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COKE AND GAS manufacture in combination, on somewhat the same plan that is now in operation in Boston, is to be put into practice at Cleveland, Ohio. The Semet-Solvay Company, of Syracuse, N. Y., is preparing to erect near Cleveland a block of by-product ovens, which will make coke for furnace and foundry use, and will dispose of the surplus gas for fuel purposes, either in factories or for domestic use.



It is with considerable regret that we record the decision to close one of the most important metaliferous mines in England. This is the Devon Great Consols, near Tavistock, which has been the chief arsenic producer in England for many years. Just how long the mine has been worked we cannot say, but the present company has worked it continuously since 1844 and profits have been distributed equal in the aggregate to nearly twenty-five times the amount of the capital.



THE GERMAN coke syndicates, which practically control the supply of coke to the German blast furnaces, have not shown themselves at all ready to respond to the present condition of the iron industry. In spite of all appeals from the iron and steel furnaces they have strictly enforced the full rates on 1901 contracts, and have consented to grant only a very moderate reduction for 1902.



A REPORT of some interest comes from London, to the effect that a large interest in the Nickel Corporation, Limited, has been sold to a syndicate connected with the United States Steel Corporation. The Nickel Corporation was formed in 1899 to work concessions in New Caledonia. It was promoted by the London & Globe Company, and that concern held a large part of the stock, which has now been sold to the American syndicate.



THE REPORT of Prof. Wilbur C. Knight on the discovery of platinum in Carbon County, Wyo., which is given in another column of this issue, will be found of special interest. The indications are that the metal occurs in considerable quantity. The Rambler Mine from which the platinum comes is a copper proposition and it was only through un-

countable variations in the assays that the rarer and more valuable metal was brought to light. The discovery, which is an important one, was made by Dr. L. D. Godshall, manager of the Boston & Wyoming Smelter at Encampment, where the ore is reduced to matte. It is not yet known whether the platinum is in the copper, or in the iron pyrite which accompanies it, or both. The important point is that it is there in considerable quantity.



WE take pleasure in publishing in this issue a statement from Mr. Arthur L. Collins, manager of the Smuggler-Union Mining Company, in regard to the disastrous fire which occurred in the Bullion Tunnel on November 20. Mr. Collins' communication corrects some statements made in our columns which reflected upon the management and the construction of the works. Our despatches conveyed the idea that the buildings were dangerously close to the mouth of the tunnel and that no appliances for fire protection were on hand.



AS TO COPPER STOCKS.

A statement, which carries with it the suspicion of having received its inspiration in the offices of the Amalgamated Copper Company, has found its way into the columns of the daily press. According to this statement all of the blame for the unsatisfactory condition of the copper market during the last few months lies with the independent concerns, by "independent" meaning those outside the influence of the Amalgamated interest.

In forming a judgment of the conditions which have prevailed in the copper market it must be remembered that the two principal "offenders" from the Amalgamated viewpoint are the Calumet & Hecla and the Copper Queen. It must also be remembered that these two interests have never figured on Wall street as manipulators of the stock market. So little interest is taken by the owners of Calumet & Hecla stock in the quotations of the street that no attempt is made to "protect" it from declining prices.

inclined to enter into any definite alliance with the Amalgamated people, whose actions, to say the least, have not been above suspicion.

There is a very general impression abroad that there has been something of an unholy alliance between the management of the Amalgamated business and the stock market. It is recognized that the "inside" parties have the power to manipulate the stock to suit their purposes, and it is strongly suspected that what has been lost by the accumulation of copper in stock and the recent fall in prices has been more than made up by the profits on the street. A drop from \$130 to \$60 per share on a capitalization of \$155,000,000 means a loss of about \$100,000,000. There may have been some profits derived from selling out or "short" at the higher price. Until the insiders of Amalgamated have purged themselves of the suspicions which have arisen about them, it is of little use to try to throw the blame of the recent demoralization upon others.

The fact that, after the reduction of the Amalgamated dividend and a cut of 4 cents a pound in the price of copper, the quotations began to rise, and are, at the present writing, 9 points above the lowest figure reached, strengthens our conclusions.



LAKE SUPERIOR IRON ORE.

The total shipments from the Lake Superior iron mines have now been made up for the year ending December 1, which is the customary period for the statement. The figures, as given by the Cleveland *Marine Review*, are as follows, the rail shipments for 1901 being estimated, as they are not yet fully reported. The figures are in long tons:

	1900.	1901.	Changes.
Lake Superior Ports, except Marquette.....	12,471,720	13,780,570	I. 1,308,850
Marquette and Escanaba..	6,098,595	6,376,952	I. 278,357
Total by Water.....	18,570,315	20,157,522	I. 1,587,207
Rail Shipments.....	489,078	500,000	I. 10,922
Total.....	19,059,393	20,657,522	I. 1,598,129

While the greater part of the increase was from the Vermilion and Mesabi ranges, it will be noticed that there was still a substantial gain in the Marquette and Escanaba shipments, which come from the old ranges—the Marquette and Menominee.

In addition to the shipments above given, a total of 230,000 tons was shipped from the mines of the Michipicoten District in Canada. Of this ore about 160,000 tons went to Lake Erie ports, 70,000 tons being taken by the furnaces at Midland and Hamilton in Ontario.

The receipts of ore at Lake Erie docks for the year reached a total of 17,014,076 tons, which compares with 15,797,787 tons in 1900, and 15,222,187 tons in 1899. Notwithstanding the large increase shown this year, the stocks on dock on December 1 last were less by 45,009 tons than a year ago. There was little change in the relative rank of the receiving ports this year, but Cleveland and Conneaut showed greater gains than any others.

The shipments to furnaces through Lake Erie ports during the season of navigation have been the largest ever reported. The ore on docks at Lake Erie ports on May 1, 1901, was 3,050,183 tons; the receipts for the season were 17,014,076 tons, making a total stock of 20,064,259 tons. The stocks remaining on December 1 amounted to 5,859,663 tons, showing shipments to furnaces during the season of 14,204,596 tons. This compares with 11,613,773 tons during the corresponding period in 1900; 11,765,158 tons in 1899; and 9,059,829 tons in 1898. From present appearances shipments will be heavy through the winter, and there will be only a light stock on hand at the opening of navigation in 1902.

It will be noticed that the receipts at Lake Erie ports were less than the shipments from the upper

ports by 3,143,446 tons. This balance went chiefly to South Chicago and Milwaukee for the furnaces of the Illinois Steel Company.

The division of the ore production by ranges has not yet been completely reported.



MARKET CONDITIONS.

The iron trade continues this week in a state of activity altogether unparalleled for the closing month of the year. It is usually the case that mills shut down over the holidays to make repairs and adjust machinery before beginning their preparations for the spring trade. This year, however, there is no vacation, for mills and furnaces, almost without exception, are full of orders for delivery well up into 1902. Contracts continue to be offered, moreover, and there is no time in the memory of the trade when so much business has been in sight. In fact, the pressure is so great that some sales of German steel billets are reported here, to mills which have been unable to secure supplies at home. The terms on which such sales have been made are naturally kept quiet.

A disturbing element in the trade, which is becoming serious, is the delay in railroad transportation. In the Central West—including the Pittsburg District, the Mahoning and Shenango Valleys in Ohio, and the region south of Lake Erie—it seems to be impossible to obtain cars enough to move finished products from the mills or to carry fuel and ore to the furnaces. Mill yards are piled with material ready for shipment everywhere, but cannot get it carried away. In the Pittsburg District and the Valleys furnaces and mills cannot get their fuel, while coke is being piled up at the ovens in the Connellsville region. In Pittsburg this week premiums are being paid for coal, the amounts varying according to the necessities of buyers. The worst feature is that there is no prospect of immediate relief, since orders placed for additional cars cannot be immediately filled; and on some railroads complaints are made that the locomotives are giving out under the strain of extra traffic. The conditions seem to imply a want of foresight, or a policy of short-sighted economy, on the part of many railroad companies.

The railroad conditions are also affecting the Western coal trade to a serious extent. Mines are unable to ship coal which is urgently needed at consuming points. In some cities—Chicago, for instance—only the recent mild weather has prevented a shortage for domestic consumption, while factories have difficulty in obtaining fuel enough to keep at work. It was hoped that the closing of lake navigation would release many cars which had been used in carrying coal to Lake Erie ports, but these seem to have been absorbed at once.

In the seaboard bituminous coal trade the short car supply difficulty has been intensified by the recent storms and washouts which have blocked some important coal-carrying lines. The supply for steamship and other purposes in New York Harbor is below the demand, and as high as \$4 a ton is reputed paid for immediate deliveries. Coastwise trade has been blocked by bad weather, and shipments are slow.

The anthracite trade is gradually clearing itself from the troubles caused by storms, floods and railroad delays, and is returning to its normal condition of steady activity.

In the metal markets, copper is at a stand, and there is little or no business. Some further reductions are reported in the nominal prices, and buyers apparently fear more such action and hesitate to go beyond their immediate necessities. It is reported that sales have been made below nominal quotations, and there is a general position of uncertainty which does not favor business. The leading seller seems to have taken the position that as an artificial level is no longer maintained, there is nothing to prevent prices going down to the cost of copper—or below. Meantime the independent producers show no signs

of giving way or entering into any sort of agreement.

In the other metals there is little or nothing of especial importance. Tin is depressed, though the demand continues good. The reduction in the price of lead, noted last week, does not seem to have increased business to any considerable extent, though a fair trade is reported. Spelter shows the best position of any of the metals, and a good market is noted; while there has been a sharp advance in the prices for zinc ores in the Joplin District.

Silver continues quiet and without special feature or any considerable change in prices. The conditions affecting this metal have been fully referred to in recent issues.



CLARENCE KING.

Mr. Clarence King, geologist and mining engineer, died at Phoenix, Arizona, on December 24th.

Clarence King stood entirely alone in his worldwide reputation as a mining geologist, and as the pioneer in governmental work in this kind of geological exploration. Just as Hayden was the great master of general reconnaissance work over great areas of the West at a time when they were almost unknown, so King stands out beyond all other explorers for his more quantitative examination of the West's mineral deposits.

Clarence King was born in Newport, R. I., January 6, 1842. At twenty years of age he graduated from the Sheffield Scientific School, and the next year at the opening of the spring season he crossed the continent with James T. Gardiner, his college friend. They went with an emigrant train for the purpose of becoming well acquainted with the region west of the Missouri River. This was a four months' journey on horseback, in which Mr. King began the work which was his greatest contribution to geological science, that of applying an exact scientific training to the careful examination and complete study of each mineral deposit found. In the autumn of 1863 he joined the California Geological Survey, under Prof. J. T. Whitney, with Prof. William H. Brewer in charge of the field work. In that year Brewer and King explored the Northern Sierras, especially the region about Mount Shasta, Cal., and during the winter months King joined in the examination of the Mariposa mines. In the following year he was actively engaged again with a party under Prof. Brewer, this time exploring the southern part of the Sierra Nevadas. On this expedition King climbed and named Mount Whitney and Mount Tindall, and established Mount Whitney as the summit of the United States. It was in this work that his remarkable endurance and skill as a mountain climber and named Mount Whitney and Mount Tindall and James T. Gardiner were again associated in a geological and topographical survey of the Yosemite Valley for the State of California, and during the winter they made an exploration of Arizona under the direction of General McDowell, in command of the Department of Arizona. This work was interrupted by the hostility of the Apache Indians.

This exploratory work convinced King of the folly of attempting a proper scientific survey of the West without Government aid, and during the winter of 1866 and 1867, he succeeded, through his personal influence and his persuasive enthusiasm, in securing the necessary authority and funds from Congress for a scientific survey from the eastern slope of the Rocky Mountains to the Pacific Ocean. He was placed in charge under General Humphreys, of the Army.

The next five years of his life were spent in the prosecution of the geological exploration of the 40th parallel, which resulted in a complete geological and topographical cross-section of the whole system of the cordillera of Western America. The publications resulting from this work of King and the band of distinguished mining geologists gathered by him, have become classics in mining geology. These re-

ports contributed not only a vast amount of well arranged scientific facts, but established standards and methods of the highest order for the Geological Survey of the United States, which followed in its natural sequence, with Clarence King as its first director.

In the course of this long series of labors in the geology of the western part of the continent, King began a long series of laboratory experiments to determine the inter-action of primal constituents of the globe, under conditions of heat and pressure. The chemical and physical work required for these experiments was very costly and was not entirely completed at the time of King's death.

In the later years of his life, Mr. King was most actively engaged in the development of the mineral deposits of the United States, in which he displayed the most remarkable physical vigor and activity. Mr. King traveled widely, was of varied cultivation in letters and in art, and a most alert and fascinating thinker, which made his success in inspiring and developing other scientific minds one of his greatest contributions to science. To these friends his countless manifestations of kindness of heart will make him deeply and tenderly mourned.

Mr. King was a member of the Metropolitan and Tuxedo clubs, the Yale Alumni and the Century associations and the American Geographical Society. He was also a member of the National Academy of Sciences.

The list of his scientific contributions is entirely beyond enumeration in this notice and they will be presented later with a more extended account of his life.

THE DISCOVERY OF PLATINUM IN WYOMING.

By WILBUR C. KNIGHT.

Very recently this vicinity was thrown into quite an excitement by the report that platinum had been discovered in the Rambler copper ore. Several times prior to this platinum has been reported from various places in the same county, but with the exception of the find in the placer mines of Douglas Creek, they all lack confirmation. On this account it is necessary to call the attention of the mining world to this unique find, or as a whole they may consider it similar to the previous supposed discoveries.

For some time the Rambler Mining Company has had some trouble in adjusting differences in assays, in settlements for its ore. This difference has usually been in the assay for silver, and never amounted to more than a few ounces. A short time ago the Denver assayers, while attempting to account for the variation in the assay value of the ores, discovered that platinum was present and usually in paying quantities. Upon receiving this report the Rambler Company commenced to investigate, much to its credit, and had numerous samples tested from various parts of the mine and also had assays run on car lots varying in quantity from 20 to 45 tons. Without exception, this rare metal has been found in the ores from all parts of the mine, but more especially from the blue copper ore. Besides the platinum, it has been hinted that there are other rare metals present.

The Rambler Mine is located about 50 miles southwest of Laramie, in the Medicine Bow Mountains, at an elevation of about 9,000 feet. About a year ago this property came into prominence as a copper producer and has been one of the greatest mines ever discovered in the State. At a depth of 70 feet a huge vein of oxidized copper ores was found, which made it possible to commence shipping ore immediately after the strike was made. The ore was hauled to Laramie and shipped to various smelters until the melting snow made the roads impassible. Ore was then stored on the dump, and later in the spring sold to the new Grand Encampment Smelter, where it has been matted with ores from the Grand Encampment mines. Below the oxidized ores, chalcocite and bornite were found, and, still deeper, covellite. The ores have varied considerably in value, but the blue ore has averaged about 30 per cent of

copper by the carload. The vein occurs in a schistose formation that is only a short distance from the Archean granite.

The discovery of platinum in a vein is a matter of extraordinary scientific interest, and especially so when it appears to have a commercial aspect. About 15 years ago I found a few small pieces of metallic platinum in a lot of placer gold that I was refining, and which had been taken from Douglas Creek. The metal was of so little value that it had no commercial importance. This find, however, only strengthens the recent report, and there is a probability that this region may prove to be of great importance as a platinum producer.

This is I believe the third instance where platinum has been found associated with veins. The one in Canada has no commercial bearing. I am not familiar with the reports from Russia, or others, if they have been reported.

I am not able to state at this time whether the platinum is found in the metallic state or as a compound. There is a quantity being worked at the university laboratory at this place, and several other chemists are also at work on the ore to ascertain if possible the nature of the platinum in the ore, and also to discover other rare elements if they are present.

The tests to prove this discovery are numerous, and through the courtesy of Dr. A. B. Hamilton, of the Rambler Company, I have been permitted to publish the following assays, which were made by Henry E. Woods, of Denver, Colo. The first lot of assays were made from samples taken from various places in the mine, and were made for platinum only. The second lot were made from car samples, the cars varying from 20 to 45 tons each.

ASSAYS FOR PLATINUM

No.	Kind of Ore.	Platinum	
1	.....	0.06	ounce per ton.
2	Covellite	0.40	" " "
3	.....	0.10	" " "
4	Bornite	0.18	" " "
5	Cuprite	0.18	" " "
6	Ore, west stope	0.70	" " "
7	Chalcocite, upper stope	0.60	" " "
8	White iron from covellite	0.10	" " "
9	White iron, north drift	0.18	" " "
10	Chalcocite	0.15	" " "
Average		0.259	

ASSAY RETURNS FROM CAR LOAD LOTS.

No.	Gold		Platinum		Silver		Copper		Remarks
	Oz. Per Ton	Ozs. Per Ton	Oz. Per Ton	Ozs. Per Ton	Oz. Per Ton	Per Cent	Per Cent		
1	0.03	1.40	8.6	32.8				Covellite ore	
2	0.03	0.40	2.5	6.2					
3	0.03	0.68	9.0	29.4				Covellite ore	
4	0.04	0.72	9.4	34.4				Covellite ore	

Av. in Platinum 0.80.

There were also two other tests; the first was an average sample of ore carrying 0.5 ounce in platinum, and the second a sample of matte carrying 1.92 ounces of platinum to the ton.

The Rambler Company has never gotten gold enough from the ore to receive pay for. Usually it has assayed a little less than 0.05 ounce per ton. Just how the platinum has been missed in the assays prior to this time is a problem that I cannot account for. Naturally I would have expected it to be reported as gold.

IRON IMPORTS INTO GREAT BRITAIN.—

For the 11 months ending November 30 the imports of pig iron into Great Britain were 173,381 tons, of which 32,377 tons were from the United States. For the corresponding period in 1900 the total was 157,694 tons, of which 80,129 tons came from the United States.

ENGLISH AND AMERICAN BLAST FURNACES.—

The London *Iron and Coal Trades Review* says: "Mr. J. A. Longden (managing director of the Stanton Ironworks Company), gave a very interesting account of a recent visit he had paid to America, at a dinner held at Ilkeston recently. Speaking of his visit to the Edgar-Thompson furnaces at Pittsburg, he said there were nine furnaces going, each of which turned out as much iron as all their nine furnaces at Stanton, and 30 men were doing the work of 300 here."

COAL IN ICELAND.—The find of coal in Iceland reported by Copenhagen journals does not appear to be so valuable as was at first supposed, to judge by the results of analyses made under the direction of the Danish State Railway Administration, but a vessel has been despatched to gather more and larger samples, which are to be examined by the above body and also at the gasworks.

A RUSSIAN IRON TRUST.—A telegram from St. Petersburg recently announced that all the principal ironfounders in Russia have agreed to combine and form a trust, with the object of regulating the output, keeping up the prices of iron, and preventing Government contracts from going into the hands of foreign contractors. The Ural ironfounders, who have hitherto held aloof from all combination of this kind, are said to have thrown in their lot with the movement.

EXPORTS OF IRON AND STEEL FROM GREAT BRITAIN.—Exports of iron and steel, including machinery, from Great Britain for the 11 months ending November 30 were valued by the Board of Trade returns as below:

	1900.	1901.	Changes.
Iron and steel	£29,826,697	£23,332,507	D. £6,494,190
Machinery	18,027,703	16,502,876	D. 1,524,827
New ships	7,750,831	7,209,029	D. 541,802

Totals £55,605,231 £47,044,412 D. £8,560,819

The decrease shown was both in quantities and values. Mining machinery was valued this year at £473,704, against £530,274 for the corresponding period last year.

NEW COAL EXPLORATIONS IN ENGLAND.—

The London *Iron and Coal Trades Review* says: "For some time past the boring operations conducted by the Barrow Coal Exploration Company, Limited, have been going on at Risedale, Barrow-in-Furness, and a depth of 2,000 feet has been reached. With this depth they are still in red sandstone, and, unfortunately, the whole of the money has been expended. A circular has been issued and sent to capitalists and important employers in the district, with a view to raising more money to further carry on operations, and bore through the red sandstone, until a depth of 3,000 feet is reached, where it is hoped coal will be found. The coal measures at St. Bees, some miles up the coast, are found under the same strata of red sandstone. Messrs. Vickers, the Furness Railway Company, and several prominent local gentlemen are interested in the search for coal, the finding of which would be so beneficial to the district."

ELECTRIC FURNACE.—

A novel form of electric furnace, suited especially for large units, is described in a patent issued December 17 to Charles Albert Keller, of Paris, says the *Electrical World and Engineer*. The electrodes take the form of trucks mounted upon rails and each adjustable toward a central horizontal firebrick hearth which carries the main body of the charge. The electrode carriages are framed in iron and covered by a raised arch of firebrick, upon which, inclined slightly toward the hearth and with its lower edge level therewith, is the carbon or outer surface which constitutes the working face of the electrode. The central horizontal hearth and the upwardly inclined lateral electrodes together form a broad shallow furnace bed, over which a layer of granular carbon is spread. This layer serves to close the circuit between the electrodes and by its resistance to develop a temperature sufficient for the reaction desired. Or if such excess of carbon would be injurious, other resistance material may be substituted, either the charge itself or one of its components being so employed. For instance, in the production of chrome-iron, the carburization of which is to be avoided, a bed of granular iron may be used to develop the necessary heat, the metal being alloyed as reduced. The furnace proper is enclosed by a fire-brick vault to conserve its heat and exclude the air. The specifications show a careful elaboration of details and the construction seems practical.

BRITISH COLUMBIA—VANCOUVER ISLAND MINES AND PROSPECTS.

By WILLIAM M. BREWER.

Recently the writer has visited the Mount Sicker and the Alberni Canal mining districts on Vancouver Island in order to observe the results from the operations carried on during the past season.

Mounts Sicker and Brenton, which are separated by the Chemainus River, are located within a few miles of Horseshoe Bay (Chemainus Harbor), Osborne and Maple bays, on the east coast of Vancouver Island. Discoveries of copper-gold ores were first made near the summit of Mount Sicker in 1897, when the Lenora mineral claim was located. Later followed the location of the Tyee claim, adjoining the Lenora on the east; the Key City, Victoria, Copper Cañon and Susan to the west of the Lenora, with the Key City adjoining that claim, and the others situated in the order named. The boundaries of these claims east and west embrace all the ground 1,500 feet wide from the extreme summit of Mount Sicker across the Chemainus River, almost to the summit of Mount Brenton, and present at the present time the productive portion of the district. A large number of other claims have been staked, and partially prospected north, south, east and west from those designated by name.

The district is within the boundaries of the land grant made some years back to the Esquimalt & Nanaimo Railroad, consequently locators of mineral claims are compelled to obtain from that corporation a title to the surface and base metals, as well as crown grant from the Provincial Government covering the precious metals. As long as the company adheres to its present policy of issuing deeds on payment of \$5 per acre, which convey title to the surface, timber, and base metals, the cost for perfect titles to surface and all minerals does not exceed the cost for crown grants to mineral lands in other portions of the province outside of this belt, because the law is that crown grants issued to mineral claims after the requisite \$500 have been expended in development work and survey do not convey surface rights, other than to erect necessary buildings and the right to mine.

In order to secure a perfect title to the surface and timber an additional payment of \$5 per acre must be made. The only difference between obtaining a perfect title to a mineral claim situated within the railway belt on Vancouver Island, and without that belt is that in the former the surface right must be secured, but in the latter it may be. As a matter of fact it is a very rare occurrence that the additional \$5 per acre is ever paid to the province, because the surface of a mineral claim is rarely, if ever, of sufficient value, unless for town site purposes, to make it worth while to pay the extra amount to secure the surface.

The railway belt on Vancouver Island embraces practically nearly all of the eastern portion of the island, which includes all the productive coal lands, but only a comparatively small proportion of the lands carrying other minerals. These occur chiefly outside of the railway belt, and on the western side of the island.

As the writer has already explained in previous articles on the mineral resources of Vancouver Island, there is a decided difference between the geology of the eastern portion of the island and the western, especially north from the Mount Sicker District, which is situated about 50 miles northerly from Victoria. Sedimentary rocks, including the coal measures, occupy most of the eastern portion north from Mount Sicker, while igneous and metamorphic rocks, including large areas of crystalline limestone, make up the western and southern portions.

The Mount Sicker District may be considered to occupy a position almost at the line of demarcation between the sedimentary rocks and the crystalline area. A zone of schist occurs extending from Maple Bay on the east coast through Mounts Sicker and Brenton towards the west coast, an undetermined distance. The line of strike is nearly due East and

West. The width of the mineralized zone, so far as at present known, is about 1,200 feet, and if it maintains its continuity to the west coast it should cross the Alberni Canal near its entrance to Barclay Sound. But instead of doing this the zone apparently wedges out near Cowichan Lake, while another zone of schistose rocks, very similar to those of the Mount Sicker region, occurs on China Creek, about 12 miles from the head of Alberni Canal.

On Mount Sicker there is one feature connected with the mineralized zone which deserves attention. It is that on the northern boundary of the schist a well-defined, persistent ledge of hungry-looking quartz occurs. This has up to the present time marked the northern limit of the local occurrences of ore. The southern limit being as equally well defined and marked by a dike of porphyritic rock, which at the contact between it and schist has a peculiar appearance, and resembles a body of dirty brown melted gutta percha with white nodules as impregnations through it. When struck with a pick or drill this material is found to be a soft, but spongy-like india rubber. Its thickness varies from a few inches up to 2 feet, and when exposed to the air it slacks and breaks up like shale. This material has been noticed by the writer in the underground workings of both the Tyee and Lenora mines, but has not been noticed on the surface, although he is informed that it can be found at some points marking the contact.

The character of ore occurring in the zone of schist is chalcopryrite with an iron pyrite, the latter being chiefly marcasite, while sometimes pyrrhotite also forms a portion of the ore body. The gangue is principally silica, sometimes massive quartz, at others siliceous schist; but often the ore is a solid mixture of chalcopryrite and iron pyrites of considerable thickness, even reaching fully 30 feet in some portions of the workings and maintaining that thickness for considerable length.

During the writer's recent visit he was permitted by the management to examine the underground workings of the Tyee Mine, adjoining the Lenora on the east, but was not allowed the privilege of examining the underground workings on the latter.

The shipments of first-grade ore from the Lenora, which have been almost continuous since 1899, have established a reputation for the camp second to none on Vancouver Island. The total shipments to date as estimated by the writer must have been about 25,000 tons, while about the same tonnage of second-grade ore remains on the dump awaiting the erection of a local smelter. The ore shipped has carried about \$20 per ton in all values, some of it even having yielded higher values. In order to facilitate shipments, the management of the Lenora Company has built a narrow-gauge railroad from the mine to connect with the Esquimalt & Nanaimo Railroad, about 7 miles distant, and is at present extending this line to Osborne Bay, on the east coast of the island, about 4 miles beyond the junction with the main line.

Tyee Mine.—This property has been opened to a depth of 235 feet by two vertical shafts. One of these shafts was sunk for prospecting, but when the present owner, the Tyee Copper Company, commenced extensive development, the management installed heavy hoisting machinery and air drills and commenced sinking a new 2-compartment shaft. This is now down to the 235-ft. level, and sinking has been continued to open up another level 100 feet deeper. The policy of this company has been to block out ore in sight and thus ascertain the capacity of the mine, previous to either shipping or erecting a smelter to treat the ore.

A station has been opened on the 100-ft. level, where the ore body has been cross-cut and drifted on showing a body of ore with a maximum thickness of about 30 feet, and continuous an undetermined length beyond about 75 feet. To the height of one set of timbers this ore has been mined to the dimensions given, leaving both faces along the strike solid ore. It is claimed by the management that this body of ore is continuous to within 40 feet of the surface above the 100-ft. level, and from the writer's investigations he

is of the opinion that it maintains continuity to within about 20 feet of the 235-ft. level. On that level he found that drifting and cross-cutting had failed to expose any body of ore of commercial value under the body opened on the 100-ft. level, but upraising from the lower level from 15 to 20 feet had exposed the ore body, thus clearly showing that it had lenticular structure and that probably sinking another 100 feet would open up another lense at about the point where it reached its maximum thickness. Cross-cutting towards the north on the 235-ft. level exposed a vein of pyritous quartz-ore carrying chiefly gold values. This is about 30 inches thick where cross-cut, and has been drifted on about 50 feet. The average values are, from information from the management, about \$20 per ton, but samples yielding values as high as \$500 per ton have been taken from the vein. The same vein, the writer was informed, also occurs on the Lenora ground. The strike and dip are conformable with the country rock, striking nearly true east and west and dipping about 80° south. This vein occurs in the same schist as the main body of copper-gold ore. Recently a sample shipment of 200 tons of copper ore has been made from the Tyee to the Tacoma Smelter. The average assay value of this is 8 per cent copper and \$5 in gold.

Following the zone of mineral-bearing schist towards the west, the Lenora, Key City, Victoria, Copper Cañon and Susan mineral claims are crossed by the Chemainus River, flowing along the boundary between the Victoria and Copper Cañon claims from south to north.

The Lenora Mine is employing about 100 men, and shipping 50 or 60 tons of ore daily; sometimes the shipments, it is claimed, have reached 100 tons. This mine has been a steady producer for 3 years past, the production having increased as the facilities for shipping have been improved, from a wagon road to a tramway, and from the latter to the present narrow-gauge railway. The mine has been opened with a series of drift tunnels, the lower or third one being run at a level about 300 feet below the outcrop. The stipes on the second level are about 70 feet from the Tyee west line.

This property has been one of the few propositions which have really paid from grass roots. In fact, the purchase price cost for building wagon road, tramway and railroad, as well as expenditure for all work in the mine, have been already taken from the mine itself, while some 25,000 or 30,000 tons of second-grade ore still remain on the dump. The extent of the ore reserves is unknown to the writer, but it is reported on reliable authority that Messrs. Breen & Bellinger, formerly of Northport, propose erecting a 300-ton smelter at the water-front terminus of the narrow-gauge railroad on the strength of the future possibilities of the Lenora Mine and Mount Sicker District. Therefore, it would appear that these gentlemen had satisfied themselves with regard to ore contracts before having decided on erecting the smelter.

On the Key City Claim a limited amount of development has been performed, but this has not shown very satisfactory results up to the present time, in fact, no well defined outcroppings have been discovered to date between the Lenora outcrop and the Victoria claim.

On the Copper Cañon Group, which includes the Victoria, Copper Cañon and Susan claims with some fractions, outcroppings of iron capping carrying chalcopryrite and marcasite are found on each of the claims. The most easterly of these outcroppings is on the Victoria about 500 feet above the Chemainus River, where three parallel ledges occur carrying ore. These have been exposed by open cuts, and at the time of the writer's visit a tunnel was being run to intersect these at a depth of about 50 or 75 feet below the outcrops.

This tunnel is being run in schist, crossing the formation diagonally. During the progress of the work a ledge carrying ore was exposed, cross-cut diagonally, and left to the north of the tunnel. The management propose cross-cutting from the present face of the tunnel 150 feet in, in both directions, north

and south, to determine the conditions under the outcroppings. The schist is all more or less mineralized with marcasite which towards the face, where the schist becomes more siliceous, shows every indication of giving place to chalcopyrite. This is generally characteristic of the Mt. Sicker mineral zone wherever systematic work has been done.

Other outcroppings on the Copper Cañon occur at the river, also on the Susan claim about 600 feet above the river on the side of Mount Brenton. Several tunnels and open cuts have been made on each side of the river exposing bodies of chalcopyrite associated with marcasite and quartz gangue.

Mine, the advantageous situation of such a line of railway with a town-site on the Copper Cañon claim easily accessible to the river, presents itself very forcibly to any disinterested visitor to the district.

To the west from Mount Brenton is situated Cowichan Lake. Whether the same geological and mineralogical conditions prevail in the region adjacent to and on the north side of the lake as in the Mounts Sicker and Brenton districts is at present unknown, because but very few prospectors have penetrated into that territory, and no discoveries of the occurrence of mineral have been reported; but on the south side of the lake and towards its head a

waters of the Gordon and Nitinat rivers will be prospected during the season of 1902 from this route rather than by following up those rivers from the west coast of Vancouver Island, as has been the custom heretofore. The country to the west between Mount Brenton and the Alberni Canal, and to the north between Cowichan Lake and Nanaimo Lake is at the present time unknown and unexplored. Near the latter lake some locations of mineral claims yielding copper-gold ore have been reported. These are at present remote from transportation facilities and must await the building of wagon roads at least before extensive development can be attempted.



VANCOUVER ISLAND, BRITISH COLUMBIA.

In the bed of the river itself the writer examined a zone about 50 feet wide, which is highly mineralized, and as this crosses the stream it would appear probable that when cross-cut at points beyond the action of the leaching process from surface waters a body of pay ore would be exposed. This group of claims is most advantageously situated as regards economical working, because the east line of the Victoria claim is 900 feet above the level of the river, while the west line of the Susan claim is 1,200 feet above the same level. The group takes in 4,700 feet along the line of strike of the mineral bearing zone, and 1,500 feet in width.

The river will furnish ample water power to run all the mining and lighting machinery for the entire district. A survey for a railroad having a 2 1-2 per cent grade has been made from Chemainus Harbor up the river, passing across the Copper Cañon claim from north to south on a flat which would be well adapted for town-site purposes.

As the tendency is in future to prospect west from the Susan claim rather than east from the Tye

discovery of galena ore was reported during the past summer by Mr. H. S. Smith, of Duncan's, who was the discoverer of the Leonora Mine. This is in the vicinity of the head-waters of the Gordon River, which empties into the Straits of Juan de Fuca at San Juan Harbor, on the southwest coast of Vancouver Island.

Previous to the present year reports of discoveries of galena on the Gordon River have been circulated, but the location was remote from any trails and very difficult to reach. The country between San Juan Harbor and the head of the Gordon River is heavily timbered, mountainous and for the most part unexplored except at some points close to the river.

The discoveries reported on the south side of Cowichan Lake are not so inaccessible because there is a good wagon road from Duncan's Station on the Esquimalt & Nanaimo Railroad to the foot of the lake, where a summer resort is situated. From this point to within a short distance of the occurrence of the mineral claims, the lake itself affords an excellent route to travel. It is quite possible that the head-

The Alberni Canal District has naturally received more attention than any other portion of the island because it has a water route some 40 miles in length from Barclay Sound on the west coast to the head of the canal, where is located a settlement composed of mining men, farmers and Indians, which is the most thickly populated and important on the western side of the island.

Prospectors have quite thoroughly explored the country adjacent to the canal and the streams emptying into it. But even in this district the interior has received but little attention, the difficulties attending travel into the interior through almost impenetrable forests, across high rugged mountains, to say nothing of the obstacles to be overcome in constructing tram-roads or other means for transporting ore—should any of commercial value be discovered—to the coast have up to the present time apparently been considered almost insurmountable. The general opinion has prevailed that previous to attempting such a difficult task, it was advisable to await the results of the development work being done on the

mineral claims within easy reach of salt water. This waiting game has been going on now, so far as lode mining is concerned, since 1897, when the first real excitement following the discoveries of good grade copper-gold ores and high grade gold-bearing quartz manifested itself until the present year. More activity has been in evidence in the Alberni District during 1901 than since the commencement of lode mining.

The Thistle mineral claim near the head of China Creek was purchased by San Francisco people during the summer, and a large force of men employed to build a wagon road and do other necessary work previous to installing machinery, and beginning systematic deep development work on the mine itself.

The writer has never seen this property, so cannot speak from knowledge as to its possibilities of value. In 1898 it was bonded by Mr. G. A. Kislingbury, representative for the De La Mar interests in Mercur, Utah, and after some \$6,000 had been expended was turned down. The original owners later pushed the work of development beyond the point where Mr. Kislingbury suspended operations and the results were sufficiently satisfactory for the San Francisco syndicate to pay \$15,000 cash for the claim, and start up work as referred to.

On the Golden Eagle, in the same vicinity, work has been carried on continuously since 1898 with a limited force of miners who have been driving a long cross-cut tunnel to intersect an ore body indicated by outcrops, and building a wagon road to the claims. This location has not been visited by the writer, therefore he is not prepared to discuss the merits of the proposition.

The backbone of the entire district has been the Three Jays or Hayes Group of mineral claims owned by the Nahmint Mining Company, because ever since the property passed out of the hands of the original locators, systematic development work has been carried on with the expressed intention of blocking out ore in sight and determining the capacity of the mine, before attempting to ship ore to the smelters. During the spring of 1900 the writer visited this property, and a description of the workings was published in the columns of the *ENGINEERING AND MINING JOURNAL*. He has again visited the camp recently and found so much additional work had been performed and was in progress that he deems it advisable to give briefly the impressions produced by his second visit to the property.

At the time of his first visit over a year ago, there had been done about 2,000 linear feet of work, consisting mainly of drifts and cross-cut tunnels; but up to the present time the total development reaches 4,000 linear feet of underground work, while the surface improvements have been increased by the installation of a compressor plant, an aerial tramway nearly a mile in length, bunkers and additional wharf accommodations.

In addition to installing surface improvements referred to which will provide for a shipping capacity of 200 tons of ore daily, the management some time since commenced driving a cross-cut tunnel, 8 by 6 feet in dimensions, on a level 425 feet lower than No. 2 tunnel, which is about 250 feet below the apex of the outcroppings. It is calculated that this lowest tunnel will have to be driven about 700 feet before any of the ore bodies developed in the upper workings will be intersected. Up to date this tunnel is in about 300 feet, and the latest reports are that bunches of ore have been struck already, while a zone which is apparently crossing the general trend of the known mineral bearing zones has been exposed. The general trend of the ore shoots in the upper workings is nearly east and west.

In addition to being permitted to make a personal cursory examination of the workings of the Three Jays, the writer was given access to a report made by Mr. Chester Lee, for the management. This is a very exhaustive report made after a long and thorough examination of the property. Mr. Lee gives the mine credit for 70,000 tons of ore in sight. He states that there are five known ore shoots within an

area of 240 by 380 feet, having their lines of strike east and west, and dipping about 80° to the south, and pitching to the west. The ore zone is 5,000 feet long.

From 31 sets of analyses of the gangue of the first-class ore the average contents were 24.4 per cent iron, 6.3 per cent lime and 24.8 per cent silica, showing an excess of lime and iron of 2.2 per cent.

The total measurement of the development work previous to the driving of No. 3 or lowest tunnel was as follows: Shaft No. 1, 146 feet deep; No. 2, 82 feet, with 17 feet of drifts; tunnel No. 1, with connections, 1,566 feet; No. 2, with connections, 1,713 feet; tunnel A, 56 feet; total, 3,580 feet.

In calculating the ore in sight, Mr. Lee says he considered the width of the veins from the average from wall to wall where cross-cut, and that the maximum allowance for ore not actually blocked out has been 25 feet beyond the actual faces exposed. By this method of measurement he has arrived at the following results as to first-class ore in sight:

Shoot.	Thickness.	Cu. feet.	Tons 2,000 lbs.
No. 1	17 ft.	71,775	8,970
" 2	15 "	307,290	38,410
" 3	6 "	87,168	10,890
" 4	5 "	73,820	9,200
" 5	5 "	13,750	1,720
Total			69,190

The average values per ton of this ore he gives in the following table, which he says has been arrived at from the results of a large number of assay tests:

Shoot.	Copper per cent.	Silver oz.	Gold oz.
1	6.90	0.50	0.035
2	10.20	0.60	0.020
3	9.03	1.10	0.030
4	7.61	0.70	0.035
5	8.70	1.02	0.044
Dumps.			
750 tons	11.90	0.60	0.021
Averages	9.23	0.69	0.026

Of second grade ore he says there are two shoots 25 feet wide, 240 feet long, and 50 feet high, containing 30,000 tons, which will yield an average value per ton of 2.58 per cent copper, 0.18 ounce silver, 0.015 ounce gold, and an additional ore zone 60 feet wide which yields about 1 per cent copper with traces of gold and silver per ton.

He estimates that the ore can be treated for about \$7 per ton, if shipped, or for \$5.20 per ton in a local smelter. The cost for development work of all descriptions he places at \$8 per linear foot. The smelter returns for shipments already made for sample tests he gives at 13.27 per cent copper, 1.06 ounces silver, 0.032 ounce gold per ton.

Space does not permit of a detailed description of the underground workings examined by the writer, but he was impressed by the fact that the management had shown great confidence in continuing work in the face of many obstacles due to irregularities in the structural geology which would have deterred many men from continuing, and in consequence would have caused operations to result in failure instead of success as has been demonstrated. This is really the only proposition on the west coast of Vancouver Island which has been developed to any great extent, and the results are gratifying.

It is to be hoped that similar operations based on the same systematic and thorough policy will be carried on by owners of other propositions in the Alberni District, which show indications of developing into as valuable properties, provided capital, experience, confidence and conservatism are employed in the development work.

On the Monitor Company's property it is proposed to carry on a thorough exploration of the ore zone before attempting to resume shipments, which were made regularly during the early portion of the year, and netted the company a handsome profit over expenses up to the time of suspension of shipments.

Mr. George W. Maynard, of New York, the president of the company, has been on the ground for several weeks during the autumn and has convinced himself of the possibilities of the mine. This he proposes to arrange for on his return to New York, and expects shortly to inaugurate a more thoroughly systematic exploitation to block out ore in sight before he attempts to resume shipments.

COPPER MINING IN JAPAN.*

By E. W. NARDIN.

So little is generally known of copper mining in Japan, that it is somewhat surprising to find that the metal is produced in considerable quantity, that the metallurgy is perfectly understood, and at least in one case, the Ashio Mine, the work of winning the ore and extracting the metal is carried on in a thoroughly scientific manner, and with all the up-to-date appliances used in mining and treating copper ores on a large scale. Japan, at present, stands third on the list of copper producing countries, and in 1899 was responsible for 13.25 per cent of the total production from all countries, exclusive of the United States.

The two largest mines in the Empire are the Ashio and Besshi, and they each produce from 15 to 20 tons of copper daily; besides these there are numbers of small mines, scattered pretty well all over the main island, which produce 30 tons, and downwards, monthly. As a general thing, copper seems to be the principal metal of Japan; some of the mines have been worked for hundreds of years, and the Japanese for ages have been noted for their bronze and copper working industries. During a six-months residence in Japan, the author has visited a number of the mines, and the following notes on the Ashio Mine will be of interest.

A second mine owned by the proprietor of the Ashio (Mr. Furakawa), and situated at the north end of the main island, showed a novel way of producing copper from the smelter matte, and it would be interesting to know if this is simply a makeshift for the converter or not. No one on the mine could speak English and the explanation in Japanese was unintelligible, but, from what the author could see, a hole in the ground, lined with fire-brick and fire-clay, takes the place of the converting vessel; it is covered by a dome of fire-clay, and has a working door in front; two tuyere pipes enter the receptacle from opposite sides, and the blast from the blowers is kept on during the operation. There were eight or nine of these vessels arranged in a long row, all in different stages of relining, stirring, skimming and ladling out the copper. About 27 tons of copper are produced monthly in this way.

The Ashio Mine, which is the largest producer of copper in the Empire, is situated about 15 miles southwest from Nikko, in the Province of Simotsuke. It is stated to have been worked for a period of 300 years, and probably much longer, but for most of that time in a small way. At present, work is done on a large scale, and the company's pay sheets show that about 12,000 people are employed; that is, including those in the mine, treatment works, transport, office employees, and timber, charcoal and flux supply.

Besides this a very large amount of power is developed from adjacent streams, and transmitted electrically to various parts of the mine and works, and a number of horses (over 100) and bullocks are used for transport on the numerous tramways. Although the output of ore from the mine is not large compared with the number of hands employed, the fact that labor is cheap, and the surrounding country is so rugged and difficult from an engineer's point of view, necessitating a great deal of handling of ore and supplies, the amount of labor employed seems to be justified. The employees include men, women and children; some of the latter being very young and principally employed at light work, such as hand sorting the ore, etc.

As a result of the works having been added to, and extended at various times, and this in a place where suitable ground is limited in extent, a great deal of handling is made necessary; at some of this work, old women and young children can be seen carrying light loads, such as two or three bricks, a few pounds of ore, etc., in small boxes strapped on the back. On a first visit to the works one wonders how all this labor is controlled, but some ticket and book system is employed, by which a record of each person's work is kept, and payments made according-

*Abstract of paper read before the Royal Society of New South Wales.

ly, to the satisfaction of both parties. The rate of wages is, of course, small, and ordinary laborers would get from 30 to 40 sen (one sen equals 0.5 cent) per day, while women and children would receive from 10 to 25 sen. This rate is for 10 hours work per day.

The transport of coke and other supplies from Nikko to Ashio is difficult, as a high and steep main range of mountains has to be crossed en route, and for four months of the year this is covered with snow 2 to 3 feet thick. From Nikko (the railway town) to the foot of the range, a distance of 5 miles, the road is level and in good order; the mine supplies are brought to this point by tramway, bullocks being used for haulage. This is the receiving station for the two aerial cable tramways, which cross the range and descend to the foot on the Ashio side. They are each about 19,500 ft. in length, and some of their spans are long and very high, having to cross from ridge to ridge over deep gullies. The gantries are of timber and the carriers are a simple hook-shaped frame suitable for bags of coke, etc. The cables are

in thickness. The veins vary in strike, but it is generally northeast and southwest, with a slight dip to the southeast.

The mine is divided into three branches (see sketch map) as follows:

1. Honzan, where the Ariki adit is driven on the Champion lode, and the chief treatment works are situated.

2. Tsudo, where an adit has been driven a distance of 10,000 feet, till it cuts the Champion lode, 400 ft. below the Ariki adit.

3. Kotaki, where the chief concentration works are situated, and an adit connects with the Tsudo main adit.

The highest point of the mountain is 4,400 ft. above sea level, and the Ariki adit 3,300 ft., so that the latter is some 1,100 feet below the top of the mountain. The Tsudo adit is 400 ft. lower than the Ariki, and the main shaft being sunk from the cross-cut west from the Tsudo adit, to work the Kosei vein, is down 100 ft., and it is the intention to continue it to 1,000 ft. if the ore holds good.

tric motor, the speed being reduced by two sets of spur wheels. The stroke of the pump is 1 meter, and it can be worked up to 20 strokes per minute.

As the mine water contains CuSO_4 in solution, all the pipes, pump, etc., are made of brass.

Single-handed drilling is used throughout in driving, stoping, etc., the drills used being 0.67 inch diameter; as an average, $2\frac{1}{2}$ feet are drilled in six hours, and miners are paid at per foot depth, 15 sen in soft rock, and 40 sen in hard. Dynamite is used for blasting, and is fired by fuse made locally by the villagers. In sinking, electric firing is employed. A Japanese, who does not know what a chair is, seems specially suited for mining work, especially with narrow veins; miners usually have a bag hanging behind and strapped round the waist; with this to sit on, they squat about in any position, and can stay like that for hours. In drilling bottom holes, the drill is held at the hole by the toes of one foot, besides being supported by one hand; this keeps the drill much firmer and stops splashing from the hole. Altogether in the three mining districts, 2,400 men are employed; their wages average 65 sen per day, and the daily output is 70 short tons.

In the Tsudo adit, horses are used for trucking, but in the Ariki and Kotaki adits, electric motors are employed, with an overhead wire system; there are 20 of these in use, and each one is capable of hauling 8 trucks, each holding half a ton of ore. The timbering throughout the mine is good.

