPANY.—The changes in progress at the Alta mill for the purpose of amalgamating the ore concentrates will be completed and the stamps started dropping on ore from the mine this month, after which regular bullion shipments will be made. The ore developed on the 900 level of the mine is stripped for a length of over 100 feet. At several points in the lateral drift, where the vein shoves out beyond its general trend, ore has been cut of fine quality. It is stated that there is also a large area of high-grade ore stripped on the 825 level.

CONSOLIDATED CALIFORNIA & VIRGINIA MINING COMPANY.—The total operating expenses of the mine in November were \$147,000, and the bullion yield for that month was \$220,373, leaving a coin balance of \$35,910 above the cost of production. This, added to the surplus in the treasury, carried over from the October account, leaves a balance of \$95,000 in coin to carry over to the December account.

HALE & NORCROSS MINING COMPANY.—Shipments of ore to the Mexican mill now average 150 tons daily, battery sample assays showing a value of above \$30 per ton. The bullion yield of the mine will be increased to a dividend-paying basis as soon as the Nevada mill is ready to drop all of its stamps, which it is thought will be before the 1st of next month.

SILVER HILL MINING COMPANY.—At a meeting of the directors held in San Francisco on the 12th inst. Mr. A. C. Hamilton was appointed Superintendent, and instructed to resume operations in the mine forthwith. It is claimed that ore assaying \$35 a ton was cut in sinking the shaft, and this is to be explored to ascertain its extent. The shaft is thought to be in fair condition down to the 600 level.

YELLOW JACKET MINING COMPANY.—The extraction of ore has been resumed and daily shipments of 100 tons to the Santiago mill will now be made.

NEW MEXICO.

SANTA FE COUNTY.

SANTA FE COPPER COMPANY.—The manager of this company, operating the copper mine at San Pedro, reports everything going on in a satisfactory manner, and says the company is now shipping a car-load of matte per day, and expecting to double the present output by the middle of January.

SIERRA COUNTY.

SILVER MINING COMPANY OF LAKE VALLEY.—The mines keep up their usual output. If the new machinery which is now being tested proves satisfactory, the output will be doubled within six months.

OHIO.

Tests were to be made this week at Bellaire, Ohio, with a suction pump that has been put on one of the natural gas mains. The pump is a kind of wind-mill, and will be used to draw the gas from the Washington fields of the Wheeling Natural Gas Company. If the pump works successfully, it will keep four pounds pressure of natural gas in Bellaire at all times. The pump, or wind-mill, will be located about four miles this side of Bellaire. If the pump is a success on this main, the company will put others on all its mains.

CARROLL COUNTY.

NEW YORK & OHIO COAL COMPANY.—All the

property of this company, consisting of about one thousand acres of coal lands with a full plant for working the same, with Harrison mining machines, triples, other buildings, some sixty dwelling-houses, and the exclusive right for the State of Ohio—excepting one township in Hocking County—to use and sell the Harrison Mining Machine, will be sold at auction at two o'clock P. M., January 4th, at New Hazleton, near Sherrodsville, in this county, by the Receiver, A. St. J. Newberry, 42 Mercantile Bank building, Cleveland, O.

MONTGOMERY COUNTY.

The Standard Oil Company is reported to have purchased within the past 10 days 3000 acres in Liberty township, for which it paid \$60,000.

PENNSYLVANIA.

COAL.

A miners' meeting will be held at Scranton on the 27th inst., to formulate a demand on the coal companies for the reduction of the price of mining powder from \$3 to \$2 a keg.

The railroad miners of Western Pennsylvania, at a delegate convention representing 9000 miners, held on the 20th inst., in Pittsburg, decided to join the Miners' National Progressive Union. Most of the miners were members of the Knights of Labor and their desertion will be a hard blow to the district assembly.

OIL.

Exports of refined, crude, and naphtha from the following ports, from January 1st to December 15th:

	1888.	1887.
	Gallons.	Gallons.
From Boston.....	4,437,990	4,166,026
Philadelphia.....	130,361,869	156,179,463
Baltimore.....	6,536,325	8,905,823
Perth Amboy.....	20,533,872	16,825,685
New York.....	357,489,629	332,207,194
Total exports.....	519,859,685	548,284,206

The Chief of the Bureau of Statistics reports the total values of the exports of mineral oils from the United States for the month of November, 1888, and during eleven months ended November 30th, 1888, as compared with similar exports during the corresponding periods of the preceding year, as follows: November, 1888, \$4,259,284; November, 1887, \$3,713,074; eleven months ended November 30th, 1888, \$42,549,492; November 30th, 1887, \$41,246,286. The exports from the above named ports comprise about 99 per cent of the total exports of mineral oils. It is stated on good authority that the distillation of 100 gallons of crude petroleum will yield 76 gallons of illuminating oil, 12 gallons of gasoline, benzine, or naphtha, 3 gallons of lubricating oil, and 9 gallons of residuum.

GLOBE REFINING COMPANY.—The company is now putting down an independent new 3-inch pipe line, which is to extend from the Bald Ridge oil territory to the refinery, a distance of about 23 miles. The company has a large tract of oil land in that section, and a number of wells which are being increased by new ones. The pipes for this new line are made at the Etna Iron Works of Spang, Chalfant & Co. The line is to extend under the West Penn Railroad at Pine Creek, and from there across the river to the refinery. As soon as it is finished crude oil will be pumped direct from the wells to the stills to be refined.

TEXAS.

ERATH COUNTY.

TEXAS & PACIFIC COAL COMPANY.—Reports state that the miners of this company have been on strike for a month past, and that they are becoming quite unruly, and the governor had been appealed to. At last accounts the sheriffs of adjoining counties had been ordered to the scene of the conflict, and a company of State Rangers will probably be sent there.

UTAH.

PLEASANT VALLEY COAL COMPANY.—This company is spending some \$8000 or \$9000 in a steam engine, a 40 horse-power fan to aid ventilation in the mine, and a complete electric light plant, and this new machinery is now ready for operating. Electric lights are to be used around the mouth of the tunnel to aid in loading coal and handling cars, and a line of lights will be run through the working tunnel, and likely into some of the rooms.

SUMMIT COUNTY.

MASSACHUSETTS MINING COMPANY.—The closing down of this mine is reported. From what can be ascertained it is supposed the shut down is only temporary, and it is the intention of the company to resume work at some future time by sinking the shaft 200 or 400 feet lower. It is said that the developments on the 300 and 600 levels are sufficiently favorable to convince the management that they have a good prospect. The company is a reorganization of the Empire Mining Company.

WASHINGTON TERRITORY.

[Special Correspondence ENGINEERING AND MINING JOURNAL.]

Colville is located in the northeastern part of Washington Territory, about 90 miles northwest from Spokane Falls. It is the county seat of Stevens County, and lies in a valley from two to three miles in width, through which the Colville River courses on its way to the Columbia. Its nearest shipping point by rail is Spokane Falls, from which place everything not produced here is brought in on the old style freighting teams. It received its first boom at the time of the building of the Canadian Pacific Railway. Colville was hardly thought of as a mining camp,

however, until within the past few years, but in that time hundreds of prospects and some few properties of value have been discovered.

The mining districts tributary to Colville are: 1. The Colville District. Here are located the Old Dominion mine, from the present outlook probably capable of producing 5 to 10 tons daily; the Ella, a low-grade deposit; the Portland, the Rustler and a number of prospects of but little value. 2. The Clugston Creek District, which is really included in the Colville District, about 15 miles northeast of Colville. It contains a large number of prospects running fairly in lead, but carrying very little silver. A few, as the Uncle Sam and the Tenderfoot, carry sufficient lead to pay for its profitable extraction. Here are also some very good prospects of iron ore (limonite) of excellent quality. 3. The Little Dalles District, about 33 miles northwest. The most important property is the Silver Crown; it promises well, but has been but slightly developed. The Young America and Bonanza are usually included in this district, but lie fifteen to twenty miles south of the Little Dalles, and much nearer Colville. The Bonanza has a capacity of from fifteen to twenty tons per day easily. The ore is low-grade, but can be mined at a fair profit. The Young America lacks development, but will doubtless prove a good property. In this district there are also numerous prospects of more or less value. 4. The Summit District, about 80 miles southwest. Here the only property of any consequence is the Daisy. The indications point to a large body of low-grade mineral. 5. The Chewelah district, 23 miles south. With numerous prospects of but little value, and one property, the Eagle mine, which at one time bid fair to become a very valuable mine.

Besides these, there are several mining districts in the territory, which with a better system of roads and cheaper transportation might become tributary to Colville, but at present are unavailable. These are the Metaline District (about 40 miles northeast from Colville, but no road), said to contain immense bodies of heavy lead ore; the Okanogan and Ruby districts, over 100 miles westerly, with numerous prospects, but none developed.

None of these properties, however, deserve to be classed as mines, as the mineral appears to lie in pockets, and its future supply is an element of great uncertainty. Mineral of all grades and character can be found in all points of the compass from Colville, but as yet the mineral in place has not been discovered. Until such discovery is made, the progress of this portion of Washington Territory as a mining center must be very slow. It may be that the mineral formation may be an entirely new one, but in the opinion of the more intelligent mining men here, the ore when discovered in place will doubtless be found as a contact deposit.

About a year ago a water jacket smelter was erected for the purpose of treating these ores; its capacity was from 30 to 40 tons daily. Lately the firm were obliged to close down on account of an insufficient ore supply. The mines in the vicinity if properly worked were fully capable of furnishing a sufficient supply, but almost all the properties here, in fact all of any value, were in the hands of men ignorant of mining, and who, instead of developing the properties, merely held them for speculative purposes. Their attempts at working the properties and determining their real value have been spasmodic, and even these attempts have been made without any intelligent system of working or end in view. The prices they ask are far beyond a legitimate estimate, and consequently effectually prevent the properties falling into better hands.

Another cause of the present inactivity at Colville has been largely due to the excitement of new mining camps which were constantly springing up, with stories of wonderful discoveries, their mushroom growth being succeeded by almost as sudden a collapse. This deprived Colville of the more enterprising, industrious and really intelligent mining men, and so prevented the development which their presence would doubtless materially effect.

R. F. C.

FOREIGN MINING NEWS.

AUSTRALIA.

QUEENSLAND.

Queensland mining papers indicate a great rush into copper prospecting on the Walsh River, says the *Financial News*. The existence of copper there has long been known; but though the assays of the ore were exceedingly good, the lowness of the price of the metal prevented it from being worked. The prospect of a long continuance of high prices has turned attention again to these copper deposits, and already copper produced on the Walsh River has been sold in Melbourne for good prices.

MOUNT MORGAN GOLD MINE.—According to a book called "Rockhampton and Mount Morgan," recently published at Brisbane, the dividends so far paid by the Mount Morgan mine amount to £383,333, and since the beginning of 1887 they have been at the rate of £50,000 per quarter. It is estimated, according to the same authority, that with the present rate of increase and the facilities given by additional machinery, the output of gold will be increased threefold by next January.

Since the publication of the book there has been at least one more quarterly dividend paid.

MEXICO.

[From our Special Correspondent.]

LOWER CALIFORNIA.—The district of Calamall in this territory has been known as gold producing for about five years, and owes its discovery to Don Emiliano

Ybarra. The region is extremely arid, and was an unpeopled desert at the time when gold was first discovered. Water was reached by digging a well of three hundred and sixty feet deep at a cost of over twenty thousand dollars. Provisions are brought in from San Francisco through the port of Santo Domingo. Numerous placers of gold and some quartz veins have been discovered.

SONORA.—During the last three months 112 new veins and old mines were denounced in this State.

An aerolite has been discovered imbedded in the side of a small hill on the road from Bacubirito to Moco-rito. It is three meters long, one and a half meters high, and two meters wide. It is estimated to weigh 35 tons, and is shaped like a peacock with its open tail directed toward the east. Its appearance is like a large piece of iron, black in some places, yellow in others, and lustrous in places where it has been rubbed by the curious. On the surface may be noticed markings in the shape of chains which are intertwined in the most varied form. It is very sonorous, and on being struck with a stone it rings like a bell.

No tradition exists as to when this aerolite fell. The proprietor of the field discovered it by his plow scraping on it, and thought, from the brilliancy of the mark made by the plow, that he had found an immense mass of native silver. Several pieces were cut from the mass, which were soon found to be nothing but iron, and which were afterward made up into agricultural tools of good quality.

CHIHUAHUA.—At Batopilas, in order to penetrate economically to a greater depth than could be reached in any other way, the Porfirio Diaz tunnel, which is the greatest modern mining work now being carried on in this Republic, was re-oloved on. This work commences on the bank of the river of Batopilas, about 15 meters above the water level, and is to run due west for 1200 meters or until it gets to the Vaca vein; it will then run south 10 degrees east until it reaches the Camuchin group of veins. The total length of the tunnel will be 5000 meters (16,400 feet), and it will be joined to the present workings by a number of drifts whose united length will be over 1100 meters. The work has been carried on by hand labor during two years, but the rock is so hard and there is such a scarcity of workmen that the progress has been slow, only 370 meters having been opened in that time. Some air compressing machinery is now being put in place, which will work machine drills, by which it is expected to open at least ten meters a week. If this is the case the whole work will be finished in about five years. Besides the tunnel there are several other improvements in progress to facilitate the development of these properties. One of the most important is the railroad from the mouth of the deep tunnel of Penasquites, to the hacienda or silver mill of San Miguel. This runs horizontally for 1500 meters, from which point it will cross a chain of foothills by inclined planes leading into the hacienda. Another railroad, 1300 meters long, on which the cars are run by mule power, has been in operation for some years between the San Miguel mines and the same hacienda.