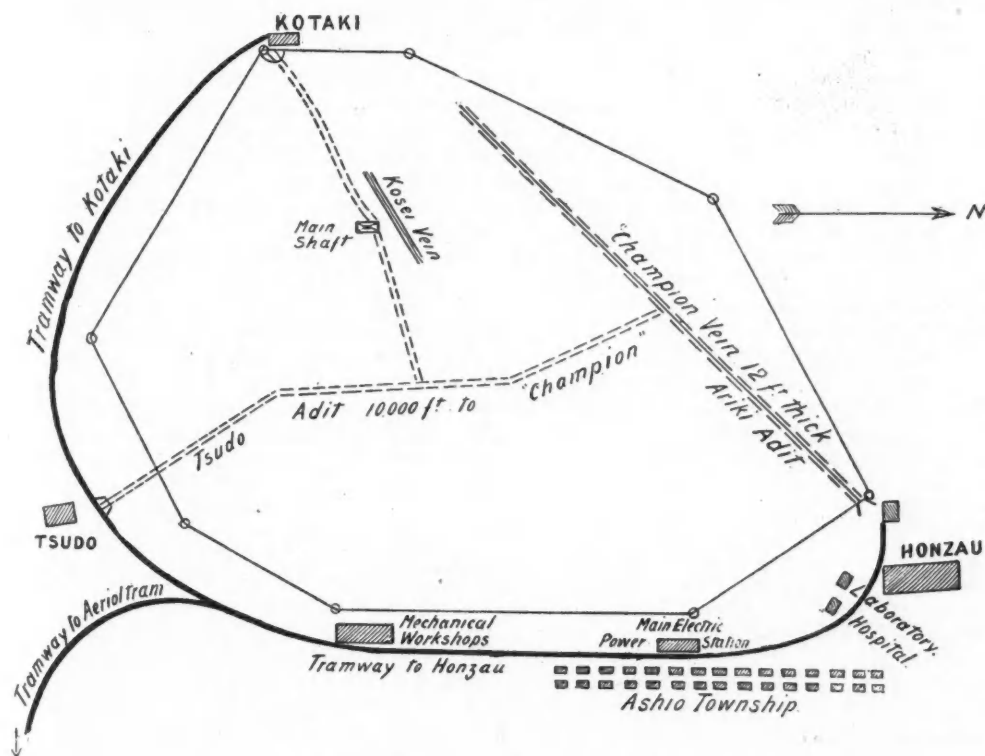
Treatment.—The ore treatment comprises the following four stages: 1. Concentration. 2. Roasting. 3. Smelting. 4. Bessemerizing.

Small works are situated at both Honzan and Tsudo, but the main ore dressing establishment is at Kotaki. Here the ore is first sent to tromeels to size it, from there it passes to endless belts about 15 inches wide, where it is hand picked by girls; it is then elevated to the top floor of a main building and crushed in three Blake machines; from there to tromeels and four revolving disc tables, where it is again sorted by women. These different grades pass on to three sets of Krom rolls, where it is crushed finer, tromeelled, and passed to two rows of coarse jigs; these are of ordinary type with stepped ore beds. The waste material from these jigs is fine crushed in 4 Huntingdon mills, and passed to Spitzkasten, 5 jigs, and lastly to 7 convex buddles. The waste water from these works is agitated with lime water to neutralize the free sulphuric acid. The power for these works is obtained from a 15-in. pipe with a head of 60 ft. and 5-in. nozzle working on a Pelton wheel.

The ore is subjected to a preliminary roasting, the rich lump ore in stalls, and the dressed ore in long reverberatories. The latter are 100 feet long, 10 feet wide, and have 12 working doors. Six of these furnaces are used, each roasting 24 tons per day, to 7 per cent sulphur. Three tons of firewood are used per day for each furnace. Both of these operations leave the ore in a more or less fine condition, as no clothing is carried out, so that about 18 per cent of flue dust is formed by the blast furnaces, this is made into brickettes and charged back into the smelters.

There are 9 water-jacketed blast furnaces, 5 having eight tuyeres on each side, and of 20 tons daily capacity, and 4 smaller ones. Fore-hearths are used in each case, and slag and matte are drawn off continuously, the former being granulated and run off with water and the latter run into sticks and thin cakes; some of the slag is run into pots for brick making. The matte runs 50 per cent copper, and the slags carry off 0.5 per cent. The ore being siliceous, a limestone flux is used, this has to be brought about 8 miles by horse tram. The charge to a smelter consists of ore, coke, limestone, and slags from the converters, etc. Six No. 6 Root blowers supply the blast, and they are run by a Pelton wheel.

Four converters are in use, of 1,000 to 1,500 pounds capacity per charge, supplied by one remelting furnace. They are supplied with air at a pressure of 10 pounds per square inch, by an air compressor of a vertical type, built entirely at the mine workshops, and worked by a Pelton wheel. A Fraser & Chalmers steam horizontal compressor is kept in reserve.



PLAN OF ASHIO COPPER MINE, JAPAN.

worked by water-power on the Ashio side—flumes pipe lines, and Pelton wheels being employed as usual. From the receiving station on the Ashio side a horse tramway runs for some miles to the different branches of the property.

The Mine.—The country adjoining is absolutely bare of vegetation, and the slopes are, in places, steeper than 45° . On most of these slopes, above the works and township, it has been found necessary to cover them with a complete network of plaited brushwood, firmly pegged down, in order to prevent the continual washing down of the loose surface stone by heavy rains and snow.

The ore deposits consist of true contact veins formed between an acid eruptive rock called leparite, and a hard black slate, known as adinole slate, from the fact that it contains adinole fossils; the former is the footwall and the latter the hanging wall. Other rocks formed in the locality include pegmatite, aplite, dacite and pyroxene andesite. The ore itself is composed principally of chalcopyrite, with quartz and occasionally erubescite. Some of the high grade ore carries 30 per cent copper, but the general ore is much poorer, and the average contents of the dressed ore is about 15 per cent copper. There are a number of veins, large and small, but the principal one is the Champion, which has been followed by the Ariki adit for about two miles, and averages 12 ft.

The Tsudo adit is 12 by 9 ft. in the clear, and closely timbered nearly all the way; it carries a double track line, and a large drainage channel on one side. In its length of 10,000 ft., it cuts 50 separate veins before reaching the Champion, but they were chiefly small veins in the slate, and not the true contact bodies. At about three-quarters of its length a cross-cut runs west to meet the Kotaki adit, and, where it cuts the Kosei vein, a main shaft is being put down; it is now at the first level (100 feet), and the reef is being stoped at that point; it is 4 feet wide, well defined, and strikes about east and west.

The shaft is 20 by 6 feet in the clear, divided into 4 compartments, 2 for winding, 1 ladderway, and 1 for pumping. The timbers are 12 inches square, and the sets 3-ft. centers, while the chambers for the pumping and winding machinery are well supported by larger timber. The winding engines consist of 2 drums, 2 meters in diameter, driven by belt gearing from an 80-h. p. electric motor, supplied with current from the surface. The cages weigh about two tons each when loaded, and are properly equipped with guides, safety grips, detaching hook, etc.

A considerable amount of water has to be contended with, and a pump is in position at the 100-ft. level. It is an ordinary lift and force pump, with 8-in. suction and 6-in. delivery; it is worked from the main level by rods, which are connected to an 80-h. p. elec-

The operations are carried out in the usual way, and when a charge is finished it is poured into a receiver, which is wheeled to a circular revolving table carrying the moulds, and the metal poured. These converters turn out about 20 tons of 98.8 per cent copper per day; each bar is branded "F.A.B.C." (Furakawa Ashio Bessemer Copper) "made in Japan." A main flue from the roasting furnaces, smelters and converters, leads to a series of dust chambers, and an arrangement like a Glover tower; as the gases and fumes pass up the tower they meet a spray of lime water falling. This is done to neutralize the free H_2SO_4 , which was said to be causing trouble to farming properties down the river.

Main Electric Power Station.—The power for driving the generators is derived from a pipe about 4 feet diameter, with a head of water of 110 feet. Branches from this main, drive 4 Pelton wheels, 2 large and 2 small. The waste water then passes to 2 turbines, with a head of 18 feet.

The two large wheels drive 3 Siemens & Halske dynamos of 80 h. p. each, equalling 240 h. p., while the two smaller ones drive two more dynamos of 56 h. p. each, equalling 112 h. p.

The turbines develop about 180 h. p., and drive a large and a small dynamo, so that altogether there is 450 h. p. developed from one supply pipe.

The mine is equipped with a chemical laboratory, and has a full staff of chemists. There is a small library, containing all the best scientific literature in English, German and French. A reading room is attached. There is also a very good hospital and a school for the village.

The whole property is controlled and managed by a Japanese, and there is not a foreigner employed. The heads of departments all read German, French and English.

THE CALIFORNIA STATE MINER'S ASSOCIATION.

The California Miners' Association was organized about 10 years ago with the avowed object of resuscitating hydraulic mining in that State. For several years the members worked diligently, and finally a law was enacted by Congress permitting the mines of this character to work under certain restrictions, which were fully described in the *ENGINEERING AND MINING JOURNAL* of December 7. This much being accomplished, the association turned its attention in other directions, mainly toward the establishment of a Department of Mines and Mining, with its chief in the Cabinet; the question of mineral and of railroad grants in California; legislation affecting the miner both in Congress and the State Legislature, etc. Though having a membership of about 15,000, the detail work is done by an executive committee composed of mining men from the different counties, regular monthly meetings being held in San Francisco, where the headquarters of the secretary are established. Once each year a convention is held, at which time officers are elected who are supposed with the executive committee to manage affairs until the next annual convention.

Mr. E. C. Voorheis, of Sutter Creek, Amador County, was re-elected president at the last convention, and has just appointed the following committees to serve for the year:

Executive Committee at Large—J. H. Neff, chairman, 1154 O'Farrell street, San Francisco; W. C. Ralston, Robinson's, California; Harold T. Powers, Michigan Bluff; Terey L. Ford, Claus Spreckels Building, San Francisco; A. D. Foote, Grass Valley; Edward Coleman, 1701 Franklin street, San Francisco; Charles G. Yale, United States Mint, San Francisco; J. J. Crawford, Claus Spreckels Building, San Francisco; B. N. Shoecraft, Crocker Building, San Francisco; Charles C. Derby, Mariposa, Cal.; Louis Glass, 216 Bush street, San Francisco; C. C. Bush, Redding, Cal.; Dr. C. T. Deane, 606 Sutter street, San Francisco; David McClure, Jr., Gwin Mine, Calaveras County; George E. Dow, First and Howard streets, San Francisco; J. W. C. Maxwell, 320 Sansome street, San Francisco; C. M. Belshaw,

Antioch, Cal.; E. A. Belcher, Claus Spreckels Building, San Francisco; Lewis T. Wright, Keswick, Cal.; J. F. Halloran, 330 Market street, San Francisco; John McMurray, Ukiah, Cal.; W. S. Keyes, Pacific Union Club, San Francisco; W. H. McClintock, Sonora, Cal.; Willis G. Dodd, 222 Market street, San Francisco; W. W. Montague, 1103 Bush street, San Francisco; George H. Wallis, 8 Pine street, San Francisco; F. F. Thomas, Gwin Mine, Calaveras County; A. J. McSorley, San Andreas, Cal.; Fred Bradley, Crocker Building, San Francisco.

County Executive Committee, Alameda—Frank A. Leach, United States Mint, San Francisco; Professor S. B. Christy, Berkeley. **Amador**—J. F. Parks, Jackson; John R. Tregloan, Amador. **Butte**—A. Ekman, Oroville; W. P. Hammon, Oroville. **Calaveras**—Lafe Pence, San Andreas; I. S. Foorman, 2022 California street, San Francisco. **El Dorado**—W. A. Winsboro, Mills Building, San Francisco; H. E. Pickett, Placerville. **Fresno**—A. R. Briggs, Fresno; W. H. McKenzie, Fresno. **Inyo**—J. J. Gunn, Darwin; J. E. Meroney, Independence. **Kern**—B. F. Brooks, Bakersfield; J. B. Treadwell, Kern City. **Mariposa**—A. H. Ward, 71 Stevenson street, San Francisco; William Johns, Alameda. **Mono**—R. T. Pierce, Lundy; J. S. Cain, Bodie. **Nevada**—J. S. McBride, North San Juan; W. F. Englebright, Nevada City. **Northern California**—J. H. Tibbits, Redding; E. A. Davis, Crocker Building, San Francisco; George Hellmich, Callahans, Cal. **Placer**—William Nicholls, Jr., Dutch Flats; E. J. Kendall, Auburn. **Plumas**—A. B. White, Spanish Ranch; S. W. Cheney, 120 Sutter street, San Francisco. **Sacramento**—J. H. Batcher, Sacramento; A. C. Hinkson, Sacramento. **Santa Clara**—Thomas Derby, New Almaden; Ellard W. Carson, New Almaden. **San Francisco**—J. O. Harron, 21 Fremont street, San Francisco; Colonel George Stone, Claus Spreckels Building, San Francisco. **Shasta**—W. J. Gillespie, Redding; Fred Hurst, Redding. **Sierra**—F. S. Moody, 422 Townsend street, San Francisco; Frank R. Wehe, Downieville. **Solano**—A. C. Holly, Dixon; Alf Tregidgo, Vallejo. **Sonoma**—Alfred Abbey, Nevada block, San Francisco; C. A. Grimmer, Pine Flat, Sonoma County. **Southern California**—H. Z. Osborne, 740 South Hope street, Los Angeles; C. A. Burcham, 2400 South Flower street, Los Angeles; Daniel Murphy, 948 Beacon street, Los Angeles. **Siskiyou**—A. G. Myers, Fort Jones; T. J. Nolton, Yreka. **Trinity**—C. D. Galvin, Weaverville; W. I. Hupp, Jr., Weaverville. **Tuolumne**—Charles A. Long, Groveland; Samuel L. Fischer, Sonora. **Yuba**—W. B. Meek, Camp-tonville; Joseph Durfee, Smartsville.

Committee on Finance—Andrew Carrigan, chairman, 21 Reade street, San Francisco; Joseph Sloss, Mission and Fremont street, San Francisco; J. O. Harron, 21 Fremont street, San Francisco.

Committee on Legislation—John F. Davis, chairman, Jackson; W. B. Lardner, Auburn, Cal.; J. R. Tyrrell, Grass Valley, Cal.; W. C. Ralston, Robinson's, Cal.; C. M. Belshaw, Antioch, Cal.; F. S. Moody, 422 Fremont street, San Francisco; A. E. Muentner, Lathrop, Cal.; R. C. Rust, Jackson, Cal.

Committee on Mineral Lands and Conservation of Water—Harold T. Power, chairman, Michigan Bluff; Marion de Vries, New York City; Professor George Davidson, 2221 Washington street, San Francisco; Mark B. Kerr, Grass Valley, Cal.; H. E. Pickett, Placerville, Cal.; B. S. Rector, Nevada City, Cal.; Marsden Manson, 2010 Gough street, San Francisco.

Committee on Department of Mines and Mining—W. C. Ralston, chairman, Robinson's, Cal.; J. F. Halloran, 330 Market street, San Francisco; Charles G. Yale, United States Mint, San Francisco; W. S. Keyes, Pacific Union Club, San Francisco; F. L. Stewart, Jackson, Cal.

Committee on Dams—A. Caminetti, chairman; Jackson; Fred Seales, Nevada City; J. S. McBride, North San Juan; A. C. Hinkson, Sacramento; Joseph Mooser, 320 Sansome street, San Francisco; W. B. Meek, Smartsville; Mark B. Kerr, Grass Valley.

Committee on Revision Constitution and By-laws—Mark B. Kerr, chairman, Grass Valley; C. H. Dunton, Placerville; Colonel George Stone, Claus Spreckels Building, San Francisco.

BRIQUETTES IN BELGIUM.—A recent consular report says that in Belgium briquettes are made in the form of bricks, either solid or perforated, and used chiefly as fuel for steam engines, locomotives, etc. Small bricks are also manufactured in the form of cubes or of parallelograms, in round or oval balls, and are used in place of anthracite coal for stoves built on the American system. The material employed for the manufacture of these bricks is coal dust, which has generally been previously washed. The glutinous element used in the composition is the residue from the distillation of coal tar, which is produced in large quantities from the gas and coke plants. The bricks thus manufactured contain 94 per cent of coal. The coal dust is usually obtained from what is called hard coal in this country (not anthracite) and from coal which is said to be one-fourth soft. In 1900, 1,395,910 tons of large and small bricks and balls were manufactured. In this amount is not included the production of some minor factories where small balls without tar residue are made from coal one-half soft. The material used in these small balls is held together by injecting steam into the mass while it is being molded and pressed. About 1,000 tons of these small balls, without tar residue, were manufactured in 1900. The average price at the manufactory of the large bricks and balls made with tar residue was, in 1900, 23.56 francs (\$4.55) per ton. This price in 1899 was 16.05 francs (\$3.10); in 1898, 19.30 francs (\$3.72); in 1897, 12.51 francs (\$2.41); in 1896, 11.99 francs (\$2.31); in 1893, 11.29 francs (\$2.18)—at which date it reached its lowest limit.

The commercial movement in these composition bricks of coal is rather important in Belgium, and is increasing every year. In 1900, the exportation amounted to 604,864 tons, as compared with 525,625 tons in 1899.

THE ANDREW CARNEGIE RESEARCH SCHOLARSHIP.—The Iron and Steel Institute of Great Britain issues the following notice: "A research scholarship or scholarships, of such value as may appear expedient to the Council of the Iron and Steel Institute from time to time founded by Mr. Andrew Carnegie (vice-president), who has presented to the Iron and Steel Institute 64 \$1,000 Pittsburg, Bessemer & Lake Erie Railroad Company 5 per cent debenture bonds for the purpose, will be awarded annually, irrespective of sex or nationality, on the recommendation of the Council of the Institute. Candidates, who must be under 35 years of age, must apply, on a special form before the end of March to the secretary of the institute.

"The object of this scheme of scholarships is not to facilitate ordinary collegiate studies, but to enable students, who have passed through a college curriculum or have been trained in industrial establishments, to conduct researches in the metallurgy of iron and steel and allied subjects, with the view of aiding its advance or its application to industry. There is no restriction as to the place of research which may be selected, whether university, technical school or works, provided it be properly equipped for the prosecution of metallurgical investigations.

"The appointment to a scholarship shall be for one year, but the Council may at their discretion renew the scholarship for a further period instead of proceeding to a new election. The results of the research shall be communicated to the Iron and Steel Institute in the form of a paper to be submitted to the annual general meeting of members, and if the Council consider the paper to be of sufficient merit, the Andrew Carnegie gold medal shall be awarded to its author. Should the paper in any year not be of sufficient merit, the medal will not be awarded in that year."

All applications should be addressed to Bennett H. Brough, secretary of the Iron and Steel Institute, at 28 Victoria street, London, England.

ALLOYS AS SOLUTIONS

BY JOHN ALEXANDER MATHEWS

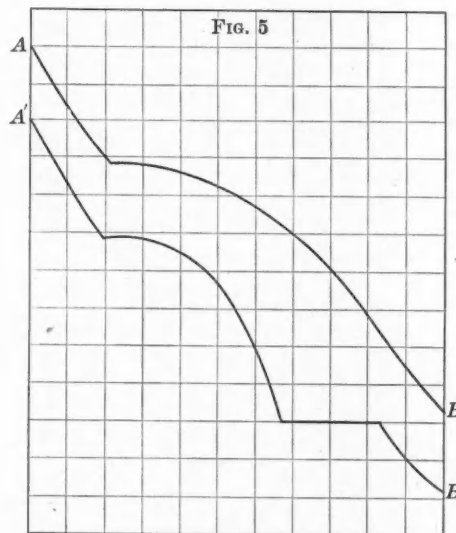
(Continued from Page 822.)

Cooling Curves.—During the cooling of a molten alloy, various constituents may crystallize out successively; definite compounds which are stable only at high temperatures may split up into simple constituents; or, new combinations, impossible at high temperatures, may be formed as the temperature falls. All such molecular changes are accompanied by corresponding thermal effects, such as the disengagement or the absorption of heat. By the accurate measurement of the temperature at which these changes take place we obtain most valuable information in regard to the molecular movements in the mass. The Le Chatelier pyrometer used in conjunction with an auto-photographic recording device seems best suited to measure and record these changes. The general principles of thermoelectric pyrometry are too well known to require discussion here. For reference, however, I could not do better than to refer to H. Le Chatelier and O. Boudouard's volume, "Mesure des Températures Elevées," or to its English translation with supplement by George K. Burgess.

The instruments used by Sir William Roberts-Austen in his private laboratory have been described fully in the *Reports of the Alloys Research Committee* of the Institution of Mechanical Engineers. During several months that it was my privilege to work in his laboratory I made use of a recorder designed by Dr. Stansfield and constructed by the Cambridge Instrument Company. For a description of this, with illustrations, see the *Journal of the Franklin Institute*, January, 1902. Neither of these forms of recorder is perfect, and many improvements will be required to produce an instrument that is entirely satisfactory. Fortunately it is not the accuracy of these instruments, but certain inconveniences of manipulation that are at fault. In using any thermocouple, with or without a recorder, it is necessary to calibrate frequently. The temperatures usually taken as "fixed points" are the boiling points of water (100°), naphthaline (218°), mercury (356.7°), and sulphur (444.5°); the melting points of tin (232°), lead (329°), aluminum (655°), gold (1064°), and copper (1083°). Not all of these need be determined for a single calibration; three or four points if determined with great accuracy will suffice. Other points may be determined by way of verification, and it is convenient as well to have a large variety of materials to select from so that for any special work the curve may be calibrated by means of substances whose melting or boiling points lie near the temperatures at which we desire to operate. For instance, one would not ordinarily use the temperatures 100°, 218° and 232° in constructing a curve for use above 1000°, but would choose 655°, 1064° and 1083°, or other temperatures in this region which are well established as the melting point of potassium sulphate (1084°), or sodium carbonate (850°).

In using the thermo-couple to obtain a cooling-curve of a metal or alloy it is only necessary to insert the couple, suitably protected by a fire-clay or porcelain tube, into the molten mass. A current of electricity is generated whose electro motive force is approximately equal to the temperature, or rather the current gives us a measure of the difference in temperature between the hot and cold junction of the couple. If now this current be passed through a reflecting galvanometer, the beam of light moves rapidly from left to right until it attains a deflection proportional to the temperature measured. This beam of light falls upon the scale which has been calibrated by the establishment of certain fixed points as just explained. If the beam passes through a narrow horizontal slit in a recording device, behind which a photographic plate is rising or falling at a uniform rate, we obtain a cooling-curve whose co-ordinates are time and temperature. The type of curves given by a pure metal, by surfusion and impure metals has already been shown in Fig. 2.

Two other classes of alloys give a cooling-curve identical with that of a pure metal, viz.: eutectic alloy and intermetallic compounds, that is these three classes of substances freeze at a single temperature. The nature of a eutectic will be discussed later; suffice it here to define it as that alloy of a series which has the lowest freezing-point, which is constant in composition, and which is not a chemical compound of the metals which compose it. In Fig. 5, the curve A B represents that of a homogeneous solid solution. It shows but one "break," though the temperature does not remain constant during the whole period of solidification, as in the case of pure metals, compounds and eutectics. In A' B' is shown a curve with two "breaks," the upper one resembling that of a solid solution and the lower one shows the form of an eutectic. The first abrupt change in direction in either of these curves indicates the temperature at which solidification begins. As the excess of one metal solidifies the concentration of the residual fluid is increased with respect to the metal which is not in excess. The ultimate cause of the change in direction is the liberation of the latent heat of solution or of fusion.



As is well known, when concentrated hydrochloric acid (solution of hydrochloric acid gas in water) is boiled, the hydrochloric acid gas evaporates faster than the water. If dilute hydrochloric acid is boiled, the water evaporates relatively faster than the gas. The inevitable result is that at a certain concentration hydrochloric acid and water vapor leave the liquid at a rate proportional to their concentration; thereafter the composition of the liquid remains constant and the boiling point fixed.

A somewhat analogous condition is that of the solidification of two metals, M and N. Either of them may be considered as the solvent. If M is the solvent and N the dissolved substance, then on cooling such alloy, M crystallizes first retaining some N in solid solution. Similarly an alloy containing much N and little M begins to solidify by the separation of crystals of nearly pure N containing M in solid solution. As M or N begin to separate out in solid form the remaining liquid portions become concentrated in respect to N and M respectively. The freezing-point of the remaining liquid is thus continually lowered. Eventually either of these classes of alloys reaches a concentration greater than that of a saturated solid solution and then there crystallizes out simultaneously two solid solutions, one of which is a saturated solid solution of M in N and the other a saturated solid solution of N in M. In any one series of metals this takes place at a definite fixed temperature which is the lowest freezing point in the series and no matter what

the original composition of the alloy, the part solidifying at this constant temperature is uniform in composition. This is the "eutectic" alloy; it will be considered more fully later in this paper.

Some students of alloys consider that at temperatures between the first separation of solid and the point at which the residue solidifies as a whole, there does not exist a homogeneous condition in the still liquid portions. They liken alloys within this range to an emulsion, or conjugate solution, etc., simply because ultimately the mass solidifies in a banded or laminated mass characteristic of eutectics. It is not necessary, however, to consider that the two solid solutions constituting the ordinary eutectic existed as such in an emulsified state above the eutectic point. To be sure, the microscope reveals a very marked separation of the alloy into two constituents (when there is any eutectic), usually with characteristically laminated structure, but these two components show no tendency to separate into layers when the alloy is kept for a long time just above its eutectic point; on the other hand, the magnitude of the eutectic structure is markedly influenced by the slowness of cooling. Furthermore there is always an evolution of heat during the freezing of a eutectic which is very decided and may well be accounted for by such a marked molecular rearrangement as the formation of a laminated structure from a homogeneous mass would involve, and lastly, we might cite some concrete evidence on this point which was brought to my attention by Mr. William Campbell. As is well known the constituent of steel known as martensite which is a solid solution of iron carbide in iron is capable of splitting up at about 690° C. or nearly 800° C. below its freezing-point into the beautifully characteristic structure known as pearlite; accompanying this change is a marked evolution of heat, the critical point Ar, of Osmond. If such a decided transformation can take place in solid steel, it surely ought not to be thought improbable that a similar one could take place in an alloy at the instant of final solidification when the molecular freedom of the particles is doubtless many times as great as in the example cited.

Molecular Depression of the Freezing-Point of Metals.—In 1889, Prof. Ramsey determined the molecular weight of many of the metals by the method of measuring the change in vapor pressure when certain known weights of solid metals were dissolved in it. He also made determinations at the boiling point of mercury. From these experiments he states "that it would appear legitimate to infer that in solution, as a rule, the atom of a metal is identical with its molecule."

Messrs. Heycock and Neville found that when two metals were melted together, considering M as solvent and N as the dissolved metal, then

- (1) The freezing-point of M is lowered,—the most frequent result.
- (2) The freezing-point of M is raised, e. g., silver in cadmium, and antimony in tin.
- (3) The freezing-point is unchanged, e. g., thallium in lead, and, I believe, within narrow limits, silver in gold.

But these skillful investigators, to whom we are so much indebted for their careful researches upon alloys, went further and showed that none of these cases contradicted Vant Hoff's theory of solution. This they did in each case by filtering off the part first solidifying. In the first case the more fusible filtrate was found to be richer in the dissolved metal than were the first crystals. In the second instance the crystals were richer in the dissolved metal; that is, the excess of solvent was not first to separate in the solid form but what was probably a definite compound of the two metals having a higher melting point than the metal M, which was assumed to be the solvent. In the third case there was absolutely no separation of the two metals during cooling; that is, the fused crystals and the fluid part were identical in composition. That is,

the two metals in these instances form isomorphous mixtures. In all their experiments, Messrs. Heycock and Neville were dealing with dilute solutions in which, as in the case of salts dissolved in water, it might be expected that the molecules of the dissolved substance would obey the laws of gases. When their experiments were conducted quantitatively, Heycock and Neville found that two of the empirical laws of Coppey and Raoult hold good for alloys, viz:

(1) For moderate concentration the fall of freezing point is proportional to the weight of dissolved substance present in a constant weight of solvent, and

(2) When the falls produced in the same solvent by different metals are compared, it is found that a molecular weight of a dissolved metal produces the same fall whatever the metal is.

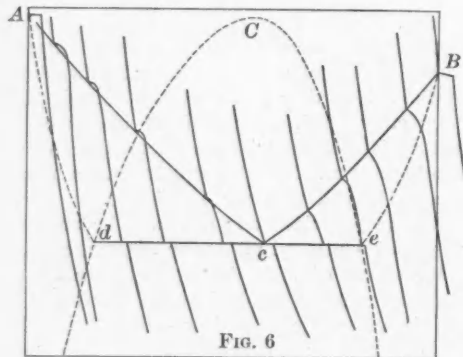


FIG. 6

In these experiments tin was the solvent and it was assumed that the metals are monatomic in solution or that their molecules are of one type, — R_n , when n is constant and probably equal to 1.

The third law is probably incorrect, for it assumes that if a constant number of molecules of solvent be employed, the fall is independent of the nature of the solvent. The solvent in the case of metals often tends to chemical combination with the other metal. Thus gold in 100 atoms of sodium gave 4° C. depression in the freezing-point; in tin, 3° C. and in potassium only 1.8° C.

Freezing-point Curves.—One must not confuse cooling-curves and freezing-point curves. The former, as already pointed out, result during the cooling of a single metal or alloy and time and temperature are the co-ordinates of such curves.

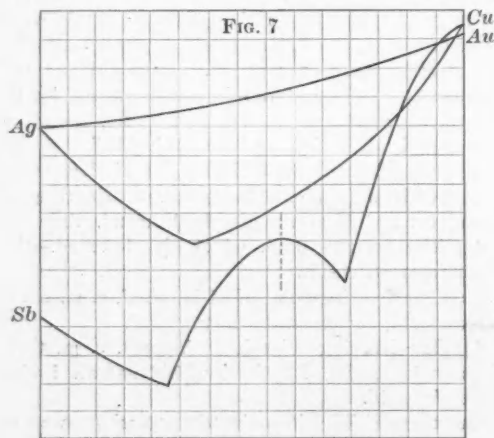


FIG. 7

When a series of such curves are obtained for any pair of metals mixed in all proportions from 0 to 100 per cent M in 100 to 0 per cent N, and the critical points are plotted in a diagram of which the co-ordinates are temperature and composition we get what is known as a freezing-point curve. That is, the points at which all possible combinations of the two metals freeze are indicated more or less accurately: The more points in the curve actually determined, the more likely becomes the accuracy of the other points. Subsidiary points in the cooling-curves may also be plotted, though they are not strictly speaking freezing-points. Figure 6 is taken from a paper upon "La Constitution des Alliages Metalliques" by Rob-

erts-Austen and Stansfield which was presented at the Physical Congress, Paris, 1900. The vertical co-ordinate is temperature and the horizontal one represents both time (for cooling-curves) and composition (for the freezing-point curve). It shows graphically how a complete freezing-point curve is constructed from cooling-curves. It will be noticed that the metals A and B forming the alloy give cooling-curves of the type of pure met-

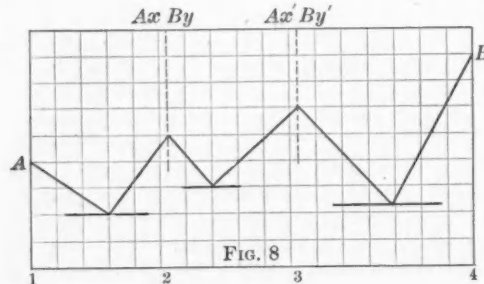


FIG. 8

als. In the curves showing a eutectic break, it will be noticed that the magnitude of the eutectic break as compared with the upper or freezing-point break becomes relatively greater as we approach the composition of the alloy c which is pure eutectic and gives a cooling-curve identical in form with those of A and B. In fact this ratio gives a rough approximation of the proportion of the alloy which consist of solid solution separating at the first break and eutectic alloys crystallizing at the fixed temperature indicated by the horizontal part of the cooling-curve; or, in other words, if the alloy consists mostly of solid solution and a little eutectic, it will take the former longer to

unite chemically. Antimony and copper unite to give the highly colored compound known as regulus of Venus, Cu_3Sb_2 . This compound is indicated in the cooling-curve by the intermediate summit. In general such a summit will be found to occur at a formula percentage, and indicates an intermetallic compound. To explain such a curve, we have only to consider it as made up of separate sections, as indicated in the figure by a dotted line. The intermetallic compound has a melting point of its own, quite independent of that of the constituent metals. It may be higher, lower or intermediate as compared with the constituent metals which compose it. In such a curve as the Sb-Cu one, we may consider that one series of alloys is composed of mixtures of Sb and Sb_2Cu_3 , and the other of Sb_2Cu_3 and Cu. We are virtually dealing with two distinct series of alloys, each of which taken separately is of the simple type illustrated by the Ag-Cu curve. In the Sb- Sb_2Cu_3 portion of the curve there is no free copper, and in Cu- Sb_2Cu_3 portion of the curve there is no free antimony. Dissociation of the compound might make some modification of the above statement necessary, and, indeed, it has been suggested that dissociation causes a summit to appear rounded instead of angular. Curves containing more than one summit may be similarly resolved into series of two components, which may be respectively a metal and an intermetallic compound, or, if between two summits, the components are both intermetallic compounds. An ideal representation of such a curve is shown in Fig. 8. In this figure we see that alloys whose compositions fall between 1 and 2 consist of metal A and compound $AxBy$; alloys between 2 and 3 consist of components $AxBy$, and Ax_1By_1 —they contain no

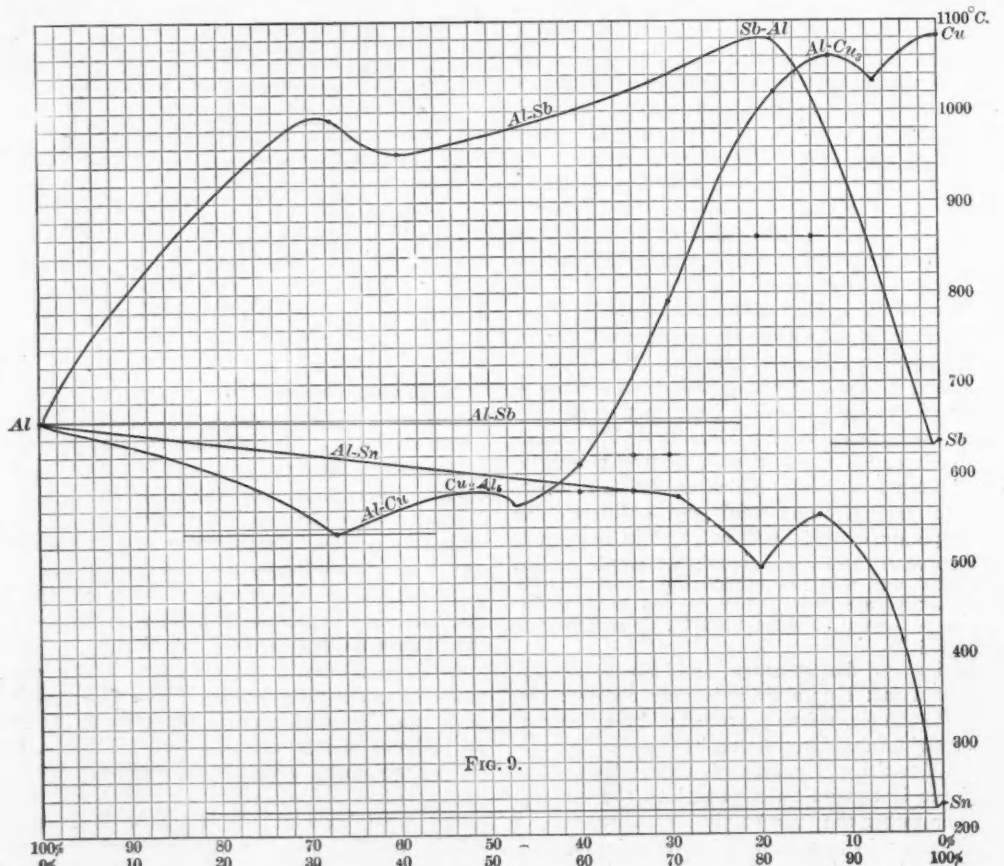


FIG. 9.

solidify than it does the latter and the cooling-curve indicates this roughly. Sometimes more than two breaks occur in a cooling-curve, indicating changes, allotropic or otherwise, occurring in the solid.

Freezing-point curves conform in general to three types, as shown in Fig. 7. These curves are not drawn exactly to scale, but are approximately correct. Gold and silver alloys form perfectly isomorphous mixtures, and their freezing points give almost a straight line joining the freezing points of the pure metals. Copper and silver give the typical curve of two metals, which mix in all proportions, but do not

free A or B; alloys between 3 and 4 consist of compound Ax_1By_1 and metal B. Each of these pairs of components has its melting point depressed by the presence in it of the adjacent component. Our Cu-Al curve (Fig. 9) may be explained in this way: Two summits occur at the compositions corresponding to Cu_2Al_3 and $AlCu_2$ (48.49% Cu, and 87.6% Cu respectively). Le Chatelier thinks he has detected with the microscope at least four compounds. Our curve gives no indication of them, unless they be in some way connected with the dotted horizontal lines whose explanation we have not yet fathomed. Our own microscopic study of these alloys is not yet com-

pleted. Our Al-Sb curve (Fig. 9) shows the presence of a compound whose melting point is more than 400° C. above that of either constituent. Its formula is Sb Al (81.6% Sb). In this series of alloys we are dealing with two pairs of constituents, Al-Al Sb and Al Sb-Sb. The compound seems to be almost insoluble in either of the pure metals, but on theoretical grounds we should expect to find a slight depression in the freezing point of each metal as indicated in the curve. These points have not as yet been experi-

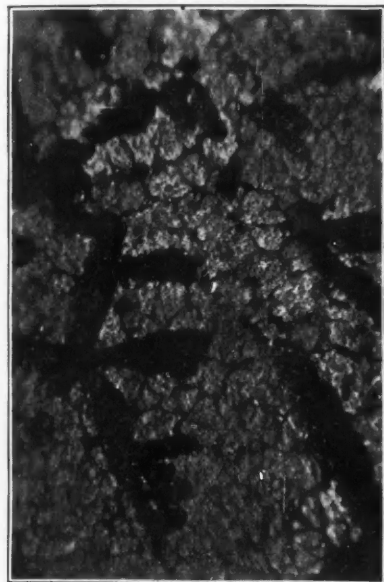


FIG. 10.

mentally detected. The tin-aluminum curve shows a fall of 3° or 4° C. by the addition of 0.5% Al, while with increased additions of aluminum the freezing point is raised 300° C. at a concentration of 10% Al, 99% Sn.

If in a certain series of alloys we get a cooling curve with a summit occurring at a formula percentage, and examine the alloys whose freezing points give rise to that summit, we shall find that in general an intermetallic compound in the pure state presents under the microscope a homogeneous mass made up



FIG. 11.

of crystals, all of which are the same. As we descend from the summit on either branch of the curve we find these crystals becoming less and less in number and size, and at the next angle in the curve they disappear entirely. This is illustrated by the accompanying photographs of antimony-aluminum alloys. These microphotographs were made by Mr. Campbell.

Fig. 10.—20 per cent Sb, 80 per cent Al \times 33 diameters, oblique illumination, shows crystals of Sb Al in granular ground mass of nearly pure Al.

Fig. 11.—50 per cent Sb, 50 per cent Al \times 33 diameters, oblique. Crystals of Sb Al increasing in size and amount, ground mass decreasing.

Fig. 12.—82 per cent Sb, 18 per cent Al \times 16 diameters, vertical illumination. This photograph shows nearly pure Sb Al.

Fig. 13.—85 per cent Sb, 15 per cent Al \times 33 diameters, vertical illumination. We have passed the summit of the curve; the ground mass of aluminum has disappeared and some free antimony is seen.

Fig. 14.—95 per cent Sb, 5 per cent Al \times 33 diameters, oblique. Sb Al crystals diminishing in quantity, and ground mass of Sb—probably containing a little Sb Al in solid solution—is conspicuous.

Regarding this microscopic evidence, supporting the pyrometric evidence, Mr. Neville says: "These criteria taken together, (1) the occurrence of a summit at a formula percentage, (2) the presence of large crystals of the same kind, decreasing in amount as we descend the branch on either side, are an absolute proof of the reality of a compound."

The Nature of Eutectics.—In several portions of this paper eutectic alloys have been mentioned, a term for which we are indebted to Dr. Guthrie, who used it to designate the most fusible alloy of a series—the one which freezes last. There are certain points

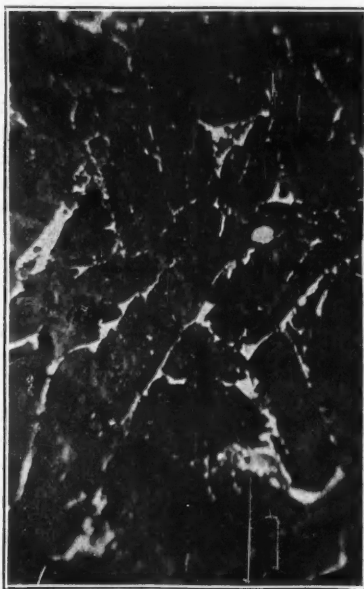


FIG. 12.

in which eutectics may differ, and upon these differences they may admit of classification. Every eutectic, however, possesses the following properties:

1. It is of uniform composition in any one series of alloys.
2. Its freezing point is constant throughout any one series.
3. The freezing point is the lowest in the series.
4. It is not a chemical compound.

The composition of a eutectic may and occasionally does correspond to some simple atomic ratio. This coincidence, though striking, does not prove the presence of a compound as the sole constituent of a eutectic. Usually it possesses a laminated microstructure, and often requires very high magnification to detect the two constituents. Mr. Stead, in his splendid paper upon iron and phosphorus, gives his ideas upon the subject of eutectics, and in addition to what has just been said as to the essentials of a eutectic, he adds some remarks upon what a eutectic may be: (1) "It may consist of two or more metals which do not unite chemically, or (2) of a metal and a definite compound (containing that metal), or (3) possibly of two or more definite compounds. (4) It may consist of a mixture of a solid solution of one metal in another and a free metal. (5) It may contain a solid solution of a definite metallo-metallic salt (intermetallic compound) and that same metallo-metallic salt in the free state. (6) It may possibly consist of two solid solutions." The last of these statements, which he qualified by the

word "possibly," seems to me to be the most important of all; and since I am unwilling to admit that any metal or intermetallic compound ever separates absolutely pure, those conditions in which Mr. Stead speaks of the separation of pure substances seem to me to be inaccurate. The form of the freezing point curves and the explanation of them according to Prof. Roozeboom renders it highly improbable that any strictly pure material separates at the freezing point of the eutectic. The most that we can say of the constituents of a eutectic is that in certain cases

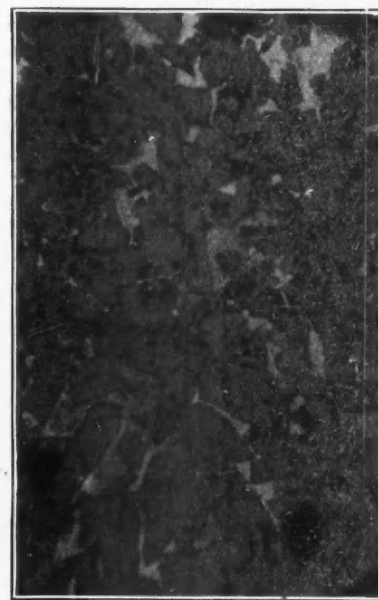


FIG. 13.

they are solutions of extreme dilution. In cases where the freezing point curve lies almost entirely above the melting point of either or both constituents, but in which there is a slight depression of the freezing point by very small additions of one metal to the other, as in the case of tin-aluminum, previously mentioned, and when this depression is further indicated in a well-marked eutectic break in other alloys of the series, it may be possible that the eutectic is a single solid solution. The quantity of dissolved metal in such a eutectic might not be enough to change the type of cooling curve seriously, and probably exceedingly high magnification would fail to resolve such an eutectic into two components, for it crystallizes isomorphously with the pure tin, hence it seems that no two juxtaposed constituents are there. This conception of a eutectic is not at variance with the four essentials already enumerated. While not speaking positively on this point, I think it reasonable, and am not sure but that in such a curve as the Sb-Su curve,

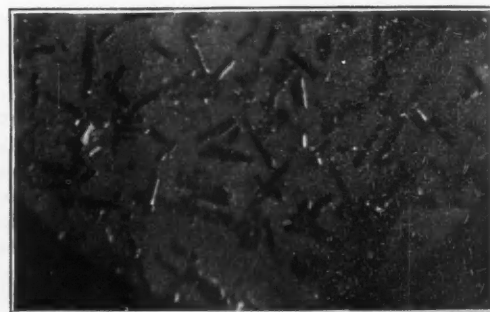
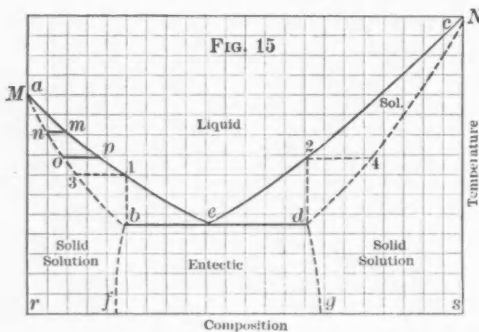


FIG. 14.

where all the points seem to lie above the melting point of tin, we must consider pure tin as the eutectic—it melts lowest for the series, it is of constant composition, and it is not a chemical compound.

We have now indicated many points of resemblance between metallic mixtures and ordinary solutions. One metal diffuses into another like a salt into water; like two liquids, they may be perfectly miscible or form layers; the layers are not pure, but each contains a little of the other in solution; in general, the solubility increases with the temperatures. They will

flow under pressure; they may or they may not react chemically when brought into intimate association by fusion or pressure; the molecular mobility increases with the temperature; upon cooling of binary alloys we observe phenomena strongly suggestive of the freezing of salt solutions; the depression of the freezing point of one metal when another is added follows the laws of Copper and Raoult, and the eutectic reminds us very much of the "cryohydrates" of ordinary solutions. Scarcely another point of resemblance is needed but one is at hand, and a very important one, viz., the phase rule applies quite as well to the explanation of conditions of equilibrium in alloys as it does to explanation of similar problems in regard to liquid solutions. The classification of the systems, however, requires some modification before the generalizations of Trevor apply, and it is practically somewhat difficult to ensure complete equilibrium in an alloy—the cooling is usually much too rapid to allow of the establishment of equilibrium in the solid mass. If equilibrium has been established, then the number of distinct substances in the



mass will depend upon the number of constituents which enter into the composition of the mass. In my paper already referred to in the *Journal of the Franklin Institute*, January, 1902, I have shown how the adaptation of the phase rule to alloys is accomplished, and as this is more a chemical conception than one of direct interest to engineers, it need not be dwelt upon here. The phase rule does not tell us the number of phases in which one or two components may exist, but how many of them may exist simultaneously in equilibrium. Thus pure iron may exist in three solid, and one liquid phase, but never in all four at one time. Again the iron-carbon alloys, according to Roozeboom, may exhibit at least seven phases, viz., carbon, alpha, beta and gamma-iron, liquid solution, solid solution of carbon in gamma-iron, and cementite or iron-carbide. The provisions of the phase rule, however, tell us that only three of these may exist in equilibrium at any given temperature and concentration. Professor Roozeboom's explanation of a freezing-point curve considered as an equilibrium curve is of great interest in helping to make clear the series of phenomena which are exhibited during the actual solidification of molten alloys. His original explanation was given in connection with the highly complicated iron-carbon curves of Roberts-Austen. It has seemed to me that a simpler figure would lend itself more readily to this explanation and the accompanying figure shows the type of curves which gold-copper and copper-silver alloys give, i. e., pairs of metals soluble in each other in all proportions but not forming any compounds. In Fig. 15 the curve *a e c* represents the temperatures at which for each concentration solidification begins. The curve *a b d c* shows the temperature at which solidification is complete. Except for the straight portion of this curve, *b d*, the exact position of it is a matter of conjecture. According to Stansfield, its position may be calculated with some degree of accuracy upon theoretical grounds, if the latent heat of fusion of the solvent is known and assuming that the dissolved substance is monatomic in the liquid state. The upper line, *a e c* Roozeboom calls the "liquid" curve, and the lower line, *a b d c* he calls the "solid" curve. When in a series of alloys the liquid and solid curves there is a maximum or minimum point formed by the branches of the curve,

they touch at this point as in the curve before us. The point in our diagram where the liquid and solid curves meet is the eutectic point. It means that the liquid represented by the composition corresponding to that point solidifies as a whole at a single temperature. Curves similar to this may be used to explain such complicated freezing-point curves as that of the Al-Cu series, remembering that the termini of the liquid and solid curves are not necessarily pure metals, but may be a metal and a compound, or perhaps two compounds. The more or less triangular areas, *a b e* and *c d e* represent mixtures of liquid and solid phases. The areas *a b e f* and *c d g s* are solid solutions, and in the area *b d f g* we have a conglomerate of eutectic alloy, with varying amounts of crystals of solid solution upon the composition of the alloy from which they were derived. At the single composition *e*, however, we have an exception to this statement, for this alloy consists of eutectic only, while to the left of this the conglomerate consists of eutectic plus solid solutions of N in M, and in alloys represented by compositions to the right of *e* we have eutectic (always constant in composition) plus more or less of a solid solution of M in N.