A new mill is in construction at the mouth of the Porfirio Diaz tunnel. The ditch for this mill commences at 3 kilometers up the river; there is a fall of 20 meters available at the works. The river has a flow of about 1½ cubic meters of water per second during the dry season, so that the minimum water-power is calculated as about 300 horse-power. Most of the machinery for the new mill is reported as being on the ground, and it is stated that it will be in operation by next June. An iron suspension bridge has been thrown across the Batopilas River, between the old and the new mill, and telephones put the works into direct communication with all the mines.

There are only about 300 men employed on these properties during the rainy season, but this force is ordinarily doubled during the seven or eight dry months. The average weekly wage of these workmen is about \$10.

OAXACA.—A mine of fabulous richness has been recently discovered by a poor Indian near Zimatlan in this State. The specimens of ore brought to this city show an abundance of native silver. The mine is now owned by General Albino Zertuche and a shaft has been sunk to a depth of ten meters. The vein at the bottom of the shaft is nine feet wide and its average assay is said to be 8720 ounces of silver per ton. Over \$200,000 worth of silver is said to have been taken out during the sinking of the shaft.

HIDALGO.—The Teoloyucan branch of the Hidalgo Railroad has been opened for traffic. By this new line the distance between Pachuca and this city has been materially reduced, and the coal brought from the Rio Pecos mines down the Mexican National Railroad can be laid down in Pachuca without transfer. As Pachuca has for many years been hampered by the scarcity of fuel, the construction of this new line should stimulate matters there to a considerable extent.

VERA CRUZ.—A French company is said to have been formed in Paris with a capital of \$400,000, to work the marble quarries at Orizaba in this State.

GUANAJUATO.—The San Juan de la Chica gold mine is situated some twelve miles to the westward of the San F. line station on the Mexican National Railroad. The owner of this property is the Republic Gold Mining Company, of Chicago, which was organized about two years ago by Col. B. F. Bivins, of Philadelphia. There are said to be three parallel veins on this property; two of these have not as yet been opened. The third vein, now being worked, and which was also exploited by the Jesuits in former times, has brown porphyry on the foot-wall and light colored porphyry on the hanging-wall. The vein is said to be forty feet wide, with a paystreak of from twenty to thirty feet in thickness. The company had some difficulties at

first, as it was decided not to amalgamate the pulp in pans, but simply to run it over copper plates. The loss by this system, the plates being only eight feet long, was simply enormous, and pans were put in, since which the superintendent reports a saving of 75 per cent of the value of the ores. There is a ten-stamp mill which crushes twenty tons of the ore daily, and the battery samples are said to run from \$28 to \$30 in gold, with a few ounces of silver per ton. Some development work is being done by which it is expected to strike a richer ore-body below the present workings, though the superintendent states that he has ore enough in sight already to run the mill a long time.

The San Antonio group of mines to the west of the town of Dolores Hidalgo, is now being opened up by Colonel Bivins. These mines are stated to be in the same ore belt as the San Juan de la Chica mines, but the veins are not as wide. The property is said to be crossed by a network of veins about 20 to 30 feet wide, with pay streaks from 3 to 7 feet wide. Several car loads of ore from this property were shipped to Denver, and the returns show an average value of about \$30 per ton, sixty per cent of this value being gold, the rest silver. The company being organized to work these properties is called the Providencia Mining Company, and has its head office in Cleveland, Ohio.

The above mines are located in a gold-bearing belt that lies on the eastern slope of the Guanajuato Mountains. This region has been rather neglected for many years past on account of the difficulty of access before the railroad era, but now the Mexican National Railroad skirts the base of these mountains, and machinery and supplies can be cheaply brought in. Water is reported abundant and timber plenty, and the mountains are intersected by deep cañons, which cut across many of the veins so as to make them accessible to depths of several hundred feet.

NUEVO LEON.—The lead mines around Monterey and along the line of the Mexican National Railroad have felt the blight of the recent drop in lead and have stopped producing to a considerable extent. The most prominent mine in the Monterey district is called the Alta Cruz, situated in the Mitra Mountain. It has exported many car loads of good ore.

SAN LUIS POTOSI.—The Concepcion mine in Catorce is producing now about 300 tons of low-grade ore weekly, although its capacity is said to be at least a quarter more than this. The mine is, however, much troubled by water, and the pumps lately put in can scarcely do more than hold the water even with the assistance of the large hoisting engines. The pumps are much smaller than those recommended by the English engineers who drained the mine some forty years ago, notwithstanding that the quantity of water is increasing as the mine gets deeper.

The total production of the Catorce district is now only about from 600 to 700 tons weekly, which will assay between 60 and 140 ounces per ton. The extraction of this, all expenses included, costs about \$14 per ton. The costs of treatment are very high. It costs about \$14 per ton to work the best free milling ores. More rebellious ores, such as sulphurets that have to be roasted, cost about \$28 per ton for treatment, while the richest ores, such as have to be smelted with lead or litharge, are said to cost as high as \$132 per ton.

ZACATECAS.—The extensive copper mines in the district of Mazapil belonging to the estate of Dr. R. P. Morrison have been sold by the executors to a Philadelphia company, represented by Mr. James Liliendahl. These mines have laid practically idle for many years, although they were formerly a source of wealth to their owners, who sold the sulphurets for the purpose of making magistral (an impure sulphate) to the patio haciendas in Zacatecas. A report was made on the property some years ago by Mr. James Douglas, Jr., who estimated the value of the dumps on the grounds of the old smelting-works at about \$140,000, on a basis of 15c. per pound for bar copper. There is also a considerable amount of gold and silver in these ores, and it is quite likely that with proper management the new enterprise will be a success.

STATE OF MEXICO.—The New York and Temascaltepec Mining Company has a mine in the district of Temascaltepec which produces argentiferous lead ores, which also carry iron and are very docile in the furnace. The smelting is done in water jacket furnaces, but I am not informed as to the results of the company's work so far. The mine is in charge of Mr. S. H. Finck. A French company, which has its home office in Paris, has a silver mine in the same district under the direction of M. Carlos Monchot. There are seventeen other mines in this district, all in various stages of development. The country-rock is a green talcose slate, and the ore is galena, found in veins traversing the slates and mixed with large quantities of quartz and with some feldspar. The district is traversed by dykes of porphyry, which obliterate the veins completely wherever they cross them and add greatly to the uncertainty of mining operations.

SINALOA.—It is officially announced that there are 110 mines in the Cosala district that are now open to denouncement. This district is situated among the foothills of the Pacific slope of the great Sierra Madre, and counts within its limits the famous mine of Guadalupe de los Reyes, as well as many others of lesser note.

SOUTH AMERICA.

CHILI.

CAMARONES COPPER MINING AND SMELTING COMPANY, LIMITED.—This company has been organized in London with a capital of £200,000, shares £2 each. The purpose is to acquire, as a going concern, and further develop rich copper mining properties, with reduction-works, machinery, etc., and a freehold smelting and refining establishment at the port of

Huasco, in the province of Atacama. The distance between Valparaiso and its port, Huasco, is about 50 miles, and a contract has been entered into by the Chilean Government for the construction of a railway connecting the two places, which is expected to be completed during 1890. The Camarones mines are twelve in number. These mines have been known and worked for many years. The principal shaft has attained a depth of 270 yards, the horizontal workings extending about 800 yards, and being in good ore at all points. At present the output is about 1500 tons of ore per month, with an average assay of about 8 per cent copper, producing monthly some 250 tons of copper regulus of 50 per cent, but with the improved machinery now being sent out the above quantities will be materially increased. The services of Mr. F. G. Welch (late technical manager for some years of the Panulillo Copper Company's mines and works) have been secured, and the extensions of the works, at Camarones and Huasco, have been designed and are being carried out by him.

REPUBLIC OF COLOMBIA.

SANTIAGO GOLD MINING COMPANY.—A bullion shipment valued at about \$8000, which was made on the 15th inst. from the Isthmus, is due in New York on the 24th. This, we believe, is the second bullion shipment made by this company. Letters from the mine dated November 17th, state that during the two weeks ending on that date the mill ran with ten stamps and crushed 200 tons of ore. Work in the mine progresses steadily and favorably. On the 17th inst. 66 pounds and 1 ounce of amalgam which will return, it is said, nearly 50 per cent gold, were on hand.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, Dec. 21.

Statistics.

Production of Anthracite Coal for week ended December 15th and year from January 1st:

1888.		1887.	
Tons of 2240 lbs.	Week.	Year.	Year.
P. & Read, R.R. Co.	120,727	6,973,713	7,362,305
Cent. R.R. of N. J.	129,403	5,558,094	4,698,828
L. V. R.R. Co.	156,669	6,462,402	5,634,353
D., L. & W. R.R. Co.	115,623	6,713,906	5,898,528
D. & H. Canal Co.	89,258	4,336,190	3,833,640
Penna. R.R.	63,404	4,426,059	3,611,740
Penna. Coal Co.	16,330	1,597,473	1,537,565
N. Y., L. E. & W.	20,000	929,983	730,487
Total	711,414	36,997,820	33,357,426

Increase..... 3,640,394
The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

Production for corresponding period:
1883..... 30,566,188 | 1885..... 30,431,870
1884..... 30,863,856 | 1886..... 31,566,047

Production of Bituminous Coal for week ended December 15th, and year from January 1st:

1888.		1887.	
Tons of 2240 lbs.	Week.	Year.	Year.
Phila. & Erie R.R.	1,417	63,611	18,891
Cumberland, Md.	69,909	3,465,483	3,189,503
Barclay, Pa.	4,500	153,421	165,950
Broad Top, Pa.	11,823	364,439	341,771
Clearfield, Pa.	71,209	3,250,047	3,104,162
Alleghany, Pa.	21,651	790,051	804,440
Pocahontas Flat Top	33,114	1,331,869	997,625
Kanawha, W. Va.	33,341	1,562,384	1,401,283
Total	246,969	10,971,355	10,023,625

WESTERN SHIPMENTS.		
Pittsburg, Pa.	13,323	700,487
Westmoreland, Pa.	36,647	1,510,121
Monongahela, Pa.	3,718	370,241
Total	53,688	2,580,849
Grand total	300,657	13,552,204

Production of Coke on line of Pennsylvania R.R. for week ending December 15th and year from January 1st, in tons of 2000 lbs.: Week, 93,570 tons; year, 3,944,630 tons; to corresponding date in 1887, 3,582,233 tons.

Anthracite.

The anthracite market is dull, though the cold snap has enlivened it somewhat, more particularly in the East. The companies have commenced curtailing seriously, and this also has had a tonic effect upon prices. No general stoppage of the mines over the holidays, as was announced in the daily papers, is contemplated. There is plenty of coal to be had, and some of it to be had at less than circular prices, but on the whole we hear less about "cutting" than we did during the past few weeks.

At the meeting of the sales agents this week the subject of cutting of prices by individual operators and by some of the companies was discussed with a good deal of energy. After mutual explanations harmony was restored, and it was agreed by every one that every one should stick to prices and bring very little coal to market.

The official statistics of production show that stocks at tide-water have increased 210,000 tons during the month. The Delaware & Hudson is stocking coal at Homedale, but this is not included, for the company brings down only 1200 tons a day to tide-water, and the balance of its output, stocked at Homedale, is counted on its subsequent quota. It is therefore no embarrassment to the trade.

There will be a meeting of the sales agents again next week, when there will also be a meeting of the Western agents, and the question of prices will then be still further discussed. There is no suggestion of

modifying prices in the West nor even in the East at present, nor could anything be gained by reducing them now. What is wanted at present is a rigid curtailment of production and a continuous low thermometer.

The production of coal to the 1st December is reported to have exceeded that in the eleven months of 1887 by 3,868 856 tons. The production for the week ending December 8th was 704,877 tons, which was an increase of nearly 8000 tons over the corresponding week last year. During the balance of this month the output will probably be a little less than it was last year, but it will still leave the shipments fully 3,750,000, and perhaps nearly 3,800,000 tons greater than it was last year. This would bring our total shipments to market this year to about 38,750,000 tons, or, including the colliery consumption, it would make our total output of Pennsylvania anthracite 41,000,000 gross tons.

This production is greater than any one had anticipated even a few months ago, and is very much greater than it was expected to reach when we commenced the year.

The circular prices for free-burning coals remain as heretofore f.o.b. at New York shipping ports: Broken, \$3.95; Egg, \$4.30; Stove, \$4.65; Chestnut, \$4.65; Pea, \$2@\$.25.

Mr. John H. Jones, Chief of Bureau of Anthracite Coal Statistics, has issued the following statement of anthracite coal tonnage for the month of November, 1888, compared with same period last year. This statement includes the entire production of anthracite coal, excepting that consumed by employes and for steam and heating purposes about the mines, but does not represent the entire anthracite coal tonnage actually transported by the respective railroad companies, adjustment being necessary in the compilation to avoid duplications, etc.