Above the liquid curve we have only liquid phases; below the solid curve we have only solid phases, while intermediate areas correspond to a mixture of liquid and solid phases.

Any alloy whose composition falls within the areas marked solid solution gives but one break in the cooling curve. Alloys represented by compositions falling within the area of the eutectic (except alloy *e*) give two breaks in the cooling-curves. The eutectic itself consists of two solid solutions, whose compositions are indicated by compositions corresponding to the extreme ends of the eutectic line, viz., *b* and *d*. However, since the solubility of one metal in another is a function of the temperature below its freezing point as well as above, we may assume that the solubility in the two components of the eutectic decreases slightly even after solidification, and therefore the lines *b f* and *d g* are represented as slanting rather than perpendicular to the composition line. These lines indicate the maximum solubility of either metal in the other at temperatures below the freezing point of the eutectic.

Let us consider the phenomena of solidification of an alloy represented by a composition on *a e*, as explained by Roozeboom. Any solution represented by the composition *m* begins to solidify at that temperature by the separation of crystals of the composition *n*. They therefore contain less of N than the liquid alloy *m*. The residual alloy has therefore become enriched in N, and its freezing point is lowered; its composition passes thus from *m* to *p*, at which point solidification is complete, for at this point the temperature has fallen till it encounters the solid curve at the point *o*. The point *o*, moreover, indicates the composition of the last crystals to solidify. That is, while the liquid solution is changing from *m* to *p*, the composition of the crystals has changed from *n* to *o*. Complete solidification has thus taken place through an interval, *m o*. Now there is an alloy whose final solidifying point is *b*; and according to Roozeboom's explanation it is an alloy of composition, *e*, which is freezing. At the same temperature, however, occurs the solidification of the solid solution of composition *d*. Finally, then, all alloys represented by compositions between 1 and 2, after separating out crystals of solid solutions of N in M, or M in N, represented by compositions along the lines 3, 1 and 2, 4, respectively, become concentrated to the composition *e*, where saturated solid solutions of compositions *b* and *d* solidify side by side, constituting the eutectic. That is, an alloy the vertical projection of whose composition upon the solid curve does not cut the eutectic line, consists of a single solid solution. An alloy whose composition projected vertically intersects the eutectic line, consists of a conglomerate of eutectic of constant composition *e* and a solid solution, whose composition is represented by the horizontal projection of its composition upon the corresponding solid curve. At temperatures and concentrations lying within the

areas enclosed by the liquid and solid curves there exists in equilibrium solid and liquid solutions, e. g., at a temperature and concentration represented on the line *m n* there exists simultaneously liquid solution *m* and solid solution *n*.

Great as has been the progress in alloys research within the past few years, yet much remains to be done. When many sets of complete freezing-point curves have been determined, when all the alloys of these series have been examined metallographically, and when their ordinary physical tests, tensile strength, electrical and heat conductivity, specific gravities, etc., have been accurately worked out, then we may be able to generalize and to predict properties of new pairs of metals as well as to set out intelligently to produce new and useful alloys. It must be admitted that the production of alloys in the past has been by the very wasteful method of chance. I hope to see the manufacture of alloys become an exact science and that ultimately even ternary or more complex alloys may be brought within the range of applicability of "natural laws," which as yet remain undiscovered. We are making progress in the right direction, but American scientists have not yet assumed their due share of this task. It is time that we followed the example of the British association, the Société d'Encouragement pour l'Industrie Nationale, the Institution of Mechanical Engineers and the National Physical Laboratory of Great Britain, in promoting the scientific study of problems in connection with alloys.

IRON IN NEW SOUTH WALES.

By JOHN PLUMMER.

The successful establishment of the iron manufacturing industry has long been the desire of the people of New South Wales, and its realization in the near future constitutes one of the possibilities of Australian federation. Although the State abounds with extensive deposits of iron ore, the use of the metal was unknown to the aborigines. The existence of iron ores of various kinds was known in the early days of the State, but nothing was done for many years in the way of utilizing them. Subsequently a blast furnace was constructed near Mittagong, 60 miles south of Sydney, and another at Lithgow, in the Blue Mountain District. The former has been idle for over 20 years, but the latter is still in active operation, a Siemens steel furnace having recently been added, in which steel was produced for the first time in Australia. The works also include a modern sheet mill, a galvanizing plant, and machinery for the manufacture of railway spikes. The ores employed are red siliceous, averaging 22 per cent, and brown hematite, yielding 50 per cent of metallic iron. The metal is, says Mr. Coghlan, widely diffused throughout the State, and occurs principally in the form of magnetite, brown hematite or goethite, limonite, and bog-iron. Deposits of chrome iron are also found. Magnetite is the richest of all the iron ores, sometimes containing a little over 72 per cent of available metallic iron, though it is not often found reaching this very high percentage. These ores are largely distributed throughout New South Wales. The results of a number of analyses made from deposits at Brown's Creek, in the County of Bathurst, and at Wallerawang, where veins were opened out a few years ago, show that the samples of ore yielded from 40.9 to 56.9 per cent of metallic iron. At Wallerawang, a variety of garnet, containing a large percentage of metal, occurs in conjunction with the ore in the veins, which is described as "extremely well adapted for reduction in the blast furnace." Brown hematite or goethite occurs in very extensive deposits in the Blue Mountain Ranges, the principal centers so far explored being situated at Mittagong, Picton, Berrima, Lithgow Valley, Wallerawang, in the Rylstone and Mudjee districts, and in the vicinity of Port Stephens. The result of a number of analyses of this kind of ore denotes that it is very rich in metallic iron, containing a proportion of 42.7 to 64.5 per cent, and in the majority of cases

over 55 per cent of metal. A sample of hematite from the Maitland District contained 60.8 per cent of metallic iron. A sample of brown hematite, from Mount Pleasant, near Wollongong, analyzed during 1891, gave 54.3 per cent of iron. The value of these deposits is enhanced by their almost invariable occurrence in proximity to limestone and coal-beds. It is fortunate, also, that the main lines of railway pass through the regions where the deposits are most easily worked. The iron ore deposits of Seaham and Clarence Town, in the Williams River District, received some attention during 1897. These deposits were locally supposed to contain considerable quantities of titanium producing a most objectionable acid from a smelting point of view. With the object of testing the ore, samples were taken as far as possible apart from one another, and on being assayed separately, the results gave from 42 to 49 per cent of metallic iron, and yielded no appreciable quantity of titanitic acid. In a report dated January, 1891, by the late Mr. C. S. Wilkinson, New South Wales Government geologist, it was stated that the iron deposits in the districts of Mittagong, Wallerawang, and Rylstone contained in sight 12,944,000 tons of ore, estimated to yield 5,853,000 tons of metallic iron; but such estimates as these are naturally the roughest of approximations. These districts are most favorably situated for the establishment of smelting works. Some years ago public attention in England was drawn to the possibility of manufacturing iron within the State, and a mining expert was sent out from that country to inspect the iron, lime, and coal deposits, and to report upon the probable cost of establishing the industry in the State, but the visit was without result. In 1897 it seemed as if the project for establishing works for the manufacture of iron would take practical shape, and negotiations for the promotion of a company in England were well under way when they were interrupted by the death of the prime mover. No definite action has yet been taken, although the question is receiving the serious attention of capitalists. It is still hoped, remarks Mr. Coghlan, that some practical result will follow; but, in any case, the foundation of the industry is a mere matter of time, for the natural facilities of New South Wales for the manufacture of iron are unsurpassed.

RECENT DECISIONS AFFECTING THE MINING INDUSTRY.

SPECIALLY REPORTED.

DUTY ON FIRE-TILES.—Fire-tiles, a species of unglazed tiles weighing about 100 pounds apiece, and some being 36 by 15 by 3 inches and some 30 by 15 by 3 inches, are dutiable as tiles under the provisions of paragraph 88, act of July 24, 1897, and are not dutiable under paragraph 97, as earthenware undecorated.—Appeal of Balfour, Guthrie & Co. from Collector of Customs at San Francisco; Board of General Appraisers.

ABSTRACTS OF OFFICIAL REPORTS

Lake View Consols, Limited, Western Australia.

The report of T. F. Hartman, general manager of this mine, which is one of the most important gold mines of Western Australia, says that during the year ending August 31, 1901, much work had to be done to bring the mine plant into good condition and repair the neglect of previous years. It is now in condition to treat 9,000 tons a month. Many additions were made to the machinery both at the mine and in the mill.

All the ordinary operations of the company were carried on with smoothness, and insured satisfactory results from the ores available for treatment at the various plants. Underground operations proceeded during the year without the slightest check. The amount of development work done is much in excess of previous records. It may incidentally be mentioned that much the heaviest part of this develop-

ment work has been done during the last five or six months. The various footages are as follows: Shaft, 271½ feet; winzes, 996½; rises, 166½; drives, 3,776½; cross-cuts, 1,699½; plats, 73; total, 6,983½ feet. Results from this development work have been very satisfactory. Fresh ore-bodies have been opened up, and previously known ones have been proved to greater depths, while values generally have been well maintained.

The sinking of the main shaft has been continued, and it has now reached a depth of 972 feet. The whole of the distance sunk during the year has been through hard unbroken diorite. The third compartment in the shaft has been fitted with guides and cage, and is now used as an additional hauling shaft, the old winding engine being brought into use for haulage purposes. The shaft is thus fully equal to any demand likely to be made upon it for some time to come. Driving northwards and southwards has been continued on every level to the 800, while at promising points cross-cutting has been done to thoroughly prove the value of the ground. In the upper levels, a western lode (hitherto unknown) was struck, which opened up well, carrying good values, from which already a fair amount of ore has been won. The prospecting work on the lower levels has been continued on similar lines to that of last year, and a reference to the plan and longitudinal section will show that a large amount of work has been done in systematically opening up the mine and preparing for an increased extraction of ore.

A very substantial reduction is apparent in the mining costs, that for extraction of ore being 13s. 2d., against 27s. 7d. for last year, and it must not be overlooked (which makes the comparison all the more striking) that the whole of the year's stoping has been in hard sulphides, while much of the previous year's work was in the softer oxidized zone. While the tonnage treated is in excess of the reserve ore shown on last annual report, we have still in sight a greater tonnage of the same grade ore as treated than we had at the close of the previous year. All this ore has been opened up on three sides, and some of it even on four.

The particulars of the ore at present above the 700 level show 77,798 tons in sight averaging above 1 ounce gold per ton; 42,772 tons over 0.75 ounce; 58,227 tons over 0.5 ounce, and a large quantity of low grade ores.

Stoping has been followed up on every level from the 100 to the 700, inclusive; 76,571 tons were broken and sent to the reduction works for treatment, the value being very consistent throughout. Prospecting by means of the diamond drill has also been pursued during the year. The most important result was obtained in the bore put down from the 400-level at 1,000 feet north. This bore was put down to a depth of 850 feet. After passing through hard diorite and various schistose formations, the bore encountered lode matter at 664 feet, continuing therein for 60 feet. From the core, assay results ranging from a 0.25 up to 2.15 ounces of gold were obtained. Basing calculations on the angle of the bore and the known dip of the lode, the width of the ore at the 1,000-ft. level is estimated at about 14 feet, with an average value of 1 ounce of gold per ton. This is an extremely important development, demonstrating as it does the payable character of the ore at depth. This will be more thoroughly proved in the near future by means of the usual drives and cross-cuts. Future operations underground will embrace the sinking of the main shaft and the thorough exploration of the lower ground by drives and cross-cuts.

Important changes have been made in the reduction works during the year. The four Brown furnaces have been in continuous work, and have treated 35,517 tons of ore for a product of 53,251 ounces gold. From the beginning of the year there has been a gradual increase in the tonnages treated, as well as in the percentage of extraction, with a very material reduction in cost. The cost last year was 43s. 5d. per ton; this year it is 31s. 7d. Contemplated improvements in the direction of finer crushing, and consequent increased sliming, will, we antici-

pate, still further increase the extraction and at a correspondingly reduced cost. The installation of the Diehl plant (which was in course of erection at the close of the last year's operations) has been completed, and has resulted in a substantial increase to the monthly output. The tonnage treated by the plant was 41,054, the product from which was 40,121 ounces in bullion, and 1,601 tons concentrates, containing 21,217 ounces of gold. These concentrates were treated at the Fremantle Smelting Works, but the question of local treatment has been receiving serious attention. The extraction by the Diehl method has been very fair, and the costs quite up to expectation. Without the realization of the concentrates the average cost for the period was 28s. 3d. per ton. Improvements and alterations are from time to time being effected to the plant, which promise to increase the extraction at a reduction in the cost.

In addition 160 tons of oxidized sands and 15,733 tons of oxidized slimes were treated early in the year for a result of 43 and 6,793 ounces of gold, respectively. This practically exhausted the supply of oxidized slimes and sands which were stored on the mine. The total output of gold for the year is 121,684 ounces, approximately valued at £461,584, made up as follows: Furnaces, 53,251 ounces; oxidized sands, 43; oxidized slimes, 6,793; Diehl slimes, 40,121; Diehl concentrates, 21,217; slags, 259; total, 121,684 ounces. Additions to the present plant are in contemplation so that very shortly it will be possible to increase the tonnage treated to about 12,000 tons monthly.

The successful completion of the Coolgardie water scheme (now in hand) means much to this and every other mine on the field. An assured supply of cheaper water will enable lower grade propositions to be successfully faced. Present arrangements insure the Lake View a continuous and sufficient supply for boiler requirements, but water at 5s. 6d. and 6s. per 100 gallons is a heavy item in the monthly costs. The installation of the surface condensers will result in a considerable saving monthly, and should soon repay the cost of their erection. No trouble has been experienced in the matter of salt water supply, a contract having been renewed with the Associated Southern Gold Mines, Limited. Arrangements for fuel supply are ample, and occasion no concern at present. The present contract terminates in December, 1902.

BOOKS RECEIVED.

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

Wortlehre des Adjectivs in Altsaechsischen. By Dr. Edwin Carl Roeder. Being *Bulletin No. 50* of the University of Wisconsin, Madison, Wis.; published by the University. Pages, 92.

On the Dielectric Constants of Pure Solvents. By Dr. Herman Schlundt. Being *Bulletin No. 49* of the University of Wisconsin, Madison, Wis.; published by the University. Pages, 36.

Ninth Biennial Report of the Bureau of Labor Statistics for the State of Iowa. 1899-1900. C. F. Wennerstrum, Commissioner. Des Moines, Iowa; State Printer. Pages, 598.

Die Geschichte des Eisens in Technischer und Kulturgeschichtlicher Beziehung. Part 5. By Dr. Ludwig Beck. Brunswick, Germany; F. Viewig & Sohn. Pages, 176; illustrated. Price (in New York), \$1.75.

Coal Measures of the Philippines. Compiled by Lieut. Charles H. Burritt, U. S. A. Prepared under direction of the Division of Insular Affairs, War Department. Washington; Government Printing Office. Pages, 264; with maps.

The Copper Mines of the Southwest. By George L. Walker. Boston; Charles T. Dukelow. Pages, 60; illustrated. Price, 50 cents.

Thirty-second Annual Report of the State Board of Health of Massachusetts. Dr. Samuel W. Abbott, Secretary. Boston, Mass.; State Printers. Pages, 892.

NEW PUBLICATIONS.

Prospecting for Gold. By Daniel J. Rankin, London; Crosby Lockwood & Son, 1901. Pages, 184; illustrated. Price (in New York), \$2.50.

The author states in his preface that his aim in compiling this hand-book has been to furnish the intelligent prospector with information in a portable form for which heretofore he would have had to refer to a number of volumes, the bulk of which makes their carriage on an expedition inconvenient or unpracticable. Although the information which he gives appears to be sound from a mineralogical and geological standpoint, it does not seem to us to be just what is needed by the practical prospector, at least as we know him.

Sixteenth, Seventeenth and Eighteenth Annual Reports on Coal Mines in the State of West Virginia. For the Years Ending June 30, 1898, 1899 and 1900. James W. Paul, Chief Inspector. Charleston, W. Va.; published for the State. Pages, 400.

This report contains a history of the coal mines of West Virginia for three years, during which their development has been rapid. It gives many interesting particulars with regard to the mines, their condition and methods of operation, and the various accidents which have occurred in them. During the latest year covered by these reports West Virginia produced 18,886,911 long tons of coal; there were 28,017 men employed in the mines, of whom 141 were killed and 176 injured by accidents, showing a death rate of about 5 per 1,000 and an accident rate of 6.25 per 1,000. The causes of these accidents are fully explained in the report.

Society for the Promotion of Engineering Education. Proceedings of the Ninth Annual Meeting, 1901. Edited by Frank O. Marvin, Robert Fletcher and Henry S. Jacoby, Committee. New York; Engineering News Publishing Company. Pages, 348. Price, \$2.50.

The Society for the Promotion of Engineering Education, numbers many prominent men among its members. Its annual meeting was held in Buffalo in June and July last, and the record of the proceedings is given in the present volume. The actual transactions take up only a brief space, the greater part of the volume being taken up by the papers read and the discussions called out by those papers. These papers include the presidential address on the Cultural Value of Engineering Education, by Prof. Frank O. Marvin; Electrical Engineering Courses, by John Price Jackson; A Neglected Opportunity in Technical Education, by Charles F. Burgess; the Howard Houston Hall, University of Pennsylvania, by Henry W. Spangler; Languages in Engineering Courses, by Charles L. Crandall; Graduating Theses, by William M. Towle; Correspondence Schools as Trade Schools, by Dugald C. Jackson; Danger of Excessive Specialization, by James G. Nagle; Graduation Requirements, by William G. Raymond, with papers on the same topic, by Robert Fletcher and Ligan S. Randolph; Higher Technical Education, by John B. Johnson; Esthetics in Engineering Design, by Russell Sturgis; Acceptance of Engineering Employment by Professors, by C. Frank Allen; Engineering Teachers in Outside Work, by William Kent; Research and Publication Among Engineering Teachers, by William S. Aldrich; A Riehle-Gray Apparatus, by George R. Chatburn; Machine Work in Engineering College, by W. P. Furner; Trades Training for Non-technically Educated Men, by John G. D. Mack. In addition there are several reports presented by committees of the society.

These papers, presenting the views of educators of varied experience, are of much interest to teachers in all engineering schools, and also to engineers who have to depend largely upon such schools for their assistants and future successors, and who have therefore a vital interest in the proper conduct and progress of engineering education.

State of Michigan. Mines and Mineral Statistics. James Russell, Commissioner of Mineral Statistics; Horace J. Stevens, Assistant Commissioner, Marquette, Mich.; printed for the State. Pages, 136.

The Upper Peninsula of Michigan is one of the most important mining regions in the United States, its great stores of copper and iron ores having had an essential part in furnishing supplies to our manufacturers. The iron mines have been in recent years passed in the amount of their output by the later discovered deposits of the Vermilion and Mesabi ranges in Minnesota, just as the copper mines have had to compete with those of Montana and Arizona; but both remain important factors in the respective trades. Statistics in relation to these mines are of much interest, and show results which are not only of local importance, but also have a bearing on the iron and copper trades of the whole country. The report gives the general figures of production for the year 1900, and in addition gives many particulars in relation to individual mines and properties. The year covered was a prosperous one for the mines, and in addition to the actual work of producing mineral a large amount was spent in prospecting and developing new mines and—in the copper district—in reopening old mines which were formerly operated and abandoned. In the case of most of these new and new-old mines, some account is given of the development work done and its results up to the date of the report.

For a State which produces so large a quantity of iron ore, Michigan is not an important maker of pig iron. The charcoal furnaces of the Upper Peninsula and of the forest region of the western part of the State, however, turned out 164,506 tons of pig iron in 1900, and 93,484 tons in the first half of 1901. This production will be largely increased when the new plant of the Cleveland Cliffs Iron Company at Marquette makes its output felt.

In addition to the iron and copper of the Upper Peninsula, there is in the Lower Peninsula a considerable mineral production, the more important items of which are salt, coal, cement, gypsum and graphite. The salt production has determined the location in Michigan of several large establishments for the manufacture of alkalies and bleaching powder, chiefly by electrolytic processes. The coal mines have been developed mainly within the past three years, and promise to be an important addition to the industries of the State. The cement industry is growing very rapidly, and is based upon the large quantity of available material found in parts of the State.

In addition to the minerals named above the quarrying of building stone is carried on extensively, and the clay industries are of considerable importance. The latter, however, come in only for brief mention in the report.

CORRESPONDENCE.

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

The Smuggler-Union Fire—A Correction.

SIR:—Permit me to correct the reports you have published on the recent disastrous fire at this mine, which convey an altogether wrong impression of the facts. Our Bullion Tunnel reaches the surface on a rocky shelf among precipitous cliffs, where every inch

of space safe from snowslides has to be utilized. To place all buildings far from the tunnel mouth is practically impossible. There was nothing over the actual entrance but a light iron-covered snowshed; very necessary in this San Juan country, at an elevation of 11,000 feet, where men come warm from work into winter blizzards. It is not true that there was no fire protection. Hoses were at hand connecting with a fire tank under good head, and a dozen chemical hand extinguishers were in the burned buildings. But the fire seems to have been long smouldering, and was practically beyond control when it first burst out. The great mass of flame was swept right across the tunnel entrance by a high wind, catching the timbering at the mouth, and making all access impossible.

The tunnel was, of course, provided with doors, some 30 feet from its mouth, and these seem to have been closed when warning was first sent in to the miners underground, but opened again by the men first coming out, after which they could not be reached. Attempts to blow up the mouth of the tunnel itself failed, until it was too late, when the heavy timbering was largely burned through. Few mines have so many different outlets as the Smuggler-Union, but the great length of the levels kept the men from receiving warning in time. The tunnel level itself is over a mile long, and several of the other main working levels are still longer, and the very excellence of the ventilation spread the smoke all the faster. Several of the men were found dead right at their working places, not having had time to move away.

Nor is it true that a coroner's jury censured any of our minor officials for neglect of duty. All of them worked like men, and two lost their lives in warning and saving the miners under their charge. Thanks to unfortunate labor troubles here, a local jury might incline against our bosses, but your statement is a slur upon brave men, which I am sure you would not mean.

The disaster was most deplorable, and carries its lesson. The use of doors which can be shut from the outside and the substitution of masonry for timbering at a tunnel's mouth being the most obvious. But it only obscures an issue to misstate the facts, and one looks for something better than alarmist reports in your valuable journal.

ARTHUR L. COLLINS,

Smuggler-Union Mine; Telluride, Colo., Dec. 13, 1901. *Manager.*

Concentrating.

SIR: In your issue of September 14, 1901, page 322, you give some valuable suggestions regarding concentrating systems, which perhaps can stand some criticism. Your arguments against slime concentration are very much on the same lines as generally argued by conservative mining engineers. You even go to extremes in asserting that soft sulphides once ground to slime cannot be recovered by any system of concentration. The fact is that heretofore there has not been much evolution in slime concentrating as in coarse jigging systems. The writer admits that there are a large number of slime concentrating plants built and running with questionable success. Some of these plants are very elaborate and expensive, but I am positive that these slime concentration systems never were Americanized or successful from the engineer's point of view until milling began in the Aspen mining district, Colorado. What I mean by "Americanized" is a slime concentrating mill equipped with nothing but originally designed American machinery.

The mill recently built in Aspen is arranged in such a way that each and all the machines work harmoniously and with such success that the Joplin, Mo., system of milling can stand no comparison when our complex ore is considered. The new Aspen mill has a complete ore breaker and roll crushing plant, intermediate screens being used, and the ore further pulverized to 35-mesh in 6-foot Huntington mills. The pulp is further distributed through 18 sets of suitable classifiers to 14 Wilfley tables and 4 Frue vanners. This system of classification, in combination with the Wilfley tables and Frue vanners, makes

it possible to save over 90 per cent of the values in the ore, at a nominal cost, because the complete separation is done in one continuous operation.

The bulk of the ore from the Della S. Mine running through this mill is shaley limestone and baryta, impregnated with silver, lead, zinc and iron. The baryta carries polybasite (gray copper), and the bedding and joint planes in the limestone have an insignificant coating of silver sulphide, but such phenomena as floating values of any kind cannot be noticed on the tables except in the concentrates. In this mill the muddy or slimy water is successively carried to settling tanks and the settled pulp run over slow running Frue vanners, making high grade concentrates and worthless tailings.

CHAS. E. ANDERSON.

Aspen, Colo., Dec. 18, 1901.

The Removal of Iron from Zinc Blende.

SIR: I have read with much interest Dr. Phillips' paper on the above subject in your issue of November 30. I have paid some attention to this matter myself, particularly with regard to the preliminary roasting of the ore, and should like to make a few suggestions and comments.

In the first place, every one who has studied the subject at all will endorse the author's remarks concerning the importance of the roast being properly carried out. The difficulty of doing this depends, *coeteris paribus*, upon the degree of "mixedness" of the blende and pyrites. In an article recently published in the ENGINEERING AND MINING JOURNAL on this subject the crushed ore is described as being passed through a screen of $\frac{1}{4}$ -in. mesh before roasting. Ore which is sufficiently coarse-grained to separate into its constituent minerals at that size would present little difficulty in the roasting. But when crushing to 40 mesh is necessary to separate the blende from the pyrites the matter becomes much more awkward, while in some Tasmanian ores crushing to 70 mesh will not bring about a satisfactory separation of the minerals.

It is interesting to note in table 1 of this paper that the proportion of middlings is much higher in the material that has passed through a 24-mesh screen than in that which was retained on a 24-mesh screen after passing an 8 mesh, and that all the products in the former are more impure than in the latter. Now middlings arise from two causes, (a) from the presence of grains of ore carrying both minerals, (b) from combination of the two minerals during roasting. This combination is, I believe, partly mechanical and partly chemical. Seeing that the middlings are higher in the fine material than in the coarse, and that (b) being essentially a surface action will be promoted by fine crushing, it appears probable that the middlings are in this case mainly due to cause (b). The author does not say whether a retreatment of these middlings has actually been tried, but I should think that under these circumstances its success would be only partial.

When a mixed ore of this description is roasted it is the pyrites that roasts first. This mineral always sinks more or less during roasting and has a strong tendency to adhere to particles of ore in its neighborhood. This tendency increases with the temperature and duration of the roast, as is well shown in table 3 of the paper, where the increase in the amount of magnetic heads (which would include the bulk of the middlings) and of their fine contents is well marked. When the pyrites is largely in excess of the blende, so that the temperature generated by the burning ore is high, I have found it impossible to get a satisfactory separation. The stirring of the ore during the roast either by rabbling or rotating the calciner tends to promote this action.

It follows then that if the ore could be roasted in such a way that the particles would be prevented from coming into contact during the roast and until the ore was cool, it would be possible to do away with middlings due to intermineral combination and get only those due to particles unseparated by crushing, which, in such ores as those referred to in

the paper, would not be a serious matter. It is to draw attention to a means of effecting this that I write this letter.

I have made numerous experiments on the use of a modification of the "Stetefeldt" furnace for this purpose. In this furnace the ore is roasted by being let fall down a shaft up which the flames and hot gases from two fireboxes placed near the bottom are rising. Provision is also made for dealing with the dust and finer portions of the ore which are carried over by the draught. With ore crushed to pass through a 30-mesh screen and containing 40 per cent zinc, 7 per cent iron and 3 per cent copper, falling down a square shaft 30 feet high and tapering from 6 feet to 4 feet, internal measure, the pyrites reached the bottom roasted to a highly magnetic condition, while the blende was only oxidized on the outside of the grains. It is obvious that if the ore is received upon suitable cooling surfaces at the bottom of the shaft, that the roast will have been carried out without allowing the particles of ore to touch one another until cooled below the temperature at which combination can take place.

The very short duration of the roasting operation, which is simply the time required for the particles of ore to fall down the shaft, is an excellent safeguard against over-roasting. Moreover, the roasting of each grain of ore takes the same length of time, instead of, as in a reverberatory furnace, the ore first roasted having to await the completion of the remainder before it can be withdrawn.

The fine ore, which is carried over the bridge at the top of the shaft and down a down-cast flue, is treated similarly, a firebox being provided near the top of the flue instead of at bottom, as in the original "Stetefeldt," to ignite the fine particles of Provision must be made for rapidly cooling the ore at the bottom of the flue.

Experiments already made under somewhat unfavorable conditions have been so promising that as I have now no further opportunity of continuing them I wish to bring the method to the notice of those interested in this important question of the treatment of pyritic blende in the hope that further work may be done in this direction. The furnace is not a costly one to build; the output is high, labor low, and it is easy to maintain the roasting conditions uniform. Its chief feature, however, as I have said above, is the keeping of the different minerals out of contact with one another during the roast.

As regards iron in molecular combination in the blende as ferrous sulphide, I have always found it to be low in pyritic blende as though pyrites had, during the formation of the minerals, exerted a "collecting" effect. It is usually the leady blends that are richest in combined iron. This is my experience and I should be interested to know if it tallies with the observations of other parties.

Swansea, South Wales.

GILBERT RIGG.

QUESTIONS AND ANSWERS

(Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc.; preference will be given to topics which seem to be of interest to others besides the inquirer. We cannot give professional advice, which should be obtained from a consulting expert. Nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preferences will, of course, always be given to questions submitted by subscribers. Books referred to in this column can be obtained from the Book Department of the ENGINEERING AND MINING JOURNAL.)

Iron Ore Mining in the Lake Superior Region.—Please state where I can find any descriptive article on methods of mining used in the underground iron mines of Michigan and Minnesota.—J. C.

Answer.—A very full description of mining methods in use in the iron mines of the Lake Superior region, written by Mr. J. Parke Channing, was published in the *Mineral Industry*, Volume III.

Manganiferous Iron Ores.—An iron ore contains 35 to 40 per cent iron and 4 to 6 per cent manganese, both counted as metal. Would the value of the iron

be greater owing to manganese. What percentage of manganese would be found in the pig? The ore contains phosphorus 0.10, sulphur trace.—J. E. T.

Answer.—Manganiferous ores usually command a slightly higher price. It is necessary, however, to find a furnace using ores of that class. The proportion of manganese in the pig to the iron is usually somewhat less than in the ore. Your ore is not high grade, and the proportion of phosphorus is over what is usually known as the bessemer limit. Inquiry addressed to well known iron makers would probably find you a market and a price.

Steel as a Substitute for Timber in Mines.—Are steel I-beams or rails being used to any extent for caps or stulls in American collieries and metalliferous mines? If so, about how have they been found to compare with wood in first cost and in cost of maintenance? Is there any recent literature touching on this point?—D. L. H. F.

Answer.—Steel rails and beams have been used to some extent in American mines, though not as frequently as in Europe. Their greatest use has been in the anthracite collieries of Pennsylvania. The relative cost would depend largely on the location of the mine, whether in a region where timber was abundant and cheap or scarce and dear. As a rule, the steel would probably cost more in the first place than timber, but the cost of maintenance would be less. As to the latter point, however, there are no full data on record. In some mines corrosion of steel supports would be rapid, and would increase the cost of maintenance.

You will find a chapter on the use of steel beams and old rails in mines in Dr. Le Neve Foster's "Test-book of Ore and Stone Mining."

COMPRESSING STEEL.—The *London Engineer* says that in a process for compressing fluid steel ingots, introduced by Beutter in the steel works of St. Etienne, France, pressure is applied to the ingot from below, and there is no cover to the conical chill, so that the effect of the pressure is to force the ingot further upwards, with the result that the tapered sides of the mould bring lateral pressure to bear upon the fluid metal within, cavities are prevented, and the metal is forced into the head. By this process superficial fissures are prevented, the scrap is reduced to 4 per cent porosity and internal strains are prevented, liquation is reduced, and the molecular condition and mechanical properties are improved. The reduction in waste causes a saving of 25 per cent of the cost of the raw steel, but from this must be deducted the cost of compression, which amounts to about 8 marks per ton.

A CONVENIENT POST HAMMER.

The American Engineering Works, Chicago, have recently designed a small post hammer, to be operated by steam or compressed air. This hammer is particularly well adapted for all classes of general blacksmith shop work, and will be found especially valuable by mining companies for use in their smith shops. It works very quickly, will turn out a large amount of work per day, and is thoroughly satisfactory for all forging work $2\frac{1}{2}$ inches in diameter or smaller. This hammer will be found to be an extremely useful tool for railroad, mining and blacksmith shops generally where any forging work is required. The following cut shows the hammer attached to a post with anvil supported independently.

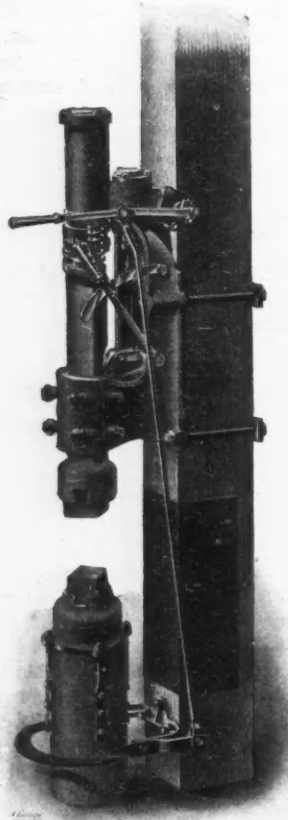
The action of this hammer is the same as that of a large steam hammer. The ram can be regulated to strike a blow of the full force developed by the falling weight with the momentum due to the pressure of the steam or air behind it, or it can be regulated so as to give the lightest possible blow, merely touching the object on the anvil without doing the work.

The cylinder is 3 inches in diameter by 10 inches stroke. It is cast in one piece with the frame from

the best quality of gray iron. The exhaust ports are arranged so as to keep the cylinder always drained. The valve is under perfect control of the operator, and is operated by a foot treadle or by hand lever. The steam valve is controlled by a cam working on a cam-path on the back of the ram, the position of the cam being governed by the operating levers. There is also provided a safety device to limit the stroke of the piston. There is clear space of about 10 inches from center of die to side of post supporting the frame.

The hammer is usually arranged for bolting to a wooden post 8 by 8 inches. Special attachments can be furnished for bolting to an I-beam or other form of steel column, or where preferred a steel column made of extra heavy wrought pipe will be furnished, together with necessary clamps for properly clamping frame of hammer.

The ram is a solid steel forging, square in form where it passes through the lower part of the frame which acts as a guide. The lower end of the ram is arranged to receive the upper die in such position that it stands at an angle of 45° to the post supporting the hammer, thus enabling long pieces to be



IMPROVED POST HAMMER.

worked either way of the die without coming in contact with the post. The upper die is a steel casting having a face 4 by 5 inches, dovetailed to the ram and fastened with wedges. The lower die is a steel casting having a face 4 by 5 inches, dovetailed to the anvil and fastened with wedges so that it is easily removable. The anvil is designed to be secured to a 12-in. wooden block set on end, the anvil being bolted to the block with lag screws.

The falling weight is 100 pounds. The weight of the lower die and anvil is about 150 pounds. The total shipping weight is about 575 pounds.

THE IMPROVED BUFFALO FORGE.

It seems that great advance has been made recently in forge-shop equipments, and that smiths are quick to see the advantage derived and to install new systems and forges in their shops. This progress is due largely to the Buffalo Forge Company of Buffalo, N. Y. Down-draft forges were patented by this company in 1894, under United

States patent No. 529,845. The down-draft forge is owned and controlled by this company.

By the down-draft method, the smoke and gases are immediately and completely withdrawn by means of the down suction through an adjustable hood and under-ground tile piping. There is no escape of gases, fumes, or smoke from the larger fire. The cast iron hoods are adjustable to different positions, according to conditions at the fire. These forges are practically indestructible, cases being recalled, where Buffalo down-draft forges taken from burned buildings have been re-installed without repairs of any kind. Fumes of hard coal, coke and furnace fires, which are a menace to the smith's health are rapidly eliminated by the thorough exhaust. They have ample blast.

The valuable space and light about the forge is not obstructed by inefficient telescopic hoods, which are subject to frequent renewals. The first cost is moderate, and there need be no further expense. The down-draft system is durable and efficient.

The illustration shows the latest design of the Buffalo down-draft forge. It is neat and compact, yet not filled to excess. This forge stands 27 inches to the top of the fire pan, which is 24½ inches by 47½ inches. It has a water tank 6 by 47 inches and 10 inches in depth, and a coal box 10 by 14 inches and 47½ inches long. It is also furnished with tool-rack, a blast gate, an improved anti-clinker



IMPROVED BUFFALO DOWN-DRAFT FORGE.

dumping tuyere, and Buffalo patented down-draft smoke exhaust hood. This forge, with the exception of the down-draft hood and tuyere, which are of heavy cast iron, is constructed entirely of heavy gauge steel plate, and is thoroughly braced. It is best adapted to medium work and also well suited to light and heavy forging.

AN INTERNATIONAL EXPOSITION IN FRANCE.—An International Industrial and Commercial Exhibition is to be held at Lille next year, from May to September. It will cover about 50 acres, and will be under the patronage of the municipality. The exhibits will comprise commercial, industrial, and agricultural products, and there will also be a fine art section. Exhibitors will be divided into two categories:—(1) Manufacturers and producers; (2) those who exhibit articles made by others. The French railways will allow a reduction of 50 per cent on the cost of transport of all exhibits, and no customs duty will be levied on goods from abroad consigned to the Exhibition, provided bond be given for their re-exportation to the country of their origin after the Exhibition is closed.

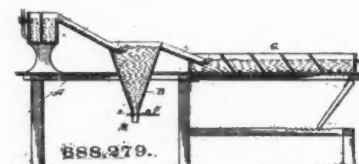
PATENTS RELATING TO MINING AND METAL LURGY

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

UNITED STATES.

Week Ending December 10, 1901.

688,279. ORE SEPARATOR.—Alexander A. Allen, Birmingham Ala. The combination with a vessel arranged to discharge by overflow a broad unbroken sheet of liquid, a receptacle arranged at a lower level to contain a body of approximately still water and to discharge by overflow at one side, a broad inclined chute extending from said vessel to a point in said receptacle below the plane of discharge of the latter and arranged to receive the sheet discharged by said vessel and deliver it substantially unbroken in said receptacle, and means for placing upon the moving sheet discharged from said vessel a thin layer of material to be separated.



688,290. APPARATUS FOR UNLOADING COAL.—Alexander E. Brown, Cleveland, Ohio, assignor to Brown Hoisting Machinery Company, a corporation of Delaware. An apparatus for receiving and discharging coal and other material consisting of a bucket having a bottom hinged, or otherwise movably connected thereto; one or more cables attached to said sides or shell of said bucket at their one end and passing over and being supported by a system of sheaves or drums provided for the purpose, and fastened at their other ends, to a counterweight or counterweights, heavier than the shell or body of said bucket; one or more cables connected at their one end to links, or other suitable means of closing the bottom of said bucket, when counter force is exerted on said cable, or cables, the said cable or cables passing over and being supported by a system of sheaves and drums, provided for the purpose, and wound around and controlled by a drum, or drums in said system, and attached, at their other end, to a counterweight or counterweights, heavier than said bottom of said bucket, together with suitable means of stopping the ascent of said first-named counterweight, or counterweights, at any predetermined point, and means for controlling said drum, or drums.

688,338. HYDRAULIC DREDGING APPARATUS.—Elton Risley, Pleasantville, N. J. A pipe having a flexible or yielding section and provided with means operated by the movement of said flexible or yielding section for indicating an excess of material above a predetermined amount flowing through the pipe.

688,345. KILN FOR BURNING CEMENT LIME, ETC.—Herman Schmidt, Bonn, Germany. A kiln composed of a receiving-chamber, flues lying against the side of said chamber, within the lower portion thereof, to form a hopper, a burning-chamber communicating with said hopper, a fuel-opening intermediate the burning-chamber, and the flues, a cooling chamber below the burning chamber and a rotatable cylinder entering the upper portion of the receiving-chamber above the hopper.

688,358. COMBINATION-FURNACE.—John K. Stewart, Chicago, Ill. 1. A combined furnace, comprising a unitary metal shell inclosing a single continuous chamber and a fire-brick lining for such chamber extended to form vertical partition therein continuous with said lining, dividing the cavity into separate, non-communicating chambers, and independent burners for supplying fluid fuel to said chambers respectively.

688,364. ELECTRIC FURNACE.—Edward R. Taylor, Penn Yan, N. Y. An electric furnace having in combination, a metallic shell, a working chamber within the same, means for supplying said chamber with material for treatment and for discharging the product, electrodes opposed to each other within said chamber.

688,392. VALVE FOR COMPRESSORS.—Hugh V. Conrad, Tarrytown, N. Y., assignor to Rand Drill Company, New York, N. Y., a corporation of New York. In a valve for compressors or the like, the combination with a valve-disk, stem, and stem-head of a split bushing comprising two members, each having a portion adapted to partially embrace the said valve-stem, and together to form a guide therefor, one of the said members provided with an extension having a valve-seat therein for the said valve-disk.

688,434. LUBRICATING DEVICE.—Frederick W. Parsons, Elmira, N. Y., assignor to Rand Drill Company, New York, N. Y., a corporation of New York. The combination with a well adapted to contain lubricating-oil, and a rotatable disk arranged to be partially immersed in the oil in said well, of a scraper, located at a point above the level of the center of the disk, and having one end in contact with the periphery of said disk, the said scraper in-

clined toward the said disk in a direction opposite to the direction of rotation of said disk, and an oil-conduit in communication with the other end of said scraper.

688,439. **AMALGAMATING-MACHINE.**—Gerard C. Scott, Columbus, Ohio. The combination with a casing having inlet and outlet openings and a body of mercury contained therein, of a plurality of copper-plate cylinders arranged one within the other, said cylinders being connected and mounted to rotate within said casing and travel through said body of mercury.

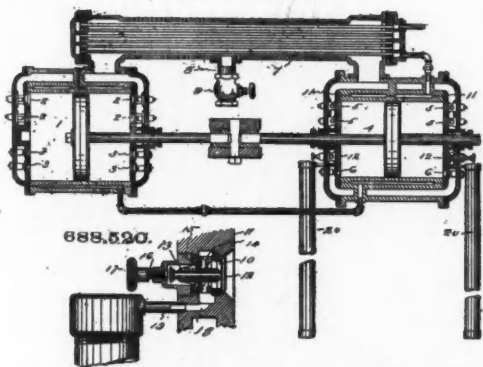
688,449. **APPARATUS FOR THE ANALYSIS OF GAS.**—Carrington C. Tutwiler, Philadelphia, Pa., assignor to the United Gas Improvement Company, Philadelphia, Pa., a corporation of Pennsylvania. Apparatus comprising in combination a tar-arrester, a graduated burette, a stoppered graduated vessel arranged to drop its contents into the top of the burette, means for establishing and disestablishing communication between the top of the burette and the tar-arrester and the atmosphere, and between the measuring vessel and the burette, a mercury-leveling bulb, and means for controlling communication between the base of the burette and the leveling-bulb and between the bulb and the atmosphere.

688,463. **METHOD OF MAKING CAUSTIC ALKALI.**—Hans A. Frasch, Hamilton, Canada. The process consists in allowing the hydroxide of a metal to react upon the salt of an alkali in presence of ammonia.

688,475. **CONVEYER.**—Thomas S. Miller, South Orange, N. J., and Joseph H. Dickinson, Atlanta, Ga. In combination, a load-pulling rope, a traversing carriage, an outhaul-rope, and a grip actuated by said outhaul-rope and adapted to engage the load-pulling rope to draw it outwardly.

688,483. **SUPPORTING-BRACKET FOR MINERS' LAMPS.**—Max Pell, Wilkes-Barre, Pa. A lamp-supporting bracket for miners' lamps, consisting of a plate of metal including a central body portion having its lower end bent forwardly and adapted for attachment to the vizer of a cap, and having its upper portion bent upon itself to form a transverse seat in the form of a split tube.

688,510. **PROCESS OF PRODUCING METALS.**—William H. Greene and William H. Wahl, Philadelphia, Pa. The method consists in incorporating silicides with metallic oxides, the heat of formation of which is less than that of the oxides of either element of silicides, and subjecting the mass to heat, and thereby effecting the primary reduction of the oxides by the chemical energy of both elements of the silicides.



688,520. **AIR COMPRESSOR.**—Ebenezer Hill, South Norwalk, Conn. A compound air-compressor having cylinders, pistons, inlet-valves, discharge-valves, interduct between the cylinders, an outlet from the interduct, an auxiliary reservoir connected with the high-pressure cylinder of the pair that are connected by the interduct that is tapped, and a valve controlling the passage from the high-pressure cylinder to the auxiliary reservoir.

688,538. **APPARATUS FOR MAKING SULPHURIC ACID.**—Theodor Meyer, Offenbach, Germany, assignor of one-half to Charles Glaser, Baltimore, Md. The combination of a series of circular or substantially circular chambers connected by pipes, each chamber having a single inlet-pipe, and a single outlet-pipe, the single inlet-pipe of each chamber entering it at the side near the top only and tangentially, and the single outlet-pipe descending and leaving said chamber from the center of the bottom, whereby gases are admitted at the top of the chamber, permitted to rotate in the chamber, and as they cool and descend, drawn off from the center of the bottom of the chamber in a downward direction.

688,557. **ART OF MANUFACTURING IRON OR STEEL.**—Benjamin Talbot, Pencoed, Pa. The process consists in forming a bath of purified or partially-purified molten metal and maintaining on the surface of said bath a slag covering containing an oxide capable of removing carbon in greater percentage than is required for oxidizing the carbon contained in the metal brought into contact therewith, and building up and purifying said bath by bringing additional molten metal containing carbon into contact with said oxidizing-slag, thereby rapidly producing large volumes of carbonic-oxide gas, burning said gas so as to produce an intense heat, and utilizing said heat in the purification of said metal.

688,567. **ORE-CONCENTRATOR.**—Martha P. Willits, Indianapolis, Ind., executrix of Van Burton Willits, deceased. The combination with an endless belt of jiggging-frame thereunder, and means for imparting a reciprocating motion to both sides of said frame.