COMPANIES.	Nov., 1888.	Nov., 1887.	Difference.
Phila. & Reading RR.	845,065	788,608	Inc. 56,457
Lehigh Valley RR.	660,264	397,526	Inc. 262,738
Central RR. of N. J.	535,456	427,473	Inc. 107,983
Del., Lack. & West. RR.	663,847	717,542	Dec. 53,695
Del. & Hud. Canal Co.	410,425	444,586	Dec. 34,162
Pennsylvania RR.	371,002	366,528	Inc. 4,473
Pennsylvania Coal Co.	134,821	177,375	Dec. 42,553
N. Y., L. E. & W. RR.	97,773	66,552	Inc. 31,221
Total	3,718,652	3,386,190	Inc. 332,462

COMPANIES.	For year 1888.	For year 1887.	Difference.
Phila. & Reading RR.	6,707,096	6,996,947	Dec. 229,851
Lehigh Valley RR.	6,110,617	5,427,804	Inc. 682,813
Central RR. of N. J.	5,295,692	4,470,413	Inc. 825,279
Del., Lack. & West. RR.	6,463,756	5,495,107	Inc. 968,648
Del. & Hud. Canal Co.	4,139,693	3,630,529	Inc. 509,164
Pennsylvania RR.	4,287,360	3,464,930	Inc. 822,429
Pennsylvania Coal Co.	1,551,598	1,451,722	Inc. 99,876
N. Y., L. E. & W. RR.	885,983	695,487	Inc. 190,496
Total	35,441,795	31,572,939	Inc. 3,868,856

	Nov., 1888.	Nov., 1887.	Difference.
From Wyoming Region	1,932,029	2,236,928	Dec. 284,898
From Lehigh Region	601,894	27,936	Inc. 573,958
From Schuylkill Region	1,164,729	1,121,326	Inc. 43,403

	For year 1888.	For year 1887.	Difference.
From Wyoming Region	20,327,787	17,539,701	Inc. 2,788,086
From Lehigh Region	5,120,662	4,310,551	Inc. 809,511
From Schuylkill Region	9,993,946	9,722,687	Inc. 271,259

The stock of coal on hand at tide-water shipping points November 30th, 1888, was 569,233 tons; on October 31st, 1888, 359,133 tons; increase, 210,100 tons.

Bituminous.

There is as usual very little to say concerning the bituminous coal market. It has kept up wonderfully well and is at present very brisk, and the demand is keeping the companies quite busy. Nevertheless, we anticipate a little decline in this demand for steamships. On account of the extremely low freights on pig-iron and some other heavy freights from England, steamers have brought over coal for their return voyage. This, of course, will diminish the demand for immediate shipment in this harbor and in Philadelphia. Otherwise, the prospects of the trade are excellent so far as consumption goes, and it is said that matters are moving harmoniously toward an organization of a new pool for the coming year.

We continue our quotations as heretofore: \$2.60 f.o.b. at Baltimore and Georgetown, \$3.25 for New York Harbor shipping ports, \$3.50 alongside New York.

It is reported that Mr. M. P. Canfield, representative of Munson & Co., of New York City, who make large shipments of Pennsylvania coal to Cuba every year, is arranging for the shipment from Pensacola, Fla., of a large cargo of Alabama coal to the firm's Cuban customers. If the Alabama article shall prove satisfactory, it is the firm's intention to supply their Cuban trade with Southern mixed fuel. Mr. Canfield will go to Cuba to witness the introduction of the Alabama coal there. Vice-President Smith, of the Louisville & Nashville Railroad, has promised assistance in the promotion of the enterprise by reducing transportation rates on the coal from the mines to the seaboard.

Messrs. R. B. Wigton & Sons, one of the largest coal shippers of Center County, Pa., have given notice to the Pennsylvania Railroad Company that they will begin legal proceedings against that corporation for alleged discrimination in freight charges. The com-

plaint covers a period of seven years, and the firm's claim is for upward of \$500,000. Messrs. J. G. Johnson, George M. Dallas and George L. Crawford, of Philadelphia, have been retained as counsel by the firm. The complaint is that for the last seven years lower rates from the Clearfield region have been allowed other coal shippers than the plaintiff. The extra sum paid, with interest, amounts to between \$100,000 and \$300,000. The act entitling aggrieved shippers to triple damages did not become effective until 1883, and upon all shipments subsequent to that date the benefit of the law is taken. Among coal shippers the suit is regarded with a great deal of interest, as it is considered a test case. There are firms and individuals now waiting to go to law with claims aggregating over \$1,000,000.

The coal operators in the Hocking, Sunday Creek and Shawnee valleys, Ohio, on the 19th inst. formed a pool to regulate the output and the selling price of coal for the coming year. Propositions have been made to buy out small operators in the district who refused to join the combination, by offering them large sums to suspend operations for the year. The territory included in the "combine" produces about 3,000,000 tons of coal annually, or two thirds of the output of the State. Each member of the pool gets a percentage of the profits, and no one is allowed to sell his coal below the established figures.

Boston. Dec. 20.

[From our Special Correspondent.]

The market is not quite as dead as it was, and for this Old Boreas can be thanked. We are having the first cold weather of the season, and it naturally causes some hustling for coal en route, but no particular anxiety yet for second orders. The retail dealers must deliver considerable coal before their bins begin to look empty.

The jobbers tell us that with continued cold weather here and continued restriction at the mines a decidedly better market will result; and perhaps it will, but the winter has not yet shown its temper, and perhaps our New England dealers ought not to be blamed for refusing to bank on the weather outlook.

F. o. b. prices are not quite so favorable to the buyer as last week. That is to say, the best grades of coal are firmer, but individual coals are to be had at former figures in most cases, and there is an abundance of everything except Lykens Valley and kindred coals, which are always scarce nowadays.

The bituminous dealers are in pretty good shape, generally speaking. There have been some losses on demurrage, but these occurred only where shippers sold large amounts of coal delivered, and as this was in violation of the pool regulations and good business practice as well, no sympathy is felt for the sufferers. There is considerable preliminary "pool talk," as usual at this time, and it seems to be generally held that losses on freights and demurrage will cause a better compliance with the pool next season. It is claimed that the pool regulations will be stronger, and that every one of importance will come in. But, of course, it is early yet, as the old pool extends until March. There continues to be a very fair demand for bituminous in cargo lots, at \$2.50@2.65 f. o. b., or delivered rates on that basis.

The scarcity of barges continues to be a feature of the freight situation. Rates remain very firm.

We quote vessel rates, exclusive of discharging: New York, \$1.05@1.25; Philadelphia, \$1.55@1.65; Baltimore, \$1.65@1.75; Newport News and Norfolk, \$1.55@1.65; Richmond, \$1.75@1.80; Provincial, \$1.90@2.25.

There is now a pretty fair winter movement at retail. Prices remain unchanged.

Delivered prices are: Stove and Nut, \$6.50; Egg, \$6.25; Broken, \$6; Franklin, all sizes, \$7.75; Lehigh Egg, \$6.50; Broken, \$6.25. Wharf prices 50 cents less than the above. Bituminous coal, \$4.25 on the wharf.

Buffalo. Dec. 20.

[From our special correspondent.]

There was a great change in the weather last Monday, from warm and rainy to snow, ice and cold bleak winds. There may be plenty of opportunity yet left of this winter to use up the stocks of coal in consumers' bins. At time of writing a fine bracing atmosphere prevails—a fit harbinger of Christmas and its festivities.

Anthracite coal dull and prices unchanged; dealers at interior near-by points seem to be well supplied, as the warm weather experienced for so long a period has, of course, been against the depletion of stocks. The wholesale companies are filling up the pockets of their trestles slowly, stowing away for the future the surplus production of 1888.

Bituminous coal quiet and without change nominally in quotations. Stocks are very largely now in excess of demand, and the railroad sidings are covered with loaded cars awaiting customers for their contents.

Our city water-works used natural gas for fuel for several months, saving in cost at the rate of about \$7000 per annum, taking into consideration the expense of handling, wages, carting away ashes and other items of expenditure.

The production of coke in the Connellsville district at present is said to be the largest in the history of that region. It is rumored that prices will be advanced at the beginning of the new year at the ovens, and a corresponding increase at retail at all distributing points.

Do not be alarmed when you learn that the United States troops have been called into requisition here. The Delaware, Lackawanna & Western Railroad has a very large coal trestle at the foot of Erie street, and

is now extending and partially rebuilding it. The extension is claimed to encroach on government land over 20 ft. frontage on the river, and no need having been paid by the company's officials to the protest given by the United States authorities, a detachment of infantry arrived on the scene and stopped the work. The troops are keeping guard and an empty car does duty as a temporary barrack and sutler's quarters. The whole matter is now before the authorities at Washington, and further developments are awaited with interest. The soldiers and the railroad officials are on the best of terms and are having a good time generally, although the latter are grumbling at the delay which necessarily follows the action taken by the Government and which will cause much trouble to them if the difficulty is not solved in their favor.

The quantity of coal passing through the Sault Ste. Marie Canal this year during the season of navigation was 2,105,041 net tons, as compared with 1,352,987 tons in 1887, 1,010,000 tons in 1886 and 895,000 in 1885.

It is reported here that a syndicate has been formed to purchase important Ohio River lines and also Western lines of railroads, so as to ship iron ore from the west end of Lake Superior to Pittsburg by way of the Mississippi and Ohio rivers. The plan is to ship the ore from Duluth to St. Paul by rail, thence to Pittsburg by barges, said barges to be loaded on their return trip with coal for sale and distribution in the Northwest. At first this scheme was thought to be one that would be detrimental to Buffalo's interests, but a careful consideration has eradicated such an impression, as our merchant's and shippers' anthracite trade will not or cannot come into competition with bituminous product of the Pittsburg region. Of this matter, however, more anon.

The Eastern Minnesota Railway is building a coal dock of 550,000 tons capacity west of the Lehigh docks at West Superior.

Wishing all the readers of the ENGINEERING AND MINING JOURNAL a Merry Christmas, au revoir.

Pittsburg. Dec. 20.

[From our Special Correspondent.]

Coal.—We have to report a dull and unsatisfactory market. Notwithstanding the shut-down, there remained sufficient coal in the pools to forward to the lower markets on Wednesday last 4,325,000 bushels by the Ohio River, most of which will go direct to New Orleans and other Southern points. The following are the nominal rates:

Prices in the pools are:

PRICE OF COAL PER 100 BUSHELS = 7600 LBS.

First pool.....\$4.75 Fourth pool.....\$3.25
Second pool..... 4.25 Railroad coal..... 5.00
Third pool..... 3.75

Connellsville Coke.—Prices firm, with an upward tendency. The output for some weeks past was the largest ever made since coke was first made; in fact, the supply is said to exceed the demand, being something that don't occur very often. The week's shipments were 7050 cars; previous week, 6950 cars. With the single exception of the Western steel plant at St. Louis, all the Western coke-burning furnaces supplied from the Connellsville region are running full and taking large amounts of coke.

The rates are: Blast-Furnace, \$1.25 per ton; to dealers, \$1.35; foundries, \$1.50; crushed, \$2.20.

Freight rates to Pittsburg, 70c. per ton; to the Mahanoy and Shenango valleys, \$1.35; East St. Louis, \$3.20; to Cleveland, \$2.80; to Chicago, \$2.75; to all other points the same proportions.

FREIGHTS.

The Rates on Pig Iron.—The following notice was issued on the 19th, in accordance with a vote of the joint committee, to take effect January 1st, 1889: The east-bound and west-bound rates on pig iron and the articles named in the special iron tariff will be on the basis of 25 cents per 100 pounds in car loads, and 30 cents per 100 pounds in less than car loads between Chicago and New York.

Southern Pig-Iron Freights.—The Queen and Crescent route via the Alabama Great Southern and the Cincinnati Southern Railway have issued a new pig-iron tariff which went into effect on the 1st of December. It shows a reduction of 20 cents a ton. The rate to Chicago is \$3.70 from Dayton and Rockwood, \$3.90 from Chattanooga, \$4.15 from Rising Fawn, Attalla, Bessemer, Birmingham, Gadsden and Wheeling, Ala., \$3.90 from Florence and Sheffield, \$4.40 from Anniston, Clifton, Ironaton and Jenifer, Ala. To Cleveland the rates are 25 cents less than these. To Cincinnati the figures are: From Dayton and Rockwood, \$2.20; Chattanooga, \$2.40; Rising Fawn, \$2.65; Attalla, Bessemer, Birmingham and Wheeling, Ala., \$2.90; and Florence and Sheffield, \$2.65. The Kansas City rate is \$5.78 from Dayton and Rockwood and \$5.98 from the other furnaces. The St. Louis rates are \$2.95 from Rockwood and Dayton, and \$3.15 from Chattanooga, and \$3.40 for the Birmingham district.

The latest coal charters per ton of 2240 lbs.
From Baltimore to—Bangor, Me., 1.60; Bath, 1.60; Boston, 1.75; Bridgeport, Conn., 1.45; Bristol, 1.25@1.30; Brooklyn, 1.25; Charleston, 1.00; Fall River, 1.50; Galveston, 3.00; Gardner, Me., 1.75; New Bedford, 1.45; Newburyport, 2.25; New Haven, 1.45; New London, 1.45; New York, 1.25; Portland, 1.75; Portsmouth, N. H., 1.85; Providence, 1.45 @1.50; Quincy Point, 1.50; Richmond, Va., 70; Roxbury, 1.50 3c.; Salem, Mass., 1.75; Savannah, 1.30; Somerset, 1.35; Williamsburgh, N. Y., 1.25; Wilmington, 1.35.

From Philadelphia to—Bangor, 2.00; Boston, 1.50@1.60; Charleston, .90@1.00; Chelsea, 1.55@1.60; Com.

Point, Mass., 1.60; E. Boston, 1.70; East Cambridge, 1.50; Fall River, 1.15@1.25; Galveston, 3.00; Gardner, Me., 1.60; Georgetown, D. C., 1.00; Lynn, 1.75@1.85; New Bedford, 1.15@1.25; Newburyport, 1.75; New York, .90; Norfolk, .70@.75; Portland, 1.50@1.60; Portsmouth, N. H., 1.60@1.70; Portsmouth, Va., .65; Providence, 1.15@1.25; Richmond, Va., .80@.85; Rockport, 1.22½; Saco, Me., 1.75; Salem, Mass., .90; Savannah, 1.25; Washington, 1.00; Weymouth, 1.15; Wilmington, N. C., .60.

* And discharging. 3c. per barge extra. † Alongside. ‡ And towing.

METAL MARKETS.

NEW YORK, Friday Evening, Dec. 21, 1888.
Prices of silver per ounce troy.

Dec.	Sterling Exch'g.	London Pence.	N. Y. Cts.	Dec.	Sterling Exch'g.	London Pence.	N. Y. Cts.
15	4.88¼	42 9-16	93	19	4.88¼	42½	92½
17	4.88½	42½	92¾	20	4.88¼	42 5-16	92½
18	4.88½	42 7-16	92¾	21	4.88	42 5-16	92½

The market is unreliable, but the tendency is weak, due to stringency in the London money market.

Foreign Bank Statements.—The governors of the Bank of England at their weekly meeting made no change in its rate for discount, and it remains at 5 per cent. During the week the bank gained £147,000 bullion, and the proportion of its reserve to its liabilities was reduced from 40-32 to 39-91 per cent, against a reduction from 46-16 to 44-92 per cent in the same week of last year, when its rate for discount was 4 per cent. The weekly statement of the Bank of France shows a gain of 500,000 francs gold and a gain of 4,875,000 francs silver. In the open market rates for discount of bankers' bills ruled at 4½ per cent.

Copper.—The market remains firm but quiet, with good demand on the part of consumers. The failure of the promoters of the Panama Canal project to raise the additional capital required to continue operations produced a very uneasy feeling in the market for copper shares in Boston at the close of last week, and a sharp decline in values took place. This decline has, however, since been recovered to a great extent on it becoming apparent that the French Copper Syndicate were not in any way connected with the unfortunate Panama Canal scheme.

Little business is doing in the copper market, and the latest quotations on the Metal Exchange are about 17½c. for Lake and 16c. for casting brands. The European market is also dull, with quotations in London unchanged at £77 10s. to £77 12s. 6d. Spot, and £78 to £78 2s. 6d. three months for both Chili bars and G. M. R. Manufactured copper is quiet at about £84 to £86 for strong sheets, £80 to £81 for best selected and £79 10s. to £80 for English tough. Very little business is doing in furnace material.

According to cable advices from Messrs. Henry R. Merton & Co., of London, the statistics of visible supplies of copper again show an increase of 3000 tons for the first half of December.

The fire in the Calumet & Hecla mine is said to be extinguished, and work will commence at once to put the mine in condition to send out copper.

It is said that the company has decided to fill the workings with old tailings, or possibly with other waste material. In this way the possibility of fires would be absolutely prevented.

As the Calumet & Hecla tailings are considerably higher grade than Atlantic ore, and may possibly some day pay to rework, it is scarcely probable that they will be run into the mine, but if the roof cannot be allowed to fall, it would appear a wise measure to fill the old workings.

The exports of copper from New York during the past week were as follows:

To Liverpool—	Copper Matte.	Lbs.	\$10,000
By S. S. Italy.....	Sacks, 798	93,500	
By S. S. Italy.....	Bbls., 346	344,294	32,500
To Bremen—			
By S. S. Ems.....	Sacks, 236	30,800	4,000
To Liverpool—	Copper.	Lbs.	\$10,000
By S. S. Adriatic.....	Casks, 134	167,500	26,500
By S. S. City of Chester.....	" 134		27,956
To Hamburg—	Old Yellow Metal Sheathing.		
By S. S. Mozart.....	Bbls., 3	15,846	1,585
To Hamburg—	Silver Bearing Copper Ore in Transit from Mexico.		
By S. S. Australia.....	Sacks, 1,109	76,000	2,314

Copper estimated at 1,140 lbs.
Messrs. James Lewis & Son advise, under date Liverpool, December 3d, as follows:

"On the 5th ult. the syndicate, having previously sold a considerable quantity of furnace material to the smelters for delivery and payment prior to the 28th December, raised their selling price of both furnace material and smelted copper £2 10s. per ton. They subsequently purchased considerable quantities of Chili bars and good merchantable copper at £78 for cash and £79 for three months' prompt. Finding that they were unable to make any sales at the advance, being undersold by the smelters to the extent of £4 per ton, and that a great deal of copper was offered to them, they reduced their purchasing price to £77 10s. for cash and £78 for three months. The market is consequently now 10s. per ton lower than a month ago, notwithstanding the nominal advance in the syndicate quotations.

"The sale of the Produce of the Anaconda mines to the syndicate for next year does not appear to be yet completed. The price paid for the current six months is 15s. per unit. The import into England for the past eleven months has been 26,222 tons matte, representing 15,732 tons fine. In addition to this probably 8000

to 10,000 tons fine have been smelted at Baltimore, and large quantities are stored at the smelting works at Anaconda.

"During the month the public have been invited to subscribe capital to develop a copper mine in New Zealand and another in Asia Minor.

"During the past month 925 tons of Chili bars have been transferred from here to France, making 24,242 tons to date, viz.: 20,068 tons to Havre, 2848 tons to Rouen, and 1326 tons to Dunkirk.

"Stocks show an increase of 2573 tons since the 1st ult., imports being 37,749 tons greater to date than last year, while deliveries are 34,881 tons less. The visible supply has increased 4163 tons the past month.

"The arrivals in England from Chili during the month have been 1441 and the deliveries 997 tons fine, and from other countries 4729 and 4558 tons fine respectively. Only 25 tons of Chili bars have been delivered to consumers.

"The arrivals in Liverpool and Swansea from the United States have been 75 ingots, 3107 matte (including 2527 tons Anaconda), and 757 ore, equal to about 2007 tons fine copper, and in France 249 tons.

"The Chili charters for the month are 3400 tons, and the closing rate of exchange is 28 $\frac{1}{2}$ d., bars being nominally \$27.20 per quintal."

Tin.—The market has been dull during the whole of the week, and the transactions which have taken place have been for small quantities at prices somewhat below the quotations previously reported. In face of the approaching holidays and the close of the year, consumers show no disposition to purchase more than required to meet their urgent needs. Generally speaking, the feeling is good, and it is expected that a more satisfactory business will be done after the turn of the year. We quote to-day, Spot, 21 $\frac{1}{2}$; December, 21 $\frac{1}{2}$; January, 21 $\frac{1}{2}$; February, 22; March, 22 $\frac{1}{2}$.

The London market has also been weak and dragging, and prices gave way to 496 15s.; but during the last few days an active business is reported, and an improving tendency, and the last prices are: Spot, 497; three months, 497 17s. 6d.

Lead.—The business to be reported is quite of a retail character, with some odd carloads lots changing hands at from 3 $\frac{7}{8}$ to 3 $\frac{3}{8}$, but larger parcels could only be sold at considerably less. There is practically no desire on the part of either buyers or sellers to operate at the present moment. Two hundred tons on dock, New York, were offered yesterday on the Metal Exchange, and 3 $\frac{67}{8}$ was the best price bid by consumers, and the lot had consequently to be bought in at 3 $\frac{7}{8}$. A sale of about 900 tons hypothecated lead is advertised to take place on January 3d, and more is promised to follow. This promise may affect the price, for it is known that there is a good deal of lead to be sold in this way if it can be done without breaking the market too much. We quote Spot December and January 3 $\frac{7}{8}$ to 3 $\frac{7}{8}$, and the more distant months, 2 $\frac{1}{2}$ to 5 points higher. The London market has been rather active, the lower quotations lately having tempted buyers, and prices have advanced to 412 17s. 6d. for Spanish and 413 2s. 6d. for English, a 2s. 6d. decline from the highest.

The advertisement, "National Lead Trust Stocks Bought and Sold," elicited a visit by an ENGINEERING AND MINING JOURNAL reporter to the brokers who have the matter in charge. They said: "We know very little about the National Lead Trust, except that the certificates are dealt in to a small extent here. The price is \$20 asked and might be bought for less for a few hundred shares; par \$100. We believe this is the White Lead Trust, though that does not appear on the certificates. We have been told about \$20,000,000 have been issued, and that 90 per cent of the stock is pooled and that there is very little afloat." The form of these certificates is very similar to those of Standard Oil Trust, after which most of the later trusts are fashioned. The investor is required to agree to all the provisions of the agreement upon which the trust is formed, although he is not allowed to know what they are. In our issue of September 29th we gave full particulars about the White Lead Trust.

St. Louis, Mo.—Messrs. John Wahl & Co. telegraph us to-day as follows: Market does not reveal any activity, but on the other hand, shows no sign of weakness, holders having quite frequent inquiries for small lots, maintaining prices fairly well. Offerings are very light, especially for deferred deliveries. The event of the week has been the sale of about 650 tons at prices ranging from 3 $\frac{50}{100}$ to 3 $\frac{55}{100}$.

Spelter has shown more life, and considerable sales have been made for December and January shipment at 5@5 $\frac{1}{2}$. The foreign markets are unaltered and steady at 18 12s. 6d. for good ordinary and 18 17s. 6d. for specials in London.

Antimony.—The demand is good, but cannot be met, as practically there is no available stock on this side. We quote: Hallett's, 10 $\frac{1}{8}$ @11 $\frac{1}{8}$; Cookson's, 13. In England makers have again raised their prices, Hallett's being now quoted 44s.

CHEMICALS AND MINERALS.

NEW YORK, Friday Evening, Dec. 21.

Heavy Chemicals.—There is little of interest to report concerning the chemical market this week. Spot business is very slow, and although supplies are light they are sufficient to supply the existing demand. For futures there is a very encouraging outlook. Considerable business continues to be done in carbonated soda ash, 48 per cent, and a slight ease in the price of caustic soda seems to have increased the volume of business in this article.

There is nothing worthy of note from abroad, either by letter or cable. Although the general alkali combination seems to have fallen through, or, at least, is attracting little attention, the separate articles are all well under control, and makers are firm in their views. The apparent safety of the Salt Union is also an element of strength in the market.

According to *Kühlow* an arrangement has been arrived at for keeping up prices by the Westphalian Salt-Works Union, the Lorraine Salt Syndicate and the Heilbronn Salt-Works. A similar agreement was made in July last between the Westphalian Salt-Works Union and the North German Salt-Works in Hanover.

Below will be found full and accurate reports by our special correspondents in Liverpool on the English chemical and mineral markets. We also print this week the description of an electrolytic process of decomposition of sea salt, to which we referred in our last report. We also give some interesting figures on the English alkali trade. Chemical manufacturers and dealers should refer to these pages regularly for the latest and most reliable information concerning chemical matters.

During the week there have been several reports in regard to a salt trust, which, it was said, an agent of an English syndicate was endeavoring to form in this country. The alleged scheme was given in detail, and the daily press devoted considerable attention to the subject. Those who are familiar with the situation of the salt industry in this country, however, declare the project not only improbable, but impracticable, owing to the vast territory to be covered, the divergence of the interests of English and American makers, and the generally expressed disinclination of the latter to enter into any such agreement as that which has been proposed.

In detail, the New York market stands about as follows: Carbonated soda ash, 48 per cent, continues in good demand. Considerable business in contracts is reported and the spot supply is limited. Prices are firm, ranging from 1 $\frac{25}{100}$ to 1 $\frac{35}{100}$ for large quantities to 1 $\frac{35}{100}$ for small lots from store. The former figure is the usual quotation for contracts. Caustic soda ash, 48 per cent, is attracting little attention. Prices are nominally 1 $\frac{25}{100}$ @1 $\frac{35}{100}$, according to quantity and quality.

Caustic soda has eased a little in value and buyers have taken a little more in consequence. The latest quotations are 2 $\frac{27}{100}$ @2 $\frac{30}{100}$ for all the higher tests, although some dealers profess to get as high as 2 $\frac{35}{100}$ for 70 per cent. There is very little inquiry for 60 per cent, which may be quoted nominally at 2 $\frac{50}{100}$. Sal-soda is quiet, buyers taking little more than actually necessary for immediate wants. For both spot and to arrive, we may quote 95c.

Bleaching powder is depressed again, the rather large supplies, the low prices in Boston and the want of demand having given a heavy tone to the market. We have heard of a lot offered at 1 $\frac{85}{100}$, or equivalent to the ruling price in Boston, and this is perhaps the actual market level for delivery in 1889. Liverpool cables report sales at 47 15s., and at 47 12s. 6d. The spot market may be quoted 2 $\frac{12}{100}$ ¢.