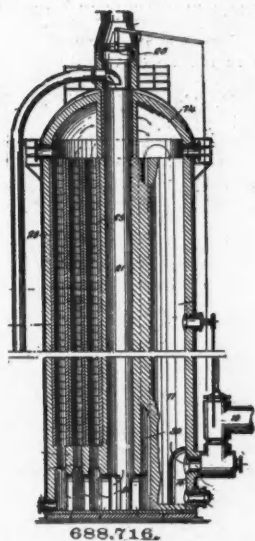
688,587. **DOOR FOR ORE-ROASTING FURNACES.**—John P. Bridgewater, Everett, Wash. The combination with a calcining-furnace having a slot in its side wall and a series of pins projecting from said wall above said slot, of a series of plates supported on said pins and having a vertical bodily movement thereon and normally closing said slot, the adjacent ends of said plates being overlapped and the lower forward edge of each plate being beveled upward.

688,608. **AIR COMPRESSOR.**—George Donges, Brooklyn, N. Y., assignor to New York Hydraulic and Steam Pump Company, borough of Brooklyn, New York, N. Y., a corporation of New York. The combination with a casing having an air-outlet at its upper end and water inlet and outlet at its bottom, an air-inlet pipe extending within the casing and terminating near the top thereof, valves controlling the water inlet and outlet, and a float adapted to control the movement of said valves, of a sleeve fitted about the inner end of the air-inlet pipe, said sleeve being closed at its outer end and having one or more slots in its side wall, and a lever, connected to said sleeve, fulcrumed on the air-inlet pipe and adapted to be actuated by direct contact with the aforesaid float to so adjust said sleeve as to bring the slots beyond the end of the air-inlet pipe.

688,616. **ROTARY PUMP OR MOTOR.**—Allen Ferguson, 1,000 Springs, Idaho, assignor of three-fourths to Benjamin G. Mullins, Bliss, Idaho. The combination with a casing comprising removably-attached end plates, a shaft and an opposing piston adapted to coat therewith, of a piston having a chambered body with hand-holes in its ends, peripheral piston-blade seats and bolt-holes extending into said chambers, piston blades fitted to said seats, and blade-attaching bolts occupying said bolt-holes.

688,651. **COMBINED ORE ROASTER AND SMELTER.**—Peter Kirk, Kirkland, Wash. The combination with an open smelting hearth and vertical roasting chambers rising therefrom at each end and having ore-supporting devices in the same, the said roasting chambers and smelting hearth being in open communication; of two injectors for oil and steam arranged on the inner sides of each roaster, an air-heating chamber with steam blower arranged between the injectors, and a pipe and damper for directing said hot-air blast into the top of either roasting chamber.

688,699. **METALLIC PRODUCT.**—Marcus Ruthenburg, Philadelphia, Pa. A product, which consists in an agglomerated mass of unreduced magnetite, wherein the assembled particles are fitted together without the interposition of a binding material.



688,716. **HOT-BLAST STOVE.**—John W. Calder, Pittsburgh, Pa. A hot-blast stove, having two combustion chambers arranged side by side and extending vertically through it at one side of the stove, walls erected at the base of the stove at the other side thereof and forming arc-shaped chambers, piers sustained on said walls, checker work forming regenerative flues sustained on the piers and communicating at its lower end with the said arc-shaped chambers, a centrally disposed flue passing between the combustion chambers and the checker work, a dome at the top of the stove with which the combustion chambers and the checker work communicate, the said central flue extending through the dome and being open beyond the same, the lower end of the central flue communicating with the said arc-shaped chambers in the base of the stove, means at the base of the combustion chambers for supplying the fuel, means at the upper part of the central flue for supplying the blast and means constituting a hot-blast outlet at the base of the combustion chambers.

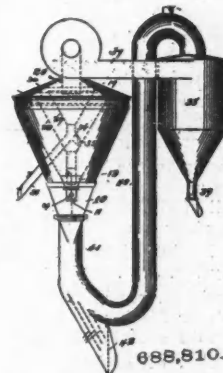
688,751. **ROLLING MILL.**—John Stevenson, Jr., Sharon, Pa. A rolling mill comprising a reversing universal mill having sets of vertical rolls on both sides of the horizontal rolls and a set of plain-faced two-high rolls arranged to receive the metal therefrom, and in line with said universal mill.

688,782. **COAL-SAVING COMPOSITION.**—Thomas Hillery, Salem, Mass., assignor, by direct and mesne assignments, to Koale Sava Manufacturing Company, Boston, Mass., a corporation of West Virginia. An improved composition consisting of mineral salt, copperas, charcoal, saltpetre, and bicarbonate of soda.

688,793. **PROCESS OF MAKING CYANIDES.**—Edmund C. Rossiter, Langley Green, and Horace W. Crowther, West Bromwich, England, assignors to British Cyanides Company, Limited, Oldbury, England. The manufacture of the cyanides of the alkalis by heating a metallic cyanide in the presence of hydrogen and absorbing the hydrocyanic acid gas so produced in caustic alkali.

688,794. **PROCESS OF MAKING CYANIDES.**—Edmund C. Rossiter, Langley Green, and Horace W. Crowther, West Bromwich, England, assignors to British Cyanides Company, Limited, Oldbury, England. The manufacture of the cyanides of the alkalis by heating a sulfo-cyanide of a metal other than the alkalis or alkaline earths in the presence of hydrogen and absorbing the hydrocyanic acid gas so produced in caustic alkali.

688,802. **AMALGAMATOR.**—Samuel A. West, San Francisco, Cal., assignor of five-eighths to Bertin A. Weyl, San Francisco, Cal. An amalgamating box provided with a pocket adapted to contain mercury, and white or bank sand in said box at the side of the pocket traversed by the pulp before reaching said pocket, said sand being adapted to receive the water but to float the gold-containing sand of the pulp and said pocket projecting above the sand.



688,810. **PNEUMATIC SEPARATOR.**—Albert Raymond, Chicago, Ill., assignor to the Raymond Bros. Impact Pulverizer Co., Chicago, Ill., a corporation of Illinois. A pneumatic separator, comprising an outer conical shell having a closed head, an opening in its lower contracted portion into which the material to be separated is delivered, and an air-supply opening below said delivery point, a plurality of internal cones concentrically arranged within each other in an ascending series, open at their tops and having separate discharge spouts at their lower contracted ends, deflectors extending downward from the head between said cones, a central discharge pipe extending downward through the head below the upper edge of the uppermost cone, an exhaust fan connected to said discharge pipe, and a dust collector into which the exhaust fan discharges.

GRAT BRITAIN.

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

Week Ending November 23, 1901.

19,592 of 1900. **TREATING IRON ORES.**—E. N. Bradford, Neath. Adding a sulphur compound to tin slags, which will combine with the iron, and so free the tin.

20,040 of 1900. **BALL MILL.**—C. W. Kitto and H. H. Kitto, London. An improved ball mill for crushing minerals.

20,513 of 1900. **ELECTROLYTIC SEPARATION OF IRON.**—A. Simon, Bordeaux, France. A process for the electrolytic production of iron from oxide in an electrolyte of fluorspar.

21,440 of 1900. **CRUCIBLE FURNACE.**—G. Welsh and R. Welsh, Sheffield. Improvements in the walls of crucible melting furnaces.

21,733 of 1900. **BLAST FURNACE GAS UTILIZING.**—B. H. Thwaite, London. A machine for thoroughly mixing blast furnace gases and air for use in gas engines.

3,586 of 1901. **COKE OVENS.**—J. H. Darby, Wrexham. A hood for bringing to the discharge end of coke ovens to receive the coke, and in which to effect the quenching out of presence of air, thus producing a silvery colored coke.

19,403 of 1901. **ALUMINUM ALLOY.**—A. Manhart, Vienna, Austria. An aluminum alloy containing copper and tin, that does not oxidize so soon as the pure metal.

PERSONAL.

Mr. C. A. Molson has returned to Salt Lake, Utah.
Mr. George Westinghouse has returned from his trip to Europe.

Mr. O. W. Harper, manager of a large mine in Ecuador, is now at Minas Prietas, Sonora, Mex.

Mr. A. J. McMillan, managing director of the Snowshoe Mine, in British Columbia, has gone to London.

Mr. H. G. Bond, a mining engineer of Santa Clara County, Cal., is visiting mining camps near Salt Lake, Utah.

Mr. Alan G. Lamson, has returned to Salt Lake, Utah, from the East after an absence of several months.

Messrs. D. D. Erwin and F. A. Winn, of Muskegon, Mich., have been in Salt Lake, Park City and other Utah camps.

Capt. F. Wain Morgan Draper is at present at the Waldo Copper Mines at Waldo, Ore., of which he is general manager.

Mr. Geo. Barkley, formerly with the Detroit Copper Mining Company, recently returned to Clifton, Ariz., from Mexico.

Mr. Robert Schorr, mechanical engineer, of Kennet, Cal., is on a short visit to Bielitz, Austria. He will return in a few weeks.

Mr. Otto M. Rosendale, mining engineer of Portland, Ore., is at Vancouver, B. C., inspecting properties for New York men.

Prof. William B. Scott, Blair professor of geology, at Princeton University, has returned from his visit to the Argentine Republic.

Mr. C. S. Herzig, has returned to New York City, from a week's professional trip through Virginia, North Carolina and Tennessee.

Mr. J. H. Sanborn, of the J. George Leyner Drill Company, left Salt Lake recently for a business trip through Nevada and California.

Mr. H. C. Bellinger, formerly superintendent of the Montana Ore Purchasing Company's smelters at Butte, Mont., is at Zacatecas, Mex.

Mr. R. H. Postlethwaite has returned to San Francisco, Cal., from a reconnaissance through New Mexico, where he will place some gold dredgers.

Mr. F. S. Goldsmith has been appointed manager of the Seaton Mining Company, at Idaho Springs, Colo., succeeding Mr. J. J. May, resigned.

Mr. John Singleton, president and general manager of the Yellow Aster Mining Company, of Randsburg, Cal., has gone to Honolulu for his health.

Mr. G. E. Price, of Helena, Mont., has left for England on the "Germania," en route to Africa, to be absent about a year on professional business.

Mr. T. E. Shelton, agent for the Wood Drill Works, of Paterson, N. J., has returned to El Paso, Tex., from a business trip into the interior of Mexico.

Mr. W. L. Thurston, formerly superintendent Omaha and Lone Star mines, at Grass Valley, Cal., has returned to that place from the Transvaal.

Mr. A. B. Lewis, president of the Majestic Company's copper mines in Beaver County, Utah, arrived in Salt Lake recently from Boston and New York.

Mr. Clarence K. McCornick, returned to Salt Lake, Utah, recently after a visit of 7 weeks to Arizona and the Pacific coast, where he went on mining business.

Mr. H. W. Harding, of Denver, Colo., is directing the placing of machinery in the refining works of the Greene Consolidated Copper Company at Cananea, Sonora, Mex.

Mr. Hartwig A. Cohen, president and general manager of the Consolidated Mercur and superintendent of Capt. De La Mar's mines, arrived in Salt Lake recently from the East.

Capt. Duncan McVitchie and Mr. V. P. Strange have been examining the Gold Dust, Rover and other claims near Mercur, Utah, in behalf of the New Mercur Mining Company.

Dr. Theodore W. Richards has been elected a full professor of chemistry at Harvard University. Prof. Richards was recently called to the chair of chemistry at Gottingen, Germany.

Mr. W. Bainbridge, superintendent of the El Paso Mine, at Cripple Creek, Colo., has been appointed manager for the Black Belle Gold Mining Company, which owns an adjoining claim.

Mr. J. B. Hammond, the Portland, Ore., dredge manufacturer, has been at Ketchikan, Alaska, where his company is putting in a wharf, compressors, and about \$60,000 worth of machinery.

Mr. George K. Fischer, chief engineer of the new smelter being erected in Salt Lake Valley for the United States Mining Company, returned to Salt Lake, Utah, recently from the East.

Mr. W. A. Prichard, has resigned as superintendent of the Keystone Consolidated Mining Company, at Amador City, Cal. He has accepted a similar position at Coolgardie, West Australia.

Mr. Geo. W. Tinsman, of Custer, S. Dak., who has been doing some work of late for the Blackbird and Queen of the Hills Mines near Salmon City, Idaho, was in Salt Lake City, Utah, recently.

Mr. D. M. Riordan, of the General Electric Company, New York City, was recently in the Picacho District, San Diego County, Cal., looking over the properties of the California King Mines Company.

Mr. Robert Angus has left the employ of the Le Roi Company, at Rossland, B. C., the position of superintendent having been abolished. The highest official in the mine proper now is Mr. L. W. Gunkle, foreman.

Mr. H. A. Keller, who as noted recently, will not act as superintendent of the Trinity Copper Company at Kennet, Cal., the coming year, states that his address hereafter will be 120 Sutter street, San Francisco, Cal.

Mr. J. F. Jones, of Philadelphia, Pa., an expert in coal, has been at Tacoma, Wash., and vicinity, making an investigation of the extensive Willis and Gale-Creeks coal properties, assisted by Mr. W. J. Wood, mining engineer of Tacoma, Wash.

Mr. Henry M. Whitney has sold a controlling interest in the Dominion Iron and Steel Company to Mr. James Ross, of Montreal. Mr. Ross will become managing director and assume the active direction of the works at Sidney, Nova Scotia.

Mr. H. L. Browne, manager of the Candelaria mining property at Parral, Mex., owned by Colorado Springs men, is going to Colorado, where he is to visit the different large milling camps to get points on the erection of a modern mill on the company's property.

Mr. Lemuel Bannister, for the past five years general manager of the British Westinghouse Company, with headquarters in London, Eng., has resigned all his positions with the Westinghouse interests and will remove to Germany with his family on account of poor health.

Messrs. F. M. Coburn, president, and C. W. Baine, secretary, of the Pittsburg Coal Company, recently resigned their positions. It is said the reason for Mr. Osborne's resignation is that he desires to give more attention to his private matters and also because his residence is in Cleveland.

Mr. E. L. McGary, late chief engineer of the American Steel Hoop Company, has opened offices in the Kleber Building, Pittsburg, Pa., as consulting engineer. He will design and install complete rolling mill plants, structural, bar and guide mills, sheet and tin plate mills, plate and universal mills and steam, hydraulic and electric plants.

Mr. J. M. Callow, mechanical engineer and metallurgist, was in Park City, Utah, recently making metallurgical researches. Mr. Callow was accompanied by Mr. D. J. Nevill, mechanical engineer for the United States Mining Company and assistant to Mr. George K. Fisher, the designer of the United States Smelter now in course of erection in Salt Lake Valley.

Mr. Thomas D. Adams, of New York, treasurer of the American Smelting and Refining Company, has resigned his position to take an interest in a new banking house enterprise shortly to be organized. Mr. Adams was assistant and acting treasurer of the Consolidated Kansas City Smelting and Refining Company, for 10 years previous to the absorption of that company by the American Smelting and Refining Company.

OBITUARY.

Francis Wenrich, died at his home in Millersburg, December 12. He was born in Dauphin County, Pa., September 9, 1810, and was in his 92d year.

Mr. Wenrich was left to his own resources when very young and at 16 he engaged in contract work. He afterwards superintended the building of the Lykens Valley Railroad between York and Baltimore. He also directed the excavation and construction of the famous Summit Branch coal basin at Millersburg, the great shipping point by canal of all the coal mined in the Lykens District, until this trade was relieved by the Northern Central Railroad. Then he became the shipping agent for all the coal mined by the Lykens and Summit Branch Coal Companies. Here he manifested foresight and sagacity as a shrewd business man and opened markets for the product of these famous operations. He continued in this capacity until 1867, when he retired to private life.

William Van Slooten, 44 years old, a well-known mining engineer of New York City, shot himself December 10 at his home in Brooklyn as a result of mental trouble and nervous prostration. Mr. Van Slooten was born in New Orleans in 1858. His father, John Van Slooten, participated in the revolutionary movement in Germany in 1848 and came to this country as a refugee. Young Van Slooten had the distinction of being the youngest graduate of the University of Virginia, securing his degree as a mining engineer when 19. After leaving college he studied law in the office of James B. Minor in New Orleans, but soon abandoned his law studies to follow the profession of mining engineer. Shortly after reaching his majority, he

was appointed Assistant Assayer of the Mint in New Orleans, and held the place for 2 years. He was engaged for several years in mining operations in New Mexico, Colorado, Arizona, and Nova Scotia, in the last-named place, as the representative of a London syndicate. He came to New York in 1881 and established himself as a mining engineer. He was once connected with the firm of U. O. Crane & Company, metal dealers. His mental troubles were the result of a fever contracted on a recent visit to South America. He leaves no children.

SOCIETIES AND TECHNICAL SCHOOLS.

AMERICAN ELECTRO-CHEMICAL SOCIETY.—Over 200 persons have already enrolled for membership in this proposed new society, and the first meeting for definite organization and reading of papers and discussion will probably be held in Philadelphia about Easter. An enthusiastic gathering of electro-chemists from all over the United States is assured. Carl Hering, of Philadelphia, is temporary secretary.

CASE SCHOOL OF APPLIED SCIENCE.—The catalogue of this school at Cleveland, O., for the year 1901-02 gives the total number of students enrolled as 363. The school provides regular courses of study in civil, electrical, mechanical and mining engineering, physics, chemistry, architecture and general science. Each course requires 4 years for its completion. The catalogue describes the advantages and facilities offered students and gives data regarding examinations, expenses, etc.

COPPER COUNTRY ENGINEERING SOCIETY.—This society was organized at Houghton, Mich., recently with the following officers: F. G. Coggin, Jr., president, superintendent Atlantic Mills; Prof. F. W. Spurr, vice-president, of Michigan College of Mines; W. J. Smith, treasurer, engineer Wolverine Mine; G. A. Christensen, recording secretary; J. O. Jackson, corresponding secretary. The object of the society is to bring together all persons interested in the various ranches of engineering in the copper country to collect data, have practical discussions, etc. A charter membership of about 75 is expected. Meetings are held in Science Hall of the Michigan College of Mines at Houghton on the first Saturday evening in each month.

ENGINEERS' CLUB OF ST. LOUIS.—At the meeting, on December 4, 31 members were present. Mr. Fritz Luburger was elected to membership.

The annual reports of the officers and various committees of the club were read. Owing to the absence of the president, no report of the Executive Committee was made. The secretary's report was read, and on motion made and carried it was accepted and filed. The treasurer's report was read and referred to the Executive Committee. Reports of the Librarian, members of the Board of Managers, and the Entertainment Committee were read, and motion was carried that they be accepted and filed. The report of the Committee on Prizes was read. The chair announced that the recommendations of the committee had been approved by the Executive Committee, and in accordance with their recommendations he was pleased to award the prize to Mr. J. S. Branne for his paper entitled "The Steel Skeleton Construction of a Tall Office Building," which was read before the club at the meeting held November 7.

INDUSTRIAL NOTES.

The Gray & Blaisdel air compressor plant, at Bradford, Pa., is practically finished.

The Lorenzo Marques Water Company, of Portuguese, East Africa, will shortly be in the market for the purchase of steam pumps.

The Ingersoll-Sergeant Drill Company, of New York City, has purchased additional ground at Easton, Pa., and will increase largely its present plant there.

The plant of the Dayton Coal and Iron Company, of Dayton, Tenn., will be improved by the expenditure of \$65,000, recently decided upon by the directors for improvements.

The Columbia Engineering Works, of Portland, Ore., of which Fred. Hesse is manager, will soon move into a new brick structure 200 by 100 ft. in North Portland.

The Goubert Manufacturing Company, with offices in New York City, has just shipped 2,500 h. p. feed water heating outfits to Sydney, Australia, for the main power station of the Sydney City & Suburban Tramways.

The Chicago Asbestos Manufacturing Company, of Chicago, Ill., has been incorporated with a capital of \$4,000 to manufacture asbestos, mineral wool, hair, felt, etc. The incorporators are David Q. Stephens, George A. Vandergrift and William E. Stout.

Recently No. 2 stack of the Ohio plant of the National Steel Company, Youngstown, O., working on bessemer ores, produced 800 tons of iron in 24 hours. This is the greatest record ever made by any blast

furnace in the world. The stack is 105 ft. high, and was completed during the past year.

Charles T. Schoen, late president of the Pressed Steel Car Company, which he founded and until recently directed, is at work on the details of a new car wheel plant near Pittsburg. The machinery is under contract to be delivered March 1, 1902, and Mr. Schoen hopes that everything will be in readiness to begin operations by April 1.

The Globe Iron Works, Stockton, Cal., have been supplying their Globe battery stem guides to the Golden Chest Mining Company, of Murray, Idaho, and the Liberty Bell Gold Mining Company, of Telluride, Colo. The firm reports considerable demand for the Truax ore cars, the manufacture and sale of which it controls on the Pacific Coast.

Open-Hearth furnace No. 3, of the Solid Steel Casting Company, at Chester, Pa., recently completed a remarkable run of 490 consecutive heats without any stop for repairs, during which some 12,250,000 pounds of steel castings were made. The furnace is of Herick design, 15 tons capacity, and is supplied with 2 improved gas producers.

Among the other orders received by the Acme Machinery Company, of Salt Lake, Utah, is one for a 500-light electric plant and a 150-h. p. Corliss engine. The company reports that the new dredging plant recently equipped for the Hoff Dredging and Exploration Company, is in active operation on the Snake River, and is giving satisfaction.

The Laclède Fire Brick Manufacturing Company, of St. Louis, Mo., has completed a new vitrified brick plant and has also contracted for an addition to its sewer pipe factory, and has in course of erection a new building 139 ft. long, 42 ft. wide and 3 stories high. These enlargements will increase the output of sewer pipe about 50 per cent.

Caldwell Brothers, of Tacoma, Wash., recently shipped a large compressor, 3 drills, and a complete milling outfit to the Olympia Mining Company, on Prince of Wales Island, Alaska. Also an invoice of machinery to the Northwest Copper Company, of Texada Island, and another to the Great Excelsior mines in the Mt. Baker District, Washington.

The Alabastine Company, of Grand Rapids, Mich., is building a brick and iron plaster mill and separate power house, to replace the mill recently destroyed by fire. The mill will have a capacity of 120 tons of stucco per 10-hour day, and the power plant will be of 250 h. p. capacity, equipped with Allis-Corliss engine. The equipment has been purchased.

The plant and property of the Buckhorn (W. Va.) Portland Cement Company was recently sold under a decree of the United States Court in the suit of the Equitable Trust Company, of Philadelphia, Pa., and was bought by John T. McGraw for \$67,550. The property, which has not been finally completed, was owned by Philadelphia and New York men.

The Bleichert aerial wire rope tramway now installed at the New Year Gold Mining Company's property, at New Year, near Lewiston, Mont., has a length of 5,150 ft. and a guaranteed capacity of 25 tons per hour, and cost \$17,500. This is the first wire rope tramway ever erected in that county, and was furnished by the Trenton Iron Company, of Trenton, N. J.

The McFeely-Wheeler Brick Company, recently organized at Pittsburg, Pa., with a capital stock of \$30,000, has purchased five acres of land at Latrobe, adjoining the property of the Superior Coal and Coke Company, and has completed a new plant with a capacity of 10,000 silica brick per day. F. B. McFeely is president; G. Y. Wheeler, secretary, and J. H. McFeely, vice-president.

The Pelton Water Wheel Company, through its New York City offices, has taken a contract from the Toluca Electric Company, of Toluca, Mex., for the shipment of some 120 tons of pipe and 3 700-h. p. water wheel equipments, which are to be installed in that concern's hydraulic plant. A 300-h. p. plant, including a quantity of piping, is also to be shipped by the Pelton concern for another power installation in Mexico.

Courtenay De Kalb, Gerente-General of the Fernando Mining Company, at San Fernando, Mexico, is reported desirous of purchasing corrugated cylindrical sheet iron cans, "knocked down," such as are employed for gunpowder. He also wants a crimping machine for the purpose of setting up the cans in Mexico. The cans are required for the shipment of granulated matte. They should measure 11 in. in diameter by 17 in. long inside.

The association of the manufacturers of structural steel, better known as the "beam pool," has been renewed for another year. The association stands as it did before and W. C. Temple, of Pittsburg, has been elected commissioner. The following firms are members: Carnegie Steel Company, Jones & Laughlins, Limited, Pittsburg; Cambria Steel Company, Johnstown, Pa.; Passaic Rolling Mill Company, Passaic, N. J., and the A. & P. Roberts Company, owners of the Pencoyd Iron Works, Pencoyd, Pa.

The Norris Mining and Manufacturing Company, a new concern in which Pittsburg, Pa., men are interested, will soon begin developing 950 acres of coal and fire clay lands in the Salineville, O., field. The company was chartered under the laws of Ohio with a capital stock of \$150,000. The company expects to produce 75,000 fire bricks daily in a new plant to be erected by April 1 next. The following are the officers and directors: J. H. Norris, president and treasurer; S. J. Burnside, secretary and general manager; F. N. Norris, Charles W. Walper and Henry N. W. Fleckner. All are Pittsburg men except F. N. Norris, who is a resident of Sebring, O.

An American exhibition will be held in the Crystal Palace, London, Eng., from May to September, 1902. Alfred H. Post, of the Produce Exchange, New York City, is commissioner for the United States. The exhibits are to be in 11 classes; machinery and mechanical industry, including mining and electrical machinery, locomotives, automobiles, typewriters, hardware and tools; natural and agricultural products; prepared food products, pharmaceutical and kindred preparations and surgical appliances; carriages, vehicles and leather goods; lighting, heating, ventilating and sanitary appliances; textiles, fabrics and clothing; musical, photographic and optical apparatus; education and science; naval and military appliances, including ordnance, ammunition and small arms; fine arts and decoration. In connection with the exhibition a commercial bureau will be established where information will be supplied as to channels of trade and the placing of goods upon the British and Continental markets.

The H. W. Johns Manufacturing Company, of New York City and the Manville Covering Company, of Milwaukee, Wis., each company having been closely identified as handling the goods manufactured by the other, have consolidated their interests. This consolidation is to take effect January 1. The new company, whose capital stock will be \$3,000,000, will be known as the H. W. Johns-Manville Company. Its officers will be: T. M. Manville, president; C. B. Manville, vice-president; George W. Gladwin, vice-president; F. R. Boocock, treasurer, and H. E. Manville, secretary. James G. Cannon will be chairman of the Board of Directors, C. R. Manville will be manager of the Western department, and he, with C. B. Manville will remain in Milwaukee. T. F. Manville and H. E. Manville will remove to New York City. The new company is rapidly completing a plant at Milwaukee for the manufacture of carbonate of magnesia and mineral wool. When this plant is completed, the company will be prepared to furnish a most complete line of all grades of steam pipe and boiler coverings and asbestos goods of all descriptions.

The Jessup Steel Company, Washington, Pa., composed of \$250,000 of British-American capital, has been incorporated under the laws of Pennsylvania for the purpose of building and carrying on the new works of William Jessup & Sons, Sheffield, Eng. The directors of the new concern are William Jessup, of Sheffield; Herbert Hughes, of Sheffield; W. F. Wagner, of New York; E. L. Hand, of Philadelphia, Pa.; C. N. Brady, of Washington, Pa., and Robinson Hughes. The officers of the company will be William Jessup, president, Robinson Hughes, vice-president, and James Jessup, secretary and treasurer. The initial plant will consist of 3 main buildings—a crude melting shop, 225 ft. by 110 ft.; rolling mill plant, 275 ft. by 110 ft. and a power house, 100 ft. by 60 ft. The company at first proposes to manufacture sheet steel. A large portion of the ore utilized will be imported from Sweden. The Washington works will be designed by James J. Mahon, of Chicago, Ill., through whom the contracts for the construction and equipment of the plant are being given out. The contract for the grading and foundations is being executed by C. J. McDonald & Son, of Pittsburg, Pa. The contract for the buildings, including about 1,000 tons of structural steel to be turned out at the Pittsburg plant of the American Bridge Company, has been secured by Gustav Kaufman, of New York City. The rolling mill machinery will be supplied by the G. A. Hogg Company, of Pittsburg, Pa. The engines, one 28 by 72, another 24 by 60, will be built by the Lane & Bodley Company, of Cincinnati, O., and the water-tube boilers are to be manufactured by the Babcock & Wilcock Company, of New York City. Contracts for machine tools, cranes, etc., have not yet been placed.

TRADE CATALOGUES.

Bristol's recording pressure and vacuum gauges are described in an illustrated 12-page pamphlet published by the Bristol Company, of Waterbury, Conn. These gauges are regularly furnished with charts making one revolution in 24 hours, but are also furnished with charts making one revolution in 15 minutes, 1 hour, 6 hours, 12 hours, and 1 week. The charts are graduated for a wide range of pressures.

The John Davis Company, of Chicago, Ill., has

published its steam catalogue C, a cloth-bound 12 mo. volume of 543 pages. The company states the book contains a complete list of the steam, engineers' supply and waterworks material manufactured and handled by the company. The list includes cast and malleable iron pipe fittings, steam, gas and water pipe, boiler tubes, spiral rivetted hydraulic pipe, artesian well supplies, valves, water gates, cocks, steam gauges, oil pumps and feeders, injectors and inspirators, boilers, packing, belts, hydrants, hose and hose couplings, hand pumps, and pipe fitters' supplies.

Rock drills of improved construction are described in an illustrated 40-page pamphlet, published by the Wood Drill Works, of Paterson, N. J. These drills are stated to be the result of nearly 10 years' experience in the manufacture of rock drills and mining machinery, and the manufacturers claim lightness, strength and durability for their product. The construction is said to be simple, and the materials used the best obtainable. The valves are described as of the spool type, having no mechanical connection with the piston and giving a variable stroke. The Wood drills are made in 8 sizes, suitable for drilling the smallest hole to holes 26 or 28 ft. deep.

Catalogue No. 45, published by the Sullivan Machinery Company, of Chicago, Ill., describes the company's Corliss engines. The company states that in these engines semi-steel is used for many parts formerly made of cast iron on account of its greater strength and toughness. The regulating device is described as simple and delicate, and the cut-off gives a wide range; thus, it is remarked, making the engines particularly suitable for electric light or rolling mill purposes. The design of the engine is at once simple and massive, while the outlines are graceful. The engines are built simple, tandem compound and cross compound. The company says it makes a specialty of hoisting engines, either of the drum or reel type, built to suit any requirement.

GENERAL MINING NEWS.

ALABAMA.

DE KALB COUNTY.

Alabama Coal, Mineral and Lumber Company.—This Reading, Pa., company has secured 2,000 acres of the Fern Cliff coal lands, near Scottboro, and development, will be pushed after January 1. The officers of the company are I. F. March, president, and M. L. Riler, secretary.

ALASKA.

PRINCE OF WALES ISLAND.

(From Our Special Correspondent.)

Wales Copper Mine.—Superintendent George W. Boggs has men opening a road to the mine, and taking ore preparatory to making a shipment the first of the year. The ore is said to run from \$28 to \$34 to the ton. The property is owned by Tacoma men.

ARIZONA.

MOHAVE COUNTY.

C. O. D.—This mine on the Wallapai Valley side of the Cerbat Range has been worked off and on for many years. The property is now owned by the C. O. D. Mines Company, of which Henry S. MacKay is manager. The vein is about 26 ft. wide, with a shoot 4 to 10 ft. wide in a quartz gangue. This shoot is opened at the 300 level. The ore is an iron and lead sulphide, carrying gold, silver and lead values. The company has erected a concentrating mill of 40 tons daily capacity, with crusher, trommels, high-speed rolls and Bartlett tables. It is stated that the mill will be enlarged and a shaft house and sorting room built. About 1-10th of the output will be shipped crude and 9-10ths milled. The company has acquired the Prince George Mine at Stockton Hill and the Golden Gem at Cerbat.

Leonora Mill.—This mill at Hardyville, recently started on a trial run. The ore runs about \$35 per ton, and the mill is said to save a high percentage of the values. It is the intention of the company to repair the hoisting plant and start work.

PINAL COUNTY.

Casa Grande Copper and Gold Mining Company.—This company, the new owners of the old Jack Rabbit Mine, 20 miles south of Casa Grande, will treat the ore by the Russell lixiviation process. The contained values are gold and silver, in the form of chloride.

SANTA CRUZ COUNTY.

Montrose.—Captain J. D. Burgess, of Tucson, is arranging to erect a 60-ton smelter at Calabasas, to reduce ores from this mine in Josephine Canyon, Santa Rita Mountains.

YAVAPAI COUNTY.

Minnesota.—The big hoisting plant for this mine is being installed at Chloride. It was made for sinking 2,000 ft. As soon as it is in place a large force of men will begin sinking, drifting and stoping. The new building to contain the concentrating plant is inclosed. The new concentrator is expected to be in operation early in January.

Philadelphia & Arizona Mining Company.—This company has a new gasoline steam hoist installed at its new well. The water is for the new concentrating plant of the Minnesota Mine, 2 miles away.

Pinkham.—This mine at Chloride has put in a 12-h. p. Fairbanks & Morse steam hoist and outfit.

Schuykill.—This mine at Chloride, is working smoothly. Mr. W. D. O'Neil is the manager.

Tennessee.—It is given out that the closing of this mine at Chloride was caused by difficulties with the smelter at Pueblo, Colo., to which the mine and mill had been sending their ores and concentrates, and that as soon as the smelter at El Paso starts up, work will be resumed in every department of the mine.

CALIFORNIA.

AMADOR COUNTY.

(From Our Special Correspondent.)

Lambing.—Frank and Henry Lambing have begun work on a placer claim near May and will use the hydraulic system.

Price.—The new company developing this mine north of Plymouth has started a tunnel from Indian Creek.

Shenandoah.—S. K. Thornton, of Plymouth, superintendent, is installing new machinery.

Steiger Terra Cotta Works.—This San Francisco concern which owns the Carbonate banks is opening new clay pits on the Glasscock property near Ione.

Tricot & Miller.—These parties have secured the Ed-Edel's ranch on Indian Creek, near Plymouth and will attempt to save the fine gold in the tailings and sand which have washed down from the Plymouth quartz mills. These tailings are from 4 to 7 ft. deep and about a mile long. Buildings and machinery are being erected.

CALAVERAS COUNTY.

(From Our Special Correspondent.)

The entire group of mines at Angels, including the Utica, Madison, Lightner, etc., have started again after a month's shut-down, due to repairs on the Union ditch.

Bovee.—This old mine at Angels is being unwatered.

Duchess.—A ledge of rich ore has been cut in this mine at Vallecito.

Ennis.—This old mine at Jesus Maria, 20 miles from Valley Springs, is to be re-opened by William Roundtree, of San Francisco. The Dolphine, another old mine near by is also to be reopened.

Fritz.—At this mine near Altaville night and day shifts are sinking the main shaft.

Gold Hill.—A rich strike is reported in this mine at Angels, owned by an Illinois corporation with C. Wolf superintendent. Work has stopped until mill machinery can be put in.

Melone's Consolidated.—This group of mines, owned by a Boston company, of which Wm. C. Ralston, of 331 Pine street, San Francisco, is general manager, will soon have 60 stamps of the new mill ready. Finally 120 stamps will be installed. The large new ditch and flume will shortly be ready. The mine is at Robinson's Ferry, where very rich telluride ores have been mined. A dam is completed and operations on a large scale will shortly begin.

Utica.—At this mine, Angels Camp, while the repairs to the Union ditch were being made, various repairs were made and the mill thoroughly overhauled.

EL DORADO COUNTY.

(From Our Special Correspondent.)

Red Hill.—W. W. Stone, Jr., has applied to the Debris Commission for a license to work this mine near Placerville by hydraulic process. The tailings are to be deposited in an old pit.

Gignac.—Application has been made to the Debris Commission by Mrs. Oliver A. Stone to work by hydraulic process this mine near Placerville. The debris is to be impounded in Webber Creek.

HUMBOLDT COUNTY.

(From Our Special Correspondent.)

Fortuna.—This copper property with ore carrying some gold has been bonded for a year on the basis of \$150,000 as selling price.

Hoagland Oil Well.—This oil well at Upper Mattole, from which much was expected, has been abandoned after reaching 2,000 ft. Caving at the bottom and other adverse conditions stopped work.

INYO COUNTY.

(From Our Special Correspondent.)

Geo. D. Calvert, Chas. Walter and D. P. Hargis, owning a claim near Aberdeen, have bonded it to Norman Belden, of Bakersfield, Kern County, for \$15,000.

Ubaheda District.—There are extensive deposits of copper in this district, Saline Valley, but lack of shipping facilities has prevented development. Only work enough is done to hold the claims.

KERN COUNTY.

(From Our Special Correspondent.)

Associated Oil Company.—This company is formed to combine all the companies in the field under one management and thereby raise the price of oil and will be in working operation by the first of the year.

Bullard.—This mine at Woody has been bonded by John Keith, of Bakersfield, and will be opened at once.

Pacific Automobile Company.—This corporation formed with a capital of \$75,000, has ordered 4 steam automobiles capable of carrying 12 people to run through the oil fields in the west side of the county on schedule time. They will carry mail and express.

Randsburg Railway Company.—This company intends to sink shallow wells at the dry Cuddebach Lakes, raise the water 1,200 ft. to the top of Red Mountain, pipe it about 5 miles to Randsburg, and sell it to the mines. A good supply of water is expected. Lack of cheap water is the great drawback in working small claims at Randsburg.

Sunset Railroad.—This road will be opened by January 1, giving the producers of that territory an outlet.

York Syndicate.—This company has struck a gusher on its holdings in the Kern River fields at a depth of 902 ft.

MARIPOSA COUNTY.

(From Our Special Correspondent.)

Mariposa Grant.—Miners are allowed to work on leased claims on this grant, when permission is asked from the Mariposa Commercial and Mining Company. John H. Mackenzie, of Mt. Bullion, is manager. The secretary is Joseph H. Mooser, of 320 Sansome street, San Francisco. The company is operating the Princeton, Josephine, Pine Tree, Mariposa, Louis and Mt. Ophir mines.

Texas.—John Jackson, B. McFadden and Henry Colonel have leased this old mine, near Princeton, and will develop it.

MODOC COUNTY.

(From Our Special Correspondent.)

Quicksilver Discoveries.—Discoveries are reported 25 miles southeast of Cedarville, and several claims have been staked. This is the extreme northeastern part of the State in the Sierra Nevada, an entirely new section for cinnabar. The claims have not been sufficiently developed to prove the extent of the deposits. The ore so far found is reported of good grade.

MONO COUNTY.

(From Our Special Correspondent.)

Sunshine.—This cyanide plant at Bodie, W. D. Davidson, superintendent, has closed down for the winter, after a successful 7-months' run on tailings.

NEVADA COUNTY.

(From Our Special Correspondent.)

Home.—At this mine, Nevada City, there are 30 stamps running 24 hours a day. J. D. McFall is superintendent.

ORANGE COUNTY.

(From Our Special Correspondent.)

Dunlap Mining.—Machinery has been shipped from Los Angeles to Frank Porter of Orange to replace that which has been idle for years on the Dunlap-McArthur mines in Silverado Canyon. Active work is to start.

SACRAMENTO COUNTY.

(From Our Special Correspondent.)

Ashburton Mining Company.—This company's dredger near Folsom, managed by Donald Cameron, is in good ground and making satisfactory clean-ups of about \$6,000 per week. Dredgers are being built by 2 other companies in the vicinity.

Colorado Pacific Gold Dredging Company.—This company has let a contract to build another dredge at Mississippi Bar near Folsom. It is the intention to run both dredges by electricity.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

Colorado River Gold and Copper Company.—This company has been formed by Eugene Gannon, Arthur Wilson, R. L. Coons, Arthur Slickwell, P. E. Vestal and John Spence, of Los Angeles. The 9 claims taken up are on the Colorado River, 60 miles south of Needles, and opposite Giers Landing. Developments are said to show evidences of a good body of copper ore. Eugene Gannon is secretary.

Columbia.—This mine in the Providence Mountains near Blake is to add 15 stamps to the mill.

Davis Mining and Smelting Company.—This company, which owns mines at Oro Grande, is preparing to install an 80-ton smelter.

Malachite Copper-Gold Company.—This company, of which James B. Cook, of Los Angeles, is secretary, recently organized to work 5 copper claims near Daggett, has a shaft down 165 ft. and expects before long to ship to the smelter. The mines adjoin the Osborn group.

Nitrate Deposits.—It is stated that a rancher named George Zwanwig has found extensive nitrate deposits on the Mohave River, 12 miles from Newberry, a station on the Santa Fe Railroad. A number of Los Angeles men are interested in the claims, including Clinton Johnson, D. S. Cahill, H. E. Young, H. E. Carter, I. F. Johnson and C. P. Watson. Nothing has yet been done to develop the deposits, which are said to cover over 200 acres.

SANTA BARBARA COUNTY.

(From Our Special Correspondent.)

Quicksilver Deposits.—Deposits of cinnabar at the head of Santa Inez Valley are being investigated by Los Angeles men.

Santa Barbara Liquid Asphalt Company.—The refining plant of this company at Summerland, which was rebuilt about 2 months ago after having been burned up, was destroyed by fire on December 16, with a loss of some \$10,000.

SANTA CLARA COUNTY.

(From Our Special Correspondent.)

Santa Teresa.—This quicksilver property, 11 miles from San Jose, has passed into the hands of Boston men, the negotiations having been conducted by R. B. Harper, of San Francisco. The mine was opened first some 30 years ago, but litigation kept it idle for a long time. Mr. Kelly was the owner.

SHASTA COUNTY.

(From Our Special Correspondent.)

Midas Mining Company.—At Knob this company has cut the ledge at the 600 level.

Mount Shasta Gold Mines, Limited.—This company will shortly start as all the new machinery will be shipped in. The property is near Shasta, and F. E. Ware is superintendent. The company's main office is in Los Angeles, and H. A. Ladd, is secretary. The mine is to be worked on a larger scale.

Oak.—Henry Mitchell has bonded this group of copper claims at Bushy Canyon, near Copper City.

SIERRA COUNTY.

(From Our Special Correspondent.)

Dudley.—The Corotoman Mining Company has been organized in Los Angeles to work this gravel mine at Forest. The directors are M. C. and Helen Green, of San Diego, and W. R. and Henry A. Green, and E. B. Spencer, of Los Angeles.

Lassiat.—J. B. Lassiat, of Poker Flat, 9 miles from Gibsonville, has applied to the Debris Commission for a license to hydraulic at this mine, the tailings to be impounded in an old pit.

SISKIYOU COUNTY.

(From Our Special Correspondent.)

Gold Ball.—The Gold Ball or Klamath Mine on Salmon River near Rollin, owned by the Yreka Mining Company, of which L. D. Ball is superintendent, is yielding good returns with plenty of water. The company also owns the Mountain Laurel and the Ohio claims.

Helena Mining Company.—This company at Callahan's has started up again after overhauling the cyanide plant and adding a new 40-ton vat. A. D. Chidsey, of Easton, Pa., is president, and principal owner in the company, and James McKeen, of Callahan's, is superintendent.

Jordan.—This hydraulic claim near Cecilville owned by the Salmon River Consolidated Gold Mining Company, W. A. Cooper, manager, has been started for the season with an abundance of water.

Preston Peak.—This copper property, near the Oregon line, is to start development work at once, the trouble between the owners having been compromised.

SOLANO COUNTY.

(From Our Special Correspondent.)

St. Johns.—The San Francisco company which has taken over the St. Johns and Mount Luffman quicksilver mines, 5 miles from Vallejo, will retain Alf. Tredidgo as superintendent. Electric power is furnished by the Bay Counties Power Company, whose line passes close to the main adit, at \$5.40 per h. p. per month for 24 hours' service. The old furnaces at the mine need but slight repairs for use again, and it is expected that the mine will shortly become productive.

TUOLUMNE COUNTY.

(From Our Special Correspondent.)

App.—Captain W. A. Nevills, owner of this mine at Quartz, contemplates putting in chlorination works and a new hoist. The old hoist will be moved to the new shaft at the north end.

Contention.—A small mill has been erected near Columbia. C. Summers is superintendent.

Crackerjack.—Messrs. Quince Eckel and W. E. Cole, owners, have been doing development and shipping some bullion.

Harvard Mining Company.—At shaft No. 1 a new hoist, engines, etc., are to be set up. W. B. Newcomb, of Oak Hill, Napa County, is general manager.

Jumper Gold Syndicate of California, Limited.—P. George Gow, of Stent, is general manager. The company is preparing to use petroleum as fuel. The 60-stamp mill is now run by electricity.

Longfellow Gold Syndicate, Limited.—This Glasgow, Scotland, company's sulphurets are being treated by the cyanide process by C. F. Leithold. A. P. Dron is superintendent.

Mountain Lily.—This mine at Columbia has started under bond to Messrs. Woodruff and St. Clair, the latter being superintendent.

Norwegian.—This mine at Tuttle town, is noted as having yielded some remarkable quartz gold pockets. Some of the surface ground on Jackass Gulch is to be worked by a small hydraulic plant. Wm. Murdoch, 805 Market street, San Francisco, is president of the company; Captain Hewiston is superintendent.

Santa Ysabel.—This property, near Quartz, has 12 men employed. A winze was recently sunk from the 600 to the 700 level, where cross-cutting is under way. Ore from a 2-1/2 ft. vein opened up above the 700 level is said to go \$20 to the ton.

Seminole.—This mine at Carter's has been unwatered and the mill will shortly start.

Soulsby.—The rich shoot found in this mine at Soulsbyville continues to improve.

Springfield Tunnel Company.—L. F. Triplett, T. F. Woodside and A. L. Homer have bonded this placer claim on Table Mountain west of Columbia for \$18,000.

Stockton Gravel Mining Company.—W. Tucker, superintendent, has started up the company's property known as the Philadelphia Diggings, near Columbia.

Tanzy.—Messrs. Berney, Wainwright and Monroe have found a very rich pocket in this mine at Sonora which they have under lease. The mine has yielded several very rich pockets during the past 3 years.

TRINITY COUNTY.

(From Our Special Correspondent.)

Sweepstake.—About 450 men are working on the pipe line of this hydraulic mine near Weaverville. The difficult job of laying the 5,800 ft., known as the La Grange siphon, is nearly completed. The company expects to be able to work at least 3 giants by the first of the new year.

COLORADO.

BOULDER COUNTY.

Ward-Rose.—This company, at Ward, according to a local paper, in an upraise from the tunnel, has cut a 1-1/2 in. streak of ore giving 150 oz. gold and 75 oz. silver to the ton. R. A. Donaldson is manager.

CLEAR CREEK COUNTY.

(From Our Special Correspondent.)

Central Tunnel.—A new air compressor has been received for driving the tunnel to the north at Idaho Springs. The same people are also putting in a Leyner compressor at the Edgar Union Mine.

Colorado Specie Payment.—An option has been secured by this company on the Champion Mine, also the mill and other claims belonging to the Kohinoor-Donaldson Company, an English concern. The property was sold for taxes but effort is to be made to break the tax deed. The Kohinoor-Donaldson people have allowed the property to go to tax sale for several years but have heretofore redeemed it before a deed could be issued. The Dover Company adjoining the mill has possession under deed.

S. & S. Mining Company.—Articles of incorporation have been filed by P. R. Stanhope, Arthur Ponsford and K. McDonald for \$100,000. The company is to acquire the silver mines on Red Elephant Mountain, which were worked several years ago. The Tabor tunnel is to be driven for drainage. Machinery has been installed.

GILPIN COUNTY.

(From Our Special Correspondent.)

Mining Deeds and Transfers.—W. Morgan et al. to Tungsten Gold Mining and Milling Company, the Walter A. lode, Kansas District; F. C. Rowley to J. H. Servis, the Wood lode, Russell District; J. P. Leming to P. Rohling, the Deadwood placer, South Boulder District; P. R. Cobb to Boulder Park Mining and Milling Company, the Carrie K, John D., Prescott and Frank M. lodes, Pine District; C. F. BARNED et al. to T. H. Stryker 2-7 interest in Clark-Gardner lode, Nevada District; Mattie M. Collier to N. W. Hawley, 1-3 interest in Sunny Side lode, Independent District; E. H. Humphrey et al. to L. J. Rachofsky et al. the Becky Sharp lode, Russell District; Rees C. Vidler, trustee to Lucania Transportation, Mining, Tunnel and Drainage Company, the Camperdown and 9 other lodes in Russell District; G. W. Ward to S. L. Young 1-8 interest in Dane and Half Way lodes, and 1-16 interest in Miss Add lode in Phoenix District; B. B. Lawrence to Gold Coin Mining and Smelting Company the Hidden Treasure No. 2 and 21 other lodes and the Camp Grove mill site, in Nevada District.

Bobtail No. 5.—Leasers from a depth of 700 ft. be-

low the tunnel level, recently shipped 24 tons of iron to the State ore sampling works which brought returns of over \$100 per ton. L. H. Stockbridge, Central City, is manager.

Boodle Syndicate, Limited.—A good looking streak of lead ore has been opened in the Boodle shaft at a depth of 250 ft., which carries fair values in gold. The British owners are to sink to much greater depth to have plenty of stoping ground. They have begun to ship concentrating ores. W. J. Richards, Central City, is in charge.

Lillian Mining Company.—Operations have been resumed on this property in Russell District and development work will be pushed. R. Hughes, Russell Gulch, is in charge.

Missouri.—Denver men are interested under a bond and lease in extending the 300 west level where a nice crevice showing gray copper and iron has been opened, carrying good values. Sinking is to start soon. W. Woods, Central City, is in charge.

Providence.—Duluth, Minn., men are interested in a lease and bond and have started repairs on the Fort Logan tunnel in South Boulder District, which has been driven a distance of 500 ft. E. Shepard, Rollinsville, is in charge.

Topeka.—Some work has started in a couple of levels, under the direction of A. J. Richardson. Litigation has tied the property up for nearly 2 years.

Travis Gulch Mining and Milling Company.—Eastern parties are interested in a group of 15 lodes and a placer situated in the Central District. A cage shaft is being sunk on the General Garfield lode for a main shaft. It will go to 500 ft. after which cross-cutting will start to open up the other veins. A new steam plant is to be installed. A. M. Willard, Gilpin, is in charge.

Wilkes-Barre Gold Mining Company.—A gasolene plant of about 12 h. p. is to be installed. Development work has been very successful. E. C. Sherman, Central City, is manager.

HINSDALE COUNTY.

Bachelor.—This shaft at Lake City, is down 325 ft., and will be continued with Rufus Neal in charge. Good ore is reported encountered at 300 ft.

Ute & Ulay.—John McLellan, master mechanic, has returned from a visit to Leadville and is installing the new compressor plant at this Lake City mine. Part of the machinery has arrived and the remainder is en route. The compressor entire will occupy floor space 42 ft. long and weighs 100 tons.

LAKE COUNTY—LEADVILLE.

(From Our Special Correspondent.)

Leadville Production.—The average daily output is 2,000 tons, largely oxidized iron and manganese-iron ores. The smelters are in the market for all the siliceous and iron ores they can get but there is no change in the glut of sulphide ores.

Belgian.—New lessees are working the old Doddridge where a fine carbonate contact has recently been encountered.

Dinero Leasing Company.—Ore is now coming from the 3d and 5th levels. The 450-ft. shaft will be sunk another lift of 60 ft. The ore averages about \$40 gross in silver to the ton.

Fanchon Mining Company.—In addition to shipping occasional lots of good ore from the old workings arrangements are being made to sink the new shaft to the lower contacts.

Home Extension Mining Company.—Plans are under way for resuming work at this new down-town shaft where a large manganese body was encountered. It will be necessary to sink another 100 ft.

Homer Placer.—The Leadville Power and Drainage Company is putting in a diamond drill to test the formation.

Homestake Leasing Company.—Shipments are regular. The main winze is now 60 ft. deep and for 40 ft. a vein of rich silver ore has been opened that will average 2 ft. thick. The property is owned by Philadelphia men but local people are at the head of the lease.

La Plata Mining Company.—Local people are attempting to close a satisfactory deal for leasing this territory.

Mikado.—Lessees are shipping 100 tons a day of siliceous ores from the dump of the Mikado. The ore is needed by the smelters and is returning nice profits.

New Leadville Home Mining Company.—The most important find of the past month is a fine body of iron ore in the new Alice workings. The company is shipping 250 tons a day of oxidized ore and the value has increased from \$4.10 a ton to \$5.91 a ton net. Occasional lead shipments and some rich chlorides are running up the values. The Bon Air and Star workings all show ore while the iron body in the Penrose is growing larger.

Niles-Augusta.—Good iron ore is being hoisted and the lead carbonate streak at the 225-ft. level is holding out nicely. The lease is paying a nice profit.

Ohio Gold Mining Company.—In the new work on the lower levels a very nice streak of gold ore is being followed. Eastern men are back of this new gold belt enterprise.

Park No. 1.—Lessees on this claim of the Benton Mining Company have found a good breast of oxidized gold ore and arrangements are being made to ship. They believe it is the extension of the Penn shoot.

Printer Boy Mining Company.—A settlement has been made with Manager Childs, who has been released, and all legal difficulties are ended. J. L. De-weese has been appointed manager. The old shaft is to be unwatered at once and sunk to the lower contacts. W. W. Detrick and Judge McDonald, both of New York City, are at the head of the new company. A fine plant of machinery has been purchased and is now being put in.

Small Hopes Combination.—The company is handling several hundred tons of sulphides daily which are placed in three separate dumps to await a more favorable market. The Emmet pumps are handling the water.

OURAY COUNTY.

(From Our Special Correspondent.)

Blaine Group.—This property is worked by a Canadian company under the management of J. J. Carmichael and the breast is now 1,300 ft. under cover. Twenty-five men are employed and drifting is going on to cut the big vein some distance ahead.

Congress.—Another body of good ore was opened recently in this property in the Red Mountain District, carrying high values in gold and silver with considerable copper.

El Mahdi.—At this property in Dexter Creek District, the shaft at the 200-ft. level opened a nice streak of silver ore and drifting has started.

Governor.—This company in the Sneffels District is pushing development and storing ore for treatment at its new mill to be erected in the early spring.

Liberty Bell.—This property in the Grizzly Bear District, is said to have struck a 24-in. streak of gold-silver ore. A force of men has been put on and shipments will begin at once.

Ruby-Trust.—This old producer, near Ouray, has been taken hold of by the T. M. Anchor Mining Company, of Lake City, and 35 men are doing repair work. The mill has been overhauled and will be operated by steam until the arrival of 2 electric motors. A new bunk and boarding house has been erected and everything is in shape for the winter.

Syracuse.—A good body of gold ore has been struck at this mine west of Ouray, operated by W. W. Rowan, et al., and the first shipment is being prepared. This is an old time producer, which has been idle several years.

SAN JUAN COUNTY.

(From Our Special Correspondent.)

Mining Transfers.—Louis Desautel to Joseph Bordeleau, Champion lode; Wyandotte Mining Company to Ed. Clement, McAlpine lode; Frank B. Brown to Joseph B. Blizzard, Esmeralda et al. lodes; Joseph Bordeleau to J. B. Patterson, Sultan et al. lodes; Silverton Deep Mining Company to Joseph Gibbons Consolidated Mining and Milling Company, quit claim deed, Cascade Mill site; Odele Rohrig to R. H. Rohrig, Idaho lode.

Bald Eagle.—A drift 30 ft. long has been run on the vein and a car-load of ore now awaits shipment.

Beaton Group.—Six men are driving a long cross-cut to these properties in Minnie Gulch to test the large vein previously developed near surface.

Black Hawk Group.—This group in Hematite Basin, near Silverton, consisting of the Black Hawk, Johnnie and Snow Bird, is being developed by a cross-cut. The vein will probably be tapped within the next 25 ft. at a depth of 180 ft.

Copper King.—This tunnel on Boulder Mountain, near Silverton, is being pushed by Reed & Schmelzer and is expected to cut the heavy sulphide ore body soon.

Gold King Mining and Milling Company.—A contract has been let for 500-ft. of work on the lower crosscut tunnel on this Gladstone property. The breast is now in 1,380 ft. Workmen have finished cleaning out the old workings, all of which are re-timbered.

Iowa-Tiger.—During the week ending December 7 these mines shipped 100 cars of ore and concentrates to the Durango smelters.

Notaway Gold and Copper Mining Company.—This company has made final payment of \$30,000 on the Champion No. 2 group and now has a clear title to the property.

North Star.—A company of Chicago, Ill., men is working this mine on Sultan Mountain, near Silverton. John C. O'Neill, of Chicago, organized the company, which now is prepared to work about 250 men. Work is being done in 2 tunnels, and a shaft of 1,000 ft. is being sunk. Four ore bodies run through the properties. John Mackin is president; Nick Kuhn, treasurer; John C. O'Neill, general manager, and Herbert

Starkweather, superintendent. The ore is said to run about \$60 to the ton in silver, gold, lead and copper.

Scranton City No. 2.—This property on Kendall Mountain, near Silverton, was recently purchased by the Silver Lake Company. Six men are now busy on development.

Silver Lake.—Surveys are completed for an immense water power plant. The pipe line will be 29,000 ft. long and 54 in. in diameter, with a capacity of 5,000 h. p. About one-fourth of this will be utilized by the Silver Lake at Silverton, the remainder being for custom use.

Silver Ledge.—A new shaft house is nearly completed. The shaft is to be sunk an additional 100 ft. during the winter.

Stony Pass.—A vein of good ore 2 feet wide has been cut. The shaft has been renovated and a contract has been let for sinking 100 ft. more.

Wabuse Mining Company.—Six men will be employed during the winter on development at this Silverton mine and the ore will be stored until spring.

Woods Investment Company.—Ore carrying gold values was struck recently on the Fitz-Hugh Lee. The tunnel is now in 200 ft. and 600 ft. further will cut the Lee vein.

Yankee Girl Group.—This group of 14 claims in the Red Mountain District, has been sold to a New York syndicate and work will start shortly on a tunnel which will ultimately be 2 miles long and tap the properties at great depth.

TELLER COUNTY—CHIPPLE CREEK.

Acacia.—At the annual meeting in Colorado Springs, of the Acacia Company, there were represented in person or by proxy 816,296 shares, which were voted for the following directors: J. E. Hundley, F. E. Robinson, Kenneth McKenzie, J. W. Miller and W. P. Sargent. These in turn elected the following officers: President, J. E. Hundley; vice-president and general manager, Kenneth McKenzie; secretary-treasurer, W. P. Sargent; assistant secretary, C. E. Titus.

General Manager McKenzie's annual report, detailing operations since March 15, showed royalties of \$29,565, from which was deducted \$5,649, operating expenses, leaving a cash balance on November 29, of \$23,916. Additional receipts since make a total of about \$25,000.

The main work of the Burns Claim consists of a 350-ft. perpendicular shaft, a cross-cut north about 50 ft. to the vein, and an east drift on the vein 270 ft. to the east side line of the claim. The majority of the ore shipped at present comes from drifts and stopes worked through a 300-ft. winze sunk 60 ft. back from the side line, and from between 350 and 50 ft. levels. About 300 tons of ore are produced monthly, running from \$40 to \$160 per ton. Thirty men are worked by several lessees on this portion.

On the Morning Star Claim, R. P. Russell now owns the lease, and employs 6 men in development.

Little Puck Company.—This company has granted a 2 years' lease at 25 per cent flat royalty on the Climax No. 2 shaft to N. J. Heating and associates.

(From Our Special Correspondent.)

Mary McKinney and Katinka Companies.—The directors of these 2 companies have held a joint meeting to discuss the latter's claim against the former, and it was decided that each should make an underground survey before further steps were taken.

Pinnacle Gold Mining Company.—The directors have granted a lease on the main workings to the Lansing Leasing Syndicate, a strong company which promises to do thorough development work. The company has already installed a compressor and the mine is equipped with a good hoist and adequate boiler capacity. The property is located on Bull Hill adjoining the Isabella and comprises about 30 acres.

Reno Gold Mining Company.—Mr. C. W. Kurie has purchased something like 500,000 shares of Reno stock from Foley & Mattocks at 2 1/2c. a share, giving him control. The property consists of about 10 acres in Poverty Gulch, in the immediate neighborhood of the El Paso Gold King Mine, and adjoins the extensive Poverty Gulch holdings of W. S. Stratton. Mr. Kurie states that it will probably be necessary to increase the capitalization from \$1,250,000 to provide funds to pay the indebtedness and development expenses.

IDAHO.

IDAHO COUNTY.

(From Our Special Correspondent.)

American Eagle.—This property on Siegle Creek near Elk City, is being developed by C. K. Merriam and R. M. Sherman under bond.

Florence Gold Mining Company.—This new company has taken a bond on the Banner claim at Florence. Its president is P. B. Armstrong, of 45 Broadway, New York City. J. M. Herman, of Florence, is assistant secretary and manager. The shaft has been unwatered and will be sunk 200 ft. deeper. A new Huntington 5-ft. mill is being installed and the old one, partly destroyed by fire, rebuilt. The present

shaft is 280 ft. deep and there are about 1,000 ft. of levels opened. The mine is credited with having produced a large amount of gold.

Fortune.—This property in Buffalo Hump Camp has been leased by Fred. N. Hallett, who has a 2-stamp mill on the ground, and will do some development. The property has a fine showing of ore in the lower level.

High Bar.—Charles H. Harding, of Lewiston, has taken an option on this placer owned by O'Bannon & Clark, and has gone East to interest capital. The gravel deposit is quite extensive and so situated for water and dump that it can be worked at small cost.

Thunder Mountain.—The senseless snow boom of Buffalo Hump in 1898-1899 in which so much New York money was expended to move machinery over 15 ft. of snow is liable to be repeated in Thunder Mountain. Men are now going in over the snow 65 miles from Warren, the nearest wagon road, and work on a number of properties will be prosecuted all winter if supplies can be sledged in. The cause is the purchase of 11 claims known as the Caswell property, by Col. W. H. Dewey and his associates, S. B. Longfellow and T. M. Barnsdall, of Pittsburg, Pa., for \$100,000 cash. It is reported that a 100-stamp mill has been ordered for the property and a first-class road will be built to the district in the spring. The Pittsburg people are buying and bonding a great many properties and it looks as if a great gold camp would be in existence within a year. The railroad companies have had experts on the ground and are making preparations for the rush in the spring and for extensions to the camp. A tract 8 square miles in extent has already been staked around the Dewey property. W. H. Hill, mining engineer, of Grangeville, is preparing a map of the district.

ROOTENAI COUNTY.

Home Builder Mining and Development Co.—W. C. Brower, of Coeur d'Alene, is president of this company, which owns 6 claims of free milling gold ore at Wolf Lodge Creek. The tunnel has been driven 50 ft. and is expected to cut the ledge at 100 ft. depth, 40 ft. in. The company will work all winter.

OWYHEE COUNTY.

Howe-Manhattan Mines Company.—This company was recently organized at Boise, to work the Howe-Manhattan group at DeLamar. Timothy Reagan is president; Calvin Cobb, vice-president; B. S. Howe, secretary and treasurer. Mr. Morkill will have actual charge of the mines, which adjoin the famous DeLamar. The capital stock of the company is \$100,000, and the head offices of the company will be at Boise.

KENTUCKY.

HOPKINS COUNTY.

St. Bernard Coal Company.—Judge Evans in the Federal Court at Louisville, has granted an injunction restraining James D. Wood and other members of the United Mine Workers from alleged unlawful acts against this company, which was recently incorporated under the laws of Delaware.

MASSACHUSETTS.

WORCESTER COUNTY.

Milford Pink Granite Construction Company.—This company, organized under the laws of New Jersey, with \$500,000 capital, has absorbed the properties, quarries and contracts of the Bay State Pink Granite Company of Worcester and Milford, and with these properties are joined the assets, contracts and property of the D. H. Hayes Construction Company of Chicago, and those of the Dutton Granite Company of New York City. The property acquired in Milford includes the Damsell Bros.' quarry, Keefe quarry, Old Milford Pink Granite quarries, owned by Woodbury & Leighton of Boston, Darling Bros.' quarry, owned formerly by D. W. Darling, of Worcester, and Jasper T. Darling of Chicago; and the Shea Granite Company, owned by George O. Draper of Hopedale. The officers of the new company are D. H. Hayes of Chicago, president and general manager; Daniel W. Darling of Worcester, vice-president; Lewis Brittan of Milford, treasurer and secretary; Messrs. Hayes, Darling, Brittan and Burns of Chicago, and H. H. Picking, of East Orange, N. J., directors. The general offices will be concentrated in New York City.

MICHIGAN.

COPPER—HOUGHTON COUNTY.

(From Our Special Correspondent.)

Arcadian.—No. 1 shaft was closed down this week and about 50 men discharged. Recent developments at No. 1 shaft were considered favorable and the present action is not understood.

Baltic.—One head at this company's mill has gone into commission and it is expected that the second will be ready in 3 months.

Isle Royale Consolidated.—Operations were suspended 6 days owing to an accident at the stamp mill.

Rhode Island.—The cross-cut east from No. 2 shaft at the 4th level encountered the Albany & Boston conglomerate lode this week.

Trimountain.—Everything is in readiness for regular production next month when it is expected that shipments of rock to the Arcadian Mill, 1 head of which was recently leased, will start. In January the equipment of each shaft will be about completed. A mass weighing 2,500 lbs. was taken out of No. 2 shaft recently.

Wolverine.—The stamp mill on Traverse Bay is progressing well and will be ready to stamp rock next summer.

Winona.—Operations are confined at present to No. 2 shaft, which is sinking to the 4th level. Drifting on the 6th is under way. Diamond drill work is suspended. Fifty men are employed.

COPPER—KEWEENAW COUNTY.

(From Our Special Correspondent.)

Phoenix Consolidated.—This company has let a contract for the construction of a railroad between the mine and the mill site on Eagle River. Work will begin at once with a crew of about 50 men. The right-of-way will be cut and some grading done this winter and the work will be finished during the summer. The road will be standard gauge, equipped with 75-lb. steel and the contract price is \$250,000.

COPPER—ONTONAGAN COUNTY.

Victoria.—The shaft, the deepest in the county, is now sinking to the 14th level. Drifting is pushed at the 4th, 6th, 8th, 10th and 12th levels. Everything is ready for sinking another shaft 1,100 ft. west of the present one, and work will start early in the spring.

(From Our Special Correspondent.)

Belt.—Exploratory work on the Butler, Knowlton and Evergreen lodes continues. From present indications the first 2 are richer.

Penn.—Capt. W. A. Dunn is pushing work, as but 2 months remain before the option expires. Surface work has been hindered by the heavy snowfall.

IRON—MENOMINEE RANGE.

Breitung Hematite Mining Company, Limited.—This Marquette company is capitalized at \$1,000,000. The land comprises two tracts held jointly by the Kaufman and Kaufman interests at Negaunee and recently in dispute between the Breitung-Kaufman interests and the Cleveland-Cliffs Company. The company is authorized by its charter to mine and smelt ore, own water power, operate a railroad, etc. The board of managers is made up as follows: Mary Kaufman, chairman; E. N. Breitung, treasurer; N. M. Kaufman, secretary, and Charlotte Breitung.

Groveland.—At this mine east of Randville, shipping has been stopped, and ore is being stocked. The mine will be worked to its full capacity next year. About 60 men are employed under Capt. H. M. Lowmy.

Mansfield.—The Oliver Iron Mining Company has decided to sink the 1,000-ft. shaft at this mine at Mansfield, started by the De Soto Iron Company. The work will take 2 years, and cost about \$60,000. The shaft will be in the hanging wall diorite, and will be 6 by 16 ft., with 3 compartments. One crew of men will sink from surface, another will cross-cut and raise from the 6th level, and still another cross-cut and raise from the 9th.

MINNESOTA.

(From Our Special Correspondent.)

The largest cargo of iron ore shipped this year from Two Harbors was 7,473 gross, 8,369 net, tons, by the "Manila," of the United States Steel Company's fleet. There were 1,083 cargoes taken during the season and the average cargo was 4,626 gross, 5,181 net, tons. This is 500 tons more than the record breaking average of the preceding year. The season of navigation was 222 days long. In one month more than 1,000,000 tons of ore were received and shipped.

IRON—MESABI RANGE.

(From Our Special Correspondent.)

Ore over 300 ft. thick and of unknown area is reported found on school lands in the east part of section 12, T. 57, R. 21, where a drill has been working some months. It is not of high grade and when developed will probably drain the Penobscot Mine.

Arcturus.—It is reported that G. W. Wallace and associates are selling the Arcturus prospect, near the western limit of the range, for a large sum, but it is not likely that any deal has been closed.

Pearce Mining Company.—This company has sold to M. L. Fay 2 forties in section 1, T. 58, R. 20, on which small amounts of ore have been found.

Pennsylvania Iron and Steel Company.—This company has given an option for a 50-year lease on its property to D. E. Woodbridge, of Duluth, who has begun explorations with a diamond drill near Buhl, close to the Sharon, Grant and Iron Chief Mines.

Stevenson.—This mine, with a shipment of 666,000 tons for the year, has beaten all records for a first full year. It is stated by the management that the intention is to ship next year 1,500,000 tons, and that 1,000,000 tons could have been shipped this year had there been cars. An immense amount of stripping

will be done, but the contractors are well ahead of the mining shovels and will do no work this winter. If the mine reaches the total now claimed for 1902 it will surpass belief and many mining men have already made bets on the subject.

SAGENAW COUNTY.

Michigan Coal Company.—This company has closed its mine at St. Charles, permanently, on account of the high working expenses.

MISSOURI.

JASPER COUNTY.

Rochester Mining Company.—This company, composed principally of New York men, has purchased the old Commander plant at Webb City, built a year ago at a cost of \$20,000, and having a capacity of 150 tons per day. The company will move this plant to the Burgner land south of Carterville, which shows a 10-ft. face of ore.

(From Our Special Correspondent.)

Joplin Ore Market.—The ore market was very active during the past week, but the output was much below the average. Zinc ore advanced \$2 per ton and lead ore closed \$2.25 lower. The advance of zinc ore is due to the cold wave which stopped work at over 80 per cent. of the plants. The reduction in the price of lead ore is because of the reduction in metal quotations. The week's sales are much larger than the output and represent a number of large lots held for higher prices.

The closing of the year shows that the tonnage of the last 12 months is the largest in the history of the district. The valuation for the year will be close to \$8,000,000, which was only exceeded by 1899.

The highest price paid for zinc ore during the past week was \$34 per ton upon a straight bid. The highest price paid during the preceding week was \$32 per ton. The lower grades of zinc ore advanced \$2 per ton. Lead ore brought \$21 per 1,000 lbs., delivered. The cold weather affected lead production greatly. During the corresponding week last year the top price of zinc ore was \$28 per ton and lead ore brought \$23 per 1,000 lbs.

Following is the turn-in by camps of the Joplin District for week ending December 21:

	Zinc lbs.	Lead lbs.	Value.
Joplin	1,928,550	148,360	\$33,927
Carterville	1,088,380	94,170	17,303
Galena-Empire	678,470	56,710	10,189
Zincite	331,730	8,540	5,321
Oronogo	301,020	.....	3,266
Aurora	314,240	33,050	4,354
Webb City	247,450	30,810	4,359
Cave Springs	146,070	.....	2,413
Duenweg	246,680	17,440	5,074
Granby	561,000	105,000	7,511
Neck City	299,140	.....	4,786
Carl Junction	273,770	.....	4,380
Spurgeon	18,670	65,910	999
Roaring Springs	45,270	3,960	644
Stotts City	44,260	.....	604
Carthage	41,380	.....	662
Peoria	.....	43,230	951
Total	6,555,730	644,820	\$107,848

Total, 51 weeks.....508,704,360 69,247,980 \$7,810,275
Zinc value for week, \$94,396; lead, \$13,452; zinc value, 51 weeks, \$6,319,946; lead, \$1,590,320.

MONTANA.

CARBON COUNTY.

(From Our Special Correspondent.)

Carbon County Crude Oil Company.—Butte people are behind this enterprise. The directors are Wm. D. Bartlett, E. A. Nichols, John P. Reins, John N. Kirk, F. L. Grandy, Pat. Coulan and John O. Bender. The company has a capital of 500,000 shares at \$1 each.

Dickson-Weaver.—This property on Deep Creek, near Big Timber, owned by Wm. Dickson, of Miles City, has closed for the winter, owing to the excessive fall of snow. The ore is a silver-lead, carrying about \$5, 40 per cent lead and 60 oz. silver. The shoot, followed 33 ft., shows an average width of 18 in. This is one of the new finds of the year, and is located in a section of the country in which but little prospecting was ever done.

CASCADE COUNTY.

(From Our Special Correspondent.)

Diamond R.—C. D. McLure, of St. Louis, Mo., has brought suit against this company for \$81,250 on 19 promissory notes. The United States Marshall has levied on all the property of the company at Neihart. The money for which the notes were given to Mr. McLure was used to develop the property and to build the concentrator. The suits were brought in the United States Court at Helena and each note was made a separate cause of action. The concentrator was closed down a short time ago, after having run successfully, it was supposed, for several months. The Great Falls National Bank also attached for \$25,000. An interesting legal fight between the State Courts and United States Courts will be the result, each trying to establish priority of attachment.

FERGUS COUNTY.

(From Our Special Correspondent.)

Barnes-King Group.—It is reported that this North Moccasin property has been sold for \$1,000,000

to an eastern syndicate represented by Robbins & Bright, of Lewiston. The purchasers have paid \$10,000 cash and are to pay \$990,000 within 6 months. The Barnes-King Company is to operate the mines and cyanide mill until the entire amount is paid. The new cyanide mill has a capacity of 100 tons per day. The ore is quarried as at the Treadwell Mine in Alaska. Two shifts of 4 miners each keep the mill supplied with ore.

JEFFERSON COUNTY.

(From Our Special Correspondent.)

Big Chief.—This property, near Jefferson, is under the management of Frank Kauenbly. The mine was first opened 20 years ago, and made some shipments of silver-lead ore from near surface, but laid idle until Mr. Kauenbly purchased it, sometime over a year ago. The old tunnel has been cleaned out and extended 100 ft. A new shaft has been sunk, and the lead has been cross-cut at 3 points. Several new shoots have been opened.

Eureka.—Riley, Sweet & Co., of Boulder, who started in to operate this property, 12 miles from Boulder up the Little Boulder, about 6 weeks ago, have 4 cars of ore ready to haul to the railroad. The ore is expected to ship about \$40 per ton. The lease and bond run for one year at \$40,000 for the property, with a royalty on shipments of 15 per cent. The owners are Gaffeny, McDermott, Harlow and Riley, of Boulder.

MADISON COUNTY.

Kennett.—This mine, near Virginia City, has shut down for the winter, and the pumps are pulled out. In the 600-ft. level of the mine a 4-ft. body of sulphide ore was struck, and is said to show high value in gold. The Kennett Company owns a 60-stamp mill a few miles from the mine on Moore's Creek, but the mill was built for free-milling ore.

(From Our Special Correspondent.)

Comet.—This property in Georgia Gulch, 8 miles from Twin Bridges, is reported purchased by W. H. Godfrey, of Great Falls, from David Kenneally for \$10,000 cash. Considerable surface ore in the past has been shipped. Two leads are exposed, one of which has produced several hundred tons of free milling gold ore. The other lead is a galena ore of good shipping value in lead, silver and gold, with an average width of 2 ft.

Moffitt.—A strike of copper ore made by the Moffitt Bros. recently on this property in Coal Canyon, 7 miles from Twin Bridges, continues to improve with depth. The lead is 12 ft. between walls, 4 ft. of which is shipping grade; the balance of the lead, it is thought, will make a profitable concentrate.

PARK COUNTY.

St. Julien.—A 48-in. cleaning pan has been added to the mill equipment at Chico.

SILVER BOW COUNTY.

(From Our Special Correspondent.)

Butte & Anaconda Mining Company.—This concern, which has been operating the Carlisle claim east of Butte, near Columbia Gardens, on a bond, owing to dissensions among the officers, will not continue development.

Comanche.—The State Supreme Court has reversed the order made by Judge Clancy of the District Court of Butte, last spring, enjoining the Boston & Montana Company from working these mines in Butte. Adolph Witzstein, who claims 1/4 interest in the mine, but who is generally understood to represent F. A. Heinze, secured the injunction.

Virgie.—This property in the main range east of the Gardens is under a \$50,000 bond from Sam Beers. A cross-cut tunnel has been driven 500 ft. and is now within 40 ft. of the lead.

SWEET GRASS COUNTY.

Montana Success Gold Mining Company.—This company has been organized principally by Toledo, O., men. The capital stock is \$500,000. Officers have not yet been elected, but the business is being managed by trustees. C. H. Masters and J. A. McMichael are interested. The company owns the Livingston claim.

NEVADA.

HUMBOLDT COUNTY.

(From Our Special Correspondent.)

Sheba Gold and Silver Mining Company.—This Salt Lake, Utah, company is capitalized at \$500,000 shares of the par value of \$1. G. W. Barch is president; J. W. Burton is vice-president; W. H. Child is secretary and treasurer; Governor Heber M. Wells, C. O. Whittemore and H. B. Clawson are the other directors. The company owns the Silver Coin, Consolation, Gold Ring, Silver Peak, Roosevelt, East and West Sheba claims in the Star District, and an option on the Champion, Badger, Daisy, Silver Bell, Sheba, and McKinley claims, also the Krom Concentrator in the same district. The officers are all residents of Salt Lake, where the head office will be. The mine has been a heavy producer in the past and the company proposes to seek new ore bodies at lower levels.

NEW JERSEY.

WARREN COUNTY.

Pahaquarry Mining Company.—The old ore mines at Pahaquarry, opposite Shawnee, are to be opened. A meeting of the stockholders of the company was held recently, and the secretary showed \$158,000 worth of stock sold.

NEW MEXICO.

LINCOLN COUNTY.

Lady Godiva Mining Company.—This company at White Oaks, is preparing to resume work. Superintendent Dye is having the machinery overhauled.

SIERRA COUNTY.

Abbey Mining Company.—This company, which has among its stockholders, Pittsburg, Pa., men, is opening a new mining district 25 miles north of Magdalena. The company says it controls 30 claims, covering 60 acres and reports a good body of copper ore struck at 100 ft. in one of its shafts. The company also says it has bituminous coal on its lands. Machinery for reduction works, etc., will be bought. Nathan Hall is superintendent.

Hillsboro Gold Mining and Milling Company.—Manager Keiser recently received instructions to sink 200 ft. deeper on the company's main shaft near Hillsboro.

Las Animas Gold-Copper Mining Company.—This company will increase its force on the Wicks Mine near Hillsboro.

NORTH CAROLINA.

GRANVILLE COUNTY.

(From an Occasional Correspondent.)

Ex-Congressman Yost, of Staunton, Va., is doing some prospecting in the district.

Blue Wing.—A small force is developing and sinking a shaft. John B. Hart, is superintendent.

Virginia Copper Company.—Two shafts are being operated at the High Hill Mine, owned by this company. They are down about 350 ft., and shipments are being made regularly to the Norfolk Smelter. It is said the company will erect its own smelting plant. At present a small concentrator is operated. All the mines in the Virgilina District, except the Blue Wing and Yancy, are shut down for 10 days during the holidays.

OREGON.

GRANT COUNTY.

(From Our Special Correspondent.)

Hoosier Boy.—A new 20-stamp Hammond mill is being erected at this property, owned principally by eastern men. M. D. Winder is superintendent.

Maiden's Dream.—The Gray's Peak Mining Company made at the first month's run of a Hammond 5-stamp mill a clean-up of \$1,500. T. K. Muir is general manager.

PENNSYLVANIA.

ANTHRACITE COAL.

Delaware & Hudson.—The new breaker at Parsons is completed. The breaker is only a short distance from North Wilkes-Barre and was built to prepare for market a large body of coal which cannot be conveniently reached through any of the other workings of the company in that vicinity. When in full operation it will give employment to more than 200 men and boys. Coal hoisted from the shaft will be carried in cars to a large pocket, about 100 yds. from the breaker, and from this pocket it will be carried by a line of conveyors to the head of the breaker.

Flood Damages.—The Milnesville colliery was completely drowned out, and operations will not be resumed for at least a month. The colliery at Derringer is completely drowned out, and work may not be resumed for two months. The mines at both Cranberry and Crystal Ridge were flooded, and it will take some time before there is a full resumption of work. In the Cranberry Mine there were 21 mules drowned. At Tunnel Ridge, Maple Hill, St. Nicholas, Ellangown and Mahanoy City collieries there is no hope for a resumption before New Year.

Natalie Anthracite Coal Company.—The ejectment suit of Isaac B. Feltz against this company, involving coal land valued at \$1,000,000, has been decided in favor of the defendant.

Parker No. 3.—This colliery at Shenandoah, operated by the Lehigh Valley Coal Company, which has been undergoing repairs the past three months, has resumed work, giving employment to 600 hands.

Primrose.—Superintendent Zerby, of the Lehigh Valley Coal Company, has awarded the contract for driving 3 tunnels at this colliery near Mahanoy City, to Chas. A. Portland & Company. One tunnel will be driven 300 ft. from the Buckmountain vein to the Skidmore. The other tunnels will start at the 10-ft. seam to tap the Primrose and Skidmore seams. The entire length of both wings of this tunnel will be less than 500 ft.; 36 men will be employed. The work will be divided into 3 shifts of 8 hours each, and about 4 months will be required to complete it.

Rushbrook Coal Company.—Referee Charles L.

Hawley, of Scranton, has found a judgment for \$25,000 damages against this company at the instance of John S. Jenkins, of West Pittston. Mr. Jenkins brought suit to recover the amount, which he claimed he advanced while acting as its president and general manager.

BITUMINOUS COAL.

Hecla Coke Company.—William G. Wilkins, engineer of this company, of Pittsburg, has awarded to Patterson & McNeil, of Washington, Pa., the contract to sink 2 shafts, each 225 ft. deep, on the Hecla Company's property at Hecla Station, on the Southwest branch of the Pennsylvania Railroad, in Westmoreland County. One of the shafts will be for ventilating, and the other for hoisting. The contract for furnishing the hoisting engines and kindred machinery has been given to the Vulcan Iron Company, of Wilkesbarre. The improvements to be made are on the property of the late William Thaw, of Pittsburg, which has been leased. In developing the mine the company will invest about \$300,000, and will also build 300 coke ovens and erect 40 double dwelling houses for the use of its workmen. Benjamin Thaw, of Pittsburg, is president of the company, and William Darsie is secretary.

Miners' Wages.—Representatives of the Pittsburg & Buffalo Coal Company and the Kerr Coal Company recently held a conference with Uriah Bellingham, vice-president, and William Dodds, secretary, of the Pittsburg district of the United Mine Workers, at which a uniform wage scale was adopted for the mines in the Allegheny Valley. The following scale is to go into effect not later than January 1: For all coal from 3 to 4 1-4 ft. high, 55c. a ton of 2,000 lbs.; from 4 1-4 to 5 1-2 ft., 51.7c.; over 5 1-2 ft., 46c. The Pittsburg district day wage scale of prices and an 8-hour work day are included.

Somerset Coal Company.—A combination of 12 of the leading coal producing companies of Somerset County is reported to be about consummated under this coal company, to be chartered under the laws of New Jersey. The collieries are at Hooversville, Stoyestown, Landstreet, Wells Creek, Wilson Creek, Milford, Garret, Pine Grove, with 6 establishments in the Salisbury District. The mines have a combined output of 1,000 cars of coal a day.

SOUTH DAKOTA.

CUSTER COUNTY.

(From Our Special Correspondent.)

Clara Belle.—A new quartz mill is soon to be purchased. The ore is now treated in a 2-stamp Tremaine. Regular clean-ups are being made.

Lithograph Stone.—The first shipment of lithograph stone from the Black Hills occurred this week. The stone is pronounced of good quality.

LAWRENCE COUNTY.

(From Our Special Correspondent.)

Chicago & Two Bit Company.—The shaft in Two Bit Gulch is being unwatered. A new station pump has been installed.

Deer Lick Mining and Development Company.—A ledge said to carry tin and gold ore has been discovered on this company's ground, in Bear Gulch. It is 8 ft. wide.

Edna Exploration Company.—Development is in progress on the Edna group of claims near Garden City. The company is composed of Deadwood men. A 5 years' lease and option is held on the 42 acres in the group. A steam hoist and other machinery have been purchased.

Globe Mining Company.—Free gold ore is reported encountered in the development tunnel. It is a vertical, 8 ft. wide.

Hidden Fortune Gold Mining Company.—Final payments are being made for the ground purchased on the hill north of Lead, adjoining the Homestake. The original owners, with one or two exceptions, have received their money. The company is said to have the capital to build a 200-stamp mill with cyanide annex.

Minna Mining Company.—This company has leased its ground, near the head of Strawberry Gulch, to Nelson Shaw, who will begin mining.

PENNINGTON COUNTY.

(From Our Special Correspondent.)

Chilcoat.—A 2-compartment shaft is being sunk to the 200-ft. level.

Elizabeth Mining Company.—The 40-stamp mill is being enclosed. It has been running 3 weeks.

Gertie Tin Mining Company.—The mine is being pumped out, and work is to start some time during January.

Holy Terror-Keystone Consolidated.—Fifteen stamps of the Keystone Mill are dropping on ore from the Holy Terror, most of which is from the 1,250-ft. level. This is the deepest working level in the Black Hills. The Burlington is running a spur to the mill.

National Smelting Company.—The 500-ton smelter at Rapid City is nearing completion. The building is of iron and steel. The smoke stack, 178 feet high,

has been erected. It is connected with the furnaces by a dust flue 435 ft. long. Two furnaces are being put in, one for lead, the other for matte, both water jacketed.

Ohio-Deadwood Gold Mining Company.—The new tunnel is reported in ore. The old cross-cut shows a ledge 52 ft. wide 180 ft. below the surface. An air compressor has been ordered, and a 120-stamp mill will be built. The company owns 475 acres of ground.

Old Bill.—An incline shaft is being sunk and a hoist is being removed from the Golden Slipper to this mine.

Ranger Group.—A test run is being made on 200 tons of ore in the Holy Terror 10-stamp mill. The group is under bond to Iowa men.

Sunbeam Mining Company.—Two shifts are developing a free gold proposition. The ore is reported very rich in places.

TENNESSEE.

RHEA COUNTY.

Beatrice Coal Mining Company.—This Spring City company is about to develop its 5,000 acres of coal land recently bought.

ROANE COUNTY.

Roane Iron Company.—This company, at Rockwood recently purchased over 1,000 acres of iron land near its plant from the Morrison Land Company and J. H. Welcker for \$35,000.

UTAH.

BEAVER COUNTY.

(From Our Special Correspondent.)

Cactus.—Development is going on satisfactorily. The management is now drilling for water in the valley close to the mine.

Horn Silver.—This mine is producing about 1,000 tons of ore monthly and Superintendent Rohlfing is constantly adding to its reserve. The management forwarded to the Salt Lake Valley smelters 740,050 lbs. first-class ore for the week ending December 14.

Majestic.—There are about 10 cars of first grade copper ore on the dump, but the management intends holding the ore until the copper market is more settled.

BOX ELDER COUNTY.

(From Our Special Correspondent.)

Midway.—This mine is the property of Hugh Park, of Salt Lake, Francis Lake, of Park City, and some Eastern men. A trial shipment of 58,650 lbs. of silver-gold ore has been sent to Salt Lake as a test to find the best process for saving the values in the ledges exposed. The company has 34 claims adjoining the Ashbrook Mine and about 24 miles north of Park Valley. All the power necessary can be developed from the Raft River, and the country is reported well supplied with timber and water.

JUAB COUNTY.

(From Our Special Correspondent.)

Tintic Shipments.—The following are the shipments from Tintic for the week ending December 14: Ajax, 1 car; Carisa, 12; Genevieve, 14; Lower Mammoth, 2; Mammoth, 5; May Day, 4; Swansea, 6; South Swansea, 5; Tesora, 6; Uncle Sam Consolidated, 5; Yankee Consolidated, 12; Total, 72 cars ore. May Day and Mammoth mills each sent 2 cars of concentrates.

Scranton.—This mine in North Tintic is now ready for regular shipments of silver-lead ore. The mine has been carefully developed for the last year.

SALT LAKE COUNTY.

(From Our Special Correspondent.)

Bingham Shipments.—The following shipments were made for the week ending December 14: Ben Butler, ore, 47,500 lbs.; Signet, ore, 77,270 lbs.; Acme, ore, 39,300 lbs.; Last Chance, concentrates, 42,300 lbs.; Commercial, concentrates, 292,380 lbs.; Red Wing, concentrates, 40,190 lbs.; Tiewauke, ore, 50,700 lbs.; New England, ore, 26,850 lbs.; United States, lead ore, 422,340 lbs.

Bingham Consolidated Mining and Smelting Company.—This company shipped 315 tons matte from its smelter in Salt Lake Valley for the week ending December 14, to the Butte & Boston Company's smelter in Montana.

Grizzly.—This mine sent down from Alta 41,720 lbs. of ore for the week ending December 14.

New Sensation.—This mine in Big Cottonwood Canyon developed by P. S. Kimberly and others, has made a first shipment of 45,720 lbs. of ore, and will continue shipments as long as the roads can be kept open.

Utah Consolidated.—This company forwarded 3 cars of copper, gold and silver bullion containing about 180,000 lbs., from its smelter for the week ending December 14.

TOOELE COUNTY.

(From Our Special Correspondent.)

Stockton Shipments.—The following shipments were made to the Salt Lake Valley smelters for the

week ending December 14: Ophir, concentrates, 1,239,240 lbs.; Hidden Treasure, ore, 80,560 lbs.

Utah.—This mine at Fish Springs sent in 74,700 lbs. of first class ore to the Salt Lake Valley smelters for the week ending December 14.

VERMONT.

LAMOILLE COUNTY.

New England Asbestos Company.—About \$75,000 worth of machinery is being installed at the asbestos mines near Eden. The machinery has to be drawn from Hyde Park, a distance of 14 miles. The rolls of one of the quartz crushers weigh 10 tons each. There are now already 95 men employed in and around the mines. The asbestos is found in large quantities but is reported not of best grade.

WASHINGTON.

FERRY COUNTY.

(From Our Special Correspondent.)

Apache.—At this claim, in Moses District, the shaft is down 50 ft. on a very rich 8 or 10-inch vein, in low-grade quartz.

California.—On the 200-ft. level of this mine, in Eureka District, a drift is being driven in the hanging wall whence a cross-cut will be carried to the vein. The east drift on this level has followed the pay shoot about 300 ft.

Combination.—A 6-ft. vein has been exposed in an open cut and short cross-cut tunnel on this claim in Moses District. A new tunnel has been started to strike the vein at 100 ft.

Last Chance.—This Moses District prospect shows a vein 4 to 6 ft. wide, with a 6-in. streak of \$200 ore exposed. It is opened by a shaft 40 ft. deep and a cross-cut of 10 ft.

Little Chief.—This claim, in Moses District, has a 39-ft. vein of sulphide ore, some of which carries antimonial silver. The work done consists of a 30-ft. shaft and an open cut across the vein. In the latter the ore is said to average \$181 per ton.

Moses District.—For next spring and summer a very bright season is expected. A large area surrounding the Nespelem Sub-Agency will be prospected. The topography of the section resembles eastern Nevada. The hills are timberless and the vegetation scant.

WEST VIRGINIA.

HARRISON COUNTY.

Hutchinson Fuel Company.—This Wheeling company is to begin the development of 1,000 acres of coal land at Mt. Clare.

TAYLOR COUNTY.

Flemington Coal and Coke Company.—Joseph K. Wells recently got a verdict for \$26,000 against this company for breach of contract. Mr. Wells brought this suit in behalf of the trustees, who will receive the amount of the verdict to apply on the old liabilities.

FOREIGN MINING NEWS.

AFRICA.

TRANSVAAL.

Bonanza, Limited.—This company reports that during November there were 60 stamps at work in the mill. The total ore crushed was 7,705 tons. The recovery in fine gold was, from mill, 4,160 oz.; from cyaniding tailings and slimes, 2,384 oz.; total, 6,544 oz., an average of 0.85 oz. per ton crushed.

Goldenhuis Deep, Limited.—This company reports that in November its mill had 60 stamps working 29 days, 21 hours. The total ore crushed was 7,900 tons. There were 6,048 tons tailings and 2,422 tons slimes treated by cyanide. The yield in fine gold was: Mill, 2,639 oz.; tailings, 781 oz.; slimes, 195 oz.; total, 3,615 oz., showing an average of 0.45 oz. per ton crushed. The estimated profit for the month was £5,400.

MEXICO.

CHIHUAHUA.

Palmilla.—The machinery for this mine at Parral, owned by Don Pedro Alvarado, is now being set up.

(From Our Special Correspondent.)

Louis Mayer, one of the owners of the Carmen Copper Company, of Carmen, Durango, left for the interior on a business trip the early part of the week.

Adela.—Wm. V. Pettit, of Philadelphia, Pa., but recently of Cripple Creek, Colo., secured about a year ago this property in the Santa Barbara District. He has cut a bonanza, the vein being 20 ft. wide and running 19 ozs. silver and 1 oz. gold.

La Reynera.—This property of J. F. Johnston at Parral has gone into bonanza. Three cars of ore shipped recently ran: First grade, 71 ozs. silver and 73 per cent lead; second grade, 32 ozs. silver and 40 per cent lead. The mine is producing a large quantity of low-grade milling ore, and it is the intention of Mr. Johnston to erect a mill on the property. The present output is about 3 cars weekly.

SONORA.

Calera Gold Mining Company.—The new mill at this plant began work on the San Miguel River about December 1, and is running steadily. Manager A. F. Wuensch, it is said, broke a record in building a Mexican mill when he completed the Calera plant. The machinery was sent from Denver, Colo., and had to be hauled 35 miles by wagon.

(From Our Special Correspondent.)

Crestone.—This property is located near Torres. Geo. McCarthy, manager, contemplates putting in a complete agitator slimes plant at an early date.

Mexican Anthracite Coal Mining Company.—It is reported that this company, of San Francisco, is sinking a large and expensive shaft on 4,000,000 acres of coal land owned by the company near San Marcial. Some Pennsylvania coal men, in addition to the San Francisco parties, are interested in the company.

ZACATECAS.

(From Our Special Correspondent.)

Zacatecas Mining and Development Company, C. A. Hamilton, manager, has let a contract for a new smelter, which is expected to be in operation early next year.

SUMATRA.

(From Our Special Correspondent.)

Redjang-Lebong Mine.—During the month of October there were 35 stamps at work at this mine. The recovery was 2,460 oz. gold, and 13,813 oz. silver. The large new plant, now in course of erection, is expected to increase the yield about one-third by a second treatment of the tailings and slimes from the stamp mill.

MINING STOCKS.

Complete quotations will be found on pages 872 and 873 of mining stocks listed and dealt in at:

Table listing stock exchanges: Boston, Salt Lake City, Toronto, Colo. Springs, Spokane, Mexico, New York, St. Louis, Paris, Philadelphia, London, San Francisco, Montreal.

New York. Dec. 26.