Acids.—For nearly all acids there has been a relaxation in the demand, caused by the approaching holidays and the stock taking at this time of the year. A prominent manufacturer says that the word most frequently used now is "wait," either until after the 1st of January before you ask for orders, or until then before you ship us any goods, or until then before you bill us, which is probably the most important consideration.

Acetic acid is quiet at 2@2 $\frac{3}{4}$ ¢ for prompt delivery, and 1 $\frac{85}{100}$ ¢ for contracts over 1889.

Nitric and muriatic acids are moving in small lots for immediate requirements at unchanged prices.

Oxalic acid shows no special change. We are unable to learn of any important business or of any change in prices, which may be written 8 $\frac{1}{2}$ @9¢ per pound, according to quantity, for prime English and German makes, ex store or dock New York, Boston and Philadelphia.

Tartaric acid is in small demand, at unchanged figures. We quote 48¢ for crystals in lots of 3000 pounds or more, 44¢ in barrels, and 45¢ in 50-pound boxes. For powdered, advance these prices one cent per pound.

Sulphuric Acid.—The demand has fallen off a little, but prices continue firm, as dealers are expecting a very active market after the first of the year.

Fertilizers.—The trade in chemical fertilizers is still very good for most articles, and dealers look forward to the spring business with considerable satisfaction. The revised price-list is about as follows: Azotine, \$2.55@2.65 as to quality; dried blood (city), low grade, \$2.55 per unit; Western high grade, \$2.65 @2.70 per unit for ground material; tankage, high grade, \$25 per ton; low grade, \$22@23 per ton, as to quality. Fish scrap, \$25 per ton f.o.b. factory. Sulphate of ammonia, \$3.40@3.45 per cwt.

Refuse bone-black, guaranteed 70 per cent phosphate, is quoted at \$19 per ton. Dissolved bone-black is 95¢@1 per unit for available phosphoric acid, and acid phosphate 75@80¢ per unit for available phosphoric acid.

Steamed bones, unground, \$19; ground, \$25@26. Charleston rock, undried, \$5 per ton; kiln dried, \$6 per ton; both f.o.b. vessels at the mines. Charleston rock, ground, is held at \$10@10.50 ex steamer at New York.

Muriate of Potash.—There is no accumulation of

stocks, and the price is firm. Up to yesterday, the date officially fixed by the syndicate, the contract price for 1889 delivery was \$1.77 $\frac{1}{2}$, at which figure, we are informed by the agent of the syndicate, a large number of contracts were placed. From now on, or as long as the condition of the trade warrants it, the official price for contracts will be \$1.80. Spot quotations are \$1.82 $\frac{1}{2}$ @\$1.85.

Double manure salts are firm at about \$1.20 on a basis of 48 per cent. High grade sulphate of potash has been advanced to \$2.50 on a basis of 90 per cent.

Kainit.—Spot quotations are purely nominal, as there is nothing in this position unsold. Shipment is offered at \$9.50@9.75, and we are told of a small quantity to be had ex-vessel at \$10.

Brimstone.—Although the spot market is still bare, prices to arrive are weak. For best unmixed seconds, to arrive, about \$20 per ton is asked, and \$19.62 $\frac{1}{2}$ for January-February shipment. Thirds continue as previously quoted.

Nitrate of soda is perhaps a shade weaker at 2 $\frac{37}{100}$ @2 $\frac{40}{100}$ ¢ on the spot, and 2 $\frac{15}{100}$ @2 $\frac{25}{100}$ ¢ to arrive, according to position.

Acetate of lime is quiet at 2@2 $\frac{10}{100}$ ¢ for gray and 1@1 $\frac{05}{100}$ ¢ for brown.

Minerals.—Sulphate of Barytes—The supply is quite large, but nothing more than jobbing sales are reported. We quote \$21.50 for best imported brands, \$17.50@18.50 for best No. 1, and \$12@15 for off-colored grades.

China Clay.—Small sales are reported at \$13.50@18, according to grade. American remains at \$12.50.

Chalk.—No important offerings, and consequently no important transactions, have been made since our last report. We quote nominally \$2.75@3.

Liverpool.

Chemicals.—Our special correspondents, Messrs. J. P. Brunner & Co., write us as follows on the 5th inst.: There is little stirring in heavy chemicals this week, but this is usually the case at this season of the year, as in view of stocktaking consumers only operate from hand to mouth. Soda ash is nominally unchanged, there being few sellers for December delivery. One maker has accepted 3 $\frac{1}{2}$ d. for 48 per cent caustic ash, but newest values are:

Caustic ash, 48 per cent, 1d. to 1 $\frac{1}{2}$ d.; high test, 1d. 1 $\frac{1}{2}$ d. Carb. ash, 48 per cent, 1d. 1 $\frac{1}{2}$ d.; high test, 1d. 1 $\frac{1}{2}$ d. Soda crystals are in demand, but prices are easy at 2 10s. to 2 12s. 6d. Caustic soda was in request at the close of last week, and a considerable business was done, principally in 70 per cent, at an advance 1s. 3d. to 2s. 6d. a ton on bottom prices, but the market has gone very quiet again. We quote: Sixty per cent, 48 5s. to 46 7s. 6d.; 70 per cent, 47 5s. to 47 7s. 6d.; 74 per cent, 47 17s. 6d. to 48. Resellers might probably be found at 1s. 3d. under the lower figures for 60 per cent and 70 per cent. Bleaching powder is inactive at 47 17s. 6d. to 48.

At a meeting of the makers, held 30th ult., it was unanimously agreed to carry on the combination over all 1889. Chlorate of potash is dull, at 5 $\frac{1}{2}$ @5 $\frac{3}{4}$ d. for prompt delivery. Bicarbonate of soda is moving off freely at 44 12s. 6d. to 44 15s. per ton for 1 cwt. kegs, according to brand and quantity. Sal Ammoniac has been advanced to 436 per ton for firsts and 434 for seconds.

Minerals.—Geo. G. Blackwell writes as follows on the 5th inst: Our market has fully maintained the firmness last reported. Manganese: There are no imports to record, and stocks in the meantime are being considerably reduced, prices therefore have further advanced. Magnesite unaltered for raw lump; raw ground 46 10s., and calcined ground 410 to 411. French chalk: About 1,100 bags have arrived during the week, but the whole have gone into consumption, prices therefore remain unchanged, being firm at 99s. 6d. for medium, and 100s. to 107s. 6d. for best GGB. Barytes (carbonate) still inquired for, especially for best quality. Selected crystal lump scarce at 46 5s.; No. 1 lumps, 90s., best, 82s. 6d.; seconds and good nuts, 75s.; smalls, 50s., at 60s.; best ground, 46 5s., and selected crystal ground, 48 10s. Sulphate in demand; best lump, 35s. 6d.; good medium, 30s.; medium, 25s. 6d. @27s. 6d.; common, 18s. 6d. @20s.; ground, best white GGB brand, 60s.; common, 45s.; gray, 32s. 6d. @40s. Pumicestone is scarce, and a further advance has taken place, ground being quoted at 410 and specially selected lump, finest quality, 413. Fuller's earth steady; 45s. @50s. for best blue and yellow; fine impalpable ground 47. Wolfram and tungstate of soda continue drooping. Tungsten metal is easier. Chrome metal 5s. 6d. per pound. Tungsten alloys 2s. per pound. Chrome ore inquired for, especially 50 per cent to 55 per cent. Uranium 29s. to 32s. 6d. Asbestos: Best rock, 417 to 418; brown grades, 414 to 415. Potter's lead: Small, 411 10s. to 412; selected lump, 413 to 414. Calamine, steady, 60s. to 80s. Strontia steady, sulphate (celestine) 17s. 6d. Carbonate (native), 415 to 416; powdered (manufactured), 411 to 412. Limespar: English manufactured, old GGB brand, brings full prices: 45s. for ground. Plumbago: Best Ceylon lump, 425 to 435; good, 430 to 421; chips, 48 to 416; best ground, 420, 425 and 430; Italian and Bohemian, 44 to 412 per ton. French sand, in cargoes, 16s. to 17s. Ferro-manganese firm at last quotations; also spiegel and chrome pig. Bitumen, finest picked, 435; original prime, 418 to 23; and good, 48. Ground mica, 450. China Clay: Fair business doing—common, 18s. 6d.; good medium, 22s. 6d. to 25s.; best, 30s. to 35s. (at Runcoora).

BUILDING MATERIAL MARKET.

NEW YORK, Friday Evening, Dec. 21.

Up to the first of December, there was a decrease of 32 per cent in number and 33 per cent in value in the buildings projected during 1888, as compared with the corresponding period last year, and as this ratio has been maintained during the current month, it is fair to presume that this will represent the percentage of decrease for the entire year. Considering the dullness this year, when the number of buildings projected during 1887 was so large, the figures herewith presented tell their own story as to the outlook for 1889.

Bricks.—One or two of the yards persist in sending cargoes up to the very last moment when river navigation is open, but the majority have entirely stopped and the supply coming forward is not sufficient to affect the market disadvantageously. For any of the river brick, \$6 per thousand is about low water mark, although we have heard of Fishkill at about \$5.90. Jerseys continue to rule at about \$5@5.75. Pales show no change; buyers appear to be rather indifferent to this class at present. Upon a revision of the price list, we are warranted by the general condition of the market in advancing our quotations for the medium grades about 25c. per M.

Cement.—In the words of a prominent importer, "trade is slow," although for this season of the year the demand may be called "fair." Little business of moment is reported in imported stock. The out of town trade by rail, which is still of considerable importance to dealers in Rosendale, does not seem to amount to much among importers. Except within perhaps a hundred miles of New York, buyers seem to have anticipated their wants before the close of navigation.

Lime.—The few cargoes of Rockland now on hand have all been sold, and despite the oft-repeated reports to the contrary, it is probable that association rates are secured. St. John lime keeps pretty well up to previous quotations, about 90c. being the usual figure.

Building Stones.—There is nothing of interest to report in this line. Quarrymen are hoping that the Senate tariff bill, which proposes to increase the duties on free stones to such a figure that foreign competition will be impracticable, will be passed at an early date. Otherwise, there is nothing to make a change in association rates next year probable. According to the report of the Bureau of Statistics recently issued, the imports of stone and manufactures of stone, including slate, during the month of October were valued at \$33,975, against \$35,701 in October, 1887. The imports of marble during the same periods were valued at \$32,154 and \$20,217, respectively. The total imports of both marble and stone for the ten months ending October 31st, 1888, were valued at \$327,739, against \$756,448 last year.

For prices of building materials and wages of laborers, see our current prices.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, Dec. 21.

The general features of the iron market remain unchanged. There is no improvement in any part of it, except in steel rails. In this article the demand is increasing, and there is certainly a better feeling, which is showing itself in firm prices in this market at least. So far as we can learn, no steel rails can be bought here for less than \$29 delivered at tide-water and \$28 at the mills. The assurances that these figures are being maintained has added a good deal of encouragement to the trade, and orders which were floating around expecting to find some one ready to cut prices are being placed now since the would-be purchasers have found that they cannot induce any one to do so.

American Pig Iron.—This market remains very dull and there is no urgency for deliveries. Prices remain unchanged; no one dreams of any advance being made for the coming year and not a few are looking for lower figures. The Thomas Iron Company has booked a considerable number of orders for next year's delivery, but since it is the custom of this company to enter orders and protect its customers, whatever prices may be finally decided upon as the ruling figure for the year, the mere entering of orders does not indicate what iron will bring a few months hence; \$16, \$17 and \$18 for the three numbers of standard Lehigh irons may be considered as the probable opening prices, but it would not surprise us in the least to see these lowered by a dollar on the higher grades. The fancy quotation of \$19.50 for No. 1 iron, which is sometimes quoted, has little foundation in fact, for we believe every iron in the market can be bought for very little over \$18, except where it is wanted in very small quantities or under unusual conditions.

Southern iron is being pressed upon the Eastern market, particularly in Philadelphia, where it is said that 7000 tons of gray forge have been placed during the week at \$15. The possibility of the financial needs of some Southern furnaces influencing the price of some of the Southern irons is a disturbing element which tends to confirm the somewhat prevalent impression that our Eastern irons will sell somewhat lower than they did last year. The curtailment of the Eastern market for both pig iron and manufactured iron is also pointing towards the necessity for reducing the cost to a point which will enable this market to hold its own even against the South. All these reasons are at present being considered in the trade, and there is a probability at least that they will

have some influence in determining the standard quotations which are expected shortly to be announced.

Scotch Pig.—The market here is very dull, and though freights are very low, it leaves no margin of profit to importers. Freight got down to 3s. a ton (less than it costs to cart iron across town), when the steamers commenced to bring over coal for their return voyage instead of bringing iron. This may bring about a little stiffening in prices, especially if the market on the other side should continue firm. We may quote Coltness, \$21; Glengarnock, \$20.25; Dalmellington, \$19.50; Garthsherrrie, \$20; Eglington, \$19.25. There is no Summerlee or Clyde in this market.

Spiegeleisen.—There is very little doing in this, and we quote nominally \$27 for 20 per cent and \$53.50 to \$54.50 for 80 per cent ferro.

Steel Rails.—A number of small orders have been taken here mostly for the East and some for the South coast. Prices have been held firmly at \$19 at tide water delivery and \$30.50 Boston delivery. The sales have aggregated about 12,000 or 13,000 tons during the week, but there are several orders in the market which will bring the total pretty close to 20,000 or 25,000 tons. Chicago prices are said to be firm now at \$29.50 to \$30.