Speculation has been quieted by the Christmas holidays. The copper stocks have improved, notwithstanding the cut in the price of the metal and a reduction in the Amalgamated dividends. Professional traders apparently control the market just now, and prices will likely show wide fluctuations in the near future.

Of Amalgamated there were sales around \$69. The stock is now on a 4 per cent basis, just one-half what was paid last year. Anaconda was in moderate request around \$29. The curb coppers were influenced by the dealings on 'change, and in most cases prices are better.

The Colorado, California and Comstock shares are uninteresting, showing little variation from last week.

Salt Lake. Dec. 21.

(From Our Special Correspondent.)

The trading on the Salt Lake Mining Exchange for the week ending December 21, was dull with a decline in nearly all the stocks. A total of 408,672 shares were sold for \$238,334.

The directors of the Comstock Mining Company have levied an assessment of 10c. per share or \$20,000. The mine is in Thayne Canyon above Park City and a large amount has been expended during this year in opening the property. The management believes with the expenditure of \$20,000 it will be able to meet all liabilities.

The new owners of the April Fool Mine at De La Mar, Nev., met in Salt Lake City on December 18, and elected the following officers: W. S. Godbe, president; J. D. Wood, vice-president; S. Bamberger, treasurer and D. L. Wertheimer, secretary. The offices of the company are to be in Salt Lake City.

The directors of the Silver King during the week declared an extra dividend of \$100,000 payable January 1. The Daly West divided \$60,000, the Quincy \$125,000 and the Ontario \$45,000, making an excellent record for the Park City producers for the closing of the year.

At the annual meeting of the Dexter Mining Company, which has property at Tuscorora, Nev., in Salt Lake, the exhaustive report from Superintendent McKenzie was presented. E. H. Airis was elected president; S. B. Milner, vice-president; E. O. Lee, Charles B. Devereaux and John Dern as directors; George E. Airis is secretary. The office is in Salt Lake City.

The minority stockholders of the Tesora Mining Company met in Salt Lake City on December 19 to protest against the assessment of 20c. levied by the directors to pay debts of about \$95,000.

San Francisco. Dec. 21.

(From Our Special Correspondent.)

The market has brightened up a little, in spite of the approaching close of the year. There has been more business this week than for several weeks past, with a firmer tone all around. The special feature has been a demand for Ohpir and Mexican, which made matters quite lively on Thursday and Friday. The forecast that there would be no improvement before January has not proved correct.

Some quotations noted are: Consolidated California & Virginia, \$1.55@1.60; Ophir, 64@66c.; Confidence, 58c.; Silver Hill, 32c.; Mexican, 25@27c.; Sierra Nevada, 15c.; Best & Belcher, 10@11c.; Yellow Jacket, 10c.

On the Producers' Oil Exchange the trading has been rather light, and business must be called dull. Some quotations noted are: Hanford, \$90; San Joaquin Oil and Development, \$6.25; Peerless, \$5.25; Home, \$3.35; Four Oil, 49c.; Junction, 25c.; Monarch, 18@20c.; California Standard, 17c. Monarch was the special feature of the market.

London. Dec. 10.

(From Our Special Correspondent.)

There has again been some life in the South African mining market and shares are being bought in sufficient quantities to make quotations firm. It is noteworthy that one of the mines on the Rand has resumed the payment of dividends. This is the Meyer & Charlton, which was the first of the mines to start work in the spring. The dividend is only a small one, 15 per cent, and compares unfavorably with one of 80 per cent before the war broke out, but it is at least of considerable sentimental interest. On the other hand the Robinson Company announces the issue of new shares for the purpose of providing new capital to the extent of £40,000, to put the mine and plant in order. There will be several such announcements during the next few weeks for it is not all companies that are in the fortunate position of having sufficient funds in hand. Altogether, however, the market is hopeful and strong.

The West Australian market continues to be unsettled by the Lake View episode relating to the estimates of ore in sight. As already mentioned in these letters, the consulting engineer and the general manager differed considerably in their figures, the former considering that the latter's estimates were far too high. The directors asked Mr. Hewikers to examine the mine and give his opinion, and strangely enough he has reported that there is in sight an even greater quantity of ore than the general manager estimated. The effect on the market of all these reports has been very hurtful as far as the interests of shareholders is concerned, and it is not to be wondered at that many people should consider that the whole affair is a market manipulation. These big West Australian producers have always been used as speculative counters and they seem destined to continue such.

A favorable effect has been made on the market for Stratton's Independence shares by the publication of a report by Mr. Hammond on the work done during the past year. The complete report and accounts will be issued during the next few days, but the preliminary report contains a sufficient account of the situation. It appears that through economies introduced the net profit on the ore treated has been greater than was estimated, being \$8.65 per ton of crude ore instead of \$8.33 per ton. Also, the developments have brought to light additional quantities of ore, and although Mr. Hammond does not speak particularly hopefully of the future, his picture of the outlook is not so black as it was last year. So that altogether the shareholders are in a more cheerful mood. (This report was published in our issue of December 21.—Ed.)

Another of the companies that were floated by the Venture Corporation (the parent of Stratton's Independence) has not come up to the expectations of the promoters. This is the Delano Mining and Milling Company, Limited, which was formed in 1898 to acquire the Kekionga Mine in Boulder County, Colo. The property was very soon after flotation found to be of little value and it was decided in January, 1899, to effect a sale. Negotiations with this object in view failed, but recently other purchasers have come forward. It is now intended to liquidate the company, and the liquidator is to continue the negotiations for the sale.

It is interesting to record that another mine in the Kalgurlie District of West Australia has reached the dividend paying stage. This is the Kalgurlie Gold Mines, Limited, and it has just announced a dividend of 12 1-2 per cent of the year ended July 31, 1901. The company was originally formed in 1895 and considerable amounts of gold have been recovered, but owing to the refractory nature of the ore, consisting of sulphides and tellurides, the working expenses and provision for new plans, swallowed up all profits. There is no doubt that the ore deposit is very extensive, but it is irregular, and difficult to estimate. Now that a plant suitable for treatment of the ore has been

erected, there should be no difficulty in making handsome profits for some years to come. It should be mentioned that the shares in the company have always been extensively dealt in on the Stock Exchange and in 1899, the £1 share was as high as £13. At the present time it stands about £3.

A prospectus of the Lugo Gold Fields, Limited, a company formed to work a gold mine in Spain, has been circulated this week. The mine is situated in Galicia and it appears that some of the shares have already been subscribed locally. The property is not a proved one and the estimates as to costs are far too low. The proposition, if carried through, will be very profitable to the promoter, but it cannot be taken seriously from a mining point of view.

Paris. Dec. 8.

(From Our Special Correspondent.)

The mining stock section of the Bourse is still quiet and somewhat disorganized. With the end of the year rapidly approaching, no immediate improvement can be expected. As for some time past the copper stocks are the most active on the list. Dealings in Rio Tintos especially have been large. The impression is still strong that the price of copper cannot be maintained in view of the heavy decline in European consumption.

The Russian group is still comparatively quiet, at least no further declines are recorded. It must be mentioned, however, that the Russian petroleum stocks, in which little business has been done of late, have made their reappearance, and are quoted at a considerable decline from former prices.

The Spanish Government, I hear, has been trying to negotiate a new loan, based on the security of the Almaden quicksilver mines. Our bankers, however, are not disposed to lend, unless the Government takes some decided measures to remedy the disorder into which the currency has fallen. The only measure taken so far is to order the payment of customs duties in gold or in paper at a fixed discount, to be announced periodically. This may cause a slight improvement in exchange; but no permanent gain can be made until

DIVIDENDS.

Table with columns: Name of Company, Latest Dividend (Per Share, Per Date, Total), Total to Date. Lists companies like Amalgamated Copper, Am. Cement, etc.

ASSESSMENTS.

Table with columns: Name of Company, Location, No., Delinq., Sale, Amt. Lists companies like Belcher, Canton Placer, etc.

the present excessive amount of paper in circulation is reduced. It does not appear that the Government is willing—perhaps it is not able—to take up this problem.

The foreign merchandise trade of France for the 11 months ending November 30 is reported by the Ministry of Commerce as below:

	1900.	1901.
Imports	Fr. 4,261,688,000	Fr. 4,302,164,000
Exports	3,720,634,000	3,814,625,000
Excess, imports.....	541,054,000	487,539,000

This shows an increase of 40,476,000 fr. in imports; an increase of 93,991,000 fr. in exports; and a resulting decrease of 53,515,000 fr. in the excess of imports.

The imports and exports of iron and steel in France for the 10 months ending October 31 are reported as below, in metric tons:

	—Imports—		—Exports—	
	1900.	1901.	1900.	1901.
Pig iron	123,024	47,346	100,312	76,179
Wrought iron	48,677	30,965	27,246	35,337
Finished steel	17,985	7,624	15,802	33,403
Ferro-manganese	3,411	5,002	7	684
Total	193,097	90,937	143,367	145,603

The great falling off in imports was in pig iron and iron bars imported from Great Britain and Belgium. In exports it will be seen there was a slight increase, chiefly in bars, rails and other finished material to the French colonies. In finished steel the increase was entirely in rails.

The active campaign against the use of white lead as a pigment is being gradually developed. It is claimed that white lead poisons the painters who use it, and that it is injurious—though in much less degree—to those who live in dwellings painted with this material. Zinc white, it is said, is a material entirely free from these dangers, and should be substituted for the lead.

It is stated that the arrangements for the building of the Yunnan Railroad, the Government of Indo-China will turn over to the contractor the existing lines from Haiphong to Lao-Kay, 385 kilometers, and the contractor will at once begin work on the extension from Lao-Kay to Yunnan-Sen, 452 kilometers. The concession is for 75 years, and the contractor will be required to pay a percentage on the profits of the road after it is completed. It is estimated that 100,000,000 fr. capital will be required.

The Bank of France is paying out gold in its ordinary business transactions, and is willing to reduce somewhat its accumulations of the metal. Meantime I hear that several of our bankers are considering it well to strengthen their position, and are calling in loans made some time ago in New York. AZOTE.

COAL TRADE REVIEW.

New York. Dec. 27.

ANTHRACITE.

The mines and railroads are slowly recovering from the recent floods. The Wyoming and Lackawanna fields, as noted last week, suffered the least. The Delaware & Hudson, New York, Ontario & Western and the Lackawanna are now able to get coal through as usual. The Lehigh Valley, Philadelphia & Reading and the Central Railroad of New Jersey will hardly be in good shape before the first of next week. On Tuesday of this week the Reading had 24 collieries running. Its main line was little damaged but some of the branches in the mining regions suffered severely. Up to Tuesday the Jersey Central and Lehigh Valley roads had got very little coal over the washouts along the Lehigh River. Many collieries in the Lehigh and Schuylkill regions are still troubled with water and will not be running to full capacity before the new year. The holiday on Wednesday and, a general day off from its effects on Thursday with the shortage of production due to the flood has so far restricted production that cars are actually in better supply than in several months. With a general resumption of work, however, there will probably be a shortage of cars once more.

Demand is generally good. The movement of coal from the docks at the head of the Lakes continues steady. In Chicago territory, as farther East, demand fluctuates with the temperature. During the past week the market has been fairly active. Nut coal is in especial demand. At points along the Atlantic seaboard retail buying is fairly brisk. The total amount of coal wanted is greater than the amount producers can get forward and there is consequently a congestion of orders, which will hardly be worked off until the railroads are in good condition once more and the miners have got over holiday festivities.

There is no change in prices noted and quotations for free-burning white ash coal f. o. b. New York Harbor ports remain: Broken, \$4; egg, \$4.25; stove, and chestnut, \$4.50.

BITUMINOUS.

Consumers in the seaboard bituminous trade are in a rather bad way for coal. Hardly any producer is

able to supply the amounts due on his contracts and there is a continual fight with the railroads to keep mills and other industrial plants supplied. The railroads themselves are seizing coal in transit in greater amounts than usual. They say now that the controlling factor in the situation is not car supply but motive motor. One road is reported to have miles of empties on its sidings, but professes to be unable to get these cars to the mines. Some people contend that the lower grades of coal get better service than the higher grades, but it is noticed that low grade and high grade producers do not agree on this point. Car supply at the mines is now from 25 per cent to 50 per cent of the total number wanted. Producers have had to cut down all-rail trade shipments considerably to get coal to tidewater.

The speculation in coal is increasing. We hear of \$3.50 f. o. b. being paid for spot coal at New York harbor shipping ports, and \$4 at Sound ports.

The far East is calling for considerable coal and orders in the hands of producers are accumulating. The outlook for early relief is poor, however, as all lower shipping ports are taking 2 weeks and longer to load vessels in turn. Along Long Island Sound the conditions are disheartening; no producer seems able to supply his contract orders in this territory. New York Harbor trade is very short of coal and there is a good deal of speculation. Nobody cares to talk of prices except for coal in cars at tidewater or loaded on boats. All-rail trade is calling for a heavy tonnage, but it is not receiving it, as producers are cutting down their all-rail shipments, sometimes as much as 50 per cent.

Transportation from the mines to tidewater is slow, cars coming through in from 10 days to 3 weeks. Car supply keeps at between 25 and 50 per cent of the demand. In the coastwise vessel market vessels are not in heavy supply, but on account of slow loading vessel brokers and captains are seeking charters for prompt loading, and such charters can get 5@10c. below the current quotations, which are as follows from Philadelphia: Providence, New Bedford and the Sound \$1; Wareham, \$1.25; Boston, Salem and Portland, \$1.15; Lynn and Portsmouth, \$1.20; Newburyport, \$1.30.

Chicago. Dec. 25.

(From Our Special Correspondent.)

The city contracts for coal to supply the pumping and sewage stations of Chicago for the coming year were let by the Commissioner of Public Works Monday. The contracts call for the delivery of 115,450 tons of coal, most of it the so-called Maryland smokeless and West Virginia coal, with some Illinois and Indiana lump. The difference between the price on the contract just let and what the city paid last year saves the municipality \$105,997. The Dearborn Coal Company and the Weaver Coal Company got the large end of the contract. The prices ranged on Maryland smokeless from \$2.89 per ton to \$3.19. The difference is due to the length of haul from the railroad yards to the place of consumption. On Miami lump the bid was \$2.84; Indiana block, \$2.65@3.05; Illinois lump, \$2.28; Youghigheny nut, \$2.73@3.17.

The warm weather of this week saved Chicago from something of a coal famine. The scarcity of cars on the road from the Indiana, Ohio and Illinois coal districts, together with the difficulty of delivering coal by team in Chicago last week, combined to cause a temporary shortage of fuel, particularly for the large office buildings in the business center. The coal dealers of the city, however, by hiring every available team, and working night and day, rose to the emergency and met demands with reasonable promptness.

Incomplete returns from the Custom House for the season show that 2,658,280 tons of iron ore were received at South Chicago as compared with 2,335,381 tons in 1900. This is an increase of 322,899 tons for the season, or 14 per cent gain in 1901 over the previous year. It will be remembered that 1900 was a record-breaker in the iron and steel industries on the Calumet River.

The close of navigation on the Great Lakes permitted vessel owners to figure up profit and loss for the season, and they say that the season has been a fairly good one. Averaging the better class of ships, they have paid a profit of 10 per cent. This profit would unquestionably have been at least 15 per cent, had it not been for the shortage of railroad cars, which caused delays at ore docks. There is no doubt that the inadequate capacity of the Chicago River to care for the lake freight had much to do with keeping down profits, for the inability of vessel owners to reach their docks and unload promptly operated to increase charges, and in many instances prevented vessel owners from securing cargoes for the outbound trip.

The Board of Trustees of the Sanitary District of Chicago, which has jurisdiction over the Chicago Drainage Canal, is considering the advisability of installing on some of the bridges which cross the canal the necessary machinery for swinging them. These bridges are all of the movable type, but for all practical purposes they are fixed bridges. It was not believed when they were built that the demands of navigation would compel the installation of machinery and the necessary interlocking devices for railroads for many years to come. It is significant, however, of the

continued growth of Chicago as a lake port, that many manufacturing concerns and some of the large coal concerns have secured options on dock property along the canal. Chief Engineer Randolph, of the Sanitary District, has been ordered to make up estimates on making these bridges movable in fact.

Pittsburg. Dec. 25.

(From Our Special Correspondent.)

Coal.—The demand for coal for the local market cannot be supplied and consumers are offering premiums. Inability of the railroads to move the cars loaded at mines and also a lack of cars is responsible for present conditions. The Monongahela River Consolidated Coal and Coke Company shipped about 2,000,000 bu. to lower ports during the week. The strike of the pilots is still unsettled or more coal would have gone out. The new mining scale sent to the operators on the West Penn and Allegheny Valley railroads by the United Mine Workers has been ignored by all but the Pittsburg & Buffalo Company and the Kerr Coal Company, the largest mining concerns in those new fields. About 25 smaller operators refuse to sign and a strike is threatened. These fields are comparatively new but within the past few months have become an important factor in the eastern and local market. The cost of production is less as unusually low rates for mining are paid. The coal is pronounced among the best in the district for steam purposes. The Kerr Coal Company recently took the contract for supplying the Allegheny water works which had been filled for years by the river coal combine, and the Pittsburg & Buffalo Company has secured extensive contracts in Buffalo and the eastern market. The latter company is opening four new mines in other parts of the Pittsburg district.

Connellsville Coke.—The production of coke last week almost reached the highest record of the year, being 238,615 tons, but some of it was stocked in the yards owing to a lack of sufficient transportation facilities. Prices for standard Connellsville coke continue at \$2 for furnace and from \$2.50@2.75 for foundry. Of the 21,833 ovens in the region 19,965 were active and 1,868 were idle. The shipments for the week aggregated 9,684 cars, distributed as follows: To Pittsburg and river tipples, 3,477 cars; to points west of Pittsburg, 4,601 cars; to points east of Connellsville, 1,606 cars.

Foreign Coal Trade. Dec. 26.

Export trade continues in the same condition. There is still difficulty in securing coal enough to fill domestic contracts on the seaboard, and no balance to spare for export.

Exports of coal, coke and briquettes from Great Britain for the 11 months ending November 30 were 40,334,579 long tons, against 42,503,014 tons for the corresponding period in 1900; showing a decrease of 2,168,435 tons. In addition to these exports there were 12,445,281 tons of coal sent abroad for the use of steamers engaging in foreign trade, against 10,706,150 tons last year; showing an increase of 1,739,131 tons this year.

Messrs. Hull, Blyth & Co., of London and Cardiff, report under date of December 14, that at Cardiff the general tone of the coal market remains very strong, both for Cardiff and Monmouthshire descriptions. Quotations are: Best Welsh steam coal, \$4.08@4.32; seconds, \$4.08; thirds, \$3.96; dry coals, \$4.02; best Monmouthshire, \$3.90@4.02; seconds, \$3.54@3.78; best small steam coal, \$3.00@3.12; seconds, \$2.40@2.64; other sorts, \$2.28.

The above prices for Cardiff coals are all f. o. b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f. o. b. Newport, exclusive of wharfage but inclusive of export duty, and are for cash in 30 days, less 2 1/2 per cent discount.

The tone of the freight market is again distinctly weaker, with little business passing. Some rates quoted are, from Cardiff: Algiers, \$1.30; Marseilles, \$1.35; Genoa, \$1.20; Naples, \$1.26; Port Said, \$1.20; Singapore, \$2.82; Las Palmas, \$1.44; St. Vincent, Rio Janeiro, \$2.70; Santos, \$3.00; Buenos Aires, \$2.52.

Shanghai, China. Nov. 13.

(Special Report of Wheelock & Co.)

Coal.—Sales of Japan coal have been few; but the import during the fortnight has been very large. Cardiff shows very slight inquiry. Sydney Wollongong coal has remained steady, but business is small. Arrivals of all kinds of coal during the fortnight ending November 13 were 30,672 tons. We quote per ton: Welsh-Cardiff, 18 taels (\$12.06); Australian Wollongong, 13 taels (\$8.71); Japan, Takasima, Namazuta, and Miike, all contracted for; but other sorts, 6@8 taels (\$4.02@5.36); Chinese, Navy, \$16; locomotive, \$13; household, \$10; No. 1, slack, \$10; No. 2, slack, \$7.75, and No. 3, slack, \$6.50.

Kerosene Oil.—Although arrivals have been very numerous, the market has remained steady, with a slight tendency to advance. Importers are asking

1.68½@1.70 taels, less 2 per cent; but we have heard of no sales. Batum is weak. Stocks, including arrivals, are: American, 815,000 cases; Russian, 902,700 cases; Sumatra, 183,700 cases; total, 1,901,400 cases. Quotations per case are as follows: American Devoes, 1.68½ taels (\$1.13); Russian Batum, Anchor Chop, 1.55 taels (\$1.04); Star Crescent and Horse Chops, 1.48½ taels (99c.); Ram Chop, 1.48½ taels (64c.); bulk oil, in 2 tins, 1.33 taels (89c.), and loose, 95 taels (64c.); Sumatra Langkat, Dragon Chop, 1.42½ taels (95c.); bulk oil, in 2 tins, 1.33½ taels,

STATE TRADE REVIEW.

New York. Dec. 26.

The list of prices per square of No. 1 slate, standard brand, l. o. b. at quarries in car-load lots, is given below:

Size, Inches	Monson or Br'nville.	Bangor.	Bangor Ribbon.	Alb'n or Jackson Bangor.	Chap'n Keystone.	Peach Bottom.	Sea Gr'n.	Unf'd Green.	Red.
24 x 14....	6.80	3.50	3.00	3.25	...	5.30	3.25	...	...
24 x 12....	6.00	3.50	3.00	3.25	4.00	5.50	...	3.75	...
22 x 12....	6.00	3.50	3.25	3.50	...	5.50	...	3.75	...
22 x 11....	6.50	3.75	3.25	3.50	4.00	5.50	...	4.00	...
20 x 12....	6.90	3.75	3.25	3.50	...	5.50	...	3.75	...
20 x 11....	6.80	...	...	3.75	...	5.50	...	...	...
20 x 10....	6.80	4.25	3.50	3.75	4.00	5.60	...	4.25	10.50
18 x 12....	6.80	3.75	3.25	3.50	...	5.50	...	3.75	...
18 x 11....	7.00	...	...	...	...	...	...	3.75	...
18 x 10....	7.00	4.25	3.50	3.75	4.00	5.60	...	4.00	10.50
18 x 9....	7.00	4.50	3.50	3.75	4.00	5.60	...	4.25	10.50
16 x 12....	6.80	3.75	...	3.50	...	...	3.10	3.75	...
16 x 10....	7.00	4.00	3.50	3.75	4.00	5.60	...	4.00	10.50
16 x 9....	7.00	4.25	...	3.75	4.00	5.60	...	4.25	10.50
16 x 8....	7.00	4.25	3.50	3.75	4.25	5.60	...	4.25	10.50
14 x 10....	6.00	3.75	3.25	3.25	...	5.50	3.00	3.75	10.50
14 x 9....	6.50	...	...	...	...	2.90	3.75	10.50	...
14 x 8....	6.00	3.75	3.25	3.25	4.00	5.30	...	4.25	10.50
14 x 7....	6.40	3.75	3.25	3.25	3.75	5.30	2.65	4.25	10.50
12 x 10....	5.75	...	...	...	...	...	...	3.25	...
12 x 9....	5.60	...	...	...	...	...	...	3.25	...
12 x 8....	5.50	3.50	...	3.00	...	5.00	...	3.50	9.00
12 x 7....	5.00	3.25	...	3.00	3.25	5.00	2.00	3.50	9.00
12 x 6....	4.80	3.25	...	3.00	3.25	4.85	2.00	3.50	8.50

A square of slate is 100 sq. ft. as laid on the roof.

Business during the past year has been quite satisfactory, especially at home, and shipments of roofing slate and school slates show a marked improvement over 1900 and 1899. Prices have advanced, owing to the inability of quarrymen to meet the demand.

Efforts are again being made to form a combination in the Peach Bottom Region, which extends along the Maryland and Pennsylvania line, the most important quarries being located in Harford County, Md. This slate sells at a higher price than the Pennsylvania or Vermont product, but the output is comparatively small.

The exports of slate from the United States in October were the largest this year, \$112,813. In the 10 months ending October 31 the exports totalled \$805,257, which compares with \$696,557 last year; showing an increase of \$108,700, or 13.5 per cent; all in roofing slate. It is estimated that the roofing slate shipments aggregated 135,568 squares, or 45,640 squares more than last year. Part of this increase has been due to the heavier demand from Denmark. Other countries to receive large quantities of roofing slate were Great Britain and Australia while occasional lots went to Germany.

Abroad the Welsh quarries are generally busy. At the Penrhyn Quarry the output is at the rate of 34,000 tons annually. Shipments are better than a year ago. In the quarter ending September 30, the movement from Carnarvon aggregated 22,020 tons, and from Portmadoc, 13,018 tons, making a total of 35,038 tons. In Ireland the demand is good, and the quarries are similarly busy.

IRON MARKET REVIEW.

NEW YORK, Dec. 27.

Pig Iron Production and Furnaces in Blast.

Fuel used.	Week ending		From		From	
	Dec. 28, 1900.	Dec. 27, 1901.	Jan., '00.	Jan., '01.	Jan., '01.	Jan., '01.
	F'ces.	Tons.	F'ces.	Tons.	Tons.	Tons.
Anth and Coke.....	176	222,525	241	317,675	13,331,087	15,284,391
Charcoal.....	31	6,850	25	7,450	380,745	394,639
Total.....	207	229,375	266	325,125	13,711,832	15,679,030

The feature of the market this week is the congestion of transportation. In the Central West this has become a very serious matter. In Pittsburg and in the Mahoning and Shenango Valleys mills and furnaces are being forced to close down for lack of fuel, while deliveries of finished products are badly delayed

and yards are piled up with iron and steel which is badly wanted elsewhere. In Pittsburg premiums have been paid for coal during the past week, while in the Connellsville Region coke is being stored because cars in which to ship it cannot be had. It seems hard to say how long this state of affairs will last, and when the blockade will be broken.

Meantime, there is no pause in the accumulation of orders and no sign of the dulness which usually attends the close of the year. There will be no holiday stoppages; except those forced by the railroad troubles, and the spring trade is apparently covered by existing contracts, which will keep the mills fully occupied well into next year. The present conditions are really unparalleled in the history of the trade.

Buffalo. Dec. 24.

(Special Report of Rogers, Brown & Co.)

The customary holiday slackening in demand for pig iron is conspicuously absent this season, when it would be more than ordinarily welcome. Local furnaces are finding extreme difficulty in keeping up with the requirements of their customers. The early production of iron being now disposed of, sales are confined to future deliveries, with little to offer for shipment earlier than the last half of 1902. Prices are firm and held to the level scheduled below, although they could be easily advanced were sellers disposed to risk the later consequences. We quote on the cash basis, f. o. b. cars Buffalo: No. 1 strong foundry coke iron, Lake Superior ore, \$16.75; No. 2, \$16.25; Southern soft No. 1, \$16.75; No. 2, \$16.25; coke malleable, \$15.50; Lake Superior charcoal, \$18.50.

Pittsburg. Dec. 25.

(From Our Special Correspondent.)

The situation at the blast furnaces in this district and in the Valleys has become alarming owing to the inability of the railroads to deliver coke. Over a dozen furnaces were banked early in the week and before the end of the week it is authoritatively stated fully three-fourths of the furnaces in the Valleys will be banked. In an effort to keep some in blast West Virginia coke was used, being more easily obtained than the product of the Connellsville region but it did not give entire satisfaction. There does not seem to be any relief in sight and the demand for both raw and finished material continues. There is usually a lull around the holidays but this month is an exception to December in former years. Reports from the Connellsville coke fields show that the production last week was within 2,000 tons of the highest record ever made in the region and sufficient to keep all the furnaces in steady operation, but a great deal of it was stocked in the yards as it could not be shipped. An explosion occurred at one of the blast furnaces of Jones & Laughlins, Limited, last Thursday and it is out of blast. This furnace was not affected by the coke supply as the firm makes its own coke at the furnaces.

The Crucible Steel Company of America, has suffered seriously during the week. On Friday morning a battery of boilers at the Black Diamond Works, formerly operated by the Park Steel Company, exploded. The works were badly wrecked and although the repairs are being rushed, the plant will not be in full operation again before March 1. On Saturday morning there was a boiler explosion at the West End works of the company, formerly operated by Singer, Nimick & Company, incorporated, and this plant is badly crippled. On Monday the Crescent Works, also of the Crucible Steel combination, was forced to suspend operations temporarily at least, on account of a lack of material due to the freight congestion in the yards of the Allegheny Valley division of the Pennsylvania Railroad Company.

Pig Iron.—The United States Steel Corporation was forced to pay a higher rate for bessemer pig iron than \$15.25, and has just placed contracts for 15,000 tons for delivery in the first quarter at \$15.75, Valley furnaces. Other concerns look about 5,000 tons at that figure. Gray forge and foundry iron is still scarce. The demand for foundry No. 2 is stronger and prices have advanced to \$16.25@16.50. Pittsburg. Several thousand tons were contracted for at those prices for delivery throughout the first quarter. Gray forge is higher this week and 2,500 tons were sold at prices ranging from \$15.25 to \$15.50, Pittsburg.

Steel.—The bessemer steel billets market is quiet. No sales were recorded and the price remains at \$27.50@28. There is no change in the plate or bar market. The mills have orders on their books that will keep them busy for several months. Tank plates are still quoted at 1.60c. and steel bars at 1.50c.

Sheets.—The sheet situation remains unchanged. All the mills are being operated to their fullest capacity. The American Sheet Steel Company continues to quote No. 28 gauge at from 3.10 to 3.20c. Galvanized sheets are 70 and 5 per cent off.

Ferro-manganese.—Domestic 80 per cent is still quoted at \$52.50 and the foreign product is held at \$50.

New York. Dec. 27.

Pig Iron.—The market is strong and steady, but demand is expected to show a falling off as most large consumers have contracted for enough to last until April at least. We quote for tidewater delivery: No. 1X foundry, \$16.65@17.15; No. 2 X, \$16.15@16.65; No. 2 plain, \$15.65@16.15; gray forge, \$15.15@15.40. For Southern iron on dock, New York, No. 1 foundry, \$15.75; No. 2, \$15.25; No. 3, \$14.75; No. 4, \$14.25@14.50; No. 1 soft, \$15.75; No. 2, \$15.25@15.50.

Bar and Iron Steel.—Demand is lighter, due to the holidays and approaching stocktaking. We quote 1.58c. for common bars in large lots on dock; refined bars, 1.63@1.68c.; soft steel bars, 1.68c.

Plates.—Demand may be lighter, but prices are as firm as can be and prompt delivery means a special bargain. Eastern mills quote for tidewater delivery in car-loads: Tank, ¼-in. and heavier, 1.78c.; flange, 1.88c.; marine, 1.98c.; universals, 1.78c.

Steel Rails and Rail Fastenings.—Mills are well supplied with orders. Standard sections are still quoted at \$28 at Eastern mills; light rails at \$28@30, according to weight. Spikes are 1.80c.; splice bars, 1.55c.; bolts, 2.60@2.70c.

Structural Material.—The market is very strong for this season of the year. The Atlantic avenue contract in Brooklyn for 17,000 tons was taken by the American Bridge Company. We quote for large lots at tidewater as follows: Beams, 1.75c.; channels, 1.75c.; tees, 1.80c.; angles, 1.75c.

CHEMICALS AND MINERALS.

(For further prices of chemicals, minerals and rare elements, see page 874.)

New York. Dec. 26.

Heavy Chemicals.—The sodas are firmer, as stocks are comparatively small and shipments slow owing to the heavy weather recently. Some more 1902 and 1903 orders for domestic high test caustic soda have been taken around \$1.90 per 100 lbs., f. o. b. works. Jobbers' sellings on spot under prices quoted by importers have unsettled the market for bleaching powder, but as the large consumers are generally well supplied on contract the wholesale trade will not be demoralized. Further orders for next year's bleach have been booked at \$1.75@1.80 per 100 lbs. for prime Liverpool brands, and at a little lower rate for other makes. Domestic chlorate of potash has been contracted for over 1902 at \$7.50@7.75 per 100 lbs., while the present New York prompt delivery quotations are \$8.25 for powdered and \$8 for crystals. Prices per 100 lbs. are as below:

Articles.	Domestic.		Foreign.	
	F. o. b. Works.	In New York.	In New York.	In New York.
Alkali 58%....	87½ @ 90	.....	.....	.....
Alkali 48%....	90 @ 95	.....	.....	.....
Caustic Soda, high test....	\$1.95 @ \$2.00	.....	\$2.25 @ \$2.50	.....
powd. 60%....	.....	2.75	.....	.....
70@74%....	.....	2.85 @ 3.00	.....	.....
98%....	.....	3.25	3.75 @ 4.00	.....
Sal. Soda.....	.55	.65	.70	.....
Sal. Soda conc. 1.25 @ 1.50	.....	.....	.....	.....
Bicarb. Soda... 1.00 @ 1.10	.....	.....	1.37½ @ 1.75	.....
Bicarb. Soda, extra.....	3.25 @ 3.50	.....	.....	.....
Bleach. Pdr.: Eng. prime....	.....	.....	1.87½ @ 1.95	.....
Other brands.....	.....	.....	1.75 @ 1.85	.....
Chl. Pot. cryst.....	.....	8.00	10.00 @ 10.25	.....
Chl. Pot. powd.....	.....	8.25	10.50 @ 10.75	.....

Acids.—Better request reported for most acids. Contracts for 1902 delivery of muriatic have been booked around \$1.50 up per 100 lbs., according to strength, and for oxalic at \$4.75 per 100 lbs. Blue vitriol is easier, owing to weaker metal prices.

Quotations are per 100 lbs. as below, unless otherwise specified, for large lots in carboys or bulk (in tank cars), delivered in New York and vicinity.

Acetic, com'l 28%....	\$1.80	Oxalic, com'l....	4.75 @ 5.00
Blue vitrol....	4.50 @ 4.75	Sulphuric, 50 deg., bulk	.....
Muriatic, 18 deg.....	1.50	ton.....	14.00@16.00
Muriatic, 20 deg.....	1.62½	Sulphuric, 60 deg.....	1.00
Muriatic, 22 deg.....	1.75	Sulphuric, 60 deg., bulk	18.00@20.00
Nitric, 36 deg.....	4.00	Sulphuric, 66 deg.....	1.20
Nitric, 38 deg.....	4.25	Sulphuric, 68 deg.....	.....
Nitric, 40 deg.....	4.50	bulk.....	21.00@23.00
Nitric, 42 deg.....	4.87½		

Brimstone.—Small buyers are paying high prices for spot brimstone, as the steamer with 2,500 tons that was injured is still off Bermuda and the date of its arrival is in doubt. Consequently spot best unmixed seconds sold at \$26 per ton. Shipments from Sicily are also firmer at \$22.75@23. Best thirds continue \$3 less than seconds.

Brimstone exports from Sicily in October are reported to us by Messrs. Emil Fog & Sons, at 31,203 tons, against 52,566 tons last year; showing a decrease of 21,363 tons, or 40.6 per cent., due chiefly to the smaller movement to France, Holland and the United States. The exports to the United States alone were 8,800 tons, against 15,670 tons last year; a decrease of 6,870 tons. Stocks in Sicily on October 31 were 287,720 tons, being 41,877 tons, or 15 per cent larger than last year, due chiefly to the heavier holdings at Girgenti and Licata.

Pyrites.—New contracts are in order. Some have already been booked on basis of quotations.

Quotations f. o. b. are: Mineral City, Va., lump ore, \$2.90 per ton, and fines, 10c. per unit; Charlemont, Mass., lump, \$5, and fines, \$4.75. Spanish pyrites, 12@14c. per unit, delivered ex-ship New York and other Atlantic ports. Spanish pyrites contain from 46 to 51 per cent of sulphur; American, from 42 to 44 per cent.

Sulphate of Ammonia.—Shipments of gas liquor are easier at \$2.75 per 100 lbs. Little is being done in prompt.

Nitrate of Soda.—Seasonably quiet. Spot is quoted at \$1.92 1-2 per 100 lbs., and shipments at \$1.92 1-2 @ \$1.95, according to position.

Abroad attention has been attracted to the action of the Chilean Government in discontinuing its annual subsidy of £20,000 to the Permanent Nitrate Committee, of London, for propaganda purposes.

Concerning the Chilean market, Messrs. Jackson Bros., of Valparaiso, write us under date of November 2, as follows: The market has been quiet; the few holders of nitrate for this year's delivery maintaining their former limits of 6s. 11d. alongside for 95 per cent. A few parcels for delivery next February changed hands at 6s. 7d.@6s. 7½d. steamer terms. For the refined quality no inquiry has existed. The consumption of the world for the first 9 months of this year reached 27,151,000 qtls, or say, 1,629,000 qtls. more than during same period of last year. We quote 95 per cent November, 6s. 10½d.; December, 6s. 9d.; December-January, 6s. 8d.; January, 6s. 7½d.; February-March, 6s. 7d.; and 96 per cent quality at 7d. for November-December, all ordinary terms sellers. The price of 6s. 10½d., with an all round freight of 20s., stands in 8s. 8d. per cwt. net cost and freight without purchasing commission. Reported sales for the fortnight ended November 2 were 152,000 qtls., and resales 23,000 qtls.

Phosphates.—Exporters of high grade Florida rock have strengthened their views for next year's shipment, and in British territory their quotations are 7 1-2d. per unit (\$11.70 per ton), while prompt deliveries are satisfied on the basis of 6 3-4d. (\$10.53). In the same market South Carolina rock is offered freely at 5d. (\$6.50 per ton). The Algerian rock is quoted at 5 1-4d. per unit, but it is understood that more could be had. We note a charter from Fernandina to Leith, Scotland at 11s. (\$2.64), January sailing.

Exports of high grade Florida phosphate rock from Savannah, Ga., in November and the 11 months this year were as below, in long tons:

Destination.	November.	Eleven months.
Austria .....	.....	2,014
Belgium .....	.....	14,959
Denmark	2,721	5,321
Holland	5,047	27,907
Germany	5,235	77,675
Italy .....	.....	8,340
Sweden	2,497	5,651
United Kingdom	1,998	10,241
Total tons	17,498	152,108
Totals, 1900	15,491	112,163

The increase in the 11 months this year is equal to 25.3 per cent. Germany received direct about one-half the exports, and a large part of the quantity destined to Holland was re-exported to Germany. Of the total exports this year the Dutton Phosphate Company reported 61,320 tons, or 40.3 per cent, and Schilman & Bene, 39,825 tons, or 26.2 per cent, while the balance of 50,963 tons, or 33.5 per cent, was distributed among 6 other firms.

We quote:

Phosphates.	Per ton F. o. b.	C. I. f. U. S. & Kingdom or European Ports.	
		Unit.	Long ton.
*Fla. hard rock (77@80%).	\$7.00@7.50	6½@7¼d	\$10.53@11.31
*Fla. hard rock (77@80%).	\$7.00@7.50	6½@7¼d	\$10.53@11.70
*Fla. Peace Riv. (58@63%).	2.25@2.50	5 @5½d	6.00@ 6.60
†Tenn....(78@80%), export.	3.50	6½@7d	10.53@10.92
†Tenn....78% domestic.	3.00@3.25	.....	.....
†Tenn....75% domestic.	2.75@3.00	.....	.....
†Tenn....70@72% domestic.	2.25@2.50	.....	.....
†So. Car. land rock.....	3.25	4½@5d	5.67@ 6.30
†So. Car. river rock.....	2.75@3.25	.....	.....
Algerian, rock... (63@70%).	.....	6 @6½d	8.04@ 8.70
Algerian, rock... (58@63%).	.....	5¼@5½d	6.30@ 6.60
Tunis, Gafsa... (58@63%).	.....	5¼@5½d	6.30@ 6.60

*Fernandina, Brunswick or Savannah. †Mt. Pleasant. ‡On vessels Ashley River.

Liverpool. Dec. 18.

(Special Report of Joseph P. Brunner & Co.)

The market for chemicals continues quiet on spot, but a fair inquiry is reported for 1902 deliveries.

The exports of bleaching powder and sodas for the month ending November 30, as per Board of Trade returns, are as follows: Bleaching powder: Total exports to all quarters, including United States, 109,386 cwts.; exports to United States alone, 85,713 cwts. Soda compounds: Soda ash, 127,186 cwts.; caustic soda, 113,062 cwts.; bicarb. soda, 27,067 cwts.; soda crystals, 20,269 cwts.;

saltcake, 68,995 cwts.; other sorts, 33,323 cwts.; total, 389,902 cwts.

Compared with the corresponding month of last year, the shipments of bleach show a slight falling off, but shipments of sodas are considerably heavier. While the exports of bleach during last month are light compared with October shipments, sodas are much heavier, being the largest of any month this year principally accounted for by the increase in saltcake shipments, although the figures for soda ash, caustic soda, etc., are also satisfactory.

Soda ash is firm at the usual varying prices as to market. We quote spot range for tierces about as follows: Lebanc ash, 48 per cent, £5 15s.@£6; 58 per cent, £6 2s. 6d.@£6 7s. 6d. per ton net cash. Ammonia ash, 48 per cent, £4 10s.@£4 15s.; 58 per cent, £4 15s.@£5 per ton net cash. Bags, 5s. per ton under price for tierces. Soda crystals are steady at generally £3 7s. 6d. per ton, less 5 per cent for barrels, or 7s. less for bags, with special terms for certain export markets. Caustic soda is in light demand on spot, buyers holding aloof in view of the lower range of values for 1902 as follows: 60 per cent, £8 15s.; 40 per cent, £9 15s.; 74 per cent, £10 5s.; 76 per cent, £10 10s. per ton, net cash. Bleaching powder is quiet at £6 15s.@£6 17s. 6d. per ton, net cash, for hardwood package, with special terms for certain export quarters. Chlorate of potash is rather dearer at 3¼@3½d. per lb., net cash, and makers have little to sell for prompt delivery, besides being well sold for 1902. Bicarb. soda is unchanged and selling to a fair extent at £6 15s. per ton, less 2½ per cent for the finest quality in 1 cwt. kegs with the usual allowances for larger packages, also special terms for a few export markets. Sulphate of ammonia is in limited demand and weaker at £11 per ton, less 2½ per cent for good gray 24@25 per cent in double bags f. o. b. here.

Nitrate of soda is without special feature and spot lots hold for £9 10s.@£9 12s. 6d. per ton, less 2½ per cent for double bags f. o. b. here, as to quality and quantity.

Messina, Sicily. Nov. 30.

(Special Report of Emil Fog & Sons.)

Brimstone.—The market remains unaltered. Prices have not declined, although the Anglo-Sicilian have become a willing seller. No doubt they would even make concessions to a buyer who would relieve them of a considerable part of their immense stock, which well nigh must be immobilizing their whole large capital. The difficulty, however, consists in finding such a buyer at present artificially inflated prices as nobody has the courage to make heavy purchases on speculation. A characteristic sign is that warrants of the company are being offered by re-sellers, without being bought back at once by the company. Stocks in Sicily at the end of October were about 60,000 tons in excess of last year. This proves that the production is largely increasing. At present prices the Anglo-Sicilian are making large profits. The decline of our foreign exchange by 4 and 5 per cent ought to induce the managers in London to make a corresponding reduction in prices; some small concession might prevent several concerns from making the contemplated change in their plants for the use of pyrites. We quote: Best unmixd 85s. 9d. (\$20.10); best thirds, 73s. (\$17.52); current thirds, 68s. (\$16.32); refined block (100 per cent, 86s. (\$20.64); refined roll, 94s. 6d. (\$22.68); sunned flowers, pure in bags, 103s. (\$24.72); and current sublimed flowers, 94s. (\$22.56); all f. o. b.

Freights are declining, and tonnage to the United States will be plentiful. We quote: New York, 7s. (\$1.68); Baltimore and Philadelphia, 7s. 6d. (\$1.80); Boston and Portland, 8s. (\$1.92). For Canada spring shipment we can fix minimum 3,000 tons at 8s. Sailing vessels to Australia are 18s. (\$4.32).

METAL MARKET.

New York. Dec. 26.

GOLD AND SILVER.

Gold and Silver Exports and Imports.

At all United States Ports in November and Year.

Metal	November.		Year.	
	1900.	1901.	1900.	1901.
Gold Exports....	\$677,207	\$15,905,612	\$53,724,000	\$52,598,028
Imports....	12,641,988	5,270,053	63,362,473	49,808,733
Excess..... I.	\$11,964,781	E. \$10,635,559	I. \$9,638,383	E. \$2,790,195
Silver Exports....	\$5,258,080	\$4,689,209	\$58,863,325	\$50,914,827
Imports....	3,680,252	2,794,701	36,982,496	28,366,361
Excess..... E.	\$1,157,828	E. \$1,894,508	E. \$21,880,839	E. \$22,548,466

These figures include the exports and imports at all United States ports, and are furnished by the Bureau of Statistics of the Treasury Department.

Gold and Silver Exports and Imports, New York.

For the week ending Dec. 26, 1901, and for years from January 1st, 1901, 1900, 1899 and 1898.

Period.	Gold.		Silver.		Total Exports Exports or Imports.
	Exports.	Imports.	Exports.	Imports.	
Week ...	\$66,918	\$97,516	\$458,865	\$19,474	E. \$408,733
1901.....	45,988,757	4,739,353	30,654,458	2,543,197	E. 69,322,153
1900.....	34,294,572	10,538,875	39,331,728	4,692,312	E. 60,673,113
1899.....	14,352,286	13,982,311	29,733,680	3,847,074	E. 26,306,611
1898.....	6,851,230	98,646,019	34,592,008	3,280,186	E. 62,482,033

Gold imports were from the West Indies; silver from Mexico and South America. Gold exports were chiefly to Germany; silver mainly to London.

Financial Notes of the Week.

The close of the year shows some degree of quiet in business, as is customary; but there is still plenty of activity everywhere.

The statement of the New York Banks, including the 63 banks represented in the Clearing House, for the week ending December 21, gives the following totals, comparison being made with the corresponding weeks in 1900 and 1899:

	1899.	1900.	1901.
Loans and discounts....	\$673,315,900	\$787,098,700	\$857,005,400
Deposits	740,395,700	838,804,400	804,066,300
Circulation	15,906,900	30,902,500	31,929,300
Specie	143,963,100	150,041,000	161,048,800
Legal tenders	51,519,900	60,157,100	70,760,000

Total reserve.....	\$195,483,000	\$219,198,100	\$231,809,400
Legal requirements....	185,008,925	209,701,100	226,024,075
Balance surplus	\$10,384,075	\$9,497,000	\$5,785,325

Changes for the week, this year, were increases of \$50,300 in circulation, and \$330,300 in surplus reserve; decreases of \$13,368,500 in loans and discounts, \$19,062,000 in deposits, \$3,410,000 in specie, and \$1,025,200 in legal tenders.

The following table shows the specie holdings of the leading banks of the world at the latest dates covered by their reports. The amounts are reduced to dollars and comparison is made with the holdings at the corresponding date last year:

	1900.		1901.	
	Gold.	Silver.	Gold.	Silver.
N. Y. Ass'd.	\$159,041,000	.....	\$161,048,800	.....
England	150,661,315	.....	171,960,645	.....
France	466,334,225	\$222,075,000	492,896,115	\$220,625,625
Germany	132,910,000	68,465,000	158,965,000	81,830,000
Spain	69,875,000	82,075,000	70,050,000	85,595,000
Neth'lds	24,300,000	28,010,000	28,708,500	30,869,500
Belgium	14,375,000	7,190,000	15,766,000	7,688,335
Italy	77,245,000	8,850,000	79,970,000	10,303,500
Russia	390,120,000	30,110,000	339,475,000	30,465,000

The returns of the Associated Banks of New York are of date December 21, and the others December 19, as reported by the Commercial and Financial Chronicle cable. The New York banks do not report silver separately, but the specie carried is chiefly gold. The Bank of England reports gold only.

The silver market through the holiday season seems to be steady. Silver is in demand and there is a fair prospect that renewed buying in the new year will advance prices unless there is heavy pressure to sell.

Receipts of silver at the United States Assay Office in New York were 19,000 oz. for the week.

Shipments of silver from London to the East for the year up to December 12, are reported by Messrs. Pixley & Abell's circular as follows:

	1900.	1901.	Changes.
India	£6,086,779	£7,285,410	I. £1,198,631
China	1,379,304	645,617	D. 733,777
The Straits	609,154	647,412	I. 38,258
Total.....	£8,075,327	£8,578,439	I. £503,112

Arrivals for the week this year were £321,000 in bar silver from New York, £13,000 from Chile, £9,000 from the West Indies and £2,000 from Australia; total, £345,000. Shipments of bar silver were £250,000 to Bombay, and £22,500 to Calcutta; also £55,000 in Mexican dollars to the Straits; total, £327,500.

Indian exchange is steady at 15.97d. per rupee. There has been some increase to shipments of silver. Money in India continues abundant.

The foreign merchandise trade of Great Britain for the 11 months ending November 30 is given by the Board of Trade returns as below:

	1900.	1901.
Imports	£477,275,947	£475,506,540
Exports	326,482,016	318,719,708
Excess, imports	£150,793,931	£156,786,832

The imports decreased £1,769,407, or 0.4 per cent, and the exports £762,308, or 2.4 per cent; leaving an increase of £5,992,901, or 3.9 per cent, in the excess

of imports. The movement of gold and silver for the 11 months is reported as follows:

Table with columns: Imports, Exports, Excess. Rows for Gold and Silver for years 1901, 1900, 1901, 1900.

Of the silver imported this year £8,931,366, or 84.4 per cent, came from the United States.

Prices of Foreign Coins.

Table with columns: Bid, Asked. Rows for Mexican dollars, Peruvian soles, Victoria sovereigns, Twenty francs, Twenty marks, Spanish 25 pesetas.

UNITED STATES.

Table with columns: October, Ten months. Rows for Articles, Long tons, Imports, Exports, Imports, Exports, Foreign, Domestic.

Ores and Metals.

Table listing various ores and metals with their respective prices and quantities.

Minerals.

Table listing various minerals with their respective prices and quantities.

The figures for copper are those given by the Treasury Department. The statement made by Mr. John Stanton for the Associated Copper Companies will be found monthly in our metal market. These figures give the exports for October as 6,016; ten months, 74,126 tons.

Import Duties.

Metals.—The duties on metals under the present tariff law are as follows: Antimony, metal or regulus, 1/2c. a lb. Lead 1/2c. a lb. on lead ores; 2/3c. a lb. on pigs, bars, etc., 2/3c. on sheet pipe and manufactured forms. Nickels, 6c. a lb. Quicksilver, 7c. a lb. Spelter or zinc, 1/2c. a lb. on pigs and bars, 2c. on sheets, etc. Copper, tin and platinum are free of duty.

Minerals.—Duties are: Asphalt, crude, \$1.60 per ton, and refined \$3 per ton. Coal, bituminous, 67c. long ton; coke, 20c. ad. val. Cement, Roman Portland and hydraulic, in bulk, 8c. per 100 lbs. and in packages 7c. Copper sulphate, 1/2c. a lb. Salt in bulk, 8c. per 100 lbs., and in bags, etc., 12c. Brimstone, anthracite coal, graphite, phosphate rock, pyrites and nitrate of soda are free of duty.

Average Prices of Metals per lb., New York

Table showing average prices of metals per lb. for New York from 1901 to 1900, categorized by month.

The prices given in the table for copper are the averages for electrolytic copper. The average price for Lake copper for the year 1900 was 16.52c.; for the month of January, 1901, it was 16.77c.; for February, 16.90c.; for March, 16.94c.; for April, 16.94c.; for May, 16.94c.; for June, 16.90c.; for July, 16.61c.; for August, 16.50c.; for September, 16.54c.; for October, 16.60c.; for November, 16.63c.

Average Prices of Silver, per oz., Troy.

Table showing average prices of silver per oz. for Troy from 1901 to 1899, categorized by month.

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

OTHER METALS.

Daily Prices of Metals in New York.

Table showing daily prices of metals in New York, including Silver, Copper, and Spelter, with columns for various grades and prices.

London quotations are per long ton, (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars; the price of electrolytic cathodes, is usually 0.25c lower than these figures.

Copper.—The market is utterly demoralized, and business in this country remains at a standstill. The only reliable information that can be gathered as to values comes from abroad, where we understand American electrolytic copper has been sold at the parity of about 12c. New York. Transactions, however, have been few and far between, as consumers prefer to await further developments. We quote, nominally, 12 1/4@12 3/4c. for Lake; 11 1/2@12 1/4c. for electrolytic copper in cakes, wirebars and ingots; 11 1/2@12c. in cathodes; 11 1/2@12c. for casting copper.

The market for standard copper in London, which closed last Friday at £48 15s., opened on Monday at £47 10s., and the closing quotations on Tuesday were cabled as £48@£48 2s. 6d. for spot, £48 10s.@£48 12s. 6d. for three months. Owing to the Christmas holidays, the London Metal Exchange was closed on Wednesday and Thursday.

Refined and manufactured sorts we quote: English tough, £52 10s.@£53 10s.; best selected, £55 10s.@£56 10s.; strong sheets, £60@£61; India sheets, £58@£59; yellow metal, 5 1-2d.@5 3-4d.

Exports of copper from New York and Baltimore during the current week are reported by our special correspondents as follows: To Germany, 712 tons; Holland, 528; Great Britain, 206; France, 55; West Indies and South America, 6; total, 1,507 tons. Also 239 tons matte to Great Britain.

Imports were 494 tons copper, and 100 tons matte.

Imports of copper in all forms into Great Britain for the 11 months ending November 30 are reported as below, in long tons, the totals showing the equivalent tons of fine copper:

Table showing imports of copper in all forms into Great Britain for the 11 months ending November 30, categorized by year and type.

Of the imports this year the United States furnished 1,026 tons of ore, 18,242 tons of matte and 17,368 tons fine copper; which compare with 1,129 tons of ore, 8,187 tons of matte and 26,290 tons of fine copper last year.

Tin.—After we had gone to press last week, the failure of one of the most prominent bull operators on the London Metal Exchange was announced, and the market broke sharply, abroad as well as here; as low as 22 3-4c. was accepted at one time. Towards the close, however, the tendency became firmer and we quote 23 5-8@23 3-4c. for spot, 23 1-2@23 5-8c. for January.

The foreign market, which opened on Friday at £106, dropped £5 upon the announcement of the failure above referred to. It opened on Monday at £101 15s. and experienced a smart advance on Tuesday, the closing quotations being cabled as £105 5s.@£105 7s. 6d. for spot, £104@£104 2s. 6d. for three months.

Imports of tin into Great Britain and re-exports of imported metal were as follows for the 11 months ending November 30, in long tons:

Table showing imports of tin into Great Britain and re-exports of imported metal for the 11 months ending November 30, categorized by year and type.

Total Imports 29,983 32,946 I. 2,963 Re-exports 17,092 18,736 I. 1,644 Balance 12,891 14,210 I. 1,319

The increase in total imports this year was 27 per cent.

Exports of tin from the Straits for the 10 months ending October 31 are reported as below, in long tons:

Table showing exports of tin from the Straits for the 10 months ending October 31, categorized by year and type.

Totals 39,147 43,709 I. 4,562

The increase in shipments was an important one, and shows that the tin mines in the Malay Peninsula have been more actively worked this year than last.

Lead.—Has ruled quiet but steady throughout the week. The recent cut in prices has evidently not stimulated buying to any appreciable extent, this being the dull season of the year. The ruling quotations are 3.85@3.95c. St. Louis, 3.95@4c. New York.

The foreign market continues weak, Spanish lead being quoted at £10 2s. 6d.@£10 3s. 9d., English lead £10 5s.@£10 6s. 3d.

St. Louis Lead Market.—The John Wahl Commission Company telegraphs us as follows: Lead is very dull at the late decline; buyers fear a further reduction, and only take on such supplies as their immediate wants require. The price seems to be 3.95c. for both desilverized and Missouri lead.

Imports of lead into Great Britain for the 11 months ending November 30 were, in long tons:

Table showing imports of lead into Great Britain for the 11 months ending November 30, categorized by year and type.

Balance 148,217 165,872 I. 17,655

Or the lead credited to the United States nearly all is Mexican lead refined here in bond.

Spelter.—Is quiet, but firm, without any special feature. It is announced that a new smelter will be erected at Neoesha, Kansas, to be known as the Lanyon Brothers Spelter Company. The plans are said to call for some 3,000 retorts capacity, natural gas being used as fuel. The ruling quotations are 4.12 1/2 @4.15c. St. Louis, 4.27 1/2 @4.30c. New York.

The foreign market is somewhat easier, good ordinaries being quoted at £16 15s., specials at £17.

St. Louis Spelter Market.—The John Wahl Commission Company telegraphs us as follows: Spelter is dull, but firm; prices are nominally 4.12 1/2 @4.15c. Zinc ores in the Joplin District continue to advance on account of light production caused by the recent cold snap.

Imports of spelter or metallic zinc into Great Britain for the 11 months ending November 30 were 63,283 long tons, against 63,670 tons for the corresponding period in 1900; showing a decrease of 387 tons this year.

Antimony.—Is dull and depressed. We quote Cookson's at 10c.; Hallett's at 8 1/2c.; Hungarian, Italian, Japanese and U. S. Star at 7 1/4@8c.

Nickel.—The price continues firm at 50@60c. per lb., according to size and terms of order.

Platinum.—Consumption continues good and prices are strong. Ingot platinum in large lots brings \$200 @ \$21 per oz., in New York.

Chemical ware (crucibles and dishes), best hammered metal from store in large quantities, is worth 82c. per gram.

Quicksilver.—This metal can be had in New York at \$49 per flask (76 lbs.) for large quantities and from 50c. to \$1 higher for small orders. San Francisco quotations are a shade lower, say, \$46.50@£48 for domestic orders and \$42.50@£44 for export. The London price is £8 17s. 6d. a flask, with the same figure quoted from second hands.

Quicksilver receipts at San Francisco in November were 1,374 flasks. For the 11 months ending November 31 the receipts were 18,172 flasks, against 18,046 for the corresponding period in 1900, and 21,739 in 1899. These receipts do not include shipments made direct from the mines to consumers. Exports from San Francisco by water for the 11 months were as follows: Siberia, 2 flasks; Korea, 12; Japan, 24; South America, 20; Central America, 1,008; Mexico, 3,436; British Columbia, 32; New York, 70; total, 4,604 flasks, against 6,588 in 1900. In 1900 there were 1,000 flasks sent to China, but that country has taken no quicksilver this year.

Imports of quicksilver into Great Britain for the 11 months ending November 30 were 2,639,572 lbs., against 895,488 lbs. for the corresponding period in 1900. Re-exports were 1,897,992 lbs. this year against 1,825,982 lbs. in 1900; showing a balance of imports of 741,580 lbs. this year, against an excess of exports of 930,504 lbs. last year.

Minor Metals and Alloys.—Wholesale prices, f. o. b. works, are as follows:

Table listing wholesale prices for various minor metals and alloys, including Aluminum, Ferro-Tungsten, Magnesium, Manganese, Alum-brone, Nickel-alum, Bismuth, Chromium, Copper, red oxide, Ferro-Molyb'dum, Ferro-Titanium, and Tungsten.

Variations in prices depend chiefly on the size of the order.

STOCK QUOTATIONS.

NEW YORK.

Table of stock quotations for New York, listing companies and locations with columns for par value, Dec. 19, Dec. 20, Dec. 21, Dec. 23, Dec. 24, Dec. 25, and Sales.

*Holiday.

Coal and Industrial Stocks.

Table of coal and industrial stock quotations for New York, listing companies like Am. Agr. Chem., U.S. Steel, etc., with columns for par value, Dec. 19, Dec. 20, Dec. 21, Dec. 23, Dec. 24, Dec. 25, and Sales.

Total sales 641,006 shares. † Ex-dividend. *Holiday.

PHILADELPHIA, PA. §

Table of stock quotations for Philadelphia, PA, listing companies and locations with columns for par value, Dec. 19, Dec. 20, Dec. 21, Dec. 23, Dec. 24, Dec. 25, and Sales.

§ Reported by Townsend, Whelen & Co., 309 Walnut St., Philadelphia, Pa. Total sales 5,986 shares. *Holiday

MEXICO.

Dec. 14.

Table of stock quotations for Mexico, listing companies and locations with columns for Shares, Last div'd, Prices (Bid, Ask), and Sales.

BOSTON, MASS.

Table of stock quotations for Boston, Mass., listing companies and locations with columns for Name of Company, par value, Shares listed, Dec. 19, Dec. 20, Dec. 21, Dec. 23, Dec. 24, Dec. 25, and Sales.

Official Quotations, Boston Stock Exchange. Total sales, 49,791 shares. *Holiday.

ST. LOUIS, MO.*

Dec. 23.

Table of stock quotations for St. Louis, MO, listing companies and locations with columns for Name, Shares, Par, Bid, Ask, Name, Shares, Par, Bid, Ask.

*From our Special Correspondent.

SPOKANE, WASH.

Dec. 20.

Table of stock quotations for Spokane, Wash., listing companies and locations with columns for Name of Company, Par Val, B, A, Sales, Name of Company, Par Val, B, A, Sales.

SALT LAKE CITY.*

Dec. 21.

Table of stock quotations for Salt Lake City, listing companies and locations with columns for Name of Company, Location, Shares, Par Val, Quotations (High, Low), and Sales.

*By our Special Correspondent. Total sales, 406,672 shares.

STOCK QUOTATION.

COLORADO SPRINGS, COLO.

Table of stock quotations for Colorado Springs, Colo. Columns include Name of Company, par value, and prices for Dec. 14, 16, 17, 18, 19, 20, and Sales.

Total sales 812,494 shares.

Colorado Springs (By Telegraph.)

Table of stock quotations for Colorado Springs (By Telegraph). Columns include Name of Company, par value, and prices for Dec. 19, 20, 21, 23, 24, and Dec. 25.

*Holiday

MONTREAL, CANADA.

Dec. 19.

Table of stock quotations for Montreal, Canada. Columns include Name of Company, par value, and prices for Dec. 19.

LONDON.

Dec. 14.

Table of stock quotations for London. Columns include Name and Country of Company, Authorized Capital, Par value, Last dividend (Amt. Date), and Quotations (Buyers. Sellers.).

c.—Copper. d.—Diamonds. g.—Gold. l.—Lead. s.—Silver. *Ex-dividend.

PARIS.

Dec. 5.

Table of stock quotations for Paris. Columns include Name of Company, Country, Product, Capital Stock, Par value, Latest divs., and Prices (Opening, Closing).

TORONTO, ONT.

Table of stock quotations for Toronto, Ont. Columns include Name of Company, par value, and prices for Dec. 17, 18, 19, 20, 21, 23, and Sales.

Total sales, 5,700 shares.

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

Abrasives—		Cust. Meas.	Price	Barium—		Cust. Meas.	Price	Graphite—Am. f.o.b. Prov-		Cust. Meas.	Price	Metallic, brown.....		Cust. Meas.	Price
Carborundum, f.o.b. Niagara Falls, Powd., F. FF. FFF.	lb.		\$0.08	Oxide, Am. hyd. cryst.	lb.	\$0.02		dence, R. I. lump.	sh. ton	8.00		Red.....	sh. ton	\$ 19.00	
Grains.....	"		.10	Sulphate (Blanc Fixe).....	"	.02		Pulverized.....	"	30.00		Ocher, Am. common.....	"	9.25@10.00	
Corundum, N. C.....	"	.07@.10		Barytes—				German, som. pulv.....	lb.	.0134@.0112		Best.....	"	21.25@25.00	
Chester, Mass.....	"	.0434@.05		Am. Crude, No. 1.....	sh. ton	9.00		Best pulverized.....	"	.0134@.02		Dutch, washed.....	lb.	.0434	
Crushed Steel, f.o.b. Pittsburg.....	"	.0534		Crude, No. 2.....	"	8.00		Ceylon, common pulv.....	"	.0234@.0334		French, washed.....	"	.0134@.02	
Emery, Turkish flour, in kegs.....	"	.0334		Crude, No. 3.....	"	7.75		Best pulverized.....	"	.04@.08		Orange mineral, Am.....	"	.08@.0834	
Grains, in kegs.....	"	.05@.0534		German, gray.....	"	14.50		Italian, pulv.....	"	.0134		Foreign, as to make.....	"	.0834@.1134	
Naxos flour, in kegs.....	"	.0334		Snow white.....	"	17.00		Gypsum—Ground.....	sh. ton	8.00@8.50		Paris green, pure, bulk.....	"	.1234	
Grains, in kegs.....	"	.05@.0534		Bauxite—Ga. or Ala. mines:				Fertilizer.....	lg. ton	7.00		Red lead, American.....	"	.0534	
Chester flour, in kegs.....	"	.0334		First grade.....	lg. ton	5.50		Rock.....	lg. ton	4.00		Foreign.....	"	.0734@.0834	
Grains, in kegs.....	"	.05@.0534		Second grade.....	"	4.75		English and French.....	"	14.00@16.00		Turpentine, spirits.....	gal.	.3734	
Peekskill, f.o.b. Easton, Pa., flour, in kegs.....	"	.0134		Bismuth—Subnitrate.....	lb.	1.40		Infusorial Earth—Ground.....	"			White lead, Am., dry.....	lb.	.0434@.0434	
Grains, in kegs.....	"	.0234		Subcarbonate.....	"	1.65		American, best.....	"	20.00		American, in oil.....	"	.0534	
Crude, ex-ship N. Y.: Abbott (Turkey).....	lg. ton	26.50@30.00		Bitumen—"B".....	"	.0334		French.....	"	37.50		Foreign, in oil.....	"	.0734@.0934	
Kuluk (Turkey).....	"	22.00@24.00		"A".....	"	.05		German.....	"	40.00		Zinc, white, Am., ex dry.....	"	.0434@.0434	
Naxos (Greek) h. gr.....	"	.36.00		Bone Ash.....	"	.0234@.0234		Iodine—Crude.....	100 lbs.	2.45		American, red seal.....	"	.0934	
Garnet, as per quality.....	sh. ton	25.00@25.00		Borax.....	"	.0734@.0734		Nitrate, com'l.....	"	.0134		Green seal.....	"	.07	
Pumice Stone, Am. powd.....	lb.	.0134@.02		Bromine.....	"	.40		True.....	"	.04		Foreign, red seal, dry.....	"	.0534@.08	
Italian, powdered.....	"	.0134		Cadmium—Metallic.....	"	1.40		Oxide, pure copperas col.....	"	.05@.10		Green seal, dry.....	"	.0634@.09	
Lump, per quality.....	"	.04@.40		Sulphate.....	100 lbs.	2.00@2.50		Purple-brown.....	"	.02					
Rottenstone, ground.....	"	.0234@.0434		Calcium—Acetate, gray.....	"	1.25		Venetian red.....	"	.01@.0134					
Lump, per quality.....	"	.06@.20		"brown.....	"	.85		Scale.....	"	.01@.03		Potash—			
Rouge, per quality.....	"	.10@.30		Carbide, ton lots f.o.b. Niagara Falls, N. Y., or Jersey City, N. J.....	sh. ton	75.00		Kaolin—(See Clay, China.)				Caustic, ordinary.....	"	.0434@.06	
Steel Emery, f.o.b. Pittsburg.....	"	.07		Carbonate, ppt.....	lb.	.05		Kryolith—(See Cryolite.)				Elect. (90%).....	"	.0634	
				Chloride, com'l.....	100 lbs.	.75@.80		Lead—Acetate, white.....	"	.0734@.08					
				Best.....	"	1.00		Brown.....	"	.06		Potassium—			
				Cement—				Nitrate, com'l.....	"	.0634		Bicarbonate cryst.....	"	.0534	
				Portland, Am., 400 lbs.....	bb. l.	1.70@2.00		"gran.....	"	.0834		Powdered or gran.....	"	.14	
				Foreign.....	"	1.65@2.25		Lime—Com., abt. 250 lbs.....	bb. l.	.80		Bichromate, Am.....	"	.0834	
				"Rosendale," 300 lbs.....	"	.95		Finishing.....	"	.90		Scotch.....	"	.0834@.09	
				Slag cement, imported.....	"	1.65		Magnesite—Greece.				Carbonate, hydrated.....	"	.04@.0434	
				Ceresine—				Crude (95%).....	lg. ton	6.50@7.00		Calcined.....	"	.35	
				Orange and Yellow.....	lb.	.12		Calined.....	sh. ton	14.00@15.00		Chromate.....	"	.24@.25	
				White.....	"	.1334		Am. Bricks, f.o.b. Pittsburg.....	M	175.00		Cyanide (98@99%).....	lg. ton	9.05	
				Cr alk—Lump, bulk.....	sh. ton	2.45		Magnesium—				Manure salt, 20%.....	100 lbs.	.66	
				Pj, per quality.....	lb.	.0634@.06		Carbonate, light, fine pd.....	lb.	.0434		Double Manure salt, 48@53%.....	"	1.12	
				Chlo line—Liquid.....	"	.30		Blocks.....	"	.06@.07		Muriate, 80@85%.....	"	1.83	
				Water.....	"	.10		Chloride, com'l.....	"	.0134		95%.....	"	1.86	
				Chrome Ore—				Fused.....	"	.20		Permanganate, pure cr.....	lb.	.1234@.1234	
				(50% ch.) ex-ship N. Y.....	lg. ton	24.75		Nitrate.....	"	.60		Prussiate, yellow.....	"	.1334	
				Sand, f.o.b. Baltimore.....	"	33.00		Sulphate.....	100 lbs.	.75@.95		Red.....	"	.37@.3734	
				Bricks, f.o.b. Pittsburg.....	M	175.00		Manganese—Powdered,				Sulphate, 90%.....	100 lbs.	2.11	
				Clay, China—Am. com., ex-dock, N. Y.....	lg. ton	8.00		70@75% bioxide.....	lb.	.0134@.0134		90%.....	"	2.14	
				Am. best, ex-dock, N. Y.....	"	9.00		Crude, pow'd.....	"	.0134@.0234		Sylvinit.....	unit	.8934	
				English, common.....	"	12.00		75@85% bioxide.....	"	.0134@.0234		Quartz—(See Silica.)			
				Best grade.....	"	17.00		85@90% bioxide.....	"	.0234@.0334		Salt—N. Y. com. fine.....	sh. ton	2.00	
				Fire Clay, ordinary.....	sh. ton	4.25		90@95% bioxide.....	"	.0334@.0534		N. Y. agricultural.....	"	1.50	
				Best.....	"	6.00		Carbonate.....	"	.16@.20		Saltpetre—Crude.....	100 lbs.	3.50@3.55	
				Slip Clay.....	"	5.00		Chloride.....	"	.04		Refined.....	"	4.3734@5.3734	
				Coal Tar Pitch.....	gal.	.08		Ore, 50%, Foreign.....	unit	.23@.24		Silica—Best foreign.....	lg. ton	10.00@11.00	
				Cobalt—Carbonate.....	lb.	1.75		Domestic.....	"	.30		Ground quartz, ord.....	sh. ton	6.00@8.00	
				Nitrate.....	"	1.50		Marble—Flour.....	sh. ton	6.00@7.00		Best.....	"	12.00@13.00	
				Oxide—Black.....	"	2.20@2.30		Mercury—Bichloride.....	lb.	7.00		Lump quartz.....	"	2.50@4.00	
				Gray.....	"	2.28@2.40		Mica—N. Y. gr'nd, coarse.....	"	.63@.04		Glass sand.....	"	2.75	
				Smalt, blue ordinary.....	"	.06		Fine.....	"	.04@.05		Permanganate, pure cr.....	lb.	.1234@.1234	
				Best.....	"	.20		Sheets, N. C., 2x4 in.....	"	.30		Prussiate, yellow.....	"	.1334	
				Copperas.....	100 lbs.	.30@.35		3x3 in.....	"	.80		Red.....	"	.37@.3734	
				Copper—Carbonate.....	lb.	.18		3x4 in.....	"	1.50		Sulphate, 90%.....	100 lbs.	2.11	
				Chloride.....	"	.25		4x4 in.....	"	2.00		90%.....	"	2.14	
				Nitrate, crystals.....	"	.35		6x6 in.....	"	3.00		Sylvinit.....	unit	.8934	
				Oxide, com'l.....	"	.19		Mineral Wool				Salt—N. Y. com. fine.....	sh. ton	2.00	
				Cryolite.....	"	.0634		Slag, ordinary.....	sh. ton	19.00		N. Y. agricultural.....	"	1.50	
				Explosives—				Selected.....	sh. ton	25.00		Saltpetre—Crude.....	100 lbs.	3.50@3.55	
				Blasting powder, A.....	25 lb. keg	2.65		Rock, ordinary.....	"	32.00		Refined.....	"	4.3734@5.3734	
				Blasting powder, B.....	"	1.40		Selected.....	"	40.00		Silica—Best foreign.....	lg. ton	10.00@11.00	
				"Rackarock," A.....	lb.	.25		Nickel—Oxide, No. 1.....	lb.	1.00		Ground quartz, ord.....	sh. ton	6.00@8.00	
				"Rackarock," B.....	"	.18		No. 2.....	"	.60		Best.....	"	12.00@13.00	
				Judson R. R. powder.....	"	.10		Sulphate.....	"	.20@.21		Lump quartz.....	"	2.50@4.00	
				Dynamite (20% nitro-glycerine).....	"	.13		Oil—Black, reduced 29 gr.:				Glass sand.....	"	2.75	
				ine).....	"	.14		25@30, cold test.....	gal.	.0934@.1034		Permanganate, pure cr.....	lb.	.1234@.1234	
				(30% nitro-glycerine).....	"	.14		15, cold test.....	"	.1034@.1134		Prussiate, yellow.....	"	.1334	
				(40% nitro-glycerine).....	"	.15		Zero.....	"	.1134@.1234		Red.....	"	.37@.3734	
				(50% nitro-glycerine).....	"	.1634		Summer.....	"	.0934@.0934		Sulphate, 90%.....	100 lbs.	2.11	
				(60% nitro-glycerine).....	"	.18		Cylinder, dark steam ref.....	"	.0634@.1034		90%.....	"	2.14	
				(75% nitro-glycerine).....	"	.21		Dark, filtered.....	"	.1134@.1534		Sylvinit.....	unit	.8934	
				Glycerine for nitro (32 2-10° Be.).....	"	.13@.1334		Light filtered.....	"	.1434@.1734		Sulphur—Roll.....	100 lbs.	1.85	
				Feldspar—Ground.....	sh. ton	8.00@9.00		Extra cold test.....	"	.2134@.2634		Flour.....	"	1.90	
				Flint Pebbles—Danish, Best.....	lg. ton	14.75		Gasoline, 86°@90°.....	"	.14@.19		Flowers, sublimed.....	"	2.15	
				French, Best.....	"	11.75		Naphtha, crude, 68°@72°.....	bb. l.	9.05		Tar—Regular.....	bb. l.	3.80	
				Fluorspar—				"Stove".....	gal.	.12		Oil barrels.....	"	3.80	
				Am. lump, 1st grade.....	sh. ton	\$14.40		Paints and Colors—				Tin—Crystals.....	lb.	.20@2134	
				2d grade.....	"	13.90		Chrome green, common.....	"	.05		Oxide.....	"	.42	
				Gravel and crushed, 1st gr.....	"	13.40		Pure.....	"	.16		Uranium—Oxide.....	"	2.25@3.00	
				2d grade.....	"	12.40		Yellow, common.....	"	.1034		Com'l.....	"	.01	
				Ground, 1st grade.....	"	17.90		Best.....	"	.25		Sulphate, com'l.....	100 lb.	.7734	
				2d grade.....	"	16.50		Lampblack, com'l.....	"	.0434		Sulphide.....	lb.	.0134	
				Foreign, lump.....	"	8.00@12.00		Refined.....	"	.07		Sulphite crystals.....	"	.0834	
				Ground.....	"	11.50@14.00		Litharge, Am. powd.....	lb.	.0434@.0534		Sulphur—Roll.....	100 lbs.	1.85	
				Fuller's Earth—Lump.....	100 lbs.	.75		English flake.....	"	.0834		Flour.....	"	1.90	
				Refined lump.....	"	1.2		Glassmakers'.....	"	.0734@.0834		Flowers, sublimed.....	"	2.15	

THE RARE EARTHS.

	Cust. Meas.	Price
Boron—Nitrate.....	lb.	\$ 1.50
Calcium—Tungstate (Scheelite).....	"	.90</

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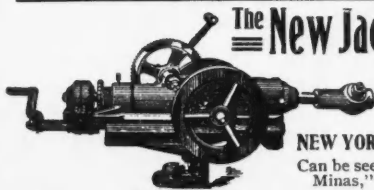
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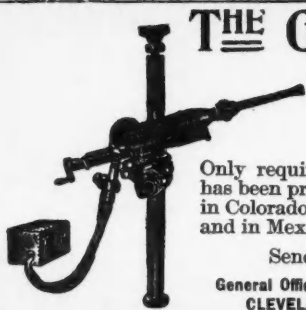
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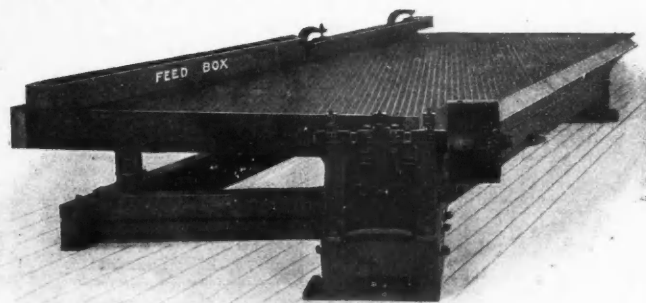
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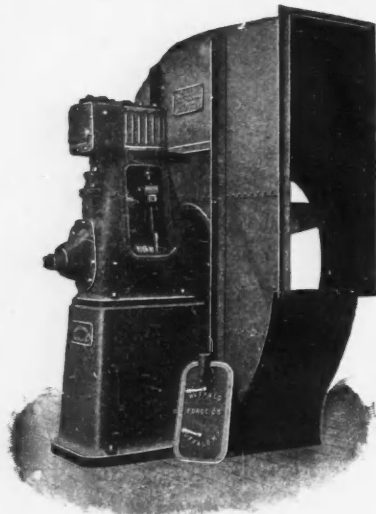
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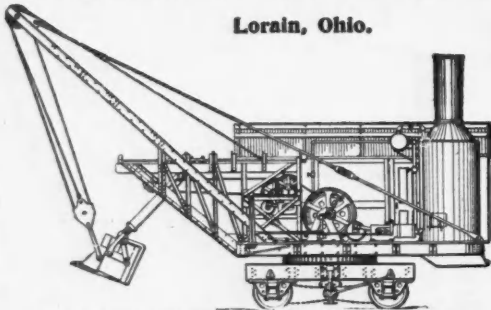
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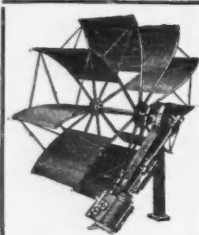
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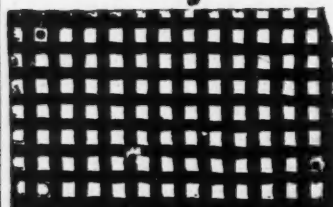
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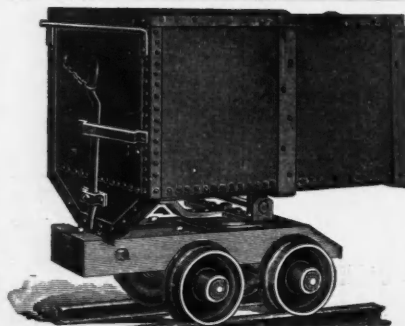
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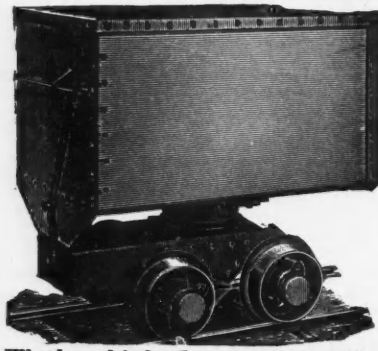
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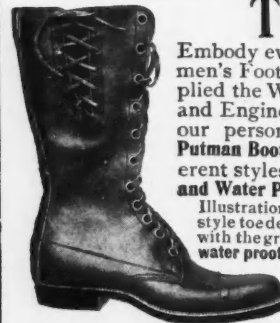
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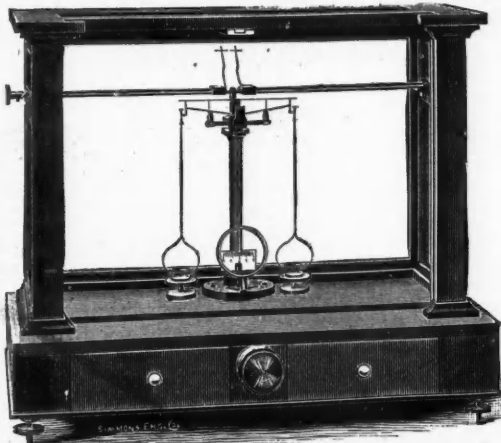
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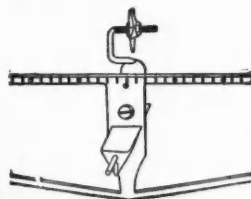
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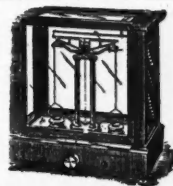
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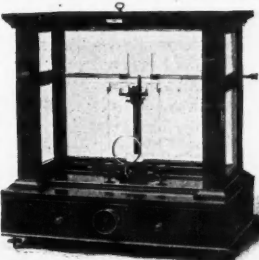
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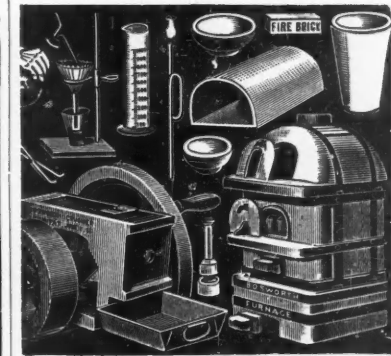
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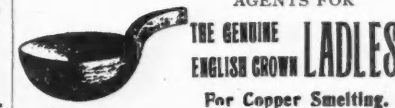
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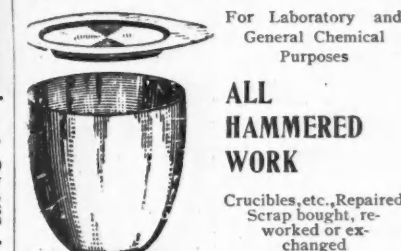


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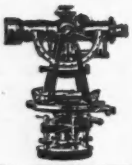
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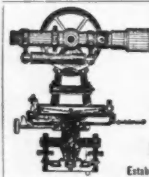
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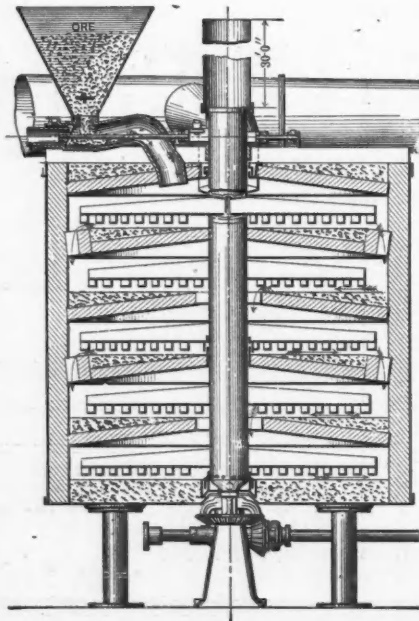
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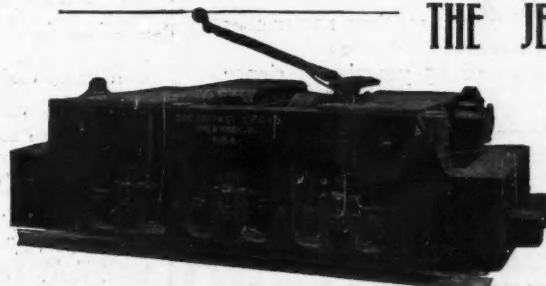
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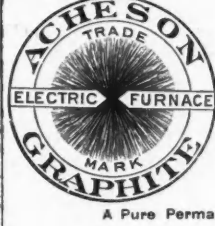
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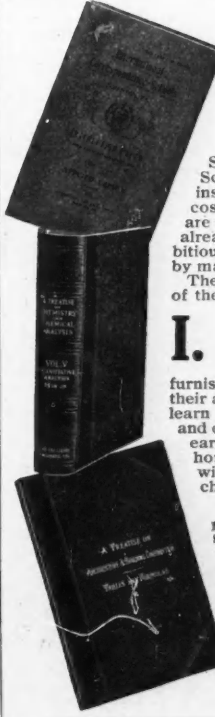
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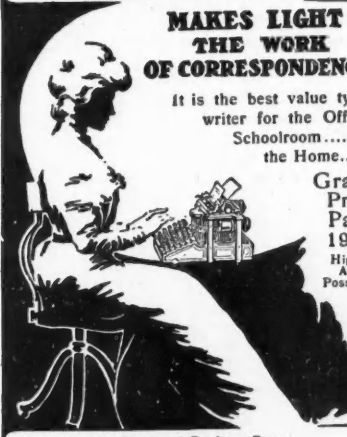
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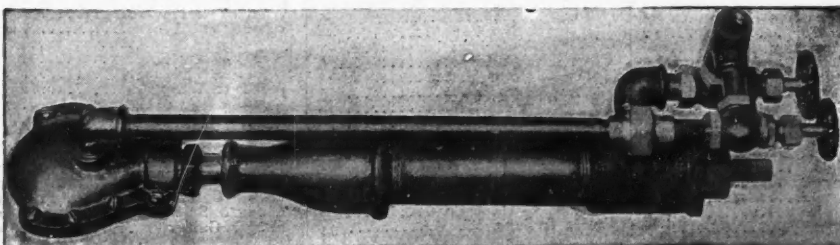
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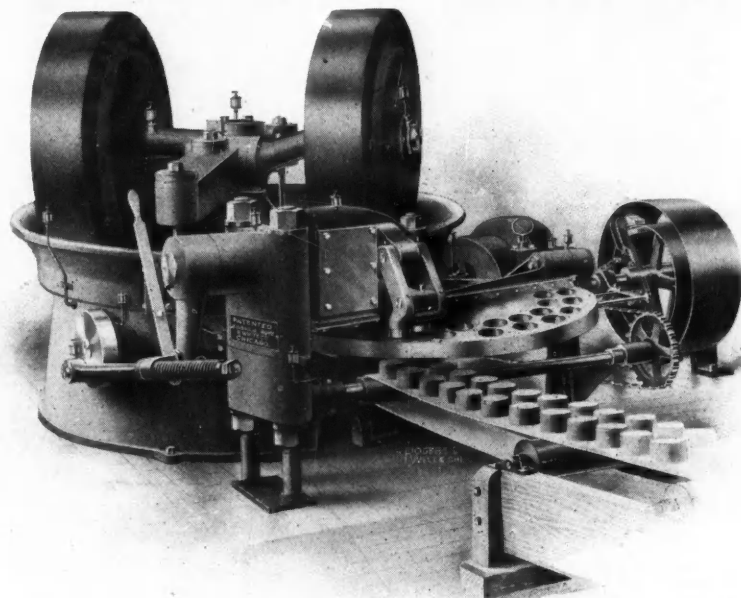
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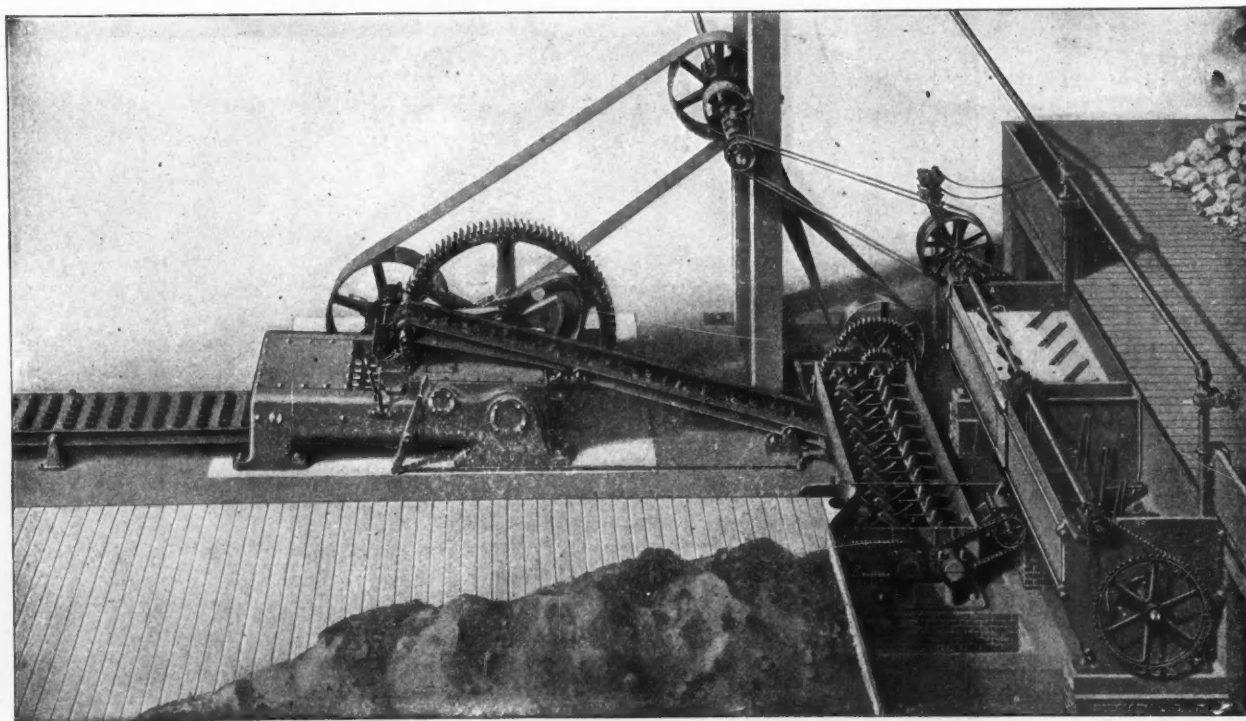
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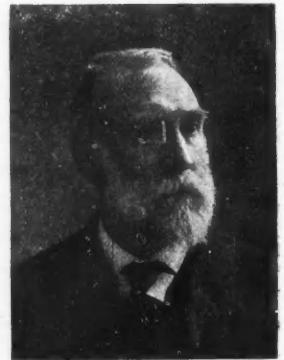
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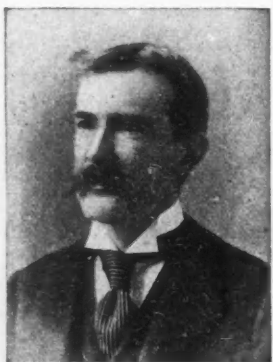
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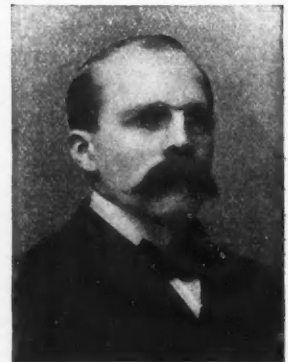
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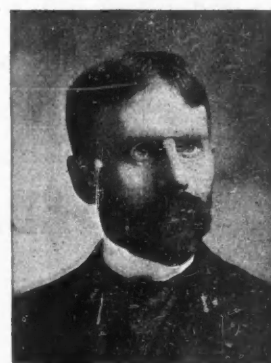
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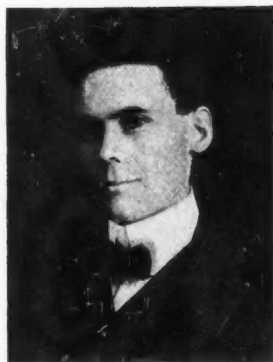
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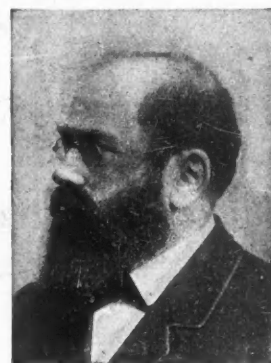
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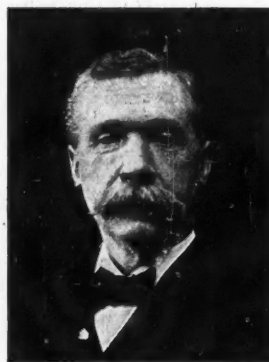
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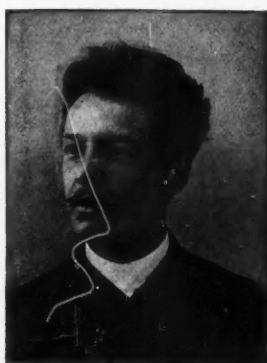
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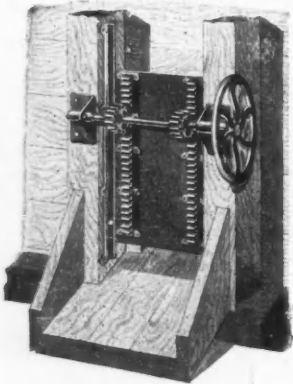
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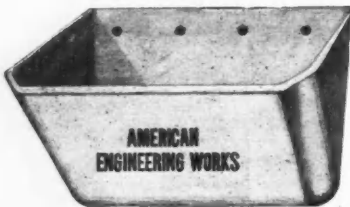
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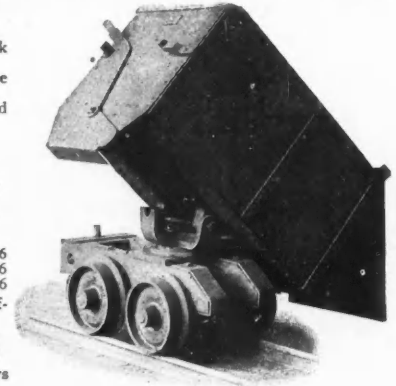
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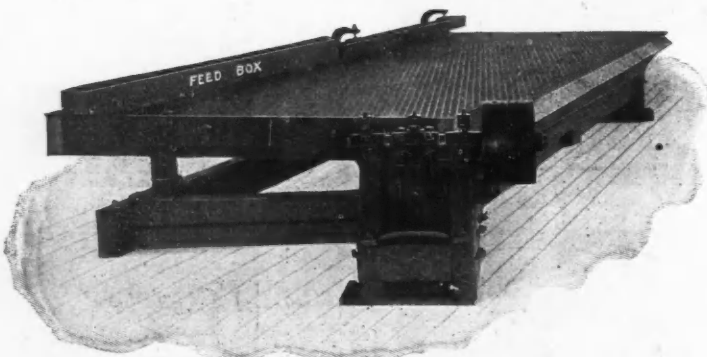
Iron Body, Brass Plug.....	3/4 in.	2 1/2 lbs.
Iron Body, Brass Plug.....	1 in.	4 1/2 lbs.
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Iron Body, Brass Plug.....	1 1/2 in.	9 lbs.
Iron Body, Brass Plug.....	2 in.	12 1/2 lbs.
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In writing for information concerning the table tell us if possible about your mill practice.—What is the nature of your ore, both as regards values and gangue? What is the size of table feed? How many tons of ore do you reduce into one ton of concentrates? Are your tailings running too high on account of slimes? We solicit correspondence and believe we can save you money.