Structural Iron and Steel.—The demand is still very good for this class of material, and there are numerous orders to be closed in the near future which are being looked after by some of our large mills. Some of these orders are very large, and will justify the introduction of special machinery in some mills which have hitherto been out of the market on this material.

Plate Iron and Steel.—There are some large orders now being figured on for steel plates. These orders will probably not be closed for a short time, but they are now being looked up by our Eastern mills. The prospect in all classes of merchant steel is rather toward lower prices. The small rail orders have left so much capacity in the mills idle that some of them are turning over onto structural and merchant steel, with the probable result of overstocking the market. At present the margin on merchant and structural steel is much larger than on rails, but it is not to be expected that it will continue so for any great length of time.

Old Rails.—We hear of no contracts having been made at this port, but sales are reported at Philadelphia at \$24. We quote here \$23 on cars.

Cast-iron Pipes.—This market is extremely dull, and nominal prices are liberally shaded; \$25 for heavy pipe is considered a full price, which does not always get the order. Small pipes go up as high as \$30, but there is nothing fixed in these figures.

For quotations in all other kinds of iron and steel see our table of current prices on another page.

LOUISVILLE, Dec. 18.

[Special report by Messrs. HALL BROTHERS & Co.]

There is nothing especially new to report of the iron market. Sales, as usual at this season of the year, are not what might be called heavy, yet there is a fair run of moderate sized orders being placed, mostly for extended shipments. Most of the furnaces on standard grades are fairly well booked ahead. There are some orders in sight which may be consummated before the end of the week, although buyers display rather an independent feeling as to placing orders until after the first of the year.

Quotations, which are for cash f.o.b. cars at Louisville, will be found in our weekly register of prices.

PHILADELPHIA, Dec. 21.

[From our Special Correspondent.]

Only a trifling amount of business has been transacted during the past few days, most of it at prices ruling last week. Very few inquiries have been presented, and scarcely any business will be transacted in a large way till after New Year's Day. Brokers and manufacturers claim that everything is very strong, and will continue so all winter, and there are no good reasons for contradicting this statement. Small lots of steel rails sold this week foot up about 10,000 tons so far as known. Steel rail makers are meeting with enlarging inquiry and heavier business for steel in other forms than rails, and this branch of business will be worked very energetically all winter. In fact, some companies contemplate putting in additional capacity to meet a demand which they feel certain will come. Structural iron is in very little demand, but a number of large transactions will undoubtedly take place in January. Negotiations are quietly going on, and some heavy contract work is in sight. The shipbuilders have about completed specifications for several large lots of material that will be contracted for next month. Prices just now are rather weak, and it is understood that the large contracts to be placed next month will be taken at shaded quotations. The merchant iron market is more irregular than last week. Some sales have been made at a tenth off. Some manufacturers have been showing an anxiety for large orders to run them through the winter, and it is quite likely that orders for the new iron car building will be taken at lower quotations than have yet been named. There is no change in the sheet iron market or in merchant steel, old rails, wrought-iron pipe or skelp, excepting that in skelp one or two offers were made at a trifle below current rates. Several large wrought-iron pipe contracts are in sight, but prices do not seem to suit buyers, and they will wait till they can test the strength of the market. A great many old rails would sell at buyers' terms. Scrap is not in as much demand. Crude iron is strong, but not active. One large lot of Southern iron has been sold here for

pipe making purposes. Consumers rely upon an increased output for lower prices in the spring, but the increased output does not promise much in reality unless a quantity of Western and Southern iron should crowd into this market. Of this there is little danger. Agents have been trying to work off large lots, but find manufacturers unwilling to buy. Foreign material is dull. There is no business in blooms. A few sales of muck bars have been made at inside figures. The nail trade is extremely dull, and prospects are far from encouraging. Quotations will be found in our weekly register of prices.

Pittsburg, Dec. 20.

[From our Special Correspondent.]

Raw Iron.—The market since our last has presented little that is new or interesting. There have been no new developments, still, taking the season of the year into consideration, we see no reason for complaint. There is just enough new business doing to keep prices from breaking. Consumers who require immediate replenishments for early deliveries have bought a few lots here and there, and in that way have steadied things, but the feeling among certain holders is nervous and somewhat anxious, and bids at slight concessions might find acceptance to a certain extent. At the same time several furnaces have set their figures and refuse to make concessions. The iron business at present is just like other branches of trade; there will always be a wide difference of opinion in regard to the present and future of the market. A sale of 7000 tons of Alabama iron was made at Philadelphia, said to be at a fraction over \$15 ex ship, quality similar to Pennsylvania gray forge. Consumption continues large, and so does production, with a continued enlargement of the output, and some are of the opinion that the amount can't be absorbed in time to prevent a break in prices.

Many of the furnaces here and in the Shenango and Mahoning valleys have a large number of orders booked for deliveries extending over three months in the New Year at prices satisfactory. The report gains strength that coke will be \$1.50 per ton on and after New Year's Day. It stands to reason that an advance in coke means an advance in iron. The furnacemen will scarcely be willing to add \$7@40 cents per ton to the cost of iron and sell at former prices. All things taken into consideration, there is slight prospect of cheaper pig-iron. The coke production for November was the largest ever made, exceeding October 8700 tons, averaging 1118 cars per day, showing a heavy increase.

Coal and Coke Smelted Lake Ore.

1250 Tons Bessemer, January, Valley furnace.	16.00 cash.
1000 Tons Gray Forge, Spot.	15.35 cash.
1000 Tons Gray Forge, Spot.	16.00 cash.
750 Tons Gray Forge, January.	15.25 cash.
750 Tons Bessemer, January.	17.00 cash.
500 Tons Gray Forge.	16.00 cash.
300 Tons Gray Forge.	16.00 cash.
300 Tons Gray Forge, Storage.	16.00 cash.
250 Tons Gray Forge, Storage.	15.50 cash.
300 Tons Mottled and White.	15.00 cash.
50 Tons No. 1 Foundry.	17.75 4 mo.
100 Tons No. 2 Foundry.	16.75 4 mo.

Coke, Native Ore.

200 Tons Gray Forge, Storage.	15.50 cash.
100 Tons Mottled and White.	15.25 cash.
50 Tons Mottled.	15.50 cash.
50 Tons Silvery, Extra.	19.00 cash.
50 Tons Cold Blast.	27.75 cash.
50 Tons No. 2 Foundry.	22.50 4 mo.
50 Tons Hot Blast.	23.75 cash.

Steel Slabs and Billets.

1000 Tons Steel Billets, Jan. and Feb.	28.50 cash.
1000 Tons Steel Billets, Jan. and Feb.	28.50 cash.
1000 Tons Steel Billets, Jan. and Feb.	28.50 cash.
750 Tons Billets.	28.25 cash.
500 Tons Billets.	28.50 cash.
800 Tons Nail Slabs.	28.00 cash.

Skelp Iron.

200 Tons Sheared, per cwt.	2.00 cash.
150 Tons Narrow Grooved, per cwt.	1.75 cash.
125 Tons Wide Grooved, per cwt.	1.82 1/2 cash.

Muck Bar.

1250 Tons Neutral, Jan. and Feb.	29.50 cash.
1000 Tons Neutral, Jan. and Feb.	29.50 cash.
1000 Tons Neutral, January.	29.50 cash.

Ferromanganese.

75 Tons 80 per cent.	56.00 cash.
50 Tons 80 per cent.	55.00 cash.

Steel Rail Bloom Ends.

1000 Tons Bloom Ends.	19.50 cash.
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Steel Wire Rods.

1000 Tons American Fines.	41.00 cash.
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Scrap Material.

200 Tons No. 1 Wrought Scrap, net.	22.00 cash.
200 Tons Steel Rails Short, gross.	18.50 cash.
200 Tons Cast Borings, gross.	12.50 cash.
100 Tons Car Wheels, gross.	19.50 cash.
100 Tons Cast Scrap, gross.	16.50 cash.

FINANCIAL.

NEW YORK, Friday Evening, Dec. 21.

There has been an increasing activity in the mining market, and it appears as if the long-promised boom is slowly rising above the horizon.

Mutual, to which we referred extensively in our last issue, was actively dealt in. The price was firm at from \$1.10 to \$1.15.

Buffalo Iron Mining shows daily transactions and considerable business at prices ranging from \$6 to \$8.38.

El Cristo was more active, and sold at from 65 to 70c.

Ontario has declared its 151st dividend. The total dividends paid to date now amount to \$9,725,000. There was a considerable business in the stock at prices ranging from \$33.75 to \$33.50. The Daly Company,

its neighbor, has declared a dividend of 25 cents per share, making a total paid to date of \$362,500.

An upward movement was shown in United Copper, which advanced from 50 to 66c.

The Colorado stocks are neglected. Silver Cord shows a sale at 75c.; Lee Basin, at from 60 to 65c.; Small Hopes, at from 75 to 80c.; Plutus, at 75c.; Little Chief, at from 16 to 18c.; Leadville, at 13@14c. Silver King, which last week advanced from 85c. to \$1.20, opened at the latter price on Saturday. During the week the price was firm at from \$1.20 to \$1.25, but to-day it declined to \$1.10.

Phoenix of Arkansas, which has been dormant for many weeks, came out on Thursday, and since then has been actively dealt in, some 2500 shares changing hands at prices which declined from 50@25c.

A sudden break in Hollywood occasioned considerable surprise on the Exchange to-day. The stock fell from 40c. to 4c. per share during the day. About 18,000 shares changed hands. This stock was held by Wm. J. Osborne, the member of the Consolidated Stock and Petroleum Exchange who fell dead in the ranks of the Republican parade in this city on November 3d, and who has always been its principal supporter. Consequently when it was offered to-day there was no one to represent the company and the price fell precipitately. The other Amador stocks also showed a declining tendency. Amador declined from \$2.25 to \$2, and to-day sold at from \$2.05 to \$2.20, and Middle Bar at from 38 to 34c. Astoria was firm at from 24 to 25c.

Plymouth Consolidated shows sales amounting to 225 shares, at from \$9 to \$9.50.

Brunswick shows one sale at 8c. Quicksilver Preferred was neglected, and Common shows one sale at \$7.

Some 600 shares of Bulwer changed hands at 50c. A few shares of Mono sold at 90c., and Standard at \$1.

The Comstocks were neglected, showing the usual transactions with but little change in price.

Sutro Tunnel stock declined from 10c. to 6c. The trust certificates were firm at 60c.

The Tuscorora stocks are coming into prominence in this market. Commonwealth has been dealt in at from \$4.10 to \$4.50. Navajo at \$2.10. North Belle Isle at \$3. Belle Isle at 35c. and Del Monte at from \$1.20 to \$1.25.

The transactions in Barcelona amounted to 16,900 shares at from 63 to 68c. Eureka Consolidated shows one sale at \$2.50.

The Homestake Gold Mining Company announces its one hundred and twenty-fifth dividend of 20 cents per share. One sale of the stock was made at \$12.50. Deadwood-Terra shows a few sales at from \$1.70@ \$1.75, and Iron Hill at from 7@9c.

Colchis was one of the few stocks which showed an upward movement. The price advanced from \$2@ \$3, at which latter price sales were made to-day.

Rappahannock declined from 10@3c. yesterday. According to reports this was occasioned by stock being sold for account of a holder who had deposited the same as collateral on a small loan. The recent bonding of the Rappahannock Company for the sum of \$8000 was stated by the president of the company to have no relation whatever with the decline in price.

Kingston & Pembroke showed a business amounting to 8980 shares, at prices ranging from \$1@ \$1.25.

A private letter from Phoenix, Arizona Territory, dated December 13th, announces the advertisement of the sale there of the Phoenix mine, owned by the Phoenix Mining Company, by the sheriff, on January 1st, 1889, under a judgment of \$13,152 and costs. There are also liens for about \$2000 filed against the company. Attorney George F. Chamberlain, of New York, acting for claimants against the mine, is about to bring suit to set aside the judgment on the ground of collusion. It is said that this judgment was obtained through collusion on the part of the present management of the mine and the Arizona creditors for the purpose of depriving the stockholders of their property and wiping out the claims of Eastern creditors. The scheme, it is said, embraced the sale of the mine to Arizona parties, the organization of a new company, and the floating of more stock—in short, a regular mining deal. Mr. Chamberlain claims to have startling and important information concerning the management of the property, which will be unfolded to all stockholders who choose to attend a meeting to be held at his office, No. 31 Nassau street, Room 54, New York, to-morrow, at noon. It is even intimated that a criminal suit against some of the parties in the deal is being considered, but, according to Mr. Chamberlain nothing quite so startling as this will occur just yet. In order to secure both sides of this interesting story, an ENGINEERING AND MINING JOURNAL reporter saw Mr. J. M. Seymour, who is said to hold by far the greater portion of the stock, and therefore may properly be classed among the "present management." Mr. Seymour said that he knew nothing about the judgment until it had been obtained, but he had at once telegraphed to his lawyer at Phoenix to have the sale postponed, and to investigate the matter. The sale has now been deferred until February 5th. "And even at that date," says Mr. Seymour, "there is little danger of the property being sold for any such amount as that for which judgment has been obtained. The company, of course, has not the ready money, but it has the stock, and as the mine is certainly a valuable one, the necessary funds will doubtless be secured."

The London Mining Share Market.

[Special Correspondence of THE ENGINEERING AND MINING JOURNAL.]

The London market shows more activity in mining shares, attention being chiefly devoted to South African mines. The Hatton Garden crowd appear to be devoting a great deal of attention to booming these

shares, with the result of an inflation in quoted values of over 500 per cent above par. Of course these values are fictitious, and the result of inside manipulation.

Investment at these figures is sheer madness, there being no developments in the mines to warrant anything more than a firm feeling at par, and in one or two mines a slight premium. American shares are neglected, the principal stocks, however, maintain their values. The Pachuca mines, of Mexico, are reported solid in London. These mines, whose chief value consists in their lying in the same neighborhood as the Santa Gertrudis and Real del Monte, have been persistently hawked in London for the past four years by a Mr. F. W. Bawden, M.E., of Pachuca. They have been examined quite frequently, and that has been the extent of the negotiation.

The stock of the Valley gold mines is quoted at 4@ 5s. We presume that this is merely nominal, otherwise we should expect to hear of Del Mar and his friends' presence in London unloading a few blocks of it. The property is, practically speaking, valueless as mining ground, unless a tunnel, some miles in length, is run to drain off the water. Even then it is by no means certain that it would produce pay gravel.

The Josephine Mining Company, operating in Fresno County, California, one of Mr. Hamilton Smith's pet projects appears to be in trouble. It is not long since Mr. Smith, as consulting engineer for the company, gave most glowing accounts of the reserves and the working of the mill. The ore, he stated, would yield \$15 per ton, and the mining and milling expenses could not exceed \$5. However, there are no profits and investors are kicking, saying that the ore only existed in the imagination of the promoters. This is a terrible accusation to bring against such an august body as the Exploration Company, Limited, composed of well known names like Rothschilds, Barings, Smith, Payne & Smith and a banking peer or two. Then also Smith & De Crano, Engineers, and Mr. McKinlay, Secretary. We can imagine the storm of indignation that shook the portly form of that intensely respectable secretary when such an insinuation was cast against his company, and the air of dignity with which he pointed out in the articles of association the names of the signatories as evidence of the impossibility of such a charge having a foundation. Investors have lost their money just the same.

Venezuela-Anstlin shares have gone up very considerably lately. There is, however, no improvement in the mines to justify this. The ore mills under three quarter ounce to the ton, and that does not pay expenses. Potosi is in the same fix, with a prospect of improvement before long.

The La Gloria Silver Mines, Limited, is the name of an incorporation formed for the purpose of purchasing a silver mining property in the State of Sonora, Mexico. The share capital is £150,000, and of this amount the British public are offered £40,000. The vendors receive as payment £110,000 in stock and £20,000 in cash, leaving a balance of £20,000 to be used as a working capital, provided the full amount of 40,000 shares offered is subscribed for.

Great prominence is given in the advertisement of the prospectus to the fact that the property is "a going concern," and a table is given showing the number of ounces in silver bullion shipped during a period of 11 months' work with a ten-stamp mill as being 154,107 oz. The number of tons of ore treated is not given, but assuming the estimate of the milling capacity at 25 tons per day to be correct, and taking 28 working days to the month, 7700 tons were treated, giving an average yield of a trifle over 20 ounces per ton. The working expenses are "averaged at, say, £1000 per month." Why the actual figures are not given is not stated. The fineness of the silver is not given, and the calculations are based upon the standard, 8s. 7d. per ounce.

Turning to the body of the prospectus we find "these mines, prior to being acquired by the present owners, were worked by Mexicans in their customary primitive way," etc. The "customary primitive way" of the Mexican miner is a pretty effective one and more than one English company has found out to its bitter cost that there is not much profit to be made in working their refuse dumps. We think it unwise of the shareholders of La Gloria to place much dependence upon this portion of their property for their dividends.

Mr. Charles Pletz, M.E., indorsed by the Government Inspector of Mines in the State of Sonora, is the authority upon which estimates of reserves and their values are given. Mr. Pletz is also one of the engineers who reported most favorably upon the properties of the Sonora Silver Mining Company, Limited, in 1887, and subsequently occupied the position of consulting engineer to that company. He estimates that the El Yeso mine contains reserves ready for stamping 12,045 tons of ore, estimated to yield 40 ounces silver per ton (double the value obtained from the mill as given in statement), and 16,000 tons in ground now opened by the La Gloria shaft; this is also assumed as yielding 40 ounces per ton, making a total of 28,045 tons of ore estimated in sight. The mining and milling expenses are put at \$10 per ton, leaving a net profit of \$30 per ton, or about £174,000 net profit in reserves in sight.

The vendors of the La Gloria silver mines must be governed by a spirit of philanthropy, otherwise why should they go to work and put ore through their mill yielding only \$20 per ton and leave in the mine large quantities which will pay them \$40 per ton, so that the British public may come in and participate in the enormous profits to be realized from milling their reserves, and all for the paltry consideration of supplying £20,000 and some additional machinery which

could easily be paid for out of the proceeds of milling a thousand or so tons of these reserves. Such chances for profit are indeed rare, and the only probability of a failure in their realization lies in the possibility of Mr. Charles Pletz, M.E., being mistaken in his estimates. That mistakes have been made in the past we regret to record. The Sonora Silver Mining Company, of which Mr. Pletz was consulting engineer, erected machinery upon the strength of estimated reserves of over £1,000,000 by no less an authority than Prof. Edward C. Garlick, M.E., and their £1 shares are selling at 9d. @ 1s. 3d., with the probabilities of a reconstruction of the company to provide further capital to wrestle out those estimated reserves. Other companies with similar prospectuses have had similar experiences. The vendors have guaranteed the profits of the company from October 1st, 1888, to January 31st, 1889, to be not less than £6500, and the prospectus states that an interim dividend may therefore be expected to be declared early in February. As eleven fifteenths of the stock belongs to the vendors it will not be a difficult matter for them to keep their promise to the public of returning £1733 6s. 8d. of the £40,000 cash raised.

The prospectus promises great things; whether the public will bite is another matter. Judging from the selling price of the stock of the La Luz mines, brought out only a short time ago on very similar lines, we are inclined to doubt it.

The mines may have value, but the estimates given in the prospectus, we consider grossly exaggerated and utterly unreliable. The public will do well to leave these very good things alone.

Electric Stock Quotations.

The following are the latest quotations, prepared for the ENGINEERING AND MINING JOURNAL by Messrs. Crosman & Quick, brokers, New York City: Edison, \$185 bid; Edison Illuminating, \$84@ \$86; Brush, \$35@ \$45; Brush Illuminating, \$80@ \$90; United States, \$20@ \$30; United States Illuminating, \$40@ \$50; Daft, \$40@ \$60; Consolidated, \$50; Westinghouse, \$31@ \$33.

Auction Sale of Stocks.

There have been few sales of interest to the readers of the JOURNAL this week. Three hundred shares of the Standard Oil Trust brought \$164 1/2 @ \$165 1/2 per share. Stock of the Pennsylvania Coal Co., Troy Steel and Iron Co., and the Julien Electric Traction Co. that was advertised for sale was withdrawn.

Meetings.

Alice Gold and Silver Mining Company, Union National Bank, Salt Lake City, Utah, January 8th, from eleven o'clock A.M. till 10 o'clock P.M.

Big Bend Hydraulic Company, No. 181 Broadway, N. Y. City, January 8th, from eleven o'clock A.M. till 12 o'clock noon.

Phoenix Mining Company, of Arizona, Room 54, No. 31 Nassau street, city, December 22d, at twelve o'clock noon. Special meeting of stockholders dissatisfied with the present management.

Assessments.

COMPANY.	No.	When levied.	D'l'nt' in office.	Day of Sale.	Am't per share.
Alpha, Nev.	24	Nov. 3	Dec. 8	Dec. 22	.87 1/2
Alpha Cons., Nev.	2	Nov. 3	Dec. 8	Dec. 28	.25
Anchor, Utah	9	Dec. 1	Jan. 3	Jan. 25	.10
Atlas, Dak.	2	July 11	Dec. 27	Jan. 15	.001 1/4
Bellevue, Idaho	-	Nov. 10	Dec. 20	Jan. 20	.15
Benton Cons., Nev.	18	Oct. 29	Dec. 3	Dec. 24	1.00
Bohama, Dak.	1	Dec. 11	Jan. 15	Feb. 2	.001
Commonw'th, Nev.	7	Nov. 24	Dec. 28	Jan. 21	.50
Concordia, Nev.	2	Nov. 12	Dec. 24	Jan. 12	.50
Cora, Dak.	3	Nov. 10	Dec. 15	Jan. 10	.01
Gray Eagle, Cal.	10	Nov. 13	Dec. 18	Jan. 8	.05
Golden Reward, Dak.	4	Nov. 21	Dec. 27	Jan. 15	.01
Hartshorn, Dak.	2	Dec. 4	Jan. 4	Jan. 21	.002 1/2
Huron Mt. L. & M., Mich.	Nov. 5	Dec. 5	.....	.....	.02 1/2
John Duncan, Mich.	Nov. 14	Dec. 15	.....	.....	.25
Last Chance, Cal.	13	Nov. 9	Dec. 11	Jan. 5	.10
Live Oak Drift, Cal.	11	Nov. 19	Dec. 21	Jan. 16	.05
Lord of Lorn, Nev.	4	Nov. 13	Dec. 28	Jan. 22	.10
Monarch, Dak.	7	Nov. 20	Dec. 22	Jan. 6	.01
Montrose, Colo.	1	Oct. 3	Dec. 26	Jan. 28	.01 1/4
National, Dak.	4	Dec. 3	Jan. 3	Jan. 10	.001
Jo Craig, Dak.	1	Dec. 11	Jan. 11	Jan. 28	.001
Omilak, Alaska	5	Dec. 4	Jan. 5	Jan. 24	.20
Pennsylvania, Cal.	Nov. 13	Dec. 17	Jan. 7	.....	.12 1/2
Overland, Idaho	Nov. 1	Dec. 10	Dec. 31	.....	.30
Potosi	31	Oct. 1	Nov. 6	Nov. 27	.50
Salt Lake, Utah	Dec. 3	Jan. 5	Jan. 13	.....	.01 1/4
Seg. Belcher, Nev.	2	Dec. 3	Jan. 7	Jan. 28	.25
Sierra Nevada, Nev.	93	Nov. 9	Dec. 13	Jan. 2	.25
Spanish R., Dak.	1	Dec. 6	Jan. 8	Jan. 24	.02
Trent, Dak.	1	Nov. 9	Dec. 11	Dec. 28	.001
Troy, Dak.	2	Nov. 1	Dec. 6	Dec. 22	.002
Wm. Penn, Nev.	3	Nov. 18	Dec. 13	Dec. 31	.10

* Delinquent day and day of sale postponed to dates given above.

† At a meeting of the directors of the Bohama Mining Company, held Dec. 11th, 1888, the 50,000 shares treasury stock was ordered divided pro rata among stockholders of record. Said stock will be ready for delivery on and after Dec. 15th, 1888.

Dividends.

The following have been declared:
 Daly Mining Company, of Utah, dividend No. 22, twenty-five cents per share, or \$37,500, payable December 26th, at No. 15 Broad street, New York City.
 Dunkin Mining Company, of Colorado, dividend No. 27, five cents per share, or \$10,000, payable January 15th.
 Homestake Mining Company, of Dakota, dividend No. 125, twenty cents per share, or \$25,000, payable

December 26th, at No. 15 Broad street, New York City.

National Gas Improvement Company, quarterly dividend of one and one-quarter per cent, payable January 10th, in New York City.

People's Natural Gas Company, regular monthly dividend of 1 per cent, payable December 20th.

Ontario Silver Mining Company, of Utah, dividend No. 151, fifty cents per share, or \$75,000, payable December 31st, at No. 15 Broad street, New York City.

Panama Railroad Company, dividend No. 103, four per cent, payable December 30th, at No. 15 Broad street, New York City.

Sunday Creek Coal Company, five per cent, payable January 15th, at Room 17, No. 2 Wall street, New York City.

Pipe Line Certificates.

Messrs. Watson & Gibson, brokers, report as follows for the week :

Oil has been steady during the week, but to-day it broke badly. The immediate cause was the announcement, not yet authenticated, that the Standard Oil Company will issue certificates against the stock, amounting perhaps to eight million barrels, accumulated at Lima, Ohio. This oil is inferior and sells for only about 15 cents per barrel, its principal use so far having been for fuel. Bears say that it is not much inferior to the old Bradford oil, which has deteriorated by age. At any rate, the fear that this oil might be used against holders of Pennsylvania oil disturbed confidence and broke the market. Statistics and facts all disappear before the operations of men's minds, which are always skeptical and suspicious about petroleum. It defies all rule and reason.

NEW YORK STOCK EXCHANGE. Table with columns: Opening, Highest, Lowest, Closing, Sales. Rows for Dec. 15, 17, 18, 19, 20, 21.

Total sales in barrels..... 4,235,000

CONSOLIDATED STOCK AND PETROLEUM EXCHANGE. Table with columns: Opening, Highest, Lowest, Closing, Sales. Rows for Dec. 15, 17, 18, 19, 20, 21.

Total sales in barrels..... 9,063,000

Dakota Mining Stocks.

Speculation in mining shares is reviving in Deadwood, and the establishment of a mining exchange is talked of. The latest quotations, which we take from the Deadwood Pioneer, are as follows:

Table of Dakota Mining Stocks with columns: Bid, Ask'd, and stock names like Golden Reward, Tornado, Ruby Bell, etc.