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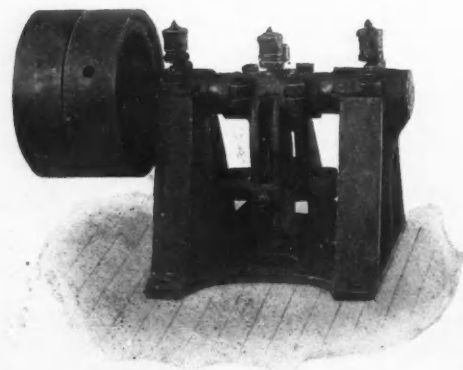
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Pulleys 14 in. x 4 in.

Speed 240 R. P. M.

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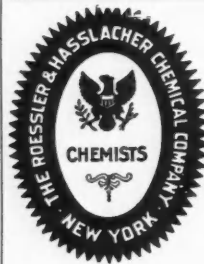
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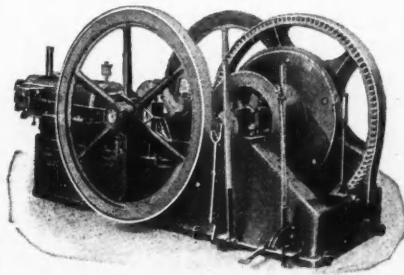
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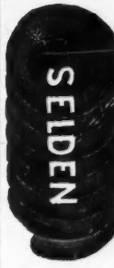
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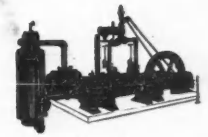
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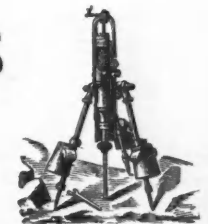
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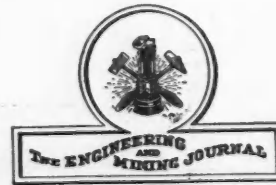
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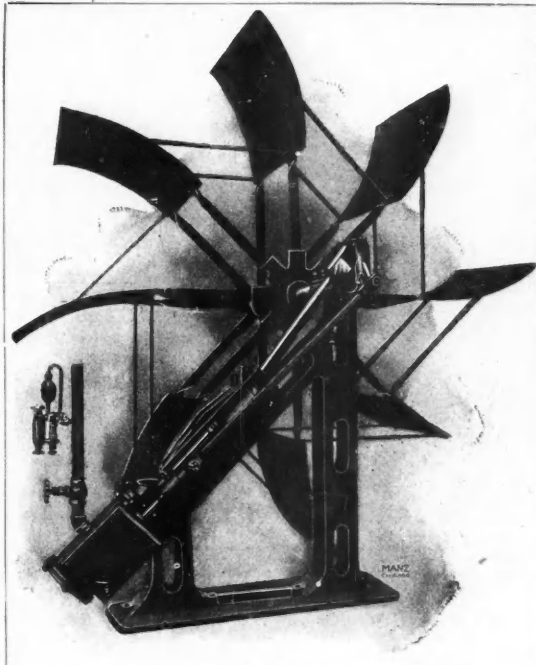
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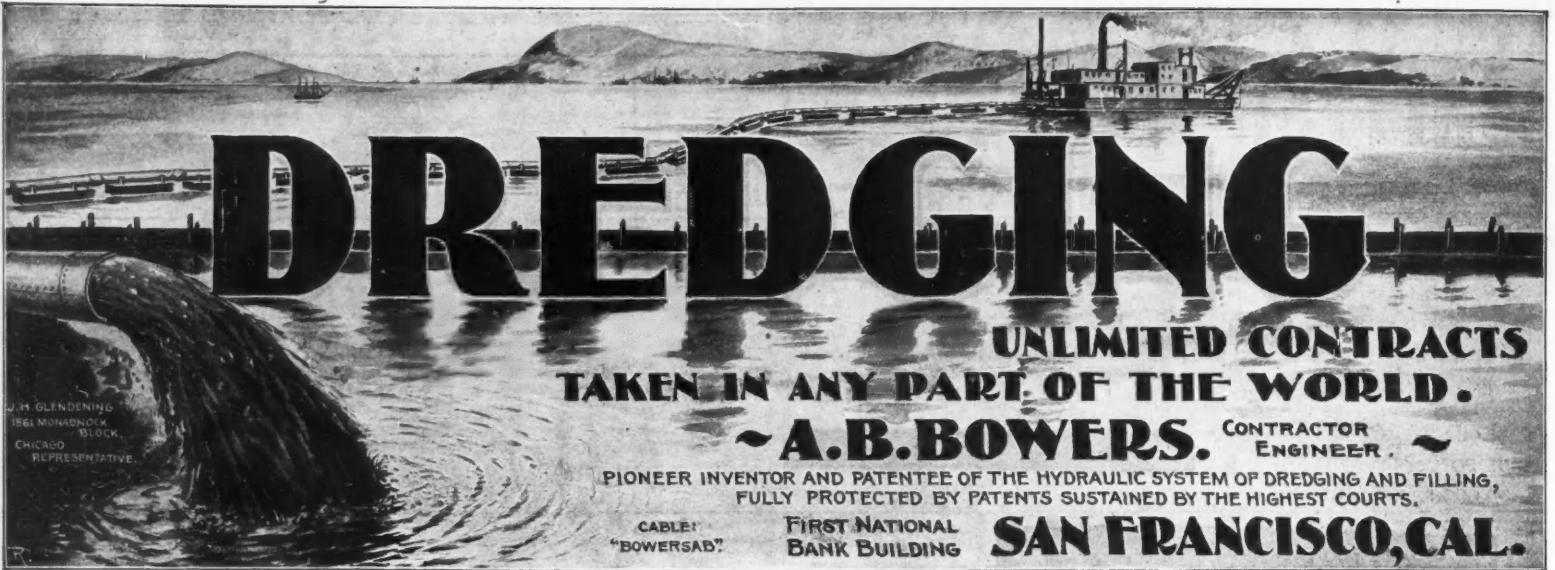


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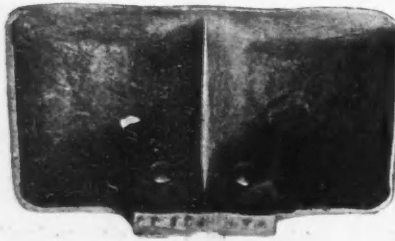
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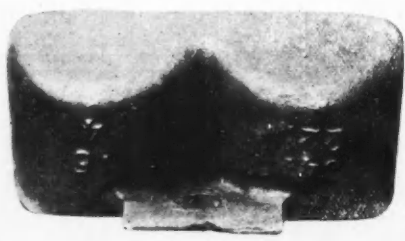
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Net, per day.....	\$1,150
Days per year.....	300
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This would enable us to pay 34½ per cent. on the market value of our total capital stock. While this estimate is made to sell at 15 cents per pound, there are many castings that we can make that will bring us 30 cents, and by running on special contracts it will never be necessary for us to sell below 20 cents, as we make the necessary tool in shape, ready for use, and by select patterns, etc., we can always get the higher and more profitable trade. But if it becomes necessary, with extended plant they can handle 30 tons Jupiter Steel per day.

60,000 lbs., sold at unnecessary low price, 8c.....	\$4,800
60,000 lbs., cost to produce, at 3½¢.....	2,100
Daily profit.....	\$2,700
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Equal 81 per cent. per year.....	\$810,000

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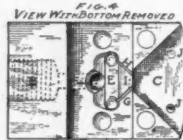
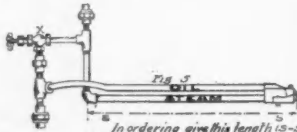
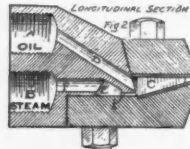
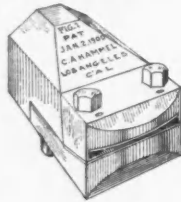
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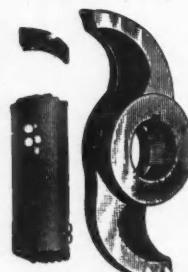


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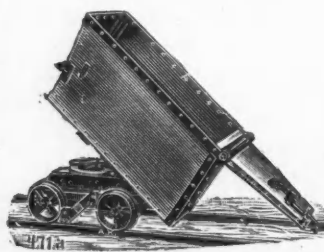
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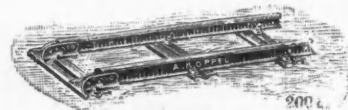
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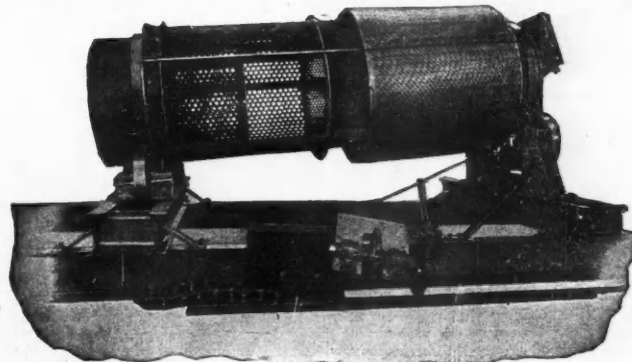
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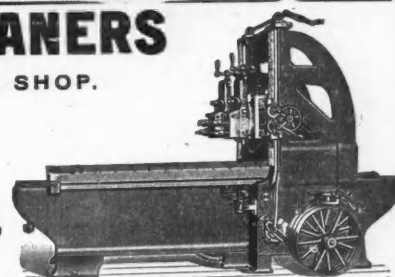
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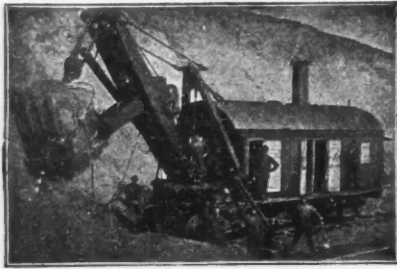
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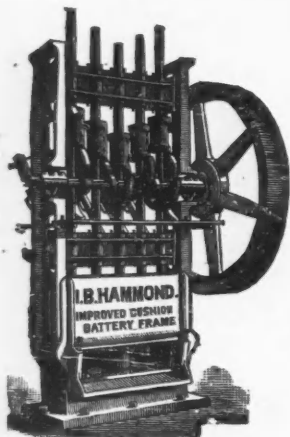
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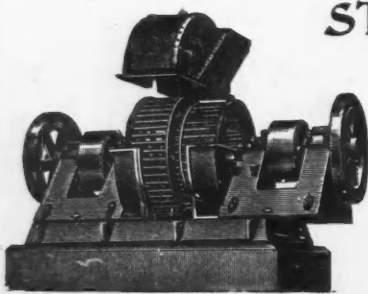
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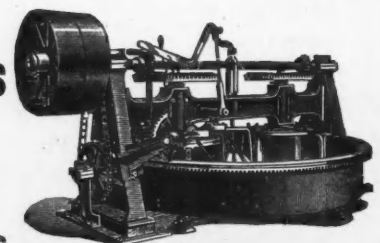
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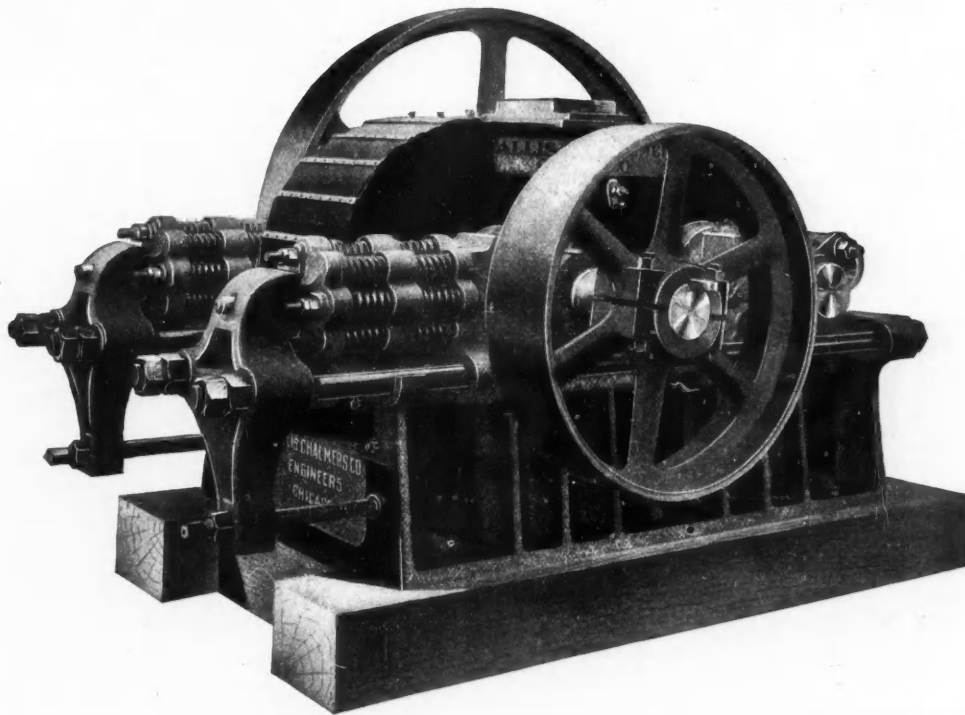
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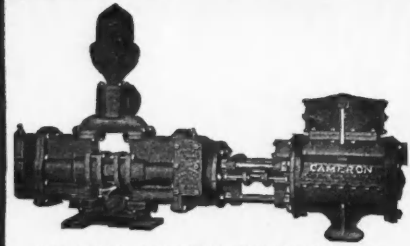


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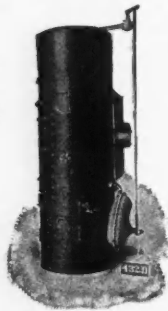
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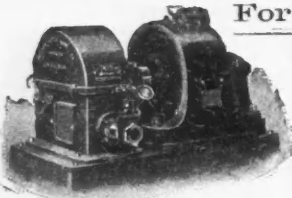
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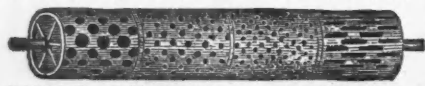
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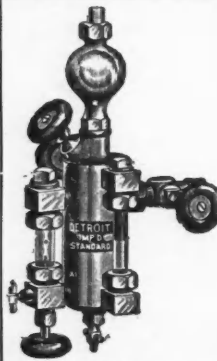


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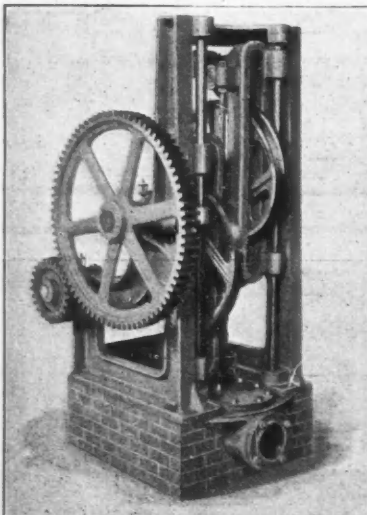
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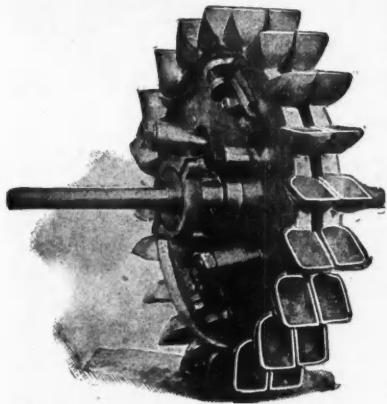
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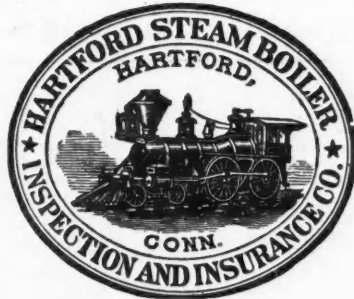
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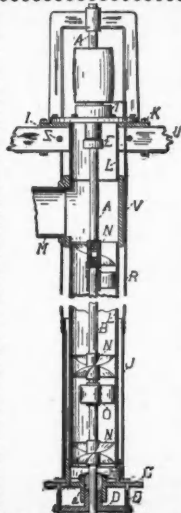
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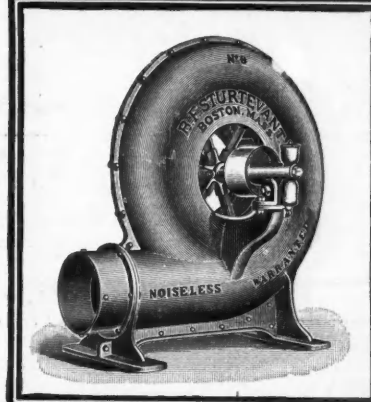
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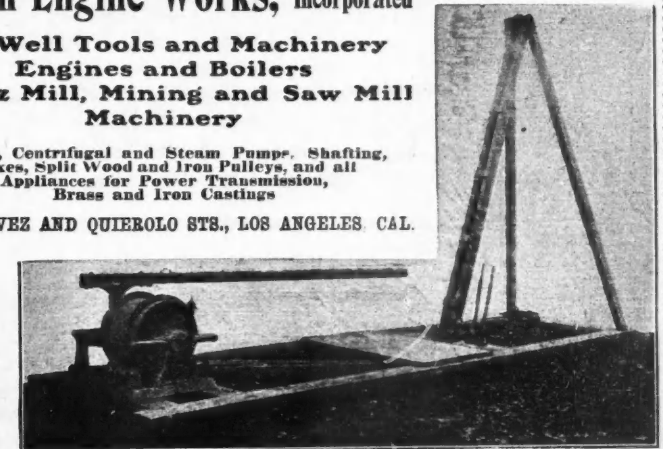
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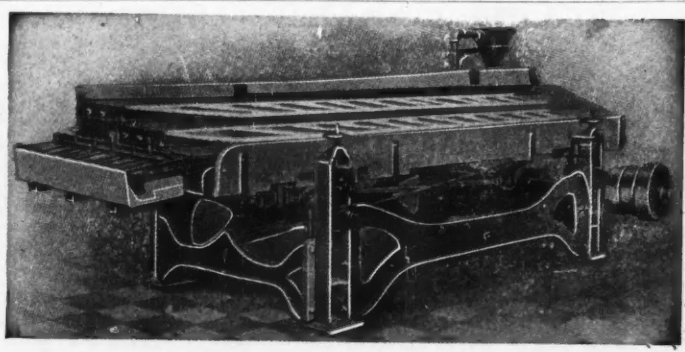
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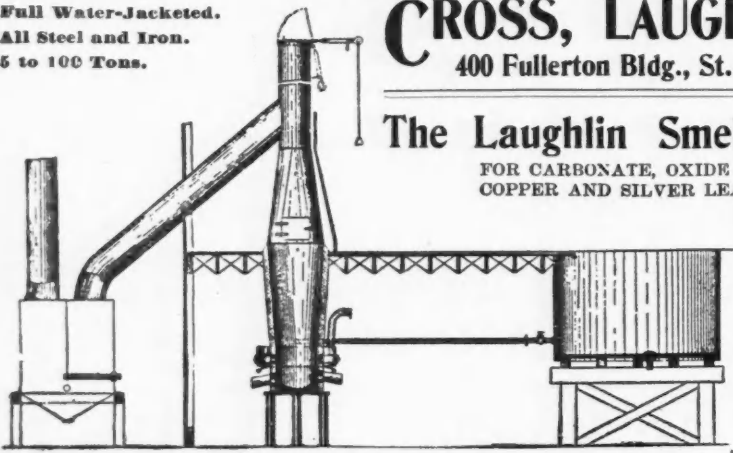
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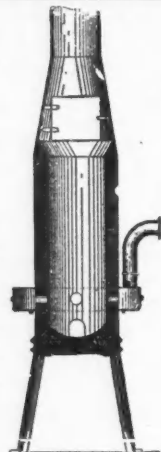


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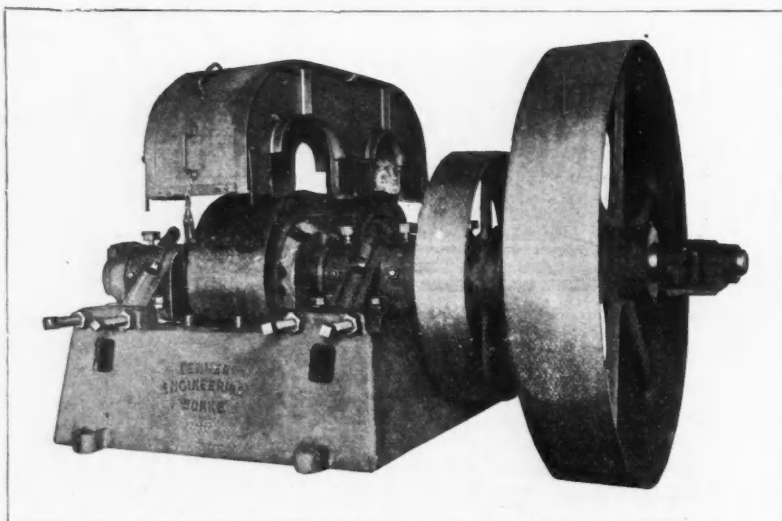
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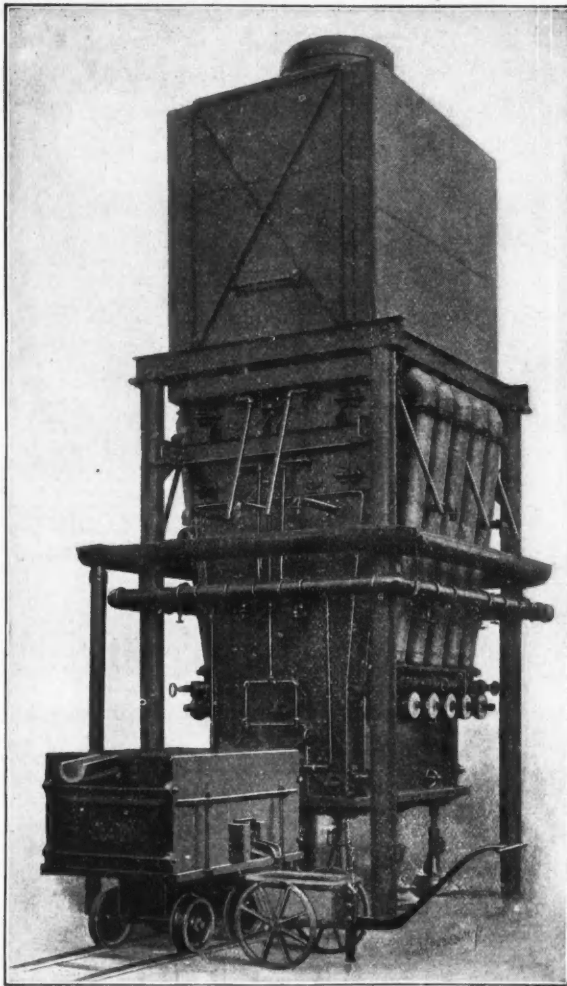
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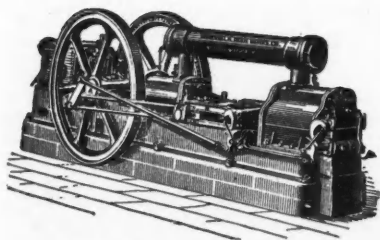
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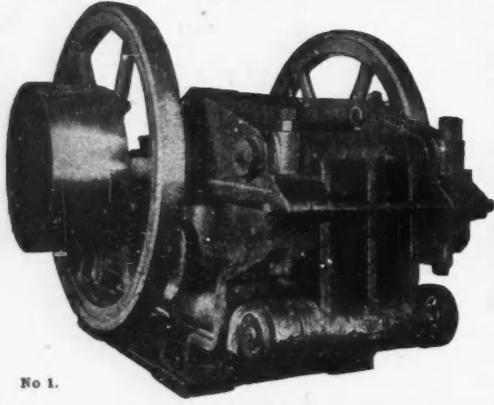
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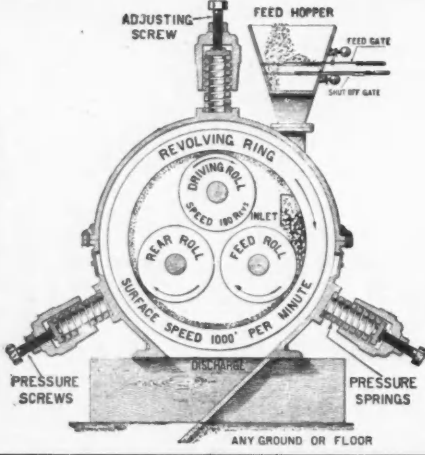
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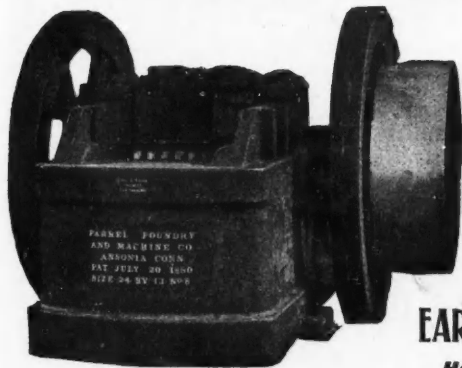
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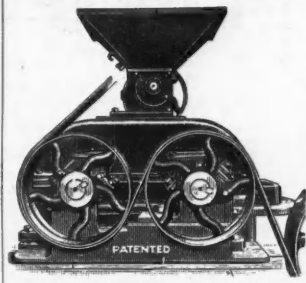


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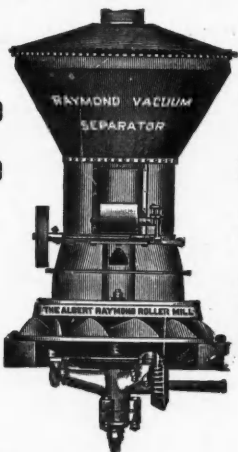
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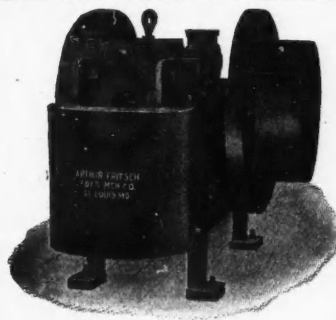


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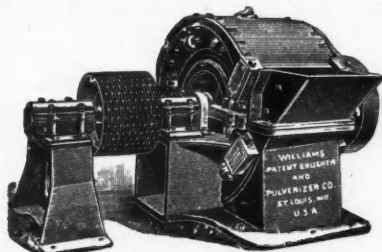
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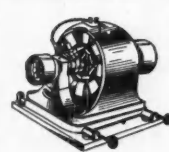
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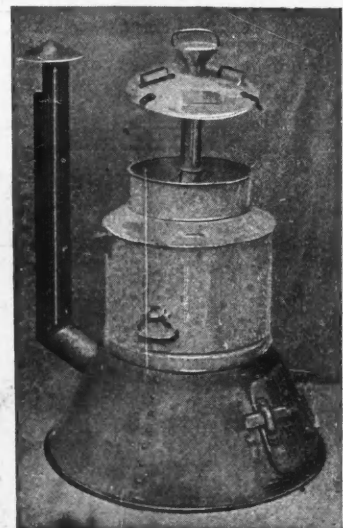
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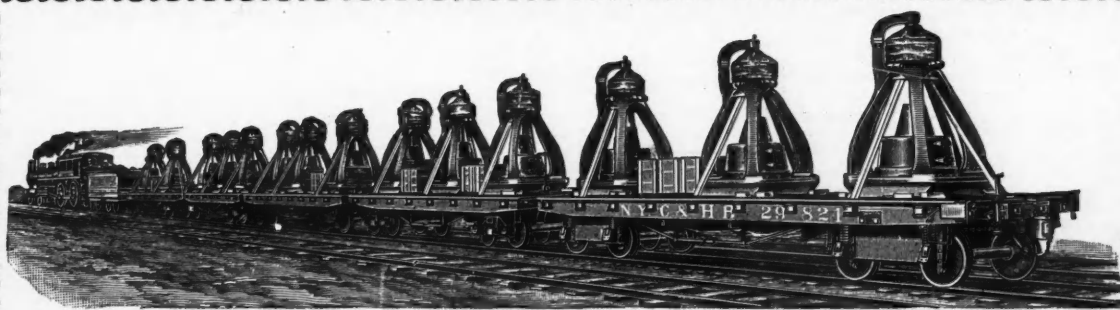
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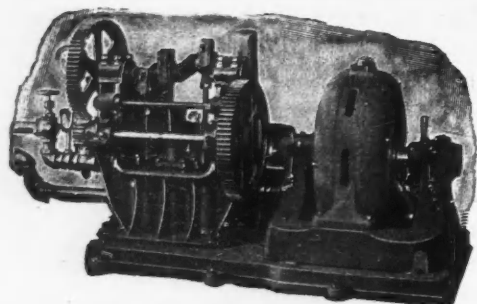
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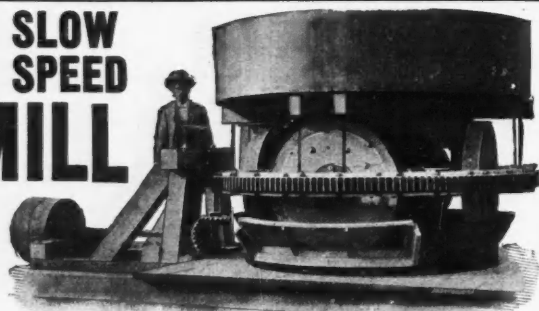
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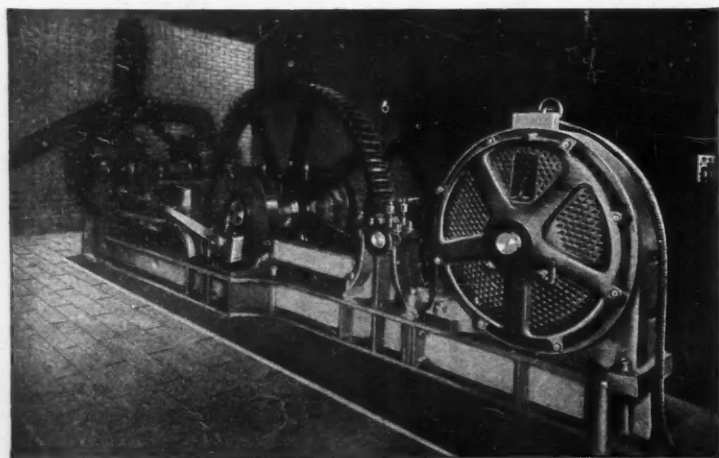
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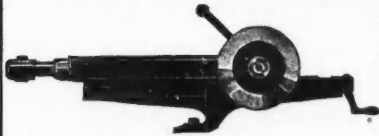
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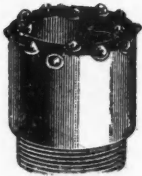
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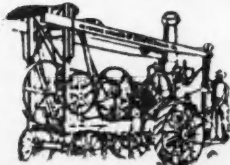
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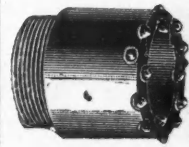
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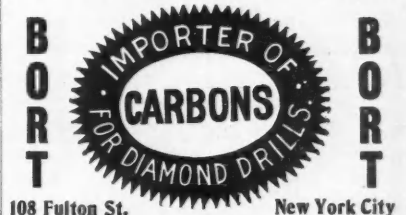
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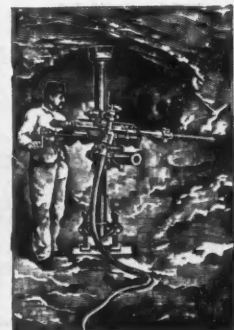
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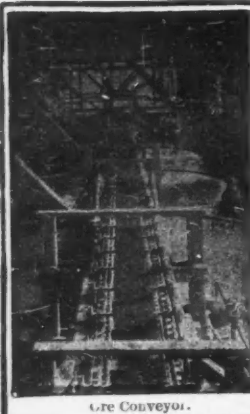
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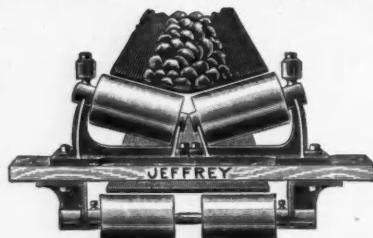
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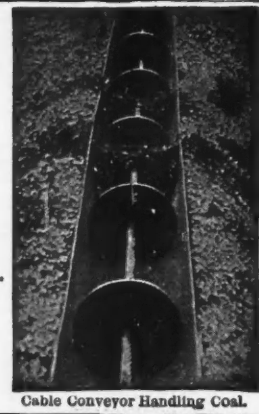


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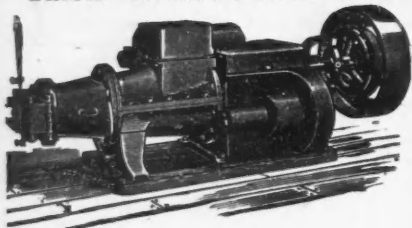
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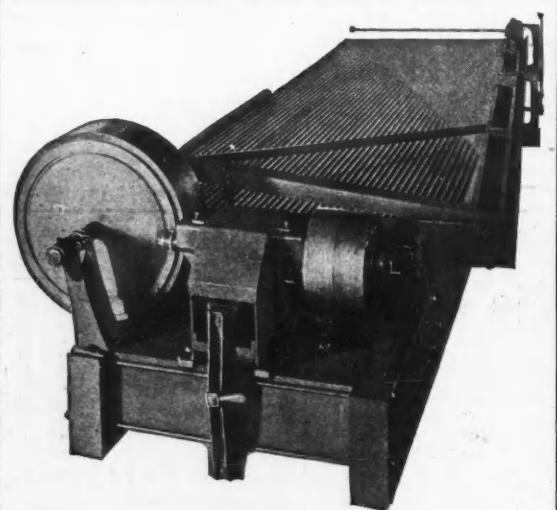
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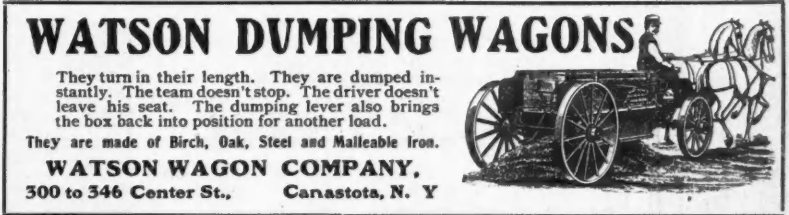
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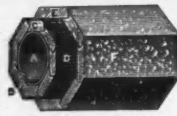
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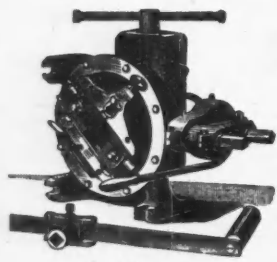
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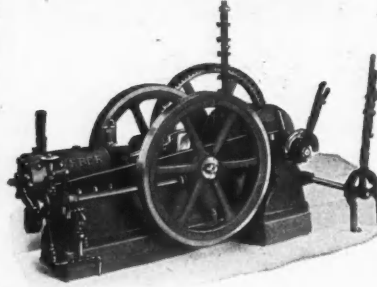
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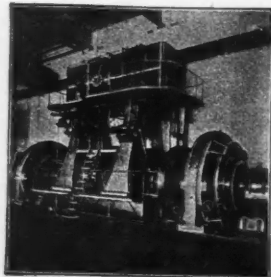
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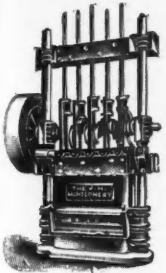
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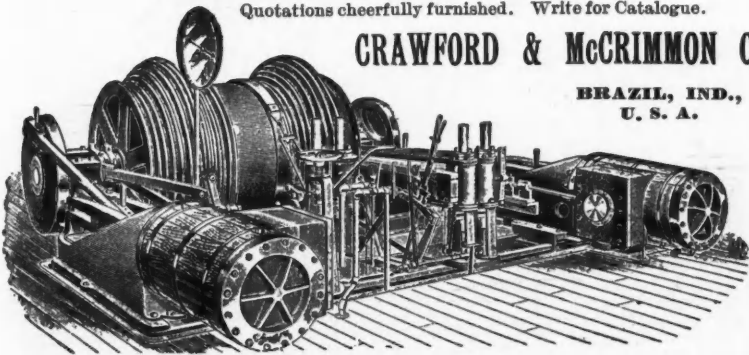
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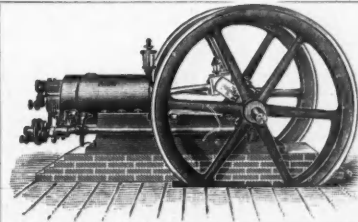
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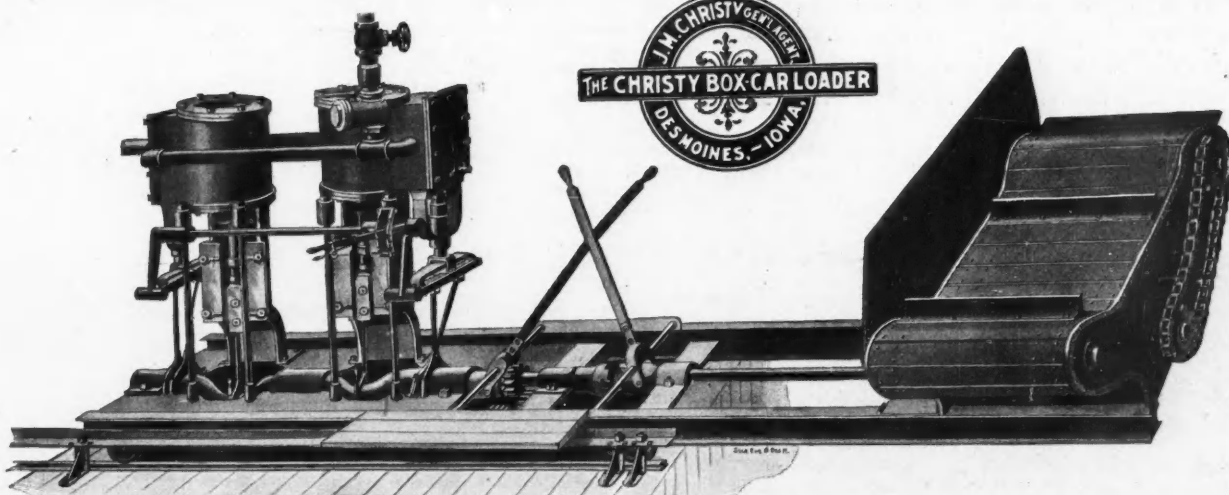
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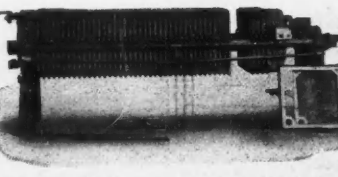
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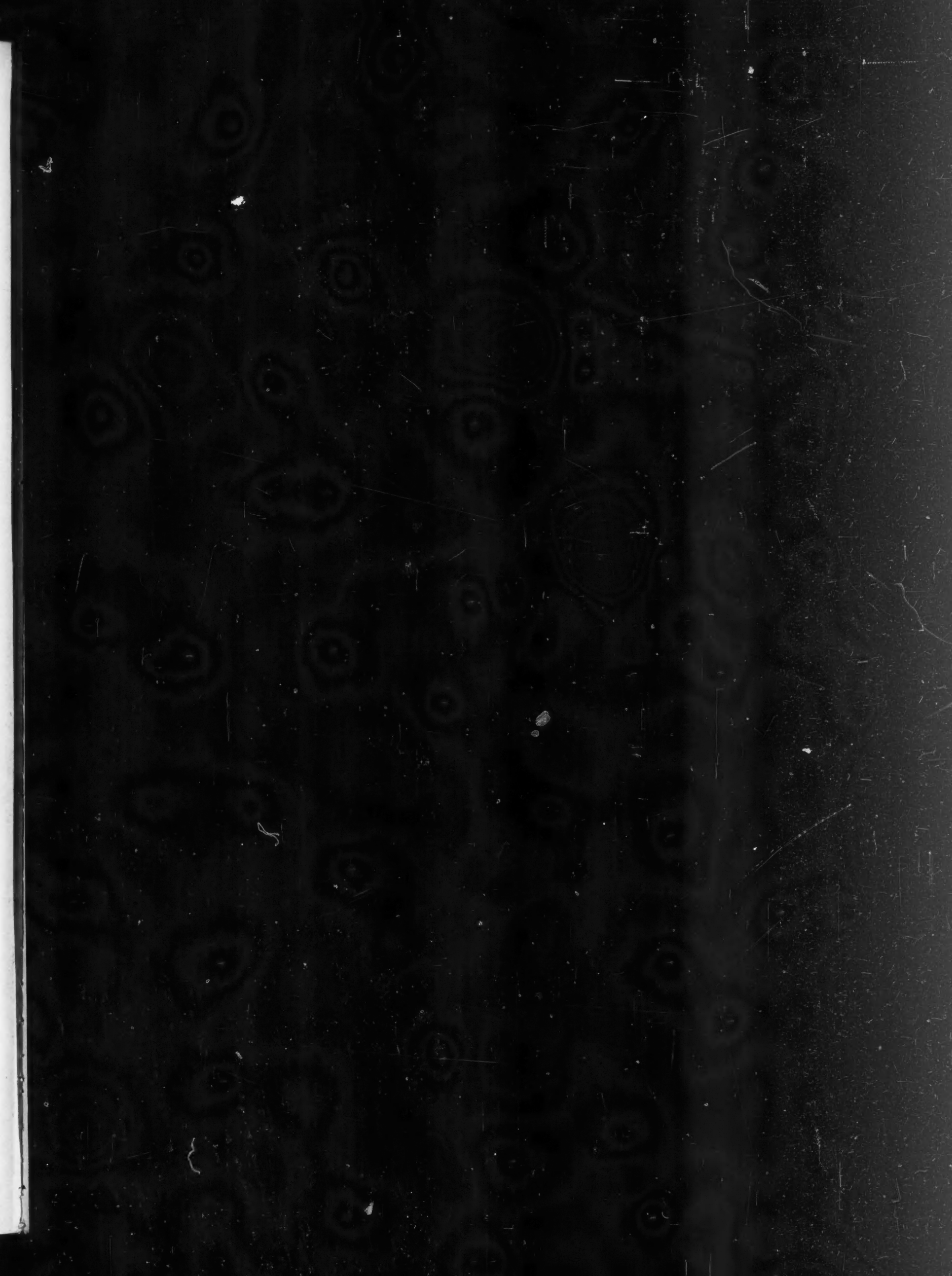
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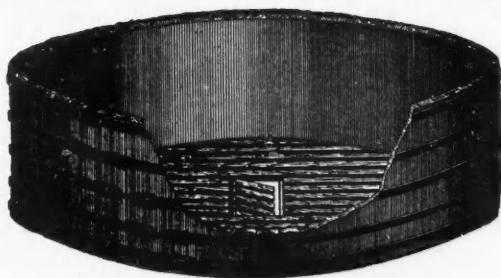
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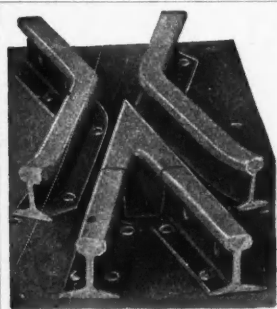


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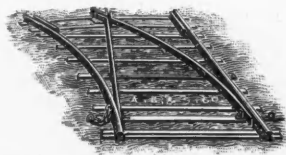


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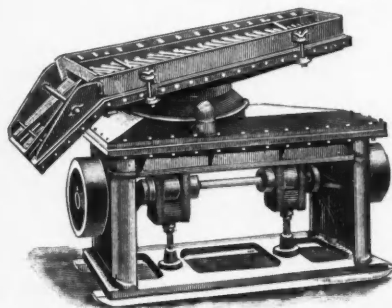
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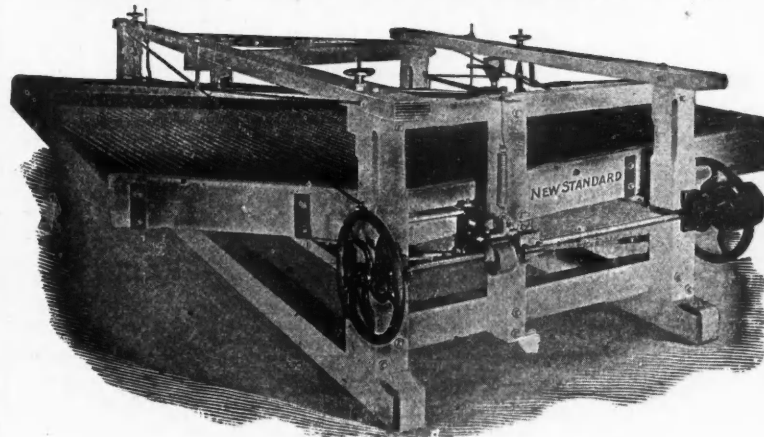
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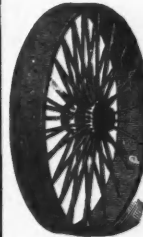
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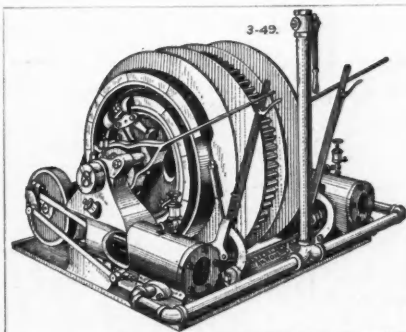
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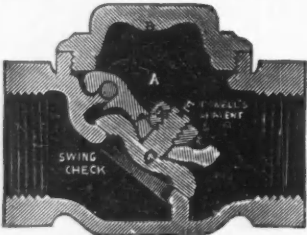
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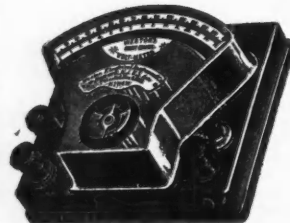
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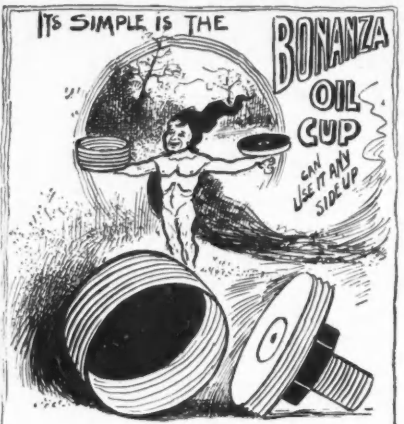
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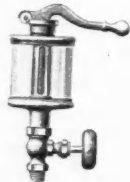


Fig. 495

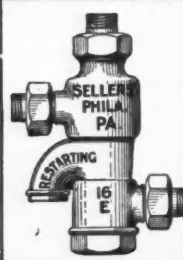
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