Boston Mining Stocks. Dec. 20.

[From our Special Correspondent.]

The market for copper stocks closed weak on our last report, and on the following day prices yielded a point or two, but on Saturday a drive was made by the bears on the whole list, which gave way under the pressure of stock thrown upon the market, and at one time it looked as if a panic was inevitable; as it was, the good stocks were forced down from \$5 to \$10 per share before good buying orders were met, and the drive stopped. Calumet & Hecla declined from \$295 to \$285, and on very small sales Boston & Montana declined \$7, from \$70 to \$63; Tamarack from \$174 to \$166, and Butte & Boston from \$28 3/4 to \$20. Osceola also dropped from \$19 to \$17, and Franklin from \$18 to \$17 1/2. Kearsarge sold at \$10, a decline of \$1 1/2, and the whole list was more or less affected. The decline was started on reports of trouble in the copper syndicate, and that the Anaconda mine was not shut down, but would continue to furnish its quota of production. The whole thing looked like a scoop engineered by parties who wanted either to cover short sales or get a line of cheap stocks. This is evident from the reaction which followed, Calumet going up again to \$290, Boston & Montana to \$68, and Tamarack to \$172 1/2, while Butte & Boston sold up to \$25 1/4, and the balance of the list gaining more or less from the lowest quotations. For the past three days the market has ruled dull, but prices are quite firm, and after New Year we look for more activity and better prices. Among the low priced stocks, Allouez is steady at \$4 1/4; Huron, \$5 1/2 @ \$6. National declined to \$6 3/4, the lowest price for two months. Bonanza declined to \$1 1/2. In silver stocks, Dunkin firm at

IMPORTS AND EXPORTS OF METALS AT NEW YORK DECEMBER 11 TO DECEMBER 17, AND FROM JANUARY 1.

Large table with multiple columns for imports and exports of various metals (Spelter, Pig Lead, Antimony, Copper, Nickel, Tin, Steel Sheets, Forgings, etc.) including company names and quantities.

CURRENT PRICES.

Table of current prices for various commodities including chemicals, acids, and minerals. Items listed include Muriatic acid, Nitric acid, Sulphuric acid, and various salts.

Table of current prices for building materials such as bricks, cement, and stone. Items include Bricks - Pale, Cement - Rosendale, and Building Stone - Amherst.

Table of current prices for various metals including iron, steel, and copper. Items include Scotch Pig-Cottless, Steel Blooms, and Bessemer Pig.

Table of current prices for rare metals such as aluminum, bismuth, and cadmium. Items include Aluminum - Metallic, Bismuth - Metallic, and Cadmium - Metallic.

Table of current prices for various types of iron and steel. Items include American Pig-Iron, Bessemer Pig, and various grades of steel.

Table of current prices for structural iron and steel components. Items include Structural Iron and Steel, Bridge Plate, and Steel Angles.

Table of current prices for iron plates and related materials. Items include Iron Plates, Common tank, and Shell.

Table of current prices for merchant steel and cast-iron pipe. Items include Merchant Steel, Cast-Iron Pipe, and Wrought-Iron Pipe.

Table of current prices for boiler tubes and rail fastenings. Items include Boiler Tubes, Rail Fastenings, and Spikes.

Table of current prices for hot blast irons and various types of charcoal. Items include Hot Blast Irons, Mahoning Valley (Lake Ore), and Missouri Charcoal.

Table of current prices for Philadelphia prices of various iron and steel products. Items include Foundry No. 1, Foundry No. 2, and Gray Forge.

Table of current prices for Bessemer pig and charcoal pig. Items include Bessemer Pig, Charcoal Pig, and various grades of pig iron.

Table of current prices for various types of steel and iron products. Items include O p. e. Spiegel, Muck-Bar, and Steel Blooms.

STOCK MARKET QUOTATIONS

Birmingham, Ala.

Table of stock market quotations for Birmingham, Alabama, listing various companies and their stock prices.

Pittsburg, Pa.

Table of stock market quotations for Pittsburg, Pennsylvania, listing various companies and their stock prices.

Foreign Quotations

Table of foreign stock market quotations for various international locations including London, London, and various European cities.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Main table with columns for Name and Location of Company, Capital Stock, Shares, Assessments, Dividends, and Date and amount of last dividend. It lists 150+ mining companies with their respective financial details.

Gold, S. Silver, L. Lead, C. Copper. * Non-assessable. † Fair company, as the Western, up to Dec. 10th, 1881, paid \$1,400,000. ‡ Non-assessable for three years. § The Deadwood previously paid \$275,000 in eleven dividends, and the Ferris \$75,000. Previous to the consolidation in Aug. 1884, the California had paid \$31,333.00 in dividends, and the Con. Virginia, \$34,500.00. ¶ Previous to the consolidation of the Copper Queen with the Atlanta, Aug., 1885, the Copper Queen had paid \$1,350,000 in dividends. † 1,000,000.

NEW YORK MINING STOCKS QUOTATIONS. DIVIDEND-PAYING MINES. NON-DIVIDEND-PAYING MINES

Table with columns for Name and Location of Company, dates from Dec. 15 to Dec. 21, and Sales. Lists various mining companies like Adams, Alice, Argenta, etc.

Ex. dividend. †Dealt in at the New York Stock Ex. Unlisted Securities ‡Assessment paid. Dividend shares sold, 14,798. Non-dividend shares sold, 119,525 Total New York, 134,340.

BOSTON MINING STOCK QUOTATIONS.

Table with columns for Name of Company, dates from Dec. 14 to Dec. 20, and Sales. Lists various mining companies like Atlantic, Bodie, Bonanza, etc.

* B'gts. Boston: Dividend shares sold, 8,781. Non-dividend shares sold, 7,885. Total Boston, 16,666.

COAL STOCKS.

Table with columns for Name of Company, Par val of sh'rs, dates from Dec. 15 to Dec. 21, and Sales. Lists coal companies like American, Barclay, Cameron, etc.

*Bid. †Asked. ‡Ex-dividend. **Of the sales of this stock, 69,306 were in Philadelphia, and 275,530 in New York. Total sales, 632,434.

San Francisco Mining Stock Quotations.

Table with columns for Company, dates from Dec. 14 to Dec. 20, and Sales. Lists mining companies like Alpha, Alta, Belcher, etc.

87½c.; a dividend of 5 cents per share is announced. Napa Quick-silver firm at \$2¼. Catalpa sold at 17c.

LATER PRICES.

(By Telegraph)—December 21st, 1 P. M.—Calumet & Hecla, \$290; Tamarack, \$159, ex \$5 dividend and rights, which are selling at \$8.

Horsford's Acid Phosphate,
A Nerve-Food and Tonic.
The Most Effective yet Discovered.

DIVIDENDS.

ASPEN MINING AND SMELTING COMPANY, No. 54 Wall street,

NEW YORK, Dec. 11, 1888.
Dividend No. 2 of TWENTY CENTS PER SHARE has this day been declared on the stock of this company (200,000 shares), payable at the office of the company on and after the 15th day of December, to stockholders of record. The transfer-books will be closed on Thursday, December 13th, at 12 o'clock noon, and reopened on Monday, December 17th, at 10 o'clock A.M.
J. L. TILTON, Secretary.

DALY MINING COMPANY.

MILLS BUILDING, 15 BROAD STREET,
NEW YORK, Dec. 18, 1888.
DIVIDEND NO. 22.

A dividend of TWENTY-FIVE (25) cents per share has been declared for November, payable 31st inst. Transfer-books close 26th inst.
LOUNSBERY & CO.

DUNKIN MINING COMPANY.

NEW YORK, Dec. 18, 1888.
DIVIDEND NO. 27.

The Board of Directors of this company have declared a quarterly dividend of TEN THOUSAND DOLLARS, being FIVE CENTS per share, payable January 15th, 1889, at the office of the Farmers' Loan and Trust Company, 22 William street, New York City. Transfer-books close January 2d and reopen January 16th.
JAMES C. ELMS, Secretary.

HOMESTAKE MINING COMPANY,

MILLS BUILDING, 15 BROAD STREET,
NEW YORK, Dec. 19, 1888.
DIVIDEND NO. 125.

The regular monthly dividend—TWENTY CENTS per share—has been declared for November, payable at the office of the company, San Francisco, or at the transfer-agency in New York, on the 26th inst. Transfer-books close on the 20th inst.
LOUNSBERY & CO., Transfer-Agents.

ONTARIO SILVER MINING COMPANY,

MILLS BUILDING, 15 Broad Street,
NEW YORK, Dec. 21, 1888.
DIVIDEND NO. 151.

The regular monthly dividend of FIFTY CENTS per share has been declared for November, payable at the office of the company, San Francisco, or at the Transfer-Agency in New York, on the 31st inst. Transfer-books close on the 26th inst.
LOUNSBERY & CO.

TECHNICAL GLASS GOODS.

WATER-GAUGES, with or without Reflectors.
GLASS CYLINDERS for Mine Lamps.
MIRRORS for Medical Purposes and Show Cases.
VACUUM GLASSES for Distilleries and Sugar Refineries. Barometer and Thermometer Tubes.
Everything BEST QUALITY and LOWEST PRICES.
Price List and Samples Mailed Free on Application.
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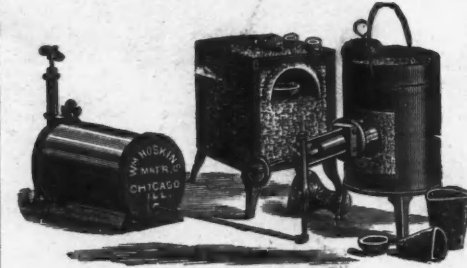
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TUNNEL AND MINING MACHINERY IN GOOD CONDITION.

Rand Compressors, Double and Single.
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Pumps of Different Sizes and Makes.
Electric Light Plants.
Baker Blowers, Lidgerwood Engines.
Electric Light and Blower Engines.
Cages and Tunnel Cars.
25-lb. Ralls, Etc., Etc.

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HOSKINS' PATENT HYDRO-CARBON BLOW-PIPE AND ASSAY FURNACES.



No dust. No ashes. Cheap, effective, economical, portable, and automatic.

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FOR SALE, AT A LARGE DISCOUNT,

Machinery complete for a modern 30-stamp mill, 750 lb. stamp, entire outfit new. Address
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New Swinging Block STEEL ROLLS, good as new.
THEODORE A. BLAKE,
New Haven Conn.

COAL AND MILL PROPERTY FOR SALE.

A twenty years' lease on 400 acres of extra coal land, fully equipped and in active operation. Also 695 acres coal and salt property, with gas well, good timber, etc., for sale outright. Also a five-story roller process flouring mill, almost new. These properties, situate in the center of the Great Kanawha Valley Mining District, West Virginia. Slack water navigation all year round. We will sell as a whole or separately. Address JOHN CLAYPOOL, or G. W. ATKINSON, Wheeling, West Virginia.

Lead Lands for Sale.

A large body of land in Missouri, inexhaustible in lead, surface rich with float in clay, below richly disseminated through magnesian limestone, capable of immense output; will be sold low for cash; perfect title; no better investment in the United States. Address W. M. LADD 1319 Spruce Street, St. Louis, Mo.

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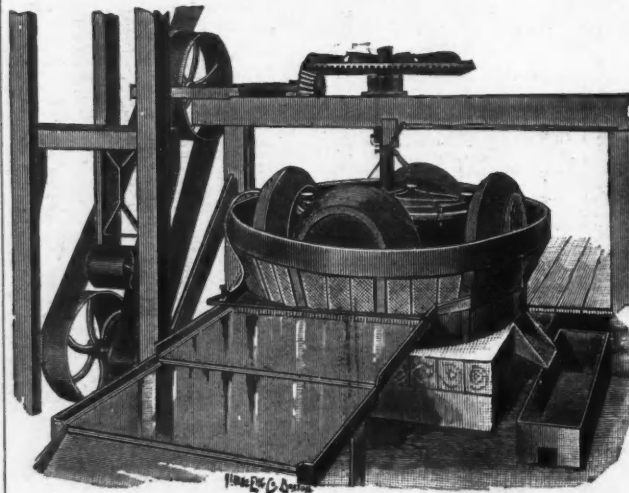
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Wiswell Ore Pulverizer and Amalgamator Combined.



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GENTLEMEN: After carefully inspecting your mill and seeing it in operation, I do not hesitate to say that it is one of the best, if not the best pulverizer, and most complete gold-saving machine I have ever seen.

Please accept congratulations for your success.

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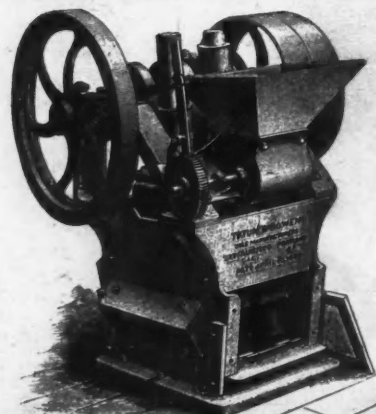
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THE DOUBLE "ECONOMIC" STAMP MILL.

4 Heads in each stamp.
1200 Lbs. to the head.
300 Revolutions per minute for each head.
Total, 4800 blows per minute.

SIMPLE,
